P A R S O N S

DRILLING LOG

AOC65-PZ01-LGR

Project: AOC-65 Groundwater Recharge Study/TO 58	**Installation:** Camp Stanley Storage Activity, U.S. Army
Geologist: E. Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects International	**Design of Drill:** G-D 1500
Hole Number(s): PZ-1	**Number of Core Boxes:** 13
Name of Driller: Antonio Landeros	**Elevation Ground Water:** 95.1'bgs (7/24/02)
Northing: 3283735.988 **Easting:** 535671.094	**Date Hole Started:** 07/10/02 **Stopped:** 07/11/02
Total Depth of Hole: 133.5'bgs	**Elevation Top of Casing:** 1224.11

Depth (bgs)	PID	Recovery	Lithologic Description (feet)	Lithology	Sample	Gamma (cps) 0 150
0	0	0/2	TOPSOIL: 0.0-2.0 Overdrill, rocky, dark brown clayey loam.			
	0	1.3/4.5	LIMESTONE: 2.0-6.5 Mudstone/fine wackestone; very pale yellow to whitish, moderately hard, broken, weathered, orange staining in unconsoildated and broken zones, damp.			
-5	0	1.5/2	LIMESTONE: 6.5-9.0 Wackestone; pale yellow to yellow, moderately hard, broken, infrequent thin clayey zone (<1.0 cm), moderate bioturbation, damp.			
	0	4.9/5	LIMESTONE: 9.0-13.5 Mudstone; very pale, yellow to very pale brown 10YR 8/2, alternating thin zones of moderately hard to hard, thin bedding, bioturbated, occasional very thin bedding plane fractures, damp.			
-10						
	0	4.3/5	LIMESTONE: 13.5-14.5 As above with oblique thin fracture with black speckled staining on surfaces. 14.5-15.5 Above but weathered, somewhat soft, more yellowish and clayey with depth, moist, orange stained contact with below, sharp color change at 15.5'. 15.5-18.5 Mudstone; various gray shades - light to regular gray, hard, dry to slightly damp in slightly softer thin zones, bioturbated. 17.7-17.9 Above, harder, more whitish. 18.1-18.5 Above but softer, moist, slightly more clayey and weathered.			
-15	0	4.2/4.5	LIMESTONE: 18.5-19.0 As above, missing section probably from top of run 18.5'-18.8' which appeared to be more shaley/clayey. 19.0-20.0 Wackestone; light gray, solid, hard, dry. 20.0-23.0 As 18.5'-19'.			
-20						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-25	0	5.2/5.5	LIMESTONE: 23.0-25.2 As above with infrequent vugs, dry, mostly light yellow with gray lenses. 25.2-25.9 Wackestone; fine, yellow, moderately hard, damp. 25.9-27.3 Clay; yellow, very stiff alternating with thin hard whitish zones, clayey layers predominate. 27.3-28.5 Mudstone; pale yellow, hard, obliquely fractured. 5.5' run to make up for previous short run.			
-30	0	2.9/5	LIMESTONE: 28.5-30.1 As above, fractured with orange and black staining on fracture surface. 30.1-30.6 Mudstone/wackestone; pale yellow to very pale brown, moist, moderately soft and clayey. 30.6-33.5 Mudstone/wackestone; hard thin bits 0.05' to 0.2' thick, with clay and weathered washouts/voids, evidence of bioturbation in zones. Missing interval likely from 30.6'-33.2'.			
-35	0	3.5/5	LIMESTONE: 33.5-36.0 Mostly not recovered but did recover 0.6' of very hard whitish mudstone piece with a handful of broken nuggets of same material, nuggets are very vuggy. 36.0-37.3 Stiff clay; mostly yellow with occasional light gray wispy mottles, moist, fractured with orange staining along fractures. 37.3-38.1 Wackestone/fine packstone; pale yellow, some light gray wispy lenses except they are mudstone without grains, one light gray patch is hard and dry (unweathered ?). 38.1-38.5 Mudstone; gray, shaley, thinnly bedded.			
-40	0	3.9/5	LIMESTONE: 38.5-39.2 Mudstone/wackestone as above, light gray, alternating thin hard and soft clayey zones, highly bioturbated. 39.2-42.3 Missing zone, probably clayey, posssibly rubble, or both, washed out. 42.3-43.5 Wackestone; light gray, fossiliferous, barely damp to dry.			
-45	0	2.75/5	LIMESTONE: 43.5-48.8 As above, gradually grading to light gray foram hash with soft clayey zones (including foram fossils) in 47' to 48.5' zone. Missing most likely from lower portion of run, clayey washouts.			
-50	0	4.7/5	LIMESTONE: 48.5-49.5 As above continues. 49.5-50.9 Abrupt color change to yellow, texture same as above. 50.9-52.0 Packstone; fine to medium, yellow to pale yellow, hard, broken, much orange staining, bioturbated shell fragments, pitted, (small), damp, small vugs with clear calcite crystals. 52.0-53.5 Fine packestone; very small percent mud, yellow, moderately hard, pitted, damp, some bioturbated, bedding not obvious.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-55	0	4.9/5	LIMESTONE: 53.5-55.1 As above. 55.1 Abrupt change to gray, texture same. 55.1-51.5 Above grading to mudstone, bioturbated, wavey horizontal stylolites. 51.5-58.5 Mudstone; gray, hard, damp, infrequent bioturbated infilled tunnels, infrequent vug 3mm to 4cm, numerous horizontal wavey stylolites 58'-58.5'.			
-60	0	2.4/5	LIMESTONE: 58.5-61.5 Mudstone/fine wackestone; gray, moist, very broken up, clayey zones, much missing. 61.5-62.0 Mudstone; whitish, hard, damp. 62.0-62.6 As above but light gray. 62.6-63.5 Clay; moderately stiff to soft, plastic, moist, much missing. Missing mostly gray clay zones washed out, bottom of run started plugging with stiff gray clay.			
-65	0	3.1/5	LIMESTONE: 63.5-68.5 Mudstone; white to very light grayish brown with depth, minor bioturbation in top 2 feet, broken, hard and brittle, damp, infrequent shell small to large, some pale yellow mottling/staining 68'-68.5'.			
-70	0	4/5	LIMESTONE: 68.5-69.7 Above continuing, becoming more mottled - white and light brownish yellow, fractured, small shells and fragments. 69.7-69.8 Quick transition from above to below: 69.8-71.5 Mudstone; gray, moderately soft with thin hard layers, clayey and moderately shaley, bioturbated, moist. Missing mostly from this interval, clay washouts probable. 71.5-71.7 Mudstone; hard with brownish clay, very thinnly bedded. 71.7-72.2 Broken bits consisting of above and below, tiny bits to 3cm in size.			
-75	0	4.5/5	72.2-73.5 Mudstone; pale yellow with minor white mottling, pitted and small occasional vugs, hard, damp. LIMESTONE: 73.5-74.7 Above continues, yellow mottling disappears with depth becoming more white, orange stained. Infrequent tiny fossil fragments 74.5'-74.7'. 74.7-77.5 Above texture continues but with abrupt color change to light gray mottled hues; Hard, dry to damp, bioturbated, small fossils fragments, increasing frequency with depth, larger shell fragments with depth.			
-80	0	4.1/5	77.5-78.5 Mudstone; gray, soft, clay zones, shaley, much washed out, no fossils. LIMESTONE: 78.5-80.1 As above. 80.1-81.4 Mudstone; gray, moderately hard, damp, infrequent tiny shell fragments 80.4-80.7 As above but broken along bedding planes into thin disks. 80.7-82.6 Mudstone; light brownish gray, soft rock, appears to be above texture with color change, occasional small fossil fragments, becoming more yellow and softer with depth.			
	0	5/5	82.6-83.5 Stiff clay; yellow, plastic, stuck tight to inside barrel surface, some small and thin brownish gray mottling.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-85			LIMESTONE: 83.5-84.0 As above 84.0-84.1 Above transition to below: 84.1-84.5 Very fine packstone; yellow, oolitic grains, moist, moderately hard, not cemented, brittle. 84.5-85.6 Very fine packstone; very pale yellow to whitish, hard, damp, infrequent tiny vugs or pits. 85.6-88.5 Packstone; white, very fossiliferous, predominately pelecypods, poorly sorted, moderately vuggy, moderately hard to hard in isolated patches.			
	0	5/5	LIMESTONE: 88.5-90.3 As above. 90.3-93.5 As above but tighter, more compact, fossils smaller, vugs disappear with depth, more grainy with depth, like 84.5'-85.6', slightly softer than above.			
-90						
	0	4.5/5	LIMESTONE: 93.5-98.5 As above continuing, moderately bioturbated, occasional bedding plane split with orange staining, 25% bioturbated. 97.0'-98.5' Infilling is yellow and very grainy in contrast to white mud matrix, orange staining on bioturbated tunnel surfaces.			
-95						
	0	4.6/5	LIMESTONE: 98.5-99.8 Mudstone; very light brownish gray to whitish, hard, damp. 99.8-100.6 Above transition to below, very broken up, some missing. 100.6-101.1 Wackestone; very pale brown, occasional fossil, bioturbated, moderately hard but brittle, numerous bedding plane wavey breaks. 101.1-102.4 Mudstone/wackestone; white to very pale yallow, hard, damp, small patches (0.25-3.0 cm) white calcite masses. 102.4-102.6 Above pieces in brown plastic clay.			
-100						
	0	4.2/5	102.6-103.5 Mudstone; very pale yellow, infrequent large fossil, minor small fossils and fragments 8-12%. LIMESTONE: 103.5-107.5 As above. 107.5-108.0 Clay and very soft mudstone; yellow, stiff, mostly not recovered. 108.0-108.4 Same as 102'-107'. 108.0' - Circulation starts to diminish			
-105						
	0	3/5	108.4-108.5 Packstone; white, some orange staining on some broken surfaces and on some fossil surfaces, very fossiliferous and poorly sorted, gastropods and pelecypods, corals, vuggy and molds, very broken in places, micro calcite in some vugs/openings.			
-110						
	0		LIMESTONE: 108.5-113.5 Packstone; white, some orange staining on some broken surfaces and on some fossil surfaces, very fossiliferous and poorly sorted, gastropods and pelecypods, corals, vuggy and molds, very broken in places, micro calcite in some vugs/openings. "Rotton" rock in driller slang. Reduced returns. LIMESTONE: 113.5-118.5 As above but less vuggy and no orange staining.			
-115						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
	0	2.2/5	LIMESTONE: 118.5-123.5 As above, very broken, some light orange stains near bottom (112'-123'). Returns appear to be diminishing further according to driller.			
-120						
	0	4.5/5	LIMESTONE: 123.5-128.5 As above except some larger patches of fine matrix material that contains no vugs or fossils. Diminished returns, hole making small amount of water.			
-125						
	0	1.8/5	LIMESTONE: 128.5-133.5 As above.			
-130						

P A R S O N S	**DRILLING LOG** **AOC65-PZ02-LGR**
Project: AOC65 Groundwater Recharge Study/TO 58	**Installation:** Camp Stanley Storage Activity, U.S. Army
Geologist: E. Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects International	**Design of Drill:** G-D 1500
Hole Number(s): PZ-2	**Number of Core Boxes:** 5
Name of Driller: Jose Landeros	**Elevation Ground Water:** 37.5'bgs (7/18/02)
Northing: 3283607.762 **Easting:** 535671.114	**Date Hole Started:** 07/17/02 **Stopped:** 07/17/02
Total Depth of Hole: 49.0'bgs	**Elevation Top of Casing:** 1211.28

