| MAJOR DIVISIONS | | | GROUP SYMBOLS | TYPICAL NAMES |
|---|---|---|---|---|
| COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size) | GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size) | CLEAN GRAVELS (Little or no fines) | GW | Well graded gravels, gravel - sand mixtures, little or no fines. |
| | | | GP | Poorly graded gravels or grave - sand mixtures, little or no fines. |
| | | GRAVELS WITH FINES (Appreciable amount of fines) | GM | Silty gravels, gravel - sand - silt mixtures. |
| | | | GC | Clayey gravels, gravel - sand - clay mixtures. |
| | SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 Sieve Size) | CLEAN SANDS (Little or no fines) | SW | Well graded sands, gravelly sands, little or no fines. |
| | | | SP | Poorly graded sands or gravelly sands, little or no fines. |
| | | SANDS WITH FINES (Appreciable amount of fines) | SM | Silty sands, sand - silt mixtures |
| | | | SC | Clayey sands, sand - clay mixtures. |
| FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size) | SILTS AND CLAYS (Liquid limit LESS than 50) | | ML | Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts and with slight plasticity. |
| | | | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. |
| | | | OL | Organic silts and organic silty clays of low plasticity. |
| | SILTS AND CLAYS (Liquid limit GREATER than 50) | | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts. |
| | | | CH | Inorganic clays of high plasticity, fat clays |
| | | | OH | Organic clays of medium to high plasticity, organic silts. |
| HIGHLY ORGANIC SOILS | | | PT | Peat and other highly organic soils. |

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

| SILT OR CLAY | SAND | | | GRAVEL | | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|
| | Fine | Medium | Coarse | Fine | Coarse | | |

No.200 No.40 No.10 No.4 3/4" 3" 12"

U.S. STANDARD SIEVE SIZE

Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)

| | GROUP SYMBOLS | TYPICAL NAMES |
|---|---|---|
| SAMPLE TYPE | SPT | Split Spoon Sample |
| | CME | Continuous Soil Sample |
| | UD | Undisturbed Sample |
| | GRAB | Bulk Sample |

ABBREVIATIONS

CHE - Chemical Analysis
CN - Consolidation test
GSZ - Grain size distribution test
H - Hydrometer test
PRS - Proctor test, Standard
PRM - Proctor test, Modified
SG - Specific Gravity test
TXD - Resonant Column /Torsional Shear
TXS - Triaxial test, Static
UC - Unconfined Compression test
WOR - Weight of Rod
NA - Not Applicable
ND - Not Determined

Correlation of Penetration Resistance with Relative Density and Consistency

| SAND & GRAVEL | | SILT & CLAY | |
|---|---|---|---|
| No. of Blows | Relative Density | No. of Blows | Consistency |
| < 4 | Very Loose | < 2 | Very Soft |
| 4 - 10 | Loose | 2 - 4 | Soft |
| 10 - 30 | Medium Dense | 4 - 8 | Medium Stiff |
| 30 - 50 | Dense | 8 - 15 | Stiff |
| > 50 | Very Dense | 15 - 30 | Very Stiff |
| | | > 30 | Hard |

| | |
|---|---|
| **Datum Reference Information** | Horizontal - NAD 83 (1992) |
| | Elevation - NAVD 88 |

# KEY TO SYMBOLS AND DESCRIPTIONS FOR SOIL LOGS

MACTEC

1) Note A - Water Level Data. Measured ground water levels during drilling are summarized on the last page of the rock log. If there is no rock log ( borings ending in -UDS or UDD) then the ground water levels are noted on the last page of the soil log.

2) Suffix- Certain borings designations end in with a -PS, -A, -UDS, -UDD. These represent borings offset up to 10 feet from the original locations for the following reasons:

-PS, drilled specifically for logging of soil with P-S Suspension logging tool.
-A, make up hole due to obstruction or abandonment at original location
-UDS, Boring to obtain undisturbed samples for static tests
-UDD, Boring to obtain undisturbed samples for dynamic tests

3) Color descriptors in Lithology Section - Color code for soil (e.g. 5YR 5/8) is based on Munsell Soil Color Chart designations (based on U.S. Dept. of Agriculture Handbook 18). Color code for rock (e.g. 5B 5/1) is based on The GSA Rock-Color Chart (The Geological Society of America)

## GENERAL NOTES FOR SOIL AND ROCK LOGS

## ROCK SYMBOLS AND NAMES

| | | | |
|---|---|---|---|
| ROCK | LIMESTONE | SOIL IN-FILL OF VOIDS | |
| | SHALE | OPEN VOID | |

### WEATHERING (abbreviation)

FRESH (F) - No visible sign of rock material weathering; perhaps slight discoloration on major discontinuity surfaces.

SLIGHTY WEATHERED (SW) - Rock mass is generally fresh with slight discoloration in rock fabric. Discontinuities are stained and may contain clay. Decomposition extends up to 1" into rock.

MODERATELY WEATHERED (MW) - Less than 50% of rock is decomposed. Significant portion of rock shows discoloration and weathering effects.

HIGHLY WEATHERED (HW) - Rock mass is more than 50% decomposed. Rock can be broken by hand or scraped with knife or pick.

COMPLETELY WEATHERED (CW) - Rock mass is completely decomposed but rock fabric and structure may still be evident. Specimen is easily crumbled or penetrated with knife or pick.

### ROCK STRENGTH (abbreviation)

EXTREMELY WEAK (R0) - Can be indented with difficulty by thumbnail. May be friable or moldable with finger pressure.

VERY WEAK (R1) - Crumbles under firm blows with point of hammer. Can be pealed by a knife.

WEAK (R2) - Can be pealed or scraped by a knife with difficulty. Cannot be scratched by fingernail. Shallow indentation made by firm blow of hammer.

MEDIUM STRONG (R3) - Cannot be scraped or picked with a knife.

STRONG (R4) - More than one blow of geologic hammer required to fracture specimen.

VERY STRONG (R5) - Specimen requires many hard blows of hammer to fracture or chip.

### IN-SITU TESTS

BHTV - Borehole televiewer
DH - Downhole logging
GJ - Goodman Jack test
NG - Natural Gamma logging
PA - Packer test
PS - P-S Suspension logging

### DISCONTINUITIES (abbreviations)

| | |
|---|---|
| Bj - Bedding joint | Pl - Planar joint |
| Bb - Bedding break | Ro - Rough surface |
| Fa - Fault | Sl - Slightly rough |
| Jo - Joint | Sm - Smooth surface |
| Mb - Mechanical break | St - Stepped joint |
| Sh - Shear break | VR - Very rough |
| Ve - Vein | Wa - Wavy joint |

Apperture: He - Healed, Op - Open
Ti - Tight, Fi - Filled

### GEOLOGIC UNITS (abbreviations)

| | | |
|---|---|---|
| NV | Nashville | Limestone, above the T3 bentonite |
| USR | Upper Stones River | Limestone with shale interbeds |
| A | Unit A (Stones River) | Interbedded shale and limestone |
| B | Unit B (Stones River) | Limestone |
| C | Unit C (Stones River) | Shale with limestone interbeds |
| D | Unit D (Stones River) | Limestone |
| E | Unit E (Stones River) | Shale with limestone interbeds |
| F | Unit F (Stones River) | Limestone |
| LSR | Lower Stones River | Limestone with shale interbeds |

| | |
|---|---|
| **Datum Reference Information** | Horizontal - NAD 83 (1992) |
| | Elevation - NAVD 88 |

## KEY TO SYMBOLS AND DESCRIPTIONS FOR ROCK LOGS

MACTEC

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC | WLA William Lettis & Associates, Inc

# SOIL LOG - Boring No. B-1000

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533129.7 N; 628373.5 E | | Total Depth<br>185.9 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>611.9 feet | Ground Water Depth<br>See Note A | Date Started<br>6/19/06 |
| Sampling Method<br>Split Spoon/HQ coring | Borehole Inclination<br>Vertical | Logged by<br>K. Krug | Date Completed<br>6/22/06 |

Reviewed by / Date DSC 3-13-07 W Golem 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 611.9 0.0 CLAY with sand, dark red (2.5YR 3/6), moist, medium stiff, few organics | | 610 |
| | | SPT 1 | 2 3 3 | 12 | | | | | | | | |
| | | SPT 2 | 3 6 6 | 15.6 | | | | | MH | 607.7 4.2 SILT with sand, yellowish red (5YR 5/8), moist, stiff to very stiff, few angular clasts, trace organics and magnesium oxide nodules | | 605 |
| 5 | | SPT 3 | 3 5 8 | 8.4 | 23.4 | 59/25 | GSZ | | | | | |
| | | SPT 4 | 3 5 11 | 18 | | | | | | | | |
| 10 | | | | | | | | | CH | 600.9 11.0 CLAY, reddish brown (5YR 5/4), moist, stiff, few sand, trace gravel | | 600 |
| | | SPT 5 | 2 3 7 | 18.6 | 23.3 | 95/68 | GSZ | | | | | |
| | | SPT 6 | 2 3 6 | 10.2 | | | | | | | | |
| 15 | | SPT 7 | 11 32/0" | 18 | | | | | | 595.4 16.5 | Auger and SPT refusal at 16.5 feet. Continuation of borehole description in rock log. Coring begins at 16.0 feet. | 595 |
| 20 | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC | WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1000

| | | | |
|---|---|---|---|
| Drilling Method: Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft) 1533129.7 N; 628373.5 E | | Total Depth: 185.9 feet |
| Drilling Contractor (Driller) and Rig: MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88): 611.9 feet | Ground Water Depth: See Note A | Date Started: 6/19/06 |
| Casing Size and Depth: HW: 4.5 inch O.D. / 16 feet | Borehole Inclination: Vertical | Logged by: K. Krug | Date Completed: 6/22/06 |

Reviewed by / Date: DSC 3-13-07 W Stokes 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 5.0/5.0 | 99 | SW to F | R3 | | | | | | LIMESTONE (micrite) with interbedded calcareous shale; micrite is dark gray (4/N) and shale is very dark gray (3/N); fresh to slightly weathered; medium strong<br>- 16-22.8 feet: shale is 0.1 feet thick with spacings of 0.01-0.2 feet<br>- 19 feet: large calcite vug | Coring begins at 16.0 feet.<br>16.5-22 feet: Good fluid return | 595 |
| 25 | 2 | 4.9/5.0 | 100 | F | R3 | | | | | | - 22.8-30.4 feet: shale layers are 0.1 - 0.2 feet thick with spacings of 0.2 - 0.4 feet | 21.1 to 22.8 feet: bioturbation<br>22 feet: Lost fluid return and did not recover throughout the boring. | 590 |
| 30 | 3 | 4.6/5.0 | 100 | | | | | | | | | 27.69 feet: Unconfined Compression Test | 585 |
| 35 | 4 | 5.1/5.0 | 100 | F | R3 | | | | Jo, 65, Wa, Ro, Ti | | - 30.4-33 feet: diffuse shale bed boundaries, calcite vugs | | 580 |
| 40 | 5 | 5.3/5.0 | 100 | | | | | | | D | | | 575 |
| 45 | 6 | 5.1/5.0 | 100 | F | R3 | | | | | | - 44.7 feet: shale beds become planar, calcite vugs from 45-50.9 feet | 43.88 feet: Unconfined Compression Test | 570 |
| 50 | 7 | 5.1/5.0 | 100 | | | | | | | | | | 565 |
| 55 | 8 | 5.1/5.0 | 100 | F | R3 | | | | | | - 51-55 feet: packstone and wackestone intervals<br>LIMESTONE (micrite) with interbedded calcareous shale, micrite is dark gray (4/N) and shale is very | | 560 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1000

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 4.7/5.0 | 93 | | | | | | | | dark gray (3/N), fresh, medium strong, fossiliferous | | 555 |
| 60 | | | | | | | | | | | | | |
| | 10 | 5.2/5.0 | 100 | | | | | | | | | | 550 |
| 65 | | | | F | R3 | | | | | | - 65.4-69.8 feet: limestone 90%<br>- 66-69.1 feet: shale is <0.1 feet thick and laminated | | |
| | 11 | 5.0/5.0 | 100 | | | | | | | | | | 545 |
| 70 | | | | | | | | | | | | 69 feet: calcite vugs<br>70 to 95.8 feet: calcite vugs common | |
| | 12 | 5.2/5.0 | 100 | | | | | | | | | | 540 |
| 75 | | | | F | R3 | | | | | D | | | |
| | 13 | 5.2/5.0 | 100 | | | | | | | | - 77.1-77.9 feet: pure limestone-micrite<br>LIMESTONE (micrite) with interbedded calcareous shale; micrite is dark gray (4/N) and shale is very dark gray (3/N); fresh; medium strong; shale beds are diffuse boundaries, laminated to thin, irregular | | 535 |
| 80 | | | | | | | | | | | | | |
| | 14 | 4.8/5.0 | 96 | | | | | | | | | | 530 |
| 85 | | | | F | R3 | | | | | | - 85.7-93 feet: shale is laminated, planar and closely spaced | | |
| | 15 | 5.2/5.0 | 97 | | | | | | | | | | 525 |
| 90 | | | | | | | | | | | | | |
| | 16 | 5.0/5.0 | 100 | | | | | | | | - 93-95.8 feet: shale constitutes ~40% of the rock, diffuse bedding pattern | | 520 |
| 95 | | | | F | R3 | | | | | | - 95.8-97.8 feet: shale is 0.01 - 0.1 feet thick with | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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# ROCK LOG - Boring No. B-1000

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 17 | 5.2/5.0 | 100 | | | | | | | | spacings of 0.001 - 0.1 feet | | 515 |
| 100 | | | | | | | | | | | LIMESTONE (wackestone); dark gray (4/N); fresh; strong; no shale | | |
| | 18 | 5.1/5.0 | 100 | | | | | | | D | - 102-102.8 feet: bioturbation infilled with calcite | | 510 |
| 105 | | | | F | R4 | | | | | | LIMESTONE (micrite) with interbeds of calcareous shale; micrite is dark gray (4/N) and shale is very dark gray (3/N); fresh; medium strong; contains scattered intervals of wackestone; locally very fossiliferous | | |
| | 19 | 4.8/5.0 | 88 | | | | | | | | - 105-123.5 feet: shale is very thin to laminated, wavy and spacing at 0.1 to 0.3 feet<br>- 107.9-108.3 feet: disturbed bedding, ~30% calcite<br>- 109.1-110.4 feet: shale dominant zone ~60% | | 505 |
| 110 | | | | | | | | | | | | | |
| | 20 | 5.1/5.0 | 100 | | | | | | | | | | 500 |
| 115 | | | | F | R3 | | | | | | | | |
| | 21 | 4.4/5.0 | 72 | | | | | | | E | - 117.2 -120.1 feet: zone with very little shale | 118.3-120.65 feet: core overdrilled (disturbed) | 495 |
| 120 | | | | | | | | | | | | | |
| | 22 | 5.0/5.0 | 99 | | | | | | | | - 123.5-132.1 feet: shale bed thicknesses increase to 0.01 - 0.2 feet with spacings of 0.1 feet | | 490 |
| 125 | | | | F | R3 | | | | | | | | |
| | 23 | 5.0/5.0 | 100 | | | | | | | | - 127.5-128.4 feet: brecciated limestone structure | | 485 |
| 130 | | | | | | | | Jo, 75, Wa, Ro, Ti | | | | | |
| | 24 | 5.0/5.0 | 100 | | | | | | | F | - 132.1-132.6 feet: wackestone mixed with calcareous shale, diffuse bedding<br>- 132.6-138.4 feet: shale is laminated and beds spaced at 0.1-0.3 feet | | 480 |
| 135 | | | | F | R3 | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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# ROCK LOG - Boring No. B-1000

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140 | 25 | 5.0/5.0 | 100 | | | | | | Uo, 50, St, Ro, Ti | | - 138.4-139 feet: pure shale bed<br>- 139-186.9 feet: shale bedding laminated to thin, wavy to planar with occasional diffuse boundaries | | 475 |
| 145 | 26 | 5.0/5.0 | 100 | F | R3 | | | | | | | | 470 |
| 150 | 27 | 5.1/5.0 | 100 | | | | | | | | | | 465 |
| 155 | 28 | 5.0/5.0 | 99 | F | R3 | | | | | F | | | 460 |
| 160 | 29 | 5.0/5.0 | 100 | | | | | | | | | | 455 |
| 165 | 30 | 5.2/5.0 | 100 | F | R3 | | | | | | - 162-163 feet: heavily deformed beds | | 450 |
| 170 | 31 | 5.2/5.0 | 98 | | | | | | | | | | 445 |
| 175 | 32 | 5.0/5.0 | 100 | F | R3 | | | | | | - 174.7-175.3 feet: highly deformed shale bed<br>- 175.2-176.1 feet: wackestone with thin shale beds | | 440 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1000

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 33 | 4.7/5.0 | 94 | | | | | | | F | - 178.5-180.2 feet: shale bed with calcite stylolite | | 435 |
| 180 | | | | | | | | | | | - 180.2-181.1 feet: wackestone with diffuse shale beds, calcite infill | | |
| | 34 | 5.2/4.8 | 100 | F | R3 | | | | | LSR | | | 430 |
| 185 | | | | | | | | | | | | | |
| | | | | | | | | | | | Boring terminated at 185.9 feet | | 425 |
| | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/20 - 16.9 feet<br>6/21 - 15.6 feet<br>6/22 - 15.8 feet | | |
| 190 | | | | | | | | | | | | | 420 |
| 195 | | | | | | | | | | | | | 415 |
| 200 | | | | | | | | | | | | | 410 |
| 205 | | | | | | | | | | | | | 405 |
| 210 | | | | | | | | | | | | | 400 |
| 215 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1001

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash / HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533081.9 N; 628359.4 E | | Total Depth<br>176.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>611.3 feet | Ground Water Depth<br>See Note A | Date Started<br>7/11/06 |
| Sampling Method | Borehole Inclination<br>-60 | Logged by<br>J. Hoeft | Date Completed<br>7/18/06 |

Reviewed by / Date W Johnson 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 611.3 — 0.0 | | 610 |
| 5 | | | | | | | | | | Soil Sampling not conducted. Refer to adjacent vertical boring B-1001A for soil profile. | | 605 |
| 10 | | | | | | | | | | | | 600 |
| | | | | | | | | | | 598.8 — 14.4 | | |
| 15 | | | | | | | | | | | | 595 |
| 20 | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1001

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash / HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533081.9 N; 628359.4 E | | Total Depth<br>176.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>611.3 feet | Ground Water Depth<br>See Note A | Date Started<br>7/11/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 16.4 feet | Borehole Inclination<br>-60 | Logged by<br>J. Hoeft | Date Completed<br>7/18/06 |

Reviewed by / Date DSC 5-9-07 Rev. 1 5-10-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 2.9/3.6 | 67 | SW to F | R3 | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); slightly weathered to fresh; medium strong; several voids and clay filled voids<br>- 15.6-15.9 feet: void | Boring is inclined 60° from horizontal. Depths indicated are measurements along drilling axis. Elevations may be used to determine vertical distances. Discontinuity angle measurements are relative to borehole axis. | |
| 20 | 2 | 3.7/5.0 | 62 | SW to F | R3 | | | | | - 17.8-18.6 feet: clay filled void, yellowish brown (10YR 5/6), wet, very stiff, medium plasticity, contains limestone clasts of sand-gravel size<br>-20.5-22 feet: clay filled void, yellowish brown (10YR 5/6), wet, very stiff, medium plasticity, contains limestone clasts of sand and gravel | 17.5-21 feet: Good water return<br>Rod dropped from 20.5 to 21.6 feet | 595 |
| 25 | 3 | 4.6/5.0 | 73 | SW to F | | | | Bj, 45, Wa<br>Sl, Op,<br>Bj, 45, Wa, Sl, Op | | - 22.9-23.7 feet: clay-filled void, dark yellowish brown (10YR 4/4), wet, stiff, medium plasticity<br>- 23.8-24.3 feet: clay material, dark yellowish brown (10YR 4/4), wet, stiff, medium plasticity, contains limestone clasts of sand and gravel | 21 feet: Lost water return and did not recover.<br>Rod dropped ~0.5' at 23.8 feet, clay filled void, no water return | 590 |
| 30 | 4 | 5.0/5.0 | 100 | F | R3 | BHTV<br>NG | Bj, 40, Wa, Sm, Ti, Mineralization | | D | - 28 feet: rock becomes fresh<br>LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; strong HCl reaction | BHTV and NG analysis were conducted over the length of cored section | 585 |
| 35 | 5 | 4.8/5.0 | 96 | | | | Jo, 45, Wa, Sm, Ti, Slicken sides | | | - bedding has an apparent dip of ~40° to 50°; shale is 0.01-0.6- feet thick with spacing of 0.05-0.6 feet<br>- 36.2-36.8 feet: rip up clasts and bioturbation | | 580 |
| 40 | 6 | 5.0/5.0 | 100 | F | R3 | | | | | - shale becomes wavy, thickness < 0.03 feet, spacing is 0.05-0.3 feet | | 575 |
| 45 | 7 | 4.3/5.0 | 86 | | | | Bj, 50, Pl, Sl, Ti, Clay along surface | | | | | 570 |
| 50 | 8 | 5.3/4.4 | 100 | F | R3 | | | | | LIMESTONE (micrite) with interbeds of shale; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; occasional vugs and calcite spars<br>- shale is wavey <0.02 feet thick, spacing varies between 0.02 and 0.3 feet | | 565 |

Project Name and No.: NuStart - Bellefonte COL Proiect: 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1001

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 9 | 5.1/5.2 | 99 | | | | | | Jo, 40, Wa/Sl, Ro, Ti, Mineralization (Calcite) Slicken sides | | | 55.5 feet: Unconfined Compression Test | |
| 60 | 10 | 5.2/5.2 | 99 | | | | | | | | - 58.4-59.6 feet: packstone bed, medium bluish gray (5B 5/1), strong HCl reaction<br>- 59.6 feet: shale is <0.02 feet thick with spacings of 0.02-0.3 feet, wavy | 58.8 feet: Unconfined Compression Test | 560 |
| | | | | F | R3 | | | | | | | | |
| 65 | 11 | 5.1/5.2 | 98 | | | | | | | | - shale is <0.02 feet thick with spacings <0.2 feet, wavy | | 555 |
| 70 | 12 | 5.2/5.0 | 100 | | | | | | | | | | 550 |
| | | | | F | R3 | | | | | | | | |
| 75 | 13 | 3.9/5.0 | 78.4 | | | | | | | D | | | 545 |
| 80 | 14 | 5.3/4.4 | 100 | | | | | | | | - shale is <0.02 feet thick with spacings <0.1 feet, very wavy, spars in rock fabric | | 540 |
| | 15 | 0.8/0.6 | 100 | F | R3 | | | | | | | | |
| 85 | 16 | 5.1/5.0 | 100 | | | | | | | | | | 535 |
| 90 | 17 | 5.0/5.0 | 100 | | | | | | Jo, 70, Wa, Sl, Ti<br>Jo, 45, Wa, Sl, Ti | | | | |
| | | | | F | R3 | | | | | | | | 530 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

WLA William Leitus & Associates, Inc.

# ROCK LOG - Boring No. B-1001

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | 18 | 4.9/5.0 | 98 | | | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite ranges from light gray (N7) to medium gray (N5) and shale is dark gray (N3); fresh; medium strong; prominent styolites (pressure solution features); strong HCl reaction | | |
| 100 | 19 | 5.1/5.0 | 100 | F | R3 | | | | | | | | 525 |
| 105 | 20 | 5.0/5.0 | 99 | | | | | | | | | | 520 |
| 110 | 21 | 4.8/5.0 | 96 | F | R3 | | | | Jo, 75, Wa, Sl, Ti | | | | 515 |
| 115 | 22 | 5.1/5.0 | 100 | | | | | | | D | LIMESTONE (micrite) interbedded with calcareous shale; micrite is medium gray (N5); shale is dark gray (N3); fresh; medium strong; strong HCl reaction<br>- shale is <0.02 feet thick with spacings of 0.05-0.2 feet, wavy | | 510 |
| 120 | 23 | 4.9/5.0 | 97 | F | R3 | | | | | | - 122-128 feet: reduction in shale bed content and frequency | | 505 |
| 125 | 24 | 5.2/5.0 | 100 | | | | | | Jo, 10, St, Sl, Ti, Slicken sides, Rake = 135 | | - shale is <0.1 feet thick with spacings of 0.03-0.7 feet, wavy and planar beds | | 500 |
| 130 | 25 | 4.9/5.0 | 97 | F | R3 | | | | | | | | 495 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1001

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 135 | 26 | 5.0/5.0 | 100 | | | | | | | | | | |
| 140 | 27 | 4.9/5.0 | 97 | | | | | | Bj, 45, Pl, Sm, Ti, Slicks, Rake = 90 Jo, 40, Wa, Sl, Ti | | - shale is on average 0.02 feet thick with spacings of 0.01-0.5 feet, planar and wavey beds | | 490 |
| | | | | F | R3 | | | | | D | LIMESTONE (micrite) with calcareous shale; micrite is medium light gray (N6) and shale is dark gray (N3); fresh; medium strong; shale is very thin laminae; micrite contains spars | | |
| 145 | 28 | 4.9/5.0 | 97 | | | | | | | | | | 485 |
| 150 | 29 | 5.2/5.0 | 100 | | | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; occasional shale rich sections 0.2-2 feet thick | | 480 |
| | | | | F | R3 | | | | | | | | |
| 155 | 30 | 4.8/5.0 | 96 | | | | | | Bj, 45, Wa, Sm, Ti, Slicks, Rake = 90 Bj, 45, Pl, Sm, Ti, Slicks, Rake = 90 | | LIMESTONE (micrite) with calcareous shale interbeds, and calcareous shale rich sections; shale is dark gray (N3); micrite is medium gray (N5); fresh; medium strong; strong HCl reaction | | 475 |
| 160 | 31 | 4.9/5.0 | 98 | | | | | | | | - 155-172 feet: shale is 0.01-0.1 feet thick with spacings of 0.03-1 feet, mainly planar shale beds | | |
| | | | | F | R3 | | | | | E | | | 470 |
| 165 | 32 | 5.1/5.0 | 100 | | | | | | | | | | |
| 170 | 33 | 5.0/5.0 | 100 | | | | | | | | | | 465 |
| | | | | F | R3 | | | | | | - 172-176.5 feet: shale is 0.01-0.2 feet thick with spacings of 0.05-0.8 feet | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# ROCK LOG - Boring No. B-1001

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 175 | 34 | 3.5 / 3.5 | 98 | | | | | | | E | | PVC: 4 inch O. D. installed after drilling for BHTV test | 460 |
| | | | | | | | | | | | Boring terminated at 176.5 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/17 - 14.8 feet<br>7/18 - 14.5 feet<br>7/20 - 14.5 feet | | |
| 180 | | | | | | | | | | | | | 455 |
| 185 | | | | | | | | | | | | | 450 |
| 190 | | | | | | | | | | | | | 445 |
| 195 | | | | | | | | | | | | | 440 |
| 200 | | | | | | | | | | | | | 435 |
| 205 | | | | | | | | | | | | | 430 |
| 210 | | | | | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

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WLA William Lettis & Associates, Inc

# SOIL LOG - Boring No. B-1001A

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft)<br>1533081.9 N; 628359.4 E | | Total Depth<br>17.2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>611.3 feet | Ground Water Depth<br>See Note A | Date Started<br>7/11/00 |
| Sampling Method<br>SPT | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>7/18/06 |

Reviewed by / Date DSC 3-13-07 W Hodson 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 611.3 CLAY, yellowish red (5YR 4/6), moist, stiff to very stiff, contains manganese nodules and occasional gravel-size limestone clasts (~5%) | | 610 |
| | | SPT 1 | 4 5 8 | 13.2 | | | | | | | | |
| | | SPT 2 | 5 11 15 | 15.6 | | | | | | - 4 feet: becomes mottled with color light yellowish brown (10YR 5/4) | | |
| 5 | | SPT 3 | 8 10 15 | 14.4 | | | | | | | | 605 |
| | | | | | | | | | CH | 603.3 CLAY, yellowish brown (10YR 5/6), moist, very stiff, contains limestone clasts of gravel size (~5%) | 8.0 | |
| | | SPT 4 | 4 8 12 | 15.6 | | | | | | | | |
| 10 | | SPT 5 | 4 9 11 | 16.8 | | | | | | | | 600 |
| 15 | | SPT 6 | 4 4 6 | 12 | | | | | CH | 596.3 -14.5 feet: becomes moist and stiff<br>CLAY, yellowish brown (10YR 5/6), moist, stiff, occasional gravel size limestone clasts | 15.0 | |
| | | SPT 7 | 1 50/3" | 8.4 | | | | | | 594.1 Borehole terminated at 17.2 feet. | 17.2 SPT refusal at 16.8 feet. Auger refusal at 17.2 feet. See adjacent inclined boring B-1001 for underlying rock profile. | 595 |
| 20 | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

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# SOIL LOG - Boring No. B-1002

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532906.7 N; 628471.5 E | | Total Depth<br>120.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>613.3 feet | Ground Water Depth<br>See Note A | Date Started<br>5/30/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery / K. Krug | Date Completed<br>5/30/06 |

Reviewed by / Date DSC 3-13-07 W Lettis 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | SPT 1 | 3 4 6 | 18 | | | | | CH | 613.3 – 0.0: CLAY, strong brown (7.5YR 5/8) with orange yellow mottling, moist, stiff, trace sand, few black manganese nodules | |
| 5 | | SPT 2 | 3 3 6 | 20 | 25.5 | 66/ 34 | GSZ | | CH | 609.8 – 3.5: CLAY, strong brown (7.5YR 4/6) to brown (7.5YR 4/4), moist, medium stiff, few gravel, sand and black manganese nodules | |
| | | SPT 3 | 3 4 4 | 16 | 22.9 | 51/ 26 | GSZ H | | CH | 606.8 – 6.5: CLAY, reddish brown (5YR 4/4), moist, medium stiff | |
| 10 | | SPT 4 | 20 26 9 | 13 | 21.5 | 50/ 27 | | | CH | 604.5 – 8.8: CLAY, strong brown (7.5YR 5/8), dry to moist, hard, trace black manganese nodules | |
| | | | | | | | | | GW | 603.9 – 9.4: GRAVEL, light gray, moist to dry, very stiff to hard, gravel is angular limestone fragments <1 in diameter, reacts with acid | |
| | | SPT 5 | 9 17 52 | 24 | 25.9 | 68/ 45 | GSZ | | CH | 602.3 – 11.0: CLAY, dark brown (7.5YR 3/4) to olive yellow (5Y 6/6), dry to moist, very stiff | |
| | | | | | | | | | GW-GC | 601.7 – 11.6: clayey GRAVEL, gravel is pale yellow (2.5Y 7/4) and clay is light gray (2.5Y 7/2), dry to moist, gravel is limestone fragments | |
| 15 | | SPT 6 | 35 30/1" | 16 | | | | | CH | 599.1 – 14.2: CLAY, strong brown (7.5YR 4/6), dry to moist, hard | |
| | | | | | | | | | GW | 598.8 – 14.5: GRAVEL with clay | |
| | | | | | | | | | | 596.8 – 16.5 | SPT refusal at 16 feet 20 blows/0". Auger down to 17 feet. Continuation of borehole description in rock log. |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 610, 605, 600, 595, 590, 585

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

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# ROCK LOG - Boring No. B-1002

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532906.7 N; 628471.5 E | | Total Depth<br>120.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>613.3 feet | Ground Water Depth<br>See Note A | Date Started<br>5/30/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 16.5 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery / K. Krug | Date Completed<br>5/30/06 |

Reviewed by / Date DSC 3-13-07 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 3.2/3.5 | 86 | SW to F | R3 | | | | Bj,15, Wa, Pl, Sl, Ro Bj 10, Wa, Pl, Sl-Ro | C | SHALE with interbedded micrite; shale is dark gray (N3) and micrite is medium gray (N5); slightly weathered to fresh; medium strong; 50-60% shale | 17-51 feet: fluid return is good | 595 |
| 25 | 2 | 5.2/5.0 | 100 | F | R3 | | | | Bj, 20, Pl, Wa, Sl-Ro, Ti Bj, 15, Pl, Sl-Ro, Ti Bj, 10, Ro, Ti | | - 24.3-25.4 feet: interbedded packstone, micrite, and shale | | 590 |
| 30 | 3 | 4.8/5.0 | 94 | | | | | | Bj, 5, no fil, Op Bj, 0, no fil | | SHALE with irregular beds of micrite; shale is dark gray (N3) and micrite is medium gray (N5); fresh; medium strong; 60% shale | | 585 |
| 35 | 4 | 4.8/5.0 | 84 | F | R3 | | | | Bj, 0, Pl, Wa, poor fit, Op Bj, 10, Pl-Wa, Sl-Ro, Op, poor fit Bj, 15, Wa poor fit Bj, 10, no fit | D | calcareous SHALE with interbedded micrite; shale is grayish black (N2) and micrite is medium gray (N5); fresh; medium strong; 55% shale | | 580 |
| 40 | 5 | 5.2/5.0 | 97 | | | | | | Bj, 15, Pl, Sl-Ro, Op Bj, 15, Pl, Wa, Sl-Ro, poor fit | | - 38 feet: decreasing shale with depth | | 575 |
| 45 | 6 | 5.1/5.0 | 100 | F | R3 | | | | | | | | 570 |
| 50 | 7 | 4.9/5.0 | 98 | | | | | | | | LIMESTONE (micrite) interbedded with thin shale; micrite is medium gray (N5) and shale is grayish black (N2); fresh; medium strong; shale reacts with acid; some rip- up clasts in shale: 25% shale | | 565 |
| 55 | 8 | 5.2/5.0 | 100 | F | R3 | | | | Bj, 10, Pl-Wa, Ro, Op | | | 51-120.5 feet: poor to moderate fluid returns. Water loss ranges from 50-100 gal per run.<br>54.3 feet: strong hydrocarbon odor. No visible evidence. | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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# ROCK LOG - Boring No. B-1002

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 4.9/5.0 | 98 | | | | | | | | | 56.38 feet: Unconfined Compression Test | |
| 60 | | | | | | | | | Bj, 10, Wa-St, Ro, poor fit | | - 60 feet: 30% shale | | 555 |
| | 10 | 5.2/5.0 | 100 | | | | | | Bj, 30, Wa, Sl-Ro, Ti<br>Bj, 10, Pl, Sl-Ro, Ti<br>Bj, 5, Wa, Sl-Ro, Ti | | | | 550 |
| 65 | | | | F | R3 | | | | | | - 65.5-75 feet: 40% shale | | |
| | 11 | 5.1/5.0 | 100 | | | | | | | | | | 545 |
| 70 | | | | | | | | | | | | | |
| | 12 | 5.0/5.0 | 90 | | | | | | | | | | 540 |
| 75 | | | | F | R3 | | | | | | | 73.7-74.7 feet: sub-vertical incipient fracture | |
| | 13 | 5.0/5.0 | 100 | | | | | | Bj, 10, Pl, Sm, Op | D | | | 535 |
| 80 | | | | | | | | | Bj, 10, Pl, Sl-Ro | | | | |
| | 14 | 4.9/5.0 | 98 | | | | | | Bj, 10, Pl, Sm<br>Fa, 10, St, Sl-Ro, slickensidess, Rake 85<br>Fa, 20, St, Sm, slickensides, Rake 65 | | | | 530 |
| 85 | | | | F | R3 | | | | | | | | |
| | 15 | 5.1/5.0 | 100 | | | | | | | | | | 525 |
| 90 | | | | | | | | | Fa, 20, Pl, Sm, slickensides, Rake 50<br>Bj, 15, Pl-Wa, Sl-Ro | | | | |
| | 16 | 5.0/5.0 | 93 | | | | | | | | | | 520 |
| 95 | | | | F | R3 | | | | Bj, 15, Pl, | | | | |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1002

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 17 | 4.8/5.0 | 93 | | | | | | Sm<br>BJ, 10, Pl, Sm, no fit<br>Bj, 5, Wa, Sl-Ro, poor fit<br>Bj, 15, Pl, Sl-Ro | | LIMESTONE (wackestone with minor micrite); fresh; medium strong; shale beds few and very thin (<0.05 ") | | 515 |
| 100 | | | | | | | | | | | LIMESTONE (micrite) interbedded with thin shale; micrite is medium gray (N5) and shale is grayish black (N2); fresh; medium strong; 25% shale | | |
| | 18 | 5.0/5.0 | 100 | | | | | | Bj, 10, Wa, Sl-Ro, Op<br>Bj, 5, Sl, Wa, Sl-Ro<br>Bj, 10, Pl, Sl-Ro, poor fit | | | | 510 |
| 105 | | | | F | R3 | | | | Bj, 10, Wa, Sl-Ro, Op | | LIMESTONE (micrite and wackestone) interbedded with thin shale; micrite is medium gray (N5) and shale is grayish black (N2); fresh; medium strong; shale beds are very thin, wavy, and react with acid<br>- 106.5-113 feet: bioturbated zone | | |
| | 19 | 5.0/5.0 | 94 | | | | | | Bj, 25, Wa, Ro, poor fit<br>Bj, 10, Pl, Sl-Ro | D | | | 505 |
| 110 | | | | | | | | | Bj, 10, Wa, Mo-Ro, Op<br>Bj, 10, Pl, Mo-Ro, Op | | | | |
| | 20 | 5.0/5.0 | 100 | | | | | | Fa, 20, Wa, Sl-Ro, slickensides<br>Bj, 1, Pl, Sm, poor fit | | | | 500 |
| 115 | | | | F | R3 | | | | | | - 114.5-116.8 feet: bioturbated zone | | |
| | 21 | 5.0/5.0 | 100 | | | | | | Bj, 5, Wa, Sl-Ro, poor fit<br>Bj, 10, Pl, Sm, Sl, Op<br>Bj/Fa, 10, Wa, Sm, Op<br>Bj, 10, Pl, Sl-Ro | | | | 495 |
| 120 | | | | | | | | | | | Boring terminated at 120.5 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/5 - 15.8 feet<br>8/6 - 12.8 feet | | 490 |
| 125 | | | | | | | | | | | | | 485 |
| 130 | | | | | | | | | | | | | 480 |
| 135 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettus & Associates, Inc

# SOIL LOG - Boring No. B-1003

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532838.5 N; 628359.6 E | | Total Depth<br>120.4 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>613.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/30/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/5/06 |

Reviewed by / Date DSC 3-13-07 W Holleman 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 613.6 / 0.0 | | |
| | | | | | | | | | ML | 613.4 / 0.2 TOPSOIL<br>SILT with sand, yellowish red (5YR 4/6), stiff, dry to moist (Fill) | | |
| | | SPT 1 | 4 6 4 | 18 | | | | | | | | |
| | | | | | | | | | | 610.1 / 3.5 | | 610 |
| 5 | | SPT 2 | 2 2 3 | 18 | 16.4 | 26/ 10 | GSZ | | CL | CLAY with sand, gray with blue tint (Gley 2 10BG5/1), moist, medium stiff (Residual) | | |
| | | SPT 3 | 2 2 3 | 18 | | | | | | | | |
| | | SPT 4 | 5 9 15 | 18 | 22.3 | 44/ 23 | GSZ | | | 604.4 / 9.2 | | 605 |
| 10 | | SPT 5 | 8 9 16 | 18 | 16 | 44/ 23 | GSZ/H | | CL | gravelly CLAY with sand, dark grayish brown (10YR 4/2), medium dense, dry to moist (Residual) | | |
| | | | | | | | | | | 600.6 / 13.0 | | 600 |
| | | SPT 6 | 31 50/1" | 7 | | | | | | highly weathered LIMESTONE, light brownish gray (10YR 6/2), moist, dense to very dense, soil consistency | | |
| 15 | | SPT 7 | 50/1" | 0 | | | | | | 598.8 / 14.8 | Auger and SPT refusal at 14.8 feet. Continuation of borehole description in rock log. | |
| 20 | | | | | | | | | | | | 595 |
| | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettre & Associates, Inc.

# ROCK LOG - Boring No. B-1003

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532838.5 N; 628359.6 E | | Total Depth<br>120.4 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>613.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/30/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 15.2 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/5/06 |

Reviewed by / Date DSC 3-13-07 W Lettre 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 1.2/1.5 | 0 | SW | R2 | | | | | | LIMESTONE (micrite) with interbedded calcareous shale; dark gray (N3) to medium light gray (N6); slightly weathered to fresh; weak; high proportion shale interbeds (~40%) | 14.8-86.4 feet: fluid return is good | |
| | 2 | 4.9/5.0 | 86 | SW | R3 | | | | Bj, 5, Wa, Sl<br>Bj, 10, Pl, Sl, Ti<br>Bj, 10, Pl, Sl, Ti | C | | | 595 |
| 20 | | | | | | | | | | | - 21.3 feet: color changes to medium light gray (N6) | | |
| | 3 | 5.0/5.0 | 84 | SW | R3 | | | | Bj, 10, Wa, Sl, Op<br>Bj, 10, Pl, Sl, Op | | | | 590 |
| 25 | | | | | | | | | | | - 26.3-31.3 feet: shale beds appear moderately thin to thin with spacings of 0.1-0.3 feet | | |
| | 4 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 5, Pl, Sl, Op | | LIMESTONE (micrite) with calcareous shale interbeds; medium light gray (N6) and dark gray (N3); slightly weathered to fresh; medium strong<br>- 30 feet: chert and calcite crystals | | 585 |
| 30 | | | | | | | | | | | - 31.5-46 feet: chert and small shell fragments found | | |
| | 5 | 5.0/5.0 | 86 | SW to F | R3 | BHTV | | | | | | BHTV analysis was conducted over the length of cored section | 580 |
| 35 | | | | | | | | | | | | | |
| | 6 | 4.8/5.0 | 90 | SW to F | R3 | | | | Bj, 5-15, Wa, Ro, Op | D | | 38.6 feet: Unconfined Compression Test | 575 |
| 40 | | | | | | | | | | | | | |
| | 7 | 5.0/5.0 | 100 | F | R4 | | | | Bj, 20, Pl, Sl, Op | | | | 570 |
| 45 | | | | | | | | | | | - 46-75 feet: small amounts of bioturbation and shell fragments, some bioturbation filled with calcite<br>- 48-82 feet: shale interbeds consistent in thickness and spacing | | |
| | 8 | 5.0/5.0 | 100 | SW to F | R4 | | | | | | | | 565 |
| 50 | | | | | | | | | | | | | |
| | 9 | 5.0/5.0 | 86 | SW to F | R4 | | | | | | | | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1003

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | | | | | | | | | Bj, 10, Pl, Sl, Op | | | | |
| 60 | 10 | 5.0/5.0 | 100 | F | R4 | | | | | | | 58.0 feet: Unconfined Compression Test | 555 |
| 65 | 11 | 5.0/5.0 | 100 | SW to F | R4 | | | | Bj, 10, Pl, Sl, Slicken sides, Calcite filling<br>Bj, 5, Pl, Sl, Ti | | | | 550 |
| 70 | 12 | 5.0/5.0 | 100 | SW to F | R3 | | | | Bj, 10, Pl, Sl, Op | | | | 545 |
| 75 | 13 | 5.0/5.0 | 86 | SW to F | R3 | | | | Bj, 5, Pl, Sl, Op | D | - 71.3-75 feet: shale bedding becomes thick<br>- 73-74 feet: calcite interbeds and slicken sided surface<br>- 75-82 feet: shale beds are moderately thin to thick with spacings of 0.1-0.3 feet<br>- 75-105 feet: small amounts of shell fragments and calcite crystals | | 540 |
| 80 | 14 | 5.2/5.2 | 100 | SW to F | R3 | | | | Ve, 80, Wa, Ro, Ti, Slicken sides<br>Bj, 15, Pl, Sl, Ti<br>Bj, 5-15, Wa, Sl, Ti, Slicken sides | | - 80.3 feet: calcite interbeds and slicken sided surface<br>- 82-92 feet: shale beds very thin and sparse<br>- 83 feet: large calcite crystals | | 535 |
| 85 | 15 | 4.9/4.9 | 100 | SW to F | R3 | | | | | | | | 530 |
| 90 | 16 | 5.0/5.0 | 100 | SW to F | R3 | | | | Bj, 10, Pl, Ro, Op | | - 90-97 feet: shale is thin to moderately thin with spacings of 0.3-0.5 feet | 86.4 feet: lost ~90% of fluid return<br>90-91 feet: lost fluid return<br>91-101 feet: some fluid return | 525 |
| | 17 | 5.0/5.0 | 100 | SW to F | R3 | | | | Bj, 5, Pl, Sl, Op<br>Bj, 10, | | - 94 feet: bioturbation with calcite filled / healed fractures | | 520 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

WLA William Lettis & Associates, Inc

# ROCK LOG - Boring No. B-1003

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | | | | | | | | | Wa, Ro, Ti | | | | |
| | 18 | 5.0/5.0 | 100 | SW to F | R3 | | | | Bj, 10, Pl, Sl, Ti | | - 97-115 feet: shale is moderately thick to moderately thin with spacings of 0.1-0.3 feet | | 515 |
| 100 | | | | | | | | | | | | 101-120.4 feet: no fluid return | |
| | 19 | 5.0/5.0 | 100 | SW to F | R3 | | | | Bj, 20, Pl, Ro, Op | | | | 510 |
| 105 | | | | | | | | | | | | | |
| | 20 | 5.0/5.0 | 100 | SW to F | R3 | | | | | D | | | 505 |
| 110 | | | | | | | | | | | | | |
| | 21 | 5.0/5.0 | 100 | SW to F | R3 | | | | | | | | 500 |
| 115 | | | | | | | | | Bj, 5, Pl, Sl, Op | | - 115-117.4 feet: shale beds become diffuse | | |
| | 22 | 4.0/4.0 | 100 | F | R3 | | | | Bj, 10, Pl, Sl, Ti<br>Bj, 10, Pl, Sl, Ti, Slicken sides, calcite | | LIMESTONE (wackestone); light medium gray (N6); fresh; medium strong; occasional shale laminae: thin to very thin with spacings of 0.2-0.4 feet | PVC: 4 inch O. D. installed after drilling for BHTV test | 495 |
| 120 | | | | | | | | | | | Boring terminated at 120.4 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/30 - 12.3 feet<br>7/5 - 14.3 feet | | |
| 125 | | | | | | | | | | | | | 490 |
| | | | | | | | | | | | | | 485 |
| 130 | | | | | | | | | | | | | 480 |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC WLA William Lewis & Associates, Inc.

# SOIL LOG - Boring No. B-1004

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532950 N; 628276.6 E | | Total Depth<br>150.2 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>611.1 feet | Ground Water Depth<br>See Note A | Date Started<br>5/1/06 |
| Sampling Method<br>CME | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | CME 1 | | 38.4 | 3.8 | 24/9 | GSZ | | CL | 611.1 sandy CLAY, dark yellowish brown (10YR 4/4), moist, very stiff, trace manganese nodules (Fill) 0.0 | | 610 |
| 5 | CME 2 | | 58.8 | 15.2 | 48/23 | GSZ | | CL | 607.1 CLAY with sand, yellowish brown (10YR 5/6), moist, hard, trace manganese nodules, trace siltstone fragments (Residual) 4.0 | | 605 |
| 10 | CME 3 | | 58.8 | 22 | 74/45 | GSZ | | CH | 602.9 CLAY, yellowish brown (10YR 5/6), moist, hard, trace limestone fragments medium gray (N5) (Residual) 8.2 | | 600 |
| 15 | SPT 4 | 50/1" | 0 | | | | | | 598.0 13.1 | CME and SPT refusal at 13.1 feet. Continuation of borehole description in rock log.<br>13-13.1 feet: Enercon Hydrogeologist collected 1 soil sample at 13-13.1 feet for special testing | 595 |
| 20 | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC

WLA William Leins & Associates, Inc.

# ROCK LOG - Boring No. B-1004

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532950 N; 628276.6 E | | Total Depth<br>150.2 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>611.1 feet | Ground Water Depth<br>See Note A | Date Started<br>5/1/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 13.6 feet | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 3.1/3.1 | 91 | F | R3 | | | | Bj, 10, Pl, Sl | | LIMESTONE (micrite) with interbedded shale; medium light gray (N6) to medium gray (N5) and pale yellowish brown (10YR 6/2); fresh; medium strong; contains uniformly spaced thin shale beds of 0.1 feet thickness and occasional vertical stylolitic features and relic burrows | 13.1- 150.2 feet: Good milky fluid return | 595 |
| 20 | 2 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 85, Pl, He, Calcite filled<br>Bj, 80, Pl, He, Calcite Filled | | | | 590 |
| 25 | 3 | 5.0/5.0 | 100 | | | | | | | | | | |
| 30 | 4 | 4.8/5.0 | 96 | F | R3 | | | | Bj, 70, Pl, He, Calcite filled<br>Bj, 5, Pl, Sl, Ti | | - 25.8 feet: color changes to medium dark gray (N4) and dark gray (N3)<br>- 27 feet: color shift to grayish blue (5PB 5/2) with interbeds of light olive gray (5Y 5/2)<br>- 30 feet: color changes to medium light gray (N6) to medium gray (N5) | | 585 |
| 35 | 5 | 5.0/5.0 | 100 | | | | | | Bj, 18, Wa, Sl, Ti<br>Bj, 10, Pl, Sl, Ti | D | | 30.8 feet: Unconfined Compression Test increased rotation speed and down pressure | 580 |
| 40 | 6 | 4.9/4.9 | 100 | F | R3 | PA | | | | | | | 575 |
| 45 | 7 | 5.0/5.0 | 100 | | | | | | Bj, 16, Pl to St, Sl, Op | | - 43.3 feet: interbeds become laminated and irregular in shape<br>- 44 feet: calcite filled vugs | | 570 |
| 50 | 8 | 4.9/4.9 | 96 | F | R3 | | | | | | - 51-52.3 feet: crystalline zone | 50 feet: hydrocarbon odor<br>51.6 feet: Unconfined Compression Test | 565<br>560 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1004

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 9 | 5.0/5.0 | 100 | | | | | | Fa, 30, Slicken sides, ~ 1" long | | | | 555 |
| 60 | 10 | 5.0/5.0 | 100 | F | R3 | | | | | | | | 550 |
| 65 | 11 | 5.0/5.0 | 100 | F | R3 | | | | | | | | 545 |
| 70 | 12 | 5.0/5.0 | 100 | | | | | | | | | | 540 |
| 75 | 13 | 5.0/5.0 | 100 | F | R3 | PA | | | | D | | | 535 |
| 80 | 14 | 5.0/5.0 | 100 | | | | | | | | LIMESTONE (wackestone); light bluish gray (5B 7/1) to medium bluish gray (5B 5/1); fresh; medium strong; generally sporadic laminated shale beds with abundant horizontal stylolitic features, relic fossils and burrows | | 530 |
| 85 | 15 | 5.0/5.0 | 100 | F | R3 | | | | Fa, 5, Slicken sides Bj, Subvertical, He Bj, 80, He | | | | 525 |
| 90 | 16 | 5.0/5.0 | 100 | | | | | | | | - 90-120.5 feet: rock is medium strong to weak | | 520 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

WLA William Lettis & Associates, Inc

# ROCK LOG - Boring No. B-1004

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | 17 | 5.0/5.0 | 100 | F | R2 to R3 | PA | | | | D | - 96 feet: development of crystalline limestone interbeds and filled vugs | | 515 |
| 100 | 18 | 5.0/5.0 | 100 | | | | | | Fa, 40, Spar, Slicken sides | | | | 510 |
| 105 | 19 | 5.0/5.0 | 100 | F | R2 to R3 | | | | | | | | 505 |
| 110 | 20 | 5.0/5.0 | 100 | | | | | | | | LIMESTONE (micrite); medium dark gray (N4) to dark gray (N3); fresh; medium strong to weak; thinly bedded shale irregularly spaced, some spar structures | | |
| 115 | 21 | 5.0/5.0 | 100 | F | R2 to R3 | | | | Bj, 12, He, 0.02-foot seam; BJ, 5, Wa, Sl, Op; Fa, 15, Slicken sides | | LIMESTONE (wackestone) medium dark gray (N4) to dark gray (N3); fresh; medium strong to weak | | 500 |
| 120 | 22 | 5.0/5.0 | 100 | | | | | | Bj, 30, St, Ro, Ti | | - 118.5-122 feet: increase in fracture zones; healed | | 495 |
| 125 | 23 | 5.0/5.0 | 82 | F | R2 | PA | | | | E | LIMESTONE (micrite); medium dark gray (N4) to dark gray (N3); fresh; weak; thin interbedded shale and burrows | | 490 |
| 130 | 24 | 5.0/5.0 | 100 | | R2 to R3 | | | | Fa, 16, Slicken sides | | LIMESTONE (wackestone) medium dark gray (N4) to dark gray (N3); fresh; weak to medium strong; generally contains irregularly defined shale interbeds (laminated to thin); also contains vertical stylolitic features and relic fossils | | 485 |
| | | | | | | | | | | | | | 480 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1004

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | 5.0/5.0 | 100 | F | R2 to R3 | | | | | E | LIMESTONE (micrite); medium gray (N5) to medium dark gray (N4); fresh; medium strong to weak; contains thin to laminated shaley interbeds; occasional sparry structures and vertical stylolitic features | | 475 |
| 135 | | | | | | | | | | | | | |
| | 26 | 5.0/5.0 | 100 | | | | | | | | - 140-143.8 feet: very thin regularly spaced shale interbeds | | 470 |
| 140 | | | | | | | | | Bj, 10, Pl, Sm, No fill | | | | |
| | 27 | 5.0/5.0 | 100 | F | | | | | | F | - 143.8-150.2 feet: beds bioturbated | | 465 |
| 145 | | | | | | | | | | | | | |
| | 28 | 4.0/4.0 | 100 | | | | | | | | | | |
| 150 | | | | | | | | | | | Boring terminated at 150.2 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/22 - 10.8 feet<br>7/19 - 14.5 feet | | 460 |
| 155 | | | | | | | | | | | | | 455 |
| 160 | | | | | | | | | | | | | 450 |
| 165 | | | | | | | | | | | | | 445 |
| 170 | | | | | | | | | | | | | 440 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1005

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532943.5 N; 628407.1 E | | Total Depth<br>251 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>608.9 feet | Ground Water Depth<br>See Note A | Date Started<br>6/7/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>6/10/06 |

Reviewed by / Date DSC 3-13-07 [signature] 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | ML | 608.9 / 0.0 SILT, very dark grayish brown (10YR 3/2), dry to moist, very soft, trace roots | |
| | | SPT 1 | 1 1 1 | 18 | | | | | CL | 607.8 / 1.1 CLAY, light olive brown (2.5Y 5/4), moist, very soft, few sand and gravel, contains manganese nodules (<1mm) (Residual) | Sample recovery was not noted for SPT 1-5 at time of drilling; values for recovery were obtained from photographs taken at the time of sampling. |
| 5 | | SPT 2 | 1 1 1 | 18 | | | | | | | |
| | | SPT 3 | 3 7 11 | 18 | | | | | ML | 602.5 / 6.4 SILT, pale yellow (5Y 7/4) mottled with gray and orange, dry to damp, very stiff (possible weathered bedrock) | |
| 10 | | SPT 4 | 3 5 9 | 18 | | | | | GW | 600.2 / 8.7 limestone GRAVEL, medium gray to medium dark gray (N5) | |
| | | SPT 5 | 5 18 | 8 | | | | | CH | 599.9 / 9.0 sandy CLAY, light greenish gray to light olive brown (2.5Y 5/4), moist, stiff to very stiff | 10.9 feet: auger grinding. Auger refusal at 11 feet. Continuation of borehole description on rock log. Casing set at 11.5 feet. |
| 15 | | | | | | | | | | 597.9 / 11.0 | |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 605, 600, 595, 590, 585, 580

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC

WLA William Lettes & Associates, Inc

# ROCK LOG - Boring No. B-1005

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532943.5 N; 628407.1 E | | Total Depth<br>251 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>608.9 feet | Ground Water Depth<br>See Note A | Date Started<br>6/7/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 11.5 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>6/10/06 |

Reviewed by / Date DSC 3-13-07 W Holm 5-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 4.0/4.5 | 80 | SW | R3 | | | | Bj, 10, Pl, Sl-Ro<br>Bj, 10, Wa, Sl-Ro | | LIMESTONE (micrite) interbedded with shale; micrite is medium gray (N5) and shale is grayish black (N2); slightly weathered to fresh; medium strong<br>- 12.7-13.2 feet: 0.5 foot void<br>- 11.5-19.4 feet: shale beds are very thin (<1 mm thick) and wavy | 13.7 feet: milky gray fluid return 5 feet away from drill rig. | 595 |
| 20 | 2 | 5.2/5.0 | 100 | F | R3 | | | | | | - 19.4-24.1: shale beds are ~ 1 cm thick and planar | Losing fluid at 12.5 feet, approximately several hundred gal/run | 590 |
| 25 | 3 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 10-15, Pl, Sm, no fit | | - 24.1- 26.4 feet: shale beds are wavy | | 585 |
| 30 | 4 | 5.0/5.0 | 99 | F | R3 | | | | | | LIMESTONE (micrite); medium gray (N5); fresh; medium strong; wavy and planar beds; some stylolites | Stop to re-grout P-S casing due to slippage in hole. Also drive steel conductor casing to 14 feet to avoid water loss. Subsequent fluid return is good throughout drilling | 580 |
| 35 | 5 | 4.9/5.0 | 98 | F | R3 | | | | Bj, 20, Pl-Wa, Ro, Ti | D | | | 575 |
| 40 | 6 | 5.2/5.0 | 100 | F | R3 | | | | Bj, 10 Sl, Sl-Ro, poor fit | | LIMESTONE (micrite) interbedded with shale; micrite is medium gray (N5) and shale is dark gray to grayish black (N3 to N2); fresh; medium strong<br>- 36-41 feet: shale beds are wavy | 36.2 feet: Petrographic Analysis (sample PET-1005E) | 570 |
| 45 | 7 | 5.1/5.0 | 100 | F | R3 | | | | Fa, 10, Pl, Sm, Ti, slickensides | | - 41-61 feet: shale beds are planar, 40% shale | 44.2 feet: Unconfined Compression Test | 565 |
| 50 | 8 | 5.0/5.0 | 99 | F | R3 | | | | Fa, 10, Pl, Sm, Ti, calcite | | | 49.1 feet: Unconfined Compression Test | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettes & Associates, Inc.

# ROCK LOG - Boring No. B-1005

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 5.0/5.0 | 99 | F | R3 | | | | coating, rake=65 | | | down hole pressure 450 psi | 555 |
| 55 | | | | | | | | | | | | | |
| | 10 | 4.9/5.0 | 98 | F | R3 | | | | Fa, 10, Pl, Sm, Op, slickensides | | | | 550 |
| 60 | | | | | | | | | | | | | |
| | 11 | 5.3/5.0 | 100 | F | R3 | | | | Bj, 25, Wa, Sl-Ro, Op | | - 61-67.7 feet: shale beds are thinner, 20% shale, some lenses of wackestone | | 545 |
| 65 | | | | | | | | | Bj/Fa, 15, Pl, Sl-Ro, Ti, calcite coating | | | | |
| | 12 | 4.9/5.0 | 97 | F | R3 | | | | | | LIMESTONE (micrite) interbedded with shale; micrite is medium gray (N5) and shale is grayish black (N2); fresh; medium strong; heavily bioturbated; fossiliferous; sparry calcite vugs; burrows frequently filled in with wackestone; shale beds are thinner | 69.0 feet: Unconfined Compression Test | 540 |
| 70 | | | | | | | | | | D | | | |
| | 13 | 4.9/5.0 | 99 | F | R3 | | | | Fa, 30, Pl, Sl-Ro, slickensides, rake=55, hydrocarbon ordor | | - 71-81 feet: less shale (10-15%) | | 535 |
| 75 | | | | | | | | | | | | | |
| | 14 | 5.1/5.0 | 100 | F | R3 | | | | Bj, 5. Wa, Sl-Ro, Op | | | 77.8 feet: Unconfined Compression Test | 530 |
| 80 | | | | | | | | | | | | | |
| | 15 | 5.2/5.0 | 100 | F | R3 | | | | | | | | 525 |
| 85 | | | | | | | | | Fa, 30, Pl, Sl-Ro, slickensides | | | | |
| | 16 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 20, Pl-Wa, Sl-Ro, Op | | - 88-90.3 feet: zone with almost no shale | | 520 |
| 90 | | | | | | | | | | | - 90.3-101.5 feet: more shale (20-25%) | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1005

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 17 | 4.9/5.0 | 100 | F | R3 | | | | Bj, 10, Pl, Sl-Ro, Ti<br>Bj, 10, Wa, Sl-Ro, Ti | | | | 515 |
| 95 | | | | | | | | | | | | | |
| | 18 | 5.1/5.0 | 95 | F | R3 | | | | | | | down hole pressure is 450 psi | 510 |
| 100 | | | | | | | | | Bj, 10, Pl, Sm, Op<br>Bj, 10, Pl, Sl-Ro, Op | | | | |
| | 19 | 5.0/5.0 | 100 | F | R3 | | | | | | LIMESTONE (micrite) with interbedded shale, light gray (N7); fresh; medium strong; no shale | | 505 |
| 105 | | | | | | | | | | | LIMESTONE (micrite) interbedded with shale; micrite is medium gray (N5) and shale is grayish black (N2); fresh; medium strong; shale beds are 0.1-0.2 inches thick; 20% shale<br>- 105.3- 109 feet: zone with little to no shale (2%) | | |
| | 20 | 4.9/5.0 | 100 | F | R3 | | | | | | - 108.9-115 feet: shale beds are planar | 108.1 feet: Unconfined Compression with Stress/Strain Test | 500 |
| 110 | | | | | | | | | | D | | | |
| | 21 | 4.8/5.0 | 98 | F | R3 | | | | Fa, 0, Pl, Sm, Ti, slickensides, rake=0 | | | | 495 |
| 115 | | | | | | | | | | | - 115-125.2 feet: shale beds become wavy and discontinuous, bioturbation | | |
| | 22 | 5.1/5.0 | 100 | F | R3 | | | | | | | | 490 |
| 120 | | | | | | | | | | | | | |
| | 23 | 5.2/5.0 | 100 | F | R3 | | | | | | | | 485 |
| 125 | | | | | | | | | | | - 125.2-126 feet: zone with no shale | | |
| | 24 | 5.0/5.0 | 98 | F | R3 | | | | Bj, 10, Pl, Sm. Op | | - 128-130.3 feet: bioturbated, fossils, shale-rich section | 126.4 feet: drill rods became temporarily jammed | 480 |
| 130 | | | | | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1005

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | 5.0/5.0 | 100 | F | R3 | | | | Fa, 5, Pl, Sm, slickensides, rake=80 | | | | 475 |
| 135 | | | | | | | | | | | | | |
| | 26 | 4.8/5.0 | 96 | F | R3 | | | | Fa, Pl, Sm, rake=40 | D | LIMESTONE (micrite); medium gray (N5); fresh; medium strong; little shale, medium light gray (N6); 2% shale | 136 to 251 feet: Rig geologist changes to K. Krug | 470 |
| 140 | | | | | | | | | | | | | |
| | 27 | 5.0/5.0 | 99 | F | R3 | | | | | | LIMESTONE (micrite) interbedded with calcareous shale; micrite is medium gray (N5) and shale is grayish black (N2); fresh; medium strong; shale laminae every 0.01-0.1 feet; bioturbation at 148.2 feet<br>- 143.8 feet: fossils | | 465 |
| 145 | | | | | | | | | | | | | |
| | 28 | 5.0/5.0 | 100 | F | R3 | | | | | | - 149.2-150 feet: shale increases and limestone is coarser, limestone color changes to medium dark gray (N4) to dark gray (N3) | 146.2 feet: Unconfined Compression Test<br>149.3 feet: Petrographic Analysis (sample PET-1005C) | 460 |
| 150 | | | | | | | | | | | | | |
| | 29 | 5.0/5.0 | 100 | F | R3 | | | | | E | - 153.6-181 feet: shale increases and limestone is coarser, limestone color change to medium dark gray (N4) to dark gray (N3) | | 455 |
| 155 | | | | | | | | | | | | | |
| | 30 | 4.8/5.0 | 97 | F | R3 | | | | | | | | 450 |
| 160 | | | | | | | | | | | - 160.6-160.9 feet: healed fractures<br>- 161-165 feet: vugs filled with calcite | | |
| | 31 | 5.2/5.0 | 100 | F | R3 | | | | Jo, 65, Wa, Sl, Ti | | | | 445 |
| 165 | | | | | | | | | | | - 165-181 feet: shale becomes interwoven with limestone, no distinct bedding | | |
| | 32 | 4.9/5.0 | 98 | F | R3 | | | | | F | | | 440 |
| 170 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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WLA William Lettes & Associates, Inc

# ROCK LOG - Boring No. B-1005

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 33 | 5.0/5.0 | 99 | F | R3 | | | | | | - 174.5-176 feet: heavily disturbed calcareous shale bed | | 435 |
| 175 | | | | | | | | | | | | | |
| | 34 | 5.1/5.0 | 100 | F | R3 | | | | | | | | 430 |
| 180 | | | | | | | | | | | | | |
| | 35 | 5.0/5.0 | 100 | F | R3 | | | | | | - 182.7-189 feet: shale beds become laminated and interwoven | | 425 |
| 185 | | | | | | | | | | | | | |
| | 36 | 5.0/5.0 | 99 | F | R3 | | | | | | - 189-197.2 feet: shale beds thin, limestone is dominant | | 420 |
| 190 | | | | | | | | | | F | | | |
| | 37 | 5.0/5.0 | 100 | F | R3 | | | | | | | | 415 |
| 195 | | | | | | | | | | | | | |
| | 38 | 5.1/5.0 | 100 | F | R3 | | | | | | - 197.2-198.3 feet: calcareous shale bedding is discernable<br>-198.3-210.6 feet: shale bedding is interwoven | | 410 |
| 200 | | | | | | | | | | | | | |
| | 39 | 5.0/5.0 | 99 | F | R3 | | | | | | - 203-205 feet: calcite veins or fracture infill present throughout, parallel to and cross cuts bedding | 205.3 feet: Unconfined Compression with Stress/Strain Test | 405 |
| 205 | | | | | | | | | | | | | |
| | 40 | 5.1/5.0 | 100 | F | R3 | | | | | | | | 400 |
| 210 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1005

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 41 | 5.1/5.0 | 100 | F | R3 | | | | | F | - 210.6-211.2 feet: calcareous shale bed with deformed bedding, fossils | | 395 |
| 215 | | | | | | | | | | | SHALE (calcareous); grayish black (N2); fresh; medium strong | | |
| | 42 | 5.0/5.0 | 92 | F | R3 | | | | | | LIMESTONE (micrite) with interbedded calcareous shale; micrite is medium gray (N5) and shale is grayish black (N2); fresh; medium strong | | 390 |
| 220 | | | | | R2/R3 | | | | | | | | |
| | 43 | 5.0/5.0 | 100 | F | R3 | | | | | | | | 385 |
| 225 | | | | | | | | | | | | | |
| | 44 | 4.7/5.0 | 94 | F | R3 | | | | | | | | 380 |
| 230 | | | | | | | | | | | | | |
| | 45 | 5.3/5.0 | 100 | F | R3 | | | | | LSR | | | 375 |
| 235 | | | | | | | | | | | | | |
| | 46 | 4.8/5.0 | 97 | F | R3 | | | | | | | | 370 |
| 240 | | | | | | | | | | | SHALE (calcareous); grayish black (N2); fresh; medium strong; few irregular inclusions possibly related to bioturbation | 241.3 feet: Petrographic Analysis (sample PET-1005A) | |
| | 47 | 5.1/5.0 | 100 | F | R3 | | | | | | | | 365 |
| 245 | | | | | | | | | | | LIMESTONE (micrite) with minor shale interbeds; medium gray (N5); fresh; medium strong | | |
| | 48 | 5.0/5.0 | 100 | F | R3 | | | | | | SHALE (calcareous); grayish black (N2); fresh; medium strong | | 360 |
| 250 | | | | | | | | | | | LIMESTONE (micrite) with minor shale interbeds; medium gray (N5); fresh; medium strong; 5% shale | | |
| | | | | | | | | | | | SHALE with interbedded limestone; shale is | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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WLA William Leidos & Associates, Inc

# ROCK LOG - Boring No. B-1005

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | grayish black (N2) and limestone is medium gray (N5); fresh; medium strong; limestone beds very thin with 0.1 feet spacing | | |
| | | | | | | | | | | | Boring terminated at 251.0 feet | | |
| 255 | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/10 - 13.0 feet<br>6/11 - 13.2 feet<br>8/4 - 11.2 feet | | 355 |
| 260 | | | | | | | | | | | | | 350 |
| 265 | | | | | | | | | | | | | 345 |
| 270 | | | | | | | | | | | | | 340 |
| 275 | | | | | | | | | | | | | 335 |
| 280 | | | | | | | | | | | | | 330 |
| 285 | | | | | | | | | | | | | 325 |
| 290 | | | | | | | | | | | | | 320 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc

# SOIL LOG - Boring No. B-1005PS

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532936.7 N; 628398 E | | Total Depth<br>30.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>609 feet | Ground Water Depth<br>See Note A | Date Started<br>7/7/06 |
| Sampling Method | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>7/7/06 |

Reviewed by / Date W Prudhomme 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 609 — 0.0 | | |
| | | | | | | | | | | Soil sampling not conducted. Refer to boring B-1005 for soil profile. | | 605 |
| 5 | | | | | | | | | | | | |
| | | | | | | | | | | | | 600 |
| 10 | | | | | | | | | | 597.8 — 11.2 | | |
| | | | | | | | | | | | | 595 |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 585 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 580 |
| 30 | | | | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

WLA William Lettes & Associates, Inc.

# ROCK LOG - Boring No. B-1005PS

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532936.7 N; 628398 E | | Total Depth<br>30.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>609 feet | Ground Water Depth<br>See Note A | Date Started<br>7/7/06 |
| Casing Size and Depth<br>PVC: 4.5 inchPVC: 4.5 inch O.D / 11.2 feet | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>7/7/06 |

Reviewed by / Date W Sobolewski 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 4.6/4.5 | 86 | SW<br>F | R3 | P-S | | | Mud seam | D | LIMESTONE (micrite) with interbedded calcareous shale; micrite is greenish grey (Gley 2 5/1) and shale is black (10YR 2/1); slightly weathered to fresh; weak to medium strong; wispy non-planar beds of shale less than 0.01 feet thick spaced less than 0.1 feet apart; rip up clasts; calcite vugs common | Top of Bedrock at 11.2 feet. Lost 0.1 feet to wash boring. Begin rock coring at 11.3 feet<br>Fluid recovery good throughout boring | 595 |
| 20 | 2 | 4.7/5.0 | 94 | F | R3 | | | | Jo, 65, Wa, Ro, Ti<br>Jo, 70, Wa, Ro, Ti | | - 19-24.6 feet: shale beds become semi-planar and thicken to 0.01-0.1 feet with spacings < 0.2 feet, stet calcite and rip up clasts | P-S analysis was conducted over the length of cored section | 590 |
| 25 | 3 | 5.0/5.0 | 100 | F | R3 | | | | | | - 24.6-26.4 feet: shale beds thin to < 0.01 feet with spacings of 0.01-0.2 feet, wispy, non-planar, fewer calcite infills<br>26.4-30.3 feet: shale becomes very wispy and non-planar with spacings of < 0.1 feet, rip up clasts | | 585 |
| 30 | 4 | 4.5/4.5 | 100 | F | R3 | | | | | | | | 580 |
| 35 | | | | | | | | | | | Boring terminated at 30.3 feet. | | 575 |
| 40 | | | | | | | | | | | | | 570 |
| 45 | | | | | | | | | | | | | 565 |
| 50 | | | | | | | | | | | | | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lewis & Associates, Inc.

# SOIL LOG - Boring No. B-1006

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532755 N; 628259.7 E | | Total Depth<br>176 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>614.5 feet | Ground Water Depth<br>See Note A | Date Started<br>5/26/06 |
| Sampling Method<br>SPT | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/29/06 |

Reviewed by / Date W. Hodum 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 614.5 CLAY with gravel, strong brown (7.5YR 5/6) mottling to orange, dry to moist, medium stiff, trace manganese nodules<br>- 1.8-2.1 feet: gravel lens, light grayish green (Gley 1 7/1), moist, angular | 0.0 |
| | | SPT 1 | 1 3 4 | 14 | | | | | | | |
| | | SPT 2 | 2 3 5 | 24 | | | | | CL | 611.0 CLAY, dark brown (10YR 3/2), moist to dry, medium stiff, micaceous, some mottling to gray, contains sand grains and manganese nodules<br>- 4 feet: color change to yellowish brown (10YR 5/4), medium stiff, trace roots | 3.5 |
| 5 | | | | | | | | | | | |
| | | SPT 3 | 1 2 4 | 13 | 25.3 | 41/16 | GSZ | | CL | 608.5 sandy CLAY, dark brown (7.5YR 3/2), moist, medium stiff, trace gravel and roots, micaceous | 6.0 |
| | | SPT 4 | 1 2 4 | 14 | 18.8 | 30/13 | | | CL | 605.3 CLAY, light olive brown (2.5YR 5/4), moist to dry, medium stiff to very stiff, weathered rock lenss<br>- 9.5-10 feet: hard rock lens | 9.2 |
| 10 | | SPT 5 | 9 11 13 | 22 | | | | | | - 11.4-12.2 feet: hard rock lens | |
| | | SPT 6 | 9 11 30 | 24 | | | | | CL | 601.1 CLAY, light olive brown (2.5Y 5/3) to gray (Gley 2) to bluish greenish gray (Gley 2, 10 BG 6/1)<br>- 13.9, 14.5 and 14.8 feet: narrow lenses of broken rounded limestone cobbles | 13.4 |
| 15 | | | | | | | | | | | |
| | | SPT 7 | 36 50/3" | 9 | | | | | GW | 598.5 well graded GRAVEL, gray (Gley 2, 10B 6/1), dry, gravel is fragmented limestone (weathered bedrock) | 16.0 |
| | | | | | | | | | | 596.0 | 18.5 SPT refusal at 18.8 feet (blow counts 35/3"). Continuation of borehole description in rock log starting at 18.5 feet. |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 610, 605, 600, 595, 590, 585

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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WLA William Lettes & Associates, Inc

# ROCK LOG - Boring No. B-1006

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532755 N; 628259.7 E | | Total Depth<br>176 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>614.5 feet | Ground Water Depth<br>See Note A | Date Started<br>5/26/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 18 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/29/06 |

Reviewed by / Date DSC 3-13-07 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 2.2/2.5 | 72 | | | | | | | | LIMESTONE (micrite) with interbedded shale beds; limestone is medium dark gray (N4) and shale is grayish black (N2); fresh; medium strong; laminated shale beds | 18.5-24 feet: poor fluid return | 595 |
| | 2 | 5.0/5.0 | 92 | F | R3 | | | | Fa, 30, rake = 70 | | | | |
| 25 | | | | SW | | | | | Fa, 55, Ro | | - 25.1-25.5 feet: slightly weathered zone, irregular rock discontinuity | 24-62 feet: intermittent to no fluid return | 590 |
| | 3 | 5.2/5.0 | 100 | | | | | | | | - 28.3-31 feet: wackestone intervals | 26.9 feet: Unconfined Compression Test | |
| 30 | | | | F | R3 | | | | | | | | 585 |
| | 4 | 4.6/5.0 | 92 | | | | | | | | - 31 feet: color change of shale to dark gray (N3) | Some clear fluid return at 31 feet | |
| 35 | | | | | | | | | | | | | 580 |
| | 5 | 5.0/5.0 | 100 | | | | | | | D | | | |
| 40 | | | | F | R3 | | | | | | | | 575 |
| | 6 | 5.0/5.0 | 100 | | | | | | | | | | |
| 45 | | | | | | | | | | | | | 570 |
| | 7 | 5.0/5.0 | 100 | | | | | | Fa, 60, Wa, St, Ro, white staining, pyrite | | - 46 feet: color change of micritic limestone to medium gray (N5) | | |
| 50 | | | | F | R3 | | | | | | | | 565 |
| | 8 | 5.0/5.0 | 100 | | | | | | | | | | |
| 55 | | | | | | | | | | | | | 560 |
| | | 5.0 | | | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1006

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 5.0 | 100 | | | | | | Jo, 10, Ti, He. Pl, Sparry calcite; 5cm width | | | | |
| 60 | | | | F | R3 | | | | | | | | 555 |
| | 10 | 5.0/5.0 | 100 | | | | | | | | | 62-176 feet: No fluid return. Driller flushes hole after each core run. Some clear fluid return at 31 feet and 116 feet | |
| 65 | | | | | | | | | | | | | 550 |
| | 11 | 5.0/5.0 | 100 | | | | | | Jo, 90, Calcite Fa, 15, Rake = 85 | | - 68-70 feet: strongly bioturbated | | |
| 70 | | | | F | R3 | | | | | | | | 545 |
| | 12 | 5.0/5.0 | 100 | | | | | | | | | | |
| 75 | | | | | | | | | | | | | 540 |
| | | | | | | | | | Fa, 20, Slickensided | | LIMESTONE (wackestone); wackestone is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; contains irregular, wispy and bioturbated shale zones, rip -up clasts and calcite spars | | |
| | 13 | 5.0/5.0 | 98 | | | | | | | D | | | |
| 80 | | | | F | R3 | | | | | | | | 535 |
| | 14 | 4.8/5.0 | 90 | | | | | | | | - 84 feet: grade to packstone interval, macro fossils | | |
| 85 | | | | | | | | | | | | | 530 |
| | 15 | 5.3/5.0 | 100 | | | | | | Jo, 60, calcite 1mm | | | | |
| 90 | | | | F | R3 | | | | | | | | 525 |
| | 16 | 5.0/5.0 | 100 | | | | | | | | | | |
| 95 | | | | | | | | | | | | | 520 |
| | | 4.8 | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettux & Associates, Inc

# ROCK LOG - Boring No. B-1006

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 17 | 5.0 | 95 | | | | | | | | - 99.2 feet: grade to wackestone interval, wavy shale laminae | | |
| 100 | | | | F | R3 | | | | | | | | 515 |
| | 18 | 5.2/5.0 | 100 | | | | | | | | | | 510 |
| 105 | | | | | | | | | | | | | |
| | 19 | 4.9/5.0 | 98 | | | | | | | | | | 505 |
| 110 | | | | F | R3 | | | | | | | | |
| | 20 | 5.3/5.0 | 100 | | | | | | Jo, 5-10, Pl-Wa, Sl-Ro | | - 112-125 feet: alternating 2 to 3 feet intervals of micritic limestone with no shale interbeds<br>- 112 feet: abrupt color change to lighter gray (N6) | | 500 |
| 115 | | | | | | | | | | | | | |
| | 21 | 4.9/5.0 | 90 | | | | | | Fa, 25, St, Slickensided<br>Fa, 25, Pl, SM, Slickensided | D | | | 495 |
| 120 | | | | F | R3 | | | | | | | | |
| | 22 | 5.0/5.0 | 96 | | | | | | | | | | 490 |
| 125 | | | | | | | | | Fa, 10, Pl, Sm, Slickensided | | | Driller replaces fluid pressure gage | |
| | 23 | 4.9/5.0 | 96 | | | | | | | | | | 485 |
| 130 | | | | F | R3 | | | | | | | | |
| | 24 | 5.2/5.0 | 95 | | | | | | | | | | 480 |
| 135 | | | | | | | | | | | | | |
| | | 5.2 | | | | | | | | | | Pump pressure=40 psi, down hole pressure=4500 psi | |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1006

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140 | 25 | 5.0 | 93 | F | R3 | | | | Fa, 10, Pl, Sl-Ro, Slickensided | D | - 147-157 feet: alternating 1 to 3 feet intervals of micritic limestone | | 475 |
| 145 | 26 | 4.9/5.0 | 98 | | | | | | Fa, 18, Sl, Calcite Mb, 10, Pl, Sm | | | | 470 |
| 150 | 27 | 4.8/5.0 | 88 | F | R3 | | | | Jo, 30, Ti-He, 1mm calcite Bj, 10, Pl, Sm | | | | 465 |
| 155 | 28 | 5.1/5.0 | 100 | | | | | | | | LIMESTONE (micrite) with interbedded shale; medium gray (N5) and shale is grayish black (N2); fresh; medium strong; approximately 70% micritic limestone to 30% shale; shale interbeds are thin to laminated and dipping 15° | | 460 |
| 160 | 29 | 4.7/5.0 | 78 | F | R3 | | | | Jo, 10, Pl, Sm, coated Fa, 10, Pl, Sm, rake=30° Fa, 25, some slickensides | E | | | 455 |
| 165 | 30 | 5.2/5.0 | 100 | | | | | | Jo, 5, Pl, Sl-Ro | | -165-168 feet: calcareous SHALE, reacts with acid; bioturbated and brecciated with some small sparry calcite | | 450 |
| 170 | 31 | 4.8/5.0 | 94 | F | R3 | | | | | | - 171-172 feet: shale-rich interval | | 445 |
| 175 | 32 | 5.0/5.0 | 100 | | | | | | | | | | 440 |
| | | | | | | | | | | | Boring terminated at 176 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface) | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA Wallman Lewis & Associates, Inc

# ROCK LOG - Boring No. B-1006

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 5/28 - 12.8 feet<br>5/29 - 12.8 feet<br>8/6 - 12.8 feet | | |
| 180 | | | | | | | | | | | | | 435 |
| 185 | | | | | | | | | | | | | 430 |
| 190 | | | | | | | | | | | | | 425 |
| 195 | | | | | | | | | | | | | 420 |
| 200 | | | | | | | | | | | | | 415 |
| 205 | | | | | | | | | | | | | 410 |
| 210 | | | | | | | | | | | | | 405 |
| 215 | | | | | | | | | | | | | 400 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1006UDD

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft)<br>1532752.4 N; 628266.8 E | | Total Depth<br>13.2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 45 | Elevation (Datum NAVD 88)<br>614.5 feet | Ground Water Depth<br>See Note A | Date Started<br>8/21/06 |
| Sampling Method<br>SPT / Shelby Tube | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>8/22/06 |

Reviewed by / Date W Lettis 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 614.5 Grass and Topsoil 0.0 | Augered 0-1.5 feet | |
| | | SPT 1 | 7 7 8 | 14.4 | | | | | CL | 613.0 CLAY with gravel, strong brown (7.5YR 5/6) and light olive brown (2.5 Y 5/6), moist, very stiff (Fill) 1.5 | | |
| | | UD 2 | | 0 | | | | | CL | 611.5 CLAY, light olive brown (2.5Y 5/6) with light gray (10YR 7/1) and yellowish-red (5YR 4/1) mottling, moist, very stiff (Fill) 3.0 | pushed Shelby tube 0.5 feet (3.2-3.7 feet), no recovery, augered to 4 feet | |
| 5 | | UD 3 | | 15.6 | | | | | | - 5 feet: color changes to light olive brown (2.5Y 5/6) with light gray (10YR 7/1) and yellowish-red (5YR 4/6) mottled, trace roots (Fill) | | 610 |
| | | SPT 4 | 16 15 14 | 18 | | | | | CL | 608.1 CLAY, olive yellow (2.5Y 6/6) with dark grayish brown (2.5Y 4/2) mottling, moist, very stiff, trace roots and angular gravel (Fill) 6.4 | Augered 5.7-6.5 feet | |
| | | UD 5 | | 12 | | | TXD | | | 604.9 9.6 | | 605 |
| 10 | | | | | | | | | CL | CLAY, light olive brown (2.5Y 5/6), moist, very stiff (Residual) | Augered 10-11.5 feet | |
| | | SPT 6 | 3 11 14 | 18 | | | | | | 601.5 13.0 | Groundwater not encountered | |
| | | UD 7 | 50/1" | 0.4 | | | | | GM | 601.3 GRAVEL with silt, medium gray (N5), gravel is limestone, coarse size and angular 13.2 | 13.1-13.2 feet: SPT test | |
| | | SPT 8 | | 0 | | | | | | Boring terminated at 13.2 feet. Did not encounter bedrock. | | |
| 15 | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | 585 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1007

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533041.2 N; 628430.9 E | | Total Depth<br>120 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>608.4 feet | Ground Water Depth<br>See Note A | Date Started<br>6/10/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/12/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 608.4 CLAY, brownish yellow (10YR 6/6), dry to moist, stiff to very stiff, few manganese nodules, few organics | 0.0 | |
| | | SPT 1 | 3 5 6 | 16.2 | | | | | | | | |
| | | SPT 2 | 8 9 9 | 18 | | | | | | - 3.5 feet: becomes yellowish brown (10YR 5/6) | | 605 |
| 5 | | SPT 3 | 6 9 14 | 18 | | | | | | - 7.0 feet: few weathered angular limestone gravel and roots | | |
| | | SPT 4 | 50/1" | 1 | | | | | | 600.3 | 8.1 SPT and auger refusal at 8.1 feet. Continuation of borehole description in rock log. | 600 |
| 10 | | | | | | | | | | | | |
| | | | | | | | | | | | | 595 |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 585 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 580 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1007

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533041.2 N; 628430.9 E | | Total Depth<br>120 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>608.4 feet | Ground Water Depth<br>See Note A | Date Started<br>6/10/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 8.65 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/12/06 |