Depth (bgs)	PID	Recovery	Lithologic Description (feet)	Lithology	Sample	Gamma 0 (cps) 150
0		0/3	LIMESTONE: 0.0-2.0 No recovery - overdrill, dark brown, very clayey and rocky soil.			
	0	0.6/4	LIMESTONE: 2.0-7.0 Mudstone-wackestone; small pieces of whitish limestone with frequent orange and brown staining on some broken/weathered surfaces.			
-5						
	0	1/7	LIMESTONE: 7.0-12.0 Wackestone; whitish to pale yellow, semi-cemented thin vertical fracture, rock softens and becomes more clayey with depth.			
-10			LIMESTONE: 12.0-14.0 Wackestone; yellow, soft, weathered, soft and moist clay layers.			
	0.2	3/5	LIMESTONE: 14.0-15.0 As above, pitted.			
-15	0.6		15.0-17.5 Mudstone; white to very pale yellow, hard, dry, infrequent thin (<0.5cm) soft clay seam, infrequent pit or small vug.			
	0.1		17.5-19.0 As above mudstone; pale yellow, slightly softer than above, thin clay seam at 17.5' and a vertical thin fracture form a "T" fracture that dissipates at 18.7', pale orange stained fracture surface.			
	0.1					
	0					
	0.1	4.7/5	LIMESTONE: 19.0-21.0 As above with softer weathered zones. Missing core most likely from this interval.			
-20	0.2		21.0-23.0 Mudstone; alternating white and very pale yellow bands, damp, hard, fractured with black speckled stains.			
	0.1		23.0-24.0 Above becoming more yellow with depth, slightly softer, more weathered, bioturbated, no fossils, some friable zones, some			
	0		sample missing.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
	0		sample missing.			
	0	5/5	LIMESTONE: 24.0-29.0 As above continues.			
-25						
	0	2.8/5	LIMESTONE: 29.0-29.5 Above hardens to whitish mudstone 29.5-29.9 as previous. 29.9-30.9 Stiff clay; yellow, light brownish gray, mottled wisps. 30.9-31.5 Above gradually grading to below: 31.5-32.4 Wackestone; 50-60% grains, mostly yellow, occasional light gray wisps, bioturbated. 32.4-32.6 Soft weathered clayey zone, washout.			
-30						
	0	4.6/5	32.6-34.0 Mudstone; gray, shaley, thinnly bedded, moderately soft (marker bed). Driller believes some missing fell back into hole from bottom of run, majority missing most likely from 32'-34'. LIMESTONE: 34.0-35.2 Wackestone; gray to light gray, moderately hard, softening with depth, moister with depth. Missing interval most likely from 36'-39'. 35.2-35.8 Above texture but yellow with occasional patchy orange staining.			
-35						
	0	4.5/5	35.8-36.1 Packstone; yellow, brittle, moist. 36.1-39.0 Mudstone/wackestone; very light grayish yellow, whitish, weathered, stiff clay in parts, light gray thin wispy wavey lenses, moderately soft, not plastic, scratch with fingernail easily. LIMESTONE: 39.0-40.2 Wackestone; yellow, somewhat hard, pitted, bioturbated. 40.2-41.2 As above, more bioturbated, friable, bioturbation filled with foram hash mud. 41.2' Abrupt color change from yellow to light gray, no textural change. 41.2-44.0 As above, foram hashy mud but light gray color.			
-40						

PARSONS	DRILLING LOG **AOC65-PZ03-LGR**
Project: AOC-65 Groundwater Recharge Study/TO 58	**Installation:** Camp Stanley Storage Activity, U.S. Army
Geologist: E. Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects International	**Design of Drill:** G-D 1500
Hole Number(s): PZ-3	**Number of Core Boxes:** 14
Name of Driller: Jose Landeros	**Elevation Ground Water:** 111.5'bgs (7/22/02)
Northing: 3283834.013 **Easting:** 535671.764	**Date Hole Started:** 07/17/02 **Stopped:** 07/18/02
Total Depth of Hole: 134'bgs	**Elevation Top of Casing:** 1234.39

Depth (bgs)	PID	Recovery	Lithologic Description (feet)	Lithology	Sample	Gamma (cps) 0 150
0	0	0/2	BLANK: 0-2.0 No recovery - overdrill, light brown clayey, rocky, dry overburden, no PID hits at well head.			
	0	2.2/5	LIMESTONE: 2.0-7.0 Alternating layers of mudstone/wackestone/packstone; yellow to pale yellow, damp, hard to moderately stiff, broken, patchy orange staining on some vertically fractured surfaces.			
-5						
	0	6.3/7	LIMESTONE: 7.0-14.0 Same as above.			
-10						
	0	9.2/10	LIMESTONE: 14.0-18.7 Mudstone; yellow hues, occasional light brownish-gray, tiny mottling, varying hardness, horizontal think orange-stained zones, more clayey with depth. 17.7'-18.7' Soft clay washouts. 18.7-18.9 Mudstone; gray, soft, clayey, thin light brownish-gray interbeds. 18.9-24.0 Mudstone/wackestone; gray to light gray hues, moderately hard, damp, some bioturbation, portions thinnly bedded, rare tiny vug. Long solid pieces of core in gray zone. 22.2'-22.7' Very thin clayey seam.			
-15						
-20						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-25	0 0 0 0.3 0.8	4.3/5	LIMESTONE: 24.0-25.0 As above with more frequent clayey interbedding or bioturbation. Orange-stained seam 2mm thick at 24.95'. Abrupt color change at 25.0'. 25.0-26.8 Mudstone/wackestone; very similiar to above but yellow and slightly softer, softens with depth. 26.8-27.1 Hard clay alternating with soft clay, yellow, zone stiffens approaching below. 27.1-28.0 Mudstone; whitish, hard, damp, fractures - subvertical and oblique, portions heavily stained black and rusty, pale pink background on fracture surface not stained black.			
-30	0	3.1/5	28.0-29.0 As above but very broken, no staining. PID activity in heavily stained thin fracture. LIMESTONE: 29.0-30.2 Mudstone continues as above but solid, damp, moderate bioturbation, infrequent wispy orange stained very thin wisps (1-2 mm), softens slightly with depth. 30.2-32.3 Wackestone; yellow, varying hardness, clayey zones, stiff, with grainy material contained in the clay, occasional soft zones, easily breakable.			
-35	0	4.5/5	32.3-34.0 Yellow clay washed out, driller reports 32'-34'missing portion. LIMESTONE: 34.0-34.5 As above (washed out). 34.5-35.0 Mudstone; whitish, damp, hard. 35.0-35.4 Above grading to below: 35.4-37.0 Clay; yellow mottled with light brownish gray, stiff, occasional small fossil fragments, clay is grainy. 37.0-37.8 Packstone; fine grained, pale yellow, hard, dry, occasional light gray wispy mottling/interclasts.			
-40	0	4.8/5	37.8-38.9 Mudstone; dark gray, shaley, moderately soft, very thinnly bedded (markerbed). 38.9-39.0 Wackestone; gray, soft, friable, moist. LIMESTONE: 39.0-40.6 Wackestone; light gray, hard, damp to dry, bioturbation. 40.6-41.0 As above but very moist, darker, softer. 41.0-41.8 Mudstone/very fine wackestone; light gray, moderately soft, friable, moist.			
-45	0	4.5/5	41.8-44.0 Wackestone; light gray, dry, hard, moderately fossiliferous with small shells and fragments. LIMESTONE: 44.0-44.5 Transition from above to below: 44.5-49.0 Wackestone-foram/fragment hash, 50% grains, gray to light gray, moderately hard but friable, softens with depth, more moist with depth.			
-50	0	4.1/5	LIMESTONE: 49.0-49.5 Same as 46-48'. 49.5-51.0 As above texture but grayish yellow color, sharp color change. 51.0-52.0 Wackestone-packstone; pale yellow, frequent orange staining on broken surfaces, broken, pieces are moderately hard, moist to damp. 52.0-53.9 Fine packstone; very pale yellow, hard, pitted, fossiliferous poorly sorted, pale orange staining on broken surfaces. 53.9-54.0 Packstone; fine, soft and yellow, moist.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-55	0	4.6/5	LIMESTONE: 54.0-55.4 Fine wackestone/packstone; yellow, moderately hard, damp, no bedding obvious. 55.4-57.0 Very fine wackestone; light gray, transition into mudstone at 57'. 57.0-59.0 Mudstone; light gray, no obvious bedding, harder with depth, damp, continues into below. 57.8'-58.7' Subvertical hairline fracture, fresh surface, no staining.			
-60	0	4.9/5	LIMESTONE: 59.0-64.0 Mudstone/fine wackestone; light gray to gray, moderately hard, occasional very thin soft clayey seam, damp to dry, occasional fossil fragments. 51.3' 45 degree slickenslide.			
-65	0	5/5	LIMESTONE: 64.0-69.0 Continuing from above mudstone/wackestone; hard, dry, light gray, some poorly sorted fossiliferous zones - pelecypods mostly, occasional mold with calcite.			
-70	0	4.5/5	LIMESTONE: 69.0-69.8 As above continues. 69.8 Transition from above to below: 69.8-71.3 Mudstone; gray, moist, moderately soft and shaley, very broken along bedding/horizontal planes. 71.3-73.0 Mudstone; light gray, thinnly bedded, damp to dry, occasional vug with micro calcite. 73.0-74.0 Same as 68'-69.8'.			
-75	0	4.6/5	LIMESTONE: 74.0-79.0 As above continues, less fossils with depth.			
-80	0	3.3/5	LIMESTONE: 79.0-80.0 Mudstone; gray, soft, moist, thin clayey zones washed out. 80.0-80.5 Mudstone; white, damp, hard, grades into below. 80.5-81.5 Same as 73'-74'. 81.5-84.0 Stiff yellow clay, silty.			
-85	0	5.4/5	LIMESTONE: 84.0-85.0 As above, more grainy with depth.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-85			85.0-85.1 Quick transition to below. 85.1-89.0 Wackestone; white, vuggy, moist to wet, fossiliferous, no bedding.			
-90	0	4.6/5	LIMESTONE: 89.0-91.7 As above, very broken. 91.7-94.0 Wackestone; whitish to very pale yellow, no vugs, small fossil fragments, hard, damp, thin threads of orange stain, bioturbation 93.4'-94'.			
-95	0	3.8/5	LIMESTONE: 94.0-97.8 As above continues, becomes more bioturbated with depth, white with yellow soft and grainy infilling of bioturbated burrows. 97.8-99.0 Clay; pale brownish-yellow, stiff, plugged core missing from 98'-99' zone.			
-100	0	4.4/5	LIMESTONE: 99.0-102.6 Wackestone; whitish to very pale yellow, dry, hard, bioturbation, fossil fragments (10-25%), occasional patchy light orange stain, brittle, very broken with missing portion 100.7'-101.2'. 102.6-103.6 Packstone; whitish to pale yellow, fossiliferous-small to medium in size, pitted but solid section. 103.6-104.0 Same as 99'-102'.			
-105	0	5/5	LIMESTONE: 104.0-105.9 Same as 99.0-102', mudstone-wackestone, whitish to very pale yellow, dry, hard. 105.9-109.0 Packstone-grainstone; white to pale yellow, hightly fossiliferous, vuggy, calcite frost in many void spaces, orange staining on some surfaces, "rotten" rock - reef material, brittle. Temporarily lose returns coring this interval.			
-110	0	2.6/5	LIMESTONE: 109.0-114.0 As above.			
-115	0	2.9/5	LIMESTONE: 114.0-119.0 As above except no orange staining, less vugs and broken (more white mud matrix).			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-120	0	1.8/5	LIMESTONE: 119.0-124.0 As above, occasional brightly orange stained patches.			
-125	0	3.1/5	LIMESTONE: 124.0-129.0 As above, less broken.			
-130	0	3.3/5	LIMESTONE: 129.0-132.4 As above. 132.4-134.0 Wackestone; 80-90% mud, pale yellow, 2.5Y 7/3, darker than above, solid, hard, damp, no evident bedding, no vugs, no reef material. TD corehole @ 134' bgs, impermeable to mostly impermeable layer below vuggy reef zone.			

PARSONS

DRILLING LOG

AOC-PZ05-LGR

Project: AOC65 Groundwater Recharge Study/TO 58	**Installation:** Camp Stanley Storage Activity, U.S. Army
Geologist: E. Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects International	**Design of Drill:** G-D 1500
Hole Number(s): CS-PZ5-LGR	**Number of Core Boxes:** 13
Name of Driller: Antonio Landeros	**Elevation Ground Water:** 62.23'bgs (8/2/02)
Northing: 3283603.005 **Easting:** 535671.032	**Date Hole Started:** 07/25/02 **Stopped:** 07/25/02
Total Depth of Hole: 129'	**Elevation Top of Casing:** 1210.97

Depth (bgs)	PID	Recovery	Lithologic Description (feet)	Lithology	Sample	Gamma (cps) 0 150
0	0	0/2	BLANK: 0.0-2.0 Not recovered, overdrill, brown clayey and rocky soil.			
	0	2.2/5	LIMESTONE: 2.0-7.0 Mudstone; white to very pale yellow, broken, weathered soft zones, moist to damp, hard zones dry, some broken bits 2'-3' are orange stained on some surfaces.			
	0					
	0					
-5	0.1					
	0					
	0.1	0.8/2	LIMESTONE: 7.0-9.0 As above but light yellowish brown, occasional speckled black stain as well as orange on some exposed surfaces, broken, signs of oblique fracturing with orange patchy stains on surfaces.			
	0					
	0	1.9/5	LIMESTONE: 9.0-10.0 As above. 10.0-12.5 Clay zone, yellow, some broken hard bits showing signs of fracturing, orange and black speckled stains on many broken surfaces, very thin calcite veins. 12.5-14.0 Wackestone; white grading to pale yellow, fractures (hairline), moderately hard but softens with depth, graininess increases with depth, weathering increases with depth, moist, small occasional fossil fragments at 11'-12', 45 degree fracture with orange and black staining at 11.3'.			
-10						
	0	1.9/5	Upper intervals estimated due to much missing sample. LIMESTONE: 14.0-16.0 As above continues. 16.0-18.5 Mudstone/very fine wackestone (10%); yellow to pale yellow, moderately hard but brittle, very broken, bioturbated, semi-cemented very thin fractures, tiny black speckles/grains throughout, clayey zones washed out. 18.5-19.0 As above but hard, damp, not broken, occasional vug (1-3cm) with calcite frosting on surface.			
-15						
	0	1.4/5	LIMESTONE: 19.0-23.2 Alternating mudstone and wackestone layers, very broken, much clay washed out according to driller. 23.2-24.0 Mudstone; white to very pale yellow, becoming harder with depth, thinnly bedded, some thin clay seams of same color, occasional very thin micro fractures are horizontal with pale orange color, oblique fracture at 23.6' with heavy black stain.			
-20						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-25	0	1.4/5	LIMESTONE: 24.0-26.9 Soft and weathered clayey zone, most of run is soft and clayey washout. 26.9-28.0 Mudstone as 23'-24'. 28.0-28.2 As above, very broken. 28.9-29.0 Void or very soft and wet clay. Driller reports possible void at 28.2', lost all returns.			
-30	0	2/5	LIMESTONE: 29.0-30.0 As above. 30.0-30.2 Mudstone; yellow, broken, hard, orange and black spotty stains. 30.2-30.7 Mudstone; whitish to pale yellow, hard, dry. 30.7-31.2 As above grading to weathered, yellow, softer rock, thin fractures with orange staining, continues grading into below. 31.2-39.0 Clay, yellow, stiff, friable, moist to damp.			
-35	0	2.9/5	LIMESTONE: 34.0-34.3 As above. 34.3-34.8 Fine packstone; pale yellow, hard, dry, brittle and broken. 34.8-35.4 Mudstone; dark gray, very shaley, thinnly bedded. 35.4-36.6 Wackestone-packstone; gray, hard and dry but softening and moister with depth. 36.6 Abrupt color change to brownish yellow, oblique contact. 36.6-36.8 Above texture but brownish yellow color.			
-40	0	2.45/5	36.8-37.3 Packstone; yellow, brittle and very brown. 37.3-39.0 Fine wackestone; pale yellow, hard dry, gradually grades to hard and stiff light yellow clay with light gray wispy lenses, moist and brittle. LIMESTONE: 39.0-41.4 No recovery, stiff clay most likely. 41.4-41.5 Wackestone; very pale yellow, soild hard contact with below: 41.5-44.0 Wackestone; 50-60% grains, light gray, hard, dry, grading to foram hash, softer with depth, moister with depth, broken.			
-45	0	1/5	LIMESTONE: 44.0-49.0 Uncertain, mostly yellow wackestone-packstone, very broken, clayey portions washed out, foram fossils abundant, occasional small, pelecypod mud-mold, majority not recovered.			
-50	0	3.6/5	LIMESTONE: 49.0-50.2 As above. 50.2-52.0 Fine packstone; yellow, moderately hard, brittle, damp, infrequent vug, no calcite, infrequent small pelecypod fragments, moderately bioturbated, very broken and darker colors at 50.9'-51.2', grades to mudstone.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-55	0	4.1/5	LIMESTONE: 54.0-55.8 As above continues grading into mudstone, some very thin oblique, semi cemented fractures. 55.8-56.8 Above changing to stiff clay, in turn changing to gray clay, mostly washed out, abrupt color change gray to below: 56.8-57.25 Stiff yellow clay; compacted by coring, bright orange staining at contact with below: 57.25-59.0 Mudstone; very pale yellow to whitish, moderately hard, dry.			
-60	0	4.1/5	LIMESTONE: 59.0-64.0 As above continues, some broken zones, occasional large pelecypod shells 61'-64', smaller fossil fragment content increases with depth, very pale wispy orange coloration/staining occasionally.			
-65	0	3.8/5	LIMESTONE: 64.0-66.3 As above continues. 66.3-66.6 Washed out clayey/weathered zone. 66.6-67.4 Mudstone; gray, shaley, no obvious bedding, moist, moderately soft, some not recovered. 67.4-69.0 Mudstone; pale brownish-yellow with light gray very thin layers, some broken zones, moderately soft to hard, damp.			
-70	0	5/5	LIMESTONE: 69.0-69.2 As above. 69.2-70.2 As above but mottled rather than banded, light grays become brownish, grades to below: 70.2-72.2 Very fine wackestone; pale yellow, pitted with tiny spaces (<2mm), moderately hard, dry, some fossils (10%), very small fragments, grades to below: 72.2-74.0 Wackestone; light gray, hard, dry, more fossilirerous than above (25%).			
-75	0	3.5/5	LIMESTONE: 74.0-75.4 As above, broken up 74.9'-75.1'. 75.4-75.7 Grainy stiff clay, gray (weathered portion of above). 75.7 Abrupt color change. 75.7-77.6 Stiff yellow clay; moist, has light brownish-gray mottling, majority not recovered. 77.6-79.0 Mudstone; pale brownish-yellow, moderately hard, dry.			
-80	0	3.3/5	LIMESTONE: 79.0-79.5 As above. 79.5-82.5 Clay; yellow, stiff, hard, fractured, much missing, above graded into below: 82.5-83.0 Packstone; fine, yellow, bioturbated, bioturbs infilled with yellow clay, harder with depth, moist. 83.0-84.0 Wackestone; white to very pale yellow, moderately vuggy, fosisliferous, broken, moist.			
-85	0	3.7/5	LIMESTONE: 84.0-88.0 Packstone; white, vuggy, very fossiliferous, hard, brittle, moist, grades to below:			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-85			brittle, moist, grades to below: 88.0-89.0 Wackestone; as above but more mud and less fossils and vugs, more solid.			
-90	0	4.5/5	LIMESTONE: 89.0-94.0 As above with bioturbation, pale orange staining in broken zones.			
-95	0	1.1/5	LIMESTONE: 94.0-99.0 As above, heavily bioturbated, no large fossil fragments, very broken, much missing, driller reports multiple small drops of the drill stem indicating small voids.			
-100	0	2.1/5	LIMESTONE: 99.0-104.0 As above grades to more "rotten", pitted, heavily bioturbated, some larger fossil fragments, soft orange clay in some void spaces, very brittle.			
-105	0	4.45/5	LIMESTONE: 104.0-104.5 Very rotten rock or clay washout, missing. 104.5-109.0 Very fine wackestone-mudstone; pale yellow, small (<2mm) black speckles throughout, hard, solid, damp to dry, sub vertical fracture 105'-106.3', sample broken 108.5'-109.0'.			
-110	0	4.4/5	LIMESTONE: 109.0-114.0 As above, broken up in spots with some orange stained surfaces.			
-115	0	4/5	LIMESTONE: 114.0-119.0 As above, more fossiliferous (casts. and molds) 118'-119'.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-120	0	4.6/5	LIMESTONE: 119.0-124.0 As above, (muddy reef material?) more solid and less fossils with depth.			
-125	0	5/5	LIMESTONE: 124.0-127.4 Above continues, grading to pale yellow wackestone, moderately hard, damp to dry, 10-20% small fossil fragments. 127.4-129.0 Abrupt color change to light gray, texture unchanged.			

PARSONS	DRILLING LOG AOC65-VEW13-LGR
Project: AOC-65 Treatability Study/TO 58	**Installation:** Camp Stanley Storage Activity, U.S. Army
Geologist: E. Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects International	**Design of Drill:** G-D 1500
Hole Number(s): VEW-13	**Number of Core Boxes:** 4
Name of Driller: Jose Landeros	**Elevation Ground Water:** Not encountered
Northing: 3283711.350633 **Easting:** 535685.025180	**Date Hole Started:** 06/24/02 **Stopped:** 06/24/02
Total Depth of Hole: 40.0'	**Elevation Top of Casing:** not surveyed

Depth (bgs)	PID	Recovery	Lithologic Description (feet)	Lithology	Sample	Gamma (cps) 0 150
0	0		BLANK: 0-2.0 Overdrill, no recovery., clayey and rocky overburden.			
		0.8/4.9	LIMESTONE: 2.0-6.9 Mudstone-fine wackestone; white, dry, recovered pieces are hard.			
-5						
	0	6.9/6.9	LIMESTONE: 6.9-13.8 Mostly as above, with some light gray and pale yellowish weathered rock and clay material. All gray below 12'.			
-10						
	0	5/5	LIMESTONE: 13.8-14.4 As above with short, discontinuous, very thin hairline cracks containing micropyrite. 14.4-15.2 As above but softer, slightly shaley. 15.2-18.8 As 13.8-14.4, grading to fine wackestone-like rock, bioturbation.			
-15						
	0	4.4/5	LIMESTONE: 18.8-19.0 As above. 19.0-20.7 Same as 12'-14.4'. 20.7-21.2 Mudstone; whitish and hard with very thin layers of pale brownish-yellow, clayey, softer material. 21.2-23.8 Stiff clay; yellow, with thin(<1cm) whitish hard layer.			
-20						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-25	0	4.7/5	LIMESTONE: 23.8-24.3 As above. 24.3-26.8 Mudstone; whitish, hard, fractured, thinly bedded in parts, oblique fractures with patchy speckled black and orange staining. 26.8-28.8 Above becoming weathered - softer, moister, grading to wackestone - more grainy with more prominent clayey matrix with depth, minor bioturbation, yellow hues. Rare, small lightgray lense. Whitish zones remain dry and hard.			
	0					
-30	0	2.7/5	LIMESTONE: 28.8-33.8 Stiff clay; mostly yellow, moist, orange staining along very thin bedding planes, occasional hard and dry white zone.			
-35	0	6.2/6.2	LIMESTONE: 33.8-34.0 As above. 34.0-35.0 Fine wackestone; pale yellow, hard. 35.0-38.8 Same as 24'-34'.			
-40	0		LIMESTONE: 38.8-40.0 Fine wackestone; 40-50% grains, light gray, vuggy, hard, damp.			