W Holemi 3-14-07

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 3.2/3.2 | 89 | SW to F | R3 | | | | Bj, 5, Wa, Sl, Op | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh to slightly weathered; medium strong; strong HCl reaction | | 600 |
| 15 | 2 | 5.3/5.3 | 99 | | | | | | | | - 8.1-15 feet: occasional chert pods of varying size from < 0.05 feet diameter to >0.15 feet thick<br>- 12-20 feet: shale is banded, rip up clasts | Fluid return good from 9 feet to bottom of boring | 595 |
| 20 | 3 | 5.0/4.9 | 100 | F | R3 | | | | | | - 20-27 feet: shale beds are <0.05 feet thick with spacings of 0.05-0.2 feet, shale is weak | | 590 |
| 25 | 4 | 4.9/5.0 | 97 | | | | | | | | | | 585 |
| 30 | 5 | 5.1/5.0 | 100 | F | R3 | | | | | D | - 27-45.5 feet: shale is <0.05-0.3 feet thick with spacings of 0.05-0.3 feet | | 580 |
| 35 | 6 | 5.0/5.0 | 99 | | | | | | | | | | 575 |
| 40 | 7 | 4.9/5.0 | 60 | F | R3 | | | | Jo, 5, Pl, Sm, Ti, Slicken sides<br>Jo, 60, Wa, Ro, Ti<br>Jo, 70, Wa, Sm, Ti | | - 39.5-41 feet: vertical joints, wavy, tight | | 570 |
| 45 | 8 | 5.1/5.0 | 83 | | | | | | Jo, 70, Wa, Sm, Ti<br>Jo, 80, Wa, Sl, Ti<br>Bj, 5, Wa, Sl., Ti. mineralization | | - 44.5-45.2 feet: vertical joint, wavy, tight<br>- 45.5-53 feet: shale is <0.05 feet thick with spacings of 0.1-0.2 feet | 47.0 feet: Unconfined Compression Test | 565 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1007

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 9 | 5.1/5.0 | 94 | F | R3 | | | | | | | 50-51 feet: core damaged during retrieval | 560 |
| 55 | 10 | 5.0/5.0 | 100 | | | | | | | | LIMESTONE (micrite) with thin calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; strong HCl reaction<br>- 52-59 feet: micrite is locally crystalline | | 555 |
| 60 | 11 | 4.5/5.0 | 90 | F | R3 | | | | | | | 58.8 feet: Unconfined Compression Test | 550 |
| 65 | 12 | 5.6/5.0 | 100 | | | | | | | | - 59.3-87.3 feet: shale is < 0.02 feet thick with spacings of 0.03-0.2 feet | | 545 |
| 70 | 13 | 4.8/5.0 | 96 | F | R3 | | | | | D | | | 540 |
| 75 | 14 | 5.0/5.0 | 100 | | | | | | | | | | 535 |
| 80 | 15 | 5.3/5.0 | 100 | F | R3 | | | | | | | | 530 |
| 85 | 16 | 4.0/4.0 | 98.7 | | | | | | | | - 87.3-89.6 feet: color of micrite changes to light | | 525 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1007

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 17 | 6.2/6.0 | 100 | | | | | | | | gray to medium light gray (N7/N6), shale is <0.02 feet with spacings of 0.2-0.8 feet | | 520 |
| 90 | | | | F | R3 | | | | | | - 89.6-100 feet: shale is < 0.01 feet thick with spacings of < 0.01-0.9 feet | | |
| | 18 | 5.0/5.0 | 99 | | | | | | | | | | 515 |
| 95 | | | | | | | | | | | | | |
| | 19 | 5.0/5.0 | 100 | | | | | | | | | | 510 |
| 100 | | | | F | R3 | | | | | | - 100-114.3 feet: shale is <0.01 feet thick with spacings of 0.02-0.3 feet, wavy | | |
| | 20 | 5.0/5.0 | 100 | | | | | | | D | | | 505 |
| 105 | | | | | | | | | | | | | |
| | 21 | 5.1/5.0 | 100 | | | | | | | | | | 500 |
| 110 | | | | F | R3 | | | | | | | | |
| | 22 | 4.8/5.0 | 95 | | | | | | | | | | 495 |
| 115 | | | | | | | | | | | - 114.3-116.6 feet: shale is 0.02-0.2 feet thick, wavy | | |
| | 23 | 3.7/3.5 | 100 | F | R3 | | | | | | - 116.3-120 feet: shale becomes discrete beds of 0.01 feet thick with spacings of 0.02-0.15 feet | | 490 |
| 120 | | | | | | | | | | | Boring terminated at 120 feet. | | |
| | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/12 - 10.5 feet | | 485 |
| 125 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1008

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533048.9 N; 628211.6 E | | Total Depth<br>121.3 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>614.1 feet | Ground Water Depth<br>See Note A | Date Started<br>6/8/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 13 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/10/06 |

Reviewed by / Date: [illegible] 3/21/07 DSC 3-20-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 3.3/3.6 | 41 | MW to SW | R4 | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5); slightly to moderately weathered; weak to high strength; shale beds are moderately thin with spacings 0.2-0.4 feet | | 600 |
| 20 | 2 | 3.0/5.0 | 12 | CW to HW | R0 to R2 | | | | | | clay filled VOID<br>- 20.5-23 feet: severely weathered limestone, weak | 18.3-21.3 feet: loss of water return | 595 |
| 25 | 3 | 4.9/5.0 | 98 | SW | R3 | | | | Bj, 5, Pl, Si, Ti<br>Bj, wih clay seam<br>Bj, 5, Pl, Si, Ti | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5); slightly weathered to fresh; medium strong<br>- 23.9 feet: clay seam, 90% loss of fluid<br>- 23-30 feet: slightly weathered micrite, high strength, shale beds moderately thin to thin with spacings of 0.1-0.2 feet | | 590 |
| 30 | 4 | 5.0/5.0 | 100 | SW to F | R3 | | | | Bj, 10, Pl, Ro, Ti | | - 30-45 feet: shale beds moderatelly thin with spacings of 0.1 feet, bioturbation present<br>- 31 feet: bioturbation present<br>- 31.6-41.0 feet: calcite filled fracture | | 585 |
| 35 | 5 | 5.0/5.0 | 98 | SW to F | R3 | | | | Bj, 10, Pl, Si, Ti<br>Bj, 10, Pl, Si, Op | D | | | 580 |
| 40 | 6 | 5.0/5.0 | 70 | SW | R3 | | | | Bj, 5, Pl, Si, Op<br>Bj, 5, Pl, Si, Ti<br>Bj, 5, Pl, Si, Op | | | 36.4-121.3 feet: Lost water return | 575 |
| 45 | 7 | 5.0/5.0 | 100 | SW to F | R4 | | | | Bj, 5, Pl, Si, Op<br>Bj, 5, Pl, Si, Op | | - 45-52 feet: shale beds very thin to thick and diffuse | | 570 |
| 50 | 8 | 5.0/5.0 | 100 | F | R4 | | | | Bj, 5, Pl, Si, Op<br>Bj, 5, Pl, Si, Ti<br>Bj, 5, Pl, Si, Op | | | | 565 |
| | | | | | | | | | | | LIMESTONE (micrite) with interbedded shale and | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# ROCK LOG - Boring No. B-1008

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 9 | 5.0/5.0 | 96 | SW to F | R4 | | | | Bj, 5, Pl, Sl, Op | | packstone intervals; micrite is medium gray (N5) and shale is dark gray (N3); slightly weathered to fresh; strong<br>- 52-60 feet: shale beds moderately thin with spacings of 0.1-0.4 feet | | 560 |
| 60 | 10 | 5.0/5.0 | 100 | SW to F | R4 | | | | Bj, 5, Pl, Sl, Op | | - 60-64 feet: shale beds thin to very thin with spacings of 0.1-0.6 feet<br>- 60 feet: small shell fragments and trace bioturbation | | 555 |
| 65 | 11 | 5.0/5.0 | 100 | F | R4 | | | | Bj, 10, Wa, Sl, Ti<br>Bj, Pl, Sl, Op<br>Bj, 10, Pl, Sl, Ti | | - 64-70 feet: shale beds thin to thick | | 550 |
| 70 | 12 | 5.0/5.0 | 100 | SW to F | R4 | | | | Bj, 5, Pl, Sl, Op<br>Bj, 5, Pl, Sl, Ti | | - 70-80 feet: shale beds thin to moderately thin with spacings 0.1-0.3 feet<br>- 70-75 feet: bioturbation replaced with calcite | | 545 |
| 75 | 13 | 5.0/5.0 | 96 | SW to F | R4 | | | | Bj, 5, Pl, Sl, Ti<br>Bj, 10, Pl, Sl, Ti | D | LIMESTONE (micrite) with interbedded shale; micrite is medium gray (N5) and shale is dark gray (N3); slightly weathered to fresh; strong<br>- 75-90 feet: bioturbation and shell fragments, small calcite spar | | 540 |
| 80 | 14 | 5.0/5.0 | 96 | SW to F | R4 | | | | Bj, 5, Pl, Sl, Op | | - 80-90 feet: shale beds very thin to moderately thick | | 535 |
| 85 | 15 | 5.0/5.0 | 94 | SW to F | R4 | | | | | | | | 530 |
| 90 | 16 | 5.0/5.0 | 94 | SW to F | R4 | | | | Bj, 10, Pl, Sl, Op | | LIMESTONE (wackestone) with interbedded shale; wackestone is medium light gray (N6) and shale is grayish black (N2); locally highly weathered, mostly slightly weathered; strong<br>- 86-86.3 feet: thick pressure solution feature, pink calcite cross cuts bedding<br>- 90-105 feet: shale beds thin to moderately thin with spacings of 0.1-0.3 feet | | 525 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1008

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 17 | 5.0/5.0 | 90 | HW to MW | R2 | | | | Bj, 5, Pl, Si, Op | D | | | 520 |
| 95 | | | | | | | | | | | - 95.8-96.6 feet: highly weathered zone | | |
| | 18 | 5.1/5.1 | 92 | SW to F | R4 | | | | Bj, 10, Pl, Si, Op | | LIMESTONE (micrite) with interbedded shale; micrite is medium gray (N5) and shale is grayish black (N2); mostly fresh; strong; shale is ~30% | | 515 |
| 100 | | | | | | | | | | | | | |
| | 19 | 5.0/5.0 | 100 | F | R4 | | | | Bj, 5, Pl, Si, Ti<br>Bj, 5, Pl, Si, Ti | | | | 510 |
| 105 | | | | | | | | | | E | - 105-119 feet: shale beds moderately thin to thin with spacings of 0.025-0.2 feet | | |
| | 20 | 5.0/5.0 | 100 | F | R4 | | | | Bj, 5, Pl, Si, Op<br>Bj, 5, Pl, Si, Op<br>Bj, 5, Pl, Si, Ti | | | | 505 |
| 110 | | | | | | | | | | | | | |
| | 21 | 4.7/4.7 | 91 | SW to F | R4 | | | | | | | 112 feet: slight hydrocarbon odor | 500 |
| 115 | | | | | | | | | | | | | |
| | 22 | 4.3/4.9 | 83 | SW to F | R3 to R4 | | | | Bj, 10, Pl, Si, Op<br>Bj, 5, Pl, Si, Op | F | - 119-121.3 feet: shale beds thin to moderately thick with spacings 0.1-3 feet apart | PVC: 4 inch O. D. installed after drilling | 495 |
| 120 | | | | | | | | | | | | | |
| | | | | | | | | | | | Boring terminated at 121.3 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/10 - 17.5 feet<br>7/21 - 6.0 feet<br>7/22 - 6.0 feet | | 490 |
| 125 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 485 |
| 130 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1008

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | 17 | 5.0/5.0 | 90 | HW to MW | R2 | | | | Bj, 5, Pl, Sl, Op | D | - 95.8-96.6 feet: highly weathered zone | | 520 |
| 100 | 18 | 5.1/5.1 | 92 | SW to F | R4 | | | | Bj, 10, Pl, Sl, Op | | LIMESTONE (micrite) with interbedded shale; micrite is medium gray (N5) and shale is grayish black (N2); mostly fresh; strong; shale is ~30% | | 515 |
| 105 | 19 | 5.0/5.0 | 100 | F | R4 | | | | Bj, 5, Pl, Sl, Ti<br>Bj, 5, Pl, Sl, Ti | | - 105-119 feet: shale beds moderately thin to thin with spacings of 0.025-0.2 feet | | 510 |
| 110 | 20 | 5.0/5.0 | 100 | F | R4 | | | | Bj, 5, Pl, Sl, Op<br>Bj, 5, Pl, Sl, Op<br>Bj, 5, Pl, Sl, Ti | E | | | 505 |
| 115 | 21 | 4.7/4.7 | 91 | SW to F | R4 | | | | | | | 112 feet: slight hydrocarbon odor | 500 |
| 120 | 22 | 4.3/4.9 | 83 | SW to F | R3 to R4 | | | | Bj, 10, Pl, Sl, Op<br>Bj, 5, Pl, Sl, Op | | - 119-121.3 feet: shale beds thin to moderately thick with spacings 0.1-3 feet apart | PVC: 4 inch O. D. installed after drilling | 495 |
| 125 | | | | | | | | | | | Boring terminated at 121.3 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/10 - 17.5 feet<br>7/21 - 6.0 feet<br>7/22 - 6.0 feet | | 490 |
| 130 | | | | | | | | | | | | | 485 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1009

| | | | |
|---|---|---|---|
| Drilling Method: Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft) 1532957.3 N; 628130.1 E | | Total Depth: 75.8 feet |
| Drilling Contractor (Driller) and Rig: MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88): 613.9 feet | Ground Water Depth: See Note A | Date Started: 6/12/06 |
| Sampling Method: Split Spoon/ HQ core | Borehole Inclination: Vertical | Logged by: K. KRUG | Date Completed: 6/12/06 |

Reviewed by / Date: W Stokes 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 613.9 CLAY, dark reddish gray (2.5YR 4/1), dry to moist, stiff, few organics | | |
| | | SPT 1 | 2 4 6 | 12 | | | | | | | | |
| | | | | | | | | | MH | 610.9 SILT with sand, very dark gray (5YR 3/1) to yellowish red (5YR 5/8), moist, trace manganese oxide nodules | | 610 |
| 5 | | SPT 2 | 2 4 4 | 12 | | | | | | | | |
| | | SPT 3 | 3 4 8 | 18 | 22 | 51/ 20 | GSZ | | | - color changes to yellowish red | | |
| | | SPT 4 | 8 9 11 | 18 | | | | | | - color changes to strong brown (7.5YR 5/8), moist, very stiff, trace gravel | | 605 |
| 10 | | | | | | | | | | 602.9 | | |
| | | SPT 5 | 8 10 14 | 16.8 | 20.5 | 55/ 27 | GSZ | | CH | sandy CLAY, strong brown (7.5YR 5/8), moist, very stiff, trace gravel, few organics | | |
| | | | | | | | | | CH | 600.9 CLAY with sand, strong brown (7.5 YR 5/8), moist, very stiff, trace to few clasts, few magnesium oxide nodules | | 600 |
| 15 | | SPT 6 | 5 5 11 | 16.8 | 21.6 | 81/ 56 | GSZ | | | | | |
| | | SPT 7 | 3 7 11 | 18.72 | | | | | | 596.9 | | |
| | | | | | | | | | CL | gravelly CLAY with sand, strong brown (7YR 5/8), moist, stiff, contains clasts 0.25-0.5 inches in diameter | | |
| | | SPT 8 | 40/1" | 0 | | | | | | 595.2 | Auger refusal at 18.6 feet. SPT refusal at 18.7 feet. Continuation of borehole description on rock log. | 595 |
| 20 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | 590 |
| | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

| Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299** MACTEC / WLA William Lewis & Associates, Inc. | | | **ROCK LOG - Boring No. B-1009** |
|---|---|---|---|
| Drilling Method: Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft) 1532957.3 N; 628130.1 E | | Total Depth: 75.8 feet |
| Drilling Contractor (Driller) and Rig: MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88) 613.9 feet | Ground Water Depth: See Note A | Date Started: 6/12/06 |
| Casing Size and Depth: HW: 4.5 inch O.D. / 18.5 feet | Borehole Inclination: Vertical | Logged by: K. KRUG | Date Completed: 6/12/06 |

Reviewed by / Date: DSC 3-13-07 (W. Nolan 3-14-07)

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 1.8/2.0 | 88 | F | R2 to R3 | | | | | | LIMESTONE (micrite and wackestone) interbedded with calcareous shale beds; limestone is medium dark gray (N4) and shale is black (N1); fresh; weak to medium strong; 20% shale; shale beds are very thin with close spacing (0.1-0.3 feet), non-planar | Fluid return good throughout boring | 595 |
| | 2 | 5.2/5.0 | 100 | F | R3 | | | | | | LIMESTONE (micrite and wackestone); medium dark gray (N4); fresh; medium strong; few interbedded shale beds; 10% shale<br>- 22.8-25.0 feet: Calcite-rich zones | | 590 |
| 25 | 3 | 5.0/5.0 | 99 | | | | | | | | - 25-36.5 feet: shale beds are very thin spaced <0.1 feet apart, bedding irregular, wavy, 15% shale | | 585 |
| 30 | 4 | 5.0/5.0 | 100 | F | R3 | | | | | | | | 580 |
| 35 | 5 | 5.0/5.0 | 99 | | | | | | | D | - 36.5-39.6 feet: Calcite-rich zones in limestone dominate with minimal shale interbeds, bedding becomes planar<br>- 39.6-57.7 feet: Shale beds are very thin with close spacing (0.1-0.3 ft), non-planar | | 575 |
| 40 | 6 | 4.8/5.0 | 95 | F | R3 | | | | | | - 43.2-43.8 feet: Thickening of shale beds, very thin to thin<br>- 43.8-49.0 feet: Shale interbeds are very thin, non-planar with calcite infilled vugs | | 570 |
| 45 | 7 | 5.2/5.0 | 100 | | | | | | | | | | 565 |
| 50 | 8 | 4.9/5.0 | 97 | F | R3 | | | | | | LIMESTONE (micrite); medium gray (N5); fresh; medium strong; very fine thin shale beds; 2% shale<br>LIMESTONE (micrite) with shale beds; medium dark gray (N4); fresh; medium strong; shale beds are thin and common; 20% shale | | 560 |
| 55 | | | | | | | | | | | LIMESTONE (micrite) with minor interbedded shale; micrite is medium gray (N5); fresh; medium strong | | |
| | 9 | 4.7 | 94 | | | | | | | | LIMESTONE (micrite) with interbedded shale; | | |

Project Name and No.: **NuStart - Bellefonte COL Proiect: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1009

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | | 5.0 | | | | | | | | | micrite is medium dark gray (N4) and shale is dark gray (N3); fresh; medium strong; 20% shale<br>- 57.7-64.7 feet: Alternating limestone and very thin interwoven shale layers | | 555 |
| | 10 | 5.2/5.0 | 100 | | | | | | | | - 62.9-63.8 feet: limestone rich in calcite vugs | | 550 |
| 65 | | | | F | R3 | | | | | | - 64.7-65.0 feet: Shale becomes interwoven with limestone<br>- 65-69.7 feet: shale beds become irregular and discontinuous, 20% shale | | |
| | 11 | 5.1/5.0 | 100 | | | | | | | D | | | 545 |
| 70 | | | | | | | | | | | - 69.7-75.6 feet: shale interbeds become planar, very thin, spaced 0.5-0.1"; 10% shale | | |
| | 12 | 5.1/5.1 | 100 | F | R3 | | | | | | | | 540 |
| 75 | | | | | | | | | | | | | |
| | | | | | | | | | | | Boring terminated at 75.8 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>No Data | | 535 |
| 80 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 530 |
| 85 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 525 |
| 90 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 520 |
| 95 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1010

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532836.3 N; 628178.5 E | | Total Depth<br>74 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>611.7 feet | Ground Water Depth<br>See Note A | Date Started<br>8/7/06 |
| Sampling Method<br>SPT / Shelby Tube | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/8/06 |

Reviewed by / Date [signature] 3/20/07 DSC 3-20-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 611.7 CLAY, brownish yellow, (10 YR 6/6), moist, very stiff, trace manganese nodules. 0.0 | | 610 |
| | | SPT 1 | 8 10 7 | 12 | | | | | | | | |
| | | SPT 2 | 6 8 10 | 12 | | | | | | | | |
| 5 | | UD 3 | | 23.4 | 19.3 | 48/ 27 | GSZ H SG TXS | | CL | 607.7 CLAY, yellowish brown (10YR 5/6), wet, medium stiff, few rock fragments (<0.02 feet) 4.0 | 4-6 feet: Static Triaxial Test (CU with pore pressure measurement) | 605 |
| | | SPT 4 | 2 3 4 | 18 | | | | | | | | |
| 10 | | UD 5 | | 18.6 | 29.1 | 74/ 49 | GSZ H SG CN | | GC | 604.2 clayey GRAVEL with sand, dark yellowish brown (10YR 4/6) mottled with light gray (Gley 1 7/N), wet, medium dense 7.5 | | 600 |
| | | SPT 6 | 3 8 9 | 16.8 | | | | | | | | |
| | | UD 7 | | 19.2 | | | | | | | | |
| | | SPT 8 | 23/6" | 6 | | | | | | 598.2 13.5 | SPT refusal at 13.5 feet. Auger refusal at 14 feet. Continuation of borehole description in rock log. | |
| 15 | | | | | | | | | | | | 595 |
| 20 | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1010

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532836.3 N; 628178.5 E | | Total Depth<br>74 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>611.7 feet | Ground Water Depth<br>See Note A | Date Started<br>8/7/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 14 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/8/06 |

Reviewed by / Date W Lettis 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 2.1/2.3 | 91 | SW to F | R3 | | | | | | LIMESTONE (micrite) with calcareous shale interbeds, micrite is medium gray (N5) and shale is dark gray (N3); slightly weathered to fresh; medium strong | | 595 |
| 20 | 2 | 5.1/5.0 | 100 | F | R3 | | | | | | - 14-29.8 feet: shale is wispy (thickness < 0.1 feet) with spacing < 0.2 feet | | 590 |
| 25 | 3 | 5.0/5.0 | 100 | F | | | | | | | | | 585 |
| 30 | 4 | 5.1/5.0 | 100 | | R3 | | | | Bj, 15, Pl, Sl, Ti | | - 29.8-44 feet: shale is < 0.03 feet thick with spacings of 0.05-0.2 feet, wavy, small rip-up clasts | | 580 |
| 35 | 5 | 4.9/5.0 | 97 | F | | | | | | D | | | 575 |
| 40 | 6 | 4.8/5.0 | 96 | | R3 | | | | | | | | 570 |
| 45 | 7 | 5.2/5.0 | 100 | F | | | | | | | - 44-51.2 feet: shale is < 0.01-0.05 feet thick with spacings 0.3-0.2 feet, wispy and wavy, non-continuous | | 565 |
| 50 | 8 | 4.8/5.0 | 95 | | R3 | | | | | | LIMESTONE (micrite) with interbedded shale and packstone; micrite is medium gray (N5), packstone is medium bluish gray (5B 5/1) and shale is dark | good fluid return | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1010

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 9 | 4.8/5.0 | 95 | F | | | | | | D | gray (N3); fresh; medium strong<br>- 51.2-51.5 and 52-53.1 feet: packstone<br>- 51.2-61 feet: shale is < 0.01 feet thick with spacings <0.2 feet, wavy, rip-up clasts | | 555 |
| 60 | 10 | 4.5/4.7 | 96 | | R3 | | | | | | | | 550 |
| 65 | 11 | 4.6/4.6 | 100 | F | R3 | | | | | | - 61-74 feet: shale is <0.01 feet thick with spacings <0.2 feet, wavy | | 545 |
| 70 | 12 | 5.1/4.4 | 100 | | | | | | | | | good fluid return | 540 |
| | 13 | 4.0/4.0 | 100 | | | | | | | | | | |
| 75 | | | | | | | | | | | Boring terminated at 74 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/8 - 11.2 feet<br>8/14 - 11.2 feet | | 535 |
| 80 | | | | | | | | | | | | | 530 |
| 85 | | | | | | | | | | | | | 525 |
| 90 | | | | | | | | | | | | | 520 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1011

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532610.4 N; 628132.4 E | | Total Depth<br>75.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>615.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/30/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof/K. Krug | Date Completed<br>6/6/06 |

Reviewed by / Date: W Lettis 3-14-07; DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 615.6 / 0.0<br>CLAY, dark reddish brown (5YR 3/3), dry to wet, stiff, trace gravel, (Fill) | | 615 |
| | | SPT 1 | 4 5 7 | 15.6 | | | | | | | | |
| | | | | | | | | | CL | 612.6 / 3.0<br>- color changes to yellowish red (5YR 4/6), and becomes wet at 4.5 feet (Residual) | possible water table at 4.5 feet | |
| 5 | | SPT 2 | 31 3 5 | 16.8 | | | | | | | | 610 |
| | | SPT 3 | WOR 4 6 | 16.8 | 24.0 | 77/ 53 | GSZ | | CH | 609.6 / 6.0<br>CLAY, yellowish brown (10YR 5/4), moist, stiff, few dark brown silt pockets | | |
| | | | | | | | | | CL | 607.1 / 8.5<br>CLAY, pale yellow (2.5Y 7/4), dry to moist, very stiff to hard, effervesces strongly in HCl acid | | |
| 10 | | SPT 4 | 5 9 12 | 16.8 | 17.9 | 34/ 16 | GSZ | | | | | 605 |
| | | SPT 5 | 26 30 33 | 10.8 | | | | | | - 12 feet: few weathered limestone fragments | | |
| | | SPT 6 | 19 26 24 | 14.4 | | | | | | | | |
| 15 | | | | | | | | | | 599.6 / 16.0 | | 600 |
| | | SPT 7 | 14 19/0" | 4.8 | | | | | GW | 599.1 / 16.5<br>GRAVEL, medium gray (N5), dry, dense, gravel is limestone rock fragments | Auger and SPT refusal at 16.5 feet. Continuation of borehole description in rock log. | |
| 20 | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1011

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532610.4 N; 628132.4 E | | Total Depth<br>75.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>615.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/30/06 |
| Casing Size and Depth<br>PVC: 6.63 inch O.D. / 16.5 feet | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof/K. Krug | Date Completed<br>6/6/06 |

Reviewed by / Date DSC 3-13-07 W Gordon 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 3.0/3.0 | 100 | F | R3 | | | | Bj, 10, Wa, Sm-Sl<br>Bj, 15, Pl, Sm, Ti<br>Bj, 10, Wa, Ro, Ti | | LIMESTONE (micrite) with interbeds of calcareous shale; micrite is medium gray (N5) and shale is medium dark gray (N4); fresh; medium strong; prominent shale-rich zone (~40%) | No fluid recovery along boring | |
| 20 | 2 | 4.8/5.0 | 96 | | | | | | Bj, 10, Pl, Sl, Ti<br>Jo, 70, Wa, Sm-Sl, Ti<br>Jo, 65, Wa, Sl, Ti | C | - 16.5-22.7 feet: shale beds are 0.5-0.02 feet with spacings of 0.1-0.2 feet | Down pressure 600 psi | 595 |
| 25 | 3 | 4.9/5.0 | 98 | F | R3 | | | | | | - 22.7-30.7 feet: reduced shale content, shale is thin (<0.1 feet) and spaced 0.2-0.4 feet apart, chert nodules present | | 590 |
| 30 | 4 | 5.1/5.0 | 99 | | | BHTV | | | | | - 30.7-35.2 feet: shale is 0.2-0.3 feet thick with spacings 0.2-0.5 feet | BHTV analysis was conducted over the length of cored section | 585 |
| | | | | | | | | | Bj, 30, St, Sl, Op<br>Bj, 15, Pl, Sm, Op | | - 33 feet: calcite coating of crack, pyrite<br>- 33.2 feet: slickensides and calcite crystals | | |
| 35 | 5 | 5.1/5.0 | 100 | F | R3 | | | | | | - 34.7 feet: chert nodule<br>- 35.2-45.7 feet: limestone becomes more crystalline, shale changes color to medium gray (N3)<br>- 37.5 feet: chert nodule 0.1x0.2 feet | | 580 |
| 40 | 6 | 4.9/5.0 | 98 | | R3 | | | | Jo, 65, Wa, SM, Ti | D | - 40.5 feet: stylolites<br>- 42.5-47 feet: high angle joints with clay and calcite coatings | | 575 |
| 45 | 7 | 4.9/5.0 | 98 | F | R2/R3 | | | | Jo, 65, Wa, Ro, Ti<br>Jo, 70, Wa, Sl-Ro, Ti | | - 45.7-49.0 feet: shale color changes to medium dark gray (N4), thickness and spacing are maintained | | 570 |
| 50 | 8 | 5.1/5.0 | 100 | | | | | | | | 49-69.8 feet: limestone becomes more crystalline, shale changes color medium gray (N3) | | 565 |
| 55 | | | | F | R3 | | | | | | | | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1011

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 5.2/5.0 | 100 | | | | | | | | | | |
| 60 | 10 | 4.9/5.0 | 98 | F | R3 | | | | | D | - 64 feet: calcite filled vugs, maximum size 0.1x0.1 feet | | 555 |
| 65 | 11 | 5.2/5.0 | 100 | | | | | | | | | | 550 |
| 70 | 12 | 4.9/5.0 | 98 | F | R3 | | | | | | - 69.5 feet: calcite filled vug on fracture<br>- 69.8-75.5 feet: shale returns to original banding, beds are 0.5-0.02 feet with spacings of 0.1-0.2 feet, fossil rich zone at 69.8-70 feet<br>- 72.4-72.6 feet: slicken-sides on bedding surface | | 545 |
| 75 | 13 | 0.8/1.0 | 80 | | | | | | Bb, 45, Wa, Sm, Ti, slicken lines | | Boring terminated at 75.5 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/6 - 13.2 feet | | 540 |
| 80 | | | | | | | | | | | | | 535 |
| 85 | | | | | | | | | | | | | 530 |
| 90 | | | | | | | | | | | | | 525 |
| 95 | | | | | | | | | | | | | 520 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1012

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532678 N; 628247.8 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>616.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/20/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/21/06 |

Reviewed by / Date DSC 3-13-07 W Solum 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | MH | 616.7 SILT, brown (7.5 YR 4/4), moist, stiff to very stiff, trace organic matter and manganese nodules | 0.0 | 615 |
| | | SPT 1 | 4 5 6 | 8.4 | | | | | | | | |
| | | SPT 2 | 4 8 12 | 11.4 | 25.2 | 63/ 28 | GSZ | | | | | |
| 5 | | | | | | | | | CH | 611.2 CLAY with sand, yellowish brown (10YR 5/6), moist, stiff to medium stiff, trace manganese nodules, trace gravel | 5.5 | 610 |
| | | SPT 3 | 3 4 5 | 9.6 | 15.6 | | CHE | | | | | |
| | | SPT 4 | 1 3 4 | 9 | 23.4 | 68/ 46 | GSZ | | | | | |
| 10 | | | | | | | | | CH | 606.2 CLAY with gravel, bluish gray (Gley 2 6/1), moist, hard<br>- 10.5 to 13.9 feet: limestone gravels are angular when fresh and rounded and white when weathered | 10.5 | 605 |
| | | SPT 5 | 23 20 37 | 18 | | | | | | | | |
| | | SPT 6 | 50/5" | 5 | | | | | | 602.8 | 13.9 | SPT refusal at 13.9 feet. Auger advanced to 14.85 feet. Continuation of borehole description in rock log. |
| 15 | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1012

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532678 N; 628247.8 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>616.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/20/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 15.1 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/21/06 |

Reviewed by / Date DSC 3-13-07 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 1.5/1.7 | 36 | SW | R2 to R3 | PA | | | Bj, 15, Wa, Sm, Op | C | SHALE with micrite interbeds; shale is dark gray (N3) and micrite is medium gray (N5); slightly weathered to fresh; medium strong to weak; strong HCl reaction<br>- 14-32 feet: shale can be scratched with a thumbnail and shows incipient fractures<br>- 14.85-16.6 feet: slightly weathered zone with clay lined fractures<br>- 15.5 feet: shale is altering to brown clay<br>- micrite is 0.05-0.15 feet thick with spacings 0.05-0.3 feet<br>- 25.3-25.7 feet: section of Packstone and micrite 0.4 feet thick | 15-50 feet: good fluid return | |
| 20 | 2 | 4.9/5.0 | 95 | F | R2 to R3 | | | | | | | | 600 |
| 25 | 3 | 5.0/5.0 | 100 | F | R2 to R3 | | | | | | | | 595 |
| 30 | 4 | 4.9/5.0 | 97 | F | R2 to R3 | | | | | | | | 590 |
| 35 | 5 | 5.0/5.0 | 100 | F | R3 | | | | | D | LIMESTONE (micrite) with calcareous shale interbeds; medium gray (N5) and dark gray (N3); fresh; medium strong; strong HCl reaction; packstone interbeds of thickness 0.05-0.1 feet<br>- shale is 0.01-0.05 feet thick with spacings of 0.03-0.1 feet<br>- 36.5-50 feet: increase in shale bed spacing, micrite is very crystaline<br>- 36.8-42.7 feet: shale is <0.01 feet thick with 0.05-0.25 feet spacing, spar in rock fabric, occasional chert pods 0.05-0.1 feet thick<br>-42.7-48 feet: shale is 0.02-0.07 feet thick with spacing 0.04-0.35 feet, occasional chert pods<br>- 43 feet: pyrite and fossils<br>- 46.3 feet: fossiliferous<br>- 48-50 feet: shale is < 0.01 feet thick with an average spacing of 0.08 feet | | 585 |
| 40 | 6 | 4.8/5.0 | 95 | F | R3 | | | Bj, 5, Wa, Sl/Sm, Ti<br>Jo, 60, Wa, Sl, Ti | | | | | 580 |
| 45 | 7 | 5.1/5.0 | 100 | F | R3 | | | Jo, 45, Wa, Sl, Ti<br>Bj, 15, Wa, Sm/Sl, Op | | | | | 575 |
| 50 | 8 | 3.6/3.5 | 100 | F | R3 | | | | | | | | 570 |
| | | | | | | | | | | | Boring terminated at 50.0 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/21 - 18.3 feet<br>8/6 - 18.3 feet | | 565 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1013

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532758.8 N; 628315.6 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>614.8 feet | Ground Water Depth<br>See Note A | Date Started<br>5/31/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/7/06 |

Reviewed by / Date W Solomi 3-19-07 DSC 3-13-07

| Depth (feet) | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Soil Type (USCS) | Lithology | Elevation (feet) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | ML | 614.8 TOPSOIL, clayey silt with organics, dark yellowish brown (10YR 4/4), very stiff, dry to moist | 0.0 | |
| | SPT 1 | 4 5 7 | 10.8 | 27.0 | 78/45 | GSZ | CH | 613.8 CLAY, light yellowish brown (2.5Y 6/4), dry to moist, stiff | 1.0 | |
| | SPT 2 | 2 2 2 | 9.6 | 18.0 | 28/12 | GSZ | CL | 611.1 CLAY, pale olive (5Y 6/3), wet, soft | 3.7 | |
| 5 | SPT 3 | 2 3 5 | 12 | | | | CH | 609.3 CLAY, yellowish brown (10YR 5/4) moist, stiff, trace manganese nodules | 5.5 | |
| | SPT 4 | 3 4 5 | 9 | | | | | | | |
| 10 | SPT 5 | 37 50/1" | 7 | | | | GW | 604.3 GRAVEL with clay, dry, dense to very dense, weathered limestone | 10.5 | |
| | | | | | | | | 603.2 | 11.6 | SPT refusal at 11.6 feet. Auger refusal at 12.5 feet. Continuation of borehole description in rock log |
| 15 | | | | | | | | | | |
| 20 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 30 | | | | | | | | | | |

Elevation (feet): 610, 605, 600, 595, 590, 585

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1013

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532758.8 N; 628315.6 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>614.8 feet | Ground Water Depth<br>See Note A | Date Started<br>5/31/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 14 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/7/06 |

Reviewed by / Date: W Hodson 3-14-07; DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | GRAVEL with clay, dry, dense to very dense, weathered limestone | | |
| 15 | 1 | 1.9/3.5 | 11 | MW to SW | NR | | | | | LIMESTONE with clay, slightly weathered to moderately weathered, weak, gravel sizes are <0.2 feet, interspersed with clay pockets | Begin rock coring after auger refusal at 12.5 feet. | 600 |
| 20 | 2 | 5.1/5.0 | 87 | SW to F | R2 to R3 | | | Bj, 20, Wa, Sm, Op<br>Bb, 10, Wa, Sm, Ti | | SHALE (calcareous) with micrite interbeds and occasional sections of packstone; shale is dark gray (N3), micrite is medium dark gray (N4) and packstone is medium bluish gray (5B 5/1); fresh to slightly weathered<br>-15-26 feet: micrite layers are 0.05-0.2 feet with spacings <0.4 feet | | 595 |
| 25 | 3 | 5.1/5.0 | 100 | F | R2 to R3 | BHTV | | Jo/Bb, Wa, Ro, Ti, Sw | C | -22.4-23.4 feet: packstone with visible rip up clasts | BHTV analysis was conducted over the length of cored section | 590 |
| 30 | 4 | 5.0/5.0 | 100 | F | R2 to R3 | | | Jo, 70, Wa, Ro, Ti | | - 26-27.7 feet: predominatly micrite<br>- 27.3-27.7 feet: high angle fracture<br>27.7-31.2 feet: micrite layers are 0.05-0.2 feet with spacings <0.4 feet | | 585 |
| 35 | 5 | 5.1/5.0 | 100 | F | R3 | | | Bb, 25, Wa, Sl, Ti | | LIMESTONE (micrite) with interbedded calcarious shale, micrite is medium gray (N5), and shale is dark gray (N3) to grayish black (N2); fresh; medium strong; occasional chert pods and vugs<br>-31.3-41 feet: shale layers are < 0.05 feet thick with spacings <0.2 feet, very crystalline | | 580 |
| 40 | 6 | 5.0/5.0 | 99 | F | R3 | | | Bb, 10, Wa, Ro, Ti | D | - 36-41 feet: many chert pods in Run 6, maximum size 0.2x0.1 feet | | 575 |
| 45 | 7 | 4.9/5.0 | 97 | F | R3 | | | Bb, 20, Wa, Sl, Ti | | - 41-50 feet: shale bed thicknesses are < 0.7 feet with spacings <0.6 feet, micrite is very crystalline | 42 feet: slower drilling | 570 |
| 50 | 8 | 3.5/4.0 | 86 | F | R3 | | | Bb, 10, Wa, Sl, Ti | | | PVC: 4 inch O. D. installed after drilling for BHTV test | 565 |
| | | | | | | | | | | Boring terminated at 50.0 feet<br>NOTE A: Water level data | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1013

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Date - Depth (below ground surface)<br>6/5 - 9.2 feet<br>6/7 - 9.1 feet<br>8/6 - 9.1 feet | | |
| 55 | | | | | | | | | | | | | 560 |
| 60 | | | | | | | | | | | | | 555 |
| 65 | | | | | | | | | | | | | 550 |
| 70 | | | | | | | | | | | | | 545 |
| 75 | | | | | | | | | | | | | 540 |
| 80 | | | | | | | | | | | | | 535 |
| 85 | | | | | | | | | | | | | 530 |
| 90 | | | | | | | | | | | | | 525 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1014

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532984.8 N; 628354.3 E | | Total Depth<br>121.2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>609.1 feet | Ground Water Depth<br>See Note A | Date Started<br>6/13/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>6/14/06 |

Reviewed by / Date DSC 3-13-07 W Lettis 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 609.1 CLAY with sand, yellowish brown (10YR 5/8), dry to moist, stiff, trace clasts of manganese oxide nodule | | |
| | | SPT 1 | 3 5 5 | 16.8 | | | | | | | | |
| | | | | | | | | | | - slight color change to yellowish brown (10YR 5/6) | | |
| | | SPT 2 | 3 5 9 | 17.4 | | | | | | 604.6 | 4.5 | 605 |
| 5 | | SPT 3 | 20/0" | 7.2 | | | | | CH | CLAY with sand, brownish yellow (10YR 6/8), dry to moist, stiff to very stiff, few clasts<br>603.1 | 6.0 | SPT and auger refusal at 5 feet.<br>Casing set to a depth of 6 feet. Continuation of borehole description in rock log. |
| 10 | | | | | | | | | | | | 600 |
| 15 | | | | | | | | | | | | 595 |
| 20 | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | 580 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1014

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532984.8 N; 628354.3 E | | Total Depth<br>121.2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>609.1 feet | Ground Water Depth<br>See Note A | Date Started<br>6/13/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 5.5 feet | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>6/14/06 |

Reviewed by / Date W Foldum 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 5.0/5.5 | 92 | SW | R2 to R3 | | | | | | LIMESTONE (micrite) interbedded with calcareous shale; micrite is medium bluish gray (Gley 2, 5/1) and shale is reddish brown (5YR 4/4) alternating to very dark greenish gray (Gley 2 3/1); slightly weathered to fresh; weak to medium strong<br>- 7.6-7.8 feet: possible void<br>- 8.2-10.8 feet: shale beds 0.05 - 0.1 feet thick and spaced 0.5 - 0.7 feet apart, non-planar, limestone is calcite rich, bioturbated zone at 8-9 feet | 7.1 feet: Unconfined Compression Test | 600 |
| 15 | 2 | 5.0/5.0 | 100 | F | R3 | | | | | | | | 595 |
| 20 | 3 | 4.9/5.0 | 98 | F | R3 | | | | | | - 17.2-18 feet: mostly medium gray (N5) limestone, fossiliferous, burrows<br>- 18-21.4 feet: shale beds are 0.1 - 0.2 feet thick with spacings of 0.01 - 0.1 feet | | 590 |
| 25 | 4 | 5.0/5.0 | 100 | | | | | | Mb, 75, Wa, Ro, Ti, incipient | | - 21.4-37 feet: shale beds indefinite and interweaving with (more dominant) limestone, 30% shale | | 585 |
| 30 | 5 | 5.3/5.0 | 100 | F | R3 | | | | | D | | | 580 |
| 35 | 6 | 4.8/5.0 | 96 | | | | | | | | - 35-35.1 feet: burrows<br>- 35.8-37 feet: healed fracture, calcite | 32.2 feet: Unconfined Compression Test | 575 |
| 40 | 7 | 5.3/5.0 | 100 | F | R3 | | | | Jo, 75, Wa, Ro, Ti, incipient 36.3-37.3' | | - 37-46 feet: interwoven shale bands become more solid and group as inbeds in thicknesses of 0.1 - 0.2 feet with spacings 0.01 - 0.5 feet | | 570 |
| 45 | 8 | 4.8/5.0 | 96 | | R2 to R3 | | | | Jo, 75, Wa, Ro, Ti incipient, 44-45.6' | | - 42-48 feet: bioturbation<br>- 43.4-45.6 feet: crystalized fracture plane | | 565 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1014

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 4.4/5.0 | 89 | | | | | | Jo, 65, Wa, Ro, Ti, 47.4-47.9' | | - 46-50.9 feet: less shale beds, shale beds are defined with thicknesses of 0.1 - 0.2 feet and spacings of 0.1 - 0.5 feet, 15% shale | 46 - 51 feet: calcite-filled vugs present throughout run | |
| 50 | | | | F | R2 to R3 | | | | | | | | 560 |
| | 10 | 5.3/5.0 | 100 | | | | | | | | - 50.9-57.7 feet: shale beds become very thin and discontinuous, calcite filled vugs, 5% shale<br>- 51-86 feet: calcite-filled vugs 0.2 - 0.01 feet diameter, common | | |
| 55 | | | | | | | | | | | | | 555 |
| | 11 | 5.3/5.0 | 100 | | | | | | | | - 57.7-73.3 feet: shale beds are 0.01 - 0.1 feet thick with spacings < 0.2 feet, 20% shale | 55.8 feet: Unconfined Compression Test | |
| 60 | | | | | | | | | Mb, slickensides | | | | 550 |
| | 12 | 5.2/5.0 | 100 | F | R3 | | | | | | | | |
| 65 | | | | | | | | | | | | | 545 |
| | 13 | 4.6/5.0 | 91 | | | | | | | D | | | |
| 70 | | | | F | R3 | | | | | | | | 540 |
| | 14 | 5.2/5.0 | 100 | | | | | | | | - 73.3-76 feet: calcite-rich limestone with no shale | | |
| 75 | | | | | | | | | | | | | 535 |
| | 15 | 5.0/5.0 | 100 | | | | | | | | - 76-86.1 feet: shale is 0.001 - 0.1 feet thick with spacings 0.2 - 0.1 feet, planar, interwoven | | |
| 80 | | | | F | R3 | | | | | | | | 530 |
| | 16 | 4.8/5.0 | 95 | | | | | | | | | | |
| 85 | | | | | | | | | | | - 85 feet: fossil-rich limestone layer | | 525 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1014

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 17 | 5.0/5.0 | 99 | | | | | | | | - 86.1-87.4 feet: very little shale (2%), limestone is medium gray (N5)<br>- 87.4-92 feet: shale is very thin | | 520 |
| 90 | | | | F | R3 | | | | | | | | |
| | 18 | 5.2/5.0 | 100 | | | | | | Jo, 70, Wa, Ro, Ti<br>Jo, 65, Wa, Ro, Ti | | - 92.0-98.1 feet: micrite interbedded with shale, micrite is medium gray (N5), 10% shale | | 515 |
| 95 | | | | | | | | | | | | | |
| | 19 | 5.2/5.0 | 100 | | | | | | | | - 98.1-105.7 feet: micrite with interbedded shale, 15% shale | | 510 |
| 100 | | | | F | R3 | | | | | | | | |
| | 20 | 4.9/5.0 | 97 | | | | | | | D | | | 505 |
| 105 | | | | | | | | | | | | | |
| | 21 | 5.2/5.0 | 100 | | | | | | | | - 105.7-111.9 feet: shale is < 0.01 feet thick with spacings of 0.001 - 0.2 feet, beds become irregular at 111 feet, 10% shale<br>- 106-115 feet: calcite infilled vugs common among bands of limestone | | 500 |
| 110 | | | | F | R3 | | | | | | | | |
| | 22 | 4.7/5.0 | 93 | | | | | | Jo, 70, Wa, Ro, Ti | | LIMESTONE (micrite) with calcareous shale; medium gray (N5); fresh; medium strong; shale is irregular; 25% shale | | 495 |
| 115 | | | | | | | | | | | - 115.2-117.6 feet: shale becomes planar, calcite-healed fractures | | |
| | 23 | 5.1/5.2 | 100 | F | R3 | | | | | | - 117.6-117.9 feet: packstone or wackestone 0.3 feet thick<br>- 117.9-120.4 feet: shale beds are irregular | | 490 |
| 120 | | | | | | | | | Mb: slickensided, calcite-coated | | LIMESTONE (micrite); medium gray (N5); fresh; medium strong; shale laminae with spacings of 0.2 feet | - 119.7 feet: slickensided calcite joint plane | |
| | | | | | | | | | | | Boring terminated at 121.2 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/6 - 12.2 feet | | 485 |
| 125 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1015

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533020.6 N; 628276.3 E | | Total Depth<br>75.4 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 45 | Elevation (Datum NAVD 88)<br>611.5 feet | Ground Water Depth<br>See Note A | Date Started<br>8/17/06 |
| Sampling Method<br>Standard/UD | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>8/18/06 |

Reviewed by / Date W Foden 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 611.5 TOPSOIL, clayey material 0.0 | | |
| | | | | | | | | | | 610.5 1.0 | | 610 |
| | | SPT 1 | 6 11 12 | 10.8 | | | | | CH | CLAY with sand, yellowish red (5YR 4/6), moist, very stiff to soft | | |
| | | SPT 2 | 1 1 2 | 0.5 | | | | | | | | |
| 5 | | UD 3 | | 27.6 | 20.4 | 78/ 44 | GSZ H SG | | | | 700 psi push pressure on shelby tubes | |
| | | | | | | | | | | 605.5 6.0 | | 605 |
| | | SPT 4 | 15 9 9 | 13.2 | | | | | CH | CLAY, strong brown (7.5 YR 4/6), moist, very stiff, few gravel and roots, trace black manganese nodules | | |
| | | UD 5 | | 27.6 | 21.7 | 98/ 77 | GSZ H SG | | | - 8 feet: color change to yellowish brown (10YR 4/6) | | |
| 10 | | SPT 6 | 7 5 50/2" | 15.6 | | | | | | 600.7 10.8 | | |
| | | | | | | | | | ML | 600.4 SILT, gray, moist, hard 11.1 | | 600 |
| | | SPT 7 | 7 17 21 | 18 | | | | | CH | CLAY with gravel, yellowish brown (10YR 5/6), moist, hard, trace black manganese nodules | | |
| | | | | | | | | | | 599.0 12.5 | SPT refusal at 12.5 feet. Auger refusal at 13.0 feet. Continuation of borehole description in rock log. | |
| 15 | | | | | | | | | | | | 595 |
| 20 | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1015

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533020.6 N; 628276.3 E | | Total Depth<br>75.4 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 45 | Elevation (Datum NAVD 88)<br>611.5 feet | Ground Water Depth<br>See Note A | Date Started<br>8/17/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 13 feet | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>8/18/06 |

Reviewed by / Date DSC 3-13-07 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2.0/2.0 | 80 | F | R3 | | | | | | LIMESTONE (micrite) interbedded with packstone and calcareous shale; micrite and packstone are medium gray (N5) and shale is dark medium gray (N4), fresh, medium strong<br>- 15-20 feet: calcite filled vugs<br>- 13-20 feet: shale is 0.01-0.04 feet thick, wavy | Downpressure 500 psi, good fluid return, brown | |
| 15 | | | | | | | | | Bj, 10, Sm, Pl, Ti | | | | |
| | 2 | 5.0/5.0 | 100 | | | | | | Bj, 10, Wa, Sl, Ti | | | | 595 |
| | | | | | | | | | Bj, 15, Pl, Sm, Ti | | | | |
| 20 | | | | F | R3 | | | | | | -16-20 feet: shale is 0.01-0.08 feet thick, gradual change from micrite to wackestone | | |
| | 3 | 5.0/5.0 | 92 | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | LIMESTONE (wackestone) with calcareious shale interbeds; wackestone is medium gray (N5) and shale is dark medium gray (N4); fresh; medium strong | fluid return good, gray-brown | |
| | 4 | 4.9/5.0 | 98 | | | | | | Bj, 10, Wa, Sl, Ti | | | | 585 |
| 30 | | | | F | R3 | | | | | | - 25-45 feet: shale is 0.01-0.03 feet thick, wavy contact | fluid return good, light gray | |
| | 5 | 5.0/5.0 | 100 | | | | | | | D | | | 580 |
| 35 | | | | | | | | | | | - 35-40 feet: rip up clasts and stylolites present. | | |
| | 6 | 5.0/5.0 | 100 | | | | | | | | - 37.5-37.6 feet and 38.4-38.6 feet: packstone interbeds | | 575 |
| 40 | | | | F | R3 | | | | Bj, 10, Wa, Sl, Ti | | | | |
| | 7 | 5.0/5.0 | 100 | | | | | | | | | | 570 |
| 45 | | | | | | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark medium gray (N4); fresh; medium strong; strong reaction to HCl<br>- 45-50 feet: few packstone filled burrows<br>- 45-65 feet: shale is 0.01-0.03 feet thick, bedding contacts irregular and wavy, sometimes discontinuous<br>- 50-55 feet: some rip up clasts | | |
| | 8 | 5.0/5.0 | 100 | | | | | | | | | | 565 |
| 50 | | | | F | R3 | | | | | | | | |
| | | 5.0 | | | | | | | | | | | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1015

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 5.0 | 100 | | | | | | | | | | |
| 55 | | | | | | | | | | | | | 555 |
| | 10 | 5.0/5.0 | 100 | | | | | | | | | | |
| 60 | | | | F | R3 | | | | | | | | 550 |
| | 11 | 5.0/5.0 | 88 | | | | | | Bj, 10, Wa, Sl, Ti | D | -62-62.6 feet: packstone interbed | | |
| 65 | | | | | | | | | | | LIMESTONE (packstone) with calcareous shale interbeds; packstone is medium gray (N5) and shale is dark medium gray (N4); fresh; medium strong | | 545 |
| | 12 | 5.2/5.2 | 100 | | | | | | | | | | |
| 70 | | | | F | R3 | | | | Bj, 10, Wa, Ro, Ti | | | | 540 |
| | 13 | 5.2/5.2 | 100 | | | | | | | | - 71.4-75.2 feet: shale is very thinly laminated, fossiliferous | | |
| 75 | | | | | | | | | | | Boring terminated at 75.4 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/18 - 9.5 feet<br>8/19 - 5.0 feet | | 535 |
| 80 | | | | | | | | | | | | | 530 |
| 85 | | | | | | | | | | | | | 525 |
| 90 | | | | | | | | | | | | | 520 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1015UDD

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft)<br>1533026.4 N; 628273.1 E | | Total Depth<br>16.5 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Gibson) / CME 45 | Elevation (Datum NAVD 88)<br>612.2 feet | Ground Water Depth<br>See Note A | Date Started<br>8/21/06 |
| Sampling Method<br>SPT / Shelby Tube | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>8/22/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Soil Type (USCS) | Lithology | Elevation (feet) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | ML | 612.2 SILT, reddish dark gray (10YR 3/1) 0.0 | | Augered 0-1.5 feet |
| | SPT 1 | 3 5 7 | 14.4 | | | | CH | 610.7 CLAY, red (2.5YR 5/6), moist, stiff (Residual) 1.5 | 610 | |
| | UD 2 | | 24 | | | | | - 3 feet: color changes to red (2.5YR 4/8) | | |
| 5 | | | | | | | | 606.0 | | Augered 5-6.5 feet |
| | SPT 3 | 5 8 14 | 14.4 | | | | CH | CLAY, red (2.5YR 5/6), moist, very stiff, trace black manganese nodules, contains weathered subrounded limestone gravel (Residual) 6.2 | 605 | |
| | UD 4 | | 8 | | | | | - 9 feet: decrease in gravel content | | Augered 9-11.5 feet |
| 10 | | | | | | | | 601.2 | | |
| | SPT 5 | 2 7 14 | 14.4 | | | | CH | CLAY with gravel, red (2.5YR 5/6), moist, stiff (Residual) 11.0 | 600 | Rig chattering, auger refusal at 11 feet |
| | UD 6 | | 20.4 | | | TXD | | | | |
| 15 | SPT 7 | 3 6 7 | 15.6 | | | | | - 15 feet: color changes to reddish yellow (7.5YR 6/8) and red (2.5YR 5/6) mottled 595.7 16.5 | | Groundwater not encountered |
| | | | | | | | | Boring terminated at 16.5 feet. Did not encounter bedrock. | 595 | |
| 20 | | | | | | | | | 590 | |
| 25 | | | | | | | | | 585 | |
| 30 | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Leitis & Associates, Inc.

# SOIL LOG - Boring No. B-1016

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532867.3 N; 628224.3 E | | Total Depth<br>20.7 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>611.6 feet | Ground Water Depth<br>See Note A | Date Started<br>6/25/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/25/06 |

Reviewed by / Date DSC 3-13-07 W Leitis 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 611.6 / 0.0<br>CLAY with sand, dark red (2.5YR 3/6), stiff, dry to moist (Fill) | | |
| | | SPT 1 | 2 5 9 | 12 | | | | | | | Observed water level at 1.5 feet, artificially high | 610 |
| | | | | | | | | | CL | 608.1 / 3.5<br>CLAY, strong brown (7.5YR 5/6), moist, stiff (Fill) | | |
| 5 | | SPT 2 | 2 4 6 | 10 | | | | | | | | |
| | | | | | | | | | CH | 605.6 / 6.0<br>CLAY with sand, strong brown (7.5 YR 5/8), moist, stiff and medium stiff (Fill) | | 605 |
| | | SPT 3 | 4 4 8 | 6 | | | | | | | | |
| 10 | | SPT 4 | 2 3 4 | 6 | | | | | | | | |
| | | SPT 5 | 3 5 8 | 12 | | | | | | | | 600 |
| | | | | | | | | | CH | 598.6 / 13.0<br>CLAY with sand, strong brown (7.5 YR 5/6), moist, stiff | | |
| 15 | | SPT 6 | 3 5 7 | 12 | | | | | | | | |
| | | SPT 7 | 50/4" | 2.4 | | | | | GW | 595.6 / 16.0<br>595.3 / 16.3<br>GRAVEL, weathered limestone | SPT refusal at 16.3 feet. Auger refusal at 17.5 feet. Continuation of borehole description in rock log. | 595 |
| 20 | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1016

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532867.3 N; 628224.3 E | | Total Depth<br>20.7 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>611.6 feet | Ground Water Depth<br>See Note A | Date Started<br>6/25/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 17.5 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/25/06 |

Reviewed by / Date W Gordon 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | GRAVEL, weathered limestone | | 595 |
| 20 | 1 | 3.2/3.2 | 91 | SW to F | R4 | | | | Ve, 45, Pl, Si, So<br>Bj, 15, Pl, R, Mo | D | LIMESTONE (micrite) with interbedded shale; medium gray (N5); fresh to slightly weathered; strong; shale beds moderately thin to thin with spacings of 0.1-0.2 feet | oil sheen coming up with drill fluid. Boring terminated due to hydrocarbon concerns. | |
| | | | | | | | | | | | Boring terminated at 20.7 feet.<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/26- 1.5 feet | | 590 |
| 25 | | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | | 580 |
| 35 | | | | | | | | | | | | | 575 |
| 40 | | | | | | | | | | | | | 570 |
| 45 | | | | | | | | | | | | | 565 |
| 50 | | | | | | | | | | | | | 560 |
| 55 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettus & Associates, Inc.

# SOIL LOG - Boring No. B-1017

| | | | |
|---|---|---|---|
| Drilling Method: Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft) 1532937.4 N; 628225.4 E | | Total Depth: 50.6 feet |
| Drilling Contractor (Driller) and Rig: MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88): 611.9 feet | Ground Water Depth: See Note A | Date Started: 7/8/06 |
| Sampling Method: Split Spoon/ NQ core | Borehole Inclination: Vertical | Logged by: J. Hoeft | Date Completed: 7/8/06 |

Reviewed by / Date: DSC 3-13-07 W Stadum 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 611.9 CLAY with sand, strong brown (7.5YR 4/6), dry, very stiff to hard | |
| | | SPT 1 | 6 7 13 | 6 | | | | | | | |
| | | | | | | | | | CL | 608.9 CLAY with sand, very pale brown (10YR 8/3), dry, very stiff, abundant manganese nodules | |
| | | SPT 2 | 9 12 12 | 12.6 | | | | | | | |
| 5 | | | | | | | | | CH | 606.4 CLAY with silt, strong brown (7.5 YR 5/6), dry, very stiff, occasional manganese nodules | |
| | | SPT 3 | 3 8 16 | 10.8 | | | | | | | |
| | | | | | | | | | CH | 604.4 CLAY, yellowish brown (10YR 5/6), very stiff, dry to moist, occasional manganese nodules | |
| | | SPT 4 | 6 10 12 | 7.2 | 16.3 | | CHE | | | | |
| 10 | | | | | | | | | | | |
| | | SPT 5 | 3 8 7 | 9.6 | | | | | | | |
| | | | | | | | | | CH | 600.4 CLAY with silt, yellowish brown (10YR 5/4), moist, soft | |
| | | | | | | | | | CH | 599.6 CLAY, strong brown (7.5YR 5/8), moist, soft to stiff, occasional manganese nodules | |
| | | SPT 6 | 2 4 7 | 13.8 | | | | | | | |
| 15 | | | | | | | | | CH | 596.9 CLAY, yellowish brown (10YR 5/4), moist, stiff, occasional limestone clasts (angular sand to gravel in size) | |
| | | SPT 7 | 3 6 8 | 15.6 | | | | | | | |
| | | SPT 8 | 50/0" | 0 | | | | | | 592.7 | Auger refusal at 19.0 feet. Continuation of borehole description on rock log. |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 610, 605, 600, 595, 590, 585

Depth scale: 0, 5, 10, 15, 20, 25, 30

Lithology depth scale: 0.0, 3.0, 5.5, 7.5, 11.5, 12.3, 15.0, 19.2

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1017

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532937.4 N; 628225.4 E | | Total Depth<br>50.6 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>611.9 feet | Ground Water Depth<br>See Note A | Date Started<br>7/8/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 19 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>7/8/06 |

Reviewed by / Date DSC 3-13-07 WLolson 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 4.4/4.4 | 99 | SW to F | R3 | | | | | D | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh to slightly weathered; medium strong; strong HCL Reaction<br>- 19.2-25 feet: shale is 0.05-0.13 feet thick with spacings of 0.08-0.2 feet, wavy | | 590 |
| 25 | 2 | 4.9/5.0 | 98.6 | F | R3 | | | | | | - 25-29 feet: shale is 0.01-0.05 thick with spacings of 0.05-0.3 feet, rip-up clasts, wavy, limestone becomes fresh | | 585 |
| 30 | 3 | 4.9/5.0 | 97.8 | F | R3 | | | Bj, 10, Wa, Sm, Ti | | | - 29.0-32.0 feet: interbedded micrite and wackestone<br>- 32-36.6 feet: shale is 0.01-0.05 thick with spacings of 0.05-0.3 feet, rip-up clasts, wavy | | 580 |
| 35 | 4 | 5.1/5.0 | 100 | | | | | Bj, 15, Wa, Sm, Ti | | | - 36.6-40 feet: shale is <0.01 feet thick with spacings of 0.02-0.05 feet, wavy | | 575 |
| 40 | 5 | 4.9/5.0 | 98 | F | R3 | | | | | | - 40-43.35 feet: shale is <0.02 feet thick with spacings of 0.05-0.2 feet, wavy | | 570 |
| 45 | 6 | 4.5/5.0 | 90 | | | | | | | | LIMESTONE (wackestone and packstone) with calcareous shale; limestone is medium gray (N5) and shale is dark gray (N3), wavy; fresh; medium strong; strong HCL reaction<br>LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5), shale is dark gray (N3); medium strong | | 565 |
| 50 | 7 | 2.7/2.0 | 100 | F | R3 | | | | | | - 45.5- 50.5 feet: shale is wavy <0.01 feet thick with spacings of 0.03-0.05 feet | | |
| 55 | | | | | | | | | | | Boring terminated at 50.6 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/9 - 5.8 feet<br>7/10 - 15.9 feet | | 560<br>555 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1017UDD

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft)<br>1532937.2 N; 628222.1 E | | Total Depth<br>16.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>612.1 feet | Ground Water Depth<br>See Note A | Date Started<br>8/21/06 |
| Sampling Method<br>SPT / UD | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/21/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 612.1 CLAY, strong brown (7.5YR 4/6), dry, very stiff, trace sand 0.0 | Groundwater not encountered | |
| | | SPT 1 | 5 10 12 | 13.2 | | | | | | | | 610 |
| | | UD 2 | | 21.4 | | | | | CL | 609.1 CLAY, strong brown (7.5 YR 5/6), dry, very stiff, contains maganese nodules 3.0 | | |
| 5 | | SPT 3 | 7 10 12 | 13.2 | | | | | | - 6.3 feet: color changes to strong brown (7.5 YR 4/6) | Augered 6.5-8 feet | |
| | | | | | | | | | CH | 604.6 CLAY, yellowish brown (10 YR 5/6), moist, very stiff 7.5 | | 605 |
| | | UD 4 | | 14.4 | | | | | | - 9.3 feet: silt lense at base of shelby tube, very pale brown (10 YR 7/3) | | |
| 10 | | SPT 5 | 3 6 10 | 16.2 | | | | | | 600.0 12.1 | Augered 11.5-13 feet | |
| | | | | | | | | | CH | CLAY, strong brown (7.5 YR 5/8), moist, very stiff to medium stiff | | 600 |
| | | UD 6 | | 14 | | | TXD | | | | | |
| 15 | | SPT 7 | 6 5 7 | 17 | | | | | | 595.6 16.5 | | |
| | | | | | | | | | | Boring terminated at 16.5 feet. Did not encounter bedrock. | | 595 |
| 20 | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1017UDS

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft)<br>1532938 N; 628228.7 E | | Total Depth<br>18 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 45 | Elevation (Datum NAVD 88)<br>612.1 feet | Ground Water Depth<br>See Note A | Date Started<br>8/21/06 |
| Sampling Method<br>UD and Bulk | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/21/06 |

Reviewed by / Date DSC 3-13-07 W Stokum 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 612.1 0.0 CLAY, strong brown (7.5YR 4/6), dry, very stiff | Augered 0-3.5 feet<br>Bulk sample 1-5 feet: 1017UDS-Bulk#1 | 610 |
| | | | | | | | | | CL | 608.9 3.2 CLAY with sand, very pale brown (10YR 8/3), dry, hard, contains sand and manganese nodules | | |
| 5 | | UD 1 | | 20.4 | 17.3 | 49/ 28 | GSZ H SG | | | | Augered 5.5-8 feet | |
| | | | | | | | | | CH | 604.6 7.5 CLAY with sand, yellowish brown (10YR 5/6), moist, very stiff, few chert clasts | Bulk sample 5-10 feet: 1017UDS-Bulk#2 | 605 |
| 10 | | UD 2 | | 12.6 | 27.7 | 115/ 82 | GSZ H SG | | | | Augered 10-12 feet | |
| | | | | | | | | | CH | 600.6 11.5 CLAY with sand, yellowish brown (10YR 5/8) to strong brown (7.5YR 5/8), moist, soft to medium stiff | 12-14 feet: Static Triaxial Test (CU with pore pressure measurement) | 600 |
| | | UD 3 | | 21.6 | 27.7 | 79/ 55 | GSZ H SG TXS | | | | Augered 14-16 feet | |
| 15 | | | | | | | | | CH | 597.1 15.0 CLAY with sand, yellowish brown (10YR 5/6), moist, medium stiff, contains limestone clasts | | |
| | | UD 4 | | 18 | | | | | | 594.1 18.0 Boring terminated at 18.0 feet. Did not encounter bedrock. | | 595 |
| 20 | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Leitis & Associates, Inc.

# SOIL LOG - Boring No. B-1018

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532827.3 N; 628217.6 E | | Total Depth<br>16.5 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>612.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/26/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/26/06 |

Reviewed by / Date W Holman 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 612.7 CLAY with sand, brownish yellow (10YR 6/6), moist, medium stiff (Fill) 0.0 | | |
| | | SPT 1 | 3 3 3 | 10 | | | | | | | Groundwater level of 1.5 feet artificially high | 610 |
| | | SPT 2 | 1 4 3 | 10 | | | | | | | | |
| 5 | | | | | | | | | | 606.7 | 6.0 | |
| | | SPT 3 | 5 6 8 | 14 | | | | | CL | CLAY, brownish yellow (10YR 6/8), moist, stiff, trace sand (Residual) | | 605 |
| | | | | | | | | | | 604.7 | 8.0 | |
| | | SPT 4 | 2 4 10 | 14 | | | | | CL | CLAY with sand, brownish yellow (10YR 6/6), moist, stiff | | |
| | | | | | | | | | | 603.1 | 9.6 | |
| 10 | | | | | | | | | | | Auger and SPT refusal (50/0") at 9.6 feet. Continuation of borehole description in rock log. | |
| | | | | | | | | | | | | 600 |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 595 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1018

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532827.3 N; 628217.6 E | | Total Depth<br>16.5 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>612.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/26/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 9.6 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/26/06 |

Reviewed by / Date W Holman 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 1.6/1.7 | 94 | SW to F | R4 | | | | | | LIMESTONE (micrite) with shale interbeds; micrite is medium dark gray (N4); fresh to slightly weathered; shale beds are moderately thick to moderately thin and 0.1-0.3 feet apart | | |
| | 2 | 5.0/5.0 | 92 | SW to F | R3 to R4 | | | | Bj, 5, Pl, Sl, So<br>Bj, 5, Pl, Sl, So | D | | Oil sheen coming up with drill fluid. Boring terminated due to hydrocarbon concerns. | 600 |
| 15 | 3 | 0.2/0.2 | 100 | | | | | | Bj, 10, Pl, Sl, So | | Boring terminated at 16.5 feet.<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/25 - 1.5 feet<br>6/26 - 2.1 feet | | 595 |
| 20 | | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | | 580 |
| 35 | | | | | | | | | | | | | 575 |
| 40 | | | | | | | | | | | | | 570 |
| 45 | | | | | | | | | | | | | 565 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1019

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532716.2 N; 628178.6 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>613.7 feet | Ground Water Depth<br>See Note A | Date Started<br>5/23/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/24/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 613.7 / 0.0 | | |
| | | | | | | | | | | 613.5 / 0.2 ASPHALT | | |
| | | | | | | | | | CL | 613.2 / 0.5 Fill gravel | | |
| | | SPT 1 | 2 4 6 | 12.6 | | | | | | CLAY, reddish brown (5YR 4/4), mottled with greenish gray (Gley 2 6/1) and dark gray (2.5Y 4/1), moist, stiff | | |
| | | | | | | | | | | 610.2 / 3.5 | | 610 |
| | | SPT 2 | 2 2 4 | 16.2 | | | | | CL | CLAY, light yellowish brown (2.5Y 6/4), moist, medium stiff | | |
| | | | | | | | | | | 609.2 / 4.5 | | |
| 5 | | | | | | | | | CH | CLAY, yellowish brown (10YR 5/4), moist, stiff to very stiff, few gravel clasts (angular ~0.5-0.2 feet and weathered limestone) | | |
| | | SPT 3 | 2 3 7 | 18.6 | 21.9 | 63/ 43 | GSZ | | | | | |
| | | SPT 4 | 4 8 12 | 11.4 | | | | | | | | 605 |
| 10 | | | | | | | | | | | 9.5 feet: low recovery likely due to gravels at the base of sample | |
| | | SPT 5 | 2 7 12 | 19.8 | | | | | | - 11.5 feet: mottled with greenish gray (Gley 1 6/1) | 12 feet: extra recovery due to slough | |
| | | SPT 6 | 6 13 13 | 12 | 17.8 | 69/ 45 | GSZ | | | - 13.5 feet: with sand | | 600 |
| 15 | | | | | | | | | | 598.7 / 15.0 | | |
| | | | | | | | | | CH | CLAY, yellowish brown (10YR 5/4) mottled with greenish gray (Gley 1 6/1), moist, very stiff to hard, few gravel clasts of limestone | | |
| | | SPT 7 | 50/4" | 6 | | | | | | 596.9 / 16.8 | SPT refusal at 16.4 feet. Auger refusal at 16.8 feet. Continuation of borehole in rock log. | |
| | | | | | | | | | | | | 595 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1019

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532716.2 N; 628178.6 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>613.7 feet | Ground Water Depth<br>See Note A | Date Started<br>5/23/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 16.8 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/24/06 |

Reviewed by / Date DSC 3-13-07 W Stolarski 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 4.7/5.0 | 94 | F | R2 | | | | Bj, 15, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti | D | LIMESTONE (micrite); micrite is medium gray (N5) with dark gray (N3) to grayish black (N2) bands; fresh; weak; strong HCL reaction; occasional chert pod inclusions; chert has no HCL reaction and is moderately hard<br>- 20.8 feet: slight mineralization on fracture surface | 17-35 feet: good fluid return | 595 |
| 25 | 2 | 5.0/5.0 | 100 | F | R2 | | | | Bj, 5, Wa, Sl, Ti | | - 23 feet: pyrite mineralization on fracture surface | | 590 |
| 30 | 3 | 4.9/5.0 | 98 | | | | | | Jo, 65, Sl/Pl, Sl, Ti/Op | | - 29-29.6 feet: pyrite mineralization on high angle fracture | | 585 |
| | 4 | 5.0/3.2 | 100 | F | R2 | | | | Bj, 0, Wa, Sl, Ti | | | | 580 |
| 35 | | | | | | | | | | | Boring terminated at 35 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/24 - 5.6 feet | | 575 |
| 40 | | | | | | | | | | | | | 570 |
| 45 | | | | | | | | | | | | | 565 |
| 50 | | | | | | | | | | | | | 560 |
| 55 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1020

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532590.2 N; 628188 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>616.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/9/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/10/06 |

Reviewed by / Date DSC 3-13-07 W Solomi 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 616.7 / 0.0 | |
| | | | | | | | | | | 616.5 / 0.2 ASPHALT | |
| | | | | | | | | | GP-GC | 616.2 / 0.5 gravel FILL | |
| | | SPT 1 | 3 5 7 | 8.4 | 6.7 | 38/ 19 | GSZ | | | GRAVEL with clay and sand, brown (7.5YR 4/4), moist, medium dense | Ground water level of 1.1 feet artificially high |
| | | | | | | | | | CL | 614.0 / 2.7 CLAY with sand, reddish brown (5YR 4/3), moist, stiff | |
| | | SPT 2 | 3 6 7 | 11.4 | 28.3 | 42/ 21 | GSZ | | | | |
| 5 | | | | | | | | | CH | 611.2 / 5.5 CLAY, dark yellowish brown (10YR 4/6), moist, stiff | |
| | | SPT 3 | 2 4 6 | 10.8 | 18.4 | | CHE | | | | |
| | | SPT 4 | 2 9 43 | 10.8 | | | | | | 607.2 / 9.5 | |
| 10 | | | | | | | | | | 606.7 / 10.0 CLAY with weathered limestone, yellow (2.5Y 8/6), dry to moist, hard | SPT refusal at 10 feet. Continuation of borehole description in rock log. |
| 15 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 615, 610, 605, 600, 595, 590

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1020

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532590.2 N; 628188 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>616.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/9/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 10.3 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/10/06 |

Reviewed by / Date DJC 3-13-07 W Graham 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 1.2/1.5 | 0 | MW to SW | R3 | | | | Bj, 15, Wa, Sl, Op | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); slightly to moderately weathered; medium strong; shale is <0.01 feet thick; fractures are clay filled | Top of Casing drop 9.8-10.3 feet in Run No. 2<br>10-35 feet: Good fluid returns | 605 |
| | 2 | 1.8/2.5 | 0 | MW to SW | R3 | | | | Jc, 75, Wa, Ro, Ti<br>Bj, 15, Wa, Sl, Ti/Op | | LIMESTONE (packstone); medium bluish gray (5B 5/1); moderately weathered; medium strong; high angle fracture at 11.8-12.4 feet | | |
| 15 | 3 | 2.4/2.5 | 90 | SW | R3 | | | | Bj, 10, Wa/Pl, Sm, Op | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); slightly weathered; medium strong<br>- 13-16 feet: shale is 0.05-0.1 feet thick with spacings of 0.08-0.15 feet | Poor core recovery in Run 1 and 2 suggests prominent weathering and voids between 10 and 13.7 feet. | 600 |
| | 4 | 4.9/5.0 | 98 | SW to F | R3 | | | | Bj, 30, Wa, Sl, Ti<br>Bj, 45, Wa, Sm, Ti<br>Bj, 5, Wa, Sm, Ti/Op | | - 16-23 feet: decrease in weathering; shale becomes more prominent and is 0.01-0.15 feet thick with spacings of 0.05-0.2 feet | | |
| 20 | 5 | 5.0/5.0 | 99.4 | F | R3 | | | | Bb, 5, Wa, Sm, Ti | C | SHALE (calcareous) with micrite interbeds; shale is dark gray (N3) and micrite is medium gray (N5); fresh; medium strong to weak; micrite is 0.05-0.2 feet thick | | 595 |
| 25 | 6 | 3.9/5.0 | 77 | F | R2 to R3 | | | | | | - 28.9-29.2 feet: packstone, medium bluish gray (5B 5/1) | | 590 |
| 30 | 7 | 5.5/4.0 | 100 | F | R2 to R3 | | | | Bb, 15, Wa, Sm/Sl, Op | | | several mechanically-induced fractures | 585 |
| 35 | | | | | | | | | | | Boring terminated at 35.0 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/10 - 1.1 feet | | 580 |
| 40 | | | | | | | | | | | | | 575 |
| 45 | | | | | | | | | | | | | 570 |
| 50 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Leitis & Associates, Inc.

# SOIL LOG - Boring No. B-1021

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532997.4 N; 628462.5 E | | Total Depth<br>35.4 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>608.6 feet | Ground Water Depth<br>See Note A | Date Started<br>6/19/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>6/20/06 |

Reviewed by / Date W Holmes 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 608.6 CLAY, yellowish brown (10YR 5/4), dry to moist, medium stiff to stiff, few manganese nodules, roots at 6.0-6.5 feet | | |
| | | SPT 1 | 1 2 3 | 18 | | | | | | | | |
| | | SPT 2 | 3 4 5 | 3.6 | | | | | | | | 605 |
| 5 | | | | | | | | | | | | |
| | | SPT 3 | 4 6 13 | 18 | | | | | | 601.6 | 7.0 | |
| | | | | | | | | | CH | CLAY, light gray (10YR 7/2), moist, very stiff to stiff, few angular and weathered limestone fragments | | |
| | | SPT 4 | 19 5 4 | 6 | | | | | | 598.9 | 9.7 | 600 |
| 10 | | | | | | | | | CH | CLAY, dark grayish brown (2.5YR 4/2), moist, stiff | | |
| | | | | | | | | | | 597.8 | 10.8 | |
| | | SPT 5 | 50/4" | 2.4 | | | | | GW | 597.3 GRAVEL, limestone fragments | 11.3 | - SPT and auger refusal at 11.3 feet. Continuation of borehole description in rock log. |
| | | | | | | | | | | | | 595 |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 585 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 580 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1021

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532997.4 N; 628462.5 E | | Total Depth<br>35.4 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>608.6 feet | Ground Water Depth<br>See Note A | Date Started<br>6/19/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 11 feet | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>6/20/06 |

Reviewed by / Date DSC 3-13-07 W. Goldman 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 4.2/4.2 | 28 | SW | R3 | | | | Bj, <5, Wa, Ro, clay filled<br>Bj, 12, Wa, Ro, clay filled | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); slightly weathered; medium strong<br>- 11.3-15 feet: shale is 0.03 feet thick and spaced irregularly, rip up clasts | - 11.3 - 35.4 feet: Good fluid return | 595 |
| 15 | 2 | 4.9/4.9 | 100 | SW | R3 | | | | | | -15-18 feet: shale beds thinly laminated at moderately close spacings, rip up clasts present<br>- 16.8 feet: calcite healed seams, close to very close spacings<br>18-24.3 feet: shale beds thicken and become more evenly spaced (0.05-0.1 feet)<br>- 0.2 feet-thick packstone beds at 18.1 and 18.6 feet depths | | 590 |
| 20 | 3 | 5.0/5.0 | 99 | SW | R3 | | | | Bj, <5, Wa, Ro, rounded by drilling<br>Bj, 10, Wa, Sl, rounded by drilling | D | - 21 feet: chert pods predominantly occurring within shale beds<br>-24.3-34.1 feet: shale beds thin to laminated, increase in calcite relic fossils 24.3-27.4 feet<br>- 25 feet: horizontal stylolitic features present<br>- 26.3 feet: chert bed 0.1 feet thick | | 585 |
| 25 | 4 | 5.0/5.0 | 100 | SW to F | R3 | | | | Bj, 15, Wa, Ro, Ti | | | | 580 |
| 30 | 5 | 5.0/5.0 | 100 | SW to F | R3 | | | | Bj, 21, Wa, Ro, Ti-Op<br>Bj, 18, Wa, Ro, Op<br>Bj, 20, Wa, Ro, Op | | - 34.1-34.4 feet: 0.3 feet thick packstone bed<br>- 34.4-35.4 feet: shale becomes more thinly bedded | 33.3 feet: Unconfined Compression Test | 575 |
| 35 | | | | | | | | | | | Boring terminated at 35.4 feet. | | |
| 40 | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>No data | | 570 |
| 45 | | | | | | | | | | | | | 565 |
| 50 | | | | | | | | | | | | | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1022

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532633.2 N; 628366.9 E | | Total Depth<br>76.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>617.4 feet | Ground Water Depth<br>See Note A | Date Started<br>5/13/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>5/14/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 617.4 / 0.0 | | |
| | | | | | | | | | | 617.2 / 0.2 ASPHALT (0.2 feet) | | |
| | | | | | | | | | | 616.4 / 1.0 FILL | | |
| | | SPT 1 | 5 7 7 | 0 | | | | | ML | SILT, mottled brownish yellow (10YR 6/6) and yellowish brown (10YR 5/8), moist, stiff, few manganese nodules (Residual) | No recovery from SPT 1 | 615 |
| | | SPT 2 | 1 2 6 | 14.4 | | | | | | | | |
| 5 | | | | | | | | | | | | |
| | | SPT 3 | 2 7 9 | 10.8 | | | | | | 610.5 / 6.9 | | |
| | | | | | | | | | CL | CLAY, olive (5Y 5/4) mottled with brownish yellow (10YR 6/8), moist, very stiff, few manganese nodules, weathered limestone fragments (Residual) | | 610 |
| | | | | | | | | | | 608.9 / 8.5 | | |
| | | SPT 4 | 5 13 20 | 14.4 | | | | | CL | CLAY with gravel, brownish yellow (10YR 6/6) with light olive gray (5Y 6/2) mottling, moist, very stiff to hard, soil readily effervesces, gravel is weathered limestone fragments, relic beds increase with depth (Residual) | | |
| 10 | | | | | | | | | | | | |
| | | SPT 5 | 40 20 22 | 4.8 | | | | | | | | 605 |
| | | SPT 6 | 6 16 19 | 18 | | | | | | - 14.1 feet: moist to wet zone of silt | | |
| 15 | | | | | | | | | | 601.6 / 15.8 | | |
| | | SPT 7 | 50/6" | 5 | | | | | GW-GM | well graded GRAVEL with silt, dry, very dense, highly to completely weathered shaly limestone fragments | | 600 |
| | | | | | | | | | | 598.9 / 18.5 | SPT and auger refusal at 18.5 feet (50 blows/0"). Continuation of borehole description on rock log. | |
| 20 | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1022

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532633.2 N; 628366.9 E | | Total Depth<br>76.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>617.4 feet | Ground Water Depth<br>See Note A | Date Started<br>5/13/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 18.4 feet | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>5/14/06 |

Reviewed by / Date W Bohlen 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 2.9/2.9 | 83 | MW to SW / SW | R3 | | | | Bj, 13, Pl, Sl, Ti<br>Bj, 10, Wa, Sl, Ti<br>Bj, 18, Pl, Sm-Sl, Ti<br>Bj, 18, Pl, Sl, Op | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); slightly to moderately weathered; weak | | |
| 25 | 2 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 5, Wa, Sl, Op<br>Bj, 10, Wa, Sm, Op<br>Bj, 20, St, Sl, Ti<br>Bj, 13, St, Sl, Ti<br>Jo, 60, He, shale infill | | SHALE with interbedded limestone (micrite); shale is dark gray (N3) and micrite is medium gray (N5); slightly weathered; medium strong; limestone beds are < 0.1 feet thick with spacings of 0.1-0.2 feet; 55% shale<br>LIMESTONE (crystalline); medium gray (N5); slightly weathered; medium strong; shale beds are laminated and stained dusky yellow green (5GY 5/2) | | 595 |
| 30 | 3 | 5.0/5.0 | 100 | F | R3 | | | | | | SHALE (calcareous) with micrite interbeds; shale is dark gray (N3) and micrite is medium gray (N5); fresh; weak to medium strong; shale is thinly bedded to fine laminated; limestone beds typically <0.2 feet thick with spacings of 0.1-0.2 feet; 70% shale; bioturbated beds<br>-27-27.1 feet: wackestone bed | | 590 |
| 35 | 4 | 5.0/5.0 | 100 | | | | | | Jo, 60<br>Bj, 5, Wa, Sm, Ti<br>Bj, <5 | | | | 585 |
| 40 | 5 | 5.0/5.0 | 88 | F | R3 | | | | Jo, subvertical He, shale infill<br>Bj, 10, Wa, Ro, Ti<br>Bj, 17, Wa, Sl, Ti<br>Bj, 13, Pl, Sl, Ti<br>Bj, <5, Pl, Ro, Ti | C | -38-38.1 feet: shale bed 0.6 feet thick, heavily fractured<br>- 39.6 feet: fossil rich bed 0.4 feet thick | | 580 |
| 45 | 6 | 5.0/5.0 | 100 | | R3 | | | | Bj, 17, Pl, Sl, Ti<br>Bj, <5, Pl, Sl, Ti<br>Jo, 70, Pl, Sl, Ti-Op<br>Bj, <5, Pl, Ro, Op | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; thin beds to fine laminations, fossiliferous beds of wackestone to packstone<br>SHALE (calcareous) interbedded with limestone; shale is dark gray (N3) and limestone is medium gray (N5); fresh; weak to medium strong; limestone is micrite and minor wackestone; limestone beds are 0.25-0.5 inches thick spaced every 0.5-1 inches; 60% shale | | 575<br>570 |
| 50 | 7 | 5.0/5.0 | 100 | F | R3 | | | | | | LIMESTONE (micrite) interbedded with calcareous shale; micrite is medium gray (N5) and shale is dark gray (N3); fresh; weak to medium strong; fossiliferous beds of wackestone and packstone; 15% shale<br>- 50.6-55.5 feet: shale content increases (35%) | | |
| 55 | 8 | 5.0/5.0 | 100 | | | | | | | | | | 565 |
| | | | | | | | | | | | SHALE (calcareous) with interbedded limestone (micrite); shale is dark gray (N3) and micrite is medium gray (N5); fresh; medium strong<br>- 57.7-58.5 feet: pyrite disseminated within shale | | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1022

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 5.0/5.0 | 100 | | | | | | | | beds | | |
| 60 | | | | F | R3 | | | | | | | | |
| | 10 | 5.0/5.0 | 100 | | | | | | Bj, <5, Wa, Sm, Ti | C | LIMESTONE (micrite) interbedded with calcareous shale; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; fossil-rich beds of medium bluish gray (5B 5/1) SHALE (calcareous) interbedded with limestone; medium gray (N5); fresh; medium strong; 60% shale | | 555 |
| 65 | | | | | | | | | | | | | |
| | 11 | 5.0/5.0 | 100 | | | | | | | | | | 550 |
| 70 | | | | F | R3 | | | | | D | LIMESTONE (micrite) with interbedded shale; micrite is medium gray (N5) and shale is dark gray (N3); fresh; weak to medium strong; localized fossil-rich beds of wackestone to packstone; some horizontal stylolites; 20% shale | | 545 |
| | 12 | 4.7/5.0 | 94 | | | | | | | | | | |
| 75 | | | | | | | | | | | | | |
| | | | | | | | | | | | Boring terminated at 76.4 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/13 - 11.2 feet<br>5/22 - 1.0 feet | | 540 |
| 80 | | | | | | | | | | | | | 535 |
| 85 | | | | | | | | | | | | | 530 |
| 90 | | | | | | | | | | | | | 525 |
| 95 | | | | | | | | | | | | | 520 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1023

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532853.9 N; 628421 E | | Total Depth<br>60.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>613.4 feet | Ground Water Depth<br>See Note A | Date Started<br>5/26/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>5/27/06 |

Reviewed by / Date W Holmes 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | ML | 613.4 SILT with sand, dark reddish brown (5YR 3/3), moist, stiff, contains concrete fragments (Fill) 0.0 | | |
| | | SPT 1 | 3 4 5 | 15.6 | | | | | | | | |
| | | | | | | | | | CH | 610.2 CLAY with sand, red (2.5 YR 4/6), moist, stiff 3.2 | | 610 |
| 5 | | SPT 2 | 2 4 5 | 13.2 | 26.6 | 62/ 36 | GSZ | | | | | |
| | | SPT 3 | 2 4 5 | 19.2 | | | | | CH | - 6.8-7.5 feet: color changes to pale olive (5Y 6/4)<br>- 7.5-9.5 feet: color changes to red (2.5YR 4/6) | | 605 |
| | | SPT 4 | 7 11 12 | 18 | 25.8 | 73/ 48 | GSZ H | | | 603.9 CLAY with gravel, weak red (2.5 YR 5/2), moist, very stiff 9.5 | | |
| 10 | | | | | | | | | | 602.3 - color changes to pale red (2.5 YR 7/2) 11.1 | Auger and SPT refusal (50/0.5") at 11.1 feet. Continuation of borehole description in rock log. | 600 |
| | | SPT 5 | 50/1" | 0.5 | | | | | | | | |
| 15 | | | | | | | | | | | | 595 |
| 20 | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1023

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532853.9 N; 628421 E | | Total Depth<br>60.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>613.4 feet | Ground Water Depth<br>See Note A | Date Started<br>5/26/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 11.7 feet | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>5/27/06 |

Reviewed by / Date DSC 3-13-07 W. Holmes 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 4.7/4.8 | 28 | SW to F | R2 | GJ<br>GJ | Bj, 10, Wa, Ro, Op | C | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is medium dark gray (N4); slightly weathered to fresh; weak; thin bedding; bioturbated and fossiliferous zone<br>- 12.1-26 feet: bioturbation throughout thin bedding<br>- 11.1-16 feet: closely spaced fractures, clay seams; bedding predominantely 10 degrees from horizontal, wavy, rough<br>- 14.1-14.3 feet: fossiliferous zone<br>- 15 feet: stylolite | 11.5-30 feet: 400 psi down pressure, good fluid return, cuttings light gray | 600 |
| 20 | 2 | 5.0/5.0 | 94 | F | R2 | | Bj, 5, Pl, Sm, Ti | | - 20-20.2 feet: highly fossiliferous | | 595 |
| 25 | 3 | 5.0/5.0 | 88 | F | R2 | | Bj, 10, Pl, Sm, Ti | | | | 590 |
| 30 | 4 | 5.0/5.0 | 100 | F | R2 | | Bj, 5, Wa, Sl, Ti<br>Bj, 5, Wa, Ro, Ti | | - 25.1-25.3 feet: highly fossiliferous<br>- 25.9-26.1 feet: highly fossiliferous<br>LIMESTONE (wackestone) with calcareous shale interbeds; wackestone is medium gray (N5) and shale is medium dark gray (N4); fresh; weak; rip up clasts thoroughout; fossiliferous zones; effervesces strongly in HCl | | 585 |
| 35 | 5 | 4.9/5.0 | 92 | F | | GJ<br>GJ | Bj, 10, Wa, Sl, Ti | | - 31.1-35.8 feet: highly fossiliferous intervals | 30-60 feet: 500 psi down pressure, good fluid return, light gray<br>34.13 feet: Unconfined Compression with Stress/Strain Test | 580 |
| 40 | 6 | 5.2/5.0 | 93 | F | R2 | | Bj/Mb, 10, Wa, Sl, Ti<br>Bj, 10, Wa, Ro, Op<br>Bj, 10, Wa, Ro, Op<br>Bj, 15, Wa, Sl, Ti | D | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh; weak; presence of stylolites, calcite filled vugs (maximum size 0.05 feet) and bioturbation | | 575 |
| 45 | 7 | 5.0/5.0 | 95 | F | R2 | | Bj, 10, St, Ro, Op | | - 40.8 feet: hydrocarbon odor detected<br>- 40.9-43.5 feet: thin beds of alternating micrite and packstone, packstone is medium dark gray (N4)<br>- 40.9-41.9 feet: contains calcite filled fractures | | 570 |
| 50 | 8 | 2.1/2.1 | 93 | F | R2 | GJ<br>GJ | Bj, 10, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti | | - 46-48 feet: thin beds of packstone<br>- 48-60.1 feet: thin beds of wackestone | 46.15 feet: Unconfined Compression with Stress/Strain Test | 565 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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# ROCK LOG - Boring No. B-1023

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 7.8/7.9 | 99 | F | R2 | | | | | | | | 560 |
| 55 | | | | | | | | | Bj, 10, Pl, Sl, Ti | D | - 56-60 feet: less bioturbation, contact between shale beds is wavy | | |
| | 10 | 4.2/4.2 | 100 | F | R2 | GJ | | | | | | 58.38 feet: Unconfined Compression with Stress/Strain Test | 555 |
| 60 | | | | | | GJ | | | | | Boring terminated at 60.1 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/26 - 9.3 feet<br>5/27 - 9.3 feet | | 550 |
| 65 | | | | | | | | | | | | | 545 |
| 70 | | | | | | | | | | | | | 540 |
| 75 | | | | | | | | | | | | | 535 |
| 80 | | | | | | | | | | | | | 530 |
| 85 | | | | | | | | | | | | | 525 |
| 90 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1024

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532702.4 N; 628492 E | | Total Depth<br>175.4 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>617.1 feet | Ground Water Depth<br>See Note A | Date Started<br>5/12/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/14/06 |

Reviewed by / Date: W Lettis 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (Inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 617.1 | | |
| | | | | | | | | | GW | 616.9 ASPHALT (0.0–0.2) | | |
| | | SPT 1 | 1 1 1 | 5 | | | | | | mixed asphalt and GRAVEL fragments, strong brown (7.5YR 5/6) to medium gray (N5), moist, very soft, few clay, poor recovery, reacts with acid (Fill) | | 615 |
| | | SPT 2 | 1 2 3 | 18 | | | | | CL | 613.1 CLAY with sand, light olive brown (2.5YR 5/6), moist, medium stiff (4.0) | | |
| 5 | | | | | | | | | | 611.1 (6.0) | | |
| | | SPT 3 | 0 1 1 | 14 | | | | | GC | 610.6 GRAVEL with clay, medium gray (N5), clasts react with acid (6.5) | | |
| | | | | | | | | | CL | CLAY, yellowish brown (10YR 5/8) with some mottling to olive yellow and reddish brown, moist, soft to stiff, few black fragments | | 610 |
| | | SPT 4 | 0 5 9 | 18 | | | | | | -9.3-9.5 feet: lense of limestone gravel, 1 inch clasts, freshly broken, brownish gray (5YR 5/6) | | |
| 10 | | | | | | | | | | - color changes to yellowish brown (10YR 5/6) | | |
| | | SPT 5 | 5 13 10 | 5 | | | | | | 605.1 (12.0) | | |
| | | | | | | | | | GC | clayey GRAVEL, medium dense to dense, gravel is limestone clasts | | 605 |
| | | SPT 6 | 6 13 25 | 10 | | | | | | 602.1 - top of severely weathered bedrock is likely at 14.5 feet (15.0) | Auger refusal at 16 feet (with SPT sampler confirmation: 20 blows, no advance). Continuation of borehole description in rock log. | |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettiv & Associates, Inc.