P A R S O N S	**DRILLING LOG** **AOC65-VEW14-LGR**
Project: AOC-65 Treatability Study/TO 58	**Installation:** Camp Stanley Storage Activity, U.S. Army
Geologist: E. Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects International	**Design of Drill:** G-D 1500
Hole Number(s): VEW-14	**Number of Core Boxes:** 6
Name of Driller: Jose Landeros	**Elevation Ground Water:** 56.80'bgs (7/10/02)
Northing: 3283689.094325 **Easting:** 535684.259635	**Date Hole Started:** 06/26/02 **Stopped:** 06/26/02
Total Depth of Hole: 59.2'	**Elevation Top of Casing:** not surveyed

Depth (bgs)	PID	Recovery	Lithologic Description (feet)	Lithology	Sample	Gamma 0 (cps) 150
0	0.5		BLANK: 0.0-1.9 No recovery - overdrill, dark brown soil, rocky.			
		1.5/5.4	LIMESTONE: 1.9-7.3 Mudstone-fine wackestone; whitish, broken, pale yellow staining on some surfaces, a few rounded pieces.			
-5	0	3.2/6.9	LIMESTONE: 7.3-14.2 Fine wackestone; alternating whitish and pale yellow zones, mostly dry and hard, occasional bioturbation, thin clayey layers appear with depth including ompacted yellow, white, light gray, thin clay zones (banded), majority is yellow. 11'-13' Oblique jagged fracture with heavy black and orange stain. Cannot ascertain where missing intervals same from.			
-10	0	4.2/5	LIMESTONE: 14.2-15.2 Mudstone; pale yellow, moderately hard, infrequent very light gray clasts/lenses. 15.2-16.1 Clay; yellow, moist, stiff, occasional light gray thin band. 16.1-16.8 Wackestone; yellow with white and light gray wispy thin mottles/lenses, moderately hard. 16.8-17.7 As above texture but light gray. 17.7-18.4 Same as 16.1-16.8'. 18.4-18.6 Mudstone; white, very hard , oblique fracture through it with speckled orange-brown staining.			
-15	0	4.5/5	18.6-19.2 Same as 16.1-16.8 but with thin harder zones occasionally. Clay zones compacted in core barrel.			
-20			LIMESTONE: 19.2-20.0 As above continuing.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			LIMESTONE: 19.2-20.0 As above continuing. 20.0-2.0 Mudstone; very pale yellow, occasional very thin yellow clayey zone, and occasional thin hard whitish zones, infrequent wispy light gray wavey lenses. 22.0-24.2 Wackestone-fine packstone; thinnly interfingered, bioturbation, mudstone portions softer and clayey, more overall clayeyness with depth.			
-25	0	4.3/5	LIMESTONE: 24.2-25.4 Clay; yellow, stiff, moist, fractured obliquely with dendritic black staining. 25.4-25.6 As above, transition to below. 25.6-27.3 Mudstone; very light gray to whitish, moderately hard, thin clay zones not recovered, dry to barely damp, frequent very thin clay zone of same color, some orange staining on some bedding plane surfaces.			
	0		27.3-29.2 Wackestone; pale yellow, moderately hard, bioturbation, damp. Horizontal fracture at 28.2' and 28.9' with black staining.			
-30	0	3.9/5	LIMESTONE: 29.2-30.5 As above continues but no fractures. 30.5-31.4 Clay alternating with very vuggy light gray mudstone, mostly not recovered. 31.4-32.0 Mudstone; very pale yellow, dry, hard. 32.0-32.6 Gradual transition from above to below. 32.6-33.6 Clay; color mottled yellow and gray, stiff, hairline fractures, patch orange staining outlining infrequent shell fragments. 33.6-34.2 Above hardening into mudstone; less yellow with depth, grainy bioturbation infilling.			
-35	0	4.5/5	Slight decrease of returns with depth according to driller. LIMESTONE: 34.2-34.9 Mudstone; shaley, various hues light to dark gray, thinnly bedded to laminated, splits easily on bedding planes, dark zones softer than light zones. 36.7-38.0 Wackestone; light gray, moderately hard, becoming softer and more clayey with depth, biotubated. 38.0-39.2 Wackestone-fine packstone; light gray, moderately hard, vuggy, heavily bioturbated with darker and softer and more moist infilling.			
-40	0	4.5/5	Diminished returns. LIMESTONE: 39.2-39.5 As above. 39.5-39.7 Gray clay. 39.7-42.8 Wackestone; light gray, fossils 10-30% varying in zones, bioturbation, hard, dry, some gray bioturbated infilling, slightly softer. 42.8-44.2 Wackestone; gray foram hash. Lost returns during this interval.			
-45	0	4.6/5	LIMESTONE: 44.2-46.2 As above. 46.2-48.0 As above foram hash but yellow. 48-49.2 Wackestone-packstone; pale yellow, very broken, heavily bioturbated, some forams with other shell fragments, heavy orange staining on many broken surfaces.			
	0.2 0.1					

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-50	0	4.7/5	LIMESTONE: 49.2-49.3 As above. 49.3-50.9 Packstone; pale yellow, hard, dry, no clear bedding. 50.9-52.8 Packstone; light yellowish brown, less mud than above, no bedding, one vug 2 x 2 cm. 52.8-54.2 Same as 49.3'-50.9', more mud and less grainy with depth.			
-55	0	3.9/5	LIMESTONE: 54.2-56.2 Mudstone; very pale yellow, dry, hard. 54'-55' Near vertical fractures, tight, pale orange staining on exposed surface. 56.2-57.2 Missing. 57.2-59.2 Wackestone; light gray, becoming whitish with depth, mild bioturbation. No returns, air escaping from AC2 towards end of this run. Driller didn't notice drop as if hitting a void.			

PARSONS	DRILLING LOG AOC65-VEW17-LGR
Project: AOC-65 Treatability Study/TO 58	**Installation:** Camp Stanley Storage Activity, U.S. Army
Geologist: E. Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects International	**Design of Drill:** G-D 1500
Hole Number(s): VEW-17	**Number of Core Boxes:** 6
Name of Driller: Jose Landeros	**Elevation Ground Water:** Not encountered
Northing: 3283697.288325 **Easting:** 535682.838395	**Date Hole Started:** 08/24/02 **Stopped:** 08/24/02
Total Depth of Hole: 53.5' bgs	**Elevation Top of Casing:** not surveyed

Depth (bgs)	PID	Recovery	Lithologic Description (feet)	Lithology	Sample	Gamma (cps) 0 150
0	0		BLANK: 0-2.0 Overdrill, no recovery, disturbed overburden and rocky soil.			
	0	1/4.8	LIMESTONE: 2-6.8.0 Wackestone and clay; whitish to very pale yellow, recovered portions moderately hard, broken, some orange staining on old broken surfaces, damp. Most weathered, soft, clayey zones washed out and not recovered.			
-5						
	0	4.3/6.7	LIMESTONE: 6.8-11.8 As above.			
			11.8-12.8 As above but weathered, yellow, one vug, softer, fractured with black and orange staining on surfaces.			
	2.0		12.5-'12.7' Very broken, fractured, and moist.			
-10	2.3		12.8-13.5 Mudstone, light gray, damp, moderately hard.			
	1.7					
	1.3					
	0.5					
	0.2	3.8/5	LIMESTONE: 13.5-14.9 As above but softer, more clayey 14.7-14.9'.			
			14.9-15.3 Stiff clay; abrupt color change to yellow. Some compaction resulting from coring operations.			
-15			15.3-15.8 Fine wackestone; yellow, moderately hard, damp, very thin vertical cemented fracture.			
			15.8-18.5 Above but gray, grades to mudstone with depth, drier with depth.			
	0	5/5	LIMESTONE: 18.5-20.8 As above with rare tiny vug, conformable contact with below:			
	2.0		PID hits from soft, moist, clayey, thin zones.			
-20						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
	0 1.7 0.3		20.8-23.5 Mudstone; light grayish yellow, alternating thin zones of various hardness, some orange stained curved patterns, weathered, damp to moist, becomes softer and moister, more clayey with depth, more broken 22.5'-23.5' and very moist.			
-25	1.0 0	1/5	CLAY: 23.5-24.0 Clay; yellow, stiff, moist. 24.0-24.4 Mudstone; whitish, hard, brittle, damp to dry, obliquely fractured with black speckled pattern on fracture surface. 24.4-28.5 Clay; yellow, stiff, moist. Barrel packed and plugged, lost 24'-28.5', but driller didn't feel resistance, indicating more clay to 28.5', no voids.			
-30	0	2.3/5	LIMESTONE: 28.5-30.0 Presummed as above, not recovered. 30.0-32.0 Wackestone; yellow, soft, weathered, occasional orange staining, occasional thin wispy gray-yellow lenses. 32.0-32.7 Mudstone; whitish, hard, dry to damp, obliquely fractured with orange speckled staining. 32.7-33.5 Clay; yellow, stiff, with grayish-yellow lenses. Normal returns/circulation, depth of lithology descriptions are estimated due to significant unrecovered core sections.			
-35	0	4.3/5	LIMESTONE: 33.5-33.7 Above transition to below: 33.7-34.9 Wackestone; pale yellow, hard, dry. 34.9-36.6 Mudstone; gray hues, soft, shaley, thinnly bedded, moist. Marker bed. 36.6-37.0 Wackestone; gray, dry, moderately hard. 37.0-38.1 Mudstone-clay and grainy clay alternating, moist, soft. Corbula 37.5-38.1'. 38.1-38.5 Wackestone; light gray, very grainy, bioturbation, damp.			
-40	0	4/5	LIMESTONE: 38.5-40.0 As above, broken. 40-43.5 Wackestone; light gray, graininess increasing with depth, fossils and fragments content increase with depth, dry to damp zones, moderately hard, slightly softer with depth, grades to foram hash with depth, some bioturbation.			
-45	0	1.1/5	LIMESTONE: 43.5-47.9 Gray foram hash, soft, moist to wet, mostly washed out and not recovered. 47.9-48.5 Wackestone; yellow with much orange stained areas, moist, pitted. Normal circulation and cuttings returns.			
	0	4.9/5	LIMESTONE: 48.5-48.9 As above.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-50			48.9-50.5 Packstone-grainstone; hard, damp, very pale yellow, fossiliferous, mostly tiny fragments and fossils, pitted, small occasional vugs. 50.5-51.0 Fine packstone; light yellowish brown, moderately soft, broken, wet. 51.0-53.5 Packstone, grading to mudstone; yellow to pale yellow with depth, damp, moderately hard, oblique slickenslide 51.5'-52' stained orange.			

P A R S O N S	**DRILLING LOG** **AOC65-VEW18-LGR**
Project: AOC-65 Treatability Study/TO 58	**Installation:** Camp Stanley Storage Activity, U.S. Army
Geologist: E. Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects International	**Design of Drill:** G-D 1500
Hole Number(s): VEW-18	**Number of Core Boxes:** 8
Name of Driller: Antonio Landeros	**Elevation Ground Water:** 76.92'bgs (8/12/02)
Northing: 3283678.075947 **Easting:** 535702.708191	**Date Hole Started:** 08/07/02 **Stopped:** 08/07/02
Total Depth of Hole: 79.0'	**Elevation Top of Casing:** not surveyed

Depth (bgs)	PID	Recovery	Lithologic Description (feet)	Lithology	Sample	Gamma 0 (cps) 150
0	0	0/2	BLANK: 0-2.0 No recovery - overdrill, filled base material.			
	0	0.1/4.5	LIMESTONE: 2.0-6.5 Mudstone-wackestone; very pale yellow, dry, moderately hard, flat horizontal surface heavily stained, brownish orange to reddish black 2.5YR 2.5/1. Soft weathered material not recovered.			
-5	5.3 0	1/2.5	LIMESTONE: 6.5-9.0 As above with infrequent, very thin thread-like cracks stained pale orange, readily effervesces in HCl (10%). * PID at wellhead = 5.3ppm, core sample itself = 0ppm.			
	0	1.3/5	LIMESTONE: 9.0-14.0 As above, broken, mild bioturbation, thinnly bedded, some clayey zones/weathered zones. * PID hit at wellhead, out of pipe = 6.2ppm; core sample =0ppm.			
-10	6.2 0					
	0	1.2/5	LIMESTONE: 14.0-19.0 Mostly clay and grainy clay; yellow, one 0.3'-thick fine yellow fractured wackestone; infrequent thin layer (<1cm) of whitish to very light gray and hard mudstone, some speckled black and pale orange stains. Missing mostly clay washed out. Driller reports very soft and easy coring.			
-15						
	0	1/5	LIMESTONE: 19.0-24.0 As above, fractured and broken, some cavities (2x2x0.4cm) filled with milky calcite, some broken surfaces show black speckled stains, others pale orange stains.			
-20						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			Broken into chips in many zones.			
-25	0	2.9/5	LIMESTONE: 24.0-25.5 Highly weathered clayey material. 25.5-27.5 Stiff clay; yellow, bedded (weathered), occasional thin, hard, apparently unweathered rock-like layers. 27.5-29.0 Mudstone; whitish to very light brownish gray, thinnly bedded, hard and brittle, damp to dry, broken, infrequent thin clayey zones.			
-30	0	1.8/5	LIMESTONE: 29.0-34.0 Mudstone-wackestone; alternating white and pale yellow, yellow softer than white, white hard and dry, broken, thin fractures. Some pale orange staining on some surfaces and some black speckled banded patterns.			
-35	0	3.8/5	LIMESTONE: 34.0-35.6 Stiff clay; yellow, some faint wispy light gray and orange thin lenses. 35.6-36.4 Wackestone; 80% grains, almost packstone, small, pale yellow, moderately hard, dry. 36.4-36.7 As above, alternating with fingers of light gray shaley mudstone, damp. 36.7-38.2 Mudstone; very shaley, gray to dark gray, thinnly bedded, soft, moist, area marker bed. 38.2-38.7 Above becoming harder and grainier.			
-40	0	3.9/5	38.7-39.0 Wackestone; light gray, barely damp, moderately hard, small fossils and (<0.5 cm) fossil fragments. LIMESTONE: 39.0-41.5 As above, broken, alternating hardness, damp. 41.4-42.5 Wackestone; light gray, hard, fossils - gastropods and pelecypods, fragments and molds, vugs. 42.5-44.0 Like above but vuggier, softer, obvious bioturbation, somewhat moister at bioturbated infilling.			
-45	0	2.2/5	LIMESTONE: 44.0-49.0 As above, alternating with soft light gray clayey and brown zones, foram hash, bioturbation. 48.8-49.0 As above texture with abrupt color change to light yellowish-brown foram hash.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-50	0	3.4/5	LIMESTONE: 49.0-49.3 As above, broken. 49.3-54.0 Packstone; various yellow hues, poorly sorted in some zones, more grainy with depth, varying hardness, moister with depth, bioturbated, infrequent fossil fragments (2-6mm), occasional thread-like fracture with orange staining.			
-55	0	4.5/5	LIMESTONE: 54.0-54.6 As above but harder. 54.6- 56.5 As above gradually grading to very fine wackestone interfingered with mudstone, various colors - white, light gray, yellows, gradually in turn grading to mudstone, hard and dry. 56.5-56.8 Mudstone; pale yellow, hard and dry. 56.8-57.3 Mudstone; abrupt and oblique color change to light gray, no textural change obvious, hard and dry. 57.3-58.0 Above but intersperced with horizontal stylolites, or fossilized thin algal mats/films.			
-60	0	2.9/5	58.0-59.0 Very fine wackestone; light gray, soft, moist, clayey zones, very broken. LIMESTONE: 59.0-61.5 Mudstone-wackestone; gray hues, alternating hard and soft zones, broken, alternating dry, damp and moist zones. 61.5-62.1 Very fine wackestone; white, hard, damp. 62.1-64.0 Wackestone; light gray, some bioturbation with gray infilling, occasional fossil fragments, pelecypods, moderately hard.			
-65	0	4.5/5	LIMESTONE: 64.0-66.3 As above with increasing mud content. 66.3-67.1 Mudstone; light gray, damp, solid, moderately hard. 67.1-69.0 Same as 62'-64'.			
-70	0	3.7/5	LIMESTONE: 69.0-71.4 Mudstone; gray, soft, moist, very broken, clayey zones. Missing from 69'-71'; 72-74' solid. 71.4-71.6 Mudstone; light brownish-gray 10YR 6/2. Diminished and sporadic returns. 71.6-72.9 Wackestone; mottled yellow and white, pitted, hard and dry, occasional micro calcite crystals, no clear bedding. 72.9-73.8 Mudstone; whitish, hard, dry, pitted, no clear bedding, lightly bioturbation, scattered small fossil fragments 73.6-73.8'. 73.8-74.0 Wackestone; gray to light gray, some fossils (20%), hard, dry. Color change at 73.8' contact clear and abrupt with orange staining along it.			
-75	0	3.9/5	LIMESTONE: 74.0-77.0 As above, light gray wackestone; returns as above, top 2.3' solid. 77.0-79.0 Mudstone; silty gray, moist, soft, very broken, clayey zones.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150

PARSONS

DRILLING LOG

AOC-65 VMP-1

Project: AOC-65 Treatability Study	**Installation:** Camp Stanley Storage Activity
Geologist: Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects Intl.	**Design of Drill:** G-D 1500
Hole Number(s): VMP-1	**Number of Core Boxes:** 10
Name of Driller: Jose Landeros	**Elevation Ground Water:** Not encountered
Northing: 3283760.84 **Easting:** 535703.05	**Date Hole Started:** 05/14/02 **Stopped:** 05/16/02
Total Depth of Hole: 100.0'	**Elevation Top of Casing:** NA

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma (cps) 0 150
0	0	0/2	ASPHALT: 0-2 Pavement, road base.			
	0	1.5/3	LIMESTONE: 2.0-5.0 Mudstone-wackestone. Whitish t o pale yellow to light yellowish brown (2.5Y 8/2 to 2.5Y 7/8). Moderately hard, scratch with fingernail, yellow zones very friable, damp. Hard in white-ish zones, moderate weathered appearance.			
-5	0	3.8/3.8	LIMESTONE: 5.0-8.8 Same as above but not broken up, brown staining. Occasional soft, damp, clayey zones less than 0.1" think. No obvious fossils.			
	0	4.5/5	LIMESTONE: 8.8-13.8 Same as above grading to grayish lines, harder.			
-10	0	5/5	LIMESTONE MUDSTONE: 13.8-18.8 Gray, 2.5Y 6/1 to 5/1 hard but easily scratched with fingernail. Whitish deformed banding below 14', thin. Pale yellow layers/banding. 17-18.8 Grays becoming lighter. Damp to dry. Harder with depth for s????, 0.75cm vug @ 18.5', pale yellowish bonds slightly softer.			
-15	0					

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma (cps) 0 150
-20	0	4.3/5	LIMESTONE MUDSTONE: 18.8-22.2 Mudstone, gray to very light gray, banded. Hard with occasional soft, damp, clayey, thin seams, otherwise dry. 22.2-23.8 Grayish and pale, yellowish banding, slightly damper. Vertical to 10 deg. hairline crack 23.3 to bottom, slight orange staining at crack, no obvious fossils.			
-25	0	3.3/5	LIMESTONE MUDSTONE: 23.8-28.8 Mudstone-wackestone, light gray and pale yellow and whitish banding. Moderately hard, lightly damp, silty. 27.5-28.8 Slightly pitted, pale yellowish hues, gray ends (not true vugs), occasionaly thin zones of orange to brownish staining, grainier texture, hard yellow-whitish zones between softer stained seams. Moist clayey (0.02" thick) seams with staining at 28.0'.			
-30	0	2.9/5	LIMESTONE MUDSTONE: 28.8-32.0 Mudstone-wackestone. Pale yellowish to yellowish light brown, becoming gray at bottom 0.5'. 3 x 2 cm vug in top 1'. Moderately soft and shattered, stiff, damp, clayey zone between 29-32'. Loss likely from here. 32.0-33.8 Grayish hues, somewhat grainier appearance, tiny pale yellow mottles/spots, darker gray with depth, silty.			
-35	0	4.05/5	LIMESTONE: 33.8-34.3 Wackestone-packstone. Gray at top to light gray with depth. Small fossils, forams. Shaley, horizontal plane splitting, silty. 34.3-37.4 Some bioturbation, some washout and thin clayey seams at <0.1', rare small vug, infrequent pyrite coated foram fossils < 1mm. 37.4-38.8 Solid piece, dry.			
-40	0	3.9/5	LIMESTONE: 38.8-43.8 Wackestone-packstone, same as above grading to higher fossil content, all fossils small and/or forams. Slightly softer and more broken with depth, more clayey, semi-foram hash, moist.			
-45	0	4/5	LIMESTONE: 45.5-46.8 Changing to yellowish brown shades, some gastropods, many forams as above. 46.8-47.3 Orange staining, zone hard but broken.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma (cps) 0 150
			47.3-48.8 Grainstone-packstone, hard, light pale yellow, pitted/vuggy (tiny), recrystalized small shell frags, rare forams.			
-50	0	4.9/5	LIMESTONE: 48.8-53.8 Packstone-boundstone to approx. 46' then wackestone-packstone to 52.8, mudstone to bottom, pale yellowish grainstone grading to gray mudstone, some bioturbation, dry to slightly damp. Gradual transition of texture throughout run; color changes abruptly at 50.6'.			
-55	0	3.2/5	LIMESTONE MUDSTONE: 53.8-58.8 Top half of run gray mudstone-wackestone continued from above, appears that some thin clay seams washed out, otherwise rock. Bottom half of run very light gray, hard, dry, becoming silty mudstone near bottom.			
-60	0	5/5	LIMESTONE: 58.8-59.2 Wackestone-packstone, gray, fossiliferous with small fragments, light gray clasts from below. 59.2-63.8 Light gray with gray fill from above in bioturbated spots, infrequent large fossil fragment (pelecypod), dry, hard.			
-65	0	4.8/5	LIMESTONE: 63.8-65 Same as above with some stylolites. 65-67 Becoming darker gray, softer, moist, clayey seams, some apparently washed out, fossils disappear. 67-68.8 Gray and light gray banding, hard, slightly damp, small vugs appear with depths, occasional fossil pelecypod fragments in bottom 1'.			
-70	0	4.6/5	LIMESTONE: 68.8-73.8 Wackestone-packstone, mostly as above, grades to light brownish gray until 70.6'. At 70.6' color change to gray on convoluted surface, no obvious textural changes though. Bioturbated surface probably. Below 70.6' gray with light gray mottling, shell fragments, corals, no fossils in bottom 0.8' except infrequent tiny fragment.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma (cps) 0 150
	0	4.1/5	LIMESTONE: 73.8-75.7 Mudstone-wackstone, gray no fossils, broken up, wet, many clayey seams apparently washed out leaving harder material. 75.7-76.3 Whitish, hard stone, dry, rare tiny fossil fragments. 76.3-77 Same as previous core 70.6-73.8'. 77-78.8 Abrupt color change to light brownish gray (10YR 6/2) at break in core, occasional larger fossil fragment (pelecypod), silty mudstone becoming wetter and softer with depth. Wet clay seams at 78.1' and 78.3' <0.05' thick, color becomes light yellowish brown at bottom 0.4' (10YR 6/4).			
-75	0	4.6/5	LIMESTONE: 78.8-83.8 Same as above transitioning to brownish-yellow, slightly hard packstone. Soft clayey wet seam near top. Core becomes vuggy and whitish with depth. Light orange staining in some vugs. Vug mm to cm in size. Vugs maybe washed out, worm or clam burrows. 81.5-83.8 Packstone-grainstone, whitish, hard, vugs present, pelecypods (small to large), moist. Crumbly/friable in zones.			
-80	0	4.9/5	LIMESTONE: 83.8-88.8 Same as above but less vuggy with depth, decreasing fossil size with depth, moist.			
-85	0	4.8/5	LIMESTONE: 88.8-91.3 Same as above only more compact, less or infrequent large fossils and fragments. Grain filled burrows and bioturbated spots, rare small vug. 91.3-91.4 Brownish-orange stained hairline cracks, occasional discontinuous hairline fractures, all less than 0.5' long. Mostly dry.			
-90	0	6.2/6.2	LIMESTONE: 93.8-100 Very pale yellowish brown mudstone-wackestone (10YR 8/4 to 7/4) occasional outline of pelecypod shell, soild with no vugs, more fossil fragments with depth but not becoming very fossilferious, dry. Moist rubble zone 95.5-95.7'. Faint orange to brown staining on occasional spots and hairline cracks.			
-95						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma (cps) 0 150
-100						