# ROCK LOG - Boring No. B-1024

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532702.4 N; 628492 E | | Total Depth<br>175.4 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>617.1 feet | Ground Water Depth<br>See Note A | Date Started<br>5/12/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 1.3 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/14/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | | | | | | | | | | | |
| | 1 | 2.4/2.4 | 50 | HW to MW | R1 to R2 | | | | | LIMESTONE (micrite) with shale interbeds; micrite is light gray (N7) and shale is medium dark gray (N4); moderate to highly weathered; weak to very weak; grain size is fine to medium grained; shale beds are 0.2-1 cm thick and wavy | good fluid return, milky gray | 600 |
| | | | | | | | | | | -~16-16.3 feet: clay-filled void | 16-19.5 feet: brecciated zone due to drillling | |
| 20 | 2 | 4.9/5.0 | 98 | SW to F | R3 | | | Bj, 90, Wa, Ro, fresh<br>Bj, 10, Pl, Sl, Ro<br>Bj, 20, St, M, Ro | | LIMESTONE (micrite) with shale interbeds; micrite is dark gray (N3) and shale is medium dark gray (N4); slightly weathered to fresh; medium strong; many small incipient vertical fractures | | 595 |
| 25 | 3 | 5.0/5.0 | 100 | F | R3 | | | | | | | 590 |
| 30 | 4 | 5.2/5.0 | 100 | F | R4<br>R3 to R4 | | | | | -28.5 feet: micrite and shale beds grade to medium grained limestone, 30% shale | | 585 |
| 35 | 5 | 4.8/5.0 | 96 | | R3 to R4 | | | Bj, 20, St, Sl, slight coating | C | SHALE with interbedded limestone; limestone is medium gray (N5) to medium light gray (N6) and shale is dark gray (N3) to medium dark gray (N4); fresh; medium strong to strong; both beds are fine grained; 50% shale<br>-34-46 feet: shale is < 0.1-12.5 cm thick | good fluid return, down pressure 450 psi | 580 |
| 40 | 6 | 5.1/5.0 | 100 | F | | | | | | | | 575 |
| 45 | 7 | 5.1/5.0 | 100 | | R3 to R4 | | | | | - 46-61 feet: shale not as dominant, shale beds 0.5-5 cm thick | | 570 |
| 50 | 8 | 5.1/5.0 | 100 | F | | | | | | | | 565 |
| 55 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1024

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 9 | 5.0/5.0 | 100 | | R3 to R4 | | | | | | | | 560 |
| 60 | 10 | 4.8/5.0 | 100 | F | | | | | | | SHALE with interbeds of micrite; medium light gray (N6) and medium dark gray (N4), fresh, medium strong to strong; evenly spaced interbed, limestone is generally twice the thickness of shale beds<br>- 61-76 feet: shale beds are 0.2-2 cm, limestone beds are 1-7 cm thick, wavy, 50-60% shale | | 555 |
| 65 | 11 | 5.2/5.0 | 100 | | R3 to R4 | | | | | C | | | 550 |
| 70 | 12 | 5.0/5.0 | 100 | F | | | | | | | - 70.6-71.8 feet: medium grained, fossiliferous limestone | Run 12 core in one intact piece | 545 |
| 75 | 13 | 5.1/5.0 | 100 | | R3 to R4 | | | | | | LIMESTONE (micrite) with interbedded shale; limestone is medium light gray (N6), shale is medium dark grey (N4); fresh; medium strong to strong; limestone is fine-grained with medium grained lenses, shale is wavy; limestone occasionally fossiliferous | | 540 |
| 80 | 14 | 4.9/5.0 | 100 | F | | | | | | | - 76-84 feet: shale beds are 0.3-4 cm thick, wavy | good fluid return, milky gray-white | 535 |
| 85 | 15 | 4.9/5.0 | 100 | | R3 to R4 | | | Ve, 15, thin, 1.5 cm calcite | | D | - 84-106 feet: shale beds are thinner and offset, possible bioturbation, some large grained calcite veins parallel to bedding planes | | 530 |
| 90 | 16 | 5.1/5.0 | 100 | F | | | | Bj, 15, Pl, He, brecciation Fa, 20, Pl, Sl-Ro, slickensides, vug on | | | | Driller having difficulty with block-off<br>good fluid return, gray to bottom of boring | 525 |
| 95 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

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# ROCK LOG - Boring No. B-1024

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | 17 | 5.1/5.0 | 100 | | R3 to R4 | | | | surface, calcite coating | | | | 520 |
| 100 | 18 | 5.0/5.0 | 100 | F | | | | | | | | | 515 |
| 105 | 19 | 5.1/5.0 | 100 | | R3 to R4 | | | | | | LIMESTONE (micrite) interbedded with shale; limestone is medium gray (N5), shale is grayish black (N2); fresh; medium strong to strong; occasional vugs and vertical fractures filled with sparry calcite; some stylolites<br>- 106-121 feet: shale is 0.1-2 cm thick, wavy | | 510 |
| 110 | 20 | 5.0/5.0 | 100 | F | | | | | | | | | 505 |
| 115 | 21 | 5.0/5.0 | 100 | | R3 to R4 | | | | | D | | | 500 |
| 120 | 22 | 5.0/5.0 | 100 | F | | | | | Ve/Bj, 15, He, sparry calcite (2 mm)<br>Bj, 10, He, calcite | | - 121-136 feet: shale is 0.2-3 cm thick | | 495 |
| 125 | 23 | 5.0/5.0 | 100 | | R3 to R4 | | | | Fa, 10, Pl, Sm, slickensides | | | | 490 |
| 130 | 24 | 5.0/5.0 | 100 | F | | | | | | | | | 485 |
| 135 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1024

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 135 | 25 | 5.0/5.0 | 100 | | R3 to R4 | | | | Fa, 10, slight slickensides, calcite lines former surface | | - 136-151 feet: limestone is 2-20 cm thick | | 480 |
| 140 | 26 | 5.0/5.0 | 100 | F | | | | | | | | | 475 |
| 145 | 27 | 5.0/5.0 | 100 | | R3 to R4 | | | | | | | | 470 |
| 150 | 28 | 4.9/5.0 | 98 | F | | | | | Ve or He-Bj, calcite infill | | - 151-171 feet: shale is thin 0.1-0.5 cm thick, wavy | | 465 |
| 155 | 29 | 5.0/5.0 | 100 | | R3 to R4 | | | | | D | | | 460 |
| 160 | 30 | 5.1/5.0 | 100 | F | | | | | | | | | 455 |
| 165 | 31 | 5.0/5.0 | 100 | | R3 to R4 | | | | | | | | 450 |
| 170 | 32 | 5.0/5.0 | 100 | F | | | | | | | -171-172.8 feet: zone with virtually no shale | | 445 |
| 175 | 33 | 2.0/2.0 | 100 | | R3 to | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# ROCK LOG - Boring No. B-1024

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 175 | | | | | R4 | | | | | | Boring terminated at 175.4 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/14 - 8.7 feet<br>5/15 - 29.1 feet | | |
| 180 | | | | | | | | | | | | | 440 |
| 185 | | | | | | | | | | | | | 435 |
| 190 | | | | | | | | | | | | | 430 |
| 195 | | | | | | | | | | | | | 425 |
| 200 | | | | | | | | | | | | | 420 |
| 205 | | | | | | | | | | | | | 415 |
| 210 | | | | | | | | | | | | | 410 |
| 215 | | | | | | | | | | | | | 405 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1025

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532823.2 N; 628567.9 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) | Elevation (Datum NAVD 88)<br>616.9 feet | Ground Water Depth<br>See Note A | Date Started<br>6/11/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/11/06 |

Reviewed by / Date DSC 3-13-07 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 616.9 CLAY, yellowish red (5YR 4/6), dry, stiff, trace sand (Fill) 0.0 | | |
| | | SPT 1 | 2 6 6 | 9 | | | | | | | | 615 |
| | | | | | | | | | CL | 613.4 CLAY with medium coarse sand, strong brown (7.5YR 4/6), dry, stiff (Fill) 3.5 | | |
| 5 | | SPT 2 | 3 4 7 | 12 | | | | | | | | |
| | | | | | | | | | CL | 610.9 CLAY, tan orange (2.5YR), moist, medium stiff, trace sand (Residual) 6.0 | | |
| | | SPT 3 | 2 2 3 | 11 | | | | | | | | 610 |
| | | | | | | | | | CH | 608.9 CLAY, grayish brown (10YR 5/2), moist, medium stiff 8.0 | | |
| 10 | | SPT 4 | 1 2 4 | 12 | | | | | | | | |
| | | | | | | | | | SC | 605.9 clayey SAND with gravel, gray (10YR 5/1), dry, medium dense (Residual) 11.0 | | |
| | | SPT 5 | 12 14 13 | 6 | | | | | | | | 605 |
| | | | | | | | | | GC | 603.4 clayey GRAVEL, gray (10YR 5/1), wet, dense (Residual) 13.5 | | |
| 15 | | SPT 6 | 7 29 17 | 16 | | | | | | 601.9 15.0 | SPT refusal at 16.0 feet (25 blows/0"). Auger refusal at 14.0 feet. Continuation of borehole description in rock log. | |
| | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1025

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532823.2 N; 628567.9 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) | Elevation (Datum NAVD 88)<br>616.9 feet | Ground Water Depth<br>See Note A | Date Started<br>6/11/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 14 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/11/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 0.3/1.3 | 0 | CW to SW | R2 to R3 | | | | | | LIMESTONE (packstone); medium light gray (N6) with strong brown (7.5YR 4/6) soil; slightly to completely weathered; moderately strong to very weak; fossiliferous; 0.1 to 0.3 feet soil pockets between 15 and 20 feet | | 600 |
| 20 | 2 | 5.0/5.0 | 28 | HW to MW | R3 | | | | | | - no fossils below 20 feet<br>- 21.3 feet: increase in shale interbeds to 30% | Good to fair fluid return throughout boring | 595 |
| 25 | 3 | 5.0/5.0 | 84 | SW to F | R3 | | | Bj, 5, Pl, Sl, Ti | | | LIMESTONE (micrite) with interbeds of shale; micrite is medium light gray (N6) and shale is medium dark gray (N4); slightly weathered to fresh; shale beds represent 30-70% of rock mass | | 590 |
| 30 | 4 | 5.0/5.0 | 98 | SW to F | R3 | | | | | | 30-75 feet: shale beds are moderately thin to thick with spacings of 0.1-0.4 feet<br>- trace bioturbation | | 585 |
| 35 | 5 | 5.0/5.0 | 94 | SW to F | R3 | | | Jo, 85, Wa, Sl, Op | | C | - 36.5-38 feet: predominately calcareous shale | | 580 |
| 40 | 6 | 5.0/5.0 | 96 | SW to F | R3 | | | Bj, 5, Pl, Sl, Op | | | | | 575 |
| 45 | 7 | 5.0/5.0 | 94 | F | R3 | | | | | | | | 570 |
| 50 | 8 | 5.0/5.0 | 84 | SW to F | R3 | | | | | | | | 565 |
| 55 | 9 | 5.0/5.0 | 100 | F | R3 | | | Bj, 5, Pl, | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1025

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | | | | | | | | | Sl, Op | | | | |
| | 10 | 5.0/5.0 | 100 | F | R3 | | | | | | - shale beds moderately calcareous (HCl reaction) | | 560 |
| 60 | | | | | | | | | | | | | |
| | 11 | 5.0/5.0 | 100 | F | R3 to R4 | | | | | C | - 61.3 feet: rock becomes moderately strong to strong | | 555 |
| 65 | | | | | | | | | | | | | |
| | 12 | 5.0/5.0 | 100 | F | R3 to R4 | | | | | | | | 550 |
| 70 | | | | | | | | | | | | | |
| | 13 | 3.6/3.7 | 97 | F | R3 to R4 | | | | Bj, 10, Pl, Sl, Ti | D | | | 545 |
| 75 | | | | | | | | | | | Boring terminated at 75.0 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/11 - 14.0 feet<br>6/12 - 10.2 feet | | 540 |
| 80 | | | | | | | | | | | | | 535 |
| 85 | | | | | | | | | | | | | 530 |
| 90 | | | | | | | | | | | | | 525 |
| 95 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA Williams Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1025UDS

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft)<br>1532828.3 N; 628567.3 E | | Total Depth<br>11.6 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 85 | Elevation (Datum NAVD 88)<br>616.9 feet | Ground Water Depth<br>See Note A | Date Started<br>8/20/06 |
| Sampling Method<br>UD Shelby Tube | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/20/06 |

Reviewed by / Date DSC 3-20-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 616.9 0.0 CLAY, yellowish red (5YR 4/6) to strong brown (7.5YR 4/6), moist, stiff (Fill) | | |
| | | GRAB | | | | 46/ 26 | PRM | | | | Bulk sample obtained 1-5 feet | 615 |
| 5 | | | | | | | | | | 610.9 6.0 | | |
| | | GRAB | | | | | | | CL | CLAY, tan orange (2.5YR), moist, medium stiff (Residual) | Bulk sample obtained 5-10 feet | 610 |
| | | | | | | | | | | 608.9 8.0 | | |
| | | UD 1 | | 21.6 | 26.8 | 76/ 54 | GSZ H SG UC CN | | CH | CLAY, dark yellowish brown (10Y r 4/6), moist, stiff, few manganese nodules | | |
| | | | | | | | | | | 607.5 9.4 | | |
| 10 | | | | | | | | | CH | CLAY with gravel, light olive brown (2.5 5/4) with greenish grey (5BG 6/1), moist, stiff, limestone gravel | bottom of sampling tube was bent | |
| | | UD 2 | | 7.2 | | | | | | 605.3 11.6 | | |
| | | | | | | | | | | Boring terminated at 11.6 feet | bottom of sampling tube was bent | 605 |
| 15 | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1026

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533363.2 N; 628319.4 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>608.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/9/06 |
| Sampling Method<br>CME Continuous Sampler and SPT with Auto Hammer/HQ Core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/10/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | ML | 608.6 0.0 SILT with sand, dusky red (2.5YR 3/2), moist, stiff (Residual) | | |
| | | CME 1 | | 62.4 | | | | | CL | 606.0 2.6 CLAY, red (2.5YR 4/6), moist, very stiff to hard, gradational contact (Residual) | | 605 |
| 5 | | CME 2 | | 62.4 | | | | | | - 5 feet: Color changes to red (2.5YR 4/8)<br>- 7.9 feet: Sharp color change to yellowish brown (10YR 5/6) | | 600 |
| 10 | | CME 3 | | 19.2 | | | | | CL | 598.1 10.5 gravelly CLAY, yellowish brown (10YR 5/6) with gray (2.5Y 6/1) along fracture surfaces, dry to moist, hard (Weathered Rock) | | |
| | | CME 4 | | 10.8 | | | | | GP-GC | 596.4 12.2 interlayered clayey GRAVEL and gravelly CLAY, clay is yellowish brown (10YR 5/6) and limestone is medium gray (N5), moist, very dense | 12-13 feet: augered before attempting CME due to difficult drilling | 595 |
| 15 | | SPT 5A, 5B | 13 10 20 | 22.8 | | | | | | | SPT sampler driven 6 inches beyond test depth | |
| | | SPT 6A, 6B | 14 16 18 | 16.8 | | | | | | | SPT sampler driven 6 inches beyond test depth | |
| | | SPT 7A | 16 50/2" | 14.4 | | | | | | 589.9 18.7 | SPT refusal at 18.7 feet. Casing set at 18 feet. Continuation of borehole description on rock log. | 590 |
| 20 | | | | | | | | | | | | 585 |
| 25 | | | | | | | | | | | | 580 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1026

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533363.2 N; 628319.4 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>608.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/9/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 18 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/10/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 3.0/3.0 | 80 | SW to F | R3 | PA | | | | D | LIMESTONE (micrite with minor wackestone) with shale interbeds; limestone is medium gray (N5) and shale is grayish black (N2); fresh to slightly weathered; medium strong; strong HCL reaction | First core run begun at 18.0 feet.<br>Poor fluid return | |
| | 2 | 3.9/3.9 | 72 | SW to F | R3 | | | | | | - 18-46 feet: shale beds <0.01 feet thick with spacings of 0.1 feet, wavy, irregular | | 585 |
| 25 | | | | | | | | | Bj, 15, Wa, Sl, Ti | | | | |
| | 3 | 6.1/6.1 | 92 | SW to F | R3 | | | | Bj, 5, Wa, Sl, Ti | | | 28-50 feet: Good fluid return | 580 |
| 30 | | | | | | | | | | | | | |
| | 4 | 5.0/5.0 | 72 | SW to F | | | | | Bj, 10, Wa, Sm, Ti<br>Bj, 10, Wa, Sl, Ti | | - 32 feet: vertical fracture, crystals formed along fractured surface | | 575 |
| 35 | | | | | | | | | Bj, 85, Wa, Sl, Ti | | - 34 feet: increase in shale beds, thin (<0.1ft)<br>- 35 feet: vertical fracture | | |
| | 5 | 5.0/5.0 | 76 | SW to F | R3 | PA | | | Jo, 85, Wa, Sm-Sl, Ti | | - 38 feet: abundant shale beds (20%), thin < 0.1 feet | | 570 |
| 40 | | | | | | | | | | | | | |
| | 6 | 5.0/5.0 | 88 | SW to F | | | | | Bj, 10, Wa, Sl, Ti | | | | 565 |
| 45 | | | | | R3 | | | | | | - 44.4 feet: calcite cement, slickensides along fracture surfaces | | |
| | 7 | 4.0/4.0 | 91 | SW to F | | | | | Bj, 20, Pl, Sl, Ti<br>Bj, 15, Pl, Sm, Ti | | LIMESTONE (wackestone); medium gray (N5); fresh to slightly weathered; medium strong | | 560 |
| 50 | | | | | | | | | Bj/Mb, 20, Wa, Ro, Ti | | Boring terminated at 50 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/16 - 4.3 feet<br>5/30 - 7.0 feet | | |
| 55 | | | | | | | | | | | | | 555<br>550 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Leitis & Associates, Inc.

# SOIL LOG - Boring No. B-1027

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532755.9 N; 627608.5 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 550 | Elevation (Datum NAVD 88)<br>608.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/1/06 |
| Sampling Method<br>CME HQ core | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>5/9/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (Inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Elevation (feet) | Lithology | Depth | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 608.6 | CLAY with limestone gravel, brown (7.5YR 4/4), moist, medium stiff, (Fill) | 0.0 | |
| | | CME 1 | | 26.4 | | | | | CL | 607.1 | CLAY, reddish yellow (10YR 7/6) to brown (10YR 4/3), moist, medium stiff, some mottling of light gray (10YR 7/1) (Residual) | 1.5 | |
| 5 | | CME 2 | | 49.2 | | | | | ML | 603.1 | SILT, light olive brown (2.5Y 5/3), moist, soft (Residual) | 5.5 | |
| | | | | | | | | | CL | 601.6 | CLAY, light olive brown (2.5YR 5/3), moist, stiff to very stiff, few manganese nodules (Residual) | 7.0 | |
| 10 | | CME 3 | | 58.8 | | | | | | 597.4 | - 9.8 feet: color changes to yellowish brown (10YR 5/6) mottled with red (10R 4/8) and light gray (10YR 7/1), abundant manganese nodules | 11.2 | SPT refusal at 12.4 feet. Rock core casing set at 11.0 feet. Continuation of borehole description on rock log. |
| | | SPT 4 | 11 50/2" | 7.2 | | | | | | 596.2 | possibly limestone rubble | 12.4 | |
| 15 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

Elevation (feet): 605, 600, 595, 590, 585, 580

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Leitis & Associates, Inc.

# ROCK LOG - Boring No. B-1027

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532755.9 N; 627608.5 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 550 | Elevation (Datum NAVD 88)<br>608.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/1/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 11 feet | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>5/9/06 |

Reviewed by / Date W Shelin 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 2 | 3.3/3.3 | 97 | SW to F | R2 to R3 | | | | | D | LIMESTONE (wackestone) interbedded with calcareous shale; wackestone is medium gray (N5) and shale is medium dark gray; slightly weathered to fresh; effervesces strongly in HCl<br>- 11.2-13 feet: abundant calcite-filled fractures<br>- 16.3-21 feet: some calcite-filled vugs and sand size openings<br>- 17.4-17.7 feet: cavity | Core Run #1 from 11.2 -13 feet: Recovery=1.2'/1.8', RQD=19% , Weathering= SW to F, Strength=R2 to R3<br>Driller uses 2 water tanks at 500 gal capacity each. No recirculation. Drill fluid white to light gray. 700 psi down pressure. fluid loss at 17 feet possibly associated with cavity | 595 |
| 20 | 3 | 4.2/5.0 | 80 | F | R2 to R3 | | | | Bj, 10, Wa, Sl, Ti<br>Bj, 20, Pl, Sl, Ti<br>Bj, 10, Wa, Ro, Op | | | | 590 |
| 25 | 4 | 5.1/5.0 | 90 | F | | | | | Bj, 15, Wa, Sl, Ti<br>Bj, 15, Pl, Sl, Ti<br>Bj, 10, Wa, Sl, Ti | | | poor fluid return | 585 |
| 30 | 5 | 5.0/5.0 | 91 | | R2 to R3 | | | | Bj, 10, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti | | | | 580 |
| 35 | 6 | 4.8/5.0 | 80 | F | | | | | Bj, 10, Pl, Sm, Ti<br>Fa, 20, Pl, Sm, Ti | E | - 31-45 feet: calcite-filled fractures (0.02 feet thick)<br>- 32.6-35.0 feet: very finely laminated beds<br>- 33.4-33.8 feet: closely spaced fractures, possible fault with slickensides at 33.8 feet<br>36.3-37.3 feet: packstone | | 575 |
| 40 | 7 | 5.0/5.0 | 100 | | R2 to R3 | | | | | | | | 570 |
| 45 | 8 | 5.1/5.0 | 100 | F | | | | | | | | rig chatter at 42 feet, drill fluid light gray, 900 psi down pressure | 565 |
| | 9 | 1.5/1.6 | 94 | | R3 | | | | | | | | |
| 50 | 10 | 1.7/2.1 | 81 | | | | | | | | | Good fluid return, brown to white, 800 psi down pressure | 560 |
| | | | | | | | | | | | Boring terminated at 50.0 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface) | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Leidis & Associates, Inc

# ROCK LOG - Boring No. B-1027

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 5/8 - 3.0 feet<br>5/9 - 4.0 feet<br>5/16 - 7.2 feet<br>8/6 - 4.0 feet | | 555 |
| 55 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 550 |
| 60 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 545 |
| 65 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 540 |
| 70 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 535 |
| 75 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 530 |
| 80 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 525 |
| 85 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 520 |
| 90 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1028

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532272 N; 628314.6 E | | Total Depth<br>88.1 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 550 | Elevation (Datum NAVD 88)<br>624.9 feet | Ground Water Depth<br>See Note A | Date Started<br>5/26/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>5/30/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 624.9 / 0.0 | | |
| | | | | | | | | | CL | 624.7 / 0.2 ASPHALT | | |
| | | SPT 1 | 8 6 6 | 18 | | | | | | CLAY with sand, yellowish red (5YR 4/6) to tan red brown (5YR 4/3), dry to moist, very stiff to stiff (Fill) | | |
| | | SPT 2 | 5 5 8 | 18 | | | | | | | | |
| 5 | | | | | | | | | | 619.4 / 5.5 | | 620 |
| | | | | | | | | | SC | SAND with clay, reddish brown (5YR 4/4) and gray (10YR 5/1), moist to dry, medium dense | | |
| | | SPT 3 | 5 6 18 | 18 | | | | | | | | |
| | | | | | | | | | | 616.9 / 8.0 | | |
| | | | | | | | | | CL | CLAY, strong brown with gray mottling (7.5 YR 5/6), moist, stiff to hard, trace sand | | |
| | | SPT 4 | 5 6 8 | 18 | | | | | | | | |
| 10 | | | | | | | | | | | | 615 |
| | | SPT 5 | 4 6 50/4" | 14 | | | | | | 612.8 / 12.1 | | |
| | | | | | | | | | | 612.1 / 12.8 LIMESTONE (weathered rock) | SPT refusal at 12.3 feet. Auger refusal at 12.8 feet. Continuation of borehole description in rock log. | |
| 15 | | | | | | | | | | | | 610 |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | 595 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1028

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532272 N; 628314.6 E | | Total Depth<br>88.1 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 550 | Elevation (Datum NAVD 88)<br>624.9 feet | Ground Water Depth<br>See Note A | Date Started<br>5/26/06 |
| Casing Size and Depth<br>PVC: 6.625 inch O.D. / 12.8 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>5/30/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2.2/2.2 | 32 | SW | R4 | | | | Bj, 5, Pl, S | | LIMESTONE (micrite) with interbedded shale; medium light gray (N6); slightly weathered; strong - shale beds moderately thin to moderately thick every 0.1 feet, clay filled seams 0.2 feet in Run 1 - fresh to slightly weathered, shale beds moderately thin to thin every 1-2 feet | | |
| 15 | | | | | | | | | | | | | 610 |
| | 2 | 5.0/5.0 | 100 | SW to F | R4 | | | | Bj, 5, Pl, S | | | | |
| 20 | | | | | | | | | | | | | 605 |
| | 3 | 5.0/5.0 | 94 | SW | R4 | | | | Bj, 15, Pl, Sl<br>Bj, 5, Pl, S<br>Bj, 5, Pl, S | | -slightly more weathering | | |
| 25 | | | | | | | | | | | | | 600 |
| | 4 | 5.0/5.0 | 94 | SW | R4 | | | | Bj, 5, Pl, S | | - 26.1-28.8 feet: fossiliferous | | |
| 30 | | | | | | | | | | | | | 595 |
| | 5 | 5.0/5.0 | 100 | SW to F | | | | | | B | - shale beds are thin to moderately thick occuring every 0.1'-0.4' | | |
| 35 | | | | | R5 | | | | | | | | 590 |
| | 6 | 5.0/5.0 | 100 | | | | | | Bj, 10, Pl, Sl | | - shale beds are moderately thick occuring every 0.1'-0.3'; filling bioturbation areas<br>- fossils and bioturbation at 37-38.6 feet<br>- 38.1 feet: Calcite crystals | | |
| 40 | | | | F | | | | | | | | | 585 |
| | 7 | 5.0/5.0 | 100 | | R5 | | | | | | - shale beds are moderately thin to thin<br>- 43.2-46.9 feet: fossils and bioturbation | | |
| 45 | | | | | | | | | | | | | 580 |
| | 8 | 5.0/5.0 | 100 | | | | | | Bj, 5, Pl, S<br>Bj, 10, Pl, Ro | | LIMESTONE (packstone) with interbedded shale; light gray (N7); fresh; very high strength; shale beds thin to moderately thin occuring every 0.4-0.1 feet | | |
| 50 | | | | F | R4 | | | | | | - 50.2-53.4 feet: fossiliferous | | 575 |
| | 9 | 5.0 | 100 | | | | | | | | LIMESTONE (wackestone) with interbedded shale; medium gray (N5); fresh; strong; shale beds | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# ROCK LOG - Boring No. B-1028

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 5.0 | | | | | | | | | moderately thin to moderately thick occuring every 0.1-0.4 feet | | |
| 55 | | | | | | | | | | | | | 570 |
| | 10 | 5.0/5.0 | 100 | F | R5 | | | | Bj, 15, Pl, Sl | B | LIMESTONE (micrite) with interbedded shale; medium gray (N5); fresh; very strong; shale beds thin to moderately thin occuring every 0.1 to 0.3 feet; small beds of shell hash, some chert pods do not react with HCl | | |
| 60 | | | | | | | | | | | | | 565 |
| | 11 | 5.0/5.0 | 56 | MW to F | R3 to R4 | | | | Jo, 80-90, St, Ro | C | LIMESTONE (packstone) with shale beds; medium light gray (N6); fresh to moderately weathered; strong to medium strong; shale beds filling bioturbation zones thin and thick, spaced every 0.2 to 0.3 feet; shale 25-35% | | |
| | | | | | | | | | | | SHALE with interbedded micrite; dark grey (3N3); moderately weathered to fresh; strong to medium strong | | |
| 65 | | | | | | | | | | | | | 560 |
| | 12 | 5.0/5.0 | 66 | MW to F | R3 to R4 | | | | Jo, 70, St, Ro<br>Ve, 60, St, Sl | | LIMESTONE (packstone) with shale beds; medium light gray (N6); fresh to moderately weathered; strong to medium strong; shale beds filling bioturbation zones; thin and thick, spaced every 0.2 to 0.3 feet; shale 25-35%<br>- shell hash and fossils start at 65.5 feet<br>- increase in shale beds starting at 68.3 feet | | |
| 70 | | | | | | | | | | | | | 555 |
| | 13 | 5.1/5.1 | 86 | SW to F | R4 | | | | | | SHALE with limestone layers; dark gray (3N3); fresh to slightly weathered; strong to very strong; bioturbations; limestone layers thin, spaced every 0.1-0.2 feet | | |
| 75 | | | | | | | | | | | | | 550 |
| | 14 | 5.0/5.0 | 100 | F | | | | | | | - becomes fresh with very high strength; thin to moderately thin limestone every 0.2' | | |
| | | | | | | | | | | | LIMESTONE (micrite) with interbedded shale; medium light gray (N6); fresh; very strong; bioturbation present; shale beds thin to moderately thick, spaced every 0.1 to 0.3 feet | | |
| 80 | | | | | R5 | | | | Bj, 10, Wa, Sl | | | | 545 |
| | 15 | 5.0/5.0 | 100 | F | | | | | | | SHALE with interbedded micrite; dark gray (3N3); fresh, very strong; limestone layers are thick to thin, spaced 0.1-0.3 feet apart | | |
| 85 | | | | | | | | | | | | | 540 |
| | 16 | 2.9/3.0 | 86 | SW to F | R5 | | | | Bj, 15, Pl, Sl | | - distribution of limestone/shale 50/50 at 87.1 feet | 85 feet: Replacement rig used to continue drilling. Damage to downhole tools. Boring was terminated due to equipment malfunction. | |
| | | | | | | | | | | | Boring terminated at 88.1 feet | | |
| 90 | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/26 - 12.3 feet<br>5/30 - 12.3 feet | | 535 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1029

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533050.8 N; 628111.8 E | | Total Depth<br>35.9 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>612.6 feet | Ground Water Depth<br>See Note A | Date Started<br>7/9/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>7/9/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 612.6 CLAY, strong brown (7.5 YR 4/6), moist, very stiff, trace manganese nodules 0.0 | | 610 |
| | | SPT 1 | 7 7 10 | 17.4 | | | | | | | | |
| | | SPT 2 | 9 10 12 | 4.2 | | | | | | | | |
| 5 | | | | | | | | | | 606.8 5.8 | Auger refusal at 5.8 feet. SPT refusal at 5.0 feet (50 blows/0"). Continuation of borehole description in rock log. | 605 |
| 10 | | | | | | | | | | | | 600 |
| 15 | | | | | | | | | | | | 595 |
| 20 | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1029

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533050.8 N; 628111.8 E | | Total Depth<br>35.9 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>612.6 feet | Ground Water Depth<br>See Note A | Date Started<br>7/9/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 5.8 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>7/9/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 3.0/3.1 | 98 | SW to F | R3 | | | | Bj, 20, Wa, Sl, Ti | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh to slightly weathered; medium strong; strong HCL reaction; shale beds are wavy with thickness <0.01 feet and spacings of 0.01-0.15 feet | | 605 |
| 10 | 2 | 4.9/5.0 | 98 | F | R3 | | | | | | | | 600 |
| 15 | 3 | 4.8/5.0 | 96 | F | R3 | | | | Bj, 15, Wa, Sl, Ti, Fi clay<br>Bj, 18, Wa, Sl, Ti | | - becomes fresh with occasional packstone interbeds, medium bluish gray (5B 5/1)<br>-17.8-19.1 feet: packstone bed | | 595 |
| 20 | 4 | 5.3/5.0 | 100 | F | R3 | | | | | D | - 20.2-21.4 feet: small burrows common (0.05-0.1 inches) | | 590 |
| 25 | 5 | 5.0/5.0 | 99 | F | R3 | | | | | | | | 585 |
| 30 | 6 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 10, Wa, Sm, Op | | - 30.6-31.4 feet: packstone bed<br>LIMESTONE (wackestone) with calcareous shale interbeds; wackestone is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; strong HCl reaction | | 580 |
| 35 | 7 | 2.1/2.0 | 100 | F | R3 | | | | | | - 34.4-34.7 feet: packstone bed | | |
| 40 | | | | | | | | | | | Boring terminated at 35.9 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/9 - 14.0 feet | | 575<br>570 |
| 45 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1030

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532718.7 N; 628698.8 E | | Total Depth<br>35.2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>618.7 feet | Ground Water Depth<br>See Note A | Date Started<br>5/10/06 |
| Sampling Method<br>CME/SPT | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/11/06 |

Reviewed by / Date W. Nolan 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | GC | 618.7 ASPHALT 0.0; 618.5 clayey GRAVEL, gray, clasts are up to 1 inch in size (Fill) 0.2 | grab sample collected at 1.5 feet, CME coring begins below gravel |
| | | | | | | | | | CL | 617.2 CLAY with sand, strong brown (7.5YR 5/6), moist, stiff to very stiff, <15% limestone rock fragments (1 cm mostly in crumbles), trace organics (Fill) 1.5 | |
| | | CME 1 | | 60 | | | | | CL | 616.1 CLAY with sand, reddish brown (2.5YR 5/4), moist; stiff to very stiff, trace sand sized fragments of black mineral (possible manganese oxide) (Residual) 2.6 | Lowest section of CME-1 was extracted with difficulty from auger. |
| 5 | | | | | | | | | GC | 612.2 - becomes very sandy 6.5 | Complete loss of CME #2 |
| | | CME 2 | | 4.5 | | | | | | GRAVEL, appears to be asphalt or fill cemented by calcite 9.0 | |
| 10 | | SPT 3 | 40/18" | 18 | | | | | CL | 609.7 CLAY with rock fragments (15%), yellowish red (5YR 5/6), many black fine grained nodules, limestone fragments light gray (N7) 10.5 | SPT sample used to recover lost CME 2<br>Practical SPT refusal at 10.5 feet. Continuation of borehole description on rock log. |
| 15 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 615, 610, 605, 600, 595, 590

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1030

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532718.7 N; 628698.8 E | | Total Depth<br>35.2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>618.7 feet | Ground Water Depth<br>See Note A | Date Started<br>5/10/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 10.5 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/11/06 |

Reviewed by / Date W Bolan 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 3.3/3.3 | 24 | MW | R2 | | | | Bj, 5, Wa, Ro, Op<br>Bj, 20, Wa, Sl, Op<br>Bj, 10, Wa, Sl, Op<br>Jo, 40, Wa,Ro, Op<br>Bj, 10, Wa, Sl, Op<br>Bj, 10, Wa, Sl, Op<br>Jo, 80, Pl, Ro, Op<br>Fracture zone 14.5-16' | B | LIMESTONE (wackestone); medium gray (N5); moderately weathered; weak to medium strong; bedding at 30°; wackestone is medium to fine grained with closely spaced 1 mm clay layers<br>10.5- 10.9 feet: contains clay infilling and gravel-size fragments<br>- 14.5-16 feet: fracture zone, becomming slightly to moderately weathered | Fluid return good throughout boring<br>17.6-18.2: no recovery | 605 |
| 15 | 2 | 4.5/5.0 | 42 | MW to SW | R2 to R3 | | | | | | | | 600 |
| 20 | 3 | 4.8/5.0 | 96 | SW | R3 | | | | | | | | 595 |
| 25 | 4 | 5.0/5.0 | 100 | F | R3 to R4 | | | | | | LIMESTONE (packstone); medium gray (N5); fresh; medium strong to strong; bedding at 30°, wavy irregular clay beds | | 590 |
| 30 | 5 | 4.0/4.0 | 100 | F | R3 to R4 | | | | | | LIMESTONE (micrite) with minor wackestone and interbedded shale; medium gray (N5); fine grained; shale beds are < 0.1 feet thick with spacings 0.2-0.5 feet | | 585 |
| | 6 | 1.0/1.0 | 100 | F | R4 | | | | | | | | |
| | 7 | 1.4/1.2 | 90 | F | R4 | | | | | | | | |
| 35 | | | | | | | | | | | Boring terminated at 35.0 feet | | |
| 40 | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/11 -2.4 feet<br>5/13 - 2.4 feet | | 580 |
| 45 | | | | | | | | | | | | | 575 |
| 50 | | | | | | | | | | | | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1031

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532538.5 N; 628081.8 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>616.9 feet | Ground Water Depth<br>See Note A | Date Started<br>5/27/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/28/06 |

Reviewed by / Date DSC 3-13-07 [illegible] 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 616.9 / 0.0 | | |
| | | | | | | | | | GC | 616.7 / 0.2 ASPHALT | | |
| | | | | | | | | | | 616.3 / 0.6 GRAVEL base rock | | |
| | | | | | | | | | CL | | | |
| | | SPT 1 | 3 6 6 | 12.6 | | | | | CH | 615.3 / 1.6 CLAY with sand, reddish brown (5YR 4/4), moist, stiff, low plasticity (Fill) | | 615 |
| | | | | | | | | | | CLAY, strong brown (7.5YR 4/6), moist, stiff, few organic matter | | |
| | | SPT 2 | 2 4 6 | 12.6 | | | | | | | | |
| 5 | | | | | | | | | | - occasional manganese nodules<br>- becomes yellowish brown (10YR 5/4), organics | | |
| | | SPT 3 | 2 3 5 | 10.2 | | | | | | | | 610 |
| | | SPT 4 | 1 4 9 | 13.2 | | | | | | | | |
| 10 | | | | | | | | | | 606.4 / 10.5 | | |
| | | | | | | | | | CL | CLAY with weathered limestone gravel (0.1-0.05 feet), pale yellow (2.5Y 7/3), dry, hard | | |
| | | SPT 5 | 19 7 29 | 16.8 | | | | | | | | 605 |
| | | SPT 6 | 17 27 38 | 16.8 | | | | | | | | |
| 15 | | | | | | | | | | 601.6 / 15.3 | SPT refusal at 15 feet. Continuation of borehole description in rock log. | |
| | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1031

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532538.5 N; 628081.8 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>616.9 feet | Ground Water Depth<br>See Note A | Date Started<br>5/27/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 15.3 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/28/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 0.8/1.0 | 0 | SW | R2 | | | | | C | SHALE with packstone and micrite interbeds; dark gray (N3); slightly weathered; weak; micrite is medium gray (N5) and packstone is medium bluish gray (5B 5/1); shale is 0.05-0.35 feet thick with average spacing of 0.1 feet, calcareous<br>- Clay filled fractures and visible fossils<br>- 16.4-18.4 feet: zone of high angle fractures, mechanical breaks and clay filled fractures<br>- packstone bed is 0.5 feet thick, medium grains | | 600 |
| 20 | 2 | 4.9/5.1 | 75 | SW to F | R2 | | | | Jo, 70, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Op | | | | 595 |
| 25 | 3 | 5.0/5.0 | 100 | SW | R2 | | | | Bj/Me, 10, Pl/Wa, Sl, Ti | D | LIMESTONE (micrite) with interbedded shale; medium gray (N5); shale bands are dark gray (N3) to grayish black (N2); fresh to slightly weathered; weak<br>- shale layers are 0.01-0.05' with spacing of 0.05-0.03'<br>- clay lined fracture | | 590 |
| 30 | 4 | 5.0/5.0 | 100 | F | R2 | | | | Bj/Me, 5, Wa, Sl, Ti<br>Bj/Me, 10, Wa, Sl, Ti<br>Bj/Me, 15, Wa, Sl, Ti<br>Bj/Me, 15, Wa, Sl, Ti | | | | 585 |
| | 5 | 3.6/3.6 | 100 | F | R2 | | | | | | - 33-35 feet: multiple vugs, range from 0.05 to 0.2 feet, nominal diameter<br>- 34.5 feet: chert pod, 0.15x0.2 feet | | |
| 35 | | | | | | | | | | | Boring terminated at 35 feet | | 580 |
| 40 | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/26 - dry | | 575 |
| 45 | | | | | | | | | | | | | 570 |
| 50 | | | | | | | | | | | | | 565 |
| 55 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1032

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533054.2 N; 628254.8 E | | Total Depth<br>175.6 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>613 feet | Ground Water Depth<br>See Note A | Date Started<br>6/20/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>6/20/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | MH | 613 SILT with sand, yellowish red (5YR 4/6), moist, stiff, trace manganese nodules present | | |
| | | SPT 1 | 2 4 6 | 18 | 17.4 | 54/ 23 | GSZ | | | | | |
| | | | | | | | | | | 609.5 | 3.5 | 610 |
| | | SPT 2 | 6 9 10 | 18 | 21.9 | 51/ 32 | GSZ | | CH | CLAY with sand, mottling of yellow(10YR 7/6), moist, very stiff, some relic structure evident | | |
| 5 | | SPT 3 | 7 10 12 | 18 | | | | | | | | 605 |
| 10 | | SPT 4 | 8 11 17 | 18 | | | | | | | | |
| | | SPT 5 | 10 11 13 | 18 | | | | | | | | |
| | | | | | | | | | | 600.0 | 13.0 | 600 |
| | | SPT 6 | 10 11 15 | 18 | | | | | CL | CLAY, yellowish brown (10YR 5/6) mottled with light gray (10YR 7/2), dry to moist, very stiff to hard, trace manganese nodules | | |
| 15 | | SPT 7 | 10 11 23 | 18 | | | | | | - presence of weathered limestone fragments below 16 feet | | |
| | | | | | | | | | | 595.0 | 18.0 | 595 |
| | | SPT 8 | 14 11 11 | 9.6 | | | | | CL | CLAY with gravel, yellowish brown (10YR 5/6) mottled with light gray (10YR 7/2), moist, very stiff, increase in limestone fragmentation with depth | | |
| 20 | | | | | | | | | | 591.8 | 21.2 | |
| | | | | | | | | | | | SPT and auger refusal at 21.0 feet. Continuation of borehole description on rock log. | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1032

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533054.2 N; 628254.8 E | | Total Depth<br>175.6 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>613 feet | Ground Water Depth<br>See Note A | Date Started<br>6/20/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 21.6 feet | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>6/20/06 |

Reviewed by / Date W Bohrer 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 1 | 4.7/5.0 | 90 | SW to F | R3 | | | | Bj, 5, Wa, Sm, Op | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh to slightly weathered; medium strong; strong HCL reaction<br>- 23.2-28.5 feet: shale beds are < 0.01 feet thick with spacings of 0.05-0.15 feet, very crystalline, contains spars | Rock coring began at 21.2 feet with casing set at 21.6 feet.<br>Fluid return good throughout boring | 590 |
| 30 | 2 | 4.9/5.0 | 93 | SW to F | R3 | | | | Bj, 5, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti | | - rock weathering becomes fresh<br>- 28.5-42.2 feet: shale beds are < 0.01 feet thick with spacings of <0.02-0.1 feet, 30% shale | | 585 |
| 35 | 3 | 5.1/5.0 | 100 | F | R3 | | | | | | | | 580 |
| 40 | 4 | 5.0/4.9 | 100 | F | R3 | | | | | D | | | 575 |
| 45 | 5 | 5.0/5.0 | 94 | F | R3 | | | | Bj, 10, Wa, Sl, Ti<br>Bj, 15, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Ti | | - 42.2-45 feet: shale beds are <0.1-0.3 inches thick with spacings of 0.5-1 inch<br>- 43.2 feet: rip-up clasts of 0.03' diameter<br>- 45-47.4 feet: irregular, discontinuous bedding | | 570 |
| 50 | 6 | 5.0/5.0 | 99 | F | R3 | | | | | | - 47.4-49 feet: shale beds are <0.1-0.3 inches thick with spacings of 0.5-1 inch<br>- 49-57.5 feet: shale beds are <0.01 feet thick with spacings of <0.03-0.1 feet, wavy | | 565 |
| 55 | 7 | 5.1/4.9 | 100 | F | R3 | | | | Bj, 15, Wa, Sl, Ti, calcite-lined | | | | 560 |
| 60 | 8 | 4.9/5.0 | 97 | F | R3 | | | | Bj, 15, Wa, Sl, Op<br>Bj, 15, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Ti | | LIMESTONE (micrite); medium gray (N5); fresh; medium strong; minor calcareous shale interbeds present, hairline thin, stylolites; 2% shale<br>LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is | | 555 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1032

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 5.1/5.0 | 100 | F | R3 | | | | Jo, 50, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Ti | | dark gray (N3); fresh; medium strong<br>- 59.2-61.5 feet: shale is < 0.01 feet thick with average spacings of 0.02 feet; 20% shale<br>- 61.5-71 feet: shale beds are < 0.01-0.05 feet thick with spacings of 0.01-0.25 feet, 15% shale<br>- 64.6 feet: calcite layer 0.01' thick shows slicken-sides | | 550 |
| 65 | | | | | | | | | | | | | |
| | 10 | 5.1/5.0 | 100 | F | R3 | | | | Bj, 10, Wa, Sl, Ti, slickensides | | | | 545 |
| 70 | | | | | | | | | | | | | |
| | 11 | 4.9/5.0 | 98 | F | R3 | | | | | | - 71-76 feet: shale is wavy with diffuse bedding, possible bioturbation, 25% shale | | 540 |
| 75 | | | | | | | | | | | | | |
| | 12 | 5.0/5.0 | 100 | F | R3 | | | | | | - 76-84 feet: shale layers are < 0.01 feet thick with spacings of 0.05-0.3 feet | | 535 |
| 80 | | | | | | | | | Jo, 80-60°, Wa, Sl, Ti, staining | D | - 80-81 feet: high angle joint with staining along fracture | | |
| | 13 | 4.9/4.9 | 92 | F | R3 | | | | | | | | 530 |
| 85 | | | | | | | | | | | SHALE (calcareous); dark gray (N3); fresh; medium strong; 50-55% shale<br>- 84-84.7 feet: prominent shaly zone<br>- 84.7-88.3 feet: shale beds are 0.02-0.08 feet thick with spacings of <0.1 feet, bedding is discontinuous, wavy, bioturbated | | |
| | 14 | 5.0/5.1 | 97 | F | R3 | | | | Bj, Op | | - 88.3-89.2 feet: shale beds wavy, stylolites beginning to form, rip-up clasts | | 525 |
| 90 | | | | | | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong<br>- 91.8 feet: slickensides; 0.2' thick shale bed | | |
| | 15 | 5.2/5.0 | 100 | F | R3 | | | | Jo, 20, Pl, Sm, Ti, slickensides | | LIMESTONE (micrite); medium light gray (N6) to medium gray (N5); fresh; medium strong; micrite is very crystalline with stylolites; contains spars | | 520 |
| 95 | | | | | | | | | | | | | |
| | 16 | 4.7/5.0 | 94 | F | R3 | | | | | | interbedded SHALE and LIMESTONE; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong<br>- 96.4-97.5 feet: micrite dominant, shale is wavy, ~0.02 feet thick<br>- 97.5-99 feet: 50% shale, shale and micrite rip-up clasts | | 515 |
| 100 | | | | | | | | | | E | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1032

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 17 | 5.0/4.9 | 87 | F | R3 | | | | Bj, 15, Pl, Sm, Ti, polished Bj, 20, Wa, Sm, Ti, polished Bj, 15, Pl, Sm, Ti Bj, 15, Pl, Sm, Ti Bj, 10, Pl, Sm, Ti Bj, 10, Pl, Sl, Ti Bj, 10, Pl, Sl Ti, slickensides | | - 99-100 feet: micrite dominant with little shale<br>- 100-101.6 feet: shale dominant (90%)<br>LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; shale beds are <0.01-0.06 feet thick; 25% shale | | 510 |
| 105 | | | | | | | | | | | | | |
| | 18 | 4.9/5.0 | 97 | F | R3 | | | | | | | | 505 |
| 110 | | | | | | | | | | | | | |
| | 19 | 5.3/5.2 | 100 | F | R3 | | | | | E | SHALE (calcareous) interbedded with micrite; shale is dark gray (N3) and micrite is medium gray (N5); fresh; medium strong; micrite is < 0.01' thick with no regular spacing; 90% shale<br>LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong | | 500 |
| 115 | | | | | | | | | | | | | |
| | 20 | 4.9/4.9 | 100 | F | R3 | | | | | | - 112.9-121 feet: shale beds are <0.01-0.3 feet thick with spacings of <0.01-0.4 feet; 20% shale | | 495 |
| 120 | | | | | | | | | | | | | |
| | 21 | 5.0/5.2 | 95.5 | F | R3 | | | | | | - 121-129 feet: shale beds are <0.01 feet thick with spacings of < 0.02-0.1 feet, wavy, rip-up clasts | | 490 |
| 125 | | | | | | | | | | | | | |
| | 22 | 5.0/5.0 | 99 | F | R3 | | | | | | | | 485 |
| 130 | | | | | | | | | | F | - 129-144 feet: shale beds are <0.02 feet thick with spacings of 0.05-0.1 feet (with the exception of a shale rich layer at 130-130.4 feet); 30% shale | | |
| | 23 | 5.0/5.0 | 99 | F | R3 | | | | | | | | 480 |
| 135 | | | | | | | | | | | | | |
| | 24 | 5.0/4.9 | 100 | F | R3 | | | | | | | | 475 |
| 140 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1032

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 145 | 25 | 5.0/5.0 | 100 | F | R3 | | | | | | - 144-166 feet: shale beds are <0.01 feet thick with spacings of 0.01-0.1 feet | | 470 |
| 150 | 26 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 20, Pl, Sm, Ti, slickensides | | | | 465 |
| 155 | 27 | 5.0/5.0 | 100 | F | R3 | | | | Jo, 60, Wa, Sl, Ti, water staining | F | | | 460 |
| 160 | 28 | 5.0/5.0 | 100 | F | R3 | | | | | | | | 455 |
| 165 | 29 | 5.0/5.0 | 100 | F | R3 | | | | | | | | 450 |
| 170 | 30 | 5.0/5.0 | 100 | F | R3 | | | | | | - 166-166.5 feet: shale-rich layer<br>- 166.5-169.7 feet: shale beds are 0.01 feet thick with spacings of ~0.05 feet | | 445 |
| 175 | 31 | 4.2/4.5 | 93 | F | R3 | | | | | LSR | SHALE (calcareous) with interbedded micrite; shale is medium dark gray (N3) and micrite is medium gray (N5); fresh; medium strong; shale beds are 0.01-0.02 feet thick with spacings of < 0.01-0.3 feet; 95% shale<br>LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong | | 440 |
| 180 | | | | | | | | | | | Boring terminated at 175.6 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/24 - 14.7 feet<br>7/18 - 15.2 feet | | 435 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1032PS

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533056.3 N; 628252.8 E | | Total Depth<br>36.2 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>613 feet | Ground Water Depth<br>See Note A | Date Started<br>7/6/06 |
| Sampling Method<br>No sampling | Borehole Inclination<br>Vertical | Logged by<br>J. Wesling | Date Completed<br>7/6/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 613 — 0.0 | Boring is 3.75 feet from B-1032 | 610 |
| 5 | | | | | | | | | | Soil sampling not conducted. Refer to boring B-1032 for soil profile. | | 605 |
| 10 | | | | | | | | | | | | 600 |
| 15 | | | | | | | | | | | | 595 |
| 20 | | | | | | | | | | 592.1 — 20.9 | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1032PS

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533056.3 N; 628252.8 E | | Total Depth<br>36.2 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>613 feet | Ground Water Depth<br>See Note A | Date Started<br>7/6/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 20.7 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Wesling | Date Completed<br>7/6/06 |

Reviewed by / Date DSC 3-13-07 M Malone 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 1 | 4.9 / 5.3 | 85 | SW to F | R3 to R4 | P-S | | | Jo, 5, Sm, Ti<br>Bj, 5, Ro, Op | D | LIMESTONE (micrite) with interbedded calcareous shale; medium gray to dark gray (N5 to N3); fresh to slightly weathered; medium strong to strong; strong HCl reaction; shaly interbeds 0.01-0.03 feet thick spaced approximately 0.1 to 0.2 feet; wavy and irregular<br>- 22.5, 23.1, 25.5 feet: calcite filled vugs ~0.125-0.5 inch diameter<br>- 23.7 feet: some mechanical breaking<br>- 22.9-25.6 feet: bioturbation (burrowing) evident | P-S analysis was conducted over the length of cored section | 590 |
| 30 | 2 | 10.0 / 10.0 | 82 | SW to F | R3 to R4 | | | | Bj, 5, Sm, Ti<br>Bj, 5, Sm, Ti<br>Jo, 90, Ro, Op, stet, 30.2-31.8' | | LIMESTONE (packstone) with interbedded micrite and shale; medium gray (N5); shale interbeds are less than or equal to 0.06 inch thick and spaced 0.3-0.5 feet<br>- 30.2-31.8 feet: vertical joint | | 585 |
| 35 | | | | | | | | | | | LIMESTONE (micrite) with interbedded shale and packstone; medium gray (N5); shale interbeds grayish black (N2); fresh to slightly weathered; medium strong to strong; shale interbeds are wavy, 0.125-0.06 inches thick with spacings of 0.5-1 inch<br>- 32.9-36.2 feet: | | 580 |
| 40 | | | | | | | | | | | Boring terminated at 36.2 feet<br><br>NOTE A: Water level data (from B-1032)<br>Date - Depth (below ground surface)<br>6/24 - 14.7 feet<br>7/18 - 15.2 feet | | 575 |
| 45 | | | | | | | | | | | | | 570 |
| 50 | | | | | | | | | | | | | 565 |
| 55 | | | | | | | | | | | | | 560 |
| 60 | | | | | | | | | | | | | 555 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lewis & Associates, Inc.

# SOIL LOG - Boring No. B-1033

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532169.8 N; 628888.6 E | | Total Depth<br>121.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>625.9 feet | Ground Water Depth<br>See Note A | Date Started<br>6/11/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Pearce | Date Completed<br>6/14/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 625.9 CLAY, dark red (2.5YR 3/6), dry, stiff, trace fine sand, black nodules, slight laminations (Fill) 0.0 | | 625 |
| | | SPT 1 | 2 6 5 | 14 | | | | | | | | |
| | | SPT 2 | 3 5 9 | 13 | | | | | | 621.4 | 4.5 | |
| 5 | | | | | | | | | CL | CLAY, yellowish brown (10YR 5/8), moist, stiff to very stiff, trace clasts, trace black nodules | | 620 |
| | | SPT 3 | 3 5 7 | 0 | | | | | | | 6-7.5 feet: No recovery and no change in cuttings | |
| | | SPT 4 | 6 8 11 | 17 | | | | | | - 8.5 feet: color becomes yellowish brown (10YR 5/6), angular limestone clasts (8.5-8.8 feet) | | |
| 10 | | | | | | | | | | 614.9 | 11.0 | 615 |
| | | SPT 5 | 1 3 15 | 15 | | | | | CL | CLAY, brownish yellow (10YR 6/6), moist, very stiff, angular limestone clasts 613.4 | 12.5 Auger and SPT refusal at 12.5 feet. Continuation of boring description in rock log. | |
| 15 | | | | | | | | | | | | 610 |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1033

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532169.8 N; 628888.6 E | | Total Depth<br>121.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>625.9 feet | Ground Water Depth<br>See Note A | Date Started<br>6/11/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 12.5 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Pearce | Date Completed<br>6/14/06 |

Reviewed by / Date W Pohlmann 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 3.2/4.0 | 75 | SW to F | R3 | | | | Jo, 5, Wa, Ro, Op, Clay filled<br>Jo, 5, Wa, Ro, Op, Clay filled | | CLAY with 0.5 inch angular gravel clasts, yellowish brown (10 YR 5/6), very soft, high plasticity<br>LIMESTONE (micrite) with shale interbeds; light gray to medium gray (N7 to N5); fresh to slightly weathered; medium strong; wet; interbeds at 20°, thin<br>- 14-14.5 feet: clay filled fractures<br>- 16.8 feet: possible vug<br>- color changes to gray to light gray (N6) and becomes dry | down pressure 500 psi, Fluid return good<br>Clasts probably broken during augering. | 610 |
| 20 | 2 | 4.1/5.0 | 66 | F | R3 | | | | Jo, 5, Wa, Sl, Op, Clay filled<br>Jo, 5, Wa, Sl, Op, Clay filled | | - 18-18.2 feet: large advance (possible void), broken rock | 19-19.7 feet: clay filled fractures | 605 |
| 25 | 3 | 5.0/5.0 | 94 | F | R3 | | | | Jo, 5, Wa, Sm, Op, Clay filled<br>Jo, 5, Wa, Ro, Op<br>Jo, 10, St, Ro, Op, Slight clay fill | | - color changes to light gray (N8 dry; N4 wet) | | 600 |
| 30 | 4 | 5.0/5.0 | 96 | | | | | | Jo, 25, Wa, Ro, Op<br>Jo, 0, Wa, Ro, Ti, Clay filled | | - 28.8-29.2 feet: fossiliferous zone about 1 inch thick<br>- 30.5-31.5 feet: vertical fractures | | 595 |
| 35 | 5 | 5.0/5.0 | 94 | F | R3 | | | | Jo, 0, Pl, Sl, Op<br>Jo, 15, Wa, Sm, Op<br>Jo, 5, Wa, Ro, Op<br>Jo, 5, Wa, Ro, Op | A | LIMESTONE (micrite) with shale interbeds; gray to light gray (N7); fresh; medium strong; thin to thick<br>- 33-34 feet: healed vertical seams<br>- 35-36 feet: zone of calcite vugs | | 590 |
| 40 | 6 | 5.0/5.0 | 94 | | | | | | | | | | 585 |
| 45 | 7 | 5.0/5.0 | 96 | F | R3 | | | | Jo, 10, Wa, Vr, Op | | | | 580 |
| 50 | 8 | 5.0/5.0 | 86 | | | | | | Jo, 10, Wa, Sl, Op<br>Jo, 0, St, Sl, Op | | LIMESTONE (micrite) with shale interbeds; light gray to very light gray (N8 dry); no observed fossils or vugs; thinly bedded, locally bioturbated | | 575 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1033

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 9 | 5.0/5.0 | 68 | F | R3 | | | | Jo, 60, Wa, Ro-Vr, Op Ve Jo, 80, Wa, Sl, Ti | A | - 53.8 feet: Possible ripup structure | | 570 |
| | | | | | | | | | Jo, 30, Wa, St, Op | | | | |
| 60 | 10 | 5.0/5.0 | 94 | | | | | | Ve Jo, Wa, Ro, Ti | | - 59.4 feet: vertical joint | | 565 |
| 65 | 11 | 5.0/5.0 | 98 | F | R3 | | | | Jo, 5, Wa, Ro, Op Jo, 5, Pl, Sm, Ti | | - micrite contains 0.2-0.4 feet thick wackestone intervals<br>- 62.5-62.8 feet: zone of fossils | down pressure 500 psi, Fluid return good down to 77 feet, dark brown | 560 |
| 70 | 12 | 5.0/5.0 | 100 | | | | | | | | Shale beds relative dip 15-25°<br>- 69.5 feet: bioturbation in micrite | | 555 |
| 75 | 13 | 5.0/5.0 | 94 | F | R3 | | | | | B | - 72.5-74.8 feet: intervals of calcite vugs | | 550 |
| 80 | 14 | 5.0/5.0 | 92 | | | | | | Jo, 10, St, Vr, Op Jo, 0, Wa, Sl, Op Jo, 5, Wa, Sl, Op Jo, 70, Wa, Ro, Ti | | LIMESTONE (micrite) with thin shale interbeds, light gray to very light gray (N7 to N8); shale beds have moderate reaction to HCL; fossils not observed | 77-103 feet: lost circulation fluid with little to no return | 545 |
| 85 | 15 | 5.0/5.0 | 100 | F | R2 to R3 | | | | Jo, 25, Wa, Vr, Op | | | | 540 |
| 90 | 16 | 5.0/5.0 | 100 | | R3 | | | | | | | | 535 |
| | | | | | | | | | | | LIMESTONE (micrite) with thin to medium thick | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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# ROCK LOG - Boring No. B-1033

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | 17 | 5.0/5.0 | 100 | F | R3 | | | | Jo, 5, Wa, Ro, Op | | shale interbeds; very light gray (N8); fresh; medium strong to strong; no fossils observed | | 530 |
| | | | | | | | | | Jo, 20, Wa, Ro, Op | | - shale interbeds sub-horizontal | | |
| 100 | 18 | 5.0/5.0 | 100 | | R3 to R4 | | | | Jo, 75, Wa, Ro, Op | | - 99-101 feet and 102.4-102.7 feet: prominent vertical jointing, open and helaed | | 525 |
| 105 | 19 | 5.0/5.0 | 100 | F | R3 | | | | | | | 103.5-106 feet: moderate fluid return, medium brown | 520 |
| 110 | 20 | 5.0/5.0 | 100 | | R3 | | | | | B | LIMESTONE (micrite) with thin shale interbeds, light gray (N7); shale interbeds horizontal to sub-horizontal; no signs of vertical joints<br>- 107.7 feet: vug | 106-116.5 feet: Good fluid return, medium to dark brown | 515 |
| 115 | 21 | 5.0/5.0 | 100 | F | R3 to R4 | | | | Jo, 25, Wa, Si, Op | | - 112.5-112.6 feet: bioturbation<br>- 115 feet: fossiliferous zone ~1 feet thick (possible Packstone) | | 510 |
| 120 | 22 | 5.0/5.0 | 100 | | R3 to R4 | | | | | | - 118.3 feet: vug | 116.5-121.5: Lost fluid return and did not recover | 505 |
| 125 | | | | | | | | | | | Boring terminated at 121.5 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/13 - 17.2 feet<br>6/14 - 17.4 feet | | 500 |
| 130 | | | | | | | | | | | | | 495 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# SOIL LOG - Boring No. B-1034

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532442.6 N; 629037 E | | Total Depth<br>249.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750/CME 85 | Elevation (Datum NAVD 88)<br>622 feet | Ground Water Depth<br>See Note A | Date Started<br>6/22/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>6/26/06 |

Reviewed by / Date WH. 5-10-07 DSC 5-9-07 Rev. 1

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 622 / 0.0<br>CLAY with sand, brown (7.5 YR 4/4) to dark yellowish brown (10YR 4/6), dry to moist, stiff, few clast and organics | | |
| | | SPT 1 | 7 6 5 | 18 | | | | | | | | 620 |
| | | SPT 2 | 2 5 5 | 18 | | | | | | - 4.5 feet: sand content decreases (some), color is yellowish brown (10YR 5/6), few manganese oxide | | |
| 5 | | | | | | | | | | 615.6 / 6.4 | | |
| | | SPT 3 | 7 13 15 | 18 | | | | | CH | CLAY, dark yellowish brown (10YR 4/6), dry, very stiff to stiff, trace manganese oxide | | 615 |
| | | SPT 4 | 7 3 5 | 18 | | | | | | 613.0 / 9.0<br>- 8.5-9 feet: no clasts, some organics | | |
| 10 | | | | | | | | | CH | CLAY, yellowish brown (10YR 5/6) to dark yellowish brown (10YR 4/6), moist to dry, medium stiff, trace manganese oxide, trace organics<br>- presence of organics | | |
| | | SPT 5 | 7 3 5 | 15.6 | | | | | | 609.9 / 12.1 | | 610 |
| | | | | | | | | | CH | sandy CLAY, yellowish brown (10YR 5/5), moist, medium stiff, rich in manganese oxide | | |
| | | SPT 6 | 25/1" | 1 | | | | | | 608.0 / 14.0 | Auger and SPT refusal at 14 feet. Continuation of borehole description on rock log. | |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 605 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1034

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532442.6 N; 629037 E | | Total Depth<br>249.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750/CME 85 | Elevation (Datum NAVD 88)<br>622 feet | Ground Water Depth<br>See Note A | Date Started<br>6/22/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 14 feet | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>6/26/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 1.8/2.0 | 20 | SW | R2 | | | | | | LIMESTONE (wackestone); medium dark gray (N4); slightly weathered; weak | 15-26 feet: poor to little fluid return | |
| 20 | 2 | 5.0/5.0 | 92 | SW | R2 to R3 | | | | Bj, 10, Wa, Ro, Op | | LIMESTONE (micrite) with interbedded calcareous shale and occasional wackestone beds; micrite is medium gray (N5) and shale is black (Gley 1, 2.5/0); slightly weathered to fresh; weak to medium strong; shale is laminated, nonplanar and indistinct, spaced 0.001 feet apart; ~20% shale<br>- 15.6-28.6 feet: shale beds are non-planar<br>- 16.8-17 feet: wackestone layer<br>- 19.3-19.5 feet: wackestone layer | | 605 |
| 25 | 3 | 5.2/5.0 | 100 | | | | | | | | - 23.2-28.6: rip-up clasts | | 600 |
| 30 | 4 | 4.7/5.0 | 94 | F | R3 | | | | | A | LIMESTONE (wackestone) with interbedded shale; fresh; medium strong; shale wispy, undulatory ,< 0.001 feet thick, spaced 0.001 feet apart; calcite-rich | | 595 |
| 35 | 5 | 5.0/5.0 | 100 | | | | | | | | LIMESTONE (micrite) with interbedded calcareous shale; fresh; medium strong; shale is planar, globular shaped, < 0.01 feet thick spaced < 0.2 feet apart | 33.2 feet: Unconfined Compression with Stress/Strain Test | 590 |
| 40 | 6 | 5.3/5.0 | 100 | F | R3 | | | | Jo, 65, Wa, Ro, Ti<br>Jo, 65, Wa, Ro, Ti | | - 35.3-35.7 feet: wackestone bed<br>- 35.7-39.1 feet: shale is globular shaped<br>- 39.1-43 feet: shale beds become more planar | | 585 |
| 45 | 7 | 5.3/5.0 | 100 | | | | | | | | | | 580 |
| 50 | 8 | 5.0/5.0 | 100 | F | R3 | | | | | B | LIMESTONE (micrite) with interbedded shale; fresh; medium strong; 10% shale<br>- 45.5-46.2 feet: shale is calcareous<br>- 43-45.5 feet: shale becomes wispy, interwoven with limestone<br>- 46.2-53.3 feet: shale is wispy, non-planar and < 0.01 feet thick, spaced < 0.3 feet apart | 45.8 feet: Petrographic Analysis (sample PET-1034F) | 575 |
| | 9 | 5.2 | 100 | | | | | | | | - 53.3 -54.4 feet: shale becomes < 0.01 feet thick | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Proiect: 6468061299**

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# ROCK LOG - Boring No. B-1034

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | | 5.0 | | F | R3 | | | | | B | with rip-up clasts<br>- 54.4-60.7 feet: shale beds become undulatory and interwoven/globular and faint with < 0.1 feet thickness spaced < 0.1 feet apart | 54.58 feet: Unconfined Compression with Stress/Strain Test<br>56-249.5 feet: no fluid return | 565 |
| 60 | 10 | 4.9/5.0 | 98 | | | | | | | | | | |
| 65 | 11 | 5.0/5.0 | 100 | F | R3 | | | | | | - 60.7- 66.6 feet: shale becomes more planar | 60.3 feet: Unconfined Compression Test | 560 |
| 70 | 12 | 5.0/5.0 | 100 | | | | | | | | LIMESTONE (wackestone) with interbedded calcareous shale; fresh; medium strong; shale beds are non-planar, very thin with spacing < 0.01 feet; calcite coating of wackestone; ~35% shale<br>LIMESTONE (micrite) with interbedded shale; fresh; medium strong; 10% shale | | 555 |
| 75 | 13 | 5.2/5.0 | 100 | F | R3 | | | | | | LIMESTONE (micrite) with interbedded calcareous shale; fresh; medium strong; shale beds are non-planar; 35 % shale<br>- 73 feet: decrease to 10% shale, shale becomes wispy, thin and spaced < 0.2 feet apart | | 550 |
| 80 | 14 | 4.9/5.0 | 98 | | | | | | | | - 79-80 feet: shale becomes more bedding defined, rip-up clasts of limestone common, fossil rich<br>- 80-82.4 feet: shale becomes wavy, wispy<br>- 81 feet: Increase in shale content to 40% | | 545 |
| 85 | 15 | 4.9/5.0 | 96 | F | R3 | | | | | | - 82.4-82.6 feet: calcite rich in-fill<br>- 82.6-86.4 feet: heavily deformed bedding, shale thickens to < 0.2 feet bands, wavy, non-planar | 83.2 feet: Unconfined Compression Test | 540 |
| 90 | 16 | 4.9/5.0 | 97 | | | | | | | | LIMESTONE (micrite and wackestone) with interbedded calcareous shale; fresh; medium strong; 10% shale<br>- 86.4-95.2 feet: shale is calcite-rich, wavy and wispy, and spaced < 0.2 feet apart<br>- 88.5 feet: calcite-filled vug, 0.2 x 0.25 feet | | 535 |
| | 17 | 5.1 | 100 | | | | | | | | | | 530 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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# ROCK LOG - Boring No. B-1034

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 5.0 | | | | | | | | | LIMESTONE (wackestone) with interbedded calcareous shale; fresh; medium strong; thickness < 0.2 feet, spaced < 0.3 feet; 30% shale | | |
| 95 | | | | F | R3 | | | | | | | | |
| | 18 | 5.0/5.0 | 100 | | | | | | | | - 95.2-98.9 feet: shale beds thicken and are globular | | 525 |
| 100 | | | | | | | | | | | | | |
| | 19 | 4.7/5.0 | 94 | | | | | | | | 101.6 feet: fossiliferous | | 520 |
| 105 | | | | F | R3 | | | | | | | | |
| | 20 | 5.3/5.0 | 100 | | | | | | | | LIMESTONE (micrite and wackestone) with interbedded shale; fresh; medium strong; 40% shale | | 515 |
| 110 | | | | | | | | | | | - 107.5-113.3 feet: shale density increases as non-distinct interwoven bands; 0.01 - 0.2 feet thick, space up to 0.2 feet | | |
| | 21 | 5.0/5.0 | 100 | | | | | | | | | | 510 |
| | | | | | | | | | | B | SHALE with interbedded limestone; fresh; medium strong; approximately 30% micrite | | |
| 115 | | | | F | R3 | | | | | | LIMESTONE (wackestone) with interbedded calcareous shale; fresh; medium strong; shale is non-planar and undulatory; 35% shale | 114.4 feet: Unconfined compression with Stress/Strain Test | |
| | 22 | 4.8/5.0 | 97 | | | | | | | | - 114.6-126 feet: shale is globular with < 0.01 feet thickness and spaced < 0.1 feet apart, rip-up clasts common | | 505 |
| 120 | | | | | | | | | | | | | |
| | 23 | 5.3/5.0 | 100 | | | | | | | | | | 500 |
| 125 | | | | F | R3 | | | | | | - 126-132 feet: shale beds become wispy and less globular | | |
| | 24 | 5.2/5.0 | 100 | | | | | | | | | | 495 |
| 130 | | | | | | | | | | | | 130 feet: changed drilling rig to CME 85 | |
| | 25 | 3.1/3.5 | 87 | F | R3 | | | | | | LIMESTONE (wackestone) with interbedded calcareous shale; fresh; medium strong; ~25% shale; occasional rip-up clasts | | 490 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1034

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 135 | 26 | 5.5/5.0 | 91 | F | R3 | | | | | | LIMESTONE (micrite), Grey (5YR 5/1), fossil-rich, interbedded with wispy calcareous shale spaced ~0.01 feet apart<br>- 137.5-143.5 feet: calcite vugs common (0.01 x 0.01 feet) | | 485 |
| 140 | 27 | 5.0/5.0 | 100 | | | | | | | | | | 480 |
| 145 | 28 | 4.4/5.0 | 88 | F | R3 | | | | | | LIMESTONE (packstone and wackestone); fresh; medium strong; with minor interbedded shale; calcite-rich; 10% shale<br>- 144.2-144.9: calcite-rich<br>- 144.9-145.4 feet: shale beds wispy and undulating<br>- 145.4-147.2 feet: 3 shale beds spaced ~0.4 feet apart<br>-147.2-149.5 feet: shale beds occur in groupings every 0.5-0.7 feet with wispy < 0.002 thick layers associated with rip-up clasts | 146.9 feet: Unconfined compression with Stress/Strain Test | 475 |
| 150 | 29 | 5.0/5.0 | 100 | | | | | Jo, 65, Wa, Ro, Ti | | B | LIMESTONE (wackestone) with interbedded calcareous shale; fresh; medium strong; 25% shale<br>- 149.5-154.5 feet: shale density increases | | 470 |
| 155 | 30 | 5.2/5.0 | 100 | F | R3 | | | Jo, 75, Wa, Ro, Ti | | | - 154.4-154.7 feet: shale bed<br>- 154.5 feet: decrease to 10% shale<br>- 154.7-168.5 feet: shale occurs in groupings spaced 1-2 feet apart with beds < 0.01 feet thick, wavy to wispy and undulating, size of calcite in-filled vugs increases to 0.01-0.1 feet | | 465 |
| 160 | 31 | 4.8/5.0 | 95 | | | | | | | | | | 460 |
| 165 | 32 | 5.1/5.0 | 100 | F | R3 | | | Jo, 70, Wa, Ro, Ti<br>Jo, 55, Wa, Ro, Ti | | | - 167-168.6 feet: shale beds become more planar and start to thicken to 0.01-0.2 feet, fewer rip-up clasts | | 455 |
| 170 | 33 | 5.0/5.0 | 99 | | | | | | | C | Interbedded LIMESTONE (packstone)and calcareous shale; fresh; medium strong; 45% shale<br>- 168.5-174.5 feet: shale beds thicken to 0.2-0.4 feet, more planar, limestone is calcite-rich, shale color changes to very dark gray (10YR 3/1) | | 450 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1034

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 175 | 34 | 5.3/5.0 | 100 | F | R3 | | | | Jo, 70, Wa, Sm | C | -174 feet: decrease in shale density (15%) and thickness (0.1 feet thick)<br>- 174-176.2 feet: healed joint structures present<br>- 174.5-175 feet: shale bed | | 445 |
| 180 | 35 | 5.1/5.0 | 100 | F | R3 | | | | | | LIMESTONE (micrite) interbedded with calcareous shale; micrite gray (5YR 5/1); fresh; medium strong; shale becomes groupings of thin, planar, 0.01-0.1 foot thick beds spaced 0.02-0.1 feet apart; 45% shale | | 440 |
| 185 | 36 | 5.0/5.0 | 100 | | | | | | Jo, 60, Wa, Ro, Ti | | LIMESTONE (alternating micrite and wackstone) with interbedded calcareous shale; fresh; medium strong; 40% shale | | 435 |
| 190 | 37 | 5.3/5.0 | 100 | F | R3 | | | | | | SHALE with interbedded limestone (micrite) beds; shale color returns to black (Gley 1, 2.5/0); fresh; medium strong; micrite beds are planar 0.01-0.1 feet thick with spacings < 0.01 feet; 80% shale | | 430 |
| 195 | 38 | 4.7/5.0 | 92 | | | | | | | | SHALE with interbedded limestone (micrite and wackestone); fresh; medium strong; 55% shale<br>SHALE (calcareous) with interbedded limestone (micrite); fresh; medium strong; beds massive and disturbed at edges; 60% shale | | 425 |
| 200 | 39 | 5.3/5.0 | 100 | F | R3 | | | | | | | | 420 |
| 205 | 40 | 4.9/5.0 | 98 | F | R2 | | | | | | | 205.5 feet: Petrographic Analysis (sample PET-1034C) | 415 |
| 210 | 41 | 4.2/5.0 | 82 | | | | | | | | LIMESTONE (micrite and wackestone) with interbedded shale; fresh; medium strong; fossil rich; 20% shale<br>- 207.9-211.1 feet: alternating micrite and wackestone, shale beds are wavy, non-continuous, and heavily disturbed;<br>- 211.1-212.1 feet: prominent shaly zone, 70% shale<br>- 212.1-224.3 feet: micrite with interbedded shale, | | 410 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1034

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 215 | 42 | 5.3/5.0 | 100 | F | R3 | | | | | C | some packstone and wackestone interbeds; shale is thin and globular; occasional fossil-rich units<br>- 217.5-218 feet: packstone interbed | | 405 |
| 220 | 43 | 4.9/5.0 | 94 | F | R3 | | | | | C | | | 400 |
| 225 | 44 | 3.5/5.0 | 68 | | | | | | | C | SHALE with interbedded limestone (micrite); fresh; medium strong; limestone is interwoven in non-planar layers with thicknesses 0.1-0.3 feet and spacings 0.01-0.2 feet; 55% shale | | 395 |
| 230 | 45 | 5.2/5.0 | 100 | F | R3 | | | | | C | - 230.1-231.9 feet: wackestone with thin shale interbeds<br>- 231.9-236.8 feet: micrite with interwoven, non-bedded massive shale; bands have no distinct boundary | | 390 |
| 235 | 46 | 5.0/5.0 | 48 | | R2 to R3 | | | | | C<br>D | - 236.3-236.8 feet: Pyrite nodules<br>LIMESTONE (micrite) with interbedded shale; fresh; medium strong; shale is wispy to thick; calcite infill; 15% shale; minor wackestone | 238.2-239.6 feet: pieces, possibly induced by drilling | 385 |
| 240 | 47 | 5.1/5.0 | 100 | F | R3 | | | | | D | - 242.2-247.8 feet: shale beds are thin to wispy, discontinuous and undulatory, spaced 0.01-0.3 feet apart, calcite infilling more common | | 380 |
| 245 | 48 | 4.7/5.0 | 93 | | R2 | | | | | D | - 247 feet: calcite vugs 0.1 x 0.01 feet common<br>- 247.8-249.6 feet: shale beds become thicker (0.01-0.1 feet) with spacings of 0.2-0.3 feet, less calcite | 247.4 feet: Unconfined Compression with Stress/Strain Test | 375 |
| 250 | | | | | | | | | | | Boring terminated at 249.5 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/25 - 14.8 feet<br>6/26 - 14.7 feet<br>6/29 - 14.9 feet<br>8/18 - 12.6 feet | | 370 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# SOIL LOG - Boring No. B-1034PS