P A R S O N S

DRILLING LOG

AOC-65 VMP-2

Project: AOC-65 Treatability Study	**Installation:** Camp Stanley Storage Activity
Geologist: Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects Intl.	**Design of Drill:** G-D 1500
Hole Number(s): VMP-2	**Number of Core Boxes:** 10
Name of Driller: Jose Landeros	**Elevation Ground Water:** Not encountered
Northing: 3283710.65 **Easting:** 535702.42	**Date Hole Started:** 05/16/02 **Stopped:** 05/17/02
Total Depth of Hole: 100.0'	**Elevation Top of Casing:** NA

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
0	0 4.1 1.1	0/5	BLANK: 0-5 Drilled out, no recovery. Condensation from compressor will add moisture to surface of rock cores.			
-5	0	2.9/4	LIMESTONE MUDSTONE: 2.0-9.0 Mudstone-wackestone. Whitish t o very pale yellow (2.5Y 8/2), some plae yellow mottles, infilled bioturbated cavities, hard, dry. At 7.8' and 8.5' - dry friable hard clay seams 0.05' thick.			
-10	0	4.1/5	LIMESTONE MUDSTONE: 9.0-14.0 Mudstone-wackestone. 9.0-11.8 As above, orange stain on broken surface. 11.8-14.0 Occasional slightly damp, hard, stiff, thin, clay seam. Overall dull yellow hues 2.5Y 8/3 to 7/8, some light gray very thin lenses with orange speckled stains. 12.0-12.5 Thin horizontal cavities, not connected, weathered clay seams. No water injected yet.			
-15	0	4.7/5	LIMESTONE MUDSTONE: 14.0-19.0 Mudstone-wackestone. Top 0.2' as above. 14.2-15.2 Gray and yellowish mottling, hard, dry. 15.2-19.0 Light gray with whitish to very light gray convoluted banding, hard and dry. 15.9 Dry to very slightly damp friable clay seam 0.05' thick.			
-20	0	4.9/5	Solid core below 16.0'. Missing 0.3' likely from top 1.5'. LIMESTONE MUDSTONE: 19.0-23.1 As above. 23.1-24.0 Silty mudstone, abrupt color change on horizontal plane, no obvious textural change 2.5Y 7/6 to 6/6 (yellow), slightly softer but still hard, slightly damp.			
-25	0	4.6/5	LIMESTONE MUDSTONE: 24.0-29.0 As above, dry, harder, lighter zone. 27.0-29.0 Slight increase in graininess, evidence of bioturbation, rare small shell fragment. Slicken slide at 27', 45 deg., no color change on			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			small shell fragment. Slicken slide at 27', 45 deg., no color change on surface. 28.1 Thin clayey seam, damp. 28.7-29 Brittle. Missing 0.4' likely from bottom 2.0'.			
-30	0	3.2/5	LIMESTONE MUDSTONE: 29.0-30.5' Mudstone-wackestone as above.			
			LIMESTONE: 30.5-34.0 Packstone. 32.0-32.5 Pale yellow-whitish, dry, hard, a vug and orange staining, grades to small shell hashy packestone. 33.1-33.8 Clayey zone, yellow and grayish yellow mottled, fine, no fossils, damp, broken up at 33.4-33.5'.			
-35	0	4.8/5	33.8-34.0 Becomes hard and dry rock. Driller reports lost circulation at 31' bgs.			
			LIMESTONE: 34.0-35.2 Continuing from above, packstone but very grainy, numerous tiny fossils and fragments, occasional whisps of light gray lenses, hard, dry. 35.2-36.3 Banded gray to light gray, shaley, splits easily parallel to bedding (horizonal), infrequent vug (<2.0mm) with calcite.			
-40	0	5/5	36.3-39.0 Various gray hues, dry, convoluted lenses, shell fragments, eroded near bottom. 38.5-39.0 No visible layers, light gray.			
			LIMESTONE: 39.0-44.0 Overall light grays. 39.0-39.4 As above, moderately hard. 39.4 Wackestone, packstone, numerous small fossils (4.0 cm) and fragments, bioturbated. Horizontal slickenslide, bottom half very hard, top softer (pelecypods, gastropods, forams).			
-45	0	4.7/5	39.4-39.8 Very vuggy, forams % increasing with depth, other species decrease with depth. 43.0-44.0 Foram hashy mud, dry, hard.			
			LIMESTONE: 44.0-47.1 As above, occasional larger fossil (1-3 cm). 46.5-47.0 Core broken up. 47.1-48.0 Above texture but abrupt color change to yellowish grays, orange stainied microfractures.			
-50	0	5/5	48.0-49.0 Pitted, weathered, dissolved zones, much orange staining, very hard but brittle, moist. 48.4 Pelecypod (4 cm). 48.8-49.0 Separates easily on horizontal planes, whitish, pitted.			
			LIMESTONE: 49.0-54.0 Packstone, dry, pale yellow, primarily tiny fossils, occasional shell to 1cm.			
-55	0	5/5	50.4-50.8 Erroded, orange-stained zone. 52.2-54.0 Light gray with gray mottling, infrequent vug, grainy packstone, no large fossils, finer and harder with depth, dry.			
			LIMESTONE MUDSTONE: 54.0-59.0 Mudstone, light gray darkening with depth to gray GLEY1 10Y 5/6. 57.0-57.7 Slightly more clayey and softer, slightly damp, occasional very thin, whispy semi horizontal stylolite-like lines.			
-60	0	5/5	LIMESTONE MUDSTONE: 59.0-59.8 As above. 59.8-60.5 Damp, gray (darker than above) 5Y 5/1, broken up, slightly softer, grainy, clayey matrix, bioturbated.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			60.5 above grading to pale yellow mudstone-wackestone. 60.5-64.0 Occasional brownish yellow bioturbations and large pelecypod shell half, dry, hard, more mudstone towards bottom.			
-65	0	5/5	LIMESTONE MUDSTONE: 64.0-66.0 Pale yellow mudstone grading to packstone with fossils, solid core, dry. 66.0-66.3 Color change to gray on 60 deg. angle, no textured changes, dry. 66.4 Horizontal carboneceous lineaments. 66.9-69.0 Alternating gray mudstone and softer clay seams, no apparent fossils, moist.			
-70	0	4.3/5	68.0 Color changes to pale yellow. LIMESTONE: 69.0-71.6 As above. 71.6-74.0 As above but light gray, bioturbated, dry, hard. Solid core 2' to 0.5' pieces, no fractures.			
-75	0	5/5	LIMESTONE MUDSTONE: 74.0-74.7 As above. 74.7-77.1 Moderately soft mudstone, gray, GLEY 10Y 5/1, damp to moist, broken up, washed out in zones. 77.1-79.0 Silty mudstone-packstone, occasional fossils (1mm to 1.5 cm), abrupt color change on horizontal plane at 78.6' to olive yellow, texture same.			
-80	0	5/5	LIMESTONE: 79.0-81.1 As above, yellow 2.5Y 7/6. 80.0-81.0 Moderately soft clayey zones alternating with graying hard rock. 81.1-82.9 Packstone, whitish, hard, tiny pitted with occasional orange stained hairline fracture (no movement). 82.9 As above but larger vugs and dissolved molds rather than pitted appearance. Getting whitish, larger fossil shells recrystalized (mostly pelecypods).			
-85	0	5/5	LIMESTONE: 84.0-89.0 As above, hard, dry, smaller fossils towards 87.0-89.0', 5% vugginess.			
-90	0	5/5	LIMESTONE: 89.0-94.0 As above only less vuggy (1%), more compact, orange stained hairline cracks occasionally. Horizontal fracture stained orange at 92.4', hard, dry.			
-95	0	6/6	LIMESTONE: 94.0-97.2 As above only more mud, less grainy. Broken zone. 94.7-94.8 Some orange stained spots, softer, shelly, broken zone 96.6-96.8'.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			97.2-98.2 As above but light gray instead of pale yellow. 98.2-100 Same as 94-97'.			
-100						

PARSONS

DRILLING LOG

AOC-65 VMP-3

Project: AOC-65 Treatability Study/TO58	**Installation:** Camp Stanley Storage Activity
Geologist: Tennyson/Riley	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects Intl.	**Design of Drill:** G-D 1500
Hole Number(s): VMP-3	**Number of Core Boxes:** 10
Name of Driller: Jose Landeros	**Elevation Ground Water:** Not encountered
Northing: 3283701.17 **Easting:** 535685.55	**Date Hole Started:** 05/21/02 **Stopped:** 05/21/02
Total Depth of Hole: 100.0'	**Elevation Top of Casing:** NA