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532441.2 N; 629046.3 E | | Total Depth<br>31.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 75 | Elevation (Datum NAVD 88)<br>621.7 feet | Ground Water Depth<br>See Note A | Date Started<br>7/7/06 |
| Sampling Method<br>No sampling | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>7/7/06 |

Reviewed by / Date W Holman 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 621.7 | | |
| | | | | | | | | | | Refer to borehole B-1034 (located 8 feet away) for the soil profile | | |
| 5 | | | | | | | | | | | | 620 |
| | | | | | | | | | | | | 615 |
| 10 | | | | | | | | | | | | 610 |
| | | | | | | | | | | 608.4 | | |
| 15 | | | | | | | | | | | | 605 |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

0.0 13.3

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1034PS

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532441.2 N; 629046.3 E | | Total Depth<br>31.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 75 | Elevation (Datum NAVD 88)<br>621.7 feet | Ground Water Depth<br>See Note A | Date Started<br>7/7/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 13.25 feet | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>7/7/06 |

Reviewed by / Date DSC 3-13-07 W. Holcomb 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 2.7/3.0 | 90 | SW | R2 to R3 | P-S | | | No major discontinuity recorded | A | LIMESTONE; alternating packstone and micrite with calcareous shale interbeds; micrite is gray (5/N) to reddish gray (2.5YR 5/1), packstone is bluish gray (Gley 2 5PB 5/1) and shale is black (Gley 1 2.5/0); slightly weathered to fresh; weak to medium strong; shale beds are non-planar, wavy to globular and thin, spaced 0.1-0.2 feet apart; rip up clasts at 13.3-14.4 feet<br>- micrite dominant, packstone 0.05-0.1 feet thick every 0.3-0.6 feet | 13.3 to 21 feet: Limited fluid recovery to 21 feet | |
| | 2 | 5.0/5.1 | 100 | F | R3 | | | | | | | | 605 |
| 20 | | | | | | | | | | | | | |
| | 3 | 5.0/5.0 | 100 | F | R3 | | | | | | LIMESTONE (micrite) with calcareous shale interbeds, micrite is reddish gray (2.5Y/R 5/1) and shale is black (Gley 1 2.5/0); fresh; medium strong<br>- 21.4-26.4 feet: shale thickens to 0.01-0.1 feet, semi-planar, rip up clasts | 21-31.25 feet: good fluid return<br><br>P-S analysis was conducted over the length of cored section | 600 |
| 25 | | | | | | | | | | | | | |
| | 4 | 5.3/4.9 | 100 | F | R3 | | | | | | - 26.4-28.4 feet: shale becomes massive and wispy, 0.001-0.2 feet thick, rip up clasts abundant<br>- 28.4- 30.3 feet: shale spacing increases to 0.1-0.2 feet between layers<br>- 30.3-31.3 feet: packstone layer | | 595 |
| 30 | | | | | | | | | | | | | |
| | | | | | | | | | | | Boring terminated at 31.3 feet<br><br>NOTE A: Water level data (from B-1034)<br>Date - Depth (below ground surface)<br>6/25 - 14.8 feet<br>6/26 - 14.7 feet<br>6/29 - 14.9 feet<br>8/18 - 12.6 feet | | 590 |
| 35 | | | | | | | | | | | | | 585 |
| 40 | | | | | | | | | | | | | 580 |
| 45 | | | | | | | | | | | | | 575 |
| 50 | | | | | | | | | | | | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1035

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532549.5 N; 629112.9 E | | Total Depth<br>171.1 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>616.1 feet | Ground Water Depth<br>See Note A | Date Started<br>8/2/06 |
| Sampling Method<br>SPT | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/5/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Soil Type (USCS) | Lithology | Elevation (feet) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | CH | CLAY, reddish brown (5YR 4/4), dry, very stiff, few limestone gravel and organic matter (Fill) | 616.1 – 614.0 (0.0 – 2.1) | |
| | SPT 1 | 10 14 16 | 8.4 | | | | | | 615 | |
| | SPT 2 | 7 10 14 | 14.4 | 21.3 | 50/26 | GSZ | CH | CLAY with sand, yellowish brown (10YR 5/6), moist, very stiff, few manganese nodules | 611.9 (4.2) | |
| 5 | SPT 3 | 2 3 6 | 7.2 | 23.4 | 58/35 | GSZ | CH | CLAY, yellowish brown (10YR 5/6), moist, stiff | 610 | |
| | SPT 4 | 8 12 9 | 15.6 | | | | CH | - 7.7 feet: becomes mottled with gray (6/O) and pressure faces<br>- 8-8.5 feet: weathered limestone gravel within clay layer | 607.6 (8.5) | |
| 10 | SPT 5 | 25 45 30/2 | 12 | | | | GC | gravelly CLAY, yellow (10YR 8/6), moist, very stiff, gravel is weathered limestone | 606.3 (9.8) | |
| | SPT 6 | 35/3" | 2.4 | | | | | clayey GRAVEL, yellow (10YR 8/6), moist, very dense, gravel is weathered limestone | 605 | |
| 15 | | | | | | | | | 601.8 (14.3) | SPT refusal at 12.6 feet. Auger refusal at 14.0 feet. Continuation of borehole description in rock log. Advance boring by washing to 14.3 feet and set PVC casing before HQ coring. |
| | | | | | | | | | 600 | |
| 20 | | | | | | | | | 595 | |
| 25 | | | | | | | | | 590 | |
| 30 | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1035

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532549.5 N; 629112.9 E | | Total Depth<br>171.1 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>616.1 feet | Ground Water Depth<br>See Note A | Date Started<br>8/2/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 14.3 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/5/06 |

Reviewed by / Date W. Abrahamson 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 1.4/1.7 | 84 | SW to F | R3 | | | | | A | LIMESTONE (micrite) with calcareous shale interbeds and occasional packstone beds; micrite is medium gray (N5), packstone is medium blueish gray (5B 5/1) and shale is dark gray (N3); fresh to slightly weathered; medium strong<br>- 14-30.7 feet: shale is 0.01-0.15 feet thick, wavy and planar beds, visible rip ups | Advance boring by washing to 14.3 feet and set PVC casing before HQ coring. 14.3-37 feet: Fluid return good | 600 |
| 20 | 2 | 5.1/5.0 | 100 | F | R3 | | | | Bj, 5, Wa, Sl, O/Ti | | | | 595 |
| 25 | 3 | 5.1/5.0 | 100 | | | | | | Bj, 5, Wa, Sl, O/Ti | | | | 590 |
| 30 | 4 | 4.6/5.0 | 91 | | | | | | | | | 26.48 feet: Unconfined Compression Test | |
| 35 | 5 | 5.1/4.9 | 100 | F | R3 | | | | Jo, 85, Wa, Sl, Ti | B | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5), and shale is dark gray (N3); fresh; medium strong; strong HCl reaction<br>- 30.7-41 feet: shale is <0.02 feet thick with spacings of 0.02-0.5 feet, wavy, stylolitic features | | 585 |
| 40 | 6 | 5.2/5.0 | 100 | | | | | | Bj, 10, Wa, Sm, Ti, mineralization | | | 37 feet: fluid return reduced significantly | 580 |
| 45 | 7 | 5.1/5.2 | 98 | F | R3 | | | | | | - 41-52.8 feet: shale is hairline thin, mainly stylolitic pressure solution features | 40.27 feet: Unconfined Compression Test<br>42 feet: No fluid return to bottom of boring | 575 |
| 50 | 8 | 5.2/5.0 | 100 | F | R3 | | | | | | | | 570 |
| | 9 | 5.0 | 99 | | | | | | | | - 52.8-60 feet: shale is hairline to 0.03 feet thick with spacings of 0.05-0.5 feet, wavy, rip ups visible | | 565 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1035

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | | 5.0 | | | | | | | | | | | 560 |
| | 10 | 5.0/5.0 | 100 | | | | | | | | | | |
| 60 | | | | F | R3 | | | | | | - 60-75 feet: shale is 0.01-0.1 feet thick with spacings of <0.5 feet, wavy | | 555 |
| | 11 | 4.9/5.0 | 97 | | | | | | | | | | |
| 65 | | | | | | | | | | | | | 550 |
| | 12 | 5.1/5.0 | 100 | | | | | | | | | | |
| 70 | | | | F | R3 | | | | | | | | 545 |
| | 13 | 4.8/5.0 | 96 | | | | | | | B | | 72.28 feet: Unconfined Compression Test | |
| 75 | | | | | | | | | | | - 75-87.3 feet: shale is <0.1 feet thick (average is 0.01 feet) with spacings of 0.05-0.4 feet, wavy | | 540 |
| | 14 | 4.3/5.0 | 86 | | | | | | | | | | |
| 80 | | | | F | R3 | | | | | | - 81-85 feet: general absence of (<5%) calcareous shale interbeds | | 535 |
| | 15 | 5.3/4.3 | 100 | | | | | | | | | | |
| 85 | | | | | | | | | Jo, 80, Wa, Sl, Tl | | | | 530 |
| | 16 | 5.2/5.3 | 98 | | | | | | Jo, 70, Wa, Sl, Tl | | LIMESTONE (micrite) with calcareous shale interbeds and occasional packstone interbeds; micrite is medium gray (N5), packstone is medium bluish gray (5B 5/1) and shale is dark gray (N3); fresh; medium strong; average packstone interbed thickness is 0.1 feet; rip up clasts and visible fossils<br>- 88.2-90.2 feet: packstone interbed<br>- 90.2-101 feet: shale is < 0.1 feet thick with spacings 0.03-0.3 feet, wavy | | |
| 90 | | | | F | R3 | | | | Jo, 90, Wa, Sl, Tl | | | | 525 |
| | 17 | 5.3/5.2 | 100 | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1035

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | | | | | | | | | | | | | 520 |
| | 18 | 5.0/5.1 | 99 | | | | | | | | | | |
| 100 | | | | F | R3 | | | | | | - 101-105 feet: shale rich section, shale is 0.05-1.0 feet thick with spacings of <0.05 feet interbedded with packstone, prominent rip up clasts | | 515 |
| | 19 | 5.2/5.0 | 100 | | | | | | | | | | |
| 105 | | | | | | | | | | | - 105-111 feet: packstone with shale, shale is 0.05-0.1 feet thick with spacings of < 0.3 feet, rip up clasts | | 510 |
| | 20 | 5.1/5.1 | 99 | | | | | | | | - 108 feet: visible fossils and rip up clasts | | |
| 110 | | | | F | R3 | | | | | | | | 505 |
| | 21 | 4.8/5.0 | 96 | | | | | | Jo, 65, Wa, Sl, Ti, mineralization | B | - 113 feet: becomes more micritic; packstone still present | | |
| 115 | | | | | | | | | | | | | 500 |
| | 22 | 5.2/5.0 | 100 | | | | | | Jo, 90, Wa, Sl, Ti | | | | |
| 120 | | | | F | R3 | | | | | | | | 495 |
| | 23 | 5.1/5.0 | 100 | | | | | | | | - 122.2-124.4 feet: packstone with shale, fossils, and rip up clasts | | |
| 125 | | | | | | | | | | | | | 490 |
| | 24 | 5.0/5.0 | 100 | | | | | | | | - 124.4-132 feet: shale beds are < 0.01 feet thick, wavy and irregular with rip up clasts | | |
| 130 | | | | F | R3 | | | | | | | | 485 |
| | 25 | 5.1 | 100 | | | | | | | | LIMESTONE (packstone) with calcareous shale interbeds; packstone is medium bluish gray (5B 5/1) and shale is dark gray (N3); fresh; medium | | |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1035

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 5.0 | | | | | | | | | strong; pressure solution features | | |
| 135 | | | | | | | | | | | | | 480 |
| | 26 | 4.9/5.0 | 98 | | | | | | | | LIMESTONE (micrite) and calcareous shale interbeds with packstone beds; micrite is medium gray (N5), packstone is medium bluish gray (5B 5/1) and shale is dark gray (N3); fresh; medium strong; shale is < 0.03 feet thick with spacings of <0.05 feet | | |
| 140 | | | | F | R3 | | | | | | | | 475 |
| | 27 | 5.1/5.0 | 100 | | | | | | | B | LIMESTONE (packstone); packstone is medium bluish gray (5B 5/1) and shale is dark gray (N3); fresh; medium strong; pressure solution features; sections of calcareous shale are 0.3-1.5 feet thick<br>- 142.2- 150 feet: no shale, all stylolitic pressure solution features | | |
| 145 | | | | | | | | | | | | | 470 |
| | 28 | 5.0/5.0 | 100 | | | | | | | | | | |
| 150 | | | | | | | | | | | - 150-160 feet: packstone with shale interbeds, spacing varies from 0.05-0.5 feet | | |
| | | | | F | R3 | | | | | | | | 465 |
| | 29 | 4.8/5.0 | 96 | | | | | | | | | | |
| 155 | | | | | | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; shale is dark gray (N3), micrite is medium gray (N5); fresh; medium strong | | |
| | | | | | | | | | | | | | 460 |
| | 30 | 4.8/5.0 | 96 | | | | | | | | - 154-165 feet: calcareous shale ~30% of rock mass | | |
| 160 | | | | | | | | | | | | | |
| | | | | F | R3 | | | | | | | | 455 |
| | 31 | 5.3/4.9 | 100 | | | | | | | C | | | |
| 165 | | | | | | | | | | | SHALE (calcareous) with interbedded micrite; shale is dark gray (N3), micrite is medium gray (N5); fresh; medium strong; planar bedding; micrite beds are thinly bedded (<0.1 feet thick); 35% micrite | | |
| | | | | | | | | | | | | | 450 |
| | 32 | 4.6/5.1 | 91 | F | R3 | | | | | | | | |
| 170 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 445 |
| | | | | | | | | | | | Boring terminated at 171.1 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/3 - 9.4 feet | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1035

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 175 | | | | | | | | | | | 8/4 - 11.6 feet<br>8/5 - 11.5 feet | | 440 |
| 180 | | | | | | | | | | | | | 435 |
| 185 | | | | | | | | | | | | | 430 |
| 190 | | | | | | | | | | | | | 425 |
| 195 | | | | | | | | | | | | | 420 |
| 200 | | | | | | | | | | | | | 415 |
| 205 | | | | | | | | | | | | | 410 |
| 210 | | | | | | | | | | | | | 405 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1036

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532263.9 N; 628856.1 E | | Total Depth<br>55.3 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 45 | Elevation (Datum NAVD 88)<br>625.2 feet | Ground Water Depth<br>See Note A | Date Started<br>7/7/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/8/06 |

Reviewed by / Date W Solomin 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 625.2 CLAY with sand, dark reddish brown (2.5 YR 3/4), dry, hard (Fill) 0.0 | | 625 |
| | | SPT 1 | 3 9 31 | 10 | | | | | | | | |
| | | | | | | | | | GP | 622.2 poorly graded GRAVEL with clay, reddish brown (2.5 YR 4/4), dry, medium dense (Fill) 3.0 | | |
| | | SPT 2 | 13 12 8 | 4 | | | | | | | | |
| 5 | | | | | | | | | CL | 619.7 CLAY with sand, brown (10YR 5/3) to reddish yellow (7.5 YR 6/8), moist, stiff (Residual) 5.5 | | 620 |
| | | SPT 3 | 4 5 7 | 10 | | | | | | | | |
| | | SPT 4 | 1 4 6 | 12 | 18.3 | 37/ 17 | GSZ | | | | | |
| 10 | | | | | | | | | CL | 614.7 CLAY with sand, reddish yellow (7.5 YR 6/8), dry, very stiff (Residual) 10.5 | | 615 |
| | | SPT 5 | 8 11 17 | 18 | | | | | | | | |
| | | SPT 6 | 6 13 12 | 18 | | | | | | | | |
| 15 | | | | | | | | | | 609.2 16.0 | SPT refusal at 16.0 feet (25 blows/0"). Auger refusal at 16.9 feet. Continuation of borehole description on rock log | 610 |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1036

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532263.9 N; 628856.1 E | | Total Depth<br>55.3 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 45 | Elevation (Datum NAVD 88)<br>625.2 feet | Ground Water Depth<br>See Note A | Date Started<br>7/7/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 17.1 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/8/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 4.4/4.4 | 34 | SW to F | R3 | | | | Bj, 10, Wa, Ro, Op<br>Bj, 10, Wa, Sl, Ti<br>Bj, 15, Wa, Sl, Ti<br>Bj, 20, Wa, Sl, Ti | A | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is medium dark gray to dark gray (N4 to N3); slightly weathered to fresh; medium strong; strong reaction to HCl; some bioturbation<br>- 17-26.2 feet: calcareous shale is very thinly spaced 0.03-0.01 feet, fractures are moderate to widely spaced<br>- 18-19 feet: vertical incipient fractures<br>- 20.5-21 feet: packstone bed<br>- 22-26 feet: some bioturbation in calcareous mudstone | 20.8-22 feet: no fluid return<br>22-40.1 feet: fluid return is good, milky white to light gray | 605 |
| 25 | 2 | 5.0/5.0 | 74 | SW to F | R3 | | | | Bj, 10, Wa, Ro, Op, clay-filled<br>Bj, 10, Wa, Sl<br>Bj, 10, Wa, Ro, Op, clay-filled | | | | 600 |
| 30 | 3 | 4.9/4.9 | 86 | SW to F | R3 | | | | Bj, 10, Wa, Ro, Op<br>Bj, 10, Wa, Ro, Op<br>Bj, 10, Wa, Ro, Op<br>Bj, 10, Wa, Sl, Ti | | LIMESTONE (micrite) with calcareous shale and packstone interbeds; limestone is medium gray (N5) and shale is medium dark gray to dark gray (N4 to N3); slightly weathered to fresh; medium strong; strong reaction to HCl<br>LIMESTONE (packstone) interbedded with calcareous shale; packstone is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; fossiliferous; very closely spaced fractures (30.9-31.1 feet) | | 595 |
| 35 | 4 | 5.2/5.0 | 96 | F | R3 | | | | Bj, 10, Wa, Ro, Op<br>Bj, 10, Wa, Sl, Op<br>Bj, 10, Wa, Ro, Ti<br>Bj, 10, Wa, Ro, Op<br>Bj, 10, Wa, Ro, Op | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is medium dark gray to dark gray (N4 to N3); fresh; medium strong; packstone interbeds spaced medium to thin at 31.1-31.8 feet<br>- 32-32.2 feet: fossiliferous zone | | 590 |
| 40 | 5 | 5.0/4.9 | 74 | F | R3 | | | | Bj, 15, Wa, Sl, Ti<br>Bj, 15, Wa, Sl, Ti<br>Bj, 10, Pl, Sl, Op | | LIMESTONE (packstone) with micrite and calcareous shale interbeds; packstone is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; shale beds are very thinly laminated | 40.1-55.3 feet: lost fluid return | 585 |
| 45 | 6 | 5.0/5.0 | 90 | F | R3 | | | | Bj, 10, Pl, Sm, Ti<br>Bj, 10, Pl, Sm, Ti<br>Bj, 20, Wa, Ro, Op<br>Bj, 15, Pl, Sm, Ti | | LIMESTONE (micrite) with calcareous shale and packstone interbeds; limestone is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; rip-up clasts at 41.4-42.2 feet<br>- 42.2-42.8 feet: healed fractures<br>LIMESTONE (packstone) with micrite and calcareous shale interbeds; packstone is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; very thinly laminated shale beds | | 580 |
| 50 | 7 | 4.9/5.0 | 88 | F | R3 | | | | Bj, 15, Wa, Sm, Ti<br>Bj, 10, Pl, Sl, Ti<br>Bj, 10, Wa, Ro, Op<br>Bj, 10, Wa, Ro, Op | | LIMESTONE (wackestone) with calcareous shale interbeds; limestone is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; shale beds are very thinly laminated (0.01-0.1 feet);<br>- 50.1-50.2 feet: fossiliferous zone | | 575 |
| 55 | 8 | 4.2/4.2 | 100 | F | R3 | | | | Bj, 10, Pl, Sm, Ti<br>Bj, 10, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti<br>Bj, 10, Wa, Ro, Op | | | 55.3 feet: Drill tools malfunction, borehole not straight. Hole is backfilled and relocated to nearby offset location. See log for B1036A. | 570 |
| | | | | | | | | | | | Boring terminated at 55.3 feet | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1036

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Bj, 15, Wa, Ro, Ti<br>Bj, 10, Wa, Ro, Op<br>Bj, 10, Wa, Sl, Ti<br>Bj, 10, Pl, Sm, Ti<br>Bj, 10, Pl, Sm, Ti | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/8 - 1.7 feet<br>7/17 - 1.7 feet<br>7/19 - 7.2 feet | | |
| 60 | | | | | | | | | | | | | 565 |
| 65 | | | | | | | | | | | | | 560 |
| 70 | | | | | | | | | | | | | 555 |
| 75 | | | | | | | | | | | | | 550 |
| 80 | | | | | | | | | | | | | 545 |
| 85 | | | | | | | | | | | | | 540 |
| 90 | | | | | | | | | | | | | 535 |
| 95 | | | | | | | | | | | | | 530 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1036A

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532263.7 N; 628852.7 E | | Total Depth<br>175.5 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>625.2 feet | Ground Water Depth<br>See Note A | Date Started<br>7/8/06 |
| Sampling Method<br>No sampling | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>7/11/06 |

Reviewed by / Date DSC 3-13-07 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 625.2 0.0 Soil sampling not conducted. Refer to boring B-1036 for soil profile. | Boring 4 feet from B-1036 | 625 |
| 5 | | | | | | | | | | | | 620 |
| 10 | | | | | | | | | | | | 615 |
| 15 | | | | | | | | | | 609.8 15.4 | | 610 |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1036A

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532263.7 N; 628852.7 E | | Total Depth<br>175.5 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>625.2 feet | Ground Water Depth<br>See Note A | Date Started<br>7/8/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 15.9 feet | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>7/11/06 |

Reviewed by / Date: W Bolen 3-14-07 / DSC 3-13-07

| Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.6/5.6 | 82 | F | R3 | P-S | | Bj, 10, Wa, Ro, Op; Bj, 10, St, Ro, Op; Bj, 10, Wa, Ro, Op; Bj, 10, Wa, Sl, Ti; Bj, 10, Wa, Sl, Ti | A | LIMESTONE (micrite) with packstone and calcareous shale interbeds; micrite and packstone are medium gray (N5) and shale is medium dark gray (N4); slightly weathered to fresh; medium strong; strong reaction to HCl<br>- shale is 0.01-0.03 feet thick with thin spacing<br>- 15.4-15.8 feet: packstone interbed<br>- 19.9-20.4 feet: packstone interbed | 15.4-21: fractures are closely to widely spaced |
| 2 | 5.0/4.9 | 94 | F | R3 | | | Bj, 15, Pl, Sm, Ti; Bj, 15, Pl, Sm, Ti; Bj, 10, Wa, Sl, Ti; Bj, 10, Wa, Sl, Ti; Bj, 20, Pl, Sm, Op; Bj, 10, Pl, Sm, Ti | | - 21-26 feet: fractures are closely to moderately spaced<br>- 26-31 feet: bioturbidation present in shale interbeds, fractures widely spaced | |
| 3 | 5.0/5.0 | 96 | | | | | Bj, 10, Pl, Sm, Ti; Bj, 10, Pl, Sm, Ti; Bj, 10, Pl, Sm, Ti; Bj, 10, Pl, Sm, Ti; Bj, 10, Pl, Sm, Ti; Bj, 10, Pl, Sm, Ti | | | P-S analysis was conducted over the length of cored section |
| 4 | 5.0/5.2 | 88 | F | R3 | | | Bj, 10, Wa, Ro, Op; Bj, 15, Wa, Sl, Ti; Bj, 10, Wa, Sl, Op; Bj, 10, Wa, Sl, Ti | | - 31-34 feet: packstone beds 0.2-0.3 feet and shale is 0.01-0.4 feet<br>- 31.4 and 31.5 feet: fossiliferous with rip up clasts<br>- 34-41 feet: shale is laminated | |
| 5 | 5.1/5.0 | 100 | | | | | Bj, 10, Wa, Ro, Op; Bj, 10, St, Sl, Op; Bj, 10, Sm, Pl, Ti | | | |
| 6 | 5.0/5.0 | 94 | F | R3 | | | | | | |
| 7 | 3.1/3.3 | 91 | | | | | Bj, 10, Pl, Sl, Op; Bj, 10, Pl, Op | B | - 47.6-49 feet: fractures are closely to moderately spaced | |
| 8 | 6.9/6.7 | 100 | | | | | Bj, 10, Pl, Op; Bj, 10, Pl, Sl, Ti; Bj, 10, St, Sl, Ti | | LIMESTONE (wackestone) with packstone micrite, and calcareous shale interbeds; micrite and packstone are medium gray (N5) and shale is medium dark gray (N4); slightly weathered to fresh; medium strong; strong reaction to HCl, 15% shale<br>- 50-56 feet: fractures are widely spaced | |

Depth (feet): 20, 25, 30, 35, 40, 45, 50, 55

Elevation (feet): 605, 600, 595, 590, 585, 580, 575, 570

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1036A

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | F | R3 | | | | | | - 54-56 feet: micrite predominates, and grades downward to wackestone | | |
| | 9 | 4.8/5.0 | 96 | | | | | | Bj, 10, Wa, Ro, Ti<br>Bj, 10, Wa, Sl, Ti | | | | |
| 60 | | | | | | | | | | | | | 565 |
| | 10 | 5.0/5.0 | 100 | | | | | | | | LIMESTONE (packstone) with calcareous shale intebeds; medium gray (N5) and shale medium dark gray (N4); fresh; medium strong; strong reaction to HCl; shale thickness 0.01-0.03 feet | | |
| 65 | | | | F | R3 | | | | Bj, 10, Wa, Ro, Op | | | | 560 |
| | 11 | 5.0/4.8 | 100 | | | | | | | | | | |
| 70 | | | | | | | | | | | | | 555 |
| | 12 | 5.0/5.2 | 100 | | | | | | Bj, 60, Pl, Sl, Ti | | LIMESTONE (wackestone) with calcareous shale interbeds; medium gray (N5) with calcareous shale medium dark gray (N4); fresh; medium strong<br>- 71-71.7 feet: fracture at 60°<br>- 71-76 feet: shale thickness 0.02-0.04 feet | | |
| 75 | | | | | | | | | | B | - 72.6-73 feet: rip up clasts | | 550 |
| | | | | F | R3 | | | | | | | | |
| | 13 | 5.1/5.0 | 100 | | | | | | | | | | |
| 80 | | | | | | | | | | | | | 545 |
| | 14 | 4.8/5.0 | 92 | | | | | | | | - 83.2-83.6 feet: fossiliferous packstone interbed | water return is less<br>84-102 feet: water loss is 80% with change in color from brown to gray | |
| 85 | | | | F | R3 | | | | Bj, 10, Pl, Sm, Ti | | | | 540 |
| | 15 | 5.1/5.0 | 100 | | | | | | | | - 87.4-87.6 feet: packstone interbed, bioturbation present | | |
| 90 | | | | | | | | | | | | | 535 |
| | 16 | 4.9/5.0 | 98 | | | | | | | | LIMESTONE (packstone) with calcareous shale interbeds; packstone is medium gray (N5) and shale is medium dark gray (N4); fresh; medium strong; incipient fracture at 91.8-92.4 feet<br>- 91-96 feet: Horizontal stylolites, rip up clasts present in shale | | |
| 95 | | | | | | | | | | | | | 530 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1036A

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 17 | 5.0/5.0 | 100 | F | R3 | | | | | | - 96-101 feet: shale bed thickness is .01-0.15 feet and packstone bed thickness is 0.03-0.07 feet, fossiliferous packstone present<br>- 97.3 feet: vug containing calcite crystals | | |
| 100 | | | | | | | | | | | | | 525 |
| | 18 | 5.1/5.1 | 100 | | | | | | | | - 101-106 feet: shale thickness 0.01-0.05 feet, fossils present in shale | 102-132 feet: No water return except at 122 feet and 127 feet | |
| 105 | | | | | | | | | | | | | 520 |
| | 19 | 5.1/5.0 | 100 | F | R3 | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; medium gray (N5) and medium dark gray (N4); fresh; medium strong<br>-106-114 feet: shale beds are 0.01-0.2 feet thick, abundant rip-up clasts and abundant fossils | | |
| 110 | | | | | | | | | | | | | 515 |
| | 20 | 4.9/4.9 | 99 | | | | | Bj, 10, Pl, Sl, Ti<br>Bj, 15, Pl, Sl, Ti, possible slickensides | | B | - 111.6-111.7 and 112.2-112.7 feet: highly fossiliferous units<br>- 113.6 feet: slickensided fracture surface | | |
| 115 | | | | | | | | | | | | | 510 |
| | 21 | 5.2/5.1 | 100 | F | R3 | | | | | | LIMESTONE (packstone) with calcareous shale interbeds; medium gray (N5) with medium dark gray (N4); fresh; medium strong<br>- 116.6-116.7 feet: highly fossiliferous zone | | |
| 120 | | | | | | | | | | | | | 505 |
| | 22 | 4.9/5.0 | 97 | F | R3 | | | | | | - 121.2-121.6 feet: abundant rip up clasts and fossils | | |
| 125 | | | | | | | | | | | | | 500 |
| | 23 | 5.0/4.9 | 100 | F | R2 to R3 | | | | | | - 126-131 feet: shale bed thickness is 0.01-0.1 feet | | |
| 130 | | | | | | | | | | | | 131-141 feet: some water return | 495 |
| | 24 | 5.1/4.9 | 100 | F | R3 | | | | | | LIMESTONE (wackestone) with calcareous shale interbeds; medium gray (N5) with medium dark gray (N4); fresh; medium strong; shale beds 0.01-0.04 feet thick; bioturbation evident, few stylolites present; highly fossiliferous zone at 133-133.5 feet | | |
| 135 | | | | | | | | | | | | | 490 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1036A

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | 4.9/5.1 | 96 | | | | | | | | LIMESTONE (micrite) with calcareous shale and packstone interbeds; micrite is predominant; medium gray (N5) and medium dark gray (N4); fresh; medium strong<br>-136-141 feet: shale thickness 0.01-0.03 feet | | |
| 140 | | | | F | R3 | | | Bj, 10, Wa, Sl, Ti | | | - 141-146 feet: shale is very thinly laminated | 141 feet: lost water return and did not recover | 485 |
| | 26 | 5.2/5.0 | 100 | | | | | | | | | | |
| 145 | | | | | | | | | | | LIMESTONE (packstone) with calcareous shale interbeds; medium gray (N5) and medium dark gray (N4); fresh; medium strong<br>- 146-161 feet: shale beds are 0.01-0.02 feet thick | | 480 |
| | 27 | 5.1/5.1 | 100 | | | | | | | | - 150-165 feet: horizontal stylolites present | | |
| 150 | | | | F | R3 | | | | | B | - 151-154.8 feet: micrite with shale interbeds | | 475 |
| | 28 | 4.9/5.0 | 97 | | | | | | | | | | |
| 155 | | | | | | | | | | | LIMESTONE (packstone); medium gray (N5); fresh; medium strong | | 470 |
| | 29 | 5.0/5.0 | 100 | | | | | | | | | | |
| 160 | | | | F | R3 | | | | | | - 161.7-162 feet: calcareous shale bed 0.01-0.3 feet thick | | 465 |
| | 30 | 5.0/5.0 | 100 | | | | | | | | | | |
| 165 | | | | | | | | | | | - 166-171 feet: packstone is fossiliferous | | 460 |
| | 31 | 5.0/5.0 | 100 | | | | | | | | SHALE with interbedded limestone (packstone); medium gray (N5) and medium dark gray (N4); fresh; medium strong; shale bed thickness is 0.01-0.35 feet; 55% shale | | |
| 170 | | | | F | R3 | | | | | C | | | 455 |
| | 32 | 4.3/4.3 | 100 | | | | | | | | | | |
| 175 | | | | | | | | | | | | | 450 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1036A

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Boring terminated at 175.5 | | |
| | | | | | | | | | | | NOTE A: Water level data (from B-1036)<br>Date - Depth (below ground surface)<br>7/8 - 1.7 feet<br>7/17 - 1.7 feet<br>7/19 - 7.2 feet | | |
| 180 | | | | | | | | | | | | | 445 |
| 185 | | | | | | | | | | | | | 440 |
| 190 | | | | | | | | | | | | | 435 |
| 195 | | | | | | | | | | | | | 430 |
| 200 | | | | | | | | | | | | | 425 |
| 205 | | | | | | | | | | | | | 420 |
| 210 | | | | | | | | | | | | | 415 |
| 215 | | | | | | | | | | | | | 410 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1036UDD

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft)<br>1532264 N; 628847.1 E | | Total Depth<br>14.4 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>625.4 feet | Ground Water Depth<br>See Note A | Date Started<br>8/21/06 |
| Sampling Method<br>SPT / UD | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/21/06 |

Reviewed by / Date W Woolum 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 625.4 CLAY (Fill) 0.0 | | 625 |
| | | | | | | | | | GP | 624.2 GRAVEL (Fill) 1.2 | Augered 0-1.5 feet | |
| | | SPT 1 | 7 7 9 | 13.2 | | | | | CL | 623.6 CLAY, dark yellowish brown (10YR 4/6), dry to moist, stiff to very stiff, contains manganese nodules 1.8 | Groundwater noted in B1036 at 1.7 feet | |
| | | UD 2 | | 19.4 | | | | | CL | 621.4 CLAY, yellowish brown (10YR 5/6), moist, medium stiff, pressure faces 4.0 | Took bulk sample at 1-5 feet: 1036UDD-Bulk #1 | |
| 5 | | SPT 3 | 2 3 5 | 12 | | | | | MH | 620.1 SILT, olive brown (2.5Y 4/3), moist to wet, medium stiff to stiff 5.3 | Took bulk sample at 10-15 feet: 1036UDD-Bulk #2 | 620 |
| | | UD 4 | | 21.4 | | | TXD | | CL | 617.6 CLAY, yellowish brown (10YR 5/6), moist, very stiff, contains manganese nodules 7.8 | | |
| 10 | | SPT 5 | 5 10 14 | 18 | | | | | | | | 615 |
| | | UD 6 | | 8.4 | | | | | CL | 612.9 CLAY with sand and gravel, very dark grayish brown (10YR 3/2), moist, hard 12.5 | Augered 11.5-13 feet | |
| | | SPT 7 | 21 18/1" | 4.8 | | | | | | 611.0 Boring terminated at 14.4 feet. Bedrock not encountered. 14.4 | 13.8 feet: Sample tube UD6 was obstructed and bent during driving | |
| 15 | | | | | | | | | | | | 610 |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1037

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532329 N; 628980.8 E | | Total Depth<br>149.7 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>621.4 feet | Ground Water Depth<br>See Note A | Date Started<br>6/19/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>6/21/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Elevation (feet) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 621.4 | CLAY, dark yellowish brown (10YR 4/4), moist, stiff, sand and gravel (<10%), few limestone fragments and black nodules | |
| | | SPT 1 | WOR 1 7 | 19 | | | | | | 618.4 | | |
| | | | | | | | | | CL | 0.0 | CLAY with sand, dark yellowish brown (10YR 4/6), moist, medium stiff, some yellow limestone fragments (<0.5 cm in diameter), minor sand (<10%), occasional black nodules (MnO), some mottling with yellow<br>- 6 feet: becomes stiff with yellow and orange mottling and increases in the amount of black nodules | |
| | | SPT 2 | 3 3 5 | 7 | 16.8 | 38/ 19 | GSZ | | | 613.4 | | |
| 5 | | | | | | | | | | 3.0 | | |
| | | SPT 3 | WOR 5 6 | 17.5 | | | | | | 608.9 | | |
| | | | | | | | | | CH | 8.0 | CLAY, dark yellowish brown (10YR 4/6), moist, stiff to very stiff<br>- 8.5 feet: slightly less black nodules | |
| | | SPT 4 | 3 5 7 | 15 | 24.8 | 73/ 43 | GSZ | | | 607.4 | | |
| 10 | | | | | | | | | | 12.5 | | |
| | | SPT 5 | WOR 25 12 | 9 | | | | | | 607.4 | - 11 feet: becomes yellowish brown (10YR 5/6) and very stiff | 12.5 feet: sound of auger scraping stone |
| | | | | | | | | | GP | 14.0 | Partially weathered rock; limestone fragments, gray, dry, freshly broken angular chips (1cm - 9 cm) | SPT refusal at 14.0 feet. Continuation of boring description in rock log. |
| | | SPT 6 | 15 20/0" | 6 | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1037

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532329 N; 628980.8 E | | Total Depth<br>149.7 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>621.4 feet | Ground Water Depth<br>See Note A | Date Started<br>6/19/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 13.5 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>6/21/06 |

Reviewed by / Date DJC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 1.1/1.3 | 61 | HW | R3 | | | | | | LIMESTONE (wackestone) interbedded with micrite and shale beds; micrite is medium gray (N5) and shale is grayish black (N2); fresh to highly weathered; medium strong; micrite is very fine grained<br>- 13.5-14 feet: weathered and fractured rock zone | 14-93.5 feet: fluid return good, milky white | |
| 15 | 2 | 5.3/5.0 | 100 | F | R3 | | | | Bj, 10, Wa, Sl - Ro | | - 13.5-22.8 feet: micrite beds are 0.1-0.2 feet thick and shale beds are wavy and laminated to 15.6 feet and less wavy and thicker (up to 8cm) from 15.6 feet to 22.8 feet | | 605 |
| 20 | 3 | 4.9/5.0 | 94 | | | | | | Bj, 10, Pl, Sm, Ti | | LIMESTONE (micrite) interbedded with calcarous shale beds; micrite is medium gray (N5) and shale is grayish black to dark gray (N2-N3); fresh; medium strong; micrite is very fine grained and slightly wavy; some wackestone lenses usually <0.2 feet thick; micrite beds are <0.2 feet thick | | 600 |
| 25 | 4 | 5.1/5.0 | 96 | F | R3 | | | | Bj, 15, St, Sl - Ro<br>Bj, 15, Pl, Sm, Ti | | - 22.8-25 feet: discontinuous and wavy, shale beds are thinner<br>- 25-31 feet: shale beds very thin, wavy, with random styolites and rip up clasts | 25-40 feet: generally fossiliferous few slight bioturbated lenses | 595 |
| 30 | 5 | 5.0/5.0 | 96 | | | | | | Bj, 15, Pl, Sm, poor fit<br>Bj, 30, Pl, Si-Ro | A | | | 590 |
| 35 | 6 | 5.1/5.0 | 93 | F | R3 | | | | Bj, 10, Wa, Sm, Ti<br>Bj, 10, Wa, Ro, Ti | | - 37 feet: sparry calcite vug 0.2 feet | | 585 |
| 40 | 7 | 4.9/5.0 | 98 | | | | | | | | | | 580 |
| 45 | 8 | 5.0/5.0 | 96 | F | R3 | | | | Fa, 20, Pl, Sm, rake = 90<br>Bj, 10, Pl, Sm, Ti<br>Bj, 25, Pl, Ro, Ti<br>Bj, 15, Wa, Sl-Ro, Op | | | | 575 |
| 50 | 9 | 5.2/5.0 | 100 | | | | | | Bj, 10, Pl, Mo-Ro, Ti | B | - 50-54.6 feet: bioturbated zone of micrite | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1037

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 10 | 4.9/5.0 | 92 | F | R3 | | | | Bj, 15, Pl, Mo-Ro, Ti<br>Bj, 10, no fit<br>Bj, 10, no fit | | LIMESTONE (micrite) interbedded with calcareous shale; micrite is medium gray(N5) and shale is grayish black to dark gray (N2-N3); fresh; medium strong; micrite is fine to very fine grained with 0.05-0.4 feet beds; shale is very thin, wavy and discontinuous | | 565 |
| 60 | 11 | 5.2/5.0 | 100 | | | | | | | | - 55-62 feet: less shale, wavy irregular beds | 59.1 feet: Unconfined Compression Test | 560 |
| 65 | 12 | 4.9/5.0 | 100 | F | R3 | | | | Jo, 60, Sl, Op, Mo-He | | - 65 feet: shale beds highly irregular, bioturbated, and discontinuous, chert nodule<br>- 67.2-74.6 feet: shale beds are thicker with an average of 0.2 feet | | 555 |
| 70 | 13 | 5.2/5.0 | 100 | | | | | | | B | - 70-85 feet: sparry, calcite-filled burrows | 68.95: Unconfined Compression Test | 550 |
| 75 | 14 | 5.0/5.0 | 100 | F | R3 | | | | | | - 76-76.8 feet: bioturbation<br>- 79-79.4 feet: bioturbation | | 545 |
| 80 | 15 | 4.8/5.0 | 100 | | | | | | Bj, 15, Pl, Ro, poor fit | | | | 540 |
| 85 | 16 | 4.9/5.0 | 100 | F | R3 | | | | | | - 84.8-89.5 feet: less shale | | 535 |
| 90 | 17 | 5.4/5.0 | 100 | | | | | | Fa, 25, Pl, Sm, Ti | | - 89.7-94.0 feet: limestone is medium to coarse grained<br>- 92 feet: sparry calcite vug | | 530 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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# ROCK LOG - Boring No. B-1037

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | 18 | 5.1/5.0 | 100 | F | R3 | | | | | | - 94.0-94.8 feet: shale rich zone | 93.5 feet: lost fluid return momentarily | 525 |
| 100 | 19 | 5.0/5.0 | 99 | F | R3 | | | | | | LIMESTONE (micrite); micrite is medium light gray to light gray (N6-N7); fresh; medium strong; micrite is fine grained with some sparry calcite filled cracks; scattered shale laminae (1%) | | 520 |
| 105 | 20 | 5.0/5.0 | 92 | | | | | | Bj, 10, Pl, Sl-Ro, Ti | | - 107.6-109.1 feet: micrite with wackestone; small, sparry, calcite-filled bioturbation | | 515 |
| 110 | 21 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 10, Pl, Sl-Ro, Ti | B | - 110.0-111.1 feet: fossiliferous<br>LIMESTONE (micrite) interbedded with shale beds; micrite is medium gray (N5) and shale is grayish black (N2); micrite is very fine grained, slightly fossiliferous, with beds 0.1-0.5 feet (avg=0.2 feet); micrite to shale ratio is 70:30 | 110 feet to bottom of boring: lost fluid return | 510 |
| 115 | 22 | 5.1/5.0 | 100 | | | | | | | | - 117.5-118.2 feet: shale rich zone<br>- 118.2-124.6 feet: shale content increases with depth, beds are 0.1-0.4 feet thick, wavy, bioturbated, with rip up clasts | | 505 |
| 120 | 23 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 10, Pl, Sl-Ro, Op | | | | 500 |
| 125 | 24 | 5.0/5.0 | 99 | | | | | | Bj, 2, Pl, Mo-Ro, Op, poor fit<br>Bj, 18, Pl, Sm, Ti | | 127.4-128.8 feet: packstone, fossiliferous | | 495 |
| 130 | 25 | 4.8/5.0 | 96 | | | | | | Bj, 5, Wa, | | LIMESTONE (wackestone and micrite) interbedded with shale layers; wackestone and micrite are medium gray (N5) and shale is grayish black (N2); fresh; medium strong; wackestone and micrite are very fine to medium grained; shale beds are wavy, thin | | 490 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1037

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 135 | 26 | 5.0/5.0 | 100 | F | R3 | | | | Sl-Ro, Ti<br>Bj, 0, Pl, Sm, Ti | | | | 485 |
| 140 | 27 | 5.1/5.0 | 100 | | | | | | | B | - 140-145 feet: shale beds are thinner<br>- 142.1-144.2 feet: bioturbation | | 480 |
| 145 | 28 | 5.0/4.9 | 98 | F | R3 | | | | Bj, 10, Wa, Sl-Ro | | LIMESTONE (wackestone) interbedded with shale and micrite beds; wackestone is medium gray (N5) and shale is grayish black (N2); fresh; medium strong; wackestone is medium grained with heavily bioturbated beds; shale is fine grained and thin with wavy beds | | 475 |
| 150 | | | | | | | | | | | Boring terminated at 149.7 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/20 - 9.2 feet<br>6/21 - 14.3 feet<br>8/17 - 13.4 feet | | 470 |
| 155 | | | | | | | | | | | | | 465 |
| 160 | | | | | | | | | | | | | 460 |
| 165 | | | | | | | | | | | | | 455 |
| 170 | | | | | | | | | | | | | 450 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA Williams Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1038

| | | | |
|---|---|---|---|
| Drilling Method: Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft) 1532091.5 N; 628812.5 E | | Total Depth: 65.8 feet |
| Drilling Contractor (Driller) and Rig: MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88): 629.4 feet | Ground Water Depth: See Note A | Date Started: 8/19/06 |
| Sampling Method: SPT / UD | Borehole Inclination: Vertical | Logged by: J. Hoeft | Date Completed: 8/19/06 |

Reviewed by / Date: W Wadleigh 3/21/07 DSC 3-20-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | GP | 629.4 Coarse GRAVEL (Fill) perimeter drain backfill 627.4 (0.0–2.0) | Gravel too coarse to get a sample |
| | | SPT 1 | 2 2 5 | 12 | | | | | CH | sandy CLAY with gravel; yellowish brown (10YR 5/4); moist to wet; medium stiff; medium plasticity, trace manganese nodules - 4 feet: becomes dark brown (7.5YR 3/2); stiff with more manganese nodules; no gravel (2.0–8.0) | |
| | | SPT 2 | 3 5 6 | 6 | | | | | | | |
| 5 | | UD 3 | | 21 | 21.5 | 68/39 | GSZ H SG | | | | |
| | | SPT 4 | 3 5 7 | 12 | | | | | | 621.4 | |
| | | UD 5 | | 10.8 | 32.3 | 88/60 | GSZ H SG CN | | CH | CLAY, yellowish brown (10YR 5/8); moist to wet, stiff, trace manganese nodules - 9.2 feet: color changes to yellowish brown (10YR 5/4) mottled with light gray (7/0) (8.0–11.5) | |
| 10 | | SPT 6 | 4 8 12 | 15 | | | | | | 617.9 | |
| | | SPT 7 | 35 20/2" | 8 | | | | | GP | GRAVEL as partially weathered limestone fragments 616.7 (11.5–12.7) | SPT refusal at 12.7 feet. Auger refusal at 15.0 feet. Auger advanced through rubbly weathered limestone prior to setting casing for NQ core. Continuation of boring description in rock log. |
| 15 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 625, 620, 615, 610, 605, 600

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1038

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532091.5 N; 628812.5 E | | Total Depth<br>65.8 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>629.4 feet | Ground Water Depth<br>See Note A | Date Started<br>8/19/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 15.5 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/19/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | GRAVEL as partially weathered limestone fragments | Flush hole to 15.5 feet before first core run, and set PVC temporary casing | |
| 15 | 1 | 2.6/2.9 | 50 | SW to F | R3 | | | | | | LIMESTONE; (packstone) with calcareous shale interbeds; medium bluish gray (5B 5/1) and dark gray (N3); fresh to slightly weathered; medium strong | | 615 |
| | | | | | | | | | Bj, 5-10, Wa, Sl, Ti, clay filled | | - 15-29.8 feet: shale is <0.02 feet thick with spacing <0.3 feet; wavy with ripups | Fluid return good throughout boring | |
| 20 | 2 | 5.0/4.8 | 98 | | | | | | | | | | 610 |
| 25 | 3 | 5.1/5.2 | 98 | F | R3 | | | | | | | | 605 |
| 30 | 4 | 4.8/5.0 | 96 | | | | | | | | LIMESTONE; micrite to wackestone, with shale and packstone interbeds; medium gray (N5) for micrite & wackestone, medium bluish gray (5B 5/1) for packstone, dark gray (N3) for shale; fresh, medium strong | | 600 |
| 35 | 5 | 4.8/4.8 | 99 | F | R3 | | | | | A | - 33.9-34.7 feet: 0.2 ft of shale followed by 0.6 ft of packstone | | 595 |
| 40 | 6 | 5.2/5.0 | 100 | | | | | | | | - 39.4-39.7 feet: shale bed | | 590 |
| | | | | F | R3 | | | | | | - 42.8-43 feet: shale bed | | |
| 45 | 7 | 5.0/5.2 | 96 | | | | | | | | LIMESTONE; (micrite) with calcareous shale interbeds and occasional packstone beds; medium gray (N5) dark gray (N3) and medium bluish gray (5B 5/1); fresh, medium strong<br>- 44-60 feet: shale is <0.04 feet thick with spacings <0.2 feet, packstone is <0.2 feet thick<br>- 45.0-45.4 feet: packstone bed | | 585 |
| 50 | 8 | 4.9/4.8 | 100 | | | | | | | | | | 580 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1038

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 9 | 4.8/5.0 | 96 | F | R3 | | | | | | | | 575 |
| 60 | 10 | 4.5/4.1 | 100 | F | R3 | | | | | A | LIMESTONE; (micrite) with shale and packstone interbeds; medium gray (N5) dark gray (N3) and medium bluish gray (5B 5/1); fresh; medium strong | | 570 |
| 65 | 11 | 3.3/3.5 | 94 | | | | | | | | - 60-60.7 feet: packstone<br>- 60.7-63.5 feet: shale is <0.3 feet thick with spacing on average <0.2 feet<br>- 63.5-65.5 feet: packstone | | 565 |
| | | | | | | | | | | | Boring Terminated at 65.8 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/20 - 15.1 feet<br>8/22 - 20.3 feet | | |
| 70 | | | | | | | | | | | | | 560 |
| 75 | | | | | | | | | | | | | 555 |
| 80 | | | | | | | | | | | | | 550 |
| 85 | | | | | | | | | | | | | 545 |
| 90 | | | | | | | | | | | | | 540 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1039

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532472.2 N; 628859.9 E | | Total Depth<br>120 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>620.2 feet | Ground Water Depth<br>See Note A | Date Started<br>4/28/06 |
| Sampling Method<br>CME soil core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>4/28/06 |

Reviewed by / Date W Poulain 3-14-07 DSC 3-13-07

| Depth (feet) | Sample Type & No. | Uncorrected Blows/6 Inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Soil Type (USCS) | Lithology | Elevation (feet) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | ML | SILT, brown (7.5YR 4/4), dry to moist, medium stiff (Fill) | 620.2 – 619.2 (0.0 – 1.0) | |
| | CME 1 | | 43 | | | | CL | CLAY, dark yellowish brown (10YR 4/4), moist, very stiff to hard, trace manganese nodules (Residual) | 619.2 – 615.7 (1.0 – 4.5) | |
| 5 | CME 2 | | 59 | | | | ML | SILT, dark yellowish brown (10YR 4/4), moist, medium stiff to stiff | 615.7 – 613.7 (4.5 – 6.5) | |
| | | | | | | | CL | 6.0 feet: becomes very stiff and non-plastic<br>CLAY, yellowish brown (10YR 5/6) with red (2.5YR 4/8) streaks, moist, very stiff, trace manganese nodules | 613.7 – 610.2 (6.5 – 10.0) | |
| | CME 3 | | 15.6 | | | | | | 610.2 (10.0) | SPT refusal at 10.0 feet with blow count 50/0". Continuation of borehole description in rock log. |
| 10 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 20 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 30 | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1039

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532472.2 N; 628859.9 E | | Total Depth<br>120 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>620.2 feet | Ground Water Depth<br>See Note A | Date Started<br>4/28/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 10.4 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>4/28/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 1.4/1.5 | 78 | F | R2 | PA | | Bj, 20, Wa, Ro, Ti | B | LIMESTONE (micrite) with interbedded shale; medium gray (N5) with grayish black (N2) beds; weak; fresh; locally fossiliferous | | 610 |
| 15 | 2 | 4.9/5.0 | 84 | F | R2 | PA | | Bj, 10, Wa, Sl, Ti; Bj, 10, Wa, Sl, Ti; Bj, 15, Wa, Ro, Ti; Bj, 5, Wa, Sl, Ti; Bj, 0, Wa, Sl, Ti | B | - 10-15 feet: dark bands vary between discrete ~1 mm thick beds and amorphous bands, predominantly amorphous beds | | 605 |
| 20 | 3 | 5.2/5.0 | 100 | F | R2 | PA | | Bj, 20, Wa, Sl, Ti | B | | | 600 |
| 25 | 4 | 4.8/5.0 | 96 | F | R2 | PA | | Bj, 5, Wa, Sl, Ti; Bj, 10, Wa, Sl, Ti | B | | | 595 |
| 30 | 5 | 5.1/5.0 | 100 | F | R2 | PA | | Bj, 10, Wa, Sl, Ti; Bj, 15, Wa, Sl, Ti | B | | | 590 |
| 35 | 6 | 4.0/5.0 | 80 | F | R2 | PA | | Bj, 20, Wa, Ro, Ti; Bj, 0, Wa, Sl, Ti | B | - 36 feet: increase in frequency and thickness of shale interbeds<br>- 37.2 feet: encountered slickensides and green residue with hydrocarbon odor. | 35.5 feet: driller reported part of the core fell out which was recovered in Run 7 | 585 |
| 40 | 7 | 6.3/5.0 | 100 | F | R2 | PA | | Bj/Me, 5, Wa, Sm, Ti; BjMe, 15, Wa, Sl, Ti; Me/Bj, 0, Pl, Sm, Ti | B | LIMESTONE (wackestone); medium dark gray (N4) with irregular dark gray (N3) relict fossils; fresh; weak<br>- 40 feet: vug with spar lining | | 580 |
| 45 | 8 | 4.8/5.0 | 100 | F | R2 | PA | | Me/Bj, 25, Wa, Sl, Ti | B | LIMESTONE (micrite); medium gray (N5); fresh; hard; sporadic fossiliferous zones | | 575 |
| 50 | 9 | 4.7/5.0 | 100 | F | R2 | PA | | Bj/Me, 5, Wa, Ro, Ti | B | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1039

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | | | | | | | | | | | | | 570 |
| | 10 | 5.5/5.0 | 100 | | | | | | | | - 52 feet: fossils are visible (<10%) | | |
| 55 | | | | F | R2 | | | | | | | | 565 |
| | 11 | 5.1/5.0 | 98 | | | | | | Me/Bj, 15, Wa, Sl, Ti | | - 57.2 feet: 0.2 feet thick fossiliferous section<br>- 60-75 feet: fossil rich zone | | |
| 60 | | | | | | | | | | | | | 560 |
| | 12 | 5.1/5.0 | 96 | | | | | | Bj/Me, 20, Wa, Sl, Ti<br>Bj/Me, 5, Wa, Sl, Ti | | | | |
| 65 | | | | F | R2 | | | | | | LIMESTONE (micrite) with interbedded shale; medium gray (N5) with grayish black shale (N2) interbeds; fresh; weak; 30% shale | | 555 |
| | 13 | 4.9/5.0 | 98 | | | | | | | B | | | |
| 70 | | | | | | | | | | | - dark bands become more frequent (Run 14 ~60% lighter color and ~40% dark bands) | | 550 |
| | 14 | 5.2/5.0 | 100 | | | | | | | | | | |
| 75 | | | | F | R2 | | | | | | | | 545 |
| | 15 | 5.1/5.0 | 100 | | | | | | Bj/Me, 5, Wa, Sl, Ti | | | | |
| 80 | | | | | | | | | | | | | 540 |
| | 16 | 5.0/5.0 | 100 | | | | | | | | | | |
| 85 | | | | F | R2 | | | | | | | | 535 |
| | 17 | 5.0/5.0 | 100 | | | | | | | | | | |
| 90 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

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# ROCK LOG - Boring No. B-1039

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | | | | | | PA | | | Bj/Me, 70, Wa, Sl, Ti | | - 91 feet: high angle fracture. Some minor crystallization along surface.<br>- 92-101 feet: stylolites | | 530 |
| | 18 | 5.0/5.0 | 100 | | | | | | Bj/Me, 10, Wa, Sl, Ti | | LIMESTONE (wackestone); grayish blue (5PB 5/2) with grayish black (N2) bands; weak; fresh | | |
| 95 | | | | F | R2 | | | | | | LIMESTONE (micrite); medium gray (N5) with grayish black (N2) bands; weak; fresh<br>LIMESTONE (wackestone); grayish blue (5 PB 5/2) with grayish black (N2) bands; weak; fresh | | 525 |
| | 19 | 4.9/5.0 | 98 | | | | | | | | LIMESTONE (micrite); medium gray (N5) with grayish black (N2) bands; weak; fresh | | |
| 100 | | | | | | | | | Bj/Me, 20, Wa, Sl, Ti | | | | 520 |
| | 20 | 5.2/5.0 | 100 | | | | | | | | LIMESTONE (wackestone); medium gray (N5) with grayish black bands (N2); weak; fresh | | |
| 105 | | | | F | R2 | | | | Bj/Me, 20, Wa/St, Ro, Ti | B | | | 515 |
| | 21 | 4.9/5.0 | 95 | | | | | | | | LIMESTONE (micrite) with thin (~0.1-0.2 feet) packstone layers; micrite is medium gray (N5), the packstone is grayish blue (5PB 5/2) with grayish black bands (N2); weak; fresh<br>- 107-111 feet: thin shale laminae | | |
| 110 | | | | | | | | | Bj/Me, 0, Wa, Sl, Ti<br>Bj/Me, 10, Wa, Sl, Ti | | - vug with calcite filling | | 510 |
| | 22 | 5.1/5.0 | 98 | | | | | | | | LIMESTONE (micrite); medium gray (N5) with dark gray bands; weak; fresh<br>- 114 -115.3 feet: high angle fracture | | |
| 115 | | | | F | R2 | | | | | | | | 505 |
| | 23 | 3.7/3.5 | 100 | | | | | | Bj/Me, 0, Wa, Sl, Ti | | | | |
| 120 | | | | | | | | | | | Boring terminated at 120 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>4/29 - 8.8 feet<br>7/19 - 7.2 feet<br>7/20 - 7.2 feet | PVC: 4 inch O. D. set at 10.0 feet for Packer testing | 500 |
| 125 | | | | | | | | | | | | | 495 |
| 130 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1040

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532554 N; 629061 E | | Total Depth<br>120 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>616.9 feet | Ground Water Depth<br>See Note A | Date Started<br>6/26/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/28/06 |

Reviewed by / Date DSC 5-9-07 Rev. 1 WG 5-10-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 616.9 CLAY, reddish brown (5YR 4/4), dry to moist, stiff to very stiff, trace manganese nodules (~0.01 inch in diameter) | | |
| | | SPT 1 | 9 7 7 | 16.2 | | | | | | | | 615 |
| | | | | | | | | | | - 1.7 feet: becomes yellowish brown (10YR 5/4) | | |
| | | SPT 2 | 7 7 8 | 16.8 | | | | | | | | |
| 5 | | | | | | | | | | | | |
| | | SPT 3 | 5 6 9 | 18 | | | | | | - 6.5 feet: becomes moist in third SPT sample | | 610 |
| | | SPT 4 | 7 22 50/6" | 16.8 | | | | | | 607.4 | 9.5 | |
| 10 | | | | | | | | | CL | CLAY with limestone gravel, yellowish brown (10YR 5/4), dry to moist, hard | | |
| | | SPT 5 | 50/0" | 0 | | | | | | - 9.5-13 feet: limestone gravel is slightly weathered with white powder coating and has sharp angular edges | SPT at 11.2 feet did not advance. Driller broke through with auger. | 605 |
| | | | | | | | | | | 603.7 | 13.2 | |
| | | | | | | | | | | | SPT refusal at 13.2 feet. Continuation of borehole description in rock log. | |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC — WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1040

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532554 N; 629061 E | | Total Depth<br>120 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>616.9 feet | Ground Water Depth<br>See Note A | Date Started<br>6/26/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 13.6 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/28/06 |

Reviewed by / Date DSC 5-9-07 Rev. 1

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 2.9/2.9 | 77 | F | R3 | | | | Bj, 10, Wa, Sl, Ti<br>Jo, 70, Wa, Sl, Ti | | LIMESTONE (micrite) with calcareous shale interbeds; medium gray (N5) and dark gray (N3); fresh; medium strong<br>- 14.8-15.6 feet: high angle fracture (70°) with slight staining | | |
| | 2 | 5.0/5.0 | 99 | F | R3 | | | | Bj, 10, Wa, Sm, Ti<br>Jo, 70, Wa, Sl-Sm, Ti | A | - 15-21 feet: shale is wavy, range of thickness is 0.01-0.1 feet with spacing < 0.01-0.2 feet<br>- 18.9-19.5 feet: high angle fracture (70°) with slight staining | | 600 |
| 20 | 3 | 5.1/5.0 | 100 | F | R3 | | | | Jo, 90, Wa, Sl, Ti, 21.4-24.2 feet<br>Bj, 25, Wa, Sl, Ti | | - 21-31 feet: shale is <0.01 feet thick with spacing <0.01-1.0 (average is 0.8)<br>- 21.4-24.2 feet: high angle fracture; 90° | | 595 |
| 25 | 4 | 4.8/5.0 | 90 | F | R3 | | | | | | | 29.1 feet: Unconfined Compression Test | 590 |
| 30 | 5 | 5.1/5.0 | 100 | F | R3 | | | | Jo, 75, Wa, incipient | | - 31- 45 feet: shale bed spacing 0.03-0.3 feet, wavy<br>- 33.5 feet: shale bed 0.08 feet thick with light olive gray (5Y 5/2) color | | 585 |
| 35 | 6 | 4.9/5.0 | 98 | F | R3 | | | | | B | | | 580 |
| 40 | 7 | 3.6/5.0 | 72 | F | R3 | | | | | | - 43 feet: rip-up clasts<br>- 45-56.5 feet: shale is 0.02-0.2 feet thick with spacing 0.05-0.3 feet | | 575 |
| 45 | 8 | 6.6/5.0 | 100 | F | R3 | | | | | | | | 570 |
| 50 | | | | | | | | | | | - 50.4 feet: shale layer 0.2 feet thick | 50.3 feet: Unconfined Compression Test | 565 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1040

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 9 | 5.0/4.9 | 100 | F | R3 | | | | | | | | |
| 60 | 10 | 5.0/5.0 | 100 | F | R3 | | | | | | - 56.5-65 feet: shale is 0.01-0.4 feet thick with spacing 0.02-0.3 feet | | 560 |
| 65 | 11 | 4.9/5.0 | 98 | F | R3 | | | | | | | 63.2 feet: Unconfined Compression Test | 555 |
| | | | | | | | | | | | - 65-75 feet: shale is 0.01-0.1 feet thick with spacing 0.1-0.6 feet, rip-up clasts | | |
| 70 | 12 | 5.0/5.0 | 99 | F | R3 | | | | | | - 69 feet: stylolites observed | | 550 |
| 75 | 13 | 4.9/5.0 | 97 | F | R3 | | | | | B | - 75-90 feet: shale is 0.01-0.1 feet thick with spacing 0.05-0.5 feet, rip-up clasts | | 545 |
| 80 | 14 | 4.2/4.1 | 100 | F | R3 | | | | | | | | 540 |
| 85 | 15 | 6.0/6.1 | 97.7 | F | R3 | | | | | | | | 535 |
| 90 | 16 | 5.2/5.0 | 100 | F | R3 | | | | | | - 90-110.4 feet: shale is 0.01-0.2 feet thick with spacing 0.05-0.3 feet<br>- 91-93 feet: calcareous shale-rich section, micrite is 0.1-0.2 feet thick | | 530<br>525 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

WLA William Lettys & Associates, Inc.

# ROCK LOG - Boring No. B-1040

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | 17 | 4.8/4.9 | 98 | F | R3 | | | | | | | | |
| | | | | | | | | | | | - 96 feet: rip-up clasts | | 520 |
| 100 | 18 | 5.1/5.0 | 100 | F | R3 | | | | | | | | |
| | | | | | | | | | | | | | 515 |
| 105 | 19 | 4.8/5.0 | 95.6 | F | R3 | | | | | | | | |
| | | | | | | | | | | B | | | 510 |
| 110 | 20 | 5.2/5.0 | 100 | F | R3 | | | | | | | | |
| | | | | | | | | | | | - 110.4-120 feet: shale is 0.01 feet thick with spacing 0.02-0.1 feet, wavy | | 505 |
| 115 | 21 | 4.8/5.0 | 96 | F | R3 | | | | | | | | |
| | | | | | | | | | | | | | 500 |
| 120 | 22 | 3.9/3.9 | 98.7 | F | R3 | | | | | | | | |
| | | | | | | | | | | | Boring teminated at 120 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/12 - 13.7 feet<br>5/14 - 11.2 feet<br>6/28 - 9.0 feet<br>6/30 - 14.4 feet<br>7/5 - 9.0 feet<br>7/14 - 7.2 feet<br>7/20 - 16.0 feet | | 495 |
| 125 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 490 |
| 130 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 485 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1041

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532544.9 N; 628845 E | | Total Depth<br>120.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>620.1 feet | Ground Water Depth<br>See Note A | Date Started<br>6/23/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>6/24/06 |

Reviewed by / Date W Goldman 3-14-07 DSL 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 620.1 CLAY, yellow brown (10YR 6/6), dry, stiff, trace sand and small manganese oxide nodules 0.0 | | 620 |
| | | SPT 1 | 11 7 7 | 17 | | | | | CH | 618.6 CLAY with gravel, strong brown (7.5YR 5/2), dry, stiff, few black manganese oxide nodules (Residual) 1.5 | | |
| | | SPT 2 | 6 7 7 | 3 | | | | | | | | |
| 5 | | | | | | | | | | | | 615 |
| | | SPT 3 | WOR WOR 2 | 9 | | | | | CL | 613.8 CLAY with gravel, dark yellowish brown (10YR 4/4), moist, very soft, gravel is tan to dark gray (Residual) 6.3 | | |
| | | | | | | | | | CH | 613.1 CLAY, grayish brown (10YR 5/3), moist, very stiff, trace sand (Residual) 7.0 | | |
| | | SPT 4 | 3 7 9 | 14 | | | | | | - 9 feet: more orange mottling, few larger black manganese oxide nodules | | |
| 10 | | | | | | | | | | | | 610 |
| | | SPT 5 | 3 10/0" | 7 | | | | | | 608.6 - 11 feet: slightly drier with larger black manganese oxide nodules (~25% of soil) 11.5 | SPT refusal at 11.5 feet. Augered to 12 feet. Continuation of borehole description on rock log. | |
| 15 | | | | | | | | | | | | 605 |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1041

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532544.9 N; 628845 E | | Total Depth<br>120.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>620.1 feet | Ground Water Depth<br>See Note A | Date Started<br>6/23/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 12 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>6/24/06 |

Reviewed by / Date W Robinson 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | weathered LIMESTONE | | |
| | 1 | 2.8/2.8 | 96 | SW to F | R3 | | | | Bj, 20, St, Mo-Ro, Op coating | | LIMESTONE (micrite) with interbedded shale; micrite is medium gray (N5) and shale is grayish black (N2); fresh to slightly weathered; medium strong; micrite and shale thin to laminated | 12-70 feet: good fluid return | |
| 15 | | | | | | | | | | | - 12.1-18.8 feet: zone with less shale, shale contains micrite rip up clasts, irregular styolite lines | | 605 |
| | 2 | 5.0/5.0 | 100 | F | R3 | | | | | | - 18.8-27.7 feet: zone with more shale | | |
| 20 | | | | | | | | | | | | | 600 |
| | 3 | 5.1/5.0 | 100 | | | | | | Bj, 20, Sl-Ro, Ti<br>Bj, 15, Wa, Sm, Ti | | - 21.4 feet: sparry calcite vug | | |
| 25 | | | | F | R3 | | | | Bj, 15, Pl, Sl-Ro, Ti | | | | 595 |
| | 4 | 5.1/5.0 | 100 | | | | | | Bj, 20, Wa, Sl-Ro, Ti<br>Bj, 15, Pl, Sl-Ro, Ti | | - 27.7-34.2 feet: zone with less shale, shale color becomes lighter (N3) | | |
| 30 | | | | | | | | | Bj, 20, Pl, Sl-Ro, Ti, coating | | | | 590 |
| | 5 | 5.0/5.0 | 100 | F | | | | | Bj, 15, Pl-Sl-Ro, Ti | B | | | |
| 35 | | | | | R3 | | | | | | - 34.2-36.2 feet: zone without shale beds | | 585 |
| | 6 | 5.3/5.0 | 100 | SW | | | | | | | | | |
| 40 | | | | | | | | | | | LIMESTONE (micrite) with interbedded shale layers with occasional wackestone interbeds; micrite is medium gray (N5), shale is grayish black (N2) and wackestone is medium light gray (N6); fresh; medium strong | | 580 |
| | 7 | 5.0/5.0 | 100 | F | | | | | Bj, 10, Pl, Wa, Sl-Ro, Ti | | - 40-42.3 feet: shale is thin with wavy beds<br>- 42.3-43.2 feet: wackestone, fossiliferous | | |
| 45 | | | | | R3 | | | | | | -43.2-50 feet: increasing shale content with depth | | 575 |
| | 8 | 4.9/5.0 | 98 | | | | | | | | | | |
| 50 | | | | | | | | | | | - 50-55 feet: increasing shale content (~45%) with depth, fossiliferous lenses throughout | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1041

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 5.0/5.0 | 100 | | | | | | Bj, 10, Wa, Ro, No fit | | | | |
| 55 | | | | F | R3 | | | | | | - 55-76.6 feet: shale content is ~50%, micrite is thin bedded; shale is laminated, slightly wavy, sometimes fossiliferous | | 565 |
| | 10 | 5.1/5.0 | 100 | | | | | | | | | | |
| 60 | | | | | | | | | | | | | 560 |
| | 11 | 5.0/5.0 | 100 | | | | | | | | | | |
| 65 | | | | F | R3 | | | | | | | | 555 |
| | 12 | 5.1/5.0 | 100 | | | | | | | | | | |
| 70 | | | | | | | | | | | | | 550 |
| | 13 | 5.4/5.0 | 96 | | | | | | Bj, 15, Pl, Mo-Ro | B | | 70.2-71 feet: lost water return | |
| 75 | | | | F | R3 | | | | | | | | 545 |
| | 14 | 4.9/5.0 | 100 | | | | | | | | - 76.6-78 feet: fossiliferous wackestone | | |
| 80 | | | | | | | | | | | | | 540 |
| | 15 | 5.1/5.0 | 100 | | | | | | | | | | |
| 85 | | | | F | R3 | | | | | | - 85-92 feet: packstone interbedded with very thin shale beds | | 535 |
| | 16 | 4.8/5.0 | 96 | | | | | | | | | 86 feet: fluid return is fair, flow is from around the casing | |
| 90 | | | | | | | | | | | | | 530 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc

# ROCK LOG - Boring No. B-1041

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 17 | 5.1/5.0 | 100 | | | | | | Bj, 5, Pl, Ro, Ti | | LIMESTONE (micrite) interbedded with shale; micrite is medium gray (N5) and shale is grayish black (N2); fresh to slightly weathered; medium strong; micrite is medium grained and constitutes ~60% with beds of <0.1 feet thickness, shale beds are mottled and discontinuous | | |
| 95 | | | | F | R3 | | | | | | | | 525 |
| | 18 | 5.0/5.0 | 100 | | | | | | | | LIMESTONE (wackestone); medium gray (N5); fresh; medium strong | 97 feet: decreasing fluid return | |
| 100 | | | | | | | | | | | | | 520 |
| | 19 | 5.0/5.0 | 100 | | | | | | | B | | 100-120 feet: poor to no fluid return | |
| | | | | | | | | | | | - 99.6-107.6 feet: zone with virtually no shale | | |
| 105 | | | | F | R3 | | | | | | | | 515 |
| | 20 | 5.3/5.0 | 100 | | | | | | Bj, 15, Pl, Si-Ro, Ti | | - 107.6-115 feet: increasing shale content (~45%), shale beds are thinly bedded, mostly planar | | |
| 110 | | | | | | | | | | | | | 510 |
| | 21 | 5.0/5.0 | 100 | | | | | | Bj, 5, Pl, Sm, Ti | | | | |
| | | | | | | | | | Bj, 20, Pl, Sm, Ti | | - 113.4-116.8 feet: beds are planar | | |
| 115 | | | | F | R3 | | | | | C | | | 505 |
| | 22 | 5.2/5.3 | 100 | | | | | | Bj, 30, Pl, Sm, No fit | | LIMESTONE(micrite) with interbedded shale; shale is grayish black (N2) and micrite is medium gray (N5); fresh; medium strong; occasional wackestone interbeds | | |
| | | | | | | | | | Bj, 20, Pl, Sm, Ti | | | | |
| 120 | | | | | | | | | | | | | 500 |
| | | | | | | | | | | | Boring terminated at 120.3 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/24 - 6.2 feet<br>6/25 - 6.3 feet | | |
| 125 | | | | | | | | | | | | | 495 |
| 130 | | | | | | | | | | | | | 490 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1042

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532375 N; 628931.2 E | | Total Depth<br>124.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>622 feet | Ground Water Depth<br>See Note A | Date Started<br>7/8/06 |
| Sampling Method<br>No sampling | Borehole Inclination<br>-60 | Logged by<br>K. KRUG | Date Completed<br>7/10/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 622 0.0 | | 620 |
| 5 | | | | | | | | | | See adjacent vertical boring B-1042A for soil profile. | | 615 |
| 10 | | | | | | | | | | | | 610 |
| 15 | | | | | | | | | | | | 605 |
| 20 | | | | | | | | | | 602.5 22.5 | | |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1042

| | | | |
|---|---|---|---|
| Drilling Method: Rotary Wash/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft) 1532375 N; 628931.2 E | | Total Depth: 124.3 feet |
| Drilling Contractor (Driller) and Rig: MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88): 622 feet | Ground Water Depth: See Note A | Date Started: 7/8/06 |
| Casing Size and Depth: HWT / 20.6 feet | Borehole Inclination: -60 | Logged by: K. KRUG | Date Completed: 7/10/06 |

Reviewed by / Date: DSC 5-9-07 Rev. 1 WH 5-10-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 1.5/1.5 | 0 | CW to SW | R1 to R3 | | | | | | LIMESTONE (micrite) with interbedded calcareous shale; micrite is dark gray (4/0) and shale is very dark gray (7.5YR 3/1); completely to slightly weathered; weak to medium strong; predominately soil and wackestone fragments | Boring is angled at 60° from horizontal. Depths shown are distances along the axis of drilling. Elevations may be used to determine vertical distances. Discontinuity angle measurements are relative to borehole axis. | |
| 25 | 2 | 3.5/5.0 | 58 | SW | R2 to R3 | | | | | | LIMESTONE (wackestone) with interbedded calcareous shale; wackestone is bluish gray (5/1) and shale is dark gray (7.5YR 3/1); slightly weathered; weak to medium strong | | 600 |
| 30 | 3 | 4.7/5.0 | 94 | F | R3 | | | | Bj, 50, Wa, Ro, Ti, calcite coated | A | LIMESTONE (micrite) with interbedded calcareous shale; micrite is dark gray (4/0) and shale is very dark gray (7.5YR 3/1); fresh; medium strong; shale is 0.01-0.3 feet thick in irregular layers with beddings spaced 0.1 feet apart<br>- 32.8-33.1 feet: shale bed<br>- 33.1-34.0 feet: packstone bed | 22.5-27 feet: good fluid return<br>27-49 feet: poor fluid return<br>29-40.5 feet: calcite infills present | 595 |
| 35 | 4 | 5.2/5.0 | 100 | | | | | | | | - 36.4-40.0 feet: shale beds are discontinuous and become irregular; rip-up clasts | | 590 |
| 40 | 5 | 5.1/5.0 | 100 | F | R3 | | | | | | LIMESTONE (micrite and wackestone) with interbedded calcareous shale; micrite and wackestone are dark gray (4/0) and shale is very dark gray (7.5YR 3/1); fresh; medium strong<br>- 40.5-42.5 feet: bioturbation in shale, calcite very common | | 585 |
| 45 | 6 | 5.0/5.0 | 100 | | | | | | | | | | 580 |
| 50 | 7 | 5.1/5.0 | 100 | F | R3 | | | | | B | - 50-90 feet: consistently spaced shale interbeds, irregular shaped, some diffuse boundaries, moderate amount of rip up clasts | 49 feet to bottom of boring: No fluid return<br>49.4 feet: Unconfined Compression Test | |
| 55 | 8 | 5.0/5.0 | 100 | | | | | | | | | 56.1 feet: Unconfined Compression with Stress/Strain Test | 575 |
| 60 | 9 | 5.1/5.0 | 100 | | | | | | | | | | 570 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1042

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | F | R3 | | | | | | | | |
| 65 | 10 | 5.0/5.0 | 100 | | | | | | | | | 65.1 feet: Unconfined Compression Test | 565 |
| 70 | 11 | 5.0/5.0 | 100 | | | | | | | | | | 560 |
| | | | | F | R3 | | | | | | | | |
| 75 | 12 | 5.0/5.0 | 100 | | | | | | | | | | 555 |
| 80 | 13 | 4.9/5.0 | 98 | | | | | | | B | - 80 feet: rock becoming strong | | 550 |
| | | | | F | R4 | | | | | | | | |
| 85 | 14 | 5.2/5.0 | 100 | | | | | | | | | | 545 |
| 90 | 15 | 5.0/5.0 | 100 | | | | | | | | - 91.2-91.8 feet: shale is massive and interwoven with limestone present only as rip up clasts | | |
| | | | | F | R4 | | | | | | LIMESTONE (micrite and wackestone) interbedded with calcareous shale; limestone is bluish gray (5/1) and shale is dark gray (7.5YR 3/1); fresh; medium strong | | |
| 95 | 16 | 5.0/5.0 | 100 | | | | | | | | - 92.7-94.3 feet: packstone with shale interwoven as thin wisps; calcite infill and replacement common, vug infill | | 540 |
| 100 | 17 | 5.0/5.0 | 100 | | | | | | | | | | 535 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1042

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | F | R4 | | | | | | | | |
| 105 | 18 | 5.0/5.0 | 100 | | | | | | | | | | 530 |
| 110 | 19 | 5.0/5.0 | 100 | | | | | | Jo, 70, Wa, Ro, Ti | | | | 525 |
| | | | | F | R4 | | | | | B | - 112.5-113.4 feet: packstone with wispy shale layers | | |
| 115 | 20 | 5.0/5.0 | 100 | | | | | | | | | | 520 |
| 120 | 21 | 5.0/5.3 | 100 | F | R4 | | | | | | | | 515 |
| 125 | | | | | | | | | | | Boring terminated at 124.3 feet.<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/9 - 15.8 feet<br>7/11 - 15.1 feet<br>7/20 - 13.2 feet | | 510 |
| 130 | | | | | | | | | | | | | |
| 135 | | | | | | | | | | | | | 505 |
| 140 | | | | | | | | | | | | | 500 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1042A

| | | | |
|---|---|---|---|
| Drilling Method: Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft) 1532377.2 N; 628935.9 E | | Total Depth: 23 feet |
| Drilling Contractor (Driller) and Rig: MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88): 622.1 feet | Ground Water Depth: See Note A | Date Started: 7/8/06 |
| Sampling Method: SPT | Borehole Inclination: Vertical | Logged by: K. KRUG | Date Completed: 7/10/06 |

Reviewed by / Date: DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | GP | 622.1 / 0.0 GRAVEL (Fill) | | |
| | | SPT 1 | 4 2 4 | 12 | | | | | CH | 620.7 / 1.4 CLAY with sand, strong brown (7.5YR 5/8), moist, medium stiff, few manganese oxide nodules | Soil boring is and SPT's test were perfomed in a vertical hole offset 3.7 feet from B1042 which is an inclined boring. | 620 |
| | | SPT 2 | 3 6 7 | 18 | | | | | | - 3.5 feet: color changes to brown (10YR 4/3) and becomes stiff | | |
| 5 | | SPT 3 | 2 1 2 | 31.2 | | | | | | - 7.0 feet: color changes to light olive brown (2.5YR 5/4), becomes soft | | 615 |
| | | | | | | | | | CH | 614.6 / 7.5 CLAY with sand, dark yellowish brown (10YR 4/4), moist, stiff, few manganese oxide nodules | | |
| | | SPT 4 | 2 4 6 | 31.2 | | | | | | | | |
| 10 | | SPT 5 | 2 5 9 | 18 | | | | | | - color changes slightly to dark yellowish brown (10YR 4/6) | | 610 |
| | | | | | | | | | CH | 609.1 / 13.0 CLAY with gravel, dark grayish brown (10YR 4/2), moist, stiff, trace sand | | |
| 15 | | SPT 6 | 9 8 6 | 14.4 | | | | | | | | |
| | | SPT 7 | 4 5 9 | 18 | | | | | | | | 605 |
| | | | | | | | | | CH | 603.6 / 18.5 CLAY, dark yellowish brown (10YR 4/4), wet, soft to medium stiff, trace gravel | | |
| 20 | | SPT 8 | 2 1 2 | 10.8 | | | | | | | | |
| | | SPT 9 | 0 5 2 | 13.2 | | | | | | - 21-21.5 feet: advance SPT with weight of rods, possible void | | 600 |
| | | | | | | | | | | 599.1 / 23.0 Boring terminated at 23.0 feet. | Auger refusal at 23.0 feet. See adjacent inclined boring B-1042 for description of underlying rock. | |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1043

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft)<br>1532423.8 N; 628741.9 E | | Total Depth<br>2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>622.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/6/06 |
| Sampling Method<br>Split Spoon | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>6/7/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | SPT 1 | * | 2.4 | | | | | | 622.7 GRAVEL (FILL) 0.0 | Drilled to test for concrete.<br>* SPT 1 blow counts not recorded due to rig geologist omission | 620 |
| | | SPT 2 | 10/0" | 1.2 | | | | | | 620.7 CEMENT/CONCRETE 2.0<br>620.6 Drilling terminated due to concrete encountered at 2 feet. Relocate to B-1043A. 2.1 | Rocks encountered.<br>10 blows at zero advancement. | |
| 5 | | | | | | | | | | | | 615 |
| 10 | | | | | | | | | | | | 610 |
| 15 | | | | | | | | | | | | 605 |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1043A

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532424.3 N; 628756.8 E | | Total Depth<br>75.6 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>622.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/6/06 |
| Sampling Method<br>SPT | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>6/8/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 622.2 CLAY with sand, dark reddish brown (2.5YR 3/4), dry to moist, hard, few organics 0.0 | | |
| | | SPT 1 | 8 4 3 | 12 | | | | | CL | 620.9 CLAY with sand, yellowish brown (10YR 5/4), moist, medium stiff to stiff, few large gravel clasts 1.3 | | 620 |
| 5 | | SPT 2 | 4 6 5 | 18 | 17.4 | 36/ 19 | GSZ | | | | | |
| | | SPT 3 | 8 7 9 | 18.5 | | | | | CH | 616.2 CLAY with sand, strong brown (7.5YR 4/6) to yellowish brown (10YR 5/6), moist, medium stiff to very stiff 6.0 | | 615 |
| 10 | | SPT 4 | 4 6 7 | 18.5 | 30 | 73/ 47 | GSZ H | | | - 6 feet: becomes yellowish brown (10YR 5/6)<br>- 8.5 feet: becomes yellowish brown (10YR 5/8) with few manganese nodules | | |
| | | SPT 5 | 4 9 11 | 24 | | | | | | - 11 feet: becomes yellowish brown (10YR 5/6) | water level measured at 12.5 feet (6/8/06) | 610 |
| | | SPT 6 | 4 10 10/0" | 12 | | | | | | - 13.5 feet: becomes dark yellowish brown (10YR 4/6) 607.7 14.5 | SPT refusal at 14.5 feet. Advance auger to 15.6 feet. Continuation of borehole description on rock log. | |
| 15 | | | | | | | | | | ROCK FRAGMENTS, limestone slightly weathered 606.6 15.6 | | 605 |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1043A

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532424.3 N; 628756.8 E | | Total Depth<br>75.6 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>622.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/6/06 |
| Casing Size and Depth<br>PVC: 6.63 inch O.D / 15.6 feet | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>6/8/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 4.2/5.0 | 83 | F | R3 | | | | | | LIMESTONE (micrite) interbedded with calcareous shale; micrite is light gray (N7) and shale is dark gray (N3); fresh; medium strong; shale is 0.1-0.2 feet thick, spaced 0.05-0.3 feet apart; calcite vugs present | good fluid return | 605 |
| 20 | | | | | | | | | Bb, 5, Wa, Sm, Ti | | | | |
| | 2 | 5.1/5.0 | 100 | F | R3 | | | | | | - 22.6-29.0: shale is 0.01-0.09 feet thick with spacings of 0.01-0.1 feet | | 600 |
| 25 | | | | | | | | | | | | | |
| | 3 | 5.2/5.0 | 100 | F | R3 | | | | | | | | 595 |
| 30 | | | | | | | | | | | - 29-39.4 feet: shale beds increase in frequency, 0.1-0.2 feet thick with spacings of 0.05-0.1 feet<br>- 30 feet: fossilifereous zone | | |
| | 4 | 4.9/5.0 | 98 | F | R3 | | | | Bb, 20, Wa, Sm-Sl, Ti | | | | 590 |
| 35 | | | | | | | | | | B | | 34-75.6 feet: good fluid return | |
| | 5 | 5.2/5.0 | 98 | F | R3 | | | | Bb, 20, Wa, Sm, Ti | | | | 585 |
| 40 | | | | | | | | | | | - 39.4-50 feet: shale beds increase in frequency, 0.1-0.2 feet thick with spacings of 0.05-0.1 feet | | |
| | 6 | 5.0/5.0 | 100 | F | R3 | | | | Bb, 18, Wa, Ro, Ti | | - Spar-filled vugs | | 580 |
| 45 | | | | | | | | | | | | | |
| | 7 | 5.0/5.0 | 100 | F | R3 | | | | Jo, 65, Wa, Ro, Ti | | | | 575 |
| 50 | | | | | | | | | | | - 50-60 feet: limestone changes to wackestone, very fossil rich | | |
| | 8 | 4.7/5.0 | 94 | F | R3 | | | | Jo, 70, Wa, Ro, Ti | | | | 570 |
| 55 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1043A