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
0	0	0/2	BLANK: 0-2.0 Overburden, not recovered, dark brown, clayey soil, rocky.			
		1/4.3	LIMESTONE MUDSTONE: 2.0-6.3 Whitish, very pale yellow, mudstone-wackestone, hard and dry.			
-5	0	2/2.7	LIMESTONE MUDSTONE: 6.3-9.0 As above, not broken up as much. Occasional very thin clayey seam, (2.5Y 8/2 to 8/4).			
	0	5/5	LIMESTONE MUDSTONE: 9.0-14.0 As above, continues with clayey seams (thicker), to 2.5 cm and slightly darker color, very light grayish pale yellow. Black speckled staining in clay seams, clayey seams damp, rock in between dry. 12.5 change to light gray, moderately hard, damp to dry, slightly softer top 0.2' of gray zone, orange speckled staining on seperated surfaces in yellowish zones.			
-10	0	4.9/5	LIMESTONE MUDSTONE: 14.0-19.0 Mudstone-wackestone. 14.5 Oblique fracture, dry surface. 15.25 & 15.45 Clayey seams 0.05'. Alternating light grays and whitish zones, pale yellow at 14.5', fracture, orange mottled spots on fractured surface, core broken with depth, whitish concoluted mottles and zones, whitish zones drier and harder, light gray zones easily scratched with fingernail, no obvious fossils.			
-15	0.8					
	0					
	0	4.9/5	18.0 Drillers introducted water. LIMESTONE MUDSTONE: 19.0-21.0 As above, light grays, clayey seam at 19.3', moist otherwise dry, moderately hard, abrupt color change to yellow at 21' (2.5Y 7/6), mostly grainy appearance in places, bioturbated appearance, alternating moist clayey seams with hard dry rock, orange staining on some surfaces and in some seams, no obvious evidence of fossils remains.			
-20	0	5/5	LIMESTONE MUDSTONE: 24.0-24.6 Yellowish, moist, soft and clayey. 24.6-29.0 Abrupt change to light pale yellow mudstone that is dry, harder, fractured. More grainy and moist and slightly softer with depth.			
-25						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			harder, fractured. More grainy and moist and slightly softer with depth, occasional hairline oblique fractures with orange staining. Parallel fractures at 24-25' (no slickenslide evidence), oblique fracture at 25' but no evidence slickenslide, cemented semi horizontal cracks/fractures. Bright orange and black speckled subdendritic staining on fracture surfaces.			
-30	0	4.2/5	LIMESTONE MUDSTONE: 29.0-29.9 As above continuing evidence of cross bedding. 29.9-30.8 Broken up, various yellow, light brown and light gray hues, vuggy, pieces, hard (clay washed away?) 30.8-32.0 Same as 29-29.9'. 32.0-33.0 Clay, moist, compacted. 33.0-34.0 Same as 30.8-32.0' but slightly harder, more compact.			
-35	0	5/5	LIMESTONE MUDSTONE: 34.0-34.6 As above grading to below. Shows gray clasts in pale yellow rock/packstone gray is silty and clayey. 34.6-39.9 Alternating light gray to dark gray shaley (mudstone) layers. Splits easily on bedding planes. rare tiny vug with calcite. 37.7-39.0 Lighter gray, more grainy, no large fossils, numerous fossils <2mm, broken, bioturbated, weathered vugs, some thin softer clayey seams that appear to be bioturbated fill.			
-40	0	4.9/5	37.7-40.0 Grayish hues packstone/wackestone, occasional softer shaley layer, whitish fossil remnants, bioturbation, moderately hard, dry, soild core. 39.9-40.0 Broken up, dark gray shaley pieces, moderately planar, moist. 39.9-40.0 Driller reports circulation loss.			
-45	0	5/5	LIMESTONE: 39.0-40.0 Light gray, fossiliferous increasing from 2mm to 1 cm in size with depth. 40.0-41.0 Numerous fossils foraminifera hash, bioturbated to 44', % of foram hash is increasing to 90%. Varying hues of light gray limestone, with bioturbated zones of darker gray fossils replaced by mineralization light gray to white. 42.0-44.0 90% fossiliferious "cereal"-like hash, light gray to white varying color. Solid core in 5 pieces, slightly damp, moderately hard.			
-50	0	4.4/5	LIMESTONE: 44.0-49.0 Gray fossil hash continues, fractured at 44'. 45.0-46.0 Fossil hash continues 90% fossils light and dark gray color change to light yellow at 45.9', fossil hash continues. 46.0-47.0 Light yellow fossil hash continues <5mm 47.0-48.0 Becoming harder, fossils increase in size to 2cm, hash discontinues fragmented and vugs present at 47.5'. 48.0-49.0 Multiple fractures, less fossiliferous, calcite mineralization with 2cm vug or mold. Fossils disappearing or becoming microscopic at 49.0'. Core fragmented 47.5 to 49.0, becoming harder 47.0-49.0'.			
-55	0	4.7/5	LIMESTONE: 49.0-50.0 As above. 50.0-51.7 Above becoming more grainy, no fossils >2mm, bioturbated somewhat, hard cannot scratch with fingernail, more convoluted bioturbation towards bottom. 51.7-52.2 As above but light gray, one small vug. 52.2-54.0 Above turning back to pale yellow (as 49.0-51.7') also becoming more mud stained with depth, vertical hairline fractures at bottom 1', patchy pale orange staining in fracture.			
-60	0	5/5	Mostly solid core in 0.5-0.8' pieces, 50.0-51.0' broken, small reappearance of circulation.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			LIMESTONE: 54.0-59.0 As above with light gray mottle, grading to below 55' - light gray, convoluted bedding, very thin lenses of dark gray, occasional thin clayey seam. ~~59.0 Harder with depth, more very light gray between 2.5Y 8/1 and 7/1.~~ LIMESTONE MUDSTONE: 59.0-64.0 Mudstone/wackestone, various gray hues.			
-65	0	4.4/5	59.0-61.0 Bioturbated, occasional small fossil, pelecypod occasional large recrystalized pelecypod 61-63', mostly hard and dry, becoming silty mudstone with depth. LIMESTONE: 64.0-64.7 As above. 64.7-66.5 Typical light gray packstone/wackestone with convoluted whitish fossil shell remnants, hard and dry. 66.5-69.0 Above type zones alternating with soft and moist clayey zones, broken up, becoming pale yellowish gray, bottom 0.4' laminated mudstone.			
-70	0	5/5	LIMESTONE MUDSTONE: 69.0-74.0 Mudstone grades to packstone/wackestone, pale yellow with whitish mottling, hard and dry. Changes to light gray at 22.5', same texture, at 71.8 oblique fracture with orange staining, no movement.			
-75	0	5/5	LIMESTONE MUDSTONE: 74.0-79.0 Above grading to gray, limey/shaley moderately soft mudstone. Frequent gray clay seams (thin) very soft and moist. 76.8 Core hardens, becomes whitish in parts, otherwise light gray, same as 72.5-74.0', oblique slickenslide at 78', approximately 45 deg. angle. 78.4-79.0 As above but abrupt color change to light yellowish brown.			
-80	0	5/5	LIMESTONE MUDSTONE: 79.0-84.0 Above light yellow brown mudstone continues to 80.4', becomes moderately soft and clayey. 80.4-82.8 Above becomes hard, grainy wackestone/packstone, hard and dry, whitish pale yellow. Horizontal fracture with orange staining at 81.1'. 82.2-84.0 White vuggy (not interconnected) fossiliferous, hard wackestone.			
-85	0	5/5	LIMESTONE MUDSTONE: 84.0-89.0 As above, less vuggy with depth, large pelecypod shells, recrystalized/replaced, some empty molds with calcite.			
-90	0	5/5	LIMESTONE MUDSTONE: 89.0-94.0 As above generally, vugginess decreasing with depth. 92.0-94.0 No vugs, bioturbation, small shells, occasional hairline fracture with orange staining throughout, hard, dry, wackestone/packstone.			
-95	0	6/6	LIMESTONE MUDSTONE: 94.0-100 As above with fractures. 95.0 Horizontal fracture with orange stain. 95.4 Oblique fracture with no apparent movement.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-100			97.0 Horizontal fracture. 99.6 Horizontal fracture with minute orange staining.			

PARSONS

DRILLING LOG

AOC-65 VMP-4

Project: AOC-65 Treatability Study/TO58	**Installation:** Camp Stanley Storage Activity
Geologist: Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects Intl.	**Design of Drill:** G-D 1500
Hole Number(s): VMP-4	**Number of Core Boxes:** 10
Name of Driller: Jose Landeros	**Elevation Ground Water:** Not encountered
Northing: 3283720.45 **Easting:** 535689.43	**Date Hole Started:** 05/22/02 **Stopped:** 05/24/02
Total Depth of Hole: 100.0'	**Elevation Top of Casing:** NA

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma (cps) 0 150
0	N/A	0/2	BLANK: 0-2.0 Not recovered, brown clayey and rocky soil, broken bits of very pale yellow limestone, dry to slightly damp.			
	N/A	0.8/3	LIMESTONE: 2.0-5.0 White to very pale yellow, wackestone, hard and dry. Recovered rubble, solvent odor at borehole 110 ppm measured in corehole at ground surface.			
-5	25 0	4.7/5	LIMESTONE: 5.0-8.8 As above lithology weathered vertical to 90 deg. fracture, odor in surfaces. Solvent odor, 70 ppm at corehole, no PID hits on core sample below 7.6' bgs.			
	0		LIMESTONE: 8.8-13.8 As above, horizontal bedding becomes evident, dry, hard, more mudstone type			
-10	0	5.7/5	LIMESTONE MUDSTONE: 13.8-18.8 As above to 14.2'. 14.2-14.8 As above but light gray color. 14.8-18.8 Mudstone, various gray hues showing moderately wavey bedding, dry, moderately hard.			
-15	0	4.35/5	LIMESTONE MUDSTONE: 18.8-23.8 As above to 21.5'. 21.5-21.7 Change to pale yellow, texture same but slightly softer with depth. 21.7-23.0 Mudstone, various pale yellow to yellow hues and values, splits on bedding planes while drying, occasional softer clayey layers. 23.0-23.8 White, hard, dry, mudstone/wackestone.			
-20	0	3.3/5	LIMESTONE MUDSTONE: 23.8-28.8 As above to about 26.5'. ~26.5-27.5 no recovery.			
-25						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			~27.5-28.3 Mudstone/wackestone, alternating wavey bands of white to yellow. More whitish is hard and the more yellowish the more clayey and soft. Appears to be wavey crossbedding. Zones not recovered are estimates. Driller does not report drop in bit, indicating voids.			
-30	0	3.3/5	LIMESTONE MUDSTONE: 28.8-33.8 Packstone, clayey yellow with white banding, flakey, moderately hard, damp, occasional orange staining in very thin seams (<1mm), wavey bedding. 31-31.5 Mudstone/wackestone, white, bery hard, one 1 cm vug, top of section broken up, pieces show numerous small vugs. Transition to repeating of 29-31'. ~3mm clay seam, mottled/bioturbated, light gray and yellow, grays - hard mudstone, yellows - packstone/grainstone, occasional orange staining at color change surfaces.			
-35	0	4.1/5	LIMESTONE: 33.8-38.8 Very shaley gray and light gray hues, banded, layered, damp, moderately hard grading to light gray packstone/wackestone with white shell spots, occasional this clayey seam, more grainy and vuggy and broken 37-38.8'.			
-40	0	5/5	LIMESTONE: 38.8-43.8 As above continues, grades into gray, clayey foram hash, still packstone/wackestone, slightly softer and more moist with depth.			
-45	0	3.7/5	LIMESTONE: 43.8-48.8 As above continues, becoming softer, more gray clay seams/bioturbation fill seams, very broken above contact. 46.3-48.8 Yellow to pale yellow, fossiliferous packstone, moderately hard, harder with depth. Convoluted bedding, orange staining on many fractures/bedding plane separations. 48.0 Small gastropods, forams, fragsments, 2cm thick clays, seam at 48'. 50-51 Majority of missing from transition/contact zone of gray foram hash and yellow shell hash.			
-50	0	4.9/5	LIMESTONE: 48.8-51.5 As above continues, bedding signs disappear, very small fragments/grains, some possible bioturbation, rare orange stain on shell mold surfaces. 51.5-53.0 Above texture continues but color changes sharply to light gray, harder with depth, wackestone grading to mudstone. 53.0-53.8 Light gray hard dry mudstone, no fossils visible.			
-55	0	5/5	LIMESTONE MUDSTONE: 53.8-58.8 Mudstone/wackestone, light gray hues, above continues with dark gray wavey, very think and whispy generally horizontal lines with micro (<0.5 mm) pyrite xtals, dry, hard. 55.0-56.0 Some white shell fragments. 56.3-56.6 Softer and clayey, moist, at 56.6' sharp change to dry and hard. 56.9-57.0 Soft grainy light brownish gray seam, broken.			
-60	0	5/5	57.0-58.8 As 55-56'. 58.0-58.3 Slickenslide at 45 degree angle. LIMESTONE MUDSTONE: 58.8-63.8 Light gray, alternating zones mudstone and wackestone, hard, dry, solid core. Large pelecypods shells			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			mudstone and wackestone, hard, dry, solid core. Large pelecypods shells in wackestone.			
-65	0	5/5	LIMESTONE: 63.8-68.8 As above. 66.0-66.5 Clayey and broken except for 66-66.5', hard and dry, varying light grays, some bioturbation, no fractures. 67.0-68.0 Thin shaley bedding evident but unbroken.			
-70	0	5/5	LIMESTONE: 68.8-73.8 As above generally, brownish yellow mottling. 68.5-69.1 Texture same in both colored areas, hard, dry, no clay seams.			
-75	0	5/5	LIMESTONE: 73.8-78.8 As above, grays continue, hard and dry, no fractures. 76.3 Abrupt change to very light gray silty mudstone, very gradually returning to previous lithology. 77.85 Abrupt change in color to light yellowish brown, becoming more yellow with depth, texture unchanged. 78.7-78.8 Brownish yellow, damp, stiff clay.			
-80	0	5/5	LIMESTONE: 78.8-83.8 Above clayey zone continues becoming harder and drier with depth, grades to grainy packstone, pale yellow. 80.4 Sharp contact with below. 80.4-83.8 Wackestone/packstone, whitish with very light pale yellow bioturbidated filling, very tiny fossil fragments increasing in size with depth to >0.2', poorly sorted frag. size 82' and below, hard, dry, slightly vuggy due to fossil molds and shell dissolution.			
-85	0	5/5	LIMESTONE: 83.8-88.8 As above continues. 86.8-88.8 Large fossils and partially empty molds absent, all fossils <0.5cm, rock the same otherwise.			
-90	0	5/5	LIMESTONE: 88.8-93.8 As above, occasional small vug with partial calcite fill. 91.7 One cm thick orange stained zone, horizontal separation possible. 93.2-93.4 Oblique (45 deg.) hairline fracture cemented, micro calcite in it.			
-95	0	6.2/6.2	LIMESTONE: 93.8-96.4 As above, more mudstone, dry. 96.4 As above texture with abrupt change to light gray color. 97.0 Group of black, carbonaceous wavey lines (like horizontal stylolites) hairline fractures, closed.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma (cps) 0 150
-100			97.7 Change back to pale yellow, mostly mudstone with occasional orange staining, no visible fractures, patchy.			