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 9 | 5.3/5.0 | 100 | F | R3 | | | | Bb, 10, Wa, Sm, Ti | | | | 565 |
| | | | | | | | | | | | - 60-75.6 feet: shale increases in frequency, 0.01-0.2 feet thick with spacings of 0.05-0.02 feet | | |
| | | | | | | | | | | | - 60-75 feet: fossil-rich bands become common | | 560 |
| 65 | 10 | 5.5/5.0 | 100 | F | R3 | | | | | | | | |
| | | | | | | | | | Bb, 20, Wa, Sl, Ti | B | | | 555 |
| 70 | 11 | 4.8/5.0 | 96 | F | R3 | | | | | | - 67.8 and 68.6 feet: fossils present in bands 1-2 feet thick | | |
| | | | | | | | | | | | | | 550 |
| 75 | 12 | 5.1/5.0 | 100 | F | R3 | | | | Bb, 5, Wa, Sm, Ti | | - clay-filled fracture | | |
| | | | | | | | | | | | Boring terminated at 75.6 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/6 - 14.0 feet<br>6/7 - 12.6 feet | | 545 |
| 80 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 540 |
| 85 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 535 |
| 90 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 530 |
| 95 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1044

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532399.8 N; 629086.6 E | | Total Depth<br>76 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>618.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/6/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>6/7/06 |

Reviewed by / Date: DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | OH | 618.7 organic CLAY, reddish brown (2.5YR 4/4), dry to moist, stiff | | |
| | | SPT 1 | 3 7 9 | 18 | | | | | | 616.7 | 2.0 | |
| | | | | | | | | | CH | CLAY with sand, strong brown (7.5YR 5/6) to yellowish brown (10YR 5/8), moist, stiff to medium stiff<br>- manganese nodules are up to 4 mm in size | | 615 |
| | | SPT 2 | 1 2 5 | 18 | 19.8 | 52/26 | GSZ | | | | | |
| 5 | | | | | | | | | | 613.2 | 5.5 | |
| | | | | | | | | | CL | CLAY, dark brown (7.5YR 3/4), moist to dry, medium stiff, few fine sand | | |
| | | SPT 3 | 2 5 8 | 18 | | | | | | 611.9 | 6.8 | |
| | | | | | | | | | CH | CLAY, yellowish brown (10YR 5/6), moist, medium stiff, black manganese nodules | | |
| | | SPT 4 | 40/1" | 0 | | | | | | 610.7 | 8.0 | 610 |
| 10 | | | | | | | | | | | Auger refusal at 8.0 feet. SPT refusal at 8 feet with blow counts of 40/1". Continuation of borehole description in rock log. | |
| | | | | | | | | | | | | 605 |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

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# ROCK LOG - Boring No. B-1044

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532399.8 N; 629086.6 E | | Total Depth<br>76 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>618.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/6/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 8 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>6/7/06 |

Reviewed by / Date [illegible] 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 2.7/2.8 | 82 | SW | R3 | | | | Bj, 5, Wa, Ro<br>Bj,10, Wa, Ro<br>Bj, 20, St, Ro<br>Bj, 10, Pl, Sl-Ro<br>Bj, 10, Pl, Sl-Ro<br>Bj, 15, Pl, Ro<br>Bj, 10, Pl, Sl-Ro, no fit | | LIMESTONE (wackestone) with interbedded shale; wackestone is medium gray (N5) and shale is grayish black (N2); slightly weathered; medium strong; shale beds are very thin (1 mm-3 cm) | Driller using recirculating tank. Series 2 drill bit 550 psi down-hole pressure. Fluid return is good from 8-61 feet. | 610 |
| 15 | 2 | 5.0/5.0 | 84 | SW | R3 | | | | Bj, 0, Pl, Sm<br>Bj, 0, Wa, Ro, Op<br>Bj, 0, ground down, no fit | | - 16 feet: weathering decreases to fresh<br>- 16.4-18.1 feet: beds are planar and not wavy | Rod drop of <=1 foot at 15.2 feet | 605 |
| 20 | 3 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 15, Pl, Sm, Op, stained | | - 18.5-18.9 feet: fossiliferous | | 600 |
| 25 | 4 | 5.1/5.0 | 100 | F | R3 | BHTV | | | Bj, 5, Wa, Sl-Ro<br>Bj, 5, Pl, Sm<br>Bj, 10, Pl, Ro, Ti | | LIMESTONE (micrite) with interbedded shale; micrite is medium gray (N5) and shale is grayish black (N2); fresh; medium strong; laminated shale; bioturbated | BHTV analysis was conducted over the length of cored section | 595 |
| 30 | 5 | 5.0/5.0 | 100 | | | | | | Bj, 10, Wa, Ro, Ti | A | LIMESTONE (wackestone) with interbedded shale; wackestone is medium light gray (N6) and shale is grayish black (N2); fresh; medium strong; shale interbeds generally wavy and laminated | | 590 |
| 35 | 6 | 4.8/5.0 | 93 | F | R3 | | | | Bj, 15, Pl-Wa, Sl-Ro<br>Bj, 10, Sm, Pl | | | | 585 |
| 40 | 7 | 5.0/5.0 | 100 | | | | | | Bj, 10, Sm, Pl, Op | | | | 580 |
| 45 | 8 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 20, Pl, Sl-Ro, Ti<br>Bj, 15, Pl, Sl-Ro, Op<br>Bj, 10, Pl, Ro, Op<br>Bj, 10, Pl, Sl-Ro, Op<br>Bj, 15, Pl, Sl-Ro, Op | | - 43-46 feet: very fossiliferous<br>LIMESTONE (micrite) interbedded with thin shale layers; micrite is medium light gray (N6) and shale is grayish black (N2); fresh; medium strong; | | 575 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1044

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 9 | 5.1/5.0 | 100 | | | | | | Bj, 10, Pl, Sl-Ro | | occasional shale beds, wavy, laminated and bioturbated<br>- 48.8-49.8 feet: fossiliferous packstone | | 570 |
| 55 | 10 | 5.2/5.0 | 97 | F | R3 | | | | Bj, 10, Wa, Sl-Ro, fossils<br>Bj, 10, Pl, Sl-Ro | A | - frequent bioturbation throughout | | 565 |
| 60 | 11 | 5.0/5.0 | 100 | | | | | | Bj, 10, Wa, Ro, no fit<br>Bj, 10, Pl, Sm, no fit<br>Bj, 5, Pl, Sm-Sl-Ro | | - 56.8-60.2 feet: shale decreasing | | 560 |
| 65 | 12 | 5.0/5.0 | 89 | F | R3 | | | | Bj, 10, Pl, Sm, Op, poor fit<br>Bj, 20, Wa, no fit<br>Bj, 15, Wa, no fit<br>Bj, 10, Pl, Sm, Op | B | | 61-66 feet: lost 25 gallons of fluid return | 555 |
| 70 | 13 | 5.1/5.0 | 100 | | | | | | Bj, 10, Pl, St, Ro, Ti | | 66-76 feet: fluid return is good.<br>- 67.3 and 69.1 feet: abundant chert<br>- 68 feet: recovered core (68 feet) slightly exceeds cored section (67.8 feet) | | 550 |
| 75 | 14 | 5.0/5.0 | 100 | F | R3 | | | | | | LIMESTONE (wackestone) interbedded with thin shale layers; medium light gray (N6) and grayish black (N2); fresh; medium strong; some styolite features | PVC: 4 inch O. D. installed after drilling for BHTV test | 545 |
| 80 | | | | | | | | | | | Boring terminated at 76.0 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/18 - 9.5 feet | | 540 |
| 85 | | | | | | | | | | | | | 535 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1045

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532482.4 N; 628986.7 E | | Total Depth<br>75.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>622.4 feet | Ground Water Depth<br>See Note A | Date Started<br>6/6/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/7/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 622.4 CLAY, strong brown (7.5 YR 5/6), dry, medium stiff to hard (Fill) | | |
| | | SPT 1 | 2 3 2 | 18 | 22.0 | 58/ 34 | GSZ | | | | | 620 |
| | | SPT 2 | 2 5 7 | 18 | | | | | | - 3.5 feet: becomes strong brown (7.5 YR 4/6) | | |
| 5 | | | | | | | | | | 616.4 | 6.0 | |
| | | SPT 3 | 9 19 20 | 18 | 10.7 | 41/ 21 | GSZ | | CL | sandy CLAY with gravel, strong brown (7.5YR 4/6), moist, hard (Fill) | | 615 |
| | | | | | | | | | | 613.9 | 8.5 | |
| | | SPT 4 | 9 4 8 | 18 | | | | | CL | CLAY with sand, reddish gray brown (2.5 YR 5/1) to light reddish brown (2.5YR 7/4), stiff, moist, few gravel (Residual Soil) | | |
| 10 | | | | | | | | | | 611.4 | 11.0 | |
| | | SPT 5 | 9 10 11 | 18 | | | | | CH | CLAY, yellowish brown (10 YR 5/6), dry, very stiff (Residual) | | 610 |
| | | SPT 6 | 6 8 14 | 18 | 23.4 | 71/ 40 | GSZ | | | | | |
| 15 | | | | | | | | | | - 15.0 feet: limestone gravel | | |
| | | SPT 7 | 7 6 7 | 18 | | | | | | | | 605 |
| | | | | | | | | | | 603.9 | 18.5 | |
| | | SPT 8 | 50/1" | 0 | | | | | | | Auger SPT refusal at 18.5 feet. Continuation of boring description in rock log. | |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1045

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532482.4 N; 628986.7 E | | Total Depth<br>75.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>622.4 feet | Ground Water Depth<br>See Note A | Date Started<br>6/6/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 18.5 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/7/06 |

Reviewed by / Date DSC 3-13-07 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 2.7/2.7 | 62 | MW to SW | R3 | | | | no significant discontinuity | | LIMESTONE (micrite) with shale beds; medium light gray (N6), slight to moderate weathering, moderate strength; shale beds are thin to moderately thin | | |
| | 2 | 4.9/4.9 | 43 | HW<br>MW | R3 | | | | | A | -18.5-26.1 feet: shale beds are 0.1 feet apart | | 600 |
| 25 | 3 | 5.0/5.0 | 100 | F | R4 | BHTV | | | | | - 26.1 feet: shale beds 0.1-0.4 feet apart<br>- 26-30 feet: small calcite crystals observed | | 595 |
| 30 | 4 | 4.9/4.9 | 79 | SW to F | R4 | | | | | | | BHTV analysis was conducted over the length of cored section<br><br>32.7 feet: Unconfined Compression Test | 590 |
| 35 | 5 | 5.2/5.2 | 100 | SW to F | R4 | | | | | | | | 585 |
| 40 | 6 | 4.8/4.8 | 100 | SW to F | R4 | | | | | B | - 41-46 feet: shale beds are irregular with small amounts of bioturbation and relic shell fragments | | 580 |
| 45 | 7 | 5.0/5.0 | 100 | F | R4 | | | | | | - 46 feet: rock becoming fresh; strong<br><br>- 46-58 feet: shale beds are moderately thick to moderately thin 0.1-0.3 feet apart and irregularly shaped | | 575 |
| 50 | 8 | 5.1/5.1 | 100 | F | R4 | | | | | | | | 570 |
| 55 | | 5.0 | | | | | | | | | | | 565 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1045

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 9 | 5.0 | 90 | F | R4 | | | | | B | - 58-61 feet: shale beds thin to very thin with spacings 0.2-0.4 feet<br>59 feet: small calcite crystals visible<br>- 61-64 feet: shale beds moderately thin to very thin with spacing 0.2-0.4 feet apart | 58.6 feet: Unconfined Compression with Stress/Strain Test |
| 65 | 10 | 5.0/5.0 | 100 | SW to F | R4 | | | | | | - 64-75.1 feet: shale beds moderately thick | |
| 70 | 11 | 5.0/5.0 | 100 | F | R4 | | | | | | - 66.8-68.5 feet: fossiliferous layer | |
| 75 | 12 | 4.0/4.0 | 100 | F | R4 | | | | | | | PVC: 4 inch O. D. installed after drilling for BHTV test |
| 80 | | | | | | | | | | | Boring terminated at 75.1 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/6 - 16.3 feet<br>7/20 - 16.0 feet | |
| 85 | | | | | | | | | | | | |
| 90 | | | | | | | | | | | | |
| 95 | | | | | | | | | | | | |

Elevation (feet): 560, 555, 550, 545, 540, 535, 530, 525

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1046

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532242.9 N; 628945.3 E | | Total Depth<br>49.4 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>625.5 feet | Ground Water Depth<br>See Note A | Date Started<br>6/10/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Pearce | Date Completed<br>6/11/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 625.5 0.0 CLAY with gravel, light red (10R 7/6), moist, stiff (Fill) | | 625 |
| | | SPT 1 | 11 10 7 | 12 | | | | | | | gravel is carbonate fragments | |
| | | | | | | | | | CL | 622.5 3.0 CLAY with sand, yellowish brown (10YR 5/8), moist, soft to medium stiff | | |
| 5 | | SPT 2 | 3 4 5 | 18 | | | | | | - 4 feet: with silt, dark yellowish brown (10YR 4/4), mottled, trace organics | | 620 |
| | | SPT 3 | 2 4 6 | 12 | | | | | | - 6 feet: brownish yellow (10YR 6/6), trace manganese oxide nodules of 0.01 feet diameter | | |
| 10 | | SPT 4 | 4 11 10 | 18 | 21.9 | 46/ 22 | GSZ H | | | - 8.5 feet: brownish yellow (10YR 6/8) with black staining, 0.25 - 0.5 inch clast in shoe, subrounded, carbonate | | 615 |
| | | SPT 5 | 2 4 7 | 18 | | | | | | - 11 feet: trace clastics, very fine sand size | | |
| 15 | | SPT 6 | 3 5 5 | 18 | | | | | | - 13.5 feet: yellowish brown (10YR 5/8), trace clasts (1-2mm) of carbonate | | 610 |
| | | | | | | | | | CH | 609.5 16.0 CLAY, yellowish brown (10YR 5/0) with black stains, moist, very stiff to medium stiff, 15-20% clastic in lower barrel, subangular to angular fragments of carbonate up to 10mm | | |
| | | SPT 7 | 5 6 15 | 14 | 24.3 | 72/ 48 | GSZ | | | | | |
| 20 | | SPT 8 | 1 3 4 | 11 | 34.3 | 79/ 50 | GSZ | | | - 18.5 feet: dark yellowish brown (10YR 4/6), few black clasts of coarse to very coarse sand<br>- 20 feet: carbonate clasts of fine sand size, coarser angular clasts in shoe (2-10mm) | | 605 |
| | | SPT 9 | 2 2 2 | 14 | 39.8 | 84/ 54 | | | | - 21 feet: yellowish brown (10YR 5/4), few localized carbonate clasts up to 10mm | | |
| | | SPT 10 | 30/1" | 0 | | | | | | 601.9 23.6 | SPT refusal at 23.6 feet. Continuation of borehole description in rock log. | |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1046

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532242.9 N; 628945.3 E | | Total Depth<br>49.4 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>625.5 feet | Ground Water Depth<br>See Note A | Date Started<br>6/10/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 23.5 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Pearce | Date Completed<br>6/11/06 |

Reviewed by / Date W Gohlmann 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 0.7 / 0.9 | 77 | SW | R1 to R2 | PA | | | | A | LIMESTONE (micrite) with shale interbeds; medium bluish gray (5B 5/1) | | |
| 25 | 2 | 5.0 / 5.0 | 100 | F | R3 | | | | Jo, 15, St, Sl | | - 25 feet: interbedded shale, trace fossils zones (2 inches)<br>- 26.5 feet: vertical calcite filled vein, shale rich zone (3 inch) with fossils<br>- 27.5 feet: irregularly spaced thin shale interbeds at 15-25° and strong reaction with HCl, thin beds<br>- 27.8 feet: joint filled with calcareous clay | 500 psi downpressure<br>25.4 feet: lost fluid circulation | 600 |
| 30 | 3 | 5.0 / 5.0 | 100 | F | R2 to R3 | | | | | | - 30 feet: fossiliferous zones 2-3 inches, light gray (N7) | | 595 |
| 35 | 4 | 5.0 / 5.0 | 100 | F | R2 | | | | Jo, 5, Wa, Ro, Op | | - 33.4 to 34 feet: vertical to subvertical fractures (joint), tight, carbonate clay-filled | | 590 |
| 40 | 5 | 5.0 / 5.0 | 100 | F | R2 | | | | Jo, 5, Wa, Sl, Ti | | - 43 feet: vugs above fracture, clay filled seam | | 585 |
| 45 | 6 | 5.0 / 5.0 | 100 | F | R2 to R3 | | | | Jo, 10, Wa, Sl, Ti | | | | 580 |
| 50 | | | | | | | | | | | Boring terminated at 49.4 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/14 - 18.1 feet | | 575 |
| 55 | | | | | | | | | | | | | 570 |
| 60 | | | | | | | | | | | | | 565 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1047

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532622.2 N; 628995.6 E | | Total Depth<br>120 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>619.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/25/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>6/26/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 619.2 CLAY, yellowish brown (10YR 5/6) to brown (7.5YR 5/4), moist, medium stiff, very stiff, and stiff, trace gravel and manganese nodules (Residual) 0.0 | | |
| | | SPT 1 | WOR 3 4 | 7 | | | | | | | | |
| | | SPT 2 | 4 8 12 | 13 | 23.1 | 59/ 33 | GSZ | | | - 3.5 feet: color changes to brown (7.5YR 5/4) | | 615 |
| 5 | | | | | | | | | | | | |
| | | SPT 3 | 4 6 9 | 13 | 25.6 | 66/ 38 | GSZ | | | - 6.5 feet: slight color change to strong brown (7.5YR 5/8) | | |
| | | SPT 4 | 3 4 8 | 9.5 | | | | | | - soil contains gravel and becomes greenish/grayish brown (10YR 5/2) | | 610 |
| 10 | | | | | | | | | | 608.2 11.0 | | |
| | | SPT 5 | 11/2" | 2 | | | | | GW | 607.7 GRAVEL with clay, yellow, very dense, possible weathered bedrock 11.5 | SPT refusal: advanced 2 inches with one blow followed by zero advancement after 10 blows Augered to 11.8 feet and washed hole to 12 feet. Continuation of borehole description in rock log. | |
| 15 | | | | | | | | | | | | 605 |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | 590 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1047

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532622.2 N; 628995.6 E | | Total Depth<br>120 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>619.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/25/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 11.6 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>6/26/06 |

Reviewed by / Date W. Abdelmi 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 3.0/3.0 | 100 | SW to F | R3 | | | | Bj, 15, Wa, Ro, poor fit | | LIMESTONE (micrite) interbedded with thin shale beds; micrite is medium gray (N5) and shale is grayish black (N2); fresh to slightly weathered; medium strong; shale interbeds are wavy, irregular and occasionally grade into thin wackestone intervals<br>- 15 feet: rock becomes fresh | Fluid return good throughout drilling of boring | 605 |
| 15 | 2 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 15, St, Ro | | | | 600 |
| 20 | 3 | 5.0/5.0 | 100 | | | | | | | | | | 595 |
| 25 | 4 | 5.0/5.0 | 99 | F | R3 | | | | Bj, 10, Pl, Sm, Ti | | | | 590 |
| 30 | 5 | 5.0/5.0 | 100 | | | | | | | B | - 30-42 feet: increasing shale content | | 585 |
| 35 | 6 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 10, Pl, Sl-Ro, Op<br>Bj, 15, Pl, Sm, Ti | | | | 580 |
| 40 | 7 | 4.9/5.0 | 99 | | | | | | | | - 42-50 feet: generally very little shale interbeds | | 575 |
| 45 | 8 | 5.0/5.0 | 100 | F | R3 | | | | | | | | 570 |
| 50 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Proiect: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1047

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 5.0/5.0 | 100 | | | | | | | | | | |
| 55 | | | | F | R3 | | | | | | | | 565 |
| | 10 | 5.0/5.0 | 100 | | | | | | | | LIMESTONE (wackestone) interbedded with shale; wackestone is medium gray to light gray (N5-N6) and shale is grayish black (N2); fresh; moderately strong; thin to laminated wavy shale beds | milky gray drilling return | |
| 60 | | | | | | | | | | | | | 560 |
| | 11 | 5.0/5.0 | 100 | | | | | | | | | | |
| 65 | | | | F | R3 | | | | | | | | 555 |
| | 12 | 5.1/5.0 | 100 | | | | | | Bj, 15, Pl, Sm, Op, poor fit | | | | |
| | | | | | | | | | | | | | 550 |
| 70 | 13 | 2.6/2.0 | 100 | | R2 to R3 | | | | | B | calcareous SHALE; grayish black (N2); fresh; weak to medium strong; beds dipping 10-15°; interbedded with micrite | | |
| | 14 | 3.3/3.0 | 100 | | | | | | | | | | 545 |
| 75 | | | | F | R3 | | | | | | | | |
| | 15 | 5.0/5.0 | 100 | | | | | | | | - 79.8 feet: grading to limestone (micrite) with interbedded shale, approximate contact at 79.8 feet | | 540 |
| 80 | | | | | | | | | | | | | |
| | 16 | 5.1/5.0 | 100 | | | | | | | | | | 535 |
| 85 | | | | F | R3 | | | | | | | down hole pressure = 500 psi | |
| | 17 | 4.8/5.0 | 96 | | | | | | | | LIMESTONE (wackestone) interbedded with shale; medium gray (N5) to dark gray (N3); fresh; medium strong; regular intervals of wavy laminations of shale | | 530 |
| 90 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1047

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 18 | 5.2/5.0 | 100 | | | | | | | | - 93-95 feet: bioturbated | | 525 |
| 95 | | | | F | R3 | | | | | | | | |
| | 19 | 4.9/5.0 | 98 | | | | | | | | | | 520 |
| 100 | | | | | | | | | | | | | |
| | 20 | 5.3/5.0 | 100 | | | | | | | | | | 515 |
| 105 | | | | F | R3 | | | | Bj, 25, Pl, Sl-Ro, Ti<br>Bj, 5, Wa, Ro, Ti | B | | |
| | 21 | 4.8/5.0 | 96 | | | | | | | | LIMESTONE interbedded with thin shale; from 106 to 120 feet, alternating 1 to 4 feet intervals of micritic limestone and wackestone; micrite and wackestone are medium gray (N5) and shale is grayish black (N2); fresh; moderately strong<br>- 108.1 feet: recovered core slightly exceeds the cored length of 108 feet<br>- 106-109 feet: micrite<br>- 109-112 feet: wackestone<br>- 112-113 feet: micrite<br>- 113-120 feet: wackestone | | 510 |
| 110 | | | | | | | | | | | | | |
| | 22 | 5.1/5.0 | 100 | | | | | | | | | | 505 |
| 115 | | | | F | R3 | | | | Bj, 0, Pl, Ro, Ti | | | | |
| | 23 | 5.0/5.0 | 100 | | | | | | | | | | 500 |
| 120 | | | | | | | | | Bj, 15, Pl, Ro | | | | |
| | | | | | | | | | | | Boring terminated at 120 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/27 - 5.2 feet | | 495 |
| 125 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 490 |
| 130 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1048

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532210.9 N; 628709.9 E | | Total Depth<br>76.3 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>627.8 feet | Ground Water Depth<br>See Note A | Date Started<br>7/6/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>7/7/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 627.8 CLAY with sand, yellowish brown (10YR 5/6), very stiff (Fill) 0.0 | |
| | | SPT 1 | 5 7 9 | 18 | | | | | CH | 626.3 sandy CLAY, brown (7.5YR 4/4) with reddish yellow mottling (7.5YR 6/8), dry, very stiff (Fill) 1.5 | |
| | | SPT 2 | 5 6 9 | 18 | 22.7 | 54/ 26 | GSZ | | | | |
| 5 | | | | | | | | | | - 5.0 feet: color changes to yellowish red (5YR 4/6) | |
| | | SPT 3 | 5 7 8 | 18 | | | | | | | |
| | | | | | | | | | CH | 619.8 sandy CLAY, strong brown (7.5YR 5/8), moist, stiff, few manganese nodules (Residual) 8.0 | |
| | | SPT 4 | 4 6 8 | 18 | 20.7 | 51/ 24 | GSZ | | | | |
| 10 | | | | | | | | | | | |
| | | SPT 5 | 4 6 7 | 15 | 18.8 | | CHE | | | | |
| | | SPT 6 | 9 10 10 | 18 | | | | | CL | 614.0 sandy CLAY with gravel, strong brown (7.5YR 5/8), moist, very stiff, gravel is angular and effervesces violently with HCl 13.8 | |
| 15 | | | | | | | | | | | |
| | | SPT 7 | 7 8 10 | 18 | 29.4 | 38/ 16 | GSZ | | CL | 611.8 CLAY, strong brown (7.5YR 5/6) to yellowish red (5YR 5/8), moist, very stiff to hard, few manganese nodules, slight effervecense with HCl 16.0 | |
| | | SPT 8 | 5 7 50/1" | 13 | | | | | | | SPT refusal at 19.5 feet. Auger refusal at 20.8 feet. Coring began at 20.6 feet. Continuation of borehole description in rock log. |
| 20 | | | | | | | | | | 607.2 20.6 | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 625, 620, 615, 610, 605, 600

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1048

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532210.9 N; 628709.9 E | | Total Depth<br>76.3 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>627.8 feet | Ground Water Depth<br>See Note A | Date Started<br>7/6/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 21.1 feet | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>7/7/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 1 | 5.5/5.5 | 73 | SW | R3 | | | | | A | LIMESTONE (micrite) interbedded with calcareous shale; medium gray (N5) and shale is dark gray (N3); slightly weathered to fresh; medium strong; effervesces strongly with HCl; bedding is medium thin to thin<br>- 21.4-22 feet: packstone bed, incipient fractures<br>- 21.6-22 feet: clay filled fractures, clay is reddish brown<br>- 24.6-25 feet: clay lined fractures, clay is olive brown | 23.8 feet: lost water return and did not recover | 605 |
| 30 | 2 | 4.7/5.3 | 83 | F | R3 | | | | | | - 26.1-26.5 feet: bioturbated<br>- 26.7-28 feet: packstone bed | | 600 |
| 35 | 3 | 5.4/4.8 | 100 | F | R3 | BHTV | | | | | - 31.2-31.4 feet: bioturbated<br>LIMESTONE (micrite) with thin beds of packstone; micrite and packstone are medium gray (N5); fresh; medium strong; effervesces strongly with HCl; bedding is medium thin to thin<br>- 34.5-35 feet: rip-up clasts, horizontal stylolites present, thinly spaced | | 595 |
| 40 | 4 | 5.0/5.0 | 100 | | | NG | | Bj, 20, Wa, Ro, Ti<br>Bj, 10, Wa, Ro, Op | | | - 37.9 and 39.0 feet: rip-up clasts present | BHTV and NG analysis were conducted over the length of cored section | 590 |
| 45 | 5 | 5.1/5.1 | 100 | F | R3 | | | | | B | | 43.5 feet: slight hydrocarbon odor along mechanical breaks | 585 |
| 50 | 6 | 4.9/5.0 | 97 | | | | | | | | - 46-51 feet: thin beds of calcareous shale present, medium dark gray (N4), rip-up clasts, thin to medium spaced horizontal stylolites | | 580 |
| 55 | 7 | 5.2/5.0 | 100 | F | R3 | | | | | | - 54.1-54.4 feet: rip-up clasts present | | 575 |
| 60 | 8 | 4.9/5.0 | 98 | | | | | | | | LIMESTONE (micrite and wackestone) with thin | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1048

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 5.1/5.0 | 100 | F | R3 | | | | Bj, 15, Wa, Ro, Ti | B | beds of packstone and thinly laminated calcareous shale; micrite and packstone are medium gray (N5); fresh; medium strong; <10% shale<br>- 62.3 feet: calcite filled vug <0.1 feet in diameter | | 565 |
| 65 | | | | | | | | | | | | | |
| | 10 | 4.9/5.0 | 98 | | | | | | Bb, 10, Wa, Sl, Ti | | - 66-71 feet: increase of calcareous shale beds with abundant rip-up clasts<br>- 65.8 -66.8 feet: incipient fractures | | 560 |
| 70 | | | | | | | | | | | | | |
| | 11 | 5.0/5.0 | 100 | F | R3 | | | | | | LIMESTONE (packstone) with micrite and shale interbeds; packstone and micrite are medium gray (N5) and shale is medium dark gray (N4); fresh; medium strong; shale is medium to thin spaced | PVC: 4 inch O. D. installed after drilling for BHTV test | 555 |
| 75 | | | | | | | | | | | | | |
| | | | | | | | | | | | Boring terminated at 76.3 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/17 - 20.7 feet<br>8/18 - 14.2 feet | | 550 |
| 80 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 545 |
| 85 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 540 |
| 90 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 535 |
| 95 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 530 |
| 100 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1048UDD

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft)<br>1532209.8 N; 628704.1 E | | Total Depth<br>18.8 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>627.8 feet | Ground Water Depth<br>See Note A | Date Started<br>8/22/06 |
| Sampling Method<br>SPT / UD | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/22/06 |

Reviewed by / Date W Bodman 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 627.8 CLAY with sand, reddish brown (5YR 4/4), moist, stiff (Fill) 0.0 | | |
| | | SPT 1 | 5 4 6 | 10.2 | | | | | | | Bulk sample taken from 1-5 feet: 1048UDD-Bulk #1 | 625 |
| | | UD 2 | | 17.9 | | | | | | | | |
| 5 | | SPT 3 | 3 6 6 | 15.6 | | | | | | | Bulk sample taken from 5-10 feet: 1048UDD-Bulk #2 | |
| | | | | | | | | | | 620.3 7.5 | | |
| | | UD 4 | | 18 | | | TXD | | CH | CLAY, yellowish brown (10YR 5/6), moist, stiff, contains manganese nodules | | 620 |
| 10 | | SPT 5 | 3 4 8 | 13.8 | | | | | | - 11 feet: color becomes mottled with light gray (10YR 7/2) | | |
| | | | | | | | | | | 615.1 12.7 | | |
| | | UD 6 | | 9 | | | | | CL | sandy CLAY with gravel, light yellowish brown (10YR 5/4), moist, very stiff | | 615 |
| | | SPT 7 | 14 9 11 | 0 | | | | | | | 13.8 feet: encountered refusal with Shelby tube at 13.8 feet. Switched to SPT No recovery from 1048UDD-7 | |
| 15 | | UD 8 | | 7.2 | | | | | | | | |
| | | | | | | | | | | 610.4 17.4 | | |
| | | SPT 9 | 8 13 21 | 13.2 | | | | | CL | CLAY with gravel, yellowish brown (10YR 5/4), moist, hard | | 610 |
| | | | | | | | | | | 609.0 18.8 | | |
| | | | | | | | | | | Boring terminated at 18.8 feet. Bedrock not encountered. | | |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1049

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532539.2 N; 628917.1 E | | Total Depth<br>128 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>617.3 feet | Ground Water Depth<br>See Note A | Date Started<br>8/15/06 |
| Sampling Method<br>SPT / Shelby Tube | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/16/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 617.3 CLAY, dark yellowish brown (10YR 4/4), moist, very stiff, few manganese nodules and organics | |
| | | SPT 1 | 5 8 8 | 12 | | | | | | | |
| | | SPT 2 | 6 7 6 | 15.6 | | | | | CH | 614.1 CLAY, olive brown (2.5Y 5/3), wet to moist, stiff, trace manganese nodules and organics | 3.2 |
| 5 | | UD 3 | | 15 | | | | | | | |
| | | SPT 4 | 2 3 6 | 18 | | | | | | | |
| | | SPT 5 | 16 13 13/5" | 10.8 | | | | | | 607.8 - 8.5 feet: becomes olive brown (2.5Y 4/3) with few limestone gravel | 9.5 |
| 10 | | | | | | | | | | | 7.5 feet: attempted to obtain a shelby tube sample without success. A hard substance was encountered that bent the tube. SPT refusal at 9.4 feet. Auger refusal at 9.5 feet. Continuation of borehole description on rock log. |
| 15 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 615, 610, 605, 600, 595, 590

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1049

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532539.2 N; 628917.1 E | | Total Depth<br>128 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>617.3 feet | Ground Water Depth<br>See Note A | Date Started<br>8/15/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D / 9.9 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/16/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 2.9/3.0 | 97 | SW | R3 | | | Bj, 5, Wa, Sl, Op | B | weathered LIMESTONE and clay<br>LIMESTONE (packstone) with calcareous shale interbeds; medium gray (N5) to medium bluish gray (5B 5/1); slightly weathered; medium strong; strong HCl reaction | Fluid return good throughout boring | 605 |
| 15 | 2 | 4.9/5.0 | 76 | | | | | Jo, 70, Wa, Sl, Ti, light colored mineralization<br>Jo, 70, Wa, Sl, Ti, light colored mineralization | | - 9.9-32.8 feet: shale is hairline to 0.1 feet thick with spacings of <0.05-0.4 feet, wavy | | 600 |
| 20 | 3 | 5.1/5.0 | 98 | SW | R3 | | | Bj, 5, Wa, Sl, Op<br>Bj, 5, Wa, Sl, Op | | - 20.5 feet: rip up features | | 595 |
| 25 | 4 | 5.1/5.0 | 100 | | | | | | | - 26 feet: rip up features | | 590 |
| 30 | 5 | 5.0/5.0 | 100 | F | R3 | | | | | - 32.8-45 feet: large rip up clasts (up to 0.05 inch diameter) and styolitic features present | Add conductor casing, reseat at 9.9 feet | 585 |
| 35 | 6 | 4.9/5.0 | 98 | | | | | | | LIMESTONE (packstone) with calcareous shale interbeds; packstone is medium bluish gray (5B 5/1) and shale is dark gray (N3); fresh; medium strong<br>- 32.8-45 feet: shale is 0.01-0.1 feet thick with varied spacing between 0.01-0.3 feet, wavy with rip ups | | 580 |
| 40 | 7 | 4.9/5.0 | 98 | F | R3 | | | | | | | 575 |
| 45 | 8 | 5.1/5.0 | 100 | | | | | Bj, 5, Wa, Sl, Op | | - 45-60 feet: shale is 0.01-0.15 feet thick with spacings of 0.01-0.5 feet, prominent rip up features | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1049

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 9 | 5.0/5.0 | 99 | F | R3 | | | | | B | | | 565 |
| 55 | 10 | 5.1/5.0 | 100 | F | R3 | | | | | B | | | 560 |
| 60 | 11 | 4.9/5.0 | 99 | F | R3 | | | | | B | - 60-75 feet: shale is 0.05-0.2 feet thick with spacings < 0.15 feet, shale constitutes ~25-30% of the rock, rip up features <0.03 feet diameter | | 555 |
| 65 | 12 | 5.0/5.0 | 99 | F | R3 | | | | | B | - 66-85 feet: intervals of micrite and lesser shale interbeds | | 550 |
| 70 | 13 | 5.0/5.0 | 100 | F | R3 | | | | | B | | | 545 |
| 75 | 14 | 5.1/5.0 | 100 | F | R3 | | | | | B | - 75-90 feet: shale is 0.01-0.1 feet thick with spacings of < 0.2 feet, wavy with rip up features | | 540 |
| 80 | 15 | 5.1/5.0 | 100 | F | R3 | | | | | B | | | 535 |
| 85 | 16 | 4.9/5.0 | 98 | F | R3 | | | | | B | | | 530 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1049

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 17 | 4.8/5.0 | 96 | | | | | | | | - 90-97.6 feet: shale is on average 0.01 feet thick with spacings of < 0.2 feet, wavy with rip up features | | 525 |
| | | | | | R3 | | | | | | | | |
| 95 | 18 | 5.3/4.8 | 100 | SW to F | | | | | | | | | 520 |
| | | | | | | | | | | | - 97.6-105 feet: area of less shale with pressure solution features | | |
| 100 | 19 | 5.2/5.3 | 98 | | | | | | Bj, 70, Wa, Sl, Op/Ti | | | | 515 |
| | | | | SW to F | R3 | | | | | | | | |
| 105 | 20 | 5.0/5.0 | 99 | | | | | | | B | - 105-109.8 feet: shale is hairline to 0.1 feet thick with spacings of <0.3 feet | | 510 |
| | | | | F | | | | | | | | | |
| 110 | 21 | 5.1/5.0 | 100 | | | | | | | | - 109.8-121.5 feet: zone with less shale, shale is hairline to 0.01 feet thick with pressure solution features | | 505 |
| | | | | | R3 | | | | | | | | |
| 115 | 22 | 4.9/5.0 | 98 | | | | | | | | | | 500 |
| | | | | F | | | | | | | | | |
| 120 | 23 | 4.9/5.0 | 98 | | | | | | | | | | 495 |
| | | | | | R2 | | | | | | | | |
| 125 | 24 | 4.7/5.0 | 95 | F | | | | | | C | SHALE (calcareous) with packstone interbeds; dark gray (N3) and packstone is medium bluish gray (5B 5/1); fresh; weak; strong HCl reaction; shale can be scratched by thumb nail; shale constitutes ~50% of the rock; spacing of shale beds is < 0.3 feet<br>- shaley zone | | 490 |
| | | | | | | | | | | | Boring terminated at 128 feet | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1049

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 130 | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface) .<br>8/17 - 9.5 feet | | 485 |
| 135 | | | | | | | | | | | | | 480 |
| 140 | | | | | | | | | | | | | 475 |
| 145 | | | | | | | | | | | | | 470 |
| 150 | | | | | | | | | | | | | 465 |
| 155 | | | | | | | | | | | | | 460 |
| 160 | | | | | | | | | | | | | 455 |
| 165 | | | | | | | | | | | | | 450 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1050

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532300.7 N; 628780.2 E | | Total Depth<br>75.2 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>624.1 feet | Ground Water Depth<br>See Note A | Date Started<br>5/28/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>5/30/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (Inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 624.1 sandy CLAY, reddish brown (2.5YR 4/4), moist, stiff, trace roots, trace manganese nodules | | |
| | | SPT 1 | 4 5 5 | 18 | 18 | 55/ 32 | GSZ | | | | | |
| | | | | | | | | | CL | 620.6 sandy CLAY, reddish brown (2.5YR 4/4), moist, stiff | | 620 |
| 5 | | SPT 2 | 4 5 5 | 14.4 | 24.2 | 49/ 21 | GSZ | | | | | |
| | | | | | | | | | CL | 618.1 CLAY, yellowish brown (10YR 5/8) mottled with dark red (2.5YR 3/6), moist, very stiff | | |
| | | SPT 3 | 7 8 8 | 15.6 | | | | | | | | |
| 10 | | SPT 4 | 10 11 13 | 18 | | | | | | - 8.5-10 feet: silt lense, very pale brown (10YR 7/4) mottled with brown (10YR 5/3),moist, very stiff, few gravel (limestone rock fragments) | | 615 |
| | | SPT 5 | 8 9 13 | 6 | | | | | | - 11-13.5 feet: few limestone gravel content, occasional black silt joints | | |
| | | SPT 6 | 23 50/0" | 6 | | | | | GC | 610.6 GRAVEL with clay, brown (10YR 5/3), moist, hard, limestone gravels | SPT refusal at 14 feet. Auger refusal at 14.5 feet. Continuation of borehole description in rock log. | 610 |
| 15 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | 595 |

Lithology: 0.0 – 3.5; 3.5 – 6.0; 6.0 – 13.5; 13.5 – 14.0

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1050

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532300.7 N; 628780.2 E | | Total Depth<br>75.2 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>624.1 feet | Ground Water Depth<br>See Note A | Date Started<br>5/28/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 19.6 feet | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>5/30/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 5.6/6.0 | 58 | SW to F | R2 | GJ GJ | | Bj, 10, Ro, Op, clay filled<br>Bj, 20, Wa, Ro, clay filled<br>Bj, 10, Sm, O, clay filled | A | GRAVEL with clay, brown (10YR 5/3), moist, hard, limestone gravels<br>LIMESTONE (micrite) with interbedded packstone and shale; micrite and packstone are medium gray (N5) and shale is dark gray (N3); slightly weathered to fresh; weak; bioturbation present; clay seams at 16.2-16.9 feet, 17.5-17.7 feet and 18.8-19 feet<br>- 18.8-18.9 feet: clay-filled bedding joint | Casing set at 14.8 feet. down pressure 400 psi<br>18.9 feet: lost fluid return and did not recover, fluid brown | 610<br>605 |
| 20 | 2 | 4.7/4.8 | 98 | F | R2 | | | Bj, 10, Wa, Ro, Op | | - 20.2-25.2 feet: increase in packstone beds, contact is wavy, increased bioturbation<br>- 23.7 feet: calcite-filled vug 0.05 feet in diameter | 19.58 feet: Unconfined Compression with Stress/Strain Test<br>Advance depth of casing to 19.6 feet in attempt to restore fluid circulation | 600 |
| 25 | 3 | 5.0/5.0 | 100 | F | R2 to R3 | | | Bj, 10, Pl, Sl, Op | | LIMESTONE (packstone) with thin beds of micrite; packstone is medium gray (N5) to medium dark gray (N4); fresh; weak to medium strong; micrite beds are thin to very thin<br>- 26.9 and 28.1 feet: micrite beds have wavy contacts | | 595 |
| 30 | 4 | 5.0/5.0 | 100 | F | R2 | | | Bj, 10, Wa, Sl, Ti | | LIMESTONE (micrite) with interbedded shale; micrite is medium gray (N5) and shale is dark gray (N3); fresh; weak; shale beds are fossiliferous<br>- 33-35 feet: thin layers of packstone present | | 590 |
| 35 | 5 | 3.0/3.0 | 100 | F | R2 | | | Mb/Bj, 15, Wa, Ro, Op | B | LIMESTONE (packstone) with thin beds of shale; packstone is medium gray (N5) and shale is medium dark gray (N4); fresh; weak; occasional stylolites | 36.2 feet: Unconfined Compression Test | |
| 40 | 6 | 1.9/1.9 | 100 | F | R3 | GJ GJ | | | | - 38 feet: rock is moderately strong | 36.7 feet: Unconfined Compression with Stress/Strain Test | 585 |
| 45 | 7 | 5.0/5.0 | 100 | F | R3 | | | | | LIMESTONE (micrite) with thin beds of shale; micrite is medium gray (N5) and shale is medium dark gray (N4); fresh; weak; shale beds are very thin with wavy contacts<br>- 42.9-43.5 feet: packstone bed<br>- 44.7-44.9 feet: packstone bed | | 580 |
| 50 | 8 | 5.0/5.0 | 100 | F | R3 | | | | | | | 575 |
| | 9 | 5.0/5.0 | 100 | F | R3 | | | | | LIMESTONE (wackestone and micrite) with thin beds of shale; micrite and wackestone are medium gray (N5) and shale is dark gray (N3); fresh; medium strong; horizontal stylolites<br>- 51.3-51.6 feet: thin packstone bed | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

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# ROCK LOG - Boring No. B-1050

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 10 | 4.9/5.0 | 98 | F | R3 | GJ | | | | B | - 55-60 feet: increase in thin beds of shale<br>- 56.9-59.6 feet: rip-up clasts<br>- 58.4-58.8 feet: thin layer of packstone | 58.3 feet: Unconfined Compression with Stress/Strain Test | 570 |
| 60 | 11 | 5.1/5.2 | 100 | F | R3 | GJ | | | | | LIMESTONE (packstone) interbedded with thin beds of micrite and shale; packstone is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; fractures are widely spaced and some are calcite filled<br>- 61.3-65 feet: fossiliferous beds with wavy contacts<br>- 64.3-64.6 feet: rip-up clasts<br>- 65-70 feet: occasional calcite-filled vugs 0.05 feet in diameter | | 565 |
| 65 | 12 | 5.0/5.0 | 100 | F | R3 | GJ | | Mb/Bj, 30, Wa, Ro, Op | | | - 68.9 feet: predominantly micrite with thin beds of packstone<br>- 70.1-73.6 feet: horizontal stylolites present | 69.1 feet: Unconfined Compression with Stress/Strain Test | 560 |
| 70 | 13 | 5.0/5.1 | 98 | F | R3 | | | | | | - 72.6-73.6 feet: micrite with thin beds of shale, fossils and rip-up clasts | | 555 |
| 75 | | | | | | | | | | | Boring terminated at 75.2 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/29 - 15.8 feet<br>5/30 - 15.8 feet | | 550 |
| 80 | | | | | | | | | | | | | 545 |
| 85 | | | | | | | | | | | | | 540 |
| 90 | | | | | | | | | | | | | 535 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1051

| | | | |
|---|---|---|---|
| Drilling Method: Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft) 1532145.5 N; 628731.1 E | | Total Depth: 43 feet |
| Drilling Contractor (Driller) and Rig: MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88): 629.1 feet | Ground Water Depth: See Note A | Date Started: 5/16/06 |
| Sampling Method: Split Spoon | Borehole Inclination: Vertical | Logged by: A. Tillery | Date Completed: 5/17/06 |

Reviewed by / Date DSC 5-8-07 Rev. 1 5-10-07

| Depth (feet) | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 0 | SPT 1 | 2 6 9 | 18 | | | | CH | CLAY with sand, yellowish red (5YR 5/6), moist, stiff, few lenses of gravel, trace black manganese nodules, gravel lenses have sub angular particles that are non reactive to acid (not limestone) 2 cm in size | |
| | SPT 2 | 3 6 6 | 17 | | | | CH | CLAY with sand, strong brown (7.5YR 4/6), moist, stiff, few gravel | |
| 5 | SPT 3 | 3 6 9 | 15 | 20.8 | 57/30 | GSZ | CH | sandy CLAY, yellowish brown (10YR 5/8) to brown (7.5YR 4/4) mottled with red and green, moist, stiff, trace limestone fragments | |
| | SPT 4 | 2 4 6 | 17 | | | | | | |
| 10 | SPT 5 | 2 2 6 | 21 | | | | | - color grades from reddish brown (5YR 4/3) to yellowish brown (10YR 5/6) | |
| | SPT 6 | 5 10 12 | 11 | | | | CH | gravelly CLAY, clay is yellowish brown (10YR 5/6) and limestone gravels are gray, moist, very stiff to stiff, trace black oxide grains | |
| 15 | SPT 7 | * | 10 | 16.3 | 72/45 | GSZ | | - 16-17 feet: zone with lower gravel content (mostly clay) | * SPT 7 blow counts not recorded due to rig geologist omission |
| | SPT 8 | 1 3 4 | 5 | | | | | | |
| 20 | SPT 9 | 1 3 8 | 18 | | | | | - 20.4-23 feet: zone with lower gravel content | |
| | SPT 10 | 1 3 0 | 17 | 45.2 | 75/44 | GSZ | CH | CLAY, light brownish gray (10YR 6/2), moist, very soft | |
| 25 | | | | | | | | - 24.6-25.4 feet: void | 24.5-25.5 feet: weight of rods (WOR) advance |
| | SPT 11 | 3 6 6 | 15 | | | | CL | CLAY, dark yellowish brown (10YR 4/4), moist, stiff | 25.5 feet: samples becoming wet |
| | | | | | | | GC | gravelly CLAY, yellowish brown (10YR 5/4), wet, soft | |
| 30 | SPT 12 | 1 1 1 | 7 | | | | | - 29-36 feet: gravel is angular with < 1 cm diameter and reacts with acid | |

| Lithology | Depth (feet) |
|---|---|
| 629.1 | 0.0 |
| 625.4 | 3.7 |
| 623.1 | 6.0 |
| 616.1 | 13.0 |
| 606.1 | 23.0 |
| 604.5 | 24.6 |
| 603.7 | 25.4 |
| 602.1 | 27.0 |

Elevation (feet): 625, 620, 615, 610, 605, 600

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1051

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | | | | GC | 598.1 31.0 VOID (drill rod dropped) | 31-36 feet: WOR advance<br>32.5 feet: depth from ground surface to water table | 595 |
| 35 | | SPT 13 | 1 1 1 | 7 | 50.3 | 62/34 | GSZ | | CH | 593.1 36.0 gravelly CLAY, light olive brown (2.5Y 5/4), wet, very soft, few sand and small gravel | 37 feet: difficulty advancing hollow-stem, begin continous SPT sampling | |
| | | SPT 14 | 1 1 1 | 4.5 | | | | | GC | 590.6 38.5 GRAVEL with clay, clay is light olive brown (2.5Y 5/4), wet, stiff, gravel fragments are 1-3 cm in diameter | | 590 |
| 40 | | SPT 15 | 1 5 4 | 24 | | | | | | | | |
| | | SPT 16 | 5 7 4 | 24 | | | | | | | | |
| | | SPT 17 | 9 11 31/0" | 11 | | | | | | 586.6 42.5 586.1 43.0 Weathered LIMESTONE, medium dark gray (N4), highly weathered<br>Boring terminated at 43.0 feet. See continuation of description on rock core log for the offset boring B-1051A. | SPT advanced but was broken when removed. The cause is believed to be due to angular advancement or binding of the tool with sloping bedrock surface. SPT refusal at 43 feet. Recovery was not recorded. Boring moved to B-1051A. | 585 |
| 45 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | 580 |
| 55 | | | | | | | | | | | | 575 |
| 60 | | | | | | | | | | | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Louis & Associates, Inc.

# SOIL LOG - Boring No. B-1051A

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532159.7 N; 628729.8 E | | Total Depth<br>51.9 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 550 | Elevation (Datum NAVD 88)<br>629.1 feet | Ground Water Depth<br>See Note A | Date Started<br>5/23/06 |
| Sampling Method<br>No sampling | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>5/23/06 |

Reviewed by / Date DSC 5-9-07 Rev. 1 RWZ 5-10-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 629.1 Refer to borehole B-1051 for soil profile. 0.0 | B-1051A boring advanced until refusal was met. Then switched to rotary wash, NQ core drilling. | 625 |
| 5 | | | | | | | | | | | | 620 |
| 10 | | | | | | | | | | | | 615 |
| 15 | | | | | | | | | | | | 610 |
| 20 | | | | | | | | | | 608.6 20.5 | Depth to bedrock for B-1051 is 43 feet and for B-1051A it is 20.6 feet. Continuation of boring description of B-1051A in rock log. | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | 595 |
| 35 | | | | | | | | | | | | 590 |
| 40 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1051A

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532159.7 N; 628729.8 E | | Total Depth<br>51.9 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 550 | Elevation (Datum NAVD 88)<br>629.1 feet | Ground Water Depth<br>See Note A | Date Started<br>5/23/06 |
| Casing Size and Depth<br>PVC: 6.63 inch O.D. / 20.5 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>5/23/06 |

Reviewed by / Date WJ 5-10-07 DSC 5-9-07 Rev. 1

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 1.4/3.0 | 0 | HW | R2 | | | | | | LIMESTONE (wackestone) with interbeds of shale and clay; medium dark gray (N4); highly to completely weathered; weak; contains yellow brown clay pockets; rock is pitted | | |
| 25 | 2 | 4.1/5.0 | 32 | HW to MW | R3 | | | | Bj, 5, Pl, S<br>Bj, 10, Pl, S<br>Bj, 5, Pl, S<br>Bj, 10, Pl, S<br>Jo, 85, VR, Fi w/calcite 25.7'-26.3' | | LIMESTONE (wackestone) interbedded with shale; medium gray (N5); moderately to highly weathered; medium strong<br>- 23.6-28 feet: frequent open bedding and high angle joints; contain clay, mineral coatings and calcite crystals | Refer to boring B-1051 for soil profile<br>Fluid return good to poor | 605 |
| 30 | 3 | 5.0/5.1 | 54 | SW | R3 | | | | Bj, 5, Pl, S<br>Bj, 10, Pl, Sm<br>Bj, 5, Pl, S<br>Bj, 10, Pl, S<br>Bj, 10, Pl, S<br>Bj, 10, Pl, S | A | LIMESTONE (micrite) with interbeds of calcareous shale; micrite is medium gray (N5) and shale is dark gray (N3); shale beds 0.1 spacing, thin, irregular<br>- 30.5-31 feet: calcite crystals in vertical fracture | | 600 |
| 35 | 4 | 5.1/5.1 | 82 | SW to F | R4 | | | | Bj, 10, Pl, S<br>Jo, 80, VR, Fi w/calcite 30.7'-31.3'<br>Bj, 10, Pl, S<br>Bj, 5, Pl, S<br>Bj, 10,Pl, S<br>Bj, 5, Pl, S<br>Bj, 5, Pl, S | | - 33.6-38.7 feet: shale is <1 inch thick with spacings of 2-3 inches<br>- 33.9-35.1 feet: fossiliferous | | 595 |
| 40 | 5 | 5.0/5.0 | 100 | F | R5 | | | | | | - 38.7-45 feet: shale is 0.5 feet thick with spacings of 0.1 feet | | 590 |
| 45 | 6 | 5.0/5.0 | 100 | F | R5 | | | | | B | - 45-51.9 feet: shale is < 0.25-0.5 feet thick with spacings of 0.5-2 feet | | 585 |
| 50 | 7 | 3.2/3.2 | 94 | SW to F | R5 | | | | Bj, 10, Wa, Sl | | | | 580 |
| 55 | | | | | | | | | | | Boring terminated at 51.9 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/23 - 18.9 feet<br>5/17 - 20.1 feet | | 575 |
| 60 | | | | | | | | | | | | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1052

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532191.1 N; 628727.2 E | | Total Depth<br>79 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>621.8 feet | Ground Water Depth<br>See Note A | Date Started<br>7/21/06 |
| Sampling Method | Borehole Inclination<br>-60 | Logged by<br>D. Stepanof | Date Completed<br>7/21/06 |

Reviewed by / Date DSC 5-9-07 Rev. 1 5-10-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 621.8 | | |
| | | | | | | | | | | See adjacent vertical boring B-1052A for soil description. | | |
| 35 | | | | | | | | | | 591.5 | | |
| 40 | | | | | | | | | | 35.0 | | |

Elevation (feet): 620, 615, 610, 605, 600, 595, 590

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# ROCK LOG - Boring No. B-1052

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532191.1 N; 628727.2 E | | Total Depth<br>79 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>621.8 feet | Ground Water Depth<br>See Note A | Date Started<br>7/21/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 35.2 feet | Borehole Inclination<br>-60 | Logged by<br>D. Stepanof | Date Completed<br>7/21/06 |

Reviewed by / Date DSC 5-9-07 WH 5-10-07 Rev. 1

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 1 | 3.0/3.0 | 53 | SW to F | R3 | | | Bj, 60, Wa, Ro, Op | A | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is medium dark gray (N4); slightly weathered to fresh; medium strong; rip- up clasts in shale | Lithology between bottom of B-1052A and beginning of core run No.1 interpreted to be weathered limestone with variable soil and limestone gravel<br>See B-1052A for overlying soil profile<br>Casing set at 35.2 feet.<br>Boring is angled at 60°.<br>Depths indicated are measurements along drilling axis.<br>Discontinuity angle measurements are relative to borehole axis.<br>Inclined boring advanced 0-32 feet via rotary wash method with HW casing<br>38 feet: lost water return and did not recover | 590 |
| | 2 | 1.0/1.0 | 100 | SW | R2 | | | | | - 38.5-40 feet: shale is 0.01-0.08 feet thick, incipient fracture | | |
| 40 | 3 | 5.0/5.0 | 92 | F | R3 | | | Bj, 50, Pl, Sl, Op, clay lined<br>Bj, 50, Pl, Sl, Ti<br>Bj, 50, Pl, Sl, Op, clay lined | | - 40-44 feet: shale is 0.01-0.03 feet thick | | 585 |
| 45 | 4 | 4.8/5.0 | 80 | F | R3 | | | Bj, 40, Wa, Sl, Ti<br>Bj, 40, Wa, Ro, Op | | - 44-51 feet: shale is 0.01-0.3 feet thick, wavy contact, shale weathering at 48-51 feet has caused a change in color to brownish gray (5YR 4/1) with dark gray fossil specs about 0.01 feet long | | 580 |
| 50 | 5 | 4.0/5.0 | 60 | MW to F | R1 to R3 | | | Bj, 50, Wa, Ro, Op | B | - 51-51.3 feet: Void<br>- 51.6-52.4 feet: Void | | 575 |
| 55 | 6 | 5.0/5.0 | 100 | F | R3 | | | | | LIMESTONE (micrite and wackestone) with shale interbeds; micrite is medium gray (N5) and shale is medium dark gray (N4); fresh; medium strong; shale is 0.01-0.03 feet thick and fossiliferous ~10%; stylolites present | | |
| 60 | 7 | 5.0/5.0 | 100 | F | R3 | | | Bj, 60, Wa, Sl, clay lined | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is medium dark gray (N4); fresh; medium strong<br>- 60.2-60.4 feet: fossiliferous | | 570 |
| 65 | 8 | 4.1/5.0 | 76 | F | R3 | | | Bj, 50, Wa, Sl, Ti | | - 65-68.4 feet: some brown clay film-lined discontinuities | | 565 |
| 70 | 9 | 2.8/5.0 | 56 | F | R3 | | | Bj, 40, Wa | | VOID with clay fill, clay is reddish yellow (7.5YR 4/8) and is highly plastic<br>LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is medium dark gray (N4); fresh; medium strong; shale is 0.01-0.03 feet thick; stylolites present<br>- 71.8 feet: shale interbeds show vugs | | 560 |
| 75 | | | | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

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# ROCK LOG - Boring No. B-1052

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 75 | 10 | 5.0 / 5.0 | 100 | F | R3 | | | | | B | | | 555 |
| 80 | | | | | | | | | | | Boring terminated at 79.0 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/21 - 11.2 feet<br>7/23 - 20.8 feet | | 550 |
| 85 | | | | | | | | | | | | | 545 |
| 90 | | | | | | | | | | | | | 540 |
| 95 | | | | | | | | | | | | | 535 |
| 100 | | | | | | | | | | | | | 530 |
| 105 | | | | | | | | | | | | | 525 |
| 110 | | | | | | | | | | | | | |
| 115 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1052A

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft)<br>1532191.1 N; 628727.2 E | | Total Depth<br>26.7 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>621.8 feet | Ground Water Depth<br>See Note A | Date Started<br>7/21/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>7/21/06 |

Reviewed by / Date DSC 5-9-07 Rev. 1

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 621.8 / 0.0<br>CLAY with gravel, strong brown (7.5YR 5/8), dry, very stiff (Fill) | | |
| | | SPT 1 | 6 11 9 | 15.6 | | | | | | | | 620 |
| | | | | | | | | | CL | 618.8 / 3.0<br>CLAY, yellowish red (5YR 4/6) to light yellowish brown (2.5Y 6/4), moist, very stiff to stiff, trace manganese nodules (Residual) | | |
| 5 | | SPT 2 | 5 7 9 | 15.6 | | | | | | | | |
| | | SPT 3 | 3 5 8 | 18 | | | | | | | | 615 |
| | | | | | | | | | CL | 613.3 / 8.5<br>CLAY, strong brown (7.5YR 5/8), moist, very stiff to stiff, trace manganese nodules | | |
| 10 | | SPT 4 | 5 8 8 | 16.8 | | | | | | | | |
| | | SPT 5 | 6 8 10 | 18 | | | | | | - 11-12.5 feet: color changes to yellowish brown (10YR 5/8), increase in manganese nodules | | 610 |
| 15 | | SPT 6 | 5 6 8 | 18 | | | | | | | | |
| | | SPT 7 | 3 12 21 | 18 | | | | | GC | 605.3 / 16.5<br>clayey GRAVEL, light gray (5Y 7/1), dry to moist, dense; strong HCl reaction | | 605 |
| 20 | | SPT 8 | 8 13 21 | 15.6 | | | | | GC | 602.7 / 19.1<br>- 18.5-19.1 feet: lens with clay, yellowish brown (10YR 5/6) and light gray (5YR 7/1), very stiff<br>clayey GRAVEL, light gray (5YR 7/1) and brownish yellow (10YR 6/8), moist, dense to medium dense to very dense | 18.5 feet: rig chatter | |
| | | SPT 9 | 9 11 12 | 18 | | | | | | | | 600 |
| 25 | | SPT 10 | 18 33/6" | 8.4 | | | | | | | 24.5-25.5 feet: advance with auger | |
| | | SPT 11 | 14 27 28/2" | 14.4 | | | | | GP | 596.3 / 25.5<br>silty GRAVEL, light gray (5Y 7/1) and pale yellow (2.5Y 7/3), dry, very dense, coarse<br>595.1 / 26.7<br>Boring terminated at 26.7 feet | Auger refusal at 25.5 feet. SPT refusal at 26.7 feet. Continuation of borehole description in rock log, for B-1052. | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1053

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532489.4 N; 628910.4 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>620.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/28/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/5/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 620.2 CLAY with sand, strong brown (7.5YR 5/6), dry to moist, stiff to medium stiff (Fill) 0.0 | | 620 |
| | | SPT 1 | 6 4 5 | 6 | 15.7 | 44/ 24 | GSZ | | | | | |
| | | SPT 2 | 4 1 4 | 14 | 10.2 | | CHE | | | | | |
| 5 | | | | | | | | | | | | 615 |
| | | SPT 3 | 3 3 4 | 14 | 23.6 | 47/ 27 | GSZ | | | - 6-7.5 feet: color is red (2.5YR 4/6) | | |
| | | SPT 4 | 2 4 5 | 8 | | | | | | - 8.5-10.5 feet: color is brown (7.5 YR 4/4) | | |
| 10 | | | | | | | | | | 609.7 10.5 | | 610 |
| | | SPT 5 | 7 50/5" | 8 | | | | | CL | CLAY with sand, strong brown (7.5YR 4/6), moist, stiff (Residual) 608.3 11.9 | SPT refusal at 11.9 feet. Auger refusal at 12.3 feet. Continuation of borehole description on rock log. | |
| 15 | | | | | | | | | | | | 605 |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# ROCK LOG - Boring No. B-1053

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532489.4 N; 628910.4 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>620.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/28/06 |
| Casing Size and Depth<br>HW: 4.5 Inch O.D. / 12.3 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/5/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 3.1/3.4 | 41 | MW | R3 | | | | Bj, 17, Pl, Ro, Op<br>Bj, 15, Pl, Ro, So<br>Bj, 20, Pl, Ro, Op | B | LIMESTONE (micrite and minor wackestone) with interbedded shale; limestone is medium light gray (N6), moderately weathered; medium strong; trace bioturbation<br><br>- 15-35 feet: shell fragments and shale layers present<br>12.3-35 feet: shale beds are thin to moderately thin with spacings of 0.1-0.3 feet; wavy and irregular due to bioturbation | | |
| 15 | | | | | | | | | | | | | 605 |
| | 2 | 5.0/5.0 | 98 | SW to F | R3 | | | | Bj, 15, Pl, Ro, Op<br>Bj, 10, Pl, Ro, Op | | | | |
| 20 | | | | | | | | | | | | | 600 |
| | 3 | 5.0/5.0 | 100 | F | R3 | | | | | | | | |
| 25 | | | | | | | | | | | | | 595 |
| | 4 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 10, Wa, Sl, Ti<br>Bj, 5, Pl, Sl, Ti | | | | |
| 30 | | | | | | | | | | | | | 590 |
| | 5 | 3.7/4.3 | 86 | F | R4 | | | | Bj, 10, Pl, Sl, Ti<br>Bj, 15, Pl, Sl, Op | | | | |
| 35 | | | | | | | | | | | Boring terminated at 35.0 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/5 - 14.7 feet | 34.4 feet: the last 0.6 feet of rock is left in the hole. Driller could not extract it. | 585 |
| 40 | | | | | | | | | | | | | 580 |
| 45 | | | | | | | | | | | | | 575 |
| 50 | | | | | | | | | | | | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1054

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532232.5 N; 628800.2 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>628.2 feet | Ground Water Depth<br>See Note A | Date Started<br>7/5/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/6/06 |

Reviewed by / Date WLA 5-10-07 DSC 5-9-07 Rev. 1

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 628.2 CLAY with sand, red (2.5YR 4/6), dry to moist, stiff (Fill) 0.0 | |
| | | SPT 1 | 6 7 8 | 8 | | | | | | | |
| 5 | | SPT 2 | 4 5 5 | 8 | 14.3 | 46/ 25 | GSZ | | | - 3.5-5 feet: color is dark yellowish brown (10YR 4/6) | |
| | | SPT 3 | 2 3 6 | 6 | 23 | 52/ 26 | GSZ H | | CH | 622.2 CLAY with sand, reddish brown (2.5YR 4/4) to yellowish brown (10YR 5/4), moist, stiff (Residual) 6.0 | |
| 10 | | SPT 4 | 2 4 4 | 16 | | | | | | | |
| | | SPT 5 | 2 5 3 | 6 | 6.7 | | GSZ | | GC | 617.5 clayey GRAVEL with sand, gray (10YR 5/1), moist, loose (Residual) 10.7 | |
| 15 | | SPT 6 | 5 11 26 | 12 | | | | | CL | 615.2 CLAY with sand, yellowish brown (10YR 5/6), moist, hard 13.0 | |
| | | SPT 7 | 31 50/5" | 8 | | | | | | 612.2 Weathered LIMESTONE, medium light gray (N6) 16.0 | SPT refusal at 16.9 feet. Auger refusal at 17.2 feet. Continuation of borehole description in rock log. |
| 20 | | | | | | | | | | 611.3 16.9 | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 625, 620, 615, 610, 605, 600

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1054

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532232.5 N; 628800.2 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>628.2 feet | Ground Water Depth<br>See Note A | Date Started<br>7/5/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 17.2 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/6/06 |

Reviewed by / Date DSC 5-9-07 WLA 5-10-07 Rev. 1

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 2.3/3.4 | 12 | MW | R1 to R3 | | | | Bj, 15, Pl, Ro, Op<br>Bj, Pl, Ro, Op | A | LIMESTONE (micrite) interbedded with shale; medium light gray (N6); moderately weathered to fresh; very weak to medium strong; pervasively fractured with clay coatings | | 610 |
| 25 | 2 | 4.7/5.0 | 48 | MW to SW | R3 to R4 | | | | Bj, 15, Pl, Sl, Op<br>Bj, 10, Pl, Sl, Op<br>Bj, 10, Pl, Sl, Op | | - 20.6-30 feet: shale beds are thin to moderately thick with spacings of 0.05-0.1 feet, becoming stronger and less weathered<br>- 20.6-35 feet: trace of bioturbation and fossiliferous | | 605 |
| 30 | 3 | 5.0/5.0 | 70 | MW | R3 | | | | Bj,10, Pl, Sl, Op<br>Bj, 10, Pl, Sl, Ti<br>Bj, 10, Pl, Ro, Op | | | | 600 |
| 35 | 4 | 4.4/4.4 | 84 | MW to F | R3 to R4 | | | | | | - 30-35 feet: shale beds are moderately thin to thick with spacings of 0.1-0.3 feet | | 595 |
| 40 | | | | | | | | | | | Boring terminated at 35.0 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/6 - 20.2 feet | | 590 |
| 45 | | | | | | | | | | | | | 585 |
| 50 | | | | | | | | | | | | | 580 |
| 55 | | | | | | | | | | | | | 575 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1055

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532492 N; 629080.8 E | | Total Depth<br>71.6 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>619.6 feet | Ground Water Depth<br>See Note A | Date Started<br>8/17/06 |
| Sampling Method<br>SPT / UD | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/18/06 |

Reviewed by / Date DSC 5-9-07 Rev. 1 5-10-07

| Depth (feet) | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | CL | 619.6 CLAY, strong brown (7/5YR 5/6), dry to moist, very stiff, few sand and organics, trace manganese nodules (Fill) 0.0 | |
| | SPT 1 | 6 9 10 | 11.4 | | | | | | |
| | SPT 2 | 6 9 12 | 16.2 | | | | | | |
| | | | | | | | CH | 615.9 - 3 feet: becomes yellowish brown (10YR 5/8), moist, trace gravel (limestone) 3.7 | 1-5 feet: Bulk sample taken for Modified Proctor test (LL=48%, PI=27%) |
| 5 | UD 3 | | 22.2 | | | | | 613.6 CLAY with gravel, dark yellowish brown (10YR 4/4), moist, very stiff (Residual) 6.0 | |
| | | | | | | | CH | CLAY, yellowish brown (10YR 5/8) mottled with red (2.5YR 4/8), moist, stiff to medium stiff | |
| | SPT 4 | 2 4 5 | 14.4 | | | | | | 5-10 feet: Bulk sample taken for Standard Proctor test (LL=52%, PI=28%) |
| | UD 5 | | 10.8 | | | | | 610.3 9.3 | |
| 10 | | | | | | | CH | gravelly CLAY, light olive brown (2.5Y 5/4), wet, stiff to hard, gravel is weathered limestone | |
| | SPT 6 | 23/6" | 6 | | | | | | 11-16 feet: augered through gravel/weathered rock |
| | GRAB 7 | | 0 | | | | | | ~13 feet: Took hand sample of cuttings, sample #1055-7HS |
| 15 | | | | | | | | 603.6 16.0 | Auger refusal at 16.0 feet. Continuation of borehole description in rock log. |
| 20 | | | | | | | | | |
| 25 | | | | | | | | | |
| 30 | | | | | | | | | |

Elevation (feet): 615, 610, 605, 600, 595, 590

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1055

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532492 N; 629080.8 E | | Total Depth<br>71.6 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>619.6 feet | Ground Water Depth<br>See Note A | Date Started<br>8/17/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 16 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/18/06 |

Reviewed by / Date W/Modeline 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2.8/2.8 | 98 | SW to F | R3 | | | | no major discontinuities | | LIMESTONE (micrite and packstone) with shale interbeds; micrite is medium gray (N5), packstone is medium bluish gray (5B 5/1) and shale is dark gray (N3); fresh to slightly weathered; medium strong; strong HCl reaction; shale is 25-30% | Good fluid return | |
| 20 | 2 | 4.9/5.0 | 97 | | | | | | | | - 16-30 feet: shale is < 0.25 feet thick with spacings of < 0.3 feet, wavy, packstone beds are < 0.8 feet thick | | 600 |
| | | | | F | R3 | | | | | | - 23.5 feet: packstone beds become more frequent | | |
| 25 | 3 | 5.2/5.0 | 100 | | | | | | | A | | | 595 |
| | | | | | | | | | | | | Drill rig pump problems | |
| | 4 | 1.3/1.3 | 100 | | | | | | | | | | |
| 30 | 5 | 3.7/3.7 | 100 | | | | | | | | - 30-38.2 feet: shale is < 0.15 feet thick with spacings of < 0.3 feet, packstone beds are < 0.8 feet, rip ups and visible fossils, shale is 15-20% | | 590 |
| | | | | F | R3 | | | | | | | | |
| 35 | 6 | 5.0/5.0 | 100 | | | | | | | | | | 585 |
| 40 | 7 | 4.7/5.0 | 93 | | | | | | | | LIMESTONE (packstone) with calcareous shale interbeds; packstone is medium bluish gray (5B 5/1) and shale is dark gray (N3); fresh; medium strong; shale is less than 10%<br>- 38.2-71.6 feet: shale is < 0.05 feet thick with spacings of < 0.5 feet, wavy, rip up clasts | | 580 |
| | | | | F | R3 | | | | | | | | |
| 45 | 8 | 4.9/4.8 | 100 | | | | | | | B | | Good fluid return | 575 |
| 50 | 9 | 5.1/5.2 | 98 | | | | | | | | - 51 feet: chert nodule | consistent drilling 1.5-2.5 minutes/foot | 570 |
| | | | | F | R3 | | | | | | | | |
| 55 | | | | | | | | | | | | | 565 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Leidis & Associates, Inc.

# ROCK LOG - Boring No. B-1055

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 5.0/4.8 | 100 | | | | | | | | | | |
| 60 | 11 | 5.0/5.0 | 100 | | | | | | | | | 58.93 feet: Unconfined Compression Test | 560 |
| | | | | F | R3 | | | | | B | | | |
| 65 | 12 | 4.9/5.0 | 98 | | | | | | | | | | 555 |
| 70 | 13 | 3.2/3.0 | 100 | F | R3 | | | | | | | | 550 |
| | | | | | | | | | | | Boring terminated at 71.6 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/18 - 11.6 feet<br>8/20 - 11.8 feet<br>8/22 - 11.8 feet | | |
| 75 | | | | | | | | | | | | | 545 |
| 80 | | | | | | | | | | | | | 540 |
| 85 | | | | | | | | | | | | | 535 |
| 90 | | | | | | | | | | | | | 530 |
| 95 | | | | | | | | | | | | | 525 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1056

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532231 N; 628882.6 E | | Total Depth<br>45.7 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>626.9 feet | Ground Water Depth<br>See Note A | Date Started<br>7/7/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/7/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 626.9 0.0 CLAY with sand, brown (10YR 4/3), wet, medium stiff (Fill) | | |
| | | SPT 1 | 2 3 3 | 5 | | | | | | | | 625 |
| | | SPT 2 | 1 2 3 | 10 | | | | | | | | |
| 5 | | | | | | | | | | 620.9 6.0 | | |
| | | SPT 3 | 1 1 3 | 18 | | | | | CL | CLAY with sand, dark grayish brown (10YR 4/2) to strong brown (7.5YR 5/8), moist, soft to medium stiff to very stiff (Residual) | | 620 |
| | | SPT 4 | 1 4 7 | 12 | | | | | | | | |
| 10 | | SPT 5 | 3 6 11 | 16 | | | | | | | | 615 |
| | | | | | | | | | | 613.4 13.5 | | |
| | | SPT 6 | 5 7 10 | 10 | | | | | CL | CLAY with gravel, yellowish brown (10YR 5/6), moist to dry, very stiff to hard | | |
| 15 | | SPT 7 | 5 8 40 | 10 | | | | | | | | 610 |
| | | | | | | | | | | 608.4 18.5 | | |
| | | SPT 8 | 42 17 20 | 10 | | | | | GP | GRAVEL with clay, yellowish brown (10YR 5/6), dry, dense | | |
| 20 | | | | | | | | | | 606.9 20.0 | SPT refusal at 20 feet. Auger refusal at 20.9 feet. Continuation of borehole description in rock log. | |
| | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1056

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532231 N; 628882.6 E | | Total Depth<br>45.7 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>626.9 feet | Ground Water Depth<br>See Note A | Date Started<br>7/7/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 20.9 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/7/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | | | | | | | | | | GRAVEL with clay, yellowish brown (10YR 5/6), dry, dense | | |
| | 1 | 4.7/4.7 | 87 | SW to F | R3 to R4 | | | | | | LIMESTONE (micrite) with shale interbeds; medium light gray (N6); fresh to slightly weathered; medium strong to strong; trace bioturbation and shell fragments<br>- 20.9-30 feet: shale beds are moderately thin to thick with spacings of 0.2-0.3 feet | 21-45 feet: pervasive mechanically-induced fractures | 605 |
| 25 | | | | | | | | | | | | | |
| | 2 | 5.0/5.0 | 46 | MW to F | R3 | | | | | | | | 600 |
| 30 | | | | | | | | | | | - 30-45.7 feet: shale beds are moderately thick to moderately thin with spacings of 0.2 feet | | |
| | 3 | 4.5/5.0 | 8 | HW | R1 to R3 | | | | Bj, 10, Pl, Sl, Ti<br>Bj, 15, Pl, Sl, Mo<br>Bj, 10, Pl, Sl, Mo<br>Bj, 10, Pl, Sl, Mo<br>Bj, 10, Pl, Sl, Mo | A | - 34-41 feet: core is brecciated, primarily mechanically-induced | | 595 |
| 35 | | | | | | | | | | | | | |
| | 4 | 5.0/5.0 | 50 | HW | R1 to R3 | | | | Bj, 35, Pl, R, Wo<br>Bj, 20, Pl, R, Wo<br>Bj, 10, Pl, R, So | | | | 590 |
| 40 | | | | | | | | | | | - 40-45 feet: rock core dipping 10-15°, fractures along bedding of shale | | |
| | 5 | 5.1/5.1 | 68 | HW to MW | R3 to R4 | | | | Bj, 10, Pl, Sl, So<br>Bj, 15, Pl, Sl, So<br>Bj, 10, Pl, Sl, So | | LIMESTONE (packstone); medium light gray (N6), slight to moderately weathered; medium strong to strong; abundance of shell fragments | | 585 |
| 45 | | | | | | | | | | | Boring terminated at 45.7 feet | | 580 |
| 50 | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/7 - 10.4 feet<br>7/8 - 10.3 feet | | 575 |
| 55 | | | | | | | | | | | | | 570 |
| 60 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1057

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532372.8 N; 628836.1 E | | Total Depth<br>35.2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>621.6 feet | Ground Water Depth<br>See Note A | Date Started<br>7/7/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>7/7/06 |

Reviewed by / Date: [illegible] 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 621.6 CLAY, yellowish brown (10YR 5/6) to strong brown (7.5YR 4/6), moist, very stiff, has small angular gravel clasts (Fill) 0.0 | | 620 |
| | | SPT 1 | 10 12 13 | 12 | 22.0 | 56/ 34 | GSZ | | | 619.1 | | |
| | | | | | | | | | CH | CLAY, olive brown (2.5Y 4/3), moist, soft (Fill) 2.5 | | |
| | | SPT 2 | 5 9 8 | 14.4 | | | | | SW-SM | 617.6 SAND, dark brown (7.5YR 3/2), moist, soft (Fill) 4.0 | | |
| 5 | | | | | | | | | CL | 617.1 CLAY, dark yellowish brown (10YR 4/6), moist, medium stiff (Residual) 4.5 | | |
| | | SPT 3 | 4 6 13 | 8.4 | | | | | CL | 615.0 CLAY with gravel, dark yellowish brown (10YR 4/6), dry to moist, very stiff, gravel is weathered limestone 6.6 | | 615 |
| | | SPT 4 | 12 9 11 | 9.6 | | | | | CL | 612.6 CLAY with gravel, yellowish brown (10YR 5/6), moist, very stiff, medium plasticity 9.0 | | |
| 10 | | SPT 5 | 3 6 11 | 10.8 | | | | | | | | 610 |
| | | SPT 6 | 50/1" | 1 | | | | | | 608.0 13.6 | SPT refusal at 13.6 feet (50/1.2"). Continuation of borehole description in rock log. | |
| 15 | | | | | | | | | | | | 605 |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1057

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532372.8 N; 628836.1 E | | Total Depth<br>35.2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>621.6 feet | Ground Water Depth<br>See Note A | Date Started<br>7/7/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 13.6 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>7/7/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 4.6/5.0 | 82 | SW | R3 | | | | Bj, 15, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti | A | LIMESTONE (micrite) with calcareous shale interbeds; medium gray (N5) and dark gray (N3); slightly weathered to fresh; medium strong; strong HCL reaction | 13.6-35.2 feet: Good fluid return | 605 |
| 20 | 2 | 5.1/5.0 | 99 | F | R3 | | | | Bj, 15, Wa, Sl, Ti | | - 20 feet: shale is wavy, and is 0.01-0.08 thick; spacing averages 0.1-0.4 feet | | 600 |
| 25 | 3 | 4.7/5.0 | 93 | F | R3 | | | | | B | - 24 feet: rip up clasts present | | 595 |
| 30 | 4 | 5.1/5.0 | 100 | F | R3 | | | | | | | | 590 |
| 35 | 5 | 1.9/1.6 | 100 | F | R3 | | | | | | - 33 feet: shale is wavy 0.01-0.08 thick, spacing is 0.1-0.4 feet | | |
| | | | | | | | | | | | Boring terminated at 35.2 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/9 - 5.8 feet | | 585 |
| 40 | | | | | | | | | | | | | 580 |
| 45 | | | | | | | | | | | | | 575 |
| 50 | | | | | | | | | | | | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA Willman Lewis & Associates, Inc.

# SOIL LOG - Boring No. B-1058

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532351.3 N; 629027.4 E | | Total Depth<br>65.2 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME550 | Elevation (Datum NAVD 88)<br>620.2 feet | Ground Water Depth<br>See Note A | Date Started<br>5/23/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>5/25/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 620.2 CLAY, brown (7.5YR 4/4), moist, stiff 0.0 | | 620 |
| | | SPT 1 | 2 8 7 | 18 | | | | | ML | 618.7 SILT with sand, dark brown (7.5YR 3/4), dry, stiff, trace gravel 1.5 | | |
| | | | | | | | | | CH | 616.9 CLAY, yellowish brown (10YR 5/6), dry, stiff, trace manganese nodules 3.3 | | |
| 5 | | SPT 2 | 5 6 7 | 18 | | | | | | | | 615 |
| | | SPT 3 | 3 4 5 | 18 | | | | | | - 6.2 feet: becoming moist | | |
| | | SPT 4 | 50/1" | 1 | | | | | | 612.4 7.8 | Auger and SPT refusal at 7.8 feet. Continuation of borehole description in rock log. | |
| 10 | | | | | | | | | | | | 610 |
| 15 | | | | | | | | | | | | 605 |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1058

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532351.3 N; 629027.4 E | | Total Depth<br>65.2 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME550 | Elevation (Datum NAVD 88)<br>620.2 feet | Ground Water Depth<br>See Note A | Date Started<br>5/23/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 7.8 feet | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>5/25/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 4.1/5.1 | 43 | HW to MW | R2 to R3 | | | | | | LIMESTONE (packstone) interbedded with shale; packstone is medium bluish gray (5B 5/1) and shale is dark gray (N3); moderately to highly weathered; weak to moderately strong; highly fractured with clay seams along fractures and bedding joints, fracture planes are <5-20° | 8.28 feet: Unconfined Compression with Stress/Strain Test | 610 |
| 15 | 2 | 4.9/4.9 | 86 | SW | R2 | GJ<br>GJ | | | Bj, 17, Pl, Sl, shale bed<br>Bj, 7, Wa, Ro, Ti, shale bed<br>Bj, 20, Pl, Ro, Ti<br>Bj, 10, Wa, Ro, Ti | | LIMESTONE (micrite) interbedded with shale; micrite is medium gray (N5) and shale is dark gray (N3); slightly weathered; weak; fossils and bioturbation visible; bedding is thin to very thin; thin wackestone to packstone interbeds from 15-20 feet<br>- 13-20 feet: shale interbeds are finely laminated with rip up clasts of limestone | Good fluid return, dark grey, 300 psi down pressure | 605 |
| 20 | 3 | 7.6/7.6 | 100 | SW | R2 | GJ | | | | | - 20-30 feet: shale beds are thin (0.2 feet) with spacings of 0.1-0.3 feet | 23.83 feet: Unconfined Compression with Stress/Strain Test | 600 |
| 25 | 4 | 5.0/5.0 | 100 | SW | R2 | | | | Bj, 18, Wa, Sl, Ti | A | - 27-28 feet: packstone interbed<br>- 28.7 feet: packstone bed 0.3 feet thick | | 595 |
| 30 | 5 | 4.0/5.0 | 70 | SW | R2 | | | | Bj, 10, Pl, Sm, Ti, shale | | - 30-35.3 feet: shale beds are thin to fine laminated with rip up clasts<br>- 32 feet: some evidence of soft sediment deformation | 31.9 feet: Unconfined Compression Test short term poor fluid return | 590 |
| 35 | 6 | 4.9/4.9 | 100 | SW | R2 | | | | | | - 35.3-40.3 feet: shale beds become thicker, bioturbated | Good fluid return | 585 |
| 40 | 7 | 5.0/5.0 | 100 | SW | R2 | | | | Bj, 11, Pl, Sl, Ti, shale bed | | - 40.3-43 feet: packstone interbedded with shale, shale exhibits soft sediment deformation and bioturbation<br>43-60 feet: shale thickness is thin to laminated with spacings of 0.1-0.4 feet, rip up clasts | 400 psi down pressure | 580 |
| 45 | | 5.0 | | | | | | | Bj, 12, Pl, Sl, shale | | | | 575 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1058

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8 | 5.0 | 100 | SW | R2 | | | | | A | - 48.2-49.7 feet: packstone bed with shale interbeds and micrite rip up clasts, grayish blue (5PB 5/2) to dusky blue (5PB 3/2), fossils | | |
| 50 | | | | | | | | | Bj, <5, Pl, Ro, Ti | | - 50.5 feet: calcite vug 0.04 feet diameter | | 570 |
| | 9 | 5.0/5.0 | 100 | SW | R2 | | | | Bj, 10, Pl, Sm, shale | | 52.4 feet: micrite bed 0.3 feet thick with grayish blue bioturbation<br>- 52.7 feet: shale bed 0.2 feet thick with some rip up clasts | | |
| 55 | | | | | | | | | Bj, 34, Wa, Ro, Ti, shale | | | | 565 |
| | 10 | 5.0/5.0 | 100 | SW | R2 | | | | | | - 58.5 feet: shale beds thin to wavy, laminations decrease | | |
| 60 | | | | | | | | | | B | LIMESTONE (wackestone) interbedded with shale; wackestone is medium gray (N5) and shale is dark gray (N3); slightly weathered; weak<br>- 60.4 feet: calcite vug<br>- 63.2 feet: heavy bioturbation | 59.4 feet: Unconfined Compression with Stress/Strain Test hydrocarbon odor, sheen visible on crystals through hand lens<br>down pressure 200 psi, drill fluid milky gray | 560 |
| | 11 | 5.0/5.0 | 100 | SW | R2 | | | | | | | | |
| 65 | | | | | | | | | | | Boring terminated at 65.2 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>Not measured | | 555 |
| 70 | | | | | | | | | | | | | 550 |
| 75 | | | | | | | | | | | | | 545 |
| 80 | | | | | | | | | | | | | 540 |
| 85 | | | | | | | | | | | | | 535 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1059

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532712.7 N; . 628706.2 E | | Total Depth<br>250 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>619 feet | Ground Water Depth<br>See Note A | Date Started<br>5/12/06 |
| Sampling Method<br>CME/SPT | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/17/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 619 / 0.0 | | |
| | | | | | | | | | GP-GM | 618.8 / 0.2 ASPHALT<br>Gravelly FILL | | |
| | | | | | | | | | CL | 617.5 / 1.5 CLAY, reddish brown (2.5YR 4/4), moist, stiff to hard, few limestone clasts | | |
| | | CME 1 | | 24 | | | | | | | | 615 |
| 5 | | | | | | | | | | | | |
| | | SPT 2 | 4 3 6 | 18 | | | | | | - 6.7 feet: small pockets of sand and weathered limestone clasts, becomes more moist | | |
| | | SPT 3 | 3 5 3 | 12 | | | | | | - 9.5-10 feet: angular gravel | 9-10 feet: difficult drilling, drilled through gravel lens | 610 |
| 10 | | | | | | | | | | | | |
| | | SPT 4 | 9 14 16 | 9.6 | | | | | | - 11 feet: color changes to brown (7.5YR 4/4) | | |
| | | | | | | | | | | 605.5 / 13.5 | | |
| | | SPT 5 | 50/5" | 1.1 | | | | | | 605.0 / 14.0 LIMESTONE (micrite) | SPT refusal at 14 feet in limestone bedrock. Rock core casing placed at 13.5 feet. Continuation of borehole description on rock log. | 605 |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1059

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532712.7 N; 628706.2 E | | Total Depth<br>250 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>619 feet | Ground Water Depth<br>See Note A | Date Started<br>5/12/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 14 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/17/06 |

Reviewed by / Date DSC 5-9-07 5-10-07 Rev. 1

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 1.9/2.0 | 95 | SW to F | R2 to R3 | | | | Bj, 10, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Ti | | LIMESTONE (micrite) with minor shale; micrite is medium gray (N5) and shale is dark gray (N3) to grayish black (N2); fresh to slightly weathered; weak to medium strong; interbedded wackestone is grayish blue (5PB 5/2) to medium gray (N5) in color; strong HCL reaction<br>- 17.5-20.5 feet: zone of fracturing, clay lined surfaces<br>- 20 feet: clay filled joint | Casing set at 13.5 feet (start of core Run#1)<br>Good fluid return throughout boring | 605 |
| 20 | 2 | 4.9/5.0 | 72 | SW to F | R2 to R3 | | | | Bj, 10, Wa, Sl, Ti<br>Bj, 0-5, Wa, Sl, Op<br>Bj, 15, Wa, Sm-Sl, Ti | | | | 600 |
| 25 | 3 | 5.0/5.0 | 100 | SW to F | R2 to R3 | | | | Bj, 15, Wa, Sl, Ti-Op<br>Bj, 15, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Op<br>Bj, 5, Wa, Sl, Op | | | | 595 |
| 30 | 4 | 5.0/5.0 | 100 | F | R2 to R3 | | | | Bj, 10, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti | | LIMESTONE (wackestone) interbedded with shale; wackestone is medium gray (N5) and shale is dark gray (N3) to grayish black (N2); fresh; weak to medium strong | | 590 |
| 35 | 5 | 5.0/5.0 | 100 | F | R2 to R3 | | | | Bj, 15, Wa, Sl/Ro, Ti<br>Bj, 10, Wa, Sl, Ti | B | - 31.7 feet: small (0.05 feet) spar filled void, angular crystal faces | 30.7 feet: Petrographic Analysis (sample PET-1059F) | 585 |
| 40 | 6 | 5.0/5.0 | 100 | F | R2 to R3 | | | | Bj, 10, Wa, Ro, Ti | | - 36.1-37.2 feet: zone of larger grain size, many fossils, bioturbation<br>- 40-40.7 feet: wackestone and packstone bed, abundant fossils, bioturbated | | 580 |
| 45 | 7 | 5.0/5.0 | 100 | F | R2 to R3 | | | | Bj, 20, St, Sl, Ti, slickensides: Rake=45°, calcite cement | | - 41.8 feet: slickensided joint (calcite cement) | | 575 |
| 50 | 8 | 5.0/5.0 | 100 | F | R2 to R3 | | | | Bj, 10, Wa, Ro/Sl, Ti | | - 45.4 feet: poorly developed stylolites | | 570 |
| | 9 | 5.0/5.0 | 100 | | R1 to R2 | | | | Bj, 5, Wa, Sl, Ti | C | LIMESTONE (micrite and packstone) with interbedded shale; micrite is medium gray (N5) and shale is dark gray (N3) to grayish black (N2); fresh; weak to very weak; occasional sections of wackestone interbeds of medium bluish gray (5PB 5/1) to medium gray (N5) in color; 30% shale | | 565 |

Project Name and No.: NuStart - Beliefonte COL Project; 6468061299

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# ROCK LOG - Boring No. B-1059

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | | | | F | | | | | Jo, 40, Pl, Sm, Ti | | - 56-57 feet: prominent shale bed, shale bed thicknesses are 0.05 - 0.5 feet, shale is softer (scratched by fingernail) and reacts with HCL (weak) | | 565 |
| | 10 | 5.0/5.0 | 100 | | R3 | | | | Bj, 15, Wa, Sl, Ti | | - 57-60.2 feet: zone of interbedded packstone, wackestone and micrite | | 560 |
| 60 | 11 | 5.0/5.0 | 100 | | R3 | | | | Bj, 10, Pl, Sm, Ti | | SHALE (calcareous) interbedded with limestone (micrite and wackestone); dark gray (N3); fresh; medium strong; limestone is very thinly bedded with spacings of 0.75-1.5 inches (average is 1 inch)<br>- 61.1 feet: healed calcite fracture<br>- 63-64.5 feet: fossiliferous | | 555 |
| 65 | | | | F | | | | | Bj, 5, Wa, Sl, Ti | | - 65.6 to 80.2 feet: zone of higher percentage of shale (70%) | | |
| | 12 | 5.0/5.0 | 100 | | R1 to R2 | | | | Bj, 10, Wa, Sl, Ti | | SHALE (calcareous) with interbedded limestone (micrite); dark gray (N3); fresh; weak to very weak; micrite is very thinly bedded; shale is very weak | | 550 |
| 70 | 13 | 5.0/5.0 | 100 | | R2 | | | | Bj, 0, Pl, Sl, Ti<br>Bj,10, Wa, Sl, Ti | C | SHALE (calcareous) with interbedded packstone; shale is dark gray (N3) to grayish black (N2) and packstone is medium gray (N5); fresh; weak; packstone is very thinly bedded; occasional sections of wackestone interbeds; visible fractures of hairline size in shale sections<br>- 71.8-72.8 feet: packstone bed<br>- 72.9-78.4 feet: very thinly bedded | | 545 |
| 75 | | | | F | | | | | Bj, 5, Wa, Sm, Ti | | | | |
| | 14 | 5.0/5.0 | 100 | | R1 to R2 | | | | Bj, 10, Wa, Sm, Ti | | - 78.4-80.2 feet: shale bed, bedding becomes irregular and disrupted, 0.5-3 inches of micrite fragments in shale matrix, fresh, weak to very weak<br>- 79 feet: vertical fractures, trilobite cephalon at fracture | | 540 |
| 80 | 15 | 5.0/5.0 | 100 | | R1 to R2 | | | | Bj, 10, Pl, Sm, Ti | | SHALE (calcareous) with interbedded micrite; shale is dark gray (N3) to grayish black (N2) and micrite is medium gray (N5); weak to very weak; fresh; incipient fractures in shale; occasional wackestone interbeds; 70% shale | 81.6 feet: Petrographic Analysis (sample PET-1059E) | 535 |
| 85 | | | | F | | | | | Bj, 10, Wa, Sm, Ti<br>Bj, 5, Pl, Sm, Ti | | - 85.6 feet: shale has visible incipient fractures | | |
| | 16 | 5.0/5.0 | 100 | | R1 to R2 | | | | Bj, 0-5, Pl, Sm, Op | | - 88.6 feet: pyrite along slickensided surface | | 530 |
| 90 | 17 | 5.0/5.0 | 100 | | R2 to R3 | | | | Bj, 10, Wa, Sl, Ti | | LIMESTONE (packstone) with interbedded shale; packstone is medium gray (N5) and shale is dark gray (N3) to grayish black (N2); fresh; weak to very weak; rock is rich in calcareous shale<br>SHALE (calcareous) with interbedded micrite; shale is dark gray (N3) to grayish black (N2) and | | 525 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1059

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | | | | F | | | | | Bj, 5, Pl, Sm, Ti<br>Bj, 5, Wa, Sl, Ti | | micrite is medium gray (N5); weak to very weak; fresh; incipient fractures in shale; occasional wackestone interbeds; 70% shale | | 525 |
| | 18 | 5.0/5.0 | 100 | | R1 to R2 | | | | Bj, 5, Wa, Sl, Ti | | LIMESTONE (micrite) with interbedded shale; micrite is medium gray (N5) and shale is dark gray (N3) to grayish black (N2); fresh; weak to medium strong; shale content increases with depth from 15-20% at the top to 30-40% at the bottom; irregular and discontinuous bedding; bioturbated/burrows; rock appears to be fragments of limestone with shale filling; soft sediment deformation | | 520 |
| 100 | | | | | | | | | Bj, 10, Wa, Sm, Ti | | | | |
| | 19 | 5.0/5.0 | 100 | | | | | | | | | | 515 |
| 105 | | | | F | | | | | Bj, 15, Pl, Sm, Ti<br>Bj, 5, Wa, Sm, Ti | C | | | |
| | 20 | 5.0/5.0 | 100 | | R2 to R3 | | | | | | - 107.5 feet: dark limestone and shale show small fractures, both vertical and horizontal (may indicate some level of permeability) | | 510 |
| | | | | | | | | | Bj, 5, Wa, Sm, Ti | | SHALE interbedded with micrite; shale is dark gray (N3) to grayish black (N2) and micrite is medium gray (N5); fresh; weak to medium strong; 20% micrite | | |
| 110 | | | | | | | | | | | | | |
| | 21 | 5.0/5.0 | 100 | | R1 to R2 | | | | Bj, 5, Wa, Sm, Ti | | LIMESTONE (wackestone and packstone) interbedded with shale; limestone is medium gray (N5) and shale is dark gray (N3) to grayish black (N2); fresh; weak to very weak; 15% shale | | 505 |
| 115 | | | | F | | | | | | | SHALE with limestone fragments; shale is dark gray (N3) to grayish black (N2) and limestone is medium gray (N5); fresh; weak to medium strong; fragments comprise 20-25% | | |
| | 22 | 5.0/5.0 | 100 | | R1 to R2 | | | | | | LIMESTONE (micrite) interbedded with shale; micrite is medium gray (N5) and shale is dark gray (N3) to grayish black (N2); fresh; weak to very weak | | 500 |
| 120 | | | | | | | | | Bj, 5, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti | | LIMESTONE (micrite) interbedded with shale; micrite is medium gray (N5) and shale is dark gray (N3) to grayish black (N2); fresh; weak to medium strong; shale is thinly bedded | 120.8 feet: Petrographic Analysis (sample PET-1059D) | |
| | 23 | 5.0/5.0 | 100 | | R2 to R3 | | | | | | - 123.5 feet: chert pod, little to no HCl reaction | | 495 |
| 125 | | | | F | | | | | Bj, 10, Wa, Ro, Ti | D | | | |
| | 24 | 5.0/5.0 | 100 | | R2 to R3 | | | | | | - 127 feet: chert pod - little to no HCL reaction | | |
| | | | | | | | | | Bj, 15, Wa, Sl, Ti | | - 129 feet: chert pod - little to no HCL reaction | | 490 |
| 130 | | | | | | | | | Bj, 15, Wa, Sl, Ti<br>Bj, 0, Wa, Sm, Ti | | - 130.8 feet: 0.05 feet thick black shale bed with white calcite cement, fractured<br>- 131.2 feet: vertical fractures with strong hydrocarbon odor and unknown green substance with a vaseline-like consistency | | |
| | 25 | 5.0/5.0 | 100 | | R2 | | | | | | | | 485 |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

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# ROCK LOG - Boring No. B-1059

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 135 | | | | F | | | | | Bj, 15, Wa, Sl, Ti | | - 134.8 feet: chert<br>- 135.9 feet: small chert layer ~0.1-0.7 feet thick, black (N1), medium strong<br>- 135.2 feet: 0.5 inch thick bed with coal-like fragments, little to no HCl reaction, harder than limestone<br>- 136 feet: small chert layer ~0.1 - 0.7 feet thick; medium strong, black (N1) | 134.7 feet: Petrographic Analysis (sample PET-1059C) | 485 |
| | 26 | 5.0/5.0 | 99 | | R3 | | | | Bj, 10, Wa, Ro, Ti | | | | 480 |
| 140 | | | | | | | | | Bj, Wa, Ro, Ti | | LIMESTONE (micrite); medium gray (N5); fresh; medium strong; little to no shale layers<br>- 141.8 feet: small chert pod ~0.05 feet thick | | |
| | 27 | 5.0/5.0 | 100 | | R3 | | | | | | | | 475 |
| 145 | | | | F | | | | | | | LIMESTONE (micrite) interbedded with shale; micrite is medium gray (N5) and shale is dark gray (N3) to grayish black (N2); fresh; medium strong; shale beds are <0.1-0.2 inches thick with spacings of 2-3 inches; 20% shale | | |
| | 28 | 5.0/5.0 | 100 | | R3 | | | | Bj, 5, Wa, Sl, Ti | | | | |
| | | | | | | | | | Bj, 15, Wa, Sl, Ti | | LIMESTONE (micrite); medium gray (N5); fresh; medium strong; minor interbedded shale: dark gray (N3) to grayish black (N2); 5% shale | | 470 |
| 150 | | | | | | | | | Bj, 15, Wa, Ro, Ti | | | | |
| | 29 | 5.0/5.0 | 100 | | R3 | | | | | D | | | 465 |
| 155 | | | | F | | | | | Bj, 0, Wa, Sm/Sl, Ti | | | | |
| | 30 | 5.0/5.0 | 100 | | R3 | | | | Bj, 10, Wa, Sl, Ti | | | | 460 |
| 160 | | | | | | | | | Bj, 5, Wa, Sl, Ti<br>Bj, 10, Pl, Sl, Ti | | | | |
| | 31 | 5.0/5.0 | 100 | | R3 | | | | Bj, 10, Wa, Sl, Ti | | | | 455 |
| | | | | | | | | | Bj, 10, Wa, Sm/Sl, Ti | | | | |
| 165 | | | | F | | | | | Bj, 10, Wa, Sl, Ti | | LIMESTONE (micrite with minor thinly bedded wackestone) interbedded with shale; micrite is medium gray (N5) and shale is dark gray (N3) to grayish black (N2); fresh; medium strong; locally bioturbated; 15% shale<br>- 165.1-165.8 feet: vertical fractures<br>- 166 to 166.8 feet: vertical fractures<br>- 167.5 feet: calcite cement-filled fracture<br>- 169.5 feet: poorly developed slickensides | | |
| | 32 | 5.0/5.0 | 100 | | R3 | | | | Bj, 10, Wa, Sl, Ti | | | | 450 |
| 170 | | | | | | | | | Bj, 15, Pl, Sm, Ti | | - 171 feet: vertical fractures<br>- 171.6 feet: calcite cement lining joint | | |
| | 33 | 5.0/5.0 | 100 | | R3 | | | | Bj, 15, Wa, Sl, Ti | | | | 445 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1059

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 175 | | | | F | | | | | Bj, 10, Wa, Sl, Ti | | | | 445 |
| | 34 | 5.0/5.0 | 100 | | R3 | | | | Bj, 10, Wa, Sl, Ti, calcite lined fracture Bj, 10, Wa, Sl, Ti | | - 176.5 feet: calcite-lined fracture | | 440 |
| 180 | | | | | | | | | Bj, 5, Wa, Sl, Ti | | | | |
| | 35 | 5.0/5.0 | 100 | | R3 | | | | Bj, 5, Pl, Sl, Ti | | - 184 feet: calcite cement-lined fracture | | 435 |
| 185 | | | | F | | | | | | | | | |
| | 36 | 4.9/5.0 | 98 | | R3 | | | | Bj, 15, Wa, Sl, Ti | | | | 430 |
| 190 | | | | | | | | | Bj, 10, Wa, Sm, Ti | | | | |
| | 37 | 5.0/5.0 | 100 | | R3 | | | | Bj, 15, Wa, Sl, Ti | D | | | 425 |
| 195 | | | | F | | | | | | | | | |
| | 38 | 5.0/5.0 | 100 | | R3 | | | | Bj, 10, Wa, Ro, Ti | | | | 420 |
| 200 | | | | | | | | | Bj, 10, Wa, Sl Bj, 15, Wa, Ro, Ti Bj, 15, Wa, Ro, Ti | | | | |
| | 39 | 5.0/5.0 | 100 | | R3 | | | | | | | | 415 |
| 205 | | | | F | | | | | | | - 204.2 feet: calcite-lined fracture | | |
| | 40 | 5.0/5.0 | 100 | | R3 | | | | Bj, 0, Wa, Sl, Ti | | | | 410 |
| 210 | | | | | | | | | Bj, 30, Wa, Sl, Ti/Op | | | | |
| | 41 | 5.0/5.0 | 100 | | R3 | | | | | | LIMESTONE (micrite); medium gray (N5); fresh; medium strong; very few shale beds of color dark | | 405 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1059

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 215 | | | | F | | | | | Bj, 5, Wa, Sl, Ti | | gray (N3) to grayish black (N2); 5% shale<br>- 214.6 feet: light-colored limestone in fracture ~0.05 feet | | 405 |
| | 42 | 5.0/5.0 | 100 | | R3 | | | | Bj, 20, Wa, Sl, Ti | | - 218.4 feet: calcite cement lining fracture | | 400 |
| 220 | | | | | | | | | | | | | |
| | 43 | 5.0/5.0 | 100 | | R3 | | | | | | | | 395 |
| 225 | | | | F | | | | | Fe, 30, Pl, St, Ti<br>Jo, 25, Wa, Sl, Ti | | - 224.9 feet: small reverse fault, slickensides | | |
| | 44 | 5.0/5.0 | 100 | | R3 | | | | | | LIMESTONE (micrite with minor thinly bedded wackestone) interbedded with shale; micrite is medium gray (N5) and shale is dark gray (N3) to grayish black (N2); fresh; medium strong; 15% shale | | 390 |
| 230 | | | | | | | | | | | - 229.9 feet: several small (<0.02 feet) calcite vugs | | |
| | 45 | 5.0/5.0 | 100 | | R3 | | | | Bj, 20, Wa, Sl, Ti | D | - 232.4 feet: vertical fractures | | 385 |
| 235 | | | | F | | | | | Bj, 5, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti | | | | |
| | 46 | 5.0/5.0 | 100 | | R3 | | | | | | | | 380 |
| 240 | | | | | | | | | Bj, 10, Wa, Sm, Ti | | - 239.4-240.4 feet: big vertical fracture has slight hydrocarbon odor | | |
| | 47 | 5.0/5.0 | 100 | | R3 | | | | Bj, 10, Wa, Sm, Sl/Ti | | | | 375 |
| 245 | | | | F | | | | | | | - 244.2 feet: strong hydrocarbon odor | | |
| | 48 | 5.0/4.5 | 99 | | R3 | | | | Bj, 10, Wa, Sl, Ti<br>Bj, 30, Pl, Sm, Sl, Ti | | LIMESTONE (micrite); light olive gray (5Y 5/2); fresh; medium strong; 100% micrite<br>- 248 feet: stylolites | | 370 |
| 250 | | | | | | | | | Bj, 15, Wa, Ro | | | | |
| | | | | | | | | | | | Boring terminated at 250.0 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/16 - 4.0 feet<br>5/17 - 7.6 feet<br>8/17 - 9.8 feet | | 365 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# SOIL LOG - Boring No. B-1060

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532444.1 N; 629267.9 E | | Total Depth<br>176.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 75 | Elevation (Datum NAVD 88)<br>621.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/27/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>7/6/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 621.7 CLAY with sand, strong brown (7.5YR 4/6); dry, very stiff, few gravel | 0.0 | 620 |
| | | SPT 1 | 3 7 13 | 18 | | | | | | | | |
| | | | | | | | | | CL | 618.2 CLAY with sand, yellowish brown (10YR 5/6 to 10YR 5/8), moist, very stiff, few gravel and organics | 3.5 | 615 |
| 5 | | SPT 2 | 5 8 11 | 16.2 | | | | | | | | |
| | | SPT 3 | 3 5 11 | 18 | | | | | | | | |
| 10 | | SPT 4 | 3 7 10 | 3 | | | | | | | | |
| | | SPT 5 | 3 8 9 | 20 | | | | | | 609.6 | 12.1 | 610 |
| | | | | | | | | | CL | CLAY, brownish yellow (10YR 6/8), moist, very stiff<br>- 13.5-13.9 feet: presence of gravel and manganese oxide<br>- 14.0 feet: 13.9-16.4 feet: presence of rock fragments 0.1 feet diameter | | |
| 15 | | SPT 6 | 8 10 12 | 18 | | | | | | | | |
| | | SPT 7 | 40/4" | 4 | | | | | | 605.3 | 16.4 | 605 |
| 20 | | | | | | | | | | | SPT and auger refusal at 16.4 feet. Continuation of borehole description on rock log. | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1060

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532444.1 N; 629267.9 E | | Total Depth<br>176.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 75 | Elevation (Datum NAVD 88)<br>621.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/27/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 16.35 feet | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>7/6/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 3.4/3.5 | 83 | SW | R2 | | | | Bj, 10, Wa, Ro, Ti<br>Bj, 15, Wa, Ro, Ti | USR | LIMESTONE (wackestone and packstone) with interbedded calcareous shale; wackestone and packstone are greenish black (5BG 2.5/1) and shale is black (2.5Y 2.5/1); slightly weathered to fresh; weak to medium strong; shale is wavy, undulatory, and wispy with fossils<br>- 20.4-22.4 feet: wackestone, fewer fossils | | 605 |
| 20 | 2 | 5.0/5.0 | 100 | F | R3 | | | | | | - 22.4-23.3 feet: shale thickens to 0.1'-0.2'; spaced 0.01-0.1 feet apart; vugs | | 600 |
| 25 | 3 | 4.6/5.0 | 84 | F | | | | | | | LIMESTONE (wackestone) with calcareous shale interbeds; wackestone and micrite are greenish black (5BG 2.5/1) and shale is black (2.5Y 2.5/1); fresh; medium strong; in some areas wackestone and micrite alternate<br>- 26.1-27.3 feet: wackestone, with 0.1 feet thick, shale bed and rip-up clasts<br>- 27.3-29.3 feet: wackestone and micrite alternat;, shale is 0.1-0.01 feet thick, spaced 0.01 to 0.3 feet apart<br>- 29.3-30 feet: wackestone | | 595 |
| 30 | 4 | 5.3/5.0 | 100 | F | R3 | | | | | | | 31.3 feet: Petrographic Analysis (sample PET-1060A) | 590 |
| 35 | 5 | 4.5/5.0 | 90 | F | | | | | | A | - 30.0-35.7 feet: wackestone with diffuse shale beds | | 585 |
| 40 | 6 | 5.3/5.0 | 100 | F | R3 | | | | | | | | 580 |
| 45 | 7 | 5.2/5.0 | 100 | F | R3 | | | | Bj, 10, Wa, Ro, Op | | | | 575 |
| 50 | 8 | 1.6/1.6 | 100 | F | R3 | | | | Bj, 20, Wa, Ro, Ti | | | Switched to new rig: CME 75 | |
| 55 | 9 | 4.9/5.0 | 100 | F | | | | | | | LIMESTONE (micrite) with interbedded calcareous shale; micrite is greenish black (5BG 2.5/1) shale is black (2.5Y 2.5/1); fresh; medium strong | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1060

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R3 | | | | | | | | 565 |
| 60 | 10 | 5.2/5.0 | 100 | F | | | | | | | - 58.6-60.7 feet: wackestone interbeds present | | |
| | | | | | | | | | | | LIMESTONE (micrite) with interbedded wackestone and calcareous shale; micrite and wackestone are greenish black (5BG 2.5/1) and shale is black (2.5Y 2.5/1); fresh; medium strong | | 560 |
| 65 | 11 | 4.8/5.0 | 92 | F | | | | | | | | | |
| | | | | | R3 | | | | | | | | 555 |
| 70 | 12 | 4.9/5.0 | 96 | F | | | | | | | - 71.0-72.3 feet: alternating micrite and wackestone | | |
| | | | | | | | | | | A | LIMESTONE (micrite) with interbedded calcareous shale; micrite is greenish black (5BG 2.5/1) and shale is black (2.5Y 2.5/1); fresh; medium strong | | 550 |
| 75 | 13 | 5.0/5.0 | 96 | F | | | | | | | - 75.5-76.4 feet: fossil-rich zone | | |
| | | | | | R3 | | | | | | | | 545 |
| 80 | 14 | 5.2/5.0 | 100 | F | | | | | | | SHALE; shale bed | | |
| | | | | | | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite and wackestone are greenish black (5BG 2.5/1) and shale is black (2.5Y 2. 5/1); fresh; medium strong | | 540 |
| 85 | 15 | 4.8/5.0 | 96 | F | | | | | | | | | |
| | | | | | R3 | | | | | | | | 535 |
| 90 | 16 | 5.2/5.0 | 100 | F | | | | | | | LIMESTONE (wackestone) interbedded with calcareous shale; micrite and wackestone are greenish black (5BG 2.5/1) and shale is black (2.5Y 2.5/1); fresh; medium strong; shale beds are 0.001-0.1 feet thick | | |
| | | | | | | | | | | B | | | 530 |
| 95 | 17 | 4.6/5.0 | 92 | F | | | | | | | - 94.6-96.0 feet: burrow features | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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# ROCK LOG - Boring No. B-1060

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R3 | | | | | | | | 525 |
| 100 | 18 | 4.9/5.0 | 98 | F | | | | | | | - 99.3 feet: large calcite vug | | |
| | | | | | | | | | | | | | 520 |
| 105 | 19 | 5.2/5.0 | 100 | F | | | | | | | | | |
| | | | | | R3 | | | | | | | | 515 |
| 110 | 20 | 5.3/5.0 | 100 | F | | | | | | | - 108 feet: occasional calcite-healed fractures | | |
| | | | | | | | | | | | | | 510 |
| 115 | 21 | 5.0/5.0 | 100 | F | | | | | | | - 114 feet: bioturbation | | |
| | | | | | R3 | | | | | B | | | 505 |
| 120 | 22 | 5.1/5.0 | 100 | F | | | | | | | | | |
| | | | | | | | | | | | | | 500 |
| 125 | 23 | 5.1/5.0 | 100 | F | | | | | | | LIMESTONE (wackestone and packstone) interbedded with calcareous shale; micrite and wackestone are greenish black (5BG 2.5/1) and shale is black (2.5Y 2.5/1); fresh; medium strong; rip up clasts; calcite infill in vug shapes | | |
| | | | | | R3 | | | | | | | | 495 |
| 130 | 24 | 4.7/5.0 | 94 | F | | | | | | | LIMESTONE (wackestone) interbedded with calcareous shale; wackestone is greenish black (5BG 2.5/1) and shale is black (2.5Y 2.5/1); fresh; medium strong | | |
| | | | | | | | | | | | | | 490 |
| 135 | 25 | 4.6/5.0 | 92 | F | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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WLA William Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1060

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R3 | | | | | | | | 485 |
| 140 | 26 | 5.3/5.0 | 100 | F | | | | | | | | | |
| | | | | | | | | | | | | | 480 |
| 145 | 27 | 5.2/5.0 | 100 | F | | | | | | | | | |
| | | | | | R3 | | | | | | LIMESTONE (packstone) interbedded with thin calcareous shale; packstone is greenish black (5BG 2.5/1)) and shale is black (2.5Y 2.5/1); fresh; medium strong; calcite infill common | | 475 |
| 150 | 28 | 5.0/5.0 | 100 | F | | | | | | | LIMESTONE (wackestone and micrite) interbedded with calcareous shale; micrite and wackestone are greenish black (5BG 2.5/1) and shale is black (2.5Y 2.5/1); fresh; medium strong; rip-up clasts associated with shale; shale beds are thin and spaced 0.01-0.3 feet apart; shale is wavy | | 470 |
| 155 | 29 | 5.2/5.0 | 100 | F | | | | | | | | | |
| | | | | | R3 | | | | | B | | | 465 |
| 160 | 30 | 4.9/5.0 | 98 | F | | | | | Jo, 75, Wa, Ro, Ti | | LIMESTONE (packstone and wackestone) with interwoven shale; micrite and wackestone are greenish black (5BG 2.5/1) and shale is black (2.5Y 2.5/1); fresh; medium strong; no bedding discernable; fossil rich; rip-up clasts associated with shale; shale is thin to wispy; packstone and wackestone ~50% and shale ~50% | 159.5-166.5 feet: lost most of the circulation fluid (60%) | 460 |
| 165 | 31 | 4.9/5.0 | 99 | F | R3 | | | | | | - 160 feet: high angle joint, 75° | | |
| | | | | | | | | | | | | 166.5-176.5 feet: very little fluid return | 455 |
| 170 | 32 | 4.9/5.0 | 98 | F | | | | | | | | | |
| | | | | | R3 | | | | | | LIMESTONE (wackestone) interbedded with shale; micrite and wackestone are greenish black (5BG 2.5/1) and shale is black (2.5Y 2.5/1); fresh; medium strong | | 450 |
| 175 | 33 | 4.7/5.0 | 94 | F | | | | | | | | PVC: 4 inch O. D. set for Packer testing | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1060

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | - Boring terminated at 176.5 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/5 - 13.7 feet<br>7/6 - 15.3 feet<br>8/17 - 16.0 feet | | 445 |
| 180 | | | | | | | | | | | | | 440 |
| 185 | | | | | | | | | | | | | 435 |
| 190 | | | | | | | | | | | | | 430 |
| 195 | | | | | | | | | | | | | 425 |
| 200 | | | | | | | | | | | | | 420 |
| 205 | | | | | | | | | | | | | 415 |
| 210 | | | | | | | | | | | | | 410 |
| 215 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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WLA William Lettis & Associates, Inc

# SOIL LOG - Boring No. B-1060PS

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532438.3 N; 629268.5 E | | Total Depth<br>31.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>621.7 feet | Ground Water Depth<br>See Note A | Date Started<br>7/10/06 |
| Sampling Method | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>7/10/06 |

Reviewed by / Date M. Graham 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 621.7 0.0 Soil sampling not conducted. Refer to boring B-1060 for soil profile. | Boring located 5 feet from B-1060 | 620 |
| 5 | | | | | | | | | | | | 615 |
| 10 | | | | | | | | | | | | 610 |
| 15 | | | | | | | | | | 605.6 16.1 | | 605 |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1060PS

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532438.3 N; 629268.5 E | | Total Depth<br>31.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>621.7 feet | Ground Water Depth<br>See Note A | Date Started<br>7/10/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 16.1 feet | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>7/10/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 5.3/5.3 | 74 | SW to F | R2 to R3 | P-S | | | Bj, 15, Wa, Ro, Op | USR | LIMESTONE (packstone and wackestone) with interbedded calcareous shale; limestone is greenish gray (Gley 1 6/1) and shale is black (Gley 1 2.5/0); fresh to slightly weathered; weak to medium strong; shale is less than 0.01 feet thick with spacings of less than 0.2 feet, shale is nonplanar and interwoven with rip-up clasts | P-S analysis was conducted over the length of cored section | 605 |
| 25 | 2 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 5, Wa, Ro, Op | | LIMESTONE (wackestone) interbedded with calcareous shale; shale is dark gray (7.5YR 4/1); fresh to slightly weathered; medium strong; shale is less than 0.01 feet thick with spacings of 0.001-0.2 feet and is wavy with stylolitic features; calcite infills present | | 600 |
| 30 | 3 | 4.9/4.9 | 76 | F | R2 to R3 | | | | | | LIMESTONE (alternating micrite, wackestone and packstone) interbedded with calcareous shale; shale is black (Gley 1 2.5/0); fresh; weak to medium strong; shale is wispy and undulatory with interwoven, less than 0.01 feet-thick, globular layers<br>- 23.6-31.4 feet: calcite infill | | 595 |
| 35 | | | | | | | | | | | Boring terminated at 31.3 feet<br><br>NOTE A: Water level data (from B-1060)<br>Date - Depth (below ground surface)<br>7/5 - 13.7 feet<br>7/6 - 15.3 feet<br>8/17 - 16.0 feet | | 590 |
| 40 | | | | | | | | | | | | | 585 |
| 45 | | | | | | | | | | | | | 580 |
| 50 | | | | | | | | | | | | | 575 |
| 55 | | | | | | | | | | | | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# SOIL LOG - Boring No. B-1061

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532124.2 N; 629092.1 E | | Total Depth<br>75.2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>630.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/8/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>6/9/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 630.2 CLAY, dark yellowish brown (10YR 4/6), dry, stiff, contains clasts of limestone 0.0 | | 630 |
| | | SPT 1 | 3 5 7 | 18 | | | | | | 627.7 2.5 | | |
| | | | | | | | | | CH | CLAY, yellowish brown (10YR 5/8), moist, stiff, trace manganese clasts and organics | | |
| | | | | | | | | | | 626.5 3.7 | | |
| | | SPT 2 | 3 4 5 | 24 | | | | | CL | CLAY, brownish yellow (10YR 6/6) to dark yellowish brown (10YR 4/4), moist, stiff, few rock clasts, trace manganese clasts | | |
| 5 | | | | | | | | | | | | 625 |
| | | SPT 3 | 3 7 50/7" | 13.2 | | | | | | 623.2 7.0 | | |
| | | | | | | | | | GC | 622.6 clayey GRAVEL, dark yellowish brown (10YR 4/4), moist, hard 7.6 | SPT refusal at 7.6 feet. Continuation of borehole description in rock log. | |
| 10 | | | | | | | | | | | | 620 |
| 15 | | | | | | | | | | | | 615 |
| 20 | | | | | | | | | | | | 610 |
| 25 | | | | | | | | | | | | 605 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1061

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532124.2 N; 629092.1 E | | Total Depth<br>75.2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>630.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/8/06 |
| Casing Size and Depth<br>PVC: 6.63 inch O.D. / 7.6 feet | Borehole Inclination<br>Vertical | Logged by<br>K. KRUG | Date Completed<br>6/9/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 1.6/2.0 | 0 | CW to HW | R1 to R3 | | | | Jo, 19, Wa, Ro, Ti | | LIMESTONE (micrite) with pockets of completely weathered rock (soil consistency) interbedded with calcareous shale; micrite is bluish gray (Gley 2 5/1)) and shale is dark greenish gray (Gley 2 4/1); shales are spaced 0.6-0.1 feet apart in bands 0.2-0.01 feet thick; weathering ranges from moderately weathered rock fragments to completely weathered; very weak rock to moderately weathered; potential soil-filled pockets between 7.6 and 14.6 feet | Possible soil filled void at depths 7.6-8.0 feet and 9.0-9.6 feet | |
| 10 | 2 | 1.2/5.0 | 0 | F | R3 | | | | | | | fluid recovery good, brown | 620 |
| 15 | 3 | 5.0/5.0 | 83 | F | R3 | | | | | | LIMESTONE (micrite) with interbeds of shale; medium gray (N5) to grayish black (N2); fresh; moderately strong; shale beds are irregularly spaced, wavy and irregular in structure | | 615 |
| 20 | 4 | 4.9/5.0 | 93 | | | | | | | | | | 610 |
| 25 | 5 | 5.0/5.0 | 94 | F | R3 | BHTV<br>NG | | | Jo, 15, Wa, Sm, Ti-Op | USR | - 26.1 feet: slickensides | BHTV and NG analysis were conducted over the length of cored section | 605 |
| 30 | 6 | 4.9/5.0 | 98 | | | | | | | | | fluid recovery good | 600 |
| 35 | 7 | 5.0/5.0 | 100 | F | R3 | | | | | | - 33.4 feet: calcite filled vugs<br>- 34-51 feet: calcareous shale beds becoming thin to medium bedded | 34.5-40.5 feet: abundant drilling-induced discontinuities | 595 |
| 40 | 8 | 5.0/5.0 | 97 | | | | | | | | | | 590 |
| 45 | 9 | 5.0 | 100 | F | R3 | | | | | | - 45-48.5 feet: calcareous shale layers spacing increases with large limestone bands | | 585 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

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# ROCK LOG - Boring No. B-1061

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 5.0 | | | | | | | | | | | |
| 50 | 10 | 4.9/5.0 | 94 | | | | | | | USR | - 51.4-56 feet: fossils or rip up structures increase; shale beds decrease in thickness and occurrence | | 580 |
| 55 | | | | F | R3 | | | | | | | | 575 |
| | 11 | 5.0/5.0 | 100 | | | | | | | | | | |
| 60 | 12 | 4.9/5.0 | 97 | | | | | | | | | | 570 |
| 65 | | | | F | R3 | | | | | A | - 63.6-75.2 feet: shale bands become more discernable | | 565 |
| | 13 | 5.0/5.0 | 100 | | | | | | Jo, 70, Wa, Ro, Ti | | - 66.6 feet: calcite filled vug | | |
| 70 | 14 | 5.0/5.0 | 100 | F | R3 | | | | | | | | 560 |
| 75 | 15 | 0.6/0.6 | 100 | | | | | | | | Boring terminated at 75.2 feet | PVC: 4 inch O. D. installed after drilling for BHTV test | 555 |
| 80 | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/7 - 12.6 feet<br>6/12 - 22.6 feet | | 550 |
| 85 | | | | | | | | | | | | | 545 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1062

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532323.8 N; 629378.9 E | | Total Depth<br>150.8 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>627.7 feet | Ground Water Depth<br>See Note A | Date Started<br>5/14/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>5/16/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 627.7 sandy CLAY, yellowish brown (10YR 5/4), dry, very stiff to stiff, trace black nodules (Fill/disturbed) 0.0 | | |
| | | SPT 1 | 5 6 10 | 18 | | | | | | | | 625 |
| | | SPT 2 | 6 5 7 | 18 | | | | | | | | |
| 5 | | | | | | | | | CH | 622.2 sandy CLAY, brownish yellow (10YR 6/6), moist, stiff (Residual) 5.5 | | |
| | | SPT 3 | 4 6 7 | 18 | | | | | | | | 620 |
| | | SPT 4 | 50/5" | 4.8 | | | | | | 618.8 8.9 | Auger and SPT refusal at 8.9 feet. Continuation of boring description on rock log. | |
| 10 | | | | | | | | | | | | 615 |
| 15 | | | | | | | | | | | | 610 |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1062

| | | | |
|---|---|---|---|
| Drilling Method<br>Holiow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532323.8 N; 629378.9 E | | Total Depth<br>150.8 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>627.7 feet | Ground Water Depth<br>See Note A | Date Started<br>5/14/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 23.5 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>5/16/06 |

Reviewed by / Date: W Nolan 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 0.8/1.7 | 23.5 | NR | NR | | | | | | LIMESTONE (micrite) with interbeds of shale; gray to medium bluish gray (5B 5/1) and medium dark gray shale (N4); highly to completely weathered; very weak to friable; 0.4-1.0 feet intervals of residual soil and gravel brownish yellow (10YR 6/6) to yellowish brown (10YR 5/8); moist; stiff | | |
| | 2 | 2.3/4.1 | 17 | NR | NR | | | | | | | core loss from 13-14.1 feet | 615 |
| 15 | | | | | | | | | | | - 14.7-21.9 feet: soil-filled cavity | 14.7-16.2 feet: SPT test conducted with blow counts of 4-5-7 and 18 inches of recovery<br>16.2-21.9 feet: augered to firm material to set casing at 23.5 feet. | 610 |
| 20 | | | | | | | | | | | | | |
| | 3 | 2.3/3.6 | 8 | HW to MW | R3 | | | | | | - 21.9-22.8 feet: highly fractured<br>- 22.8-23.3 feet: clay infill of limestone fractures<br>- 23.3-29.5 feet: zone without shale interbeds | | 605 |
| 25 | 4 | 4.8/5.1 | 78 | MW to SW | R3 to R4 | | | | Bj, 15, Pl, Sl<br>Bj, 15, Pl, Sl<br>Bj, 10, Wa, Sl<br>Bj, 10, Pl, Sl | USR | LIMESTONE (wackestone) with shale interbeds; medium bluish gray (5B 5/1); moderately weathered to fresh; medium strong to strong<br>- 29.5-35.6 feet: fossil shell fragments | fair to good fluid return to bottom of boring | 600 |
| 30 | 5 | 4.8/5.0 | 52 | SW to F | R3 | | | | Ve, 85-90, Wa, VR | | LIMESTONE (wackestone); medium bluish gray (5B 5/1); fresh; medium strong to strong; minor subplanar shale interbeds (< 5%) | | 595 |
| 35 | 6 | 5.0/5.0 | 98 | F | R3 | | | | | | | | 590 |
| 40 | 7 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 10, Pl, Sl<br>Bj, 10, Pl, Sl<br>Bj, 15, Pl, Sl | | - 42.6 feet: calcite crystals | | 585 |
| 45 | 8 | 5.2/5.2 | 100 | SW to F | R3 | | | | Bj, 10, Wa, Sl<br>Bj, 10, Pl, | | | | 580 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1062

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | | | | | | | | | Sl<br>Bj, 10, Pl,<br>Sl | | | | |
| | 9 | 5.0/5.0 | 92 | SW to F | R4 | | | | Bj, 5, Pl, Ro | | | | 575 |
| 55 | | | | | | | | | | | | | |
| | 10 | 4.4/5.0 | 62 | MW to SW | R4 | | | | Bj, Wa, Sl<br>Bj, 5, Pl, S | | | | 570 |
| 60 | | | | | | | | | | USR | - 61.3-62.8 feet: brecciated | | |
| | 11 | 5.0/5.0 | 60 | MW | R3 | | | | Ve, 10, Wa, Ro | | | | 565 |
| 65 | | | | | | | | | Bj, 15, Pl, Sm<br>Ve, 60, Wa, Ro | | | | |
| | 12 | 5.0/5.1 | 51 | HW to MW | R2 to R3 | | | | Bj, 5, Pl, Sm | | - 67-70 feet: fossiliferous limestone<br>- 67.6-67.8 feet: high angle joint (70-85°)<br>- 68-69.5 feet: high angle joint (85-90°) | | 560 |
| 70 | | | | | | | | | Bj, 10, Pl, Ro<br>Bj, 15, Pl, Ro | | | | |
| | 13 | 5.0/5.0 | 100 | SW to F | R4 | | | | Bj, 10, Pl, Ro | | | | 555 |
| 75 | | | | | | | | | | | | | |
| | 14 | 5.0/5.0 | 96 | SW to F | R4 | | | | Bj, 10, Wa, Sl | | | | 550 |
| 80 | | | | | | | | | Bj, 10, Pl, Sm | A | | | |
| | 15 | 5.0/5.0 | 100 | F | R5 | | | | | | | | 545 |
| 85 | | | | | | | | | Bj, 5, Pl, S | | | | |
| | 16 | 4.9 | 98 | F | R5 | | | | Bj, 10, Pl, Sl<br>Bj, 10, Pl, Sl | | | | 540 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1062

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 5.0 | | | | | | | | | | | |
| 90 | | | | | | | | | | | - 90.9-92.1 feet: high angle joint (90°) | | |
| | 17 | 4.8/5.0 | 74 | SW to F | R4 | | | | Bj, 10, Wa, Si | | | | 535 |
| 95 | | | | | | | | | | | | | |
| | 18 | 5.0/5.0 | 96 | F | R5 | | | | Bj, 10, Pl, Si | | | | 530 |
| 100 | | | | | | | | | | | | | |
| | | | | | | | | | Bj, 5, Pl, S | | | | |
| | 19 | 5.0/5.0 | 100 | F | R5 | | | | | | | | 525 |
| 105 | | | | | | | | | | | | | |
| | 20 | 5.1/5.1 | 100 | F | R5 | | | | Bj, 5, Wa, Si | A | | | 520 |
| 110 | | | | | | | | | | | | | |
| | | | | | | | | | | | - 111.2-116 feet: 5 feet vertical fracture (90°-75°) | | |
| | 21 | 5.0/5.0 | 100 | MW | R2 to R3 | | | | Ve, 90-75, VR | | | | 515 |
| 115 | | | | | | | | | | | | | |
| | | | | | | | | | | | - 116-119.6 feet: vertical fracture | | |
| | 22 | 5.0/5.0 | 32 | MW to F | R3 to R4 | | | | | | | | 510 |
| 120 | | | | | | | | | | | | | |
| | | | | | | | | | | | - 121-126 feet: with small calcite crystals | | |
| | 23 | 5.0/5.0 | 100 | F | R5 | | | | | | | | 505 |
| 125 | | | | | | | | | | | | | |
| | 24 | 5.0 | 100 | F | R5 | | | | Bj, 10, | | | | 500 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

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# ROCK LOG - Boring No. B-1062

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 130 | | 5.0 | | | | | | | Wa, SI<br>Bj, 5, Pl, S | | | | |
| 135 | 25 | 5.0/5.0 | 100 | F | R5 | | | | | A | | | 495 |
| 140 | 26 | 5.1/5.1 | 94 | F | R5 | | | | Bj, 10, Pl, S<br>Bj, 5 Pl, SI | | | | 490 |
| 145 | 27 | 5.0/5.0 | 96 | SW to F | R5 | | | | Bj, 5, Pl, S | B | | | 485 |
| 150 | 28 | 4.7/4.7 | 83 | SW to F | R5 | | | | Bj, 5, Pl, S<br>Bj, 5, Wa, SI<br>Bj, 10, Wa, SI | | | | 480 |
| 155 | | | | | | | | | | | Boring terminated at 150.8 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/18 - 48.7 feet<br>5/25 - 48.7 feet | | 475 |
| 160 | | | | | | | | | | | | | 470 |
| 165 | | | | | | | | | | | | | 465 |
| | | | | | | | | | | | | | 460 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# SOIL LOG - Boring No. B-1063

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1531925.4 N; 628928.3 E | | Total Depth<br>50.2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>634.7 feet | Ground Water Depth<br>See Note A | Date Started<br>5/15/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/16/06 |

Reviewed by / Date W Lodwick 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 634.7 CLAY, yellowish brown (10YR 5/6), moist, medium stiff, trace sand, trace angular gravel | 0.0 | |
| | | SPT 1 | 1 2 2 | 0 | | | | | | | No recovery in SPT-1 | |
| | | SPT 2 | 2 10/0" | 6 | | | | | CH | 631.0 CLAY with gravel, very light gray (N8) mottled to white and gray, moist, soft, gravels subrounded, weathered limestone, reacts with HCl | 3.7 | SPT and auger refusal at 4.0 feet. Continuation of borehole in rock log. |
| 5 | | | | | | | | | | 630.7 | 4.0 | 630 |
| 10 | | | | | | | | | | | | 625 |
| 15 | | | | | | | | | | | | 620 |
| 20 | | | | | | | | | | | | 615 |
| 25 | | | | | | | | | | | | 610 |
| 30 | | | | | | | | | | | | 605 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1063

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1531925.4 N; 628928.3 E | | Total Depth<br>50.2 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>634.7 feet | Ground Water Depth<br>See Note A | Date Started<br>5/15/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 4 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/16/06 |

Reviewed by / Date W Gohlmann 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 1 | 4.6/4.6 | 100 | F | R3 to R4 | | | | Bj, 15, Pl, Ro | USR | LIMESTONE (micrite) interbedded with shale; micrite is medium gray (N5) and shale is blackish gray (N2); fresh; medium stong to strong; sections of bioturbation<br>- 4-13.5 feet: shale beds 0.01-0.2 feet thick and constitute ~20% of the rock, stylolites, wavy | Good fluid returns, milky white<br>down pressure gage non-operable | 630 |
| 10 | 2 | 4.9/4.9 | 100 | F | R3 to R4 | | | | Bj, 15, Pl, Ro | | | | 625 |
| 15 | 3 | 5.0/5.0 | 100 | F | R3 to R4 | | | | Bj/Mb, 10, Pl, Ro | | LIMESTONE (micrite and wackestone) interbedded with shale; micrite is medium gray (N5) and shale is grayish black (N2); fresh; medium stong to strong;<br>-13.5-28.5 feet: shale beds are thicker (0.01-0.4 feet) and constitute ~40% of the rock<br>- 19-34 feet: bioturbation common | | 620 |
| 20 | 4 | 5.1/5.0 | 100 | F | R3 to R4 | | | | Bj, 10, Pl, M-Ro, ca coating | | | fluid return good, light grey to white | 615 |
| 25 | 5 | 5.0/5.0 | 100 | F | R3 to R4 | | | | Bj, 10, Sm, Pl<br>Bj, 15, Pl, Sl, Ro | | - 27-31 feet: increasingly fossiliferous with depth | | 610 |
| 30 | 6 | 5.0/5.0 | 100 | F | R3 to R4 | | | | | | - 28.5-34 feet: much less shale (~20%), more coarse grained section | | 605 |
| 35 | 7 | 5.0/5.0 | 100 | F | R3 to R4 | | | | | | LIMESTONE (wackestone) interbedded with shale; limestone is medium light gray (N6) and shale is dark gray (N3); fresh; medium strong to strong; limestone grades from wackestone to micrite; all fractures occur in shale<br>- 34.8-35.2 feet: fossilliferous zone<br>- 37.5 feet: sparry calcite vugs | | 600 |
| 40 | 8 | 5.1/5.0 | 100 | F | R3 to R4 | | | | | | - 34-45.6 feet: shale is thin, less than 0.01 feet and constitutes ~10% of the rock<br>- 40 feet calcite vug | | 595 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

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# ROCK LOG - Boring No. B-1063

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 9 | 5.0/5.0 | 100 | F | R3 to R4 | | | | Bj, 10, Pl, Sm, calcite coating | USR | - 45.6-46.9 feet: coarse grained section with oolites (rounded fragments) with crystals on interior<br>- 46.9 feet: shale layer 0.2 feet thick<br>- 47.1-50.2 feet: shale is very thin with only 2 beds 0.1 feet thick | | 590 |
| | 10 | 1.7/1.7 | 100 | F | R3 to R4 | | | | Bj, 10, Pl, Sm | | | | |
| 50 | | | | | | | | | | | Boring terminated at 50.2 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/16 - 3.1 feet | | 585 |
| 55 | | | | | | | | | | | | | 580 |
| 60 | | | | | | | | | | | | | 575 |
| 65 | | | | | | | | | | | | | 570 |
| 70 | | | | | | | | | | | | | 565 |
| 75 | | | | | | | | | | | | | 560 |
| 80 | | | | | | | | | | | | | 555 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1064

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532447.5 N; 628574.8 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>623.9 feet | Ground Water Depth<br>See Note A | Date Started<br>5/24/06 |
| Sampling Method<br>CME/NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/25/06 |

Reviewed by / Date W Stokes 3-14-07 DSC 3-13-07

| Depth (feet) | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | 623.9 ASPHALT (0.0–0.2); GRAVEL (Fill) (0.2–0.5) | |
| | SPT 1 | 2 3 7 | 10.8 | | | | CH | CLAY, brown (7.5YR 4/3), moist, stiff, few small sandstone gravels, trace organics<br>- 18 feet: clay-filled fracture | |
| | SPT 2 | 3 6 8 | 12 | | | | | | |
| 5 | | | | | | | CH | 618.4 (5.5) - 4.5 feet: small (~0.1 feet) layer, very dark gray (7.5YR 3/1)<br>- organic roots at base of SPT-2<br>CLAY, dark yellowish brown (10YR 4/6), moist, very stiff, trace limestone gravel, trace manganese nodules | |
| | SPT 3 | 4 8 12 | 9.6 | | | | | | |
| | SPT 4 | 3 7 10 | 12 | | | | | | |
| 10 | SPT 5 | 3 5 10 | 13.2 | | | | | | |
| 15 | SPT 6 | 2 50/2" | 7 | | | | | 610.0 (13.9) silty SAND, light yellow brown (2.5Y 6/4), wet, very loose (609.7–14.2) | SPT refusal at 14.2 feet. Continuation of borehole description in rock log. |
| 20 | | | | | | | | | |
| 25 | | | | | | | | | |
| 30 | | | | | | | | | |

Elevation (feet): 620, 615, 610, 605, 600, 595

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC — WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1064

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532447.5 N; 628574.8 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>623.9 feet | Ground Water Depth<br>See Note A | Date Started<br>5/24/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 13.7 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/25/06 |

Reviewed by / Date W Holmes 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 2.6/2.6 | 100 | SW to F | R2 | | | | Jo, 5, Wa, Sl, Op | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3) to grayish black (N2); fresh to slightly weathered; weak; occasional wackestone layers of color medium bluish gray (5B 5/1)<br>- 14.6 feet: fossiliferous section ~0.2 feet thick<br>- 14.8 feet: vug 0.02 x 0.05 feet<br>- Clay-filled fractures from 16-19 feet<br>- 16.2 and 18 feet: clay-filled fractures | First core run begun at 13.7 feet. | |
| | | | | | | | | | Jo, 10, Wa/St, Sl, Op | | | | |
| | 2 | 5.0/5.0 | 100 | SW to F | R2 | | | | Jc, 5, Wa, Sm, Op | | | | 605 |
| 20 | | | | | | | | | | | - 20.4-31.3 feet: shale-rich section, beds are < 0.02-0.3 feet thick (average of 0.06 feet), becoming fresh | | |
| | | | | | | | | | Bj/Mb, 5, Wa, Sm, Op | | | | |
| | 3 | 4.8/5.0 | 96 | F | R2 | | | | | | - 22.5 feet: bioturbation, rip-upclasts<br>- 23.6 feet: wackestone layer 0.1 feet thick | | 600 |
| 25 | | | | | | | | | Bj/Mb, 5, Wa, Sl, Ti | | - 24.3 feet: wackestone layer 0.05 feet thick<br>- 24.9 feet: bioturbation | | |
| | 4 | 4.6/4.6 | 89 | F | R2 | | | | Bj/Mb, 10, Wa, Sl, Ti | | | | 595 |
| 30 | | | | | | | | | Bj/Mb, 15, Wa, Sl, Ti | | | | |
| | 5 | 0.4/0.4 | 100 | F | R2 | | | | | B | - 31.3-35 feet: occasional shale beds, shale beds are 0.02-0.05 feet thick with spacings of 0.01-0.3 feet<br>- 32 feet: some shale layers show incipient fractures | | |
| | 6 | 5.0/5.0 | 100 | F | R2 | | | | Bj/Mb, 10, Wa, Sl, Ti | | | | 590 |
| 35 | | | | | | | | | Jo, 70, Pl/Wa, Sl, Ti/Op | | - 35-46.6 feet: shale beds are 0.01-0.03 feet with spacings of 0.05-0.35 feet<br>- 35.9 feet: high angle fractures, some with calcite crystals or clay coatings | | |
| | | | | | | | | | Jc, 70, Pl/Wa, Ro, Ti/Op | | | | |
| | 7 | 5.0/5.0 | 100 | F | R2 | | | | | | | | 585 |
| 40 | | | | | | | | | | | | | |
| | 8 | 5.0/5.0 | 100 | F | R2 | | | | | | | | 580 |
| 45 | | | | | | | | | Bj/Mb, 10, Wa, Sl, Ti | | | | |
| | 9 | 3.4/3.7 | 92 | F | R2 | | | | | | -46.6-50 feet: thin (0.01-0.02 feet) calcareous shale beds with spacings of 0.01-0.2 feet.<br>- 48.6-48.9 feet: wackestone interbeds ~0.6-0.2 feet with spacings of 0.05-0.2 feet | | 575 |
| 50 | | | | | | | | | Bj/Mb, 15, Wa, Sm | | Boring terminated at 50 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/24 - 5.6 feet | | 570 |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC | WLA William Lettis & Associates, Inc

# SOIL LOG - Boring No. B-1065

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532496.4 N; 629393.6 E | | Total Depth<br>41.5 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>628.1 feet | Ground Water Depth<br>See Note A | Date Started<br>7/9/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/9/06 |

Reviewed by / Date DSC 5-9-07 Rev. 1 5-10-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 628.1 CLAY with sand, yellowish brown (10YR 5/6), dry, very stiff (Fill) 0.0 | | |
| | | SPT 1 | 5 8 8 | 15 | | | | | | | | |
| | | SPT 2 | 6 7 8 | 12 | | | | | | | | 625 |
| 5 | | | | | | | | | | 622.1 | 6.0 | |
| | | SPT 3 | 2 4 5 | 12 | | | | | CL | CLAY with sand, dark grayish brown (10YR 4/2), moist, stiff to medium stiff, trace organics | | |
| | | SPT 4 | 3 2 5 | 10 | | | | | | | | 620 |
| 10 | | | | | | | | | | 617.6 | 10.5 | |
| | | SPT 5 | 2 3 4 | 8 | | | | | CL | CLAY with sand, brownish yellow (10YR 6/6), moist, medium stiff (Residual) | | |
| | | SPT 6 | 1 2 5 | 14 | | | | | | | | 615 |
| 15 | | | | | | | | | | 611.6 | 16.5 | |
| | | SPT 7 | 3 40 50/6" | 14 | | | | | GC | GRAVEL with clay, medium dark gray (N4), moist, very hard (weathered limestone) 610.6 17.5 | SPT and auger refusal at 17.5 feet. Continuation of borehole description in rock log. | |
| 20 | | | | | | | | | | | | 610 |
| 25 | | | | | | | | | | | | 605 |
| | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc

# ROCK LOG - Boring No. B-1065

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532496.4 N; 629393.6 E | | Total Depth<br>41.5 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>628.1 feet | Ground Water Depth<br>See Note A | Date Started<br>7/9/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 17.5 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/9/06 |

Reviewed by / Date DSC 5-9-07 Rev. 1 5-10-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2.0/2.8 | 25 | HW to MW | R1 to R3 | | | | Bj, 15, Pl, Ro, Op | | LIMESTONE (micrite); medium gray (N5); moderately to highly weathered; extremely weak to medium strong; trace bioturbation and shell fragments | | 610 |
| 20 | 2 | 4.0/5.0 | 34 | MW | R2 to R3 | | | | Bj, 20, Pl, Sl, Op | | - 17.5-36 feet: shale beds are moderately thin to thin with spacings of 0.1-0.5 feet<br>- 20.1-20.6 feet: clay filling<br>- 20.3-25.3 feet: clay filling along bedding 0.1-0.6 feet thick | 20 feet: fluid loss | 605 |
| 25 | 3 | 4.6/5.0 | 42 | MW | R2 to R3 | | | | Bj, 5, Pl, Sl, Op<br>Bj, 15, Pl, Sl, Wa<br>Bj, 15, Pl, Sl, Op | USR | - 24.4-24.5 feet: clay filling<br>- 25.3-36 feet: increase in bioturbation and fossiliferous limestone<br>- 27.7-27.9 feet: clay filling | | 600 |
| 30 | 4 | 4.9/5.0 | 48 | HW | R2 to R3 | | | | Bj, 15, Pl, Sl, Op | | | | 595 |
| 35 | 5 | 4.9/5.0 | 68 | SW to F | R3 | | | | Bj, 10, Pl, Sl, Ti<br>Bj, 10, Pl, Sl, Op | | SHALE with interbedded micrite; medium dark gray (N4); moderately weathered; medium strong; 70% shale | | 590 |
| 40 | 6 | 1.2/1.2 | 100 | F | R4 | | | | | | LIMESTONE (packstone); medium gray (N5), fresh to slightly weathered; strong; packstone is highly fossiliferous | | |
| 45 | | | | | | | | | | | Boring terminated at 41.5 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/10 - 21.9 feet | | 585<br>580<br>575 |
| 50 | | | | | | | | | | | | | |
| 55 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1066

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532293.3 N; 629209.1 E | | Total Depth<br>124.4 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 550 | Elevation (Datum NAVD 88)<br>626.4 feet | Ground Water Depth<br>See Note A | Date Started<br>5/23/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>5/25/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | GC | 626.4 sandy GRAVEL with clay, gray brown, dry, medium dense (Fill) 0.0 | | |
| | | SPT 1 | 22 17 8 | 18 | | | | | | 624.2 | | 625 |
| | | | | | | | | | CH | 2.2 CLAY, strong brown (7.5YR 5/8), moist, stiff to very stiff (Residual) | | |
| 5 | | SPT 2 | 4 5 5 | 18 | | | | | | | | |
| | | SPT 3 | 5 7 11 | 18 | | | | | | | | 620 |
| | | SPT 4 | 11 8 50/4" | 15 | | | | | | 616.6 9.8 | SPT refusal at 9.5 feet. Continuation of borehole description on rock log. | |
| 10 | | | | | | | | | | | | 615 |
| 15 | | | | | | | | | | | | 610 |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1066

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532293.3 N; 629209.1 E | | Total Depth<br>124.4 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 550 | Elevation (Datum NAVD 88)<br>626.4 feet | Ground Water Depth<br>See Note A | Date Started<br>5/23/06 |
| Casing Size and Depth<br>PVC: 6.63 inch O.D. / 9.8 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>5/25/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 0.8/4.1 | 19.5 | RS | NR | | | | | | LIMESTONE (wackestone) with interbeds of shale; medium gray (N6) with dark gray (N2); moderately to highly weathered; medium strong to weak; thin laminations of shale with diffuse boundaries in micrite matrix; weathering along low and high angle discontinuities; clay filling to 0.1 feet; clay coatings | | 615 |
| 15 | 2 | 1.7/5.0 | 18 | RS | NR | | | | | | | | 610 |
| 20 | 3 | 4.8/5.0 | 54 | HW | R2 to R3 | | | | Bj, 5-10, Pl, Sl<br>Bj, 15, Pl, Sl<br>Bj, 10, Pl, Ro<br>Bj, 15-5, Pl, Sl,<br>Bj, 5, Pl, S | | LIMESTONE (wackestone) with shale interbeds; medium gray (N6); weathered to fresh; medium strong; shale beds are thin<br>- 20.2 feet: clay filled bedding joint | | 605 |
| 25 | 4 | 4.8/5.0 | 76 | MW to SW | R3 | | | | Bj, 15, Wa, Sl<br>Bj, 10, Pl, Sl | USR | - 25.8-26.8 feet: fossiliferous<br>- 26.8-30 feet: shale layers are thicker, up to 1 inch thick<br>- 28.3 feet: open spars with calcite | | 600 |
| 30 | 5 | 5.2/5.2 | 90 | MW to SW | R3 | | | | Bj, 10, Pl, Sl | | - 30-37.5 feet: shale beds are as thick as 0.5 feet spaced every 3 inches | | 595 |
| 35 | 6 | 4.8/5.0 | 68 | HW | R2 | | | | Bj, 0, Pl, S<br>Bj, 10, Pl, Sl<br>Bj, 35, Pl, Sl<br>Bj, 10-45, Pl, Sl<br>Bj, 20, Pl, Sl | | - 35-38 feet: highly weathered | 35.4 feet: lost fluid return | 590 |
| 40 | 7 | 4.8/5.0 | 96 | F | R4 | | | | | | - 37.5-45 feet: shale beds are thin to very thin, spaced 0.5 feet apart, bioturbation, shale beds are heavily weathered | | 585 |
| 45 | 8 | 4.9/5.0 | 56 | F<br>HW | R3<br>R2 | | | | Bj, 15, Pl, Sl | A | - 45-51 feet: shale beds are very thin to moderately thin occuring every 0.1 feet | | 580 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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# ROCK LOG - Boring No. B-1066

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 9 | 5.0/5.0 | 86 | F | R3 | | | | Bj, 15, Pl, S; Bj, 15, Wa, Sl | | - 51-55 feet: shale beds are moderately thin to thin occuring every 0.1-0.5 feet | | 575 |
| 55 | 10 | 5.0/5.0 | 100 | F | R4 | | | | | | - 54.1 feet: fossiliferous limestone layer<br>- 55-61 feet: shale beds are very thin to thin and occur every 0.1-0.3 feet | | 570 |
| | | | | | | | | | | | LIMESTONE (micrite) with interbeds of shale and packstone; micrite is medium gray (N6) and shale is dark gray (N2); fresh; strong | | |
| 60 | 11 | 5.0/5.0 | 100 | | | | | | | | - 61-75 feet: shale beds are moderately thin to moderately thick occurring every 0.2-0.3 feet | | 565 |
| 65 | 12 | 4.9/5.0 | 98 | F | R4 | | | | | | - 67 feet: fossiliferous limestone layer | | 560 |
| 70 | 13 | 5.0/5.0 | 100 | F | R4 | | | | | A | | | 555 |
| 75 | 14 | 5.0/5.0 | 100 | F | R4 | | | | | | - 75-80 feet: shale beds moderately thick to thick occuring every 2-4 inches | | 550 |
| 80 | 15 | 4.9/5.0 | 98 | F | R4 | | | | | | - 80-90 feet: shale beds are moderately thick occuring every 2 inches | | 545 |
| 85 | 16 | 5.0/5.0 | 100 | F | R4 | | | | | | - 85.9 feet: fossiliferous limestone layer | | 540 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1066

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 17 | 5.0/5.0 | 100 | F | R4 | | | | | A | - 90-95 feet: shale beds are moderately thick to thick occurring every 0.1-0.3 feet | | 535 |
| 95 | 18 | 5.1/5.1 | 100 | F | R4 | | | | | A | -95-97 feet: fossiliferous limestone layer, shale layers are thick and occur every 0.2-0.3 feet<br>- 97-105 feet: shale layers are moderately thin to thin occuring every 0.1 feet | | 530 |
| 100 | 19 | 5.0/5.0 | 100 | F | R4 | | | | | A | | | 525 |
| 105 | 20 | 5.0/5.0 | 98 | SW to F | R4 | | | | | A | - 105-109 feet: shale layers moderately thick to thin occuring every 0.1-0.2 feet | | 520 |
| 110 | 21 | 5.0/5.0 | 100 | F | R4 | | | | | B | - 109-120 feet: shale beds thin to very thin occuring every 0.1-0.5 feet<br>- packstone intervals | | 515 |
| 115 | 22 | 4.3/4.4 | 95 | F | R4 | | | Bj, 5, Pl, S<br>Bj, 10, Pl, Sl | | B | | | 510 |
| 120 | 23 | 5.8/5.8 | 90 | SW to F | R4 | | | Bj, 5, Pl, Sm<br>Bj, 15, Pl, Sl | | B | - 120-124.4 feet: shale beds are thin to moderately thick occuring every 0.2 feet | | 505 |
| 125 | | | | | | | | | | | Boring terminated at 124.4 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/23 - 15.7 feet<br>5/26 - 15.7 feet<br>6/24 - 15.7 feet | | 500 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettes & Associates, Inc.

# SOIL LOG - Boring No. B-1066UDS

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft)<br>1532290.8 N; 629211.7 E | | Total Depth<br>8 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>626.5 feet | Ground Water Depth<br>See Note A | Date Started<br>8/20/06 |
| Sampling Method<br>UD | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/20/06 |

Reviewed by / Date: [illegible] 3/21/07 DSC 3-20-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | GP | 626.5 poorly graded sandy GRAVEL 0.0 | Groundwater not encountered | 625 |
| | | | | | | | | | CH | 624.0 CLAY with sand, dark yellowish brown (10YR 4/4), dry to moist, stiff (Residual) 2.5 | | |
| 5 | | UD 1 | | 18 | 30.7 | 82/56 | GSZ H SG UC CN | | CH | 622.5 CLAY, olive yellow (2.5Y 6/6), dry to moist, very stiff to hard, contains limestone gravels 4.0 | 4-6 feet: Unconfined Compression Test<br>5.5 feet: resistant zone no recovery in Shelby pushed at 6-8 feet | |
| | | UD 2 | | 0 | | | | | | 618.5 8.0 | | 620 |
| | | | | | | | | | | Boring terminated at 8.0 feet. Did not encounter bedrock. | | |
| 10 | | | | | | | | | | | | 615 |
| 15 | | | | | | | | | | | | 610 |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1067

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532868.7 N; 628839.9 E | | Total Depth<br>174.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>614.4 feet | Ground Water Depth<br>See Note A | Date Started<br>6/27/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>7/6/06 |

Reviewed by / Date DSC 3-13-07 W Stokes 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 614.4 CLAY with sand, dark yellowish brown (10YR 4/4), dry to moist, stiff, trace roots and micaceous flecks 0.0 | | |
| | | SPT 1 | 5 5 7 | 6 | | | | | | | | |
| | | | | | | | | | | 610.9 | 3.5 | |
| | | SPT 2 | 6 8 5 | 11 | | | | | CL | 609.8 CLAY, yellowish brown (10YR 5/8), dry to moist, stiff, trace sand, trace manganese nodules, occasional lenses of coarse grained material (Residual) 4.6 | Driller notes: auger chatter | 610 |
| 5 | | | | | | | | | CH | - 4.4-4.6 feet: sand lens | | |
| | | SPT 3 | 3 7 12 | 14 | | | | | | CLAY, yellowish brown (10YR 5/4), moist, stiff, trace sand, trace manganese nodules, occasional lenses of coarse grained material (Residual) | | |
| | | SPT 4 | 7/4" 20/0" | 4 | | | | | | 605.4 9.0 | SPT refusal at 8.8 feet. Auger refusal at 9.0 feet. Continuation of borehole description on rock log. | 605 |
| 10 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | 585 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1067

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532868.7 N; 628839.9 E | | Total Depth<br>174.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>614.4 feet | Ground Water Depth<br>See Note A | Date Started<br>6/27/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 9 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>7/6/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 4.9/5.0 | 92 | F | R3 | | | | Bj, 15, Pl, Ro, Op, clay coating<br>Bj, 15, Pl, Sm, Ti | B | LIMESTONE (micrite) interbedded with shale; micrite is medium gray (N5) and shale is grayish black (N2); slightly weathered to fresh; medium strong<br>- 9.4-9.9 feet: fracture zone, poor recovery, thin yellow clay coatings along fractures<br>- 8.8- 17.4 feet: shale beds are <0.05-0.3 inches thick with spacings of 0.5-2 inches, wavy, discontinuous, very fine- grained beds, bioturbation<br>- 14.4-14.8 feet: wackestone bed, fossiliferous | 9.4-50 feet: Fluid return good to fair throughout boring | 605 |
| 15 | 2 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 15, Pl, Wa, Sm, Ti | B | LIMESTONE (wackestone with interbedded packstone) interbedded with shale; micrite is medium gray (N5) and shale is grayish black (N2); fresh; medium strong | | 600 |
| 20 | 3 | 5.0/5.0 | 100 | F | R3 | | | | Fa, 20, Pl, Sm, Ti, slickensided<br>Bj, 10, Wa, no fit | B | - 22.4-25.5 feet: wavy, discontinuous, spotty shale<br>- 24 feet: bioturbation | | 595 |
| 25 | 4 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 20, Pl, Sm, Ti, calcite coating<br>Bj, 10, St, Sl, Ro, poor fit<br>Bj, 10, Wa, Ro, Ti | B | - 25.5-29.5 feet: packstone interbed with very little shale, medium gray (N5) to medium light gray (N6), many broken fossil fragments, stylolites every 0.1-0.3 feet | | 590 |
| 30 | 5 | 5.1/5.0 | 98 | F | R3 | | | | Bj, 10, Pl, Sl-Ro, Op, poor fit<br>Bj, 10, Wa, Sl-Ro, Ti<br>Bj, 10, Wa, Ro, Ti | B | - 30.5-35 feet: packstone interbed with very little shale, medium gray (N5), medium coarse grained, fossiliferous, stylolites | | 585 |
| 35 | 6 | 5.2/5.0 | 100 | F | R3 | | | | | B | - 36-37 feet: fossiliferous zone<br>- 38-40.4 feet: beds more planar with very little shale | | 580 |
| 40 | 7 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 10, Pl, Sl-Ro, Op Jo, 90, He, Ti, incipient, 43.3-43.7' | C | SHALE (calcareous) with interbedded limestone (packstone); shale is grayish black and limestone is medium gray (N9); fresh; medium strong; 60% shale<br>interbedded LIMESTONE (micrite and wackestone) and SHALE; limestone is medium gray (N5) and shale is grayish black (N2); shale content increases with depth; beds are planar; 30% shale | | 575 |
| 45 | 8 | 4.9/5.0 | 100 | | | | | | | C | - 46-46.6 feet: prominent shale bed | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

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# ROCK LOG - Boring No. B-1067

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 9 | 5.3/5.0 | 100 | F | R3 | | | | Bj, 15, Pl, Ro, Op | | SHALE interbedded with micrite and wackestone; shale is grayish black (N2) and limestone is medium gray (N5); planar beds; fresh; medium strong; 80% shale | | 565 |
| 55 | 10 | 4.8/5.0 | 96 | F | R3 | | | | Jo, 70, Pl, Sl-Op, He | | LIMESTONE (wackestone and packstone) with interbedded shale; limestone is medium gray (N5) and shale is grayish black (N2); fresh; medium strong; 35% shale<br>- 54-54.8 feet: prominent shale bed<br>- 56.8-57.6 feet: prominent shale bed, 95% shale<br>- 58.6-59.3 feet: prominent shale bed | | 560 |
| 60 | 11 | 4.8/5.0 | 100 | | | | | | | | - 60.7-62.2 feet: shale and limestone, shale beds 0.1-2 inches thick, 45% shale | | 555 |
| 65 | 12 | 5.3/5.0 | 100 | F | R3 | | | | | C | SHALE with interbedded micrite; shale is grayish black (N2) and micrite is medium gray (N5); fresh; medium strong; 70% shale<br>- 63.9-80.8 feet: planar interbeds with striped appearance, micrite beds are 0.1-0.2 feet | | 550 |
| 70 | 13 | 5.3/5.0 | 100 | | | | | | Fa, 40, Wa, Sm, Ti, | | | | 545 |
| 75 | 14 | 5.0/5.0 | 81 | F | R3 | | | | Fa, 60-20°, St, Ti, slickensides | | | | 540 |
| 80 | 15 | 5.1/5.0 | 100 | F | R2 to R3 | | | | Fa, 10, Pl, Sm Ti, rake=90 Bj, 10, Pl, Sm, Op | | LIMESTONE (micrite and packstone) interbedded with calcareous shale; micrite is medium gray (N5), packstone is medium bluish gray (5B 5/1) and shale is dark gray (N3); fresh; weak to medium strong; limestone beds are 0.05-0.2 feet thick with spacings of 0.05-0.4 feet; 35% shale | | 535 |
| 85 | 16 | 4.9/5.0 | 98.6 | | | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh; weak to medium strong; shale beds are <0.01-0.05 feet thick with spacings of 0.05-0.2 feet; 25% shale | | 530 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1067

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 17 | 4.9/5.0 | 97.6 | F | R2 to R3 | | | | | C | | | 525 |
| 95 | 18 | 5.2/5.0 | 100 | | | | | | | | SHALE (calcareous) with interbedded limestone (micrite and packstone); shale is dark gray (N3), micrite is medium gray (N5) and packstone is medium bluish gray (5B 5/1); fresh; weak to medium strong; micrite is globular; bioturbation; 60% shale | | 520 |
| 100 | 19 | 4.9/5.0 | 98.6 | F | R2 to R3 | | | | | | | | 515 |
| 105 | 20 | 5.0/5.0 | 99 | | | | | | | | | | 510 |
| 110 | 21 | 5.0/5.0 | 100 | F | R3 | | | | | D | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; 20% shale<br>- 109.1-121 feet: shale beds are <0.02 feet thick with spacings of 0.02 feet, occasional chert which varies in size from 0.03-0.06 feet, vugs and spar in rock fabric | | 505 |
| 115 | 22 | 5.1/5.0 | 100 | | | | | | | | - 115-125 feet: chert intervals | | 500 |
| 120 | 23 | 4.8/5.0 | 96 | F | R3 | | | Jo, 80, Wa, Si, Ti Jo, 15, Pl, Si, Ti, slickensides, rake=15 | | | - 121-125 feet: shale beds are 0.02-0.03 feet thick, less wavy<br>- 123.4 feet: bed with coal-like fragments 0.5 feet thick | | 495 |
| 125 | 24 | 5.1/5.0 | 100 | | | | | | | | - 125-127 feet: shale beds are 0.01-0.05 feet thick with spacings of 0.05-0.3 feet<br>- 127-135 feet: shale beddings are less discrete, contain rip up clasts and stylolitic features | | 490 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1067

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 130 | 25 | 5.1/5.0 | 100 | F | R3 | | | | | | | | 485 |
| 135 | 26 | 5.0/5.0 | 100 | | | | | | Bj, 10, Wa, Sl, Ti, mineralization | | - 135-140 feet: shale beds are 0.01-0.05 feet thick with spacings of 0.05-0.2 feet, wavy | | 480 |
| 140 | 27 | 5.0/5.0 | 99 | F | R3 | | | | | | - 140-145 feet: shale beddings are less discrete, contain rip-up clasts | | 475 |
| 145 | 28 | 4.7/5.0 | 93 | | | | | | | D | - 145-155 feet: shale beds are 0.1 thick on average with spacings of 0.05-0.2 feet | | 470 |
| 150 | 29 | 5.3/5.0 | 100 | F | R3 | | | | Jo, 80, Sl, He 152.8-153.3' | | - 153.2-154 feet: vertical incipient fracture, 80 degrees | | 465 |
| 155 | 30 | 5.0/5.0 | 100 | | | | | | | | - 155-157.5 feet: shale beds are 0.1 feet thick on average with spacing of 0.05-0.2 feet | | 460 |
| 160 | 31 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 10, Pl, Sm, Ti, slickensides | | - 159.5 feet: slickenside along bedding joint<br>- 157.5-168 feet: shale beds are 0.01 feet thick with spacings of 0.05-0.2 feet | | 455 |
| 165 | 32 | 5.0/5.0 | 100 | | | | | | Jo, 75, Wa, Sl, He | | - 167.2-167.6 feet: vertical joint, 75 degrees<br>- 168-174.6 feet: shale beds are 0.01-0.05 feet | | 450 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1067

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 170 | 33 | 5.1/5.1 | 100 | F | R3 | | | | | D | thick with spacings of 0.02-0.1 feet, shale is very sparry, wavy; stylolites | | 445 |
| 175 | | | | | | | | | | | Boring terminated at 174.5 feet | | 440 |
| | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/28 - 8.2 feet<br>7/5 - 8.0 feet<br>7/6 - 7.8 feet<br>8/1 - 8.2 feet | | |
| 180 | | | | | | | | | | | | | 435 |
| 185 | | | | | | | | | | | | | 430 |
| 190 | | | | | | | | | | | | | 425 |
| 195 | | | | | | | | | | | | | 420 |
| 200 | | | | | | | | | | | | | 415 |
| 205 | | | | | | | | | | | | | 410 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1067PS

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532872.1 N; 628836.1 E | | Total Depth<br>23.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>614.4 feet | Ground Water Depth<br>See Note A | Date Started<br>7/10/06 |
| Sampling Method | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>7/10/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 614.4 0.0 | | |
| | | | | | | | | | | Soil sampling not conducted. Refer to boring B-1067 for soil profile. | | |
| | | | | | | | | | | 606.0 8.4 | | |
| 5 | | | | | | | | | | | | 610 |
| 10 | | | | | | | | | | | | 605 |
| 15 | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | 585 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1067PS

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532872.1 N; 628836.1 E | | Total Depth<br>23.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 75 | Elevation (Datum NAVD 88)<br>614.4 feet | Ground Water Depth<br>See Note A | Date Started<br>7/10/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 8.1 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>7/10/06 |

Reviewed by / Date: WLBraham 3-14-07; DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 0.6/0.9 | 0 | SW | R3 | | | | Bj, 10, Wa, Sl | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh to slightly weathered; medium strong; strong HCl reaction; occasional medium bluish gray (5B 5/1) packstone interbeds<br>- 8.4-15 feet: shale is 0.01-0.05 feet thick with spacings of < 0.2 feet, wavy | See soil boring log B-1067 for soil descriptions<br>Good fluid return throughout boring | 605 |
| 10 | 2 | 5.2/5.0 | 99 | SW to F | R3 | P-S | | | Bj, 15, Wa, Sl, Op<br>Bj, 10, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti, clay lined | | | | 600 |
| 15 | 3 | 4.9/5.0 | 98 | SW to F | | | | | | B | - 15-23.5 feet: shale is <0.02 feet thick with spacings of < 0.1 feet, wavy | P-S analysis was conducted over the length of cored section | |
| 20 | 4 | 4.2/4.2 | 100 | F | R3 | | | | Bj, 15, Wa, Sl, Ti | | - 19.4-20.9 feet: packstone interbed 1.5 feet thick | | 595 |
| 25 | | | | | | | | | | | Boring terminated at 23.5 feet<br><br>NOTE A: Water level data (from B-1067)<br>Date - Depth (below ground surface)<br>6/28 - 8.2 feet<br>7/5 - 8.0 feet<br>7/6 - 7.8 feet<br>8/1 - 8.2 feet | | 590 |
| 30 | | | | | | | | | | | | | 585 |
| 35 | | | | | | | | | | | | | 580 |
| 40 | | | | | | | | | | | | | 575 |
| 45 | | | | | | | | | | | | | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA Wilmott Lewis & Associates, Inc.

# SOIL LOG - Boring No. B-1068

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532280.8 N; 627961.6 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 550 | Elevation (Datum NAVD 88)<br>617.2 feet | Ground Water Depth<br>See Note A | Date Started<br>5/1/06 |
| Sampling Method<br>CME | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/2/06 |

Reviewed by / Date WLA 5-10-07 DSC 5-9-07 Rev. 1

| Depth (feet) | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Soil Type (USCS) | Lithology | Elevation (feet) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | CME 1 | | 20.4 | | | | CH / CH | 617.2 CLAY with gravel, strong brown (7.5YR 5/6), dry to moist, hard, few organics (Fill) 0.0–0.3; CLAY, brown (7.5YR 4/4) mottled with reddish yellow (7.5YR 6/6) and strong brown (7.5YR 5/6), moist, hard, few manganese nodules | 615 | |
| 5 | CME 2 | | 52.8 | | | | | - 4.3-4.5 feet: sand lense (~0.2 feet thick) with pebble size grains | 610 | |
| 10 | CME 3 | | 61.2 | | | | CL | - 8 feet: color changes to yellowish brown (10YR 5/4) with red (2.5YR 4/8) mottling to 9 feet. Then light olive brown (2.5Y 5/4). 607.4–9.8; CLAY with sand, light yellowish brown (2.5Y 6/4), dry to moist, hard, sand consists of pebble sized grains 9.8–12.1 | | CME-3 recovery exceeded core length due to expansion and retrieval of CME-2. |
| | SPT 4 | 50/1" | 1 | | | | | 605.1 weathered LIMESTONE 12.1–12.7 | 605 | SPT and auger refusal at 12.7 feet. Continuation of borehole description in rock log. |
| 15 | | | | | | | | | 600 | |
| 20 | | | | | | | | | 595 | |
| 25 | | | | | | | | | 590 | |
| 30 | | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1068

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532280.8 N; 627961.6 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 550 | Elevation (Datum NAVD 88)<br>617.2 feet | Ground Water Depth<br>See Note A | Date Started<br>5/1/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 13 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/2/06 |

Reviewed by / Date DSC 5-9-07 Rev. 1 5-10-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 3.4/3.7 | 36 | SW | R2 | | | | Jo, 70, Wa, Sl, Ti | | LIMESTONE (micrite) with occasional wackestone interbeds; micrite is medium gray (N5) with dark gray (N3) to grayish black (N2) bands; wackestone is grayish blue (5PB 5/2); slightly weathered to fresh; weak; wackestone beds are 0.1-0.4 feet thick; strong HCL reaction<br>- 14-14.3 feet: possible clay and clastic section, recovered clay-covered pebbles | Good fluid return during drilling | 600 |
| 20 | 2 | 5.0/4.9 | 94 | SW to F | R2 | | | | Bj/Me, 15, Wa, Sl, Ti | | - less weathering | | 595 |
| 25 | 3 | 5.0/5.0 | 80 | SW to F | R2 | | | | Bj/Me, 5, Wa, Sl, Ti<br>Jo, 70, Wa, Sl, Ti<br>Jo, 70, Wa, Sl, Ti<br>Jo, 5, Wa, Sl, Ti<br>Jo, 70, Wa, Sl, Ti | | - 24-27 feet: increase in high angle joints, mostly 70° | | 590 |
| 30 | 4 | 5.0/5.0 | 83 | SW to F | R2 | | | | | C | | | 585 |
| 35 | 5 | 5.0/5.0 | 100 | SW to F | R2 | | | | Bj/Me, 0, Wa, Sl, Ti<br>Jo, 15, Wa, Sl, Ti | | | | 580 |
| 40 | 6 | 5.0/5.0 | 99 | SW to F | R2 | | | | Bj/Me, 0, Wa, Sl, Ti<br>Jo, 90, Wa, Sl, Ti | | | | 575 |
| 45 | 7 | 5.0/5.0 | 87 | SW to F | R2 | | | | Bj/Me, 10, Wa, Sl, Ti | | | | 570 |
| 50 | 8 | 3.7/3.7 | 100 | SW to F | R2 | | | | Bj/Me, 15, Wa, Sl, Ti | | - 47.3 feet: spar filled cavity ~0.08 feet in diameter | | 565 |
| | | | | | | | | | | | Boring terminated at 50 feet<br><br>NOTE A: Water level data | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA Williams Lettis & Associates, Inc

# ROCK LOG - Boring No. B-1068

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Date - Depth (below ground surface)<br>5/3 - 3.7 feet<br>5/8 - 3.9 feet | | |
| 55 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 560 |
| 60 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 555 |
| 65 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 550 |
| 70 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 545 |
| 75 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 540 |
| 80 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 535 |
| 85 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 530 |
| 90 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 525 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1069

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1531732.6 N; 628733.3 E | | Total Depth<br>50.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>635.8 feet | Ground Water Depth<br>See Note A | Date Started<br>4/28/06 |
| Sampling Method<br>CME/SPT | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft / D. Stepanof | Date Completed<br>4/30/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | MH | 635.8 organic SILT, black (10YR 2/1) moist, medium stiff (Fill) 0.0–0.4 | | 635 |
| | | | | | | | | | CL | 635.4 CLAY with coarse sand, reddish brown (5YR 4/4) to olive (5Y 5/4), moist, stiff (Fill) 0.4–0.9 | | |
| | | CME 1 | | 32.4 | | | | | CL | 634.9 CLAY with gravel, brownish yellow (10YR 6/6) moist, stiff to very stiff (Residual)<br>- 3.9-4.7 feet: angular limestone gravels | | |
| 5 | | CME 2 | | 61.2 | | | | | | - 6.8 feet: becomes yellowish brown (10YR 5/6)<br>- 7.7-7.9 feet: gravel | Difficult drilling from 6.8-7.8 feet | 630 |
| | | CME 3 | | 21.6 | | | | | | 626.5 - 9-9.3 feet: gravelly zone 9.3 | SPT refusal at 9.3 feet with 50/0". Continuation of borehole description in rock log. Advance casing to 10.9 feet prior to coring. | |
| 10 | | | | | | | | | | | | 625 |
| 15 | | | | | | | | | | | | 620 |
| 20 | | | | | | | | | | | | 615 |
| 25 | | | | | | | | | | | | 610 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1069

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1531732.6 N; 628733.3 E | | Total Depth<br>50.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>635.8 feet | Ground Water Depth<br>See Note A | Date Started<br>4/28/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 10.9 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft / D. Stepanof | Date Completed<br>4/30/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | | | | | | | | | | | | 625 |
| 15 | 1 | 3.6/5.0 | 42 | SW | R3 | | | | | | LIMESTONE (wackestone) interbedded with shale; medium gray (N5) and shale is medium dark gray (N4); slightly weathered; weak to medium strong; strong HCl reaction<br>- 10.9-21.4 feet: joints are rough, occasionally filled with clay, closely spaced, 10-60° | good to fair fluid return in boring (800 gal used) | 620 |
| 20 | 2 | 5.0/5.0 | 78 | SW<br>MW | R3<br>R2 | | | | Bj,10, Wa, Ro, Op<br>Bj, 20, Wa, Ro, Op | | | 18 feet: rig chatter<br>20 feet: temporary fluid loss | 615 |
| 25 | 3 | 5.0/5.0 | 94 | SW to F | R3 | | | | Bj, 20, Wa, Ro, Ti<br>Bj, 20, Wa, Ro, Op<br>Bj, 20, Pl, Sl, Ti | | | | 610 |
| 30 | 4 | 5.0/5.0 | 46 | F | R2 to R3 | | | | Jo, 90, Wa, Ro, Op<br>Bj, 10, Pl, Sl, Ti<br>Bj, 20, Pl, Sm, Ti | USR | - 26-31 feet: calcite-filled fractures<br>- 28, 32.2 and 41.5-43.5 feet: prominent shale beds 0.2 to 0.5 feet thick | 26 feet: fluid return, milky white 700 psi down pressure | 605 |
| 35 | 5 | 5.0/5.0 | 69 | F | R2 to R3 | | | | Jo, 90, Wa, Ro, Op | | - 31.3, 33.4 and 34.5 feet: clay-filled vertical fracture | | 600 |
| 40 | 6 | 5.0/5.0 | 45 | F | R2 to R3 | | | | Bj, 10, Wa, Sl, Ti<br>Bj, 20 Wa, Sl, Ti | | - 36.5-37.0 feet: vertical fracture<br>- 37.5 and 38.2 feet: clay-filled seams | | 595 |
| 45 | 7 | 5.0/5.0 | 80 | F | R2 to R3 | | | | Bj, 10, Wa, Sl, Ti<br>Bj, 20, Wa, Sl, Ti | | LIMESTONE (packstone) with interbedded shale; packstone is medium gray (N5), shale is medium dark gray (N4); fresh; weak to medium strong; strong HCl reaction | return fluid light gray | 590 |
| | 8 | 4.2/4.2 | 100 | F | R2 to R3 | | | | Bj, 30, Wa, Sl, Ti<br>Bj, 20, | | LIMESTONE (wackestone); medium gray (N5); fresh; weak to medium strong; strong HCl reaction; stylolites | | |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC

WLA William Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1069

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | | | | | | | | | Wa, Sl, Ti | USR | Boring terminated at 50.1 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>4/28 - 5.5 feet<br>4/30 - 17.3 feet<br>5/1 - 17.3 feet<br>8/14 - 17.3 feet | | 585 |
| 55 | | | | | | | | | | | | | 580 |
| 60 | | | | | | | | | | | | | 575 |
| 65 | | | | | | | | | | | | | 570 |
| 70 | | | | | | | | | | | | | 565 |
| 75 | | | | | | | | | | | | | 560 |
| 80 | | | | | | | | | | | | | 555 |
| 85 | | | | | | | | | | | | | 550 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1070

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1530825.5 N; 628348.8 E | | Total Depth<br>51 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins/Warren) / CME 550 | Elevation (Datum NAVD 88)<br>647.2 feet | Ground Water Depth<br>See Note A | Date Started<br>4/25/06 |
| Sampling Method<br>CME/Split Spoon | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>4/28/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 647.2 | | |
| | | | | | | | | | ML | SILT with sand, dark reddish brown (2.5YR 3/3), dry, soft, trace roots (0.0–0.7) | | |
| | | CME 1 | | 30 | | | | | CL | CLAY, yellow (10YR 7/6), moist, stiff, few fine to medium gravel (Fill) (0.7–2.2) | | |
| | | | | | | | | | GC | GRAVEL with clay, light yellowish brown (2.5Y 6/4), moist, stiff, trace roots (Fill) (2.2–3.2) | SPT refusal at 3.2 feet. Rock coring starts at 3 feet. Continuation of borehole description in rock log. | |
| | | SPT 2 | 50/6" | 3.6 | | | | | | | | |
| 5 | | | | | | | | | | | | 645 |
| 10 | | | | | | | | | | | | 640 |
| 15 | | | | | | | | | | | | 635 |
| 20 | | | | | | | | | | | | 630 |
| 25 | | | | | | | | | | | | 625 |
| 30 | | | | | | | | | | | | 620 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1070

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1530825.5 N; 628348.8 E | | Total Depth<br>51 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins/Warren) / CME 550 | Elevation (Datum NAVD 88)<br>647.2 feet | Ground Water Depth<br>See Note A | Date Started<br>4/25/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>4/28/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 1 | 2.3/3.6 | 31 | CW | R3 | | | | | | Partially Weathered Rock (LIMESTONE); medium gray (N5), residual to completely weathered; medium strong | Run#1 starts at 3.0 feet | |
| | | | | SW to F | R3 | | | | Bj, 0, Wa, Ro | | LIMESTONE (wackestone) interbedded with shale; wackestone is medium light gray (N6) and shale is dark gray (N3); slightly weathered to fresh; weak to medium strong; fossiliferous; strong HCl reaction<br>- 8.2-8.8 feet: clay-filled joint | Fluid return good throughout boring | 640 |
| 10 | 2 | 4.4/4.4 | 84 | SW to F | R2 to R3 | | | | Bj, 22, Pl, Sm, Ti<br>Bj, 10, Wa, Ro, Op, staining<br>Bj,10, Wa, Ro, Op, staining; 0.3' clay-filled seam | | | | |
| 15 | 3 | 5.0/5.0 | 100 | SW to F | R2 to R3 | | | | Bj, 0, Wa, Sl, Ti | | | | 635 |
| | 4 | 4.9/5.0 | 78 | SW | R2 to R3 | | | | Bj, 20, Pl, Sm, Ti | | SHALE; medium light gray to medium gray (N6 to N5); slightly weathered; weak; slight HCL reaction along bedding planes; some areas grade into limestone (micrite) medium light gray (N6)<br>- 17.4-18.4 feet: calcite-filled fracture | | 630 |
| 20 | | | | | R2 | | | | Bj, 10, Wa, Ro, Fl clay<br>Bj, 13, Pl, Sm-Sl, Ti | | | | |
| | 5 | 5.0/5.0 | 94 | SW | | | | | Bj, 10, Pl, Sm, Ti<br>Bj, 12, Pl, Sm, Ti<br>Bj, 20, Pl, Sl, Ti<br>Bj, 15, Pl, Sm, Ti | NV | - 21-26 feet: shale grades in to limestone, then back into shale and then back into limestone (micrite) | | 625 |
| 25 | | | | | | | | | Bj, 13, Pl, Sl, Ti<br>Bj, 20, Pl, Sm, Ti | | LIMESTONE (wackestone); medium gray (N5) to light greenish gray (5G 81); slightly weathered to highly weathered; weak to medium strong | | |
| | 6 | 4.6/5.0 | 88 | SW | R2 | | | | Bj, 10, Pl, Sm, Ti<br>Bj, 10, Pl, Sm, Ti | | | | 620 |
| 30 | | | | HW | R0 | | | | Bj, 40, Wa, VR, Op, slight stain | | - 28.6-29 feet: zone of metabentonite, pale yellowish green (10GY 7/2), highly weathered, extremely weak (R0), very fine grained, wavy texture, talc texture | | |
| | | | | SW | R3 | | | | Bj, 10, Pl, Sm, Ti | | | | |
| | 7 | 5.0/5.0 | 94 | F | R2 to R3 | | | | Bj, 20, Pl, Sm<br>Bj, 20, Pl, Sm<br>Bj, 10, Pl, Sm, Ti<br>Bj, 20, Pl, Sm, Ti | | LIMESTONE (micrite) with interbedded calcareous shale; micrite is light gray (N7) and shale is greenish gray (5GY 6/1); fresh; medium strong to weak; slight HCL reaction; shale beds are 0.2-0.5 inches thick with spacings of 1-6 inches<br>- 31-36 feet: vugs | | 615 |
| 35 | | | | | | | | | Bj, 10, Pl, Sl, Ti<br>Bj, 10, Pl, Sl, Ti | | | | |
| | 8 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 15, Pl, Sm, Ti<br>Bj, 22, Pl, Sm, Ti | | | | 610 |
| 40 | | | | | | | | | Bj, 5, Pl, Sm, Ti<br>Bj, 5, Pl, Sm, Ti | | | | |
| | | | | | | | | | Bj, 20, Pl, Sm, Ti<br>Bj, 10, Wa, Sl, Ti | | - 41-45 feet: calcite-filled veins | | 605 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1070

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 9 | 4.9/5.0 | 88 | F | R2 to R3 | | | | Bj, 10, Sm, Pl, Ti<br>Bj, 15, Wa, Sl, Op<br>Bj, 4, Wa, Sl, Ti, Fi | NV | | | |
| | 10 | 4.9/5.0 | 56 | CW | R0 | | | | calcite<br>Bj, 5, Wa, Sl, Op<br>Bj, 20, Wa, Sl, Op<br>Bj, 20, Wa, Sl, Op<br>Bj, 10, Wa, Sl, Op<br>Bj, 20, Wa, Sl, Ti<br>Bj, 8, Wa, Sl, Ti | USR | Metabentonite; pale yellowish green; moderately to completely weathered; extremely weak to weak; grades from well-sorted fine sand (talcy) to silt-sized at top of unit; mica rich; waxy texture | | 600 |
| | | | | HW to MW | R2 | | | | | | | | |
| 50 | | | | SW to F | R3 | | | | | | LIMESTONE (micrite); light gray (N7); slightly weathered to fresh; medium strong | | |
| | | | | | | | | | | | Boring terminated at 51.0 feet | | 595 |
| 55 | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>4/28 - Approximately 6.4 feet<br>4/30 - 7.3 feet<br>8/1 - 7.4 feet<br>8/14 - 7.4 feet | | 590 |
| 60 | | | | | | | | | | | | | 585 |
| 65 | | | | | | | | | | | | | 580 |
| 70 | | | | | | | | | | | | | 575 |
| 75 | | | | | | | | | | | | | 570 |
| 80 | | | | | | | | | | | | | 565 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettes & Associates, Inc.

# SOIL LOG - Boring No. B-1071

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1531172.7 N; 626508.3 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>614.5 feet | Ground Water Depth<br>See Note A | Date Started<br>4/25/06 |
| Sampling Method<br>CME/SPT | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>4/27/06 |

Reviewed by / Date DSC 3-20-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | CME 1 | | 8.4 | | | | | ML | 614.5 SILT with gravel, yellowish red (5YR 4/6), dry, stiff (Fill) 0.0 | |
| | | SPT 1 | 50/2" | 2.4 | | | | | | 612.3 | 1.2-2.2 feet: drilled through to clear rock impediment, no sample collected 2.2 |
| | | SPT 2 | 3 2 7 | 14.4 | | | | | CL | CLAY, strong brown (7.5YR 4/6), moist, stiff (Fill) | |
| 5 | | SPT 3 | 4 4 6 | 4.8 | | | | | | - 4 feet: introduction of few sand and gravel, color changes to brown (7.5 YR 4/4) 609.0 5.5 | 3.7 feet: encounter resistive layer, auger drove at an angle but was subsequently corrected. |
| | | CME 2 | | 50.4 | 12.8 | | CHE | | ML | SILT, light yellowish brown (10 YR 6/4), moist, stiff, trace manganese nodules (Fill) | 5.8-6.3 feet: possible perched water table |
| | | | | | | | | | | 606.2 - 8 feet: changes color to include red (2.5YR 4/8) 8.3 | |
| 10 | | CME 3 | | 60 | | | | | CL | CLAY, yellowish brown (10YR 5/6), moist, stiff to very stiff, trace manganese nodules (Residual) 601.0 13.5 | |
| | | SPT 4 | 6 3 4 | 15.6 | | | | | CH | CLAY, brown (7.5 YR 4/4), wet, soft | |
| 15 | | CME 4 | | 39.6 | | | | | | 596.6 17.9 | |
| | | SPT 5 | 50/2" | 2 | | | | | | | Auger refusal was encountered at 18.0 feet. Driller indicates boring is out of plumb. Boring redrilled in same location to make vertical for rock coring. See rock log B-1071A for rock information. |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 610, 605, 600, 595, 590, 585

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1071

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1531172.7 N; 626508.3 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>614.5 feet | Ground Water Depth<br>See Note A | Date Started<br>4/25/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 13.6 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>4/27/06 |

Reviewed by / Date DSC 3-13-07 W/Bohman 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 2 | 4.0/5.0 | 60 | SW to F | | | | | Bj, 30, Wa/Pl, Sl/Sm, Ti | | LIMESTONE (micrite); medium gray (N5) with dark gray bands (N3) of interbedded shale; slightly weathered to fresh; medium strong; strong HCl reaction<br>Run #1: Recovery = 2.6'/2.7', RQD=81%<br>Cored section from 13.5-17.9 feet is as described from 17.9-40 feet | Run #1 starts at 13.5 feet and Run #2 starts at 16.2 feet<br>16.2-17.4 feet: Field crew reports severe weathering including void spaces and fluid loss. | 595 |
| 25 | 3 | 5.2/5.0 | 100 | | R3 | | | | Bj,10, Wa, Sl, Ti<br>Bj, 8, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Ti | | - 25-40 feet: increase in the frequency of dark gray bands (closer spacing) | Discontinuities at 14, 164, and 17.5 feet are at 20°, wavy, slightly rough, and open to tight. | 590 |
| 30 | 4 | 5.0/5.0 | 90 | F | | | | | Me, 10, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Ti | | | 28.7-28.9 feet: easy drilling | 585 |
| 35 | 5 | 4.9/5.0 | 93 | | R3 | | | | Bj, 20, Wa, Sl, Ti | | | 35.2 feet: fluid has not been recirculating (loss possibly occuring at 28.7 feet) | 580 |
| 40 | 6 | 5.0/5.0 | 100 | F | | | | | | D | | | 575 |
| 45 | 7 | 4.9/5.0 | 97 | SW to F | R2 to R3 | | | | | | LIMESTONE (micrite); medium gray (N5) with dark gray bands (N3); fresh; medium strong; strong HCl reaction; dark beds are subhorizontal, sometimes with light reddish brown (5YR 6/4) inclusions<br>- 41-43.9 feet: zone with high frequency of dark gray banding | 43.8-46.2 feet: stringers of clear, sparry, calcite cement | 570 |
| 50 | 8 | 5.4/5.0 | 89 | | | | | | | | - 44.2-56.2 feet: alternating 2 to 3 foot intervals of medium gray (N5) micrite and dark gray (N3) shale with packstone interbeds; fresh; weak to medium strong; very thin shale laminae | 48.8-49.3 feet: slicken-sides on joint face as well as calcite coating cementation. Possible minor fault movement <2 mm | 565 |
| 55 | 9 | 4.9/5.0 | 98 | | R2 to R3 | | | | | | | 52.5 feet: stringers of spar<br>57-61 feet: many spars | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1071

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 5.0/5.0 | 98 | | | | | | | | - 58.4-69 feet: shale beds become erratic in shape and thickness | and stylolites | |
| 60 | | | | F | | | | | | | | | 555 |
| | 11 | 5.1/5.0 | 100 | | | | | | | | | | |
| 65 | | | | | R2 to R3 | | | | | D | | | 550 |
| | 12 | 5.0/5.0 | 99 | | | | | | | | - 69-75 feet: increase in dark shale interbed frequency and thickness (0.05-0.1 feet) | | |
| 70 | | | | F | | | | | | | | | 545 |
| | 13 | 3.9/3.8 | 93 | | R3 | | | | | | | 74 feet: dark shale bed that has slight reaction to HCl | |
| 75 | | | | | | | | | | | | | 540 |
| | | | | | | | | | | | Boring terminated at 75.0 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>4/25 - 13.3 feet<br>6/28 - 8.2 (GS)<br>7/20 - 9.5 feet | | |
| 80 | | | | | | | | | | | | | 535 |
| 85 | | | | | | | | | | | | | 530 |
| 90 | | | | | | | | | | | | | 525 |
| 95 | | | | | | | | | | | | | 520 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1071A

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1531172.7 N; 626508.3 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>614.5 feet | Ground Water Depth<br>See Note A | Date Started<br>4/25/06 |
| Sampling Method<br>CME/SPT | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>4/27/06 |

Reviewed by / Date M Hodson 3/21/07 DSC 3-20-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 614.5 0.0 | | |
| 5 | | | | | | | | | | Soil sampling not conducted. Refer to B-1071 for soil profile. | | 610 |
| 10 | | | | | | | | | | | | 605 |
| | | | | | | | | | | 601.0 13.5 | | |
| 15 | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | 585 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC — WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1071A

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1531172.7 N; 626508.3 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>614.5 feet | Ground Water Depth<br>See Note A | Date Started<br>4/25/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 13.5 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>4/27/06 |

Reviewed by / Date [illegible] 3/21/07 [illegible] 3-20-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 2.6/2.7 | 81 | SW to F | R3 | | | | Bj,20, Wa, Sl, Ti | D | LIMESTONE (micrite); medium gray (N5) with dark gray bands (N3) of interbedded shale; slightly weathered to fresh; medium strong; strong HCl reaction | Boring redrilled at same location as B-1071 to improve verticality. Redrilled boring encountered refusal to casing at 13.5 feet. No soil samples taken. Driller indicates void at 16.2-16.6 feet and loss of drilling fluid | 600 |
| | 2 | 4.0/5.0 | 60 | | | | | | Bj, 20, Wa, Sl, Op<br>Bj, 20, Wa, Sl, Op | | - 16.2-17.4 feet: soil-filled void | 13.5-40 feet: sub horizontal recemented fractures | 595 |
| 20 | | | | | | | | | Bj, 30, Wa/Pl, Sl/Sm, Ti | | | | |
| | 3 | 5.2/5.0 | 100 | SW to F | | | | | Bj,10, Wa, Sl, Ti<br>Bj, 8, Wa, Sl, Ti | | | | 590 |
| 25 | | | | | R3 | | | | Bj, 5, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Ti | | - 25-40 feet: increase in the frequency of dark gray bands (closer spacing) | | |
| | 4 | 5.0/5.0 | 90 | | | | | | Me, 10, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Ti | | | 28.7-28.9 feet: easy drilling | 585 |
| 30 | | | | F | | | | | | | | | |
| | 5 | 4.9/5.0 | 93 | | | | | | Bj, 20, Wa, Sl, Ti | | | | 580 |
| 35 | | | | | R3 | | | | | | | 35.2 feet: fluid has not been recirculating (loss possibly occuring at 28.7 feet) | |
| | 6 | 5.0/5.0 | 100 | F | | | | | | | | | 575 |
| 40 | | | | | | | | | | | LIMESTONE (micrite); medium gray (N5) with dark gray bands (N3); fresh; medium strong; strong HCl reaction; dark beds are subhorizontal, sometimes with light reddish brown (5YR 6/4) inclusions | | |
| | 7 | 4.9/5.0 | 97 | | | | | | | | - 41-43.9 feet: zone with high frequency of dark gray banding | 43.8-46.2 feet: stringers of clear, sparry, calcite cement | 570 |
| 45 | | | | | R2 to R3 | | | | | | | | |
| | 8 | 5.4/5.0 | 89 | SW to F | | | | | | | - 44.2-56.2 feet: alternating 2 to 3 foot intervals of medium gray (N5) micrite and dark gray (N3) shale with packstone interbeds; fresh; weak to medium strong; very thin shale laminae | 48.8-49.3 feet: slicken-sides on joint face as well as calcite coating cementation. Possible minor fault movement <2 mm | 565 |
| 50 | | | | | | | | | | | | 52.5 feet: stringers of | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

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# ROCK LOG - Boring No. B-1071A

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 4.9/5.0 | 98 | | R2 to R3 | | | | | D | | spar | 560 |
| 55 | | | | | | | | | | | | | |
| 60 | 10 | 5.0/5.0 | 98 | F | | | | | | | - 58.4-69 feet: shale beds become erratic in shape and thickness | 57-61 feet: many spars and stylolites | 555 |
| 65 | 11 | 5.1/5.0 | 100 | | R2 to R3 | | | | | | | | 550 |
| 70 | 12 | 5.0/5.0 | 99 | F | | | | | | | - 69-75 feet: increase in dark shale interbed frequency and thickness (0.05-0.1 feet) | | 545 |
| | 13 | 3.9/3.8 | 93 | | R3 | | | | | | | 74 feet: dark shale bed that has slight reaction to HCl | 540 |
| 75 | | | | | | | | | | | Boring terminated at 75.0 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>4/25 - 13.3 feet<br>6/28 - 8.2 (GS)<br>7/20 - 9.5 feet | | |
| 80 | | | | | | | | | | | | | 535 |
| 85 | | | | | | | | | | | | | 530 |
| 90 | | | | | | | | | | | | | 525 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1072

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1530152 N; 627504.4 E | | Total Depth<br>50.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>627.1 feet | Ground Water Depth<br>See Note A | Date Started<br>6/22/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/22/06 |

Reviewed by / Date DSC 3-13-07 W Gibson 3-14-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | SC | 627.1 SAND with clay, light brownish gray (2.5Y 6/2), moist, medium dense, few gravel (Fill) 0.0–1.3 | | |
| | | SPT 1 | 15 10 6 | 8.4 | | | | | CL | 625.9 CLAY with sand, yellowish red (5YR 4/6, moist, very stiff, few gravel and manganese nodules 1.3–2.7 | Ground water level of 1.5 feet artificially high | 625 |
| | | | | | | | | | SC | 624.4 clayey SAND with gravel, light gray (2.5Y 7/2), moist, loose 2.7–4.3 | | |
| | | SPT 2 | 9 9 3 | 7.2 | | | | | CL | 622.8 CLAY with sand, light yellowish brown (2.5Y 6/4), moist, stiff to medium stiff, few gravel 4.3–6.8 | | |
| 5 | | SPT 3 | 9 3 2 | 6.6 | | | | | | | Auger refusal at 5.2 feet. | |
| | | SPT 4 | 50/1" | 1 | | | | | | 620.3 | SPT refusal at 6.8 feet. Continuation of borehole description in rock log. | 620 |
| 10 | | | | | | | | | | | | 615 |
| 15 | | | | | | | | | | | | 610 |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1072

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1530152 N; 627504.4 E | | Total Depth<br>50.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>627.1 feet | Ground Water Depth<br>See Note A | Date Started<br>6/22/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 6.8 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/22/06 |

Reviewed by / Date N Stolan 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 0.8/4.3 | 15 | SW to F<br>RS | R3<br>R0 | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh to slightly weathered; medium strong; strong HCL reaction; shale is <0.04' thick and spacing is 0.05-0.2<br>- 7.4-11.2 feet: soil-filled void | 7-45.5 feet: good fluid return | 620 |
| 15 | 2 | 1.2/5.0 | 0 | SW to F<br>RS<br>SW to F<br>RS<br>SW to F | R3<br>R0<br>R3<br>R0<br>R3<br>R0 | | | | | | - 7.4-30 feet: very little recovered soil, consistency medium stiff, yellowish brown clay with small gravel<br>- 6.8-30.2 feet: shale is < 0.04 feet thick with spacings of 0.05-0.2 feet<br>- 11.6-14.2 feet: soil-filled void<br>- 14.6-15.4 feet: soil-filled void<br>- 15.6-15.8 feet: soil-filled void | 12 - 30 feet: Possible soil-filled voids | 615 |
| 20 | 3 | 4.5/5.0 | 85 | SW to F<br>SW to F | R3 | | | | Bj, 25, Pl, Ro, Ti | | - 17.1 feet: thin calcite cement layer | | 610 |
| 25 | 4 | 0.0/5.0 | 0 | RS | R0 | | | | | | - 20.4-28.4 feet: soil-filled void | | 605 |
| 30 | 5 | 1.9/5.0 | 33 | SW to F<br>RS<br>SW to F | R3<br>R0<br>R3 | | | | | USR | - 28.8-29.8 feet: soil-filled void<br>- 30.2-31.3 feet: less shale - stylolites beginning to form | | 600 |
| 35 | 6 | 4.9/5.0 | 99 | F | R3 | | | | Jo, 20, Pl, Sl, Ti, slickensides | | - 31.3-37 feet: average shale thickness is 0.01 feet with spacings of 0.02-0.2 feet, wavy<br>- slickensides observed on joint surface | | 595 |
| 40 | 7 | 5.2/5.0 | 100 | F | R3 | | | | | | | | 590 |
| 45 | 8 | 5.0/5.0 | 95 | F | R3 | | | | Bj, 15, Wa, Sm, Ti, calcite cement | | - 37-50 feet: shale is 0.01-0.05 feet thick with spacings of 0.05 to 0.2 feet, calcite cement | 45.5- 50.1: lost fluid return | 585 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1072

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 4.0/4.0 | 100 | F | R3 | | | | Bj, 25, Pl, Sm, Ti | USR | | | 580 |
| 50 | | | | | | | | | | | Boring terminated at 50.1 feet | | |
| | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/22 - 1.5 feet | | 575 |
| 55 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 570 |
| 60 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 565 |
| 65 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 560 |
| 70 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 555 |
| 75 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 550 |
| 80 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 545 |
| 85 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1073

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1530642.8 N; 627276 E | | Total Depth<br>75.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>629.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/22/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>6/23/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | GW | 629.2 GRAVEL with clay, gravel is poorly sorted and reacts with HCl (Fill) 0.0 | | |
| | | SPT 1 | 6 5 4 | 16 | | | | | CH | 627.7 CLAY, yellowish red (5YR 4/6) to strong brown (7.5YR 5/8), dry to moist, stiff to very stiff, few weathered rock fragments, trace mica and black manganese nodules (Residual) 1.5 | | |
| 5 | | SPT 2 | 4 6 9 | 15.5 | | | | | | - slight color change to strong brown (7.5YR 5/8) | | 625 |
| | | SPT 3 | 4 6 6 | 12 | 21.2 | | CHE | | | - slight color change to strong brown (7.5YR 5/6) | | |
| 10 | | SPT 4 | 4 7 10 | 18 | | | | | | - slight color change to strong brown (7.5YR 4/6) | | 620 |
| | | SPT 5 | 4 7 10 | 18 | | | | | CH | 618.2 CLAY with gravel, brown (7.5YR 4/4), moist, very stiff, coarse gravel reacts with HCL 11.0 | | |
| | | SPT 6 | 4 7 10 | 18 | | | | | | | | 615 |
| 15 | | | | | | | | | GC | 614.2 clayey GRAVEL, light reddish brown (5YR 6/4), moist, medium dense, gravels angular 15.0 | Auger grinding on rock or gravels | |
| | | SPT 7 | 4 7 10 | 18 | | | | | CH | 613.2 CLAY, yellowish red (5YR 5/6) to brown (7.5YR 5/4), moist, very stiff to medium stiff, trace black manganese nodules 16.0 | | |
| 20 | | SPT 8 | 3 7 8 | 17 | | | | | | | | 610 |
| | | SPT 9 | 2 3 3 | 14 | | | | | | | | |
| | | SPT 10 | 2 9 10 | 12 | | | | | | 604.5 24.7 | | 605 |
| 25 | | | | | | | | | GW | GRAVEL with sand, medium dense to very dense, moist (weathered limestone) | | |
| | | SPT 11 | 5 9 20/0" | 10 | | | | | | 602.2 27.0 | Auger grinding on rock or gravels<br>SPT refusal at 27 feet.<br>Auger advanced until refusal at 28 feet. Continuation of borehole description in rock log. | |
| 30 | | | | | | | | | | | | 600 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1073

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1530642.8 N; 627276 E | | Total Depth<br>75.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>629.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/22/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 28 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>6/23/06 |

Reviewed by / Date DSC 5-9-07 WLA 5-10-07 Rev. 1

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | GRAVEL with sand, dense to very dense, moist (weathered limestone) | | |
| | 1 | 1.5/1.4 | 26 | MW to SW | R3 | | | | | LIMESTONE (micrite) with interbedded shale; micrite is medium gray (N5), shale is grayish black (N2); moderately weathered to fresh; medium strong; micrite is very fine grained with brown clay coatings on fractures; shale beds are wavy, <0.01-0.1 feet thick, discontinuous, bioturbated with occasional stylolites<br>- 28-30 feet: core is brecciated due in part to drilling activity<br>- 30.2-32 and 33-34.5 feet: incipient, near vertical fractures, open to healed | 28-31 feet: poor fluid return<br>30-32 feet: difficult drilling<br>31-75.3: poor to sporadic fluid returns | 600 |
| 30 | 2 | 2.7/2.7 | 15 | SW | R3 | | | | | | | |
| | 3 | 2.3/2.3 | 100 | F | R3 | | | | | | | 595 |
| 35 | 4 | 5.0/5.1 | 100 | F | R3 | | | | | | | |
| | | | | | | | | | | | | 590 |
| 40 | 5 | 5.0/4.9 | 100 | F | R3 | | | | | - 41 feet: micrite beds dip 15°, with spars and calcite- filled veinlets, narrow burrows | | |
| | | | | | | | | | | | | 585 |
| 45 | 6 | 5.0/5.1 | 100 | F | R3 | | | Bj, 25, Pl, Ro, Ti<br>Bj, 30, Pl, Sl-Ro, Ti | B | | | |
| | | | | | | | | | | | | 580 |
| 50 | 7 | 5.0/5.0 | 96 | F | R3 | | | | | - 50 feet: shale is 5%, indistinct bedding, faint bioturbation | | |
| | | | | | | | | | | | | 575 |
| 55 | 8 | 5.0/4.9 | 100 | F | R3 | | | Bj, 15, Pl, Sm, Tl | | - 55-63 feet: shale beds wavy and dip ~15-20°, rip-up clasts present | | |
| | | | | | | | | | | - 59.2-60 feet: shale-rich interval | | 570 |
| 60 | 9 | 5.0/5.1 | 92 | F | R3 | | | Bj, 15, Pl, Sl-Ro, no fit | | - shale is 15% | | |
| | | | | | | | | | | | | 565 |
| 65 | | 5.0 | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1073

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 5.0 | 100 | F | R3 | | | | | | | | |
| 70 | 11 | 4.0/4.0 | 100 | F | R3 | | | | Jc, 90, He, Tl (69.4-71.2' | B | LIMESTONE (micrite and wackestone) with interbedded shale; limestone is medium gray (N5); fresh; moderately strong; limestone very fine to medium grained; shale <5% and 0.01 feet thick | | 560 |
| 75 | 12 | 2.0/1.8 | 100 | F | R3 | | | | Bj, 30, Pl, Sm | | - 74.5-74.7 feet: fossiliferous wackestone | 73 feet: improved fluid return | 555 |
| | | | | | | | | | | | Boring terminated at 75.3 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/23 - 15.7 feet<br>6/23 - 23.0 feet<br>8/19 - 16.0 feet<br>8/19 - 16.2 feet | | |
| 80 | | | | | | | | | | | | | 550 |
| 85 | | | | | | | | | | | | | 545 |
| 90 | | | | | | | | | | | | | 540 |
| 95 | | | | | | | | | | | | | 535 |
| 100 | | | | | | | | | | | | | 530 |
| 105 | | | | | | | | | | | | | 525 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1074

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1530685.8 N; 627635.9 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>637.4 feet | Ground Water Depth<br>See Note A | Date Started<br>4/25/06 |
| Sampling Method<br>CME/Split Spoon | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>4/29/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Elevation (feet) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | 637.4 | | |
| | | | | | | | | ML | 636.9 | SILT with fine sand, reddish brown (5YR 5/4), dry, few gravel, trace roots | |
| | CME 1 | | 38.4 | | | | | CL | 634.2 | CLAY, brownish yellow (10YR 6/6), moist, very stiff, trace roots, 1.5 inch silt seams, trace black manganese nodules (Fill) | |
| | | | | | | | | ML | 633.9 | SILT with sand, pale yellow (2.5Y 7/3), dry (Fill) | |
| | CME 2 | | 25.2 | | | | | CL | 633.2 | | |
| 5 | | | | | | | | ML | 631.9 | CLAY, brownish yellow (10YR 6/6), moist, very stiff | |
| | SPT 3 | 50/2" | 1.3 | | | | | | 631.7 | SILT, reddish gray (5YR 5/2), moist, very stiff, some gray angular limestone fragments at lower levels (Residual) | SPT and auger refusal at 5.7 feet. Continuation of borehole description on rock log.<br>Casing set at 5.7 feet. |
| | | | | | | | | | | weathered LIMESTONE, gray, angular fragments | |

Lithology depth scale: 0.0, 0.5, 3.2, 3.5, 4.2, 5.5, 5.7

Elevation scale: 635, 630, 625, 620, 615, 610

Depth scale: 0, 5, 10, 15, 20, 25, 30

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC — WLA Williams Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1074

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1530685.8 N; 627635.9 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>637.4 feet | Ground Water Depth<br>See Note A | Date Started<br>4/25/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 5.7 feet | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>4/29/06 |

Reviewed by / Date W Rodin 5/21/07 DSC 3-20-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 0.6/5.0 | 0 | MW | R3 | | | | | USR | LIMESTONE (wackestone); wackestone is grayish blue (5PB 5/2) to pale blue (5PB 7/2) and clay is yellow (10YR 7/6); moderately to slightly weathered; medium strong; clay is low plasticity<br>- 5.5-15.7 feet: core is highly fractured, contains clay filled seams | First core run begun at 5.5 feet.<br>5.5-46 feet: Good fluid return. | 630 |
| 15 | 2 | 1.0/5.0 | 0 | | | | | | Bj, 7, Pl, Ro, 1" clay-filled cavity | | | Advance casing to 15.8 feet | 625 |
| 20 | 3 | 3.2/5.0 | 8 | SW | R3 | | | | Bj, 10, Wa, Ro, Fi, clay | A | - 16.3-17.6 feet: clay-filled cavity 1.3 feet thick<br>- 16.8-20.2 feet: highly fractured with bedding joints and clay- and shale-filled cavities<br>CAVITY: approximately 1.6 feet | | 620 |
| 25 | 4 | 2.4/5.0 | 16 | | | | | | Bj, 20, Pl, Sl, Ti, Fi clay | | - 21.8-24.2 feet: interval highly fractured<br>- 25-25.2 feet: clay-filled void | Advance casing to 23.5 feet | 615 |
| 30 | 5 | 5.0/5.0 | 96 | SW | | | | | Bj, 15, Pl, Sl, Ti<br>Bj, 20, Fi, clay<br>Bj, 20, Wa, Ro, Op<br>Bj, 25, Pl, Sm, Ti<br>Bj, 15, Wa, Sl, Ti | | LIMESTONE (wackestone and packstone) with interbedded shale; limestone is grayish blue (5PB 5/2) to pale blue (5PB 7/2) and shale is medium gray (N5); slightly weathered; medium strong<br>- 25.3 feet: calcite-filled seam<br>- 25-31 feet: shale beds are thin laminations to wavy thin beds; bioturbation and fossils present<br>- 29.8 feet: 0.2 feet thin vertical calcite-filled vug<br>- 31-50 feet: shale is thinly laminated to finely bedded; irregular calcite-filled vugs, bioturbation, fossiliferous | 26 feet: some fluid loss | 610 |
| 35 | 6 | 5.0/5.0 | 88 | | R3 | | | | Bj, 17, Wa, Sl, Ti, shaly seam<br>Bj, 17, Pl, Sm, Ti, shaly seam | | - 31.8 feet: shaly bed 0.1 feet thick, produces sheen when exposed to water, strong hydrocarbon odor, calcite-filled vug within seam shows apparent pull-apart structure<br>- 34.6 feet: shaly bed 0.1 feet thick, bioturbation visible | | 605 |
| 40 | 7 | 5.0/5.0 | 92 | SW | | | | | Bj, 15, Pl, Sm, Ti, shaly seam<br>Bj, 20, Wa, Sl, Op<br>Bj, 25, Wa, Sl, Ti<br>Bj, 17, Wa, Ro, Ti | | - 34.8 feet: shaly bed 0.1 feet thick, bioturbation visible followed by ~0.1 feet packstone rich in calcite replaced fusilinids<br>- 35.6-41 feet: interbeds of shale and packstone present | | 600 |
| 45 | 8 | 5.0/5.0 | 100 | | | | | | Bj, 20, Wa, Sl, Ti<br>Bj, 20, Wa, Ro, Op<br>Bj, 20, Pl, Sl, Ti | | LIMESTONE (wackestone) with interbedded shale; wackestone is grayish blue (5PB 5/2) to pale blue (5PB 7/2) and shale is medium gray (N5); slightly weathered; medium strong<br>- 40.2 and 41.5 feet: calcite-filled vug 0.01 feet<br>- 41-45 feet: fossiliferous shell "ghosts"<br>- 41.9 feet: shaly bed with limestone clasts | | 595 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1074

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SW | R3 | | | | | | | | |
| | 9 | 4.0/4.0 | 100 | | | | | | Bj, 10, Wa, Sl, Ti, clay seam | A | | 46-50 feet: poor fluid return | 590 |
| 50 | | | | | | | | | | | Boring terminated at 50.0 feet | | |
| | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>4/29 - 5.28 feet<br>5/1 - 17.4 feet<br>6/24 - 17.5 feet | | 585 |
| 55 | | | | | | | | | | | | | 580 |
| 60 | | | | | | | | | | | | | 575 |
| 65 | | | | | | | | | | | | | 570 |
| 70 | | | | | | | | | | | | | 565 |
| 75 | | | | | | | | | | | | | 560 |
| 80 | | | | | | | | | | | | | 555 |
| 85 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1075

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1530444.8 N; 627150.2 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>626.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/24/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/25/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 626.2 CLAY with sand, strong brown (7.5YR 4/6), dry to moist, stiff to medium stiff (Fill) 0.0 | | 625 |
| | | SPT 1 | 3 5 6 | 12 | | | | | | | | |
| | | SPT 2 | 3 4 3 | 12 | | | | | | | | |
| 5 | | SPT 3 | 5 10 12 | 12 | | | | | CH | 619.7 CLAY with sand, strong brown (7.5YR 5/8), dry to moist, very stiff (Fill) 6.5 | | 620 |
| | | SPT 4 | 3 6 9 | 12 | | | | | | | | |
| 10 | | SPT 5 | 5 9 11 | 10 | | | | | SC | 615.7 clayey SAND with gravel, gray (10YR 6/1), dry to moist, medium dense (Fill) 10.5 | | 615 |
| | | SPT 6 | 50/5" | 5 | | | | | GW | 612.7 612.3 GRAVEL (partially weathered limestone) 13.5 13.9 | SPT and auger refusal at 13.9 feet. Continuation of borehole description in rock log. | |
| 15 | | | | | | | | | | | | 610 |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1075

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1530444.8 N; 627150.2 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>626.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/24/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 14 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/25/06 |

Reviewed by / Date: [illegible] 3/21/07; DSC 3-20-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 2.3/0.3 | 0 | MW | R3 | | | | | | LIMESTONE (micrite) interbedded with shale; medium light gray (N6), moderately weathered to fresh, medium strong to strong; 25% shale | | 610 |
| 20 | 2 | 5.0/7.0 | 100 | F | R4 | | | | | | - 13.9-19 feet: shale beds are moderately thin to thin with spacings of 0.1-0.3 feet<br>- 19-29 feet: shale beds are moderately thick to thin with spacings of 0.1-0.2 feet.<br>- 19-75 feet: trace bioturbation and shell fragments | | 605 |
| 25 | 3 | 4.9/4.9 | 96 | SW to F | R4 | | | | Bj, 40, Pl, Ro, Op | | | | 600 |
| 30 | 4 | 5.1/5.1 | 100 | SW to F | R4 | | | | Bj, 20, Pl, Ro, Op<br>Bj, 10, Pl, Sl, Wa | | - 28.6 feet: calcite crystals<br>- 29-38 feet: shale beds are moderately thin to thick with spacings of 0.1-0.2 feet | | 595 |
| 35 | 5 | 5.0/5.0 | 100 | F | R4 | | | | Bj, 10, Pl, Sl, Op | B | | | 590 |
| 40 | 6 | 5.0/5.0 | 100 | F | R4 | | | | Bj, 25, Pl, Ro, Ti<br>Bj, 10, Pl, Sl, Ti | | - 38-45 feet: shale beds are moderately thick to moderately thin with spacings of 0.2 feet; shale 15% | 36.5-37 feet: lost fluid return with some recovery at 37 feet<br>39 feet: fluid return is sporadic | 585 |
| 45 | 7 | 5.2/5.2 | 100 | F | R4 | | | | | | - 45-53 feet: shale beds are moderately thin to thin with spacings of 0.1-0.2 feet | | 580 |
| 50 | 8 | 5.0/5.0 | 100 | F | R4 | | | | | | | | 575 |
| | | 5.0 | | | R3 | | | | Bj, 10, Pl | | - 53-60 feet: shale beds are moderately thick to | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1075

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 9 | 5.0 | 66 | F | to R4 | | | | Ro, So<br>Bj, 20, Pl, Sl, Op<br>Bj, 15, Pl, Sl, Ti<br>Ve, 80, Wa, Ro, Op<br>Ve, 80, Pl, Sl, Op | B | very thin with spacings of 0.2-0.4 feet | | 570 |
| 60 | 10 | 5.0/5.0 | 100 | F | R4 | | | | | | - 60-71.5 feet: shale beds are thin with spacings of 0.1-1.0 feet | | 565 |
| 65 | 11 | 5.0/5.0 | 100 | F | R4 | | | | Bj, 10, Pl, Ro, Ti | | - 62.4 feet: calcite crystals | | 560 |
| 70 | 12 | 5.0/5.0 | 100 | F | R4 | | | | Bj, 10, Pl, Sl, Ti | | | | 555 |
| | 13 | 3.5/3.6 | 97 | F | R4 | | | | | | - 71.5-75 feet: shale beds are moderately thin to thin with spacings of 0.1-0.4 feet. | | |
| 75 | | | | | | | | | | | Boring terminated at 75.0 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/24 - 12.4 feet<br>6/25 - 12.4 feet | | 550 |
| 80 | | | | | | | | | | | | | 545 |
| 85 | | | | | | | | | | | | | 540 |
| 90 | | | | | | | | | | | | | 535 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1076

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532710 N; 628084.9 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>612.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/27/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/27/06 |

Reviewed by / Date W Bolen 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 612.7 CLAY with sand, brownish yellow (10YR 6/8), dry to moist, very stiff to stiff (Fill) | 0.0 | 610 |
| | | SPT 1 | 2 7 8 | 12 | | | | | | | | |
| 5 | | SPT 2 | 2 5 5 | 10 | | | | | | - 3.5 feet: color changes to yellow (10YR 7/8), dry | | |
| | | SPT 3 | 2 3 7 | 9 | | | | | | - 6.0 feet: color changes to brownish yellow (10YR 6/8) | | 605 |
| 10 | | SPT 4 | 50/2" | 2 | | | | | | 604.4 | 8.3 Auger and SPT refusal at 8.3 feet. Continuation of borehole description in rock log. | 600 |
| 15 | | | | | | | | | | | | 595 |
| 20 | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1076

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532710 N; 628084.9 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>612.7 feet | Ground Water Depth<br>See Note A | Date Started<br>6/27/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 8.3 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/27/06 |

Reviewed by / Date DSC 3-13-07

| Run No. | Recovery / Cuft | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2.3/2.4 | 92 | SW to F | R3 to R4 | | | | | LIMESTONE (micrite); medium dark gray (N4); fresh to slightly weathered; strong to very strong; traces of bioturbation | |
| 2 | 1.9/5.0 | 30 | F | R4 | | | Bj, 5, Pl, Sl, Op | | | |
| | | | CW | R0 | | | | | 12.6-16.6 feet: soil-filled void | 13-50 feet: no fluid return |
| 3 | 3.8/5.0 | 68 | F | R4 | | | Bj, 10, Pl, Ro, Op | | LIMESTONE (micrite) interbedded with shale; medium gray (N5); fresh to very severely weathered; weak to very strong; traces of bioturbation; shale beds are moderately thick with spacings of 0.1-0.3 feet; shale 25-30% | |
| 4 | 5.0/5.0 | 100 | SW to F | R4 | | | | | - 21-31 feet: shale beds are moderately thick to thick | |
| 5 | 5.0/5.0 | 100 | F | R4 | | | Bj, 10, Pl, Ro, Ti<br>Bj, 10, Pl, Sl, Ti | D | | |
| 6 | 5.0/5.0 | 100 | F | R4 | | | | | -31-43 feet: shale beds are moderately thick with spacings of 0.1-0.3 feet | |
| 7 | 5.0/5.0 | 100 | SW to F | R4 | | | Bj, 10, Wa, Sl, Ti<br>Ve, 35, Pl, Sl, Op | | | |
| 8 | 5.0/5.0 | 90 | SW to F | R4 | | | Bj, 10, Pl, Sl, Op | | - 43-46 feet: shale beds thin to moderately thin | |
| 9 | 4.2 | 98 | SW | R4 | | | | | - 46-50 feet: shale beds moderately thin to thin with spacings of 0.1-0.2 feet | |

Depth (feet): 10, 15, 20, 25, 30, 35, 40, 45

Elevation (feet): 600, 595, 590, 585, 580, 575, 570, 565

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1076

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 4.3 | | to F | | | | | | D | | | |
| 50 | | | | | | | | | | | Boring terminated at 50.0 feet | | |
| | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/27 - 12.2 feet | | 560 |
| 55 | | | | | | | | | | | | | 555 |
| 60 | | | | | | | | | | | | | 550 |
| 65 | | | | | | | | | | | | | 545 |
| 70 | | | | | | | | | | | | | 540 |
| 75 | | | | | | | | | | | | | 535 |
| 80 | | | | | | | | | | | | | 530 |
| 85 | | | | | | | | | | | | | 525 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1077

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532870.6 N; 626759.1 E | | Total Depth<br>15.8 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 45 | Elevation (Datum NAVD 88)<br>602.1 feet | Ground Water Depth<br>See Note A | Date Started<br>5/10/06 |
| Sampling Method<br>CME/SPT | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>5/13/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | CME 1 | | 38.4 | | | | | CL | 602.1 CLAY with sand, brownish yellow (10YR 6/8) to brown (7.5YR 4/3), dry to moist, very stiff to hard, trace organics | | 600 |
| 5 | | CME 2 | | 57.6 | | | | | | - mottled with yellow and very pale brown (10YR 7/4) | | 595 |
| | | | | | | | | | CL | 594.1 - 7.7-9.8 feet: color changes to tan gray with occasional gravel | 8.0 | |
| | | CME 3 | | 21.6 | | | | | CL | CLAY with gravel, tan gray, moist, very stiff | | |
| 10 | | SPT 4 | 14 14 22 | 18 | | | | | | | CME refusal at 9.8 feet. Auger and SPT refusal at 11.7 feet. Continuation of borehole description on rock log B-1077A. | |
| | | SPT 5 | 50/5" | 0 | | | | | | 590.4 | 11.7 | 590 |
| 15 | | | | | | | | | | | | 585 |
| 20 | | | | | | | | | | | | 580 |
| 25 | | | | | | | | | | | | 575 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1077

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532870.6 N; 626759.1 E | | Total Depth<br>15.8 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 45 | Elevation (Datum NAVD 88)<br>602.1 feet | Ground Water Depth<br>See Note A | Date Started<br>5/10/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 12 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>5/13/06 |

Reviewed by / Date W. Gookin 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2.0 / 4.1 | 19 | HW | R3 | | | | | LSR | LIMESTONE (wackestone); medium light gray (N6); fresh to severely weathered; medium strong | | 590 |
| | | | | RS | R0 | | | | | | CLAY-filled zone | | |
| 15 | | | | | R3 | | | | | | LIMESTONE (wackestone); medium light gray (N6); fresh to severely weathered; medium strong | | |
| | | | | | | | | | | | Boring terminated at 15.8 feet.<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/14 - 2.2 feet | Casing may be shearing off side of void. Hole to be rebored to rock in B1077A approximately 4 feet to the north. | 585 |
| 20 | | | | | | | | | | | | | 580 |
| 25 | | | | | | | | | | | | | 575 |
| 30 | | | | | | | | | | | | | 570 |
| 35 | | | | | | | | | | | | | 565 |
| 40 | | | | | | | | | | | | | 560 |
| 45 | | | | | | | | | | | | | 555 |
| 50 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1077A

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532870.9 N; 626755.1 E | | Total Depth<br>150.3 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>601.9 feet | Ground Water Depth<br>See Note A | Date Started<br>5/11/06 |
| Sampling Method<br>No sampling | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>5/12/06 |

Reviewed by / Date MW Graham 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 601.9 0.0 Soil sampling not conducted. Refer to adjacent borehole B-1077 for soil profile. | Borehole advanced with hollow stem auger 0-13.6 feet. | 600 |
| 5 | | | | | | | | | | | | 595 |
| 10 | | | | | | | | | | | | 590 |
| | | | | | | | | | | 588.3 13.6 | | |
| 15 | | | | | | | | | | | | 585 |
| 20 | | | | | | | | | | | | 580 |
| 25 | | | | | | | | | | | | 575 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1077A

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532870.9 N; 626755.1 E | | Total Depth<br>150.3 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 550 | Elevation (Datum NAVD 88)<br>601.9 feet | Ground Water Depth<br>See Note A | Date Started<br>5/11/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 14.2 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>5/12/06 |

Reviewed by / Date [illegible] 3/21/07 DSC 3-20-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 2.2/2.3 | 26 | MW to F | R3 to R4 | | | | | | LIMESTONE (micrite); medium light gray (N6); fresh to moderately weathered; medium strong to strong; yellow stains on fracture surfaces<br>- 14.5-14.6 feet: clay-filled void | | |
| 20 | 2 | 4.9/5.0 | 60 | SW to F | R4 | | | | | | LIMESTONE (micrite) with shale interbeds; medium light gray (N6) with dark greenish gray (Gley 2 4/1) bands; fresh to slightly weathered; strong; shale bands are moderately thin to thin and 0.1 feet apart | | 585 |
| 25 | 3 | 5.6/5.6 | 68 | SW to F | R4 | | | | Jo, 80, Wa, Ro | | - 22.5-24.5 feet: dark gray (N3) to medium dark gray (N4) shale bands occur<br>- 23.7 feet: calcite seam, small crystals | | 580 |
| 30 | 4 | 5.0/5.0 | 100 | F | R4 | | | | | | LIMESTONE (micrite) with shale interbeds; very light gray (N8) to light gray (N7); fresh; strong; shale very thin, spaced 0.4 feet apart | 28 feet: much easier drilling | 575 |
| 35 | 5 | 5.0/5.0 | 88 | SW to F | R4 | | | | | LSR | - 33 feet: color changes to very light gray (N8) to medium light gray (N6) | | 570 |
| 40 | 6 | 5.0/5.0 | 84 | SW to F | R4 | | | | Jo, 45°-90°, Vr | | - 38.3 feet: bioturbation | | 565 |
| 45 | 7 | 5.0/5.0 | 100 | F | R4 | | | | | | - 42 feet: color changes to very light gray (N8); medium grained<br>- 45-46.5 feet: some shell fragments | | 560 |
| 50 | 8 | 4.7/5.0 | 92 | SW to F | R4 | | | | | | LIMESTONE (micrite) with shale interbeds; very light gray (N8) to medium light gray (N6); fresh to slightly weathered; strong to very strong<br>- 46.5-53 feet: shale very thin, spaced 0.1 feet apart<br>- 52.5-57.5 feet: shale layers very thin to | | 555<br>550 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1077A

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 9 | 4.9/5.0 | 98 | | | | | | | | moderately thin with spacings of 0.2-0.4 feet, shell fragments | | |
| 60 | 10 | 5.0/5.0 | 96 | SW to F | R4 | | | | Bj, 10, Pj, Si | | -57.5- 60 feet: color is medium light gray (N6), almost no shale<br>- 60-67 feet: shale layers filling fissures, very thin and 0.2 feet apart | 57.8-58.1 feet: 50% fluid return; maintain full core recovery | 545 |
| 65 | 11 | 5.0/5.0 | 100 | F | R5 | | | | | | - rock becomming very strong | | 540 |
| 70 | 12 | 5.0/5.0 | 100 | F | R5 | | | | | | - 67-71.5 feet: greenish gray (5G 4/1) bands, more shell fragments, shale is moderately thin | | 535 |
| 75 | 13 | 5.0/5.0 | 92 | SW to F | R5 | | | | | LSR | LIMESTONE (micrite) with shale interbeds; medium light gray (N6) to medium gray (N5); fresh to slightly weathered; very strong<br>-71.5-75 feet: shale is moderately thin<br>- 75-91.5 feet: shale layers moderately thin and 0.3-0.5 feet apart | | 530 |
| 80 | 14 | 5.0/5.0 | 100 | F | R5 | | | | | | - 77.5 feet: color changes to light gray (N7)<br>- 79.2-82.6 feet: grayish green (10G 4/2) | | 525 |
| 85 | 15 | 5.0/5.0 | 100 | F | R5 | | | | | | | | 520 |
| 90 | 16 | 5.0/5.0 | 98 | F | R5 | | | | Bj, 10, Si, Pj<br>Bj, 10, Wa, Si | | - 89.5-90 feet: dark shale layer<br>- 91.5-105 feet: shale layers very thin with spacings of 1.0 foot | | 515 |
| | | | | | | | | | | | - 92-106 feet: slightly weathered to fresh | | 510 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

MACTEC

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# ROCK LOG - Boring No. B-1077A

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | 17 | 5.0/5.0 | 98 | SW to F | R5 | | | | Bj, 10, Pl, Sl<br>Bj, 10, Pl, Sl | | | | 505 |
| 100 | 18 | 5.0/5.0 | 100 | SW to F | R5 | | | | Bj, 10, Wa, Sl | | | | 500 |
| 105 | 19 | 5.1/5.1 | 100 | SW to F | R5 | | | | Bj, 10, Pl, Sl-Ro | | - 104.9 feet: white calcite crystals<br>- 105-113 feet: shale layers moderately thin to thin | | 495 |
| 110 | 20 | 5.0/5.0 | 100 | F | R5 | | | | | | | | 490 |
| 115 | 21 | 5.0/5.0 | 100 | F | R5 | | | | | LSR | - 113-119.5 feet: shale layers very thin and 1.0 foot apart<br>- 114.5 feet: fossiliferous | | 485 |
| 120 | 22 | 5.0/5.0 | 100 | SW to F | R5 | | | | Bj, 10, Wa, Ro | | - 116.6-119.5 feet: color changes to light gray (N7) to medium light gray (N6)<br>- 119.5-121.6 feet: limestone is light gray (N7), fresh to slightly weathered, fossiliferous | | 480 |
| 125 | 23 | 5.0/5.0 | 100 | F | R5 | | | | | | LIMESTONE (micrite) with shale interbeds; light gray (N7) to medium gray (N5); fresh; very strong<br>-121.6-137 feet: shale layers moderately thin with spacing of 0.3 feet | | 475 |
| 130 | 24 | 5.0/5.0 | 100 | SW to F | R5 | | | | Bj, 10, Pl, Sl<br>Bj, 5, Wa, Sl | | - 128 feet: bioturbation and shell fragments | | 470 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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# ROCK LOG - Boring No. B-1077A

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 135 | 25 | 5.0/5.0 | 100 | SW to F | R5 | | | | Bj, 15, Pl, Sl | LSR | | | |
| | | | | | | | | | Bj, 5, Pl, Sm | | LIMESTONE (packstone); light gray (N7) to medium dark gray (N4); slightly weathered; very strong | | 465 |
| 140 | 26 | 5.2/5.2 | 100 | SW | R5 | | | | Bj, 10, Pl, Sl | | - 137-150.3 feet: shale layers moderately thin to very thin<br>- 140-145.2 feet: zone of fossilferous (shell fragments) | | 460 |
| 145 | 27 | 5.0/5.0 | 92 | SW | R4 | | | | Bj, 15, Pl, Sl | | - 143.2 feet: chert layer, shale/shell layer | | 455 |
| | | | | | | | | | Bj, 10, Pl, Sl | | | | |
| 150 | 28 | 3.5/3.5 | 94 | SW | R4 | | | | Bj, 5, Pl, Ro | | - 147.5 feet: increase in bioturbation | | |
| | | | | | | | | | | | Boring terminated at 150.3 feet | | 450 |
| 155 | | | | | | | | | | | | | 445 |
| 160 | | | | | | | | | | | | | 440 |
| 165 | | | | | | | | | | | | | 435 |
| 170 | | | | | | | | | | | | | 430 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# SOIL LOG - Boring No. B-1078

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533819.2 N; 627721.5 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>603.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/25/06 |
| Sampling Method<br>CME/SPT | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/26/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | GW | 603.6 – 0.0<br>GRAVEL, gray, dry (Fill)<br>602.6 – 1.0 | | |
| | | CME 1 | | 20.4 | | | | | CL | CLAY with gravel, brownish yellow (10YR 6/6), dry, 10-20% black manganese nodules, gravel is from fill above<br>599.9 – 3.7 | | 600 |
| 5 | | CME 2 | | 63.6 | | | | | CL | CLAY with gravel, brownish yellow (10YR 6/6), dry to moist, very stiff, few black nodules (possibly manganese oxide)<br>- 4-4.5 feet: color changes to brown (7.5YR 4/3), few fine sand, trace limestone fragments<br>- 4.5 feet: color changes to brownish yellow (10YR 6/6) with tan and orange mottling, trace weathered rock fragments<br>- Gravel is freshly broken limestone, gravel content increases with depth<br>593.1 – 10.5 | 5-10.5 feet: very infrequent (<2%) white nodules ~2mm which do not react with acid | 595 |
| 10 | | CME 3 | | 19.2 | | | | | CL | CLAY with gravel, olive yellow (2.5Y 6/6), moist, stiff to very stiff<br>591.5 – 12.1 | | |
| | | SPT 4 | 50/1" | 0 | | | | | | | SPT refusal at 12.1 feet. Continuation of borehole description on rock log. | 590 |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 585 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 580 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 575 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1078

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533819.2 N; 627721.5 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>603.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/25/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 12 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/26/06 |

Reviewed by / Date DSC 3-13-07 [illegible] 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 3.0/3.0 | 66 | CW<br>SW | R3 | | | | | | CLAY, olive yellow (2.5Y 6/6), wet, very soft, few sand<br>LIMESTONE (micrite) with calcareous shale interbeds; medium dark gray (N4) to dark gray (N3); slightly weathered; medium strong; rock is stained near fractures | | 590 |
| 15 | 2 | 4.9/5.0 | 96 | | | | | | | | LIMESTONE (micrite) with interbedded calcareous shale; medium dark gray (N4) to dark gray (N3); fresh; medium strong; contacts are slightly gradual; 50% shale | | 585 |
| 20 | 3 | 4.9/5.0 | 100 | F | R3 | | | | | | - 20-25 feet: shale beds are 0.2-9 cm thick (average of 0.5 cm), some stylolites, rip-up clasts, possible pyrite | | 580 |
| 25 | 4 | 5.1/5.0 | 92 | | | | | | Bj, 20, Pl, Sm | | SHALE (calcareous) with limestone interbeds; medium dark gray (N4) to dark gray (N3); fresh; medium strong<br>LIMESTONE (micrite and wackestone) interbedded with calcareous shale; limestone is medium light gray (N6) and shale is medium dark gray (N4); fresh; medium strong<br>- 26-27.5 feet: beds are mostly fine grained except at 27-27.5 feet, which is wackestone | | 575 |
| 30 | 5 | 5.0/5.0 | 95 | F | R3 | | | | Bj, 10, Pl, Sl-Ro | LSR | SHALE (calcareous) with limestone (micrite) interbeds; shale is medium dark gray (N4) and limestone is medium light gray (N6); fresh; medium strong<br>LIMESTONE (wackestone and micrite); limestone is medium light gray (N6); fresh; medium strong | | 570 |
| 35 | 6 | 4.8/5.0 | 96 | | | | | | | | SHALE; alternating micrite and shale beds; shale is medium dark gray (N4)and limestone is medium light gray (N6); fresh; medium strong; 60% shale; contacts of shale beds with micrite are clear, no alteration, bioturbation or otherwise (35-40 feet) | | 565 |
| 40 | 7 | 5.0/5.0 | 94 | F | R3 | | | | | | LIMESTONE (micrite and wackestone) interbedded with shale; limestone is medium light gray (N6) and shale is medium dark gray (N4); fresh; medium strong<br>- 43.5-44 feet: wackestone<br>- 44-44.8 feet: small wavy shale beds, some brecciation | | 560 |
| 45 | 8 | 5.0/5.0 | 88 | F | | | | | | | LIMESTONE (micrite and wackestone); limestone is medium light gray (N6); fresh; medium strong; some larger grains bordering on wackestone<br>- 46.4-57.1 feet: wide to moderately wide spaced stylolitic features | | 555 |
| 50 | | | | | R3 | | | | Bj, 20, Pl, Sl-Ro | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

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# ROCK LOG - Boring No. B-1078

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 5.0/5.0 | 78 | SW to F | | | | | staining | | - 53-53.5 feet: few small wavy shale beds 0.5-1 cm thick, small fossils | | 550 |
| 55 | 10 | 5.1/5.0 | 100 | | | | | | Bj, 20, Wa, Sl-Ro | | LIMESTONE (micrite and wackestone) interbedded with calcareous shale; limestone is medium light gray (N6) and shale is dark gray (N3); fresh; medium strong; shale beds are very thin<br>LIMESTONE (micrite and wackestone) ; limestone is medium light gray (N6); fresh; medium strong; no shale beds; stylolites spaced 0.05-0.1 feet | | 545 |
| 60 | 11 | 4.9/5.0 | 90 | F | R3 | | | | Jo, 70-80, Ro, staining<br>Bj, 5, Pl, Ro | LSR | LIMESTONE (micrite); light olive gray (5Y 6/1); fresh; medium strong; wavy stylolites spaced 1-5 cm apart; few wackestone interbeds<br>- 63.8 feet: some wackestone grains (>10%) | 62-63 feet: losing water return, improvement at 63 feet | 540 |
| 65 | 12 | 4.8/5.0 | 90 | SW to F | | | | | | | - 65.6-66 feet: wackestone<br>- 65.4-66.5 feet: brown/tan staining and white powder on broken surfaces, possible indication of groundwater flow | | 535 |
| 70 | 13 | 5.0/5.0 | 92 | F | R3 | | | | Bj, 10, Wa, Ro staining | | LIMESTONE (micrite and wackestone); limestone is light gray (N7); fresh; medium strong; mainly very fine to fine grained; homogeneous very thin wavy stylolite lines<br>- 70.9-71.5 feet: fracture zone with staining, indication of groundwater movement along fractures | | 530 |
| 75 | | | | | | | | | | | Boring terminated at 75.0 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/26 - 2.1 feet | | 525 |
| 80 | | | | | | | | | | | | | 520 |
| 85 | | | | | | | | | | | | | 515 |
| 90 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1079

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533742.4 N; 628277 E | | Total Depth<br>150 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>604.8 feet | Ground Water Depth<br>See Note A | Date Started<br>5/22/06 |
| Sampling Method<br>CME/SPT | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/24/06 |

Reviewed by / Date DSC 5-9-07 Rev. 1 5-10-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 604.8 0.0 | | |
| | | | | | | | | | | 604.3 TOPSOIL 0.5 | | |
| | | CME 1 | | 60 | | | | | CL | CLAY with gravel, brown (7.5YR 4/4), moist, very stiff, trace manganese oxide nodules, clay reacts with acid. Gravel is subrounded to sub angular, clasts are limestone fragments or small quartz grains | | |
| 5 | | | | | | | | | | 599.8 5.0 | | 600 |
| | | CME 2 | | 26.4 | | | | | ML | SILT with sand, light olive brown (2.5Y 5/4), moist, very soft | | |
| | | | | | | | | | | 596.3 8.5 | | |
| | | | | | | | | | CL | CLAY, dark yellowish brown (10YR 4/6), very stiff, few sand and gravel clasts, trace manganese oxide nodules | | |
| 10 | | CME 3 | | 18 | | | | | | | CME blocked by long limestone clast at 11.5 feet SPT refusal at 11.8 feet with 38/3". Continuation of borehole description on rock log. | 595 |
| | | SPT 4 | 38/3" | 0 | | | | | | 593.0 11.8 | | |
| 15 | | | | | | | | | | | | 590 |
| 20 | | | | | | | | | | | | 585 |
| 25 | | | | | | | | | | | | 580 |
| 30 | | | | | | | | | | | | 575 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1079

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533742.4 N; 628277 E | | Total Depth<br>150 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>604.8 feet | Ground Water Depth<br>See Note A | Date Started<br>5/22/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 11.5 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/24/06 |

Reviewed by / Date WLJ 5-10-07 DSC 5-9-07 Rev. 1

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 3.5/3.5 | 100 | F | R3 | | | | | | LIMESTONE (micrite) with interbedded shale; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; micrite is medium grained; shale beds moderately thin; 10% shale | First core run begun at 11.5 feet. | |
| 15 | 2 | 4.7/5.0 | 88 | | | | | | | | - 15.5-17 feet: shale rich zone<br>LIMESTONE (micrite) with interbedded shale; micrite is medium gray (N5) and shale is dark gray (N3); fresh; weak | Good fluid retures, milky gray, 2900 psi down pressure | 590 |
| 20 | 3 | 5.0/5.0 | 98 | F | R3 | | | | | | | Drillers using circulating mud tub | 585 |
| 25 | 4 | 5.0/5.0 | 100 | | | | | | Fa, 10, Pl, slickensides, He w/calcite (0.5 cm thick) | | - 25 feet: increase in shale beds to 15%, micrite very fine-grained, very closely spaced incipient fractures, locally healed with calcite | | 580 |
| 30 | 5 | 5.0/5.0 | 79 | F | R3 | | | | Bj, 0, St, Sl-Ro, calcite coating 1 side<br>Fa,10, Pl, Sm, slickensides<br>Bj, 10, Wa, Sl-Ro | F | - 31-32.5 feet: zone of faults (minor) which exhibit prominent slickensides, indicative of bedding parallel slip, 10-20° | | 575 |
| 35 | 6 | 5.0/5.0 | 84 | | | | | | Fa, 20, Pl, Sm, slickensides<br>Fa, 15 , Pl, Sm - glassy surface<br>Fa, 10, Pl, Sl-Ro, slickensides | | | | 570 |
| 40 | 7 | 5.0/5.0 | 96 | F | R3 | | | | Bj, 10, Pl, Sl-Ro, poor fit 20, St, Sm, glassy slickensides | | - 40 feet: increase in shale beds to 20%; locally erratic and bioturbated | Good fluid return | 565 |
| 45 | 8 | 5.3/5.0 | 100 | | | | | | Bj, 30, Pl, Sm<br>Bj, 15, Pl, Sl-Ro | | | | 560 |
| 50 | | | | F | R3 | | | | | | | | 555 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1079

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 5.0/5.0 | 95 | | | | | | Bj, 10, St, Ro | F | - 54.4-55.4 feet: bioturbated zone<br>- 55 feet: increase in shale beds to 25%, micrite is light gray (N6) | | |
| 55 | 10 | 4.9/5.0 | 94 | | | | | | | | - 57-59 feet: shale rich zone | | 550 |
| 60 | 11 | 5.0/5.0 | 92 | F | R3 | | | | Bj, 5, Sl-Ro, Pl, poor fit | | LIMESTONE interbedded with shale; limestone is medium light gray (N6) and shale is dark gray (N3); fresh; medium strong; occurrence of green hydrocarbon residue on shale beds | | 545 |
| 65 | 12 | 0.9/1.0 | 60 | | | | | | | | - 64-69 feet: regularly spaced minor faults or brecciated zones 20-30°, poorly developed slickensides, poor core recovery. 5 to 10% shale, with wavy beds spaced at 0.05 feet. | | 540 |
| | 13 | 4.0/4.0 | 70 | | | | | | | | | | |
| 70 | 14 | 5.1/5.0 | 90 | F | R3 | | | | | | | | 535 |
| 75 | 15 | 5.1/5.0 | 100 | | | | | | Bj, 5, Pl, Sm, poor fit | LSR | | | 530 |
| 80 | 16 | 5.1/5.0 | 96 | F | R3 | | | | | | - 82.2-85.5 feet: very bioturbated | | 525 |
| 85 | 17 | 5.0/5.0 | 100 | | | | | | Fa, 20, Pl, Sm, slickensides, rake=70 | | | | 520 |
| 90 | | | | F | R3 | | | | | | | | 515 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1079

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 18 | 4.8/5.0 | 96 | | | | | | | | | | |
| 95 | | | | | | | | | | | | | 510 |
| | 19 | 5.2/5.0 | 100 | | | | | | | | | | |
| 100 | | | | F | R3 | | | | | | | | 505 |
| | 20 | 5.0/5.0 | 100 | | | | | | | | - 103.8-105 feet: shale bed | Good fluid return, milky gray-white | |
| 105 | | | | | | | | | | | LIMESTONE (micrite); medium gray (N5); fresh; weak | | 500 |
| | 21 | 4.9/5.0 | 98 | | | | | | Bj, 20, Pl, Sm, calcite coating Bj, 5-10, Pl, Sm, poor fit Bj, 10, Pl, Sl-Ro | | - 109-110.8 feet: shale bed | | |
| 110 | | | | F | R3 | | | | | | | Driller replaces water pressure gauge | 495 |
| | 22 | 4.9/5.0 | 98 | | | | | | | LSR | - 114-115 feet: shale rich zone | | |
| 115 | | | | | | | | | | | LIMESTONE (micrite) with minor shale interbeds; micrite is medium light gray (N6) to light gray (N7) and shale is medium dark gray (N4); fresh; weak; beds dip ~10°-15°; shale beds wavy with diffuse boundaries; 10% shale | | 490 |
| | 23 | 5.0/5.0 | 100 | | | | | | | | | | |
| 120 | | | | F | R3 | | | | | | | | 485 |
| | 24 | 5.2/5.0 | 100 | | | | | | | | | | |
| 125 | | | | | | | | | | | | | 480 |
| | 25 | 5.0/5.0 | 100 | | | | | | | | | Driller replaces mud tub fluid | |
| 130 | | | | F | R3 | | | | | | LIMESTONE (micrite) with interbeds of wackestone; micrite is medium light gray (N6) to | | 475 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1079

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 26 | 5.0/5.0 | 100 | | | | | | | | medium dark gray (N4) and wackestone is medium gray (N5); fresh; weak; diffuse relic fossil/oolite pods | | |
| 135 | | | | | | | | | | | | | 470 |
| | 27 | 5.0/5.0 | 100 | | | | | | Fa, 15, Pl, Sm, rake=80 | | | | |
| 140 | | | | F | R3 | | | | | LSR | - 139 feet: color change of wackestone to medium light gray (N6) | Driller replaces mud tub fluid | 465 |
| | 28 | 5.0/5.0 | 100 | | | | | | | | | | |
| 145 | | | | | | | | | | | LIMESTONE (micrite) with minor interbedded shale; medium dark gray (N4); very fine grained; 10% shale beds | | 460 |
| | 29 | 5.1/5.0 | 100 | F | R3 | | | | | | | | |
| 150 | | | | | | | | | | | Boring terminated at 150 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/24 - 3.2 feet | | 455 |
| 155 | | | | | | | | | | | | | 450 |
| 160 | | | | | | | | | | | | | 445 |
| 165 | | | | | | | | | | | | | 440 |
| 170 | | | | | | | | | | | | | 435 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1080

| | | | |
|---|---|---|---|
| Drilling Method: Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft) 1532389.9 N; 630169 E | | Total Depth: 35 feet |
| Drilling Contractor (Driller) and Rig: MACTEC (Akins) / CME 45 | Elevation (Datum NAVD 88): 615.8 feet | Ground Water Depth: See Note A | Date Started: 4/25/06 |
| Sampling Method: CME/SPT | Borehole Inclination: Vertical | Logged by: M. Osborne | Date Completed: 4/26/06 |

Reviewed by / Date: DSC 3-13-07 R. Wooten 3-14-07

| Depth (feet) | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | CME 1 | | 12 | | | | | CL | 615.8 – 0.0: sandy CLAY, brown (7.5YR 4/4), moist, very stiff (Fill) | |
| | SPT 2 | 14 21 31 | 15.6 | | | | | GC | 614.8 – 1.0: clayey GRAVEL, brown, moist to dry, medium dense (Fill) | 1 foot: soil core refusal on a dry white limstone clast (1.5 inches). Advanced SPT through interval. |
| | | | | | | | | SP | 614.1 – 1.8: poorly graded SAND, gray (5YR 5/1), moist, very dense, sand is angular (Fill) | |
| 5 | CME 3 | | 36 | 6.1 | | CHE | | CL | 610.4 – 5.4: CLAY with sand, yellowish brown (10YR 5/6), very stiff, occurrence of limestone fragments and manganese nodules increase with depth (possibly Residual) | |
| | CME 4 | | 12 | | | | | CL | 607.4 – 8.4: CLAY, yellowish brown (10YR 5/6), moist, stiff, trace manganese nodules (Residual) | |
| 10 | SPT 5 | 50/1" | 0 | | | | | | 605.8 – 10.0 | Auger and SPT refusal at 9.9 feet. Continuation of borehole description on rock log. |
| 15 | | | | | | | | | | |
| 20 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 30 | | | | | | | | | | |

Elevation (feet): 615, 610, 605, 600, 595, 590

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1080

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532389.9 N; 630169 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME 45 | Elevation (Datum NAVD 88)<br>615.8 feet | Ground Water Depth<br>See Note A | Date Started<br>4/25/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 9.1 feet | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>4/26/06 |

Reviewed by / Date DSC 3-13-07

| Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2.1/2.0 | 75 | SW | R3 | | | | Bj, 5-10, Wa<br>Bj, 5-10, Wa | | LIMESTONE (packstone) interbedded with shale; packstone is medium gray (N5) and shale is dark gray (N3); slightly weathered; medium strong; wavy to planar laminations to fine bedding; shale beds are 0.1-1.5 inches thick with spacings of 1-6 inches | First core run begun at 9.3 feet.<br>9.9-24.6 feet: Good fluid return, downhole pressure 500-650 psi |
| 2 | 4.9/5.0 | 74 | SW | R3 | | | | Bj, 10, Pl<br>Bj, 8, Wa<br>Bj, 12, Wa | | - 13.8 feet: vertical stylolites, color grades darker | |
| 3 | 4.9/5.0 | 88 | SW | R3 | | | | Bj, 15, St, Sl, Ti<br>Bj, 15, Pl, Sl, Ti<br>Bj, 15, Pl, Sl, Ti<br>Bj, 5, Pl, Sl, Ti<br>Bj, 10, Pl, Sl, Ti | | - 18-23 feet: possible small dissolved shell "ghosts" | |
| 4 | 5.0/5.0 | 82 | SW | R3 | | | | Bj, 5, Wa, Sl, Ti<br>Bj, 10, St, Sl, Ti<br>Bj, 15, Pl, Sm, Ti, clay infill<br>Bj, 10, St, Sl, Ti | NV | LIMESTONE (packstone and wackestone) interbedded with shale; limestone is medium gray (N5) and shale is dark gray (N3); slightly weathered; medium strong<br>- 21.6 feet: 0.05 feet thick shaly zone with clay infilling, appears to be thin metabentonite<br>- 19.2-30.5 feet: shale beds are 0.05-0.2 feet thick, subhorizontal (5°-15°); irregular calcite crystal-filled vugs | 24.6-35.0 feet: Loss of fluid return<br>24.8 feet: lost fluid return and did not recover |
| 5 | 4.8/5.0 | 94 | SW | R3 | | | | Bj, 10, St, Sl, Ti<br>Bj, 10, Wa, Sl, shaly infill<br>Bj, 5, St, Sl, Ti<br>Bj, 15, Pl, Sl, Ti<br>Bj, 20, Wa, Sl, Ti | | - 30-35 feet: fine to laminated beds, wavy | |
| 6 | 3.6/3.7 | 92 | SW | R3 | | | | Bj, 10, St, Sl, Ti<br>Bj, 20, St, Sl, clay/shaly infill | | - 34.2 feet: shaly zone 0.1 feet thick with clay infilling<br>34.5-34.6 feet: metabentonite | |

Boring terminated at 35.0 feet

NOTE A: Water level data
Date - Depth (below ground surface)
4/27 -9.0 feet
8/14 -9.0 feet

Depth (feet): 10, 15, 20, 25, 30, 35, 40, 45, 50

Elevation (feet): 605, 600, 595, 590, 585, 580, 575, 570

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1081

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532026.1 N; 628657.8 E | | Total Depth<br>33.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>625.7 feet | Ground Water Depth<br>See Note A | Date Started<br>5/9/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/10/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 625.7 CLAY, strong brown (7.5YR 5/8), moist, very stiff, few organics | |
| | | SPT 1 | 3 6 9 | 14 | | | | | | | SPT 1 used a 24 inch sampler. Remaining SPT samples taken with 18 inch sampler. |
| | | SPT 2 | 3 7 11 | 10 | | | | | | 3.5 feet: color changes to yellowish brown (10YR 5/8), | |
| 5 | | | | | | | | | CH | 620.8 CLAY with gravel, strong brown (7.5YR 4/6), moist, very stiff, trace sand | |
| | | SPT 3 | 10 12 15 | 18 | | | | | CH | 619.7 CLAY, strong brown (7.5YR 4/6), moist, very stiff, few organics<br>- 7.3 feet: sand stringer, reddish yellow (7.5YR 6/6) | |
| | | SPT 4 | 4 8 11 | 14 | | | | | | - color changes to light bluish gray (Gley 2 7/1) | |
| 10 | | | | | | | | | | 614.7 | |
| | | SPT 5 | 3 10/0" | 6 | | | | | CH | 614.2 CLAY with gravel, yellowish brown (10YR 5/6) mottled with gray veins, moist, hard, gravel is light gray (5Y 7/2) | SPT refusal at 11.5 feet. Continuation of borehole in rock log. |
| 15 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 625, 620, 615, 610, 605, 600

0.0 / 4.9 / 6.0 / 11.0 / 11.5

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1081

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532026.1 N; 628657.8 E | | Total Depth<br>33.5 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Ray) / CME 750 | Elevation (Datum NAVD 88)<br>625.7 feet | Ground Water Depth<br>See Note A | Date Started<br>5/9/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 11.5 feet | Borehole Inclination<br>Vertical | Logged by<br>A. Tillery | Date Completed<br>5/10/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 1.7/2.0 | 0 | MW to SW | R2 to R3 | | | | | | LIMESTONE (micrite) interbedded with shale; limestone is very light gray (N8) to light gray (N7); moderately weathered to fresh; weak to medium strong; many vertical and horizontal fractures; limestone is medium grained | 11-14 feet: core is brecciated due in part mechanically<br>14-15 feet: drilling equipment problems | |
| 15 | 2 | 5.0/5.0 | 56 | SW to F | R2 to R3 | | | | Bj, 10, Pl, Sm<br>Bj, 10, Pl, Sl | | - 11.5-26.5 feet: shale is 0.01-0.3 feet thick, irregular bedding planes; limestone mostly very fine grained with moderately spaced 0.1-0.3 feet zones of medium coarse grained layers; 25% shale | 450 psi down pressure | 610 |
| 20 | 3 | 4.9/5.0 | 96 | SW to F | R2 to R3 | | | | Bj, 10, St, Sl, silt bed<br>Bj, 0, Pl, Sm, silt bed<br>Bj, 20, Sm, Pl<br>Bj, 20, Pl, Sm | A | - 18.5-33.5 feet: all fractures occur along shale beds<br>- 22.6 feet: 2 inch zone with slight brecciation | good fluid return | 605 |
| 25 | 4 | 5.2/5.0 | 100 | SW to F | R2 to R3 | | | | Bj, 10, Sm, Pl, shale layer | | - 26.5-33.5 feet: shale is 2-25 mm thick, 15% shale | | 600 |
| 30 | 5 | 4.9/5.0 | 92 | F | R2 to R3 | | | | | | | | 595 |
| 35 | | | | | | | | | | | Boring terminated at 33.5 feet.<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>No Data | | 590 |
| 40 | | | | | | | | | | | | | 585 |
| 45 | | | | | | | | | | | | | 580 |
| 50 | | | | | | | | | | | | | 575 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1082

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532535.4 N; 628502.6 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>621 feet | Ground Water Depth<br>See Note A | Date Started<br>5/11/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>5/12/06 |

Reviewed by / Date [signature] 3-14-07 DJC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 621 ASPHALT 0.0–0.2 | |
| | | | | | | | | | SM | 620.8 silty SAND, yellowish brown (10YR 5/8), moist, loose to medium dense (Fill) 0.2–1.3 | |
| | | SPT 1 | * | 18 | | | | | CL | 619.7 CLAY, yellowish red (5YR 4/6), moist, stiff, some gravel 1.3–5.3 | * SPT1 blow counts not recorded due to rig geologist omission |
| | | SPT 2 | 3 4 7 | 18 | | | | | | | |
| 5 | | | | | | | | | CH | 615.7 CLAY, reddish brown (5YR 4/4), moist, stiff to very stiff - 6.0 feet: color changes to mottled brownish yellow (10YR 6/6) and white (10YR 8/1); manganese nodules 5.3–7.5 | |
| | | SPT 3 | 2 4 12 | 18 | | | | | | 613.5 | Auger chattering SPT and auger refusal at 7.4 feet. Continuation of borehole description in rock log. |
| 10 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 620, 615, 610, 605, 600, 595

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1082

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532535.4 N; 628502.6 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>621 feet | Ground Water Depth<br>See Note A | Date Started<br>5/11/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 8.4 feet | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>5/12/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 1.8/4.5 | 22 | SW, CW, SW | R3, R0, R3 | | | | | | LIMESTONE (wackestone); medium light gray (N6) to medium gray (N4) with olive gray (5Y 4/1); slightly weathered to completely weathered; medium strong<br>- 8-8.4 feet: soil-filled cavity, several clay fillings<br>- 10.8-12.9 feet: soil-filled void, contains medium stiff clay | good fluid return, brown | 610 |
| 15 | 2 | 0.9/5.0 | 10 | CW | | | | | | | - 13-16 feet: soil-filled void, contains medium stiff clay | | 605 |
| 20 | 3 | 4.5/5.1 | 41 | SW, CW, MW | R3 | | | | | | LIMESTONE (wackestone) interbedded with shale; medium light gray (N6) to medium dark gray (N4); completely to moderately weathered; medium strong; fossiliferous packstone interbeds; sparry structures<br>- 17.8-19.2 feet: highly fractured zone, shale beds highly weathered, less than 0.1' clay infilling between beds | down pressure 800 psi, good fluid return, brown | 600 |
| 25 | 4 | 5.0/5.0 | 90 | MW | R3 | BHTV<br>NG | | | | | | BHTV and NG analysis were conducted over the length of cored section | 595 |
| 30 | 5 | 5.0/5.0 | 100 | F, SW to F, SW | R3 | | | Bj, 6, Pl, Ro, Ti | | B | - 26.6 feet: clay filled vug<br>LIMESTONE; crystalline, medium light gray (N6) to medium bluish gray (5B 5/1); fresh; medium strong; white calcite crystals along break<br>LIMESTONE (packstone) with calcareous shale interbeds; packstone is medium gray (N5) and shale is dark gray (N3); fresh to slightly weathered; medium strong | | 590 |
| 35 | 6 | 5.0/5.0 | 100 | SW | R3 | | | Bj, 20, Wa, Ro, Ti | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); slightly weathered; weak to medium strong; fossiliferous, shale beds increase with depth<br>- 33.3 feet: calcite vug | | 585 |
| 40 | 7 | 5.0/5.0 | 100 | F | R3 | | | Bj, 15, Pl, Ro, Ti<br>Bj, 18, Pl, Ro, Ti | | | LIMESTONE (packstone); medium gray (N5); fresh; medium strong; mainly subhorizontal stylolites; sparry crystalline structure throughout<br>- 37-43 feet: subvertical fracture and several vugs healed with calcite | | 580 |
| 45 | 8 | 5.0/5.0 | 100 | | | | | | | | SHALE; interbedded with packstone; dark gray | | 575 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1082

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 9 | 5.0/5.0 | 100 | SW | R2 | | | | | C | (N3); slightly weathered; weak; moderate to extreme bioturbation | 850 psi down pressure, good fluid return, gray | 570 |
| 55 | 10 | 5.0/5.0 | 100 | SW to F | R3 | | | | Bj, 8, Wa, Ro, Ti | | LIMESTONE (packstone) interbedded with shale; packstone is medium dark gray (N4) to medium bluish gray (5B 5/1) and shale is dark gray (N3); fresh to slightly weathered; medium strong; calcite mineralization occuring along shale beds; 25% shale | | 565 |
| 60 | 11 | 5.0/5.0 | 100 | SW to F | R2 to R3 | | | | Bj, 65, Wa, Ro, 60-60.9' | C | SHALE interbedded with wackestone; shale is dark gray (N3) and wackestone is medium dark gray (N4); fresh to slightly weathered; weak to medium strong; extreme bioturbation | | 560 |
| 65 | 12 | 5.0/5.0 | 100 | SW | R2 | | | | Bj/Mb, 75, Wa, Ro | | SHALE (calcareous) interbedded with limestone (wackestone and packstone); grayish black (N2); slightly weathered; weak; localized fossilliferous beds; 40% limestone | | 555 |
| 70 | 13 | 5.0/5.0 | 100 | SW | R2 | | | | | | - 68.4-69.4 feet: shale beds thin to laminated, dominated by wackestone | | 550 |
| 75 | 14 | 3.2/3.2 | 100 | | R2 | | | | | | - 73.5 feet: limestone color shifts to medium gray (N5)<br>- 74 feet: fossil rich bed 0.2 feet thick | PVC: 4 inch O. D. installed after drilling for BHTV test | |
| 80 | | | | | | | | | | | Boring terminated at 75.0 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/17 - 13.2 feet | | 545<br>540<br>535 |
| 85 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1083

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532571.1 N; 629135.1 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>615 feet | Ground Water Depth<br>See Note A | Date Started<br>5/11/06 |
| Sampling Method<br>CME/SPT | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/12/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | ML | 615 / 614.8 / 0.0: SILT; very dark grayish brown (2.5Y 3/2); wet; very soft; contains organic matter; saturated (Fill) | | 615 |
| | | | | | | | | | CL | 0.2 | | |
| | | | | | | | | | ML | 613.5 / 1.5: CLAY, brown (10YR 4/3); moist; stiff to very stiff; medium plasticity | | |
| | | CME 1 | | 26.4 | | | | | CH | 613.0 / 2.0: SILT with sand and gravel; dark yellowish brown (10YR 3/4); dry<br>CLAY; brownish yellow (10YR 6/6); dry to moist; hard; high plasticity | | |
| 5 | | CME 2 | | 25.8 | 12 | | CHE | | | | | 610 |
| 10 | | CME 3 | | 19.2 | | | | | | - 9.8 feet: includes highly weathered limestone pebbles of size varying from <0.05-0.25 feet diameter<br>- color changes to light yellowish brown (2.5Y 6/3) around weathered limestone pebbles, predominantely gravelly clay below 11.5 feet | | 605 |
| | | SPT 4 | 50/5" | 5 | | | | | | | 12.8-13.8 feet: soil sampled by R. Lantz/Enercon<br>SPT refusal at 13.4 feet.<br>Driller advanced auger to 15.0 feet. Continuation of borehole description in rock log. | |
| 15 | | | | | | | | | | 600.0 / 15.0 | | 600 |
| 20 | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | 585 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1083

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1532571.1 N; 629135.1 E | | Total Depth<br>75 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>615 feet | Ground Water Depth<br>See Note A | Date Started<br>5/11/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 15 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/12/06 |

Reviewed by / Date DSC 3-13-07

| Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.0/1.0 | 95 | SW to F | R2 | PA | | Bj/Me, 0, Wa, Ro, Ti | A | LIMESTONE (micrite); medium gray (N5) with dark gray (N3) to grayish black (N2) bands; fresh to slightly weathered; weak; strong HCL reaction | 16 feet: Good fluid return throughout boring |
| 2 | 5.0/5.0 | 100 | SW to F | R2 | | | Bj/Me,10, Wa, Sm, Ti<br>Bj/Me, 30, Wa, Sl, Ti | | - 20 feet: Fossils visible along fractures | |
| 3 | 5.0/5.0 | 100 | SW to F | R2 | | | Bj/Me, 0, Wa, Sl, Ti<br>Bj/Me, 15, Wa, Sl, Ti<br>Bj/Me, 5, Wa, Sl, Ti | | | |
| 4 | 5.0/5.0 | 100 | | | | | Bj/Me, 5, Wa, Sl, Ti<br>Bj/Me, 15, Wa, Sl, Ti | | | |
| 5 | 5.0/5.0 | 100 | SW to F | R2 | | | Bj/Me, 10, Wa, Sl, Ti | B | - 34 feet: Slight stylolitic features | |
| 6 | 5.0/5.0 | 100 | | | PA | | Bj/Me, 15, Wa, Sl, Ti<br>Bj/Me, 15, Wa, Sl, Ti | | | |
| 7 | 5.0/5.0 | 100 | SW to F | R2 | | | Bj/Me, 15, Wa, Sl, Ti | | | |
| 8 | 5.0/5.0 | 100 | | | | | Bj/Me, 10, Wa, Sl, Ti | | | |
| 9 | 5.0/5.0 | 100 | | | | | Bj/Me, 15, | | | |

Depth (feet): 15, 20, 25, 30, 35, 40, 45, 50, 55

Elevation (feet): 600, 595, 590, 585, 580, 575, 570, 565, 560

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1083

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | | | | SW to F | R2 | | | | Wa, Sl, Ti | | | | 560 |
| | 10 | 5.0/5.0 | 100 | | | | | | Bj/Me, 10, Wa, Sl, Ti | | | | |
| 60 | | | | | | | | | | | | | 555 |
| | 11 | 5.0/5.0 | 100 | | | | | | | | | | |
| 65 | | | | SW to F | R2 | | | | | B | | | 550 |
| | 12 | 5.0/5.0 | 100 | | | | | | Bj/Me, 10, Wa, Sl, Ti | | | | |
| 70 | | | | | | | | | | | | | 545 |
| | 13 | 4.0/4.0 | 100 | SW to F | R2 | | | | Bj/Me, 5, Wa/Pl, Sl, Ti | | - 73.2 feet: Thin (0.1-0.2 ft) wackestone beds with visible fossils; has color of grayish blue (5PB 5/2) | | |
| 75 | | | | | | | | | | | Boring terminated at 75 feet | | 540 |
| 80 | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/15 - 6.8 feet<br>5/16 - 5.4 feet<br>5/17 - 7.4 feet<br>6/24 - 7.2 feet | | 535 |
| 85 | | | | | | | | | | | | | 530 |
| 90 | | | | | | | | | | | | | 525 |
| 95 | | | | | | | | | | | | | 520 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc

# SOIL LOG - Boring No. B-1084

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532586.4 N; 628991.9 E | | Total Depth<br>50.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>614.8 feet | Ground Water Depth<br>See Note A | Date Started<br>8/8/06 |
| Sampling Method<br>SPT / UD Shelby tube | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/9/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | MH | 614.8 SILT with sand, dark yellowish brown (10YR 4/4), dry to moist, stiff to very stiff, few organics (Fill) 0.0–1.0 | | |
| | | SPT 1 | 8 10 10 | 14.4 | | | | | MH | 613.8 SILT, olive brown (2.5Y 4/4), moist, very stiff 1.0–2.5 | | |
| | | SPT 2 | 2 3 5 | 14.4 | | | | | CH | 612.3 CLAY, olive brown (2.5Y 4/4), wet, stiff to hard, mottled with yellowish red (5YR 4/6), trace manganese nodules 2.5–7.6 | | |
| 5 | | UD 3 | | 12 | | | | | | | | 610 |
| | | SPT 4 | 0 5 75/1" | 13 | | | | | | - 6.0 feet: becomes light olive brown (2.5Y 5/4) | | |
| | | | | | | | | | | 607.2 7.6 | SPT refusal at 7.1 feet. Auger refusal at 7.6 feet. Continuation of borehole description in rock log. | |
| 10 | | | | | | | | | | | | 605 |
| 15 | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | 585 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1084

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532586.4 N; 628991.9 E | | Total Depth<br>50.3 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>614.8 feet | Ground Water Depth<br>See Note A | Date Started<br>8/8/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 7.6 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/9/06 |

Reviewed by / Date DSC 3-13-07 3-14-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 5.1/5.2 | 37.5 | SW | R3 | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3), slightly weathered to fresh; medium strong<br>- 7.6-12.7 feet: closely spaced bedding joints, dip 5°, wavy<br>- 7.6-17 feet: shale is < 0.03 feet thick with spacing of <0.2-0.5 feet, rip-up clasts | good fluid return | 605 |
| 15 | 2 | 5.1/5.0 | 81 | F | R3 | | | | Bj, 5, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Ti | | LIMESTONE (packstone) with calcareous shale interbeds, packstone is medium bluish gray (5B 5/1) and shale is dark gray (N3); fresh; medium strong | | 600 |
| 20 | 3 | 5.1/5.0 | 100 | | | | | | Bj, 5, Wa, Sl, Ti | | - 17-36.6 feet: shale is < 0.02 feet thick with spacings of < 0.2 feet | good fluid return | 595 |
| 25 | 4 | 4.8/5.0 | 95 | F | R3 | | | | Bj, 5, Wa, Sl, Ti<br>Bj, 5, Wa, Sl, Ti | B | | | 590 |
| 30 | 5 | 5.3/4.9 | 100 | | | | | | | | - 30-37 feet: wavy styolitic pressure solution features | | 585 |
| 35 | 6 | 5.0/5.2 | 96 | F | R3 | | | | | | - 36.6-45 feet: shale is 0.01-0.2 feet with spacings of <0.2 feet, wavy, rip-up clasts | good fluid return | 580 |
| 40 | 7 | 5.1/5.0 | 100 | | | | | | | | - 40.2 feet: round rip-up clasts, 0.1 feet diameter | | 575 |
| 45 | 8 | 4.8/5.0 | 96 | F | R3 | | | | Bj, 20, Wa, St, Ti<br>Bj, 5, Wa, St, Ti, mineralization | | - 44 feet: slickensided and mineralization along fracture surfaces, distinct rip-up clasts<br>- 45-50.3 feet: shale is laminated to 0.1 feet thick with spacings of <0.4 feet, wavy, rip-up clasts | good fluid return | 570 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lems & Associates, Inc.

# ROCK LOG - Boring No. B-1084

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 9 | 2.7/2.5 | 100 | F | R3 | | | | | B | | | 565 |
| | | | | | | | | | | | Boring terminated at 50.3 feet. | | |
| | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/9 - 2.6 feet<br>8/14 - 2.6 feet | | |
| 55 | | | | | | | | | | | | | 560 |
| 60 | | | | | | | | | | | | | 555 |
| 65 | | | | | | | | | | | | | 550 |
| 70 | | | | | | | | | | | | | 545 |
| 75 | | | | | | | | | | | | | 540 |
| 80 | | | | | | | | | | | | | 535 |
| 85 | | | | | | | | | | | | | 530 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1085

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532807.8 N; 627935.7 E | | Total Depth<br>6.9 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>608.5 feet | Ground Water Depth<br>See Note A | Date Started<br>7/8/06 |
| Sampling Method<br>CME | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/8/06 |

Reviewed by / Date [illegible] 3/14/07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 608.5 CLAY with sand, brownish yellow (10YR 6/6), moist, medium stiff to stiff (Residual) 0.0 | | |
| | | SPT 1 | 2 4 4 | 8 | | | | | | | | |
| | | SPT 2 | 2 2 3 | 12 | | | | | | | | 605 |
| 5 | | | | | | | | | | | SPT refusal at 6.9 feet. Boring was terminated at 6.9 feet on hard rock Limestone mistakenly believed to be a concrete utility service line. Another boring (B-1085A) was drilled 5 feet away where hard rock Limestone was encountered at 8.3 feet with no soil sampling. | |
| | | SPT 3 | 2 13/5" | 9 | | | | | | 601.6 6.9 Boring terminated at 6.9 feet | | 600 |
| 10 | | | | | | | | | | | | |
| | | | | | | | | | | | | 595 |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 585 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 580 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1085A

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532807.6 N; 627930.7 E | | Total Depth<br>16.5 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>608.2 feet | Ground Water Depth<br>See Note A | Date Started<br>7/8/06 |
| Sampling Method<br>No sampling | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/8/06 |

Reviewed by / Date W. Hodson 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 608.2 — 0.0 | | |
| | | | | | | | | | | Soil sampling not conducted. Refer to B-1085 for soil profile. | Boring located 5 feet from B-1085. | 605 |
| 5 | | | | | | | | | | | | |
| | | | | | | | | | | 599.9 — 8.3 | Rock coring begins at 8.3 feet. | 600 |
| 10 | | | | | | | | | | | | |
| | | | | | | | | | | | | 595 |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 585 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 580 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1085A

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532807.6 N; 627930.7 E | | Total Depth<br>16.5 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>608.2 feet | Ground Water Depth<br>See Note A | Date Started<br>7/8/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 8.3 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>7/8/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 3.1/3.2 | 84 | SW to F | R4 | | | | Bj, 0, Pl, Ro, Ti | D | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium light gray (N6); fresh to slightly weathered; strong; trace bioturbation and shell fragments<br>- 8.3-15 feet: shale beds are thin to moderately thin spaced 0.1 feet apart<br>- 12.5-12.7 feet: brecciated zone | 8.3 feet: Hydrocarbon odor appeared shortly after coring began. | |
| | | | | | | | | | Bj, 5, Pl, Sl, Op | | | | |
| 15 | 2 | 4.8/5.0 | 90 | SW to F | R4 | | | | Bj, 5, Pl, Sl, Op | | | Boring terminated early due to strong hydrocarbon odor which appeared shortly after coring began | 595 |
| | | | | | | | | | Bj, 15, Pl, Ro, Op | | | | |
| | | | | | | | | | | | Boring terminated at 16.5 feet.<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>No Data | | 590 |
| 20 | | | | | | | | | | | | | 585 |
| 25 | | | | | | | | | | | | | 580 |
| 30 | | | | | | | | | | | | | 575 |
| 35 | | | | | | | | | | | | | 570 |
| 40 | | | | | | | | | | | | | 565 |
| 45 | | | | | | | | | | | | | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# SOIL LOG - Boring No. B-1086

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533155.7 N; 628520.7 E | | Total Depth<br>75.3 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME550 | Elevation (Datum NAVD 88)<br>607.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/13/06 |
| Sampling Method<br>Split Spoon/ HQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/13/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 607.2 CLAY, yellowish brown (10 YR 5/4), moist, soft, few organics, few chert gravel, trace manganese nodules | | |
| | | SPT 1 | 2 2 4 | 18 | 22.3 | 58/ 33 | GSZ | | | | | 605 |
| | | SPT 2 | 4 5 6 | 18 | 18.4 | | CHE | | | | | |
| 5 | | SPT 3 | 5 7 8 | 18 | | | | | | - becomes stiff, yellowish brown (10 YR 5/6), mottled with bluish gray (5B 6/1) streaks, chert gravel and manganese nodules | | |
| | | SPT 4 | 12/1" | 1 | | | | | | 599.7 | 7.5 Auger and SPT refusal at 7.5 feet (blow count 12/0"). Continuation of borehole description on rock log. | 600 |
| 10 | | | | | | | | | | | | 595 |
| 15 | | | | | | | | | | | | 590 |
| 20 | | | | | | | | | | | | 585 |
| 25 | | | | | | | | | | | | 580 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1086

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533155.7 N; 628520.7 E | | Total Depth<br>75.3 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME550 | Elevation (Datum NAVD 88)<br>607.2 feet | Ground Water Depth<br>See Note A | Date Started<br>6/13/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 8 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/13/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 3.8/4.0 | 87.5 | F | R3 | | | | Bj, 10, Wa, Sl, Ti | | LIMESTONE (micrite) with interbeds of calcareous shale; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong<br>- 7.5-15 feet: shale banding is 0.05-0.2 feet thick with spacings of 0.05-0.2 feet | Fluid return good throughout boring | |
| 15 | 2 | 5.1/4.9 | 100 | | | | | | | | | | 595 |
| | | | | F | R3 | | | | | | - 15-19.2 feet: shale is <0.05 ft thick with spacing of 0.05-0.2 feet | | 590 |
| 20 | 3 | 5.0/4.8 | 100 | | | | | | | | - 19.2-31 feet: shale is 0.05-0.15 ft thick, increase in shale bed spacing to 0.1-0.3 feet | | 585 |
| 25 | 4 | 5.2/5.1 | 100 | F | R3 | BHTV | | | | | | BHTV and NG analysis were conducted over the length of cored section | |
| | | | | | | NG | | | | D | | | 580 |
| 30 | 5 | 5.0/5.0 | 100 | | | | | | Jo, 60, Wa, Sl, Ti<br>Jo, 60, Wa, Sl, Ti | | | 30 feet: Unconfined Compression Test | |
| 35 | 6 | 4.9/5.0 | 97 | | | | | | | | - 31-47.5 feet: shale beds are ~ 0.05 feet thick with spacings of 0.2-0.3 feet | | 575 |
| 40 | 7 | 5.3/5.0 | 100 | F | R3 | | | | Bj, 15, Pl/Wa, Sm, Ti, slicken-sides and mineralization | | - 39.6 feet: calcite layer 0.05 feet thick | | 570 |
| 45 | 8 | 4.9/5.0 | 98 | | | | | | Jo, 70, Wa, Sl/Ro, Ti (44.3' - 45.2')<br>Bj, 5, Wa, STET, Ti | | | | 565 |
| | | | | | | | | | | | | | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1086

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 9 | 5.0/5.0 | 99 | F | R3 | | | | | D | LIMESTONE (micrite) with calcareous shale bedding; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong; spar in rock fabric at 47.5-51 feet, very crystalline; less prominent shale banding | | |
| | | | | | | | | | | | - 51-60 feet: shale bedding < 0.02 ft. thick with spacing 0.03-0.2 ft., not as much shale bedding from 54.5 to 57.5 ft. | | 555 |
| 55 | 10 | 4.5/5.0 | 90 | F | R3 | | | | | | | | |
| | 11 | 4.8/5.0 | 96 | | | | | | | | | | 550 |
| 60 | | | | | | | | | | | - 60-75.3 feet: shale is < 0.02 ft. thick with spacing between 0.02-0.2 ft. | | |
| | 12 | 5.6/5.1 | 100 | | | | | | | | | First foot of run #12: deliberate slow drilling rate | 545 |
| 65 | | | | | | | | | | | - 65.2-66.2 feet: less prominent shale sections | | |
| | 13 | 4.9/5.0 | 97 | F | R3 | | | | | | - 67.5 feet: gravel-sized rip-up clasts, 0.01 x 0.05 rounded, layer is 0.1 ft. thick<br>- 69-70.5 feet: less prominent shale section | | 540 |
| 70 | | | | | | | | | | | | | |
| | 14 | 4.1/3.9 | 100 | | | | | | Bj, 5, Wa, Sl, Ti, calcite mineralization and polished surface | | | PVC: 4 inch O. D. installed after drilling for BHTV test | 535 |
| 75 | | | | | | | | | | | Boring terminated at 75.3 ft | PVC: 4 inch O. D. set for BHTV testing | |
| | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/14 - 9.2 feet<br>7/23 - 12.0<br>9/13 - 9.2 feet | | 530 |
| 80 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 525 |
| 85 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 520 |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1087

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532677.2 N; 629071.3 E | | Total Depth<br>35.4 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>613 feet | Ground Water Depth<br>See Note A | Date Started<br>8/18/06 |
| Sampling Method<br>SPT / UD | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/18/06 |

Reviewed by / Date M Stokes 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology (613) | Depth (0.0) | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | MH | SILT, light yellowish brown (2.5Y 6/3), dry, very stiff, trace manganese nodules | | | |
| | | SPT 1 | 6 8 8 | 7.2 | 9.4 | | CHE | | | | | | |
| | | SPT 2 | 9 11 22 | 15.6 | | | | | | - 2.5 feet: reddish yellow mottling (7.5YR 6/8) and rich in manganese nodules (609.5) | 3.5 | | 610 |
| | | | | | | | | | CL (609.0) | | 4.0 | SPT refusal at 4 feet. Auger refusal at 4.9 feet. Continuation of borehole description in rock log. | |
| 5 | | | | | | | | | GC (608.1) | CLAY, reddish brown (2.5YR 5/4), moist, very stiff, trace manganese nodules | 4.9 | | |
| | | | | | | | | | | clayey GRAVEL (weathered limestone) | | | |
| | | | | | | | | | | | | | 605 |
| 10 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 600 |
| 15 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 595 |
| 20 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 590 |
| 25 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 585 |
| 30 | | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1087

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532677.2 N; 629071.3 E | | Total Depth<br>35.4 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Upchurch) / CME 85 | Elevation (Datum NAVD 88)<br>613 feet | Ground Water Depth<br>See Note A | Date Started<br>8/18/06 |
| Casing Size and Depth<br>PVC: 4.5 inch O.D. / 5 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>8/18/06 |

Reviewed by / Date N Stolin 3-14-07 DJC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 1 | 2.2/2.6 | 73 | SW | R3 | | | | Bj, 10, Wa, Sl, Op, clay lined | B | LIMESTONE (wackestone and packstone) with calcareous shale interbeds; medium bluish gray (5B 5/1) and shale is dark gray (N3); fresh to slightly weathered; medium strong; strong HCl reaction<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/19 - 4.0 feet<br>- 4.9-35.4 feet: shale is <0.05 feet thick with spacings < 0.3 feet, wavy with rip-up clasts<br>- 10.8 feet: rock becomes fresh | 4.9-35.4 feet: good fluid return | |
| 10 | 2 | 5.0/5.0 | 99 | | | | | | Bj, 15, Wa, Sl, Op, clay lined | | | | 605 |
| 15 | 3 | 5.1/4.8 | 100 | F | R3 | | | | | | | | 600 |
| 20 | 4 | 4.8/5.0 | 96 | F | R3 | | | | | | | | 595 |
| 25 | 5 | 5.2/5.0 | 100 | | | | | | | | | | 590 |
| 30 | 6 | 4.9/5.0 | 98 | F | R3 | | | | | | | | 585 |
| 35 | 7 | 3.0/3.0 | 100 | | | | | | | | | | 580 |
| 40 | | | | | | | | | | | Boring terminated at 35.4 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/19 - 4.0 feet<br>8/22 - 4.0 feet | | 575<br>570 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA Willam Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1088

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533043.3 N; 628497.2 E | | Total Depth<br>71.2 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Gibson) / CME 45 | Elevation (Datum NAVD 88)<br>608.1 feet | Ground Water Depth<br>See Note A | Date Started<br>8/15/06 |
| Sampling Method<br>UD Shelby Tube | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>8/17/06 |

Reviewed by / Date W Lettis 3/21/07 DSC 3-20-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CH | 608.1 0.0 CLAY, dark yellowish brown (10YR 4/4), moist | Auger to 4.0 feet | |
| | | | | | | | | | | | 1-5 feet: Bulk sample taken for Standard Proctor test (LL=58%, PI=34%) | 605 |
| 5 | | UD 1 | | 18 | 17.2 | 72/ 51 | GSZ H SG CN | | | | | |
| | | UD 2 | | 6 | | | | | | 599.6 8.5 | 5-10 feet: Bulk sample taken for Modified Proctor test (LL=54%, PI=32%) Shelby tube refusal at 8.5 feet. Sample not retained. | 600 |
| 10 | | | | | | | | | GC | clayey GRAVEL, gray (10YR 5/1), (weathered limestone) | | |
| | | | | | | | | | | 597.1 11.0 | Auger refusal at 11.0 feet. Continuation of borehole description in rock log. | |
| | | | | | | | | | | | | 595 |
| 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | 590 |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | 585 |
| 25 | | | | | | | | | | | | |
| | | | | | | | | | | | | 580 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1088

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533043.3 N; 628497.2 E | | Total Depth<br>71.2 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Gibson) / CME 45 | Elevation (Datum NAVD 88)<br>608.1 feet | Ground Water Depth<br>See Note A | Date Started<br>8/15/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 11 feet | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>8/17/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 1.0/1.0 | 0 | | | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is gray (N5) and shale is dark medium gray (N4); fresh; medium strong; strong HCl reaction | | |
| 15 | 2 | 5.0/5.0 | 100 | F | R3 | | | | | | - 11-71 feet: shale is 0.01-0.3 feet thick, wavy, wispy<br>- 15-17 feet: bioturbation filled with packstone, wavy beds, stylolites present | down pressure 300-400 psi, good fluid return, light gray | 595 |
| 20 | 3 | 5.0/5.0 | 94 | | | | | | Bj, 10, Wa, Sl, Ti<br>Bj, 10, Pl, Sl, Ti | | | | 590 |
| 25 | 4 | 5.1/5.0 | 100 | F | R3 | | | | | | | | 585 |
| 30 | 5 | 5.0/5.0 | 100 | | | | | | | D | | 26.3 feet: Unconfined Compression Test down pressure 700 psi, good fluid return, light gray | 580 |
| 35 | 6 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 10, Wa, Sl, Ti | | - 33.8 feet: incipient fracture | | 575 |
| 40 | 7 | 5.0/5.0 | 100 | | | | | | Bj, 10, Wa, Sl, Ti | | - 37.4 feet: incipient fracture | | 570 |
| 45 | 8 | 5.2/5.2 | 100 | F | R3 | | | | Bj, 10, Pl, Sm, Ti<br>Bj, 10, Pl, Sm, Ti-Op | | | down pressure 700 psi, good fluid return, light gray | 565 |
| 50 | 9 | 5.0/5.0 | 100 | | | | | | Bj, 10, Wa, Sl, Ti | | - 47.5 feet: calcite-filled fracture 0.01 feet thick | | 560 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1088

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 10 | 4.9/5.0 | 98 | F | R3 | | | | | D | - 52-57 feet: few fossils in shale, incipient fractures | 55.1 feet: Unconfined Compression Test | 555 |
| 60 | 11 | 4.9/5.0 | 98 | | | | | | Bj, 10, Pl, Sm, Ti, slickensides | | - 57.5 feet: calcite-filled fracture with slickensides | | 550 |
| 65 | 12 | 5.0/5.0 | 88 | F | R3 | | | | Bj, 15, Wa, Sl, Ti<br>Bj, 50, Wa, Sl, Ti<br>Bj, 15-50, Wa, Sl, Ti<br>Bj, 10, Wa, Sl, Ti | | - 63-66 feet: few wackestone interbeds 0.05 feet thick<br>- 63.7-64.0 feet: high angle fracturing<br>- 66-71.2 feet: packstone-filled burrows in calcite | | 545 |
| 70 | 13 | 4.0/4.0 | 100 | | | | | | Bj, 10, Wa, Sl, Ti, calcite filling | | - 68 feet: calcite-filled fracture | 67.6 feet: Unconfined Compression Test | 540 |
| 75 | | | | | | | | | | | Boring terminated at 71.2 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>8/17 - 10.0 feet<br>8/19 - 1.0 feet<br>8/20 - 2.0 feet | | 535 |
| 80 | | | | | | | | | | | | | 530 |
| 85 | | | | | | | | | | | | | 525 |
| 90 | | | | | | | | | | | | | 520 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# SOIL LOG - Boring No. B-1089

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1531668.7 N; 628473.1 E | | Total Depth<br>40 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME550 | Elevation (Datum NAVD 88)<br>630.5 feet | Ground Water Depth<br>See Note A | Date Started<br>5/22/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>5/22/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 630.5 — 0.0<br>CLAY, dark reddish brown (5 YR 3/3), dry to moist, stiff, trace organics and manganese nodules | | 630 |
| | | SPT 1 | 4 7 7 | 18 | | | | | | 628.5 — 2.0 | | |
| | | | | | | | | | CL | CLAY, yellow (10 YR 8/8) mottled with light gray (10 YR 7/1) and yellowish red (5 YR 5/8), moist, medium stiff | | |
| | | | | | | | | | | 627.3 — 3.3 | | |
| | | SPT 2 | 3 3 5 | 18 | | | | | CL | 626.3 — 4.3<br>CLAY, dark yellowish brown (10 YR 4/6), moist, medium stiff to stiff, trace organics | | |
| 5 | | | | | | | | | | CLAY, yellowish red (5 YR 5/6) mottled with brownish yellow (10 YR 6/6) and light gray (10 YR 7/1), moist, stiff, trace manganese nodules | | 625 |
| | | SPT 3 | 2 3 6 | 18 | | | | | | | | |
| | | SPT 4 | 9 34 11 | 10.8 | | | | | | 622.2 — 8.3<br>Weathered Rock Zone (Limestone) | | |
| | | | | | | | | | CL | 621.9 — 8.6<br>CLAY, mottled brownish yellow (10 YR 6/6) and light gray ( 10 YR 7/2), moist, very stiff, few gravel (weathered limestone) | | |
| 10 | | SPT 5 | 5 8 14 | 18 | | | | | | | | 620 |
| | | | | | | | | | | | No sampling 12.5-15.0 feet | |
| 15 | | SPT 6 | 6 10 50/6" | 14.4 | | | | | | 614.0 — 16.5 | Auger and SPT refusal at 16.2 feet. Continuation of borehole description in rock log. | 615 |
| 20 | | | | | | | | | | | | 610 |
| 25 | | | | | | | | | | | | 605 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# ROCK LOG - Boring No. B-1089

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|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1531668.7 N; 628473.1 E | | Total Depth<br>40 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME550 | Elevation (Datum NAVD 88)<br>630.5 feet | Ground Water Depth<br>See Note A | Date Started<br>5/22/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 16.4 feet | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne | Date Completed<br>5/22/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 4.3/4.3 | 74 | MW<br>SW<br>MW | R2 to R3 | | | | | | LIMESTONE (wackstone) interbedded with shale, micrite, and packstone beds; medium gray (N5); moderately to slightly weathered; medium strong to weak<br><br>Packstone beds are medium bluish gray (5B 5/1)<br>- 20-20.5 feet: fracture zone and shale along fractures | | |
| 20 | | | | | | | | | | | | | 610 |
| | 2 | 4.9/5.0 | 60 | SW | R2 to R3 | | | | Bj, <5, Wa, Ro, Ti<br>Bj, 10, Pl, Ro, Ti<br>Bj, 19, Pl, Si, Ti | | | 200 psi down pressure | |
| 25 | | | | | | | | | | | | | 605 |
| | 3 | 5.0/5.0 | 76 | SW | R2 to R3 | | | | Bj, <5, Pl, Si, Ti<br>Bj, 13, Pl, Si, Ti<br>Bj, 19, Wa, Ro, Ti | A | LIMESTONE (packstone) interbedded with shale, micrite, and wackestone beds; medium gray (N5); moderately to slightly weathered; weak to medium strong | Good fluid return, gray | |
| 30 | | | | | | | | | | | | 29.6-29.9 feet: Fractured zone | 600 |
| | 4 | 4.3/5.0 | 62 | MW<br>HW | | | | | Bj, 7, Pl, Ro, Ti, shale bed | | - 33.9-35.5 feet: Heavily fractured zone with light reddish brown staining along highly weathered beds (5YR 6/4) | 33 feet: Lost fluid return and did not recover | |
| 35 | | | | | | | | | | | | | 595 |
| | 5 | 4.5/4.5 | 100 | SW | R2 to R3 | | | | Bj, 12, Pl, Ro, Ti<br>Bj, 13, Pl, Si, Ti | | Below 37.7 feet: Predominantly micrite | | |
| 40 | | | | | | | | | | | Boring terminated at 40.0 ft<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>5/23 - Approximately 13.0 feet<br>7/25 - 16.0 feet | | 590 |
| 45 | | | | | | | | | | | | | 585 |
| 50 | | | | | | | | | | | | | 580 |
| 55 | | | | | | | | | | | | | 575 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# SOIL LOG - Boring No. B-1090

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533200.9 N; 628455.8 E | | Total Depth<br>128 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>609.9 feet | Ground Water Depth<br>See Note A | Date Started<br>7/24/06 |
| Sampling Method<br>HQ core | Borehole Inclination<br>-60 | Logged by<br>D. Stepanof | Date Completed<br>7/25/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 609.9 0.0 Soil sampling not conducted. Refer to adjacent test pit T-1416 for soil conditions. | | 605 |
| 5 | | | | | | | | | | | | 600 |
| 10 | | | | | | | | | | | | 595 |
| 15 | | | | | | | | | | 597.8 14.0 | Rock coring begins at 14 feet angled at 60° from the horizontal. | 590 |
| 20 | | | | | | | | | | | | 585 |
| 25 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

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# ROCK LOG - Boring No. B-1090

| | | | |
|---|---|---|---|
| Drilling Method<br>Rotary Wash/ HQ core (3.8") | Boring Location Coordinates: AL State Grid (ft)<br>1533200.9 N; 628455.8 E | | Total Depth<br>128 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>609.9 feet | Ground Water Depth<br>See Note A | Date Started<br>7/24/06 |
| Casing Size and Depth<br>HW: 4.5 inch O.D. / 14 feet | Borehole Inclination<br>-60 | Logged by<br>D. Stepanof | Date Completed<br>7/25/06 |

Reviewed by / Date DSC 5-9-07 WH 5-10-07 Rev. 1

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 2.0/4.0 | 25 | SW | R3 | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark medium gray (N4); severly weathered to fresh; medium strong | | |
| 20 | 2 | 4.9/5.0 | 98 | MW to SW | | | | | Bj, 20, Wa, Ro, Op<br>Bj, 60, Wa, Ro, Op<br>Bj, 60, Wa, Ro, Ti | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark medium gray (N4); moderately to slightly weathered; medium strong<br>- 18-50 feet: shale is 0.01-0.05 feet thick, wavy contact | Boring is angled at 60° from the horizontal. Depths shown on log are distances along drilled hole.<br>Discontinuity angle measurements are relative to borehole axis<br>Down pressure 500 psi, Good fluid return, white to light gray | 595 |
| 25 | 3 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 40, Pl, Sl, Ti | | - packstone-filled burrow 0.04 feet thick | | 590 |
| 30 | 4 | 5.0/5.0 | 100 | | | | | | Bj, 40, Pl, Sm, Ti<br>Bj, 40, Pl, Sm, Ti | | - 30.5 feet: slickensided joint surface, calcite coating in fragments | | 585 |
| 35 | 5 | 5.0/5.0 | 96 | F | R3 | | | | Bj, 40, Wa, Sl, Ti | D | - 33-33.2 feet: very closely spaced, healed fractures<br>- 33-38 feet: rip-up clasts in shale layers, few burrows filled with sand in micrite beds | | 580 |
| 40 | 6 | 5.0/5.0 | 82 | | | | | | | | - 38-38.5 feet: healed, high angle fractures | | 575 |
| 45 | 7 | 5.0/5.0 | 100 | F | R3 | | | | | | - 42.6-43 feet: healed, high angle fracture | | 570 |
| 50 | 8 | 5.0/5.0 | 100 | | | | | | | | LIMESTONE (packstone) with calcareous shale interbeds; packstone is medium gray (N5) and shale is dark medium gray (N4); fossils and burrows in shale; shale is 0.01-0.03 feet thick; stylolites present<br>LIMESTONE (micrite) with calcareous shale | 48 feet: down pressure 4500 psi, fluid return good, light brown<br>fluid light gray to light yellow | 565 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1090

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 9 | 5.0/5.0 | 100 | F | R3 | | | | | | interbeds; micrite is medium gray (N5) and shale is medium dark gray (N4); fresh; medium strong; some packstone interbeds; some stylolites<br>-52.5-88 feet: shale is 0.01-0.02 feet thick | | 560 |
| 60 | 10 | 5.0/5.0 | 100 | | | | | | | | | | |
| 65 | 11 | 5.0/5.0 | 100 | F | R3 | | | | Bj, 40, St, Pl, Sm, Ti | | | Fluid return good, light gray | 555 |
| 70 | 12 | 5.0/5.0 | 100 | | | | | | | | -70.5-71.0 feet: packstone layer | | 550 |
| 75 | 13 | 5.0/5.0 | 98 | F | R3 | | | | | D | | | 545 |
| 80 | 14 | 5.0/5.0 | 96 | | | | | | Bj, 40, Pl, Sl, Ti | | - 78-87 feet: stylolites and calcite-filled vugs present<br>- 81.7 feet: calcite-lined discontinuity with fossils | | 540 |
| 85 | 15 | 5.0/5.0 | 100 | F | R3 | | | | | | -87.8 feet: packstone bed, medium gray (N5), stylolites<br>-88-90 feet: calcareous shale beds are fewer and then increase | | 535 |
| 90 | 16 | 5.0/5.0 | 100 | | | | | | | | 92-93 feet: packstone interbed<br>LIMESTONE (micrite and wackestone) with | | 530 |

Project Name and No.: NuStart - Bellefonte COL Project: 6468061299

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# ROCK LOG - Boring No. B-1090

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | 17 | 5.0/5.0 | 100 | F | R3 | | | | | D | calcareous shale interbeds; micrite and wackestone are medium gray (N5) and shale is medium dark gray (N4); fresh; medium strong; rip-up clasts | Down pressure 4500 psi, fluid return good, light yellow brown | |
| 100 | 18 | 5.0/5.0 | 100 | | | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is medium dark gray (N4); fresh; medium strong<br>- 98-118 feet: shale beds are 0.01-0.03 feet thick<br>- 99-99.3 feet: healed incipient fracture | | 525 |
| 105 | 19 | 5.0/5.0 | 100 | F | R3 | | | | | | - 103-113 feet: packstone-filled burrows<br>- 104.6-105.2 feet: healed, high angle fracture | | 520 |
| 110 | 20 | 5.0/5.0 | 100 | | | | | | | | | | 515 |
| 115 | 21 | 5.0/5.0 | 94 | F | R3 | | | | Bj, 20, St, Sl, Ti | | - 114-114.3 feet: healed, calcite-filled fracture 0.01 feet thick<br>- 115-115.2 feet: healed, calcite-filled fracture 0.01 feet thick | | 510 |
| 120 | 22 | 5.0/5.0 | 100 | | | | | | | | - 118-128 feet: shale beds are 0.01-0.03 feet thick; wavy contacts, rip-up clasts | Down pressure 500 psi, fluid return good, light gray | 505 |
| 125 | 23 | 4.8/5.0 | 96 | F | R3 | | | | Bj, 40, St, Sl, Ti | | - 127-127.2 feet: slickensides along bedding joint | | 500 |
| 130 | | | | | | | | | | | Boring terminated at 128.0 feet.<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/25 - 13.9 feet | | 495 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1091

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1531925.1 N; 629403.7 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>641.9 feet | Ground Water Depth<br>See Note A | Date Started<br>5/29/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/29/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Elevation (feet) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | GC | 641.9 | GRAVEL with clay and sand, dark yellowish brown (10YR 4/4) and gray (2.5Y 5/1), dry to moist, medium dense (Fill)<br>- gravel ranges in size from 0.1 down to coarse sand-sized clasts | |
| | | SPT 1 | 6 7 7 | 0.5 | | | | | | 640 | | |
| | | | | | | | | | CL | 638.4 | CLAY, strong brown (7.5 YR 4/6), dry to moist, stiff to very stiff, occasional manganese nodules | |
| 5 | | SPT 2 | 4 6 7 | 10.8 | | | | | | | | |
| | | SPT 3 | 3 3 5 | 7.7 | | | | | | 635 | - 6 feet: changes color to yellowish brown (10 YR 5/6) and becomes moderately plastic | |
| 10 | | SPT 4 | 3 4 6 | 10.8 | | | | | | | | |
| | | SPT 5 | 3 6 14 | 9.6 | | | | | | 630 | - 12 feet: Limestone clasts with average size 0.02-0.05 feet | |
| | | | | | | | | | GC | 628.7 | Limestone GRAVEL with clay and silt, light yellowish brown (2.5 Y 6/3), limestone gravel is 0.6-0.24 inches and is angular | SPT refusal at 14.2 feet. Top of rock is at 14.1 feet. Continuation of borehole description in rock log. |
| | | SPT 6 | 7 50/2" | 10 | | | | | | 627.7 | | |
| 15 | | | | | | | | | | 625 | | |
| 20 | | | | | | | | | | 620 | | |
| 25 | | | | | | | | | | 615 | | |
| 30 | | | | | | | | | | | | |

0.0 | 3.5 | 13.2 | 14.2

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# ROCK LOG - Boring No. B-1091

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1531925.1 N; 629403.7 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>641.9 feet | Ground Water Depth<br>See Note A | Date Started<br>5/29/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 13.6 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/29/06 |

Reviewed by / Date [illegible] 3-14-07 DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 2.1 / 2.4 | 70 | CW to HW | R0 / R2 | | | | Bj, 5, Wa, Sl, Op/Ti | | LIMESTONE (micrite); yellowish gray (5Y 7/2) to dusky yellow (5 Y 6/4); completely to highly weathered; extremely weak; strong HCL reaction; light yellowish brown (2.5 Y 6/3) clay; some silt and gravel | Coring begun at 13.6 feet | |
| | 2 | 5.0 / 5.0 | 76 | SW to F | R2 | | | | Bj, 10, Wa, Sl, Op | | SHALE (calcareous) with interbedded micrite and packstone; shale is dark gray (N3), packstone is medium gray (N5), micrite is medium gray (N5); fresh to slightly weathered; weak; strong HCL reaction; limestone 40-50%<br>- 17-18 feet: Highly weathered zone with clay-filled fractures<br>- 18.2 feet: 0.06 feet clay layer<br>- Shale shows rip-up clasts, individual grains and fossils | | 625 |
| 20 | 3 | 4.9 / 5.0 | 98 | F | R2 | | | | | NV | | | 620 |
| 25 | 4 | 4.9 / 5.0 | 78 | F | R1 | | | | Bj, 20, Pl, Sm, Ti<br>Bj, 20, Pl, Sm, Ti<br>Bj, 20, Pl, Sm, Ti | | SHALE; dark gray (N3); fresh; very weak; occasional limestone beds of thickness less than 0.01 feet; incipient fractures in shale; clay coatings on some of the fractures | | 615 |
| 30 | 5 | 4.0 / 4.0 | 85 | | R1 | | | | | | | | 610 |
| | | | | SW | R2 | | | | Bj, 10, Wa, Sl, Op-Ti<br>Bj/Jo, 60, Wa, Sl, Ti<br>Bj/Jo, 45, Wa, Sl, Ti | | LIMESTONE (micrite); medium light gray (N6) with medium dark gray (N4) bands; slightly weathered; weak; weathered zone with high angle fractures at 34.1 and 34.9 feet | | |
| 35 | | | | | | | | | | | Boring Terminated at 35.0 feet | | 605 |
| 40 | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>No Data | | 600 |
| 45 | | | | | | | | | | | | | 595 |
| 50 | | | | | | | | | | | | | 590 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1092

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532370.7 N; 628902.4 E | | Total Depth<br>56 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>621.6 feet | Ground Water Depth<br>See Note A | Date Started<br>7/26/06 |
| Sampling Method<br>SPT | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>7/31/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 621.6 0.0 CLAY, strong brown (7.5YR 5/6), moist, medium stiff, few gravel fragments, trace roots and concrete fragments (Fill) | | |
| | | SPT 1 | 1 3 5 | 16.8 | | | | | | | | 620 |
| | | | | | | | | | ML | 618.4 3.2 SILT, dark grayish brown (10YR 4/2), moist, very stiff (Fill) | | |
| | | SPT 2 | 5 8 7 | 12 | | | | | | | | |
| 5 | | | | | | | | | | 615.2 6.4 | | |
| | | SPT 3 | 2 3 5 | 18 | | | | | CH | CLAY, strong brown (7.5YR 5/8), stiff and very stiff | | 615 |
| | | SPT 4 | 3 7 11 | 18 | | | | | | - 8.5 feet: mottled with light gray (7.5YR 7/1) and contains black manganese nodules | | |
| 10 | | | | | | | | | | | | |
| | | SPT 5 | 2 5 8 | 18 | | | | | | - 11 feet: trace roots, more manganese nodules | | 610 |
| | | | | | | | | | | 608.6 13.0 | 12.5-13.5 feet: rig chattering while augering | |
| | | SPT 6 | 10 13 25 | 18 | | | | | ML | SILT with gravel, light gray (2.5Y 7/2), dry, hard (weathered limestone) | | |
| 15 | | | | | | | | | | | | |
| | | SPT 7 | 7 30/2" | 8 | | | | | | 604.9 16.7 | Auger refusal at 16.0 feet. SPT refusal at 16.8 feet. Casing set at 16 feet. Continuation of boring description in rock log. | 605 |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1092

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532370.7 N; 628902.4 E | | Total Depth<br>56 feet |
| Drilling Contractor (Driller) and Rig<br>MILLER (Bilbrey) / CME 750 | Elevation (Datum NAVD 88)<br>621.6 feet | Ground Water Depth<br>See Note A | Date Started<br>7/26/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 16 feet | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>7/31/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 4.7/5.0 | 58 | SW | R3 | | | | | A | LIMESTONE (micrite) with packstone and calcareous shale interbeds; micrite and packstone are medium gray (N5) and shale is medium dark gray (N4); slightly weathered to fresh; medium strong; fossiliferous; strong reaction to HCl; shale is 0.01-0.06 feet thick<br>- 17.3-18.7 feet: packstone predominant | Coring begun at 16.0 feet. Clay slough to 16.7 feet.<br>Down pressure 500 psi 17 feet: Lost fluid return and did not recover | |
| 25 | 2 | 5.0/5.0 | 82 | F | | | | | Bj, 15, Pl, Sl, Ti<br>Bj, 10, Pl, Sl, Ti<br>Bj, 15, Wa, Sl, Ti | | - 22.3-23.5 feet: packstone predominant | | 600 |
| 30 | 3 | 5.0/5.0 | 70 | F | R3 | | | | Bj, 20, Wa, Sl, Ti<br>Bj, 10, Pl, Sm, Ti | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is medium dark gray (N4); fresh; medium strong; shale is 0.01-0.3 feet thick<br>- 30.1-30.4 feet: fossiliferous | | 595 |
| 35 | 4 | 5.0/5.0 | 100 | SW to F | | | | | Bj, 10, Pl, Sl, Ti<br>Bj, 10, Wa, Ro, Ti<br>Bj, 10, Pl, Sl, Ti | B | LIMESTONE (wackestone) with calcareous shale interbeds; wackestone is medium gray (N5) and shale is medium dark gray (N4); slightly weathered to fresh; medium strong; shale interbeds are few (<5%) and thin | | 590 |
| 40 | 5 | 5.1/5.0 | 100 | F | R3 | | | | | | LIMESTONE (micrite) with calcareous shale interbeds; micrite is medium gray (N5) and shale is dark gray (N3); fresh; medium strong<br>- 36-56 feet: shale is < 0.02 feet thick with spacings of 0.05-0.5 feet, wavy | 38 feet: hydrocarbon odor, discolored (black) layer | 585 |
| 45 | 6 | 4.3/5.0 | 86 | | | | | | | | | | 580 |
| 50 | 7 | 4.9/5.0 | 97 | F | R3 | | | | | | | | 575 |
| 55 | 8 | 5.1/5.0 | 100 | | | | | | | | | | 570 |
| | | | | | | | | | | | Boring terminated at 56.0 feet | 55.3 feet: last 0.7 feet of core left in hole | 565 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1092

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/31 - 16.5 feet<br>8/1 - 16.5 feet | | 560 |
| 65 | | | | | | | | | | | | | 555 |
| 70 | | | | | | | | | | | | | 550 |
| 75 | | | | | | | | | | | | | 545 |
| 80 | | | | | | | | | | | | | 540 |
| 85 | | | | | | | | | | | | | 535 |
| 90 | | | | | | | | | | | | | 530 |
| 95 | | | | | | | | | | | | | 525 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1092UDD

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD) | Boring Location Coordinates: AL State Grid (ft)<br>1532373 N; 628904 E | | Total Depth<br>16.2 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC / CME 45 | Elevation (Datum NAVD 88)<br>621.7 feet | Ground Water Depth<br>See Note A | Date Started<br>8/20/06 |
| Sampling Method<br>SPT / UD | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>8/21/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 621.7 / 0.0 | | |
| | | | | | | | | | GP | 621.5 / 0.2 Grass, topsoil | | |
| | | | | | | | | | | 620.2 / 1.5 GRAVEL, medium gray (N5), coarse, angular | 0-1.5 feet: augered | |
| | | SPT 1 | 2 2 3 | 12 | | | | | CL | CLAY, strong brown (7.5YR 5/6) to reddish brown (2.5YR 4/4), moist, medium stiff to stiff (Fill) - 6.5 feet: color change to brown (7.5YR 4/2) | | 620 |
| | | UD 2 | | 20.4 | | | | | | | | |
| 5 | | | | | | | | | | | 5-6.5 feet: augered | |
| | | | | | | | | | | 615.2 / 6.5 | | |
| | | SPT 3 | 3 4 6 | 16.8 | | | | | CH | CLAY, brownish yellow (10YR 6/6) to dark yellowish brown, moist, stiff to very stiff, trace black manganese nodules (Residual) | | 615 |
| | | UD 4 | | 20.4 | | | TXD | | | | | |
| 10 | | | | | | | | | | | 10-11.5 feet: augered | |
| | | SPT 5 | 3 6 11 | 18 | | | | | | 609.4 / 12.3 | | 610 |
| | | | | | | | | | CH | CLAY with gravel, dark yellowish brown (10YR 4/6) and light brownish gray (2.5Y 6/2) mottled (Residual) | | |
| | | UD 6 | | 8.4 | | | | | | | Shelby tube damaged after 1.3 feet of advancement | |
| | | | | | | | | | | 606.7 / 15.0 | | |
| 15 | | SPT 7 | 16 18 50/2" | 10.8 | | | | | ML | SILT with gravel, light gray (5Y 7/1), moist, hard, gravel size coarse to fine, angular (weathered limestone) | | |
| | | | | | | | | | | 605.5 / 16.2 | bedrock encountered at 16.2 feet | 605 |
| | | | | | | | | | | Boring terminated at 16.2 feet | | |
| | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>No Data | | |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC · WLA William Lettus & Associates, Inc.

# SOIL LOG - Boring No. B-1093

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532291.1 N; 629224.6 E | | Total Depth<br>46.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins/Warren) / CME550 | Elevation (Datum NAVD 88)<br>621.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/1/06 |
| Sampling Method<br>CME/NQ core | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne/D. Stepanof | Date Completed<br>5/3/06 |

Reviewed by / Date 5-10-07 DSC 5-9-07 Rev. 1

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 621.6 / 0.0 | | |
| | | | | | | | | | ML | sandy SILT, pale brown (10 YR 6/3), dry, few limestone gravel (Fill) 620.6 / 1.0 | Groundwater not observed | |
| | | CME 1 | | 37.2 | | | | | ML | sandy SILT, yellowish red (5 YR 4/6), moist, hard, trace manganese nodules, trace limestone cobbles, mottling of brownish yellow (10 YR 6/6) | | 620 |
| | | CME 2 | | 3.6 | | | | | | | | |
| | | SPT 3 | 17 7 10 | 13.2 | | | | | | 616.6 / 5.0 | Sample distorted by large gravel clasts. CME refusal at 3.4 feet. | |
| 5 | | | | | | | | | CL | 615.9 / 5.7 CLAY, dark yellowish brown (10 YR 3/4), dry, very stiff | | |
| | | CME 4 | | 48 | | | | | CL | CLAY; dark yellowish brown (10 YR 3/4), moist, very stiff to hard, few manganese nodules | | 615 |
| | | CME 5 | | 2.4 | | | | | | | | |
| | | SPT 6 | 17 9 50/4" | 13 | | | | | | 611.8 / 9.8 | SPT and auger refusal at 9.8 feet. Continuation of borehole description on rock log. | |
| 10 | | | | | | | | | | | | 610 |
| 15 | | | | | | | | | | | | 605 |
| 20 | | | | | | | | | | | | 600 |
| 25 | | | | | | | | | | | | 595 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1093

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532291.1 N; 629224.6 E | | Total Depth<br>46.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins/Warren) / CME550 | Elevation (Datum NAVD 88)<br>621.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/1/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 10.3 feet | Borehole Inclination<br>Vertical | Logged by<br>M. Osborne/D. Stepanof | Date Completed<br>5/3/06 |

Reviewed by / Date MJ 5-10-07 DSC 5-9-07 Rev. 1

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 1.3/1.3 | 0 | SW | R3 | | | | Bj, 15, Wa, Ro, Op | | LIMESTONE (wackstone and packstone); medium gray (N5) with medium dark gray banding (N4); slightly weathered; medium strong; brown clay-filled fractures, efferveces strongly in HCL<br>- 12 feet: change to packstone<br>- 11.5-12.8 feet: clay-filled fractures<br>- rock is predominantly fresh below 12.8 feet<br>- continuing rip-up clasts and bioturbation<br>- 16-16.5 feet: wackestone interval | HW casing advanced to 10.3 feet<br>good fluid return, white to light gray, 700 psi down pressure | 610 |
| | 2 | 4.7/5.0 | 77 | SW<br>F | R3<br>R3 | | | | Bj, 10, Wa, Ro, Op<br>Bj, 15, Wa, Ro, Ti<br>Bj, 10, Wa, Sl, Op | | | | |
| 15 | | | | | | | | | | | | | |
| | 3 | 4.9/5.0 | 98 | SW<br>F<br>SW | R2 | | | | Bj, 15 Wa, Sl, Ti | | | | 605 |
| 20 | | | | | | | | | | | | | |
| | 4 | 4.7/5.0 | 90 | F | R3 | | | | Bj, 15, Pl, Sl, Ti | | | | 600 |
| 25 | | | | | | | | | | | - highly weathered, dark gray shale beds at 25.7-26 ft. Shale is extremely weak.<br>- 26.6-27.6 feet: few calcite-filled fractures, closely spaced | | |
| | 5 | 5.0/5.0 | 56 | HW<br>F<br>SW<br>F<br>HW<br>F | R0<br>R3<br>R0<br>R3 | | | | Bj, 20, Pl, Sl, Op<br>Bj, 10, Pl, Sl, Ti<br>Bj, 10, Pl, Sm, Op | USR | SHALE; medium dark gray (N4); slightly weathered<br>LIMESTONE (packstone), highly fossiliferous at 28.1'-28.3' | | 595 |
| 30 | | | | | | | | | | | LIMESTONE (wackstone and packstone); medium gray (N5) with medium dark gray banding (N4); highly weathered to fresh; medium strong to extremely weak<br>SHALE; medium dark gray (N4) | Good fluid return, light gray, 800 psi down pressure | 590 |
| | 6 | 4.0/3.9 | 66 | SW<br>F | R0<br>R3 | | | | Bj, 20, Wa, Ro, Op<br>Bj, 20, Pl, Sl, Ti | | LIMESTONE (wackestone); medium light gray (N5) with medium dark gray banding (N4); fresh to slightly weathered; medium strong to weak<br>- 35-36 feet: closely fractured | | |
| 35 | 7 | 1.1/1.1 | 0 | | | | | | | | | 450 psi down pressure | 585 |
| | 8 | 3.9/5.0 | 19 | HW<br>F | R0<br>R3 | | | | Bj, 10, Wa, Sl, Op | | | slight fluid loss | |
| 40 | | | | | | | | | | | | | |
| | 9 | 5.0/5.0 | 92 | SW<br>F | R2<br>R3 | | | | Bj, 20, Wa, Ro, Op<br>Bj, 20, Wa, Sl, Ti | | LIMESTONE (packestone); medium light gray (N5) with one thin, medium dark gray (N4) micrite bed; fresh; medium strong; containing few calcite-filled fractures and few stylolites | | 580 |
| 45 | | | | | | | | | | | | | |
| | | | | | | | | | | | Boring Terminated at 46.1 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>No Data (collapse on 5/8) | | 575 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1094

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533085.6 N; 628571.3 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>607.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/30/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/30/06 |

Reviewed by / Date W/Hodum 3-14-07 DFC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content, (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 607.6 TOPSOIL; organic rich 0.5 | |
| | | SPT 1 | 3 3 2 | 8.4 | 18.6 | 60/ 33 | GSZ | | CH | sandy CLAY, light olive brown (2.5 Y 5/4) to brownish yellow (10YR 6/6), moist, medium stiff | |
| 5 | | SPT 2 | 2 3 4 | 8.4 | | | | | CL | 603.4 CLAY, yellowish brown (10 YR 5/6), damp to moist, medium stiff 4.2 | |
| | | SPT 3 | 5 10 7 | 11.4 | | | | | CL | 601.4 CLAY with gravel, clay is yellowish brown (10 YR 5/6), clasts are pale yellow (2.5Y 7/3), dry to moist, very stiff to stiff, gravels are weathered limestone (average of 0.05-0.02 feet) 6.2 | |
| 10 | | SPT 4 | 3 4 10 | 10.2 | | | | | | | |
| | | SPT 5 | 27 50/1" | 7 | | | | | | 596.0 11.6 | SPT refusal at 11.6 feet. Continuation of borehole description in rock log. |
| 15 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

Elevation (feet): 605, 600, 595, 590, 585, 580

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Leidis & Associates, Inc.

# ROCK LOG - Boring No. B-1094

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533085.6 N; 628571.3 E | | Total Depth<br>35 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>607.6 feet | Ground Water Depth<br>See Note A | Date Started<br>5/30/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 11 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/30/06 |

Reviewed by / Date: DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 4.4/5.0 | 59 | MW to SW | R3 | | | | Bj, 5, Wa, Sl, Op<br>Bj, 15, Wa, Sm, Op, clay-lined<br>Bj, 5, Wa, Sm, Op<br>Bj, 5, Wa, Sm, Op<br>Bj, 5, Pl, Sm, Ti-Op, clay lined<br>Bj, 10, Pl, Sm, Ti | D | LIMESTONE (micrite); medium gray (N5) with dark gray (N3) to grayish black (N2) calcareous shale; slightly to moderately weathered; medium strong<br>- shale thickness is on average 0.1-0.3' with spacings of 0.02-0.2'<br>- some fractures have clay coating<br>- weathering becomes fresh | Coring begun at 11.0 feet<br>Poor to total loss of fluid return | 595 |
| 20 | 2 | 4.9/5.0 | 97 | F | R3 | | | | | | - 16-22 feet: shale is wavy; thickness is < 0.01'<br>- occasional chert pods and vugs<br>20.2 feet: vug 0.05 x 0.08' | 16 feet: Fluid return is good in the remainder of boring | 590 |
| 25 | 3 | 5.1/5.0 | 99 | F | R3 | | | | | | - 21 feet: chert pod<br>- 22-26 feet: shale thickness is 0.01-0.05' with spacings of 0.05-0.2'<br>- occasional chert pods<br>- 24.8 feet: chert pod | | 585 |
| 30 | 4 | 4.6/5.0 | 92 | F | R3 | | | | | | - 26-30 feet: shale is wavy; thickness is < 0.01' with spacings of 0.05-0.2' | | 580 |
| 35 | 5 | 4.0/4.0 | 100 | F | R3 | | | | | | LIMESTONE (micrite); medium gray (N5) with dark gray (N3); fresh; medium strong; no shale<br>- rip-up clasts seen on shale beds, beginning of stylolitic features | | 575 |
| 40 | | | | | | | | | | | Boring terminated at 35.0 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>No Data | | 570 |
| 45 | | | | | | | | | | | | | 565 |
| 50 | | | | | | | | | | | | | 560 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1095

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532077.1 N; 628968.9 E | | Total Depth<br>50.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>630 feet | Ground Water Depth<br>See Note A | Date Started<br>6/14/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/19/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 630 CLAY with sand, red (2.5 YR 4/6), dry, stiff (Fill) 0.0 | | 630 |
| | | SPT 1 | 4 4 7 | 6 | | | | | | | | |
| | | | | | | | | | CL | 627.0 CLAY with sand, strong brown (7.5 YR 4/6), dry, stiff 3.0 | | |
| | | SPT 2 | 6 6 7 | 12 | | | | | | | | |
| 5 | | | | | | | | | | | | 625 |
| | | SPT 3 | 2 4 7 | 12 | | | | | | -color change to red (2.5 YR 4/6) | | |
| | | SPT 4 | 2 4 7 | 8 | | | | | | -color change to strong brown (7.5 YR 5/8), plasticity increases | | |
| 10 | | | | | | | | | | | | 620 |
| | | SPT 5 | 2 4 7 | 6 | | | | | | | | |
| | | SPT 6 | 50/1" | 0.5 | | | | | GW | 617.4 12.6<br>616.7 GRAVEL, light gray (7.5 YR 7/1), (weathered limestone) 13.3 | SPT refusal at 12.6 feet. Auger refusal at 13.3 feet. Continuation of borehole description in rock log. | |
| 15 | | | | | | | | | | | | 615 |
| 20 | | | | | | | | | | | | 610 |
| 25 | | | | | | | | | | | | 605 |
| 30 | | | | | | | | | | | | 600 |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1095

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532077.1 N; 628968.9 E | | Total Depth<br>50.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>630 feet | Ground Water Depth<br>See Note A | Date Started<br>6/14/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 13.3 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/19/06 |

Reviewed by / Date WJ 5-10-07 DSC 5-9-07 Rev. 1

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 2.1/2.7 | 74 | MW to F | R3 | | | | | USR | LIMESTONE (micrite) with interbedded shale; medium gray (N5); fresh to moderately weathered; medium strong to strong<br>- 14.4-14.8 feet: clay<br>- 13.3- 21 feet: shale moderately thin with 0.1' spacing<br>- trace bioturbation, medium strength | Good fluid return, grayish brown | 615 |
| 20 | 2 | 4.9/5.0 | 52 | SW to F | R3 | | | | Bj, 15, Pl, Sl, Op | | | 20 feet: fluid color changes to gray | 610 |
| 25 | 3 | 4.8/5.0 | 94 | F | R3 to R4 | | | | Bj, 10, Pl, Sl, Sm | | - 21 feet: becoming fresh; bioturbation, shell fragments from 22.7 to 23.8 feet<br>- shale beds thick to moderate thin with 0.1-0.3' spacing | | 605 |
| 30 | 4 | 5.0/5.0 | 68 | F | R3 to R4 | | | | Bj, 5, Pl, Sl, Op<br>Bj, 15, Wa, Sl, Op<br>Bj, 5, Pl, Sl, Op | | - shale beds thin to thick with 0.1-0.4' spacing<br>-trace bioturbation and shell fragments | | 600 |
| 35 | 5 | 5.0/5.0 | 100 | SW to F | R3 to R4 | | | | Bj, 10, Pl, Sl, Op | | | | 595 |
| 40 | 6 | 5.0/5.0 | 98 | SW to F | R3 to R4 | | | | Bj, 5, Pl, Sl, Op<br>Bj, 6, Pl, Sl, Op | | LIMESTONE (wackstone); medium light gray (N6); fresh to slightly weathered; medium strong to strong; mostly composed of shell fragments | | 590 |
| 45 | 7 | 5.1/5.1 | 88 | SW to F | R3 to R4 | | | | Bj, 5, Pl, Sl, Ti | A | LIMESTONE (micrite) with interbedded shale; medium light gray (N6); fresh to slightly weathered; medium strong to strong; trace bioturbation and shell fragments, <5% shale<br>- shale beds moderately thin to thin with 0.1-0.2' spacing | | 585 |
| 50 | 8 | 4.0/4.0 | 92 | SW to F | NR | | | | Bj, 10, Pl, Sl, Ti | | | | 580 |
| | | | | | | | | | | | Boring Terminated at 50.1 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/19 - 15.2-15.6 feet | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1096

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532615.5 N; 629217 E | | Total Depth<br>50.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME550 | Elevation (Datum NAVD 88)<br>616.5 feet | Ground Water Depth<br>See Note A | Date Started<br>7/17/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>7/18/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 616.5 CLAY, dark yellowish brown (10 YR 4/6) to yellowish red (5 YR 4/6), moist, medium stiff to stiff, manganese filled pockets (Fill) - trace gravel below 1 foot | 0.0 | 615 |
| | | SPT 1 | 3 3 4 | 9.6 | | | | | | | | |
| | | SPT 2 | 4 6 9 | 18 | | | | | | 612.0 | 4.5 | |
| 5 | | | | | | | | | CL | CLAY, brownish yellow (10 YR 6/6), moist, stiff, contains cemented silt pockets | | 610 |
| | | SPT 3 | 4 6 8 | 18 | | | | | | 608.5 | 8.0 | |
| | | SPT 4 | 50/6" | 6 | | | | | ML | 607.5 SILT, light gray (10 YR 7/2), dry to moist, hard | 9.0 | SPT refusal at 9.0 feet. Auger refusal at 9.4 feet. Continuation of borehole description in rock log. |
| 10 | | | | | | | | | | | | 605 |
| 15 | | | | | | | | | | | | 600 |
| 20 | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA Williams Lewis & Associates, Inc.

# ROCK LOG - Boring No. B-1096

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532615.5 N; 629217 E | | Total Depth<br>50.1 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Akins) / CME550 | Elevation (Datum NAVD 88)<br>616.5 feet | Ground Water Depth<br>See Note A | Date Started<br>7/17/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 9.5 feet | Borehole Inclination<br>Vertical | Logged by<br>D. Stepanof | Date Completed<br>7/18/06 |

Reviewed by / Date DSC 5-9-07 WLY 5-10-07 Rev. 1

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 0.9/0.9 | 0 | SW to F | R3 | NG | | | A | LIMESTONE (wackestone and micrite); medium gray (N5) to medium dark gray (N4); slightly weathered to fresh; medium strong; reaction to HCL is strong | Down pressure 150 psi, fluid return good, white to light gray | 605 |
| | 2 | 5.0/4.9 | 86 | F | R3 | | Bj, 15, Pl, Sm, Ti<br>Bj, 10, Pl, Sm, Ti<br>Bj, 5, Pl, Sm, Op<br>Bj, 10, Wa, Sl, | | | LIMESTONE (micrite); medium gray (N5) with dark medium gray (N4) calcareous shale interbeds with wavy contact; fresh; medium strong; strong reaction to HCl<br>- few thin layers of Packstone; average thickness 0.2'<br>- 16.1-16.4 feet: clay-lined fracture<br>- shale bed thickness 0.01-0.03'<br>- bioturbation, sand-filled burrows | 16 feet: rig chatter, good fluid return, down pressure 200 psi | |
| 15 | 3 | 4.7/5.0 | 90 | F | R3 | | | | | | | 600 |
| 20 | 4 | 5.0/5.0 | 100 | F | R3 | | | | | | | 595 |
| 25 | 5 | 5.0/5.0 | 100 | F | R3 | | | | | LIMESTONE (packstone); medium gray (N5) with medium dark gray (N4) calcareous shale interbeds; fresh; medium strong<br>- shale bed thickness ranges from 0.01'-0.03'<br>- 26.5-26.9 feet: packstone is fossilferous<br>LIMESTONE (micrite); medium gray (N5) with medium dark gray (N4) calcareous shale interbeds; fresh; medium strong; strong reaction to HCl<br>- shale thickness ranges from 0.01'-0.05' | NG analysis wasconducted over the length of cored section | 590 |
| 30 | 6 | 5.0/5.0 | 100 | F | R3 | | | Bj, 10, Wa, Ro, Op | | | | 585 |
| 35 | 7 | 5.0/5.0 | 100 | F | R3 | | | | | - 35.2-40.2 feet: packstone interbeds, medium gray (N5), bed thickness for packstone is 0.1'-0.2' and for calcareous shale it is 0.01'-0.2' | | 580 |
| 40 | 8 | 5.0/5.0 | 100 | F | R3 | | | | B | LIMESTONE (packstone); medium gray (N5) with micrite and medium dark gray (N4) calcareous shale interbeds; fresh; medium strong; interbeds 0.01 feet thick with wavy contact | Down pressure 300 psi, good fluid return, light gray | 575 |
| 45 | 9 | 4.9/4.9 | 100 | F | R3 | | | | | LIMESTONE (micrite); medium gray (N5) with medium dark gray (N4) calcareous shale interbeds; fresh; medium strong; interbed thickness 0.01-0.03 feet with wavy bedding contacts; bioturbation present; few packstone interbeds 0.1' thick | PVC: 4 inch O.D. | 570 |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1096

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | | | | | | | | | | B | | installed after drilling for NG test | |
| | | | | | | | | | | | Boring Terminated at 50.1 ft | | 565 |
| | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>7/18 - 10.3 feet<br>7/23 - 5.0 feet | | |
| 55 | | | | | | | | | | | | | 560 |
| 60 | | | | | | | | | | | | | 555 |
| 65 | | | | | | | | | | | | | 550 |
| 70 | | | | | | | | | | | | | 545 |
| 75 | | | | | | | | | | | | | 540 |
| 80 | | | | | | | | | | | | | 535 |
| 85 | | | | | | | | | | | | | 530 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1097

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1531841.7 N; 628482.3 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>626.3 feet | Ground Water Depth<br>See Note A | Date Started<br>5/26/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/26/06 |

Reviewed by / Date [signature] 3-14-07 DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | SP | 626.3 SAND, gray (5Y 5/1) to dark gray (5Y 4/1), wet (Fill) 0.0 | | |
| | | | | | | | | | | 625.3 | | 625 |
| | | SPT 1 | 3 3 3 | 9.6 | | | | | CL | CLAY, yellowish brown (10YR 5/4), moist, medium stiff to stiff, trace manganese nodules, low to medium plasticity (Residual) 1.0 | | |
| | | SPT 2 | 4 5 5 | 10.8 | | | | | | | | |
| 5 | | | | | | | | | | | | |
| | | SPT 3 | 3 5 9 | 13.2 | | | | | | -becomes yellowish brown (10YR 5/6) to strong brown (7.5YR 4/6) | | 620 |
| | | SPT 4 | 3 5 9 | 12.6 | | | | | | | | |
| 10 | | | | | | | | | | 615.1 | | |
| | | SPT 5 | 50/2" | 2 | | | | | | 11.2 | SPT refusal at 11.2 feet (blow count 50/2"). Continuation of borehole description in rock log. | 615 |
| 15 | | | | | | | | | | | | 610 |
| 20 | | | | | | | | | | | | 605 |
| 25 | | | | | | | | | | | | 600 |
| 30 | | | | | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project: 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1097

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1531841.7 N; 628482.3 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>626.3 feet | Ground Water Depth<br>See Note A | Date Started<br>5/26/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 11 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>5/26/06 |

Reviewed by / Date DRC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1 | 5.0/5.0 | 88 | SW<br>F | R2 | | | | Bj, 5, Wa, Sl, Op<br>Bj/Me, 10, Wa, Sl, Ti | | LIMESTONE (micrite) with interbedded calcareous shale; medium gray (N5) with dark gray (N3) to grayish black (N2) bands and calcareous shale; slightly weathered to fresh; weak; strong HCL reaction; slightly weathered clay filled fractures at 11-12.4 feet<br>- shale beds are 0.01-0.08' thick with an average spacing of 0.2' | Coring begun at 11.0 feet<br>11.2-50.0 feet: Good fluid return | 615 |
| 20 | 2 | 5.0/5.0 | 100 | F | R2 | | | | | | -becomes fresh<br>- shale beds are 0.05-0.15' thick with spacing of 0.05-0.2' | | 610 |
| 25 | 3 | 5.0/5.0 | 100 | F | R2 | | | | Bj/Me, 10, Pl, Sl, Ti<br>Bj/Me, 5, Pl, Sl, Ti | | - shale layers are <0.01' thick with close (0.01-0.1') spacing<br>-packstone at 21.5-22.6 feet<br>- some interbeds are fossiliferous micrite with thickness 0.05-0.15' with 0.3-1.5' spacing<br>- shale beds show rip-up clasts<br>- incipient cracks at interface between shale and micrite-continues to bottom of hole<br>-packstone at 24.0-24.5 feet | | 605 |
| 30 | 4 | 5.0/5.0 | 100 | F | R2 | | | | | A | - shale beds are 0.01'-0.08' thick with average spacing of 0.1-0.3' | | 600 |
| 35 | 5 | 5.0/5.0 | 100 | F | R2 | | | | Bj/Me, 30, Wa, Sl, Ti | | - shale beds are 0.01-0.05' thick with average spacing of 0.1-0.3' | | 595 |
| 40 | 6 | 5.0/5.0 | 100 | SW to F | R2 | | | | Bj, 5, Wa, Sl, Ti | | LIMESTONE (packstone with small sections of micrite 0.2-1.0 feet) with interbedded shale; medium grayish blue (5B 5/1); slightly weathered to fresh; weak; shale is 0.01-0.08' thick<br>- 37 feet: fossiliferous<br>- rip-up clasts | | 590 |
| 45 | 7 | 5.0/5.0 | 100 | F | R2 | | | | | | LIMESTONE (micrite) medium gray (N5) with dark gray (N3) to grayish black (N2) bands and calcareous shale; fresh; weak; strong HCL reaction | | 585 |
| 50 | 8 | 4.8/4.0 | 95 | F | R2 | | | | | | - shale is 0.01'-0.08' thick with spacing 0.5'-0.01' | | 580 |
| | | | | | | | | | | | Boring Terminated at 50.0 feet | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC

WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1097

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | NOTE A: Water level data<br>Date - Depth (below ground surface)<br>No Data | | 575 |
| 55 | | | | | | | | | | | | | 570 |
| 60 | | | | | | | | | | | | | 565 |
| 65 | | | | | | | | | | | | | 560 |
| 70 | | | | | | | | | | | | | 555 |
| 75 | | | | | | | | | | | | | 550 |
| 80 | | | | | | | | | | | | | 545 |
| 85 | | | | | | | | | | | | | 540 |
| 90 | | | | | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC | WLA William Lettis & Associates, Inc

# SOIL LOG - Boring No. B-1098

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532350.7 N; 627838.6 E | | Total Depth<br>50.5 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>616.4 feet | Ground Water Depth<br>See Note A | Date Started<br>6/13/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/13/06 |

Reviewed by / Date MJ 5-10-07 DSC 5-9-07 Rev. 1

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | CL | 616.4 CLAY with sand, strong brown (7.5YR 5/8), dry, medium stiff (Fill) 0.0 | | 615 |
| | | SPT 1 | 2 2 4 | 6 | | | | | | | | |
| | | SPT 2 | 2 3 3 | 6 | | | | | | | | |
| 5 | | | | | | | | | CH | 610.4 CLAY, strong brown (7.5YR 4/6), moist, very soft to medium stiff, trace sand 6.0 | | 610 |
| | | SPT 3 | 1 1 1 | 4 | | | | | | | | |
| | | SPT 4 | 1 3 3 | 4 | | | | | | | | |
| 10 | | | | | | | | | | | | |
| | | SPT 5 | 2 3 4 | 4 | | | | | | 604.2 | 12.2 | 605 |
| | | | | | | | | | SC | SAND with clay, brown (10YR 4/3), wet, loose 602.9 | 13.5 | |
| | | SPT 6 | 8 13 50/5" | 9 | | | | | GP | GRAVEL, medium gray (N5), very dense, (weathered limestone) | Note for SPT 6: broken rock fragments in sampler | |
| 15 | | | | | | | | | | 601.0 | 15.4 SPT and auger refusal at 15.4 feet. Continuation of borehole description on rock log. | 600 |
| 20 | | | | | | | | | | | | 595 |
| 25 | | | | | | | | | | | | 590 |
| 30 | | | | | | | | | | | | |

Project Name and No.: NuStart - Bellefonte COL Project; 6468061299

MACTEC | WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1098

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1532350.7 N; 627838.6 E | | Total Depth<br>50.5 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>616.4 feet | Ground Water Depth<br>See Note A | Date Started<br>6/13/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 15.4 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Howard | Date Completed<br>6/13/06 |

Reviewed by / Date DSC 5-9-07 Rev. 1 5-10-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 0.9/1.1 | 0 | HW to MW | R3 | | | | Bj, 45, Pl, Sl, Op<br>Bj, 5, Pl, Ro, Op | | LIMESTONE (micrite); medium gray (N5), moderately to highly weathered; moderately strong; shale beds are very thin to thin and spaced 0.1-1.0 feet apart | Run No. 1 brecciated to gravel size (mechanical) limestone<br>Good fluid return throughout boring | 600 |
| 20 | 2 | 5.1/5.1 | 76 | MW to SW | R3 to R4 | | | | Bj, 5, Pl, Sl, Op | | - trace bioturbation and shell fragments<br>- shale beds are 0.3' apart | | 595 |
| 25 | 3 | 5.0/5.0 | 80 | SW | R4 | | | | Bj, 5, Ro, Pl, Ti<br>Bj, 5, Pl, Sl, Op | | - becomes fresh to slightly weathered, strong | | 590 |
| 30 | 4 | 4.9/4.9 | 94 | SW to F | R4 | | | | Bj, 5, Pl, Ro, Op<br>Bj, 5, Pl, Sl, Op | | - trace bioturbation and shale fragments | | 585 |
| 35 | 5 | 4.7/5.0 | 9.4 | SW to F | R4 | | | | Bj, 5, Pl, Sl, Ti<br>Bj, 5, Pl, Sl, Ti | D | | | 580 |
| 40 | 6 | 4.4/5.0 | 76 | SW to F | R4 | | | | Bj, 5, Sl, Op<br>Bj, 5, Pl, Sl, Op<br>Bj, 5, Pl, Sl, Op | | - small calcite vein at 39.0 feet | | 575 |
| 45 | 7 | 4.9/5.0 | 52 | SW to F | R4 | | | | Ve, 60, Pl, Sl, Ti<br>Bj, 5, Pl, Sl, Sm | | - bioturbation and shell fragments found in thin layers<br>- shale beds moderately thin to moderately thick and 0.1'-0.4' apart | 42.2-43.2 feet: possible mechanically broken segment | 570 |
| 50 | 8 | 3.9/4.0 | 97 | F | R4 | | | | Bj, 10, Pl, Sl, Ti | | | 47-50 feet: sulfur odor | 565 |
| 55 | | | | | | | | | | | Boring Terminated at 50.5 feet<br><br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/20 - 16.9 feet<br>6/21 - 15.6 feet<br>6/22 - 15.8 feet | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# SOIL LOG - Boring No. B-1099

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533127.1 N; 627932.7 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>604.8 feet | Ground Water Depth<br>See Note A | Date Started<br>6/8/06 |
| Sampling Method<br>Split Spoon/ NQ core | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/9/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Sample | Sample Type & No. | Uncorrected Blows/6 inches | Recovery (inches) | Water Content (%) | Atterberg Limit (LL/PI) | Other Testing | Lithology | Soil Type (USCS) | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | 604.8 TOPSOIL; Organic rich 0.0 | | |
| | | | | | | | | | | 604.1 0.7 | | |
| | | SPT 1 | 3 5 10 | 13.2 | | | | | MH | SILT, yellow (10YR 7/6) with very dark manganese nodules, dry, stiff to very stiff, trace sand | | |
| | | SPT 2 | 5 10 8 | 11.4 | | | | | | | | |
| 5 | | | | | | | | | | 599.3 5.5 | | 600 |
| | | SPT 3 | 1 3 6 | 12.6 | | | | | CL | CLAY, yellowish brown (10YR 5/6), moist, stiff to hard | | |
| | | SPT 4 | 15 50/2" | 12 | | | | | | 8 feet: saturated<br>596.0 8.5 feet: weathered limestone gravel 8.8<br>595.6 Weathered LIMESTONE with clay 9.2 | SPT refusal at 9.2 feet. Continuation of borehole description in rock log. | |
| 10 | | | | | | | | | | | | 595 |
| 15 | | | | | | | | | | | | 590 |
| 20 | | | | | | | | | | | | 585 |
| 25 | | | | | | | | | | | | 580 |
| 30 | | | | | | | | | | | | 575 |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

MACTEC | WLA William Lettis & Associates, Inc.

# ROCK LOG - Boring No. B-1099

| | | | |
|---|---|---|---|
| Drilling Method<br>Hollow stem auger (8" OD)/ NQ core (3") | Boring Location Coordinates: AL State Grid (ft)<br>1533127.1 N; 627932.7 E | | Total Depth<br>50 feet |
| Drilling Contractor (Driller) and Rig<br>MACTEC (Warren) / CME 45 | Elevation (Datum NAVD 88)<br>604.8 feet | Ground Water Depth<br>See Note A | Date Started<br>6/8/06 |
| Casing Size and Depth<br>NW: 3.5 inch O.D. / 10.85 feet | Borehole Inclination<br>Vertical | Logged by<br>J. Hoeft | Date Completed<br>6/9/06 |

Reviewed by / Date DSC 3-13-07

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 0.4/2.2 | 0 | CW to SW | R2/R0 | | | | | | Weathered LIMESTONE with clay<br>- soil-filled VOID | Coring begun at 8.8 feet | 595 |
| | 2 | 4.9/5.0 | 80 | MW | R3 | | | | | | LIMESTONE (micrite); light brownish gray (5YR 6/1); slightly weathered; medium strong; stylolitic features; strong HCL reaction; vitreous fracture coatings<br>- vertical incipient fractures<br>-becomes packstone from 14.8-16.2 feet with color medium dark gray (N4), pink calcite cement layer ~0.5' thick at 15.3 feet | | 590 |
| 15 | 3 | 5.0/5.0 | 99 | SW | R3 | | | | Jo, 20, Pl, Sm, Ti, slickensides, rake=10° | D | LIMESTONE (micrite) with interbedded calcareous shale; medium gray (N5) with shale dark gray (N3); slightly weathered; medium strong; slight staining along some of the shale-brown tinge<br>- 18.8 feet: healed fracture 50° with notable offset<br>- 19.2-21.2 feet is packstone, medium dark gray (N4) with vertical staining: yellowish gray (5Y 7/2) | | 585 |
| 20 | 4 | 4.8/5.0 | 44 | MW to SW | R3 | | | | Jo, 20, Pl, Sl, Ti<br>Jo, 20, Wa, Sl, Ti | | -21.2-22.9 feet: brecciated fracture/shear zone: angular clasts with polished glassy surfaces between many of the fractures<br>- 22.9-23.1 feet: small Void | 22 feet: Lost water return and did not recover | 580 |
| 25 | 5 | 5.0/5.0 | 96 | F | R3 | | | | Jo, 20, Wa, Sm, Ti<br>Jo, 15, Wa, Sl, Op | | LIMESTONE (micrite); medium dark gray (N4); medium strong; fresh to slightly weathered; very crystalline, styloltic features; occasional shale laminae; vertical fracture and slickensides at 26.8-27.1 feet<br>LIMESTONE (micrite) with calcareous shale; medium gray (N5) with shale dark gray (N3); fresh; medium strong<br>-shale is 0.02-0.2' with 0.05-0.1' spacing | | 575 |
| 30 | 6 | 4.8/5.0 | 72 | F | R3 | | | | Jo, 15, Pl, Sm, Ti/Op, slickensides<br>Jo, 15, Wa/Pl, Sm/Sl, Op<br>Bj, 15, Wa, Sl, Ti<br>Bj, 15, Wa/Pl, Sl, Ti<br>Jo, 15, Pl, Sl, Ti<br>Jo, 15, Pl, Sm, Ti<br>Jo, 15, Pl, Sm, Ti<br>Jo, 15, Wa, Sm, Ti<br>Jo, 15, Pl, Sm, Ti, slickensides, rake=0<br>Mb, 5, Wa, Sm, Ti<br>Jo, 15, Pl/St, Sm, Ti, slickensides, rake=10° | | -31.5-33.0 feet: calcareous shale with micrite; shale is dominant with micrite approximately 0.02-0.05' thick with average spacing of 0.05-0.2 feet.<br>- most shale layers are <0.02 feet thick (occasionally 0.05 feet) spaced 0.05-0.2 feet apart<br>-occasional pink calcite layer (~0.05 feet thick)<br>- 33-41 feet: pervasive slickensided surfaces, polished; rip-up clasts are visible; incipient vertical fractures are also prominent throughout this section. | | 570 |
| 35 | 7 | 5.0/5.0 | 99.6 | F | R3 | | | | | E | | | 565 |
| 40 | 8 | 5.0/5.0 | 100 | F | R3 | | | | | | | | 560 |
| 45 | 9 | 4.0/4.0 | 100 | F | R3 | | | | | | | | |

Project Name and No.: **NuStart - Bellefonte COL Project; 6468061299**

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# ROCK LOG - Boring No. B-1099

| Depth (feet) | Run No. | Recovery / Cut | % RQD | Weathering | Strength | In-Situ Testing | Lithology | Discontinuity Log | Discontinuity Description | Geologic Unit | Lithology | Remarks | Elevation (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | | | | | | | | | | E | Boring terminated at 50.0 feet<br>NOTE A: Water level data<br>Date - Depth (below ground surface)<br>6/9 - 6.1 feet | | 555 |
| 55 | | | | | | | | | | | | | 550 |
| 60 | | | | | | | | | | | | | 545 |
| 65 | | | | | | | | | | | | | 540 |
| 70 | | | | | | | | | | | | | 535 |
| 75 | | | | | | | | | | | | | 530 |
| 80 | | | | | | | | | | | | | 525 |
| 85 | | | | | | | | | | | | | 520 |