P A R S O N S	**DRILLING LOG** **AOC65-VMP05**
Project: AOC-65 Treatability Study/TO58	**Installation:** Camp Stanley Storage Activity, U.S. Army
Geologist: E. Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects International	**Design of Drill:** G-D 1500
Hole Number(s): VMP-5	**Number of Core Boxes:** 10
Name of Driller: Jose Landeros	**Elevation Ground Water:** Not encountered
Northing: 3283726.260133 **Easting:** 535732.423607	**Date Hole Started:** 05/28/02 **Stopped:** 05/30/02
Total Depth of Hole: 100.0'	**Elevation Top of Casing:** NA

Depth (bgs)	PID	Recovery	Lithologic Description (feet)	Lithology	Sample	Gamma (cps) 0 150
0		0/1.5	ASPHALT: 0-1.5 No recovery, pavement, roadbase, fill, gravel, clay.			
	0	1/5.5	LIMESTONE: 1.5-7.0 Mudstone-wackestone; whitish, broken, interspersed with brown clay and very pale brown clay (10YR 8/2), 1 vug (0.8 x 2 cm).			
-5						
	0	4.7/7	LIMESTONE: 7.0-12.83 Wackestone; whitish to very pale brown and yellow, fractured and cracked, bedding evident, occasional orange stained seam, occasional thin yellow clay seam < 2 cm, occasional light grayish yellow zones, rare vugs. 12.83-13.35 Mudstone; gray, hard, thin yellow clayey layer on top. 13.35-14 As 7'-12.83' but more yellowish and slightly softer.			
-10						
	0	4.65/5	LIMESTONE: 14.0-14.6 Above continues. 14.6-19.0 Mudstone; abrupt color change to gray hues, bioturbated, hard with occasional clayey/shaley zones that are slightly softer than surrounding rock, hairline fractures at 17.6'-17.8'.			
-15						
	0	4.8/5	LIMESTONE: 19.0-19.1 Mudstone; gray and yellow, wavey and interbedded, orange staining on broken surface of yellow portion, one 1.5-2.0 cm vug with orange stained inner surface and light yellow ring around it. 19.1-21.1 Mudstone; gray shades, bioturbated portions, some very thin bedding. 21.1-22.3 Mudstone; abrupt color change to yellow, heavily bioturbated, orange stains, thin bedding becomes evident with depth (less bioturbation).			
-20						
	0	4.6/5	22.3-24.0 Mudstone-clay; yellow clay zone, moist, broken with limestone gravel throughout, yellow layers softer than gray layers, missing 0.2'			
-25						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			probably from this secton (or compacted). 23.5'-24.0' thin oblique fracture, orange and black staining on fracture surface.			
-30	0	3.3/5	LIMESTONE: 24.0-27.0 Packstone; whitish to more pale yellow with depth, whitish zone hard, dry, fractured with orange and black staining, obvious oblique fractures, clay zone at 27.0'. 27.0-29.0 Above, bioturbated, moderately soft, moist, some crumbly zones.			
-35	0	4.6/5	LIMESTONE: 29.0-34.0 Mudstone-clay; white to yellow, top 0.6' fractured through hard white mudstone, yellow zones are clayey, soft and weathered, some grayish-yellow mottling, occasional think zone of tiny fossil and fragment hash. Driller reports loss of circulation during this interval, missing likely from top of interval, transition from above interval (24'-29') bottom to this one not apparent. 29'-30' Oblique fracture, lacks dark staining that is seen in 24-27' fracture, this fracture surface 30% orange stained, occasional patches of very tiny (0.01 mm) black speckles. 33.0-34.0 Packstone; whitish, grains and fragments <2.0mm, hard and dry.			
-40	0	5/5	LIMESTONE: 34.0-35.9 Mudstone; various gray to dark gray hues, very shaley with softer clayey thin beds, obvious bedding, occasional orange stain in bedding planes and in one oblique fracture (hairline). 35.9-36.35 Above alternating with below: 36.35-37.7 Wackestone, gray with whitish shelly spots, small fragments, softer with depth and moister with depth. 37.7-39.0 Mudstone-wackestone, light gray, silty, bioturbated, hard, mostly dry, occasional shell fragments.			
-45	0	5/5	LIMESTONE: 39.0-44.0 As above grading to light gray, bioturbated, foram and fragment hash (wackestone), moist, darker infilling of burrows, more clayey and softer than rock surroundings, no circulation. LIMESTONE: 44.0-46.4 Wackestone as above, light gray to gray hash. 46.4-47.0 As above but pale yellow overall. 47.0-47.8 Wackestone-packstone; whitish to light pale yellow with heavy orange staining, shell fragments, pitted and moderately vuggy, brittle. 47.8-49.0 Packstone; dull whitish, grains/fragments <3 mm, hard and well cemented.			
-50	0	4.9/5	No returns/circulation. LIMESTONE: 49.0-50.6 As above, broken up 49.6'-49.8'. 50.6-50.8 Mottled transition from above to below: 50.8-52.6 Packstone; light gray, fine grained, hard, dry, wavey gray hues suggest bioturbation, occasional vugs of various sizes, rare white shell fragments. 52.6-54.0 mudstone; light gray, moderately hard, occasional moderate bioturbation.			
-55	0	4.2/5	LIMESTONE: 54.0-55.2 As above. 55.2-56.8 As 50.8'-52.6' in thin sections (<0.1') alternating with wet clayey zones. 56.8-57.0 Above becoming hard and grading to below - dull whitish mudstone/wackestone, hard, dry. 58.0-59.0 Mudstone; grading to light gray hues of wavey bedding/bioturbation, no fossils.			
-60	0	5/5	58.8'-59' - 45 degree slickenslide. Still no returns out of corehole, missing likely from 55-57'.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			LIMESTONE: 59.0-59.6 As above continues. 59.6-60.3 Gradual, mottled transition from above to below: 60.3-64.0 Mudstone; mostly light gray, occasional fossil zones, pelecypod shells, hard, dry, slightly damp in darker shaded zones.			
-65	0	4.8/5	LIMESTONE: 64.0-65.7 As above, becoming moderately more fossiliferous with depth. 65.7-66.5 mudstone; gray, silty, gray clayey layers mostly washed out, zones broken up. 66.5-68.7 Mudstone; light gray shades, thin bedding evident, varying hardness, dry to damp. 68.7-69.0 As above containing clasts/infilling of very light brownish-gray pitted wackestone.			
-70	0	4.6/5	No returns. LIMESTONE: 69.0-74.0 Wackestone/packstone; white and light gray hues, bioturbated, hard and dry, infrequent pelecypod shell > 1 cm.			
-75	0	4.9/5	LIMESTONE: 74.0-76.0 As above continues but becomes softer with depth. 76.0-76.3 Suspected missing section. 76.3-77.0 Wackestone; white with gray clasts/bioturbated infilling, hard. 77.0-77.85 Mudstone-wackestone; light gray hues, hard, dry, occasional white shell fragments (1mm-1cm).			
-80	0	5.2/5	77.85-78.3 Above texture but abrupt change to light brownish gray - 2.5Y 6/2. 78.3-79.0 Mudstone; above color but soft, clayey and very silty, broken up, moist. LIMESTONE: 79.0-79.5 As above.			
	0		79.5-80.3 Packstone; yellow, fine-grained. 80.3-81.5 Packstone; white, dense, hard, dry, bioturbation more apparent with depth.			
-85	0	5/5	81.5-82.1 As above but softer and broken, some washout from coring. 82.1-84.0 Wackestone-packstone; whitish, large fossils and fragments mostly pelecypods, pitted and moderately vuggy, some clear calcite crystals in vugs/molds, not effective porosity, hard. No returns. LIMESTONE: 84.0-87.5 As above.			
-90	0	5/5	87.5-89.0 As above but tighter, rare large fossils, increase in mud content with depth, hard. LIMESTONE: 89.0-94.0 As above continues becoming fine whitish wackstone, orange staining 91.7-91' and 94-94.3', softer with parting in heavily stained thin zones, bioturbated. 93.8' Possible lignite, resembles wood or bark flake in color and structure.			
-95	0	6/6	LIMESTONE: 94.0-94.05 As above. 94.05-94.25 Wackestone-packstone; whitish and pale yellow and grayish olive colored wavey layers containing clasts of each other, rock types layered with varying hardness.			

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
-100			94.25-95.5 Mostly wackestone; whitish, hard and dry, solid. 95.5-95.7 As above grading to softer mudstone. 95.7-95.9 Above mudstone texture but abrupt change to gray with some bioturbation with grainy infilling. 95.7-96.2 Mudstone; very light gray, wavey bedding with olive gray carbonaceous-like lines and films (flat undeveloped stylolites), broken core. 96.2-98.0 Mudstone; many shades of light grays, mottled/bioturbated, olive-gray wavey films as previous (sub stylolites) 98.0-100.0 Above texture continues but color change to pale yellow and very light grays, hard and dry, solid core section.			

P A R S O N S

DRILLING LOG

AOC65-VMP06

Project: AOC-65 Treatability Study/TO58	**Installation:** Camp Stanley Storage Activity, U.S. Army
Geologist: E. Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects International	**Design of Drill:** G-D 1500
Hole Number(s): VMP-6	**Number of Core Boxes:** 6
Name of Driller: Jose Landeros	**Elevation Ground Water:** Not encountered
Northing: 3283683.196933 **Easting:** 535685.817785	**Date Hole Started:** 06/18/02 **Stopped:** 06/19/02
Total Depth of Hole: 60.0'	**Elevation Top of Casing:** NA

Depth (bgs)	PID	Recovery	Lithologic Description (feet)	Lithology	Sample	Gamma (cps) 0 150
0	0	0/1.5	CLAYSTONE: 0-1.5 Overdrill, brown, very clayey soil with white limestone rocks.			
		1.4/5.5	LIMESTONE: 1.5-7.0 Fine wackestone; white, fractured, hard, dry.			
-5	0	2.8/7	LIMESTONE: 7.0-14.0 Above alternating with soft, damp clayey zones, brittle, weathered, some clayey zones compacted, oblique fractures with orange and black staining.			
-10	0	4.25/5	LIMESTONE: 14.0-19.0 Fine wackestone; yellow, alternating dry and hard with soft, moist clay. Oblique, partially cemented fracture 15-16', thin layering evident.			
-15	0	3.7/5	LIMESTONE: 19.0-24.0 As above.			
-20	0	4.7/5	LIMESTONE: 24.0-29.0 As above, hairline oblique fractures with speckled orange and black staining more numerous. Yellow mud in coring returns.			
-25						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			Yellow mud in coring returns.			
-30	0	2.4/4	LIMESTONE: 29.0-33.0 As above becoming more wackestone-like and very grainy, some clay zones. 31.8-32.4 Mudstone; white, hard and dry. 32.4-33.0 Same as 29'-31.8'. Heavy yellow mud as returns, most likely missing washed out clay zones (29-31'), lost returns between 32-33', no returns after 33'.			
-35	0	4.9/6	LIMESTONE: 33.0-35.3 As above except pale yellow. 35.3-36.7 Mudstone; various values of gray to dark gray, shaley, thinly bedded to laminated. 36.7-39.0 Wackestone; light gray to gray, grainy, shells of various sizes (1 mm to 5 cm), bioturbated, occasional soft and moist thin clayey zone or bioturbated infilling.			
-40	0	4.9/5	LIMESTONE: 39.0-44.0 Wackestone/fine packstone; gray shades, very broken, grainy, vuggy, bioturbated, no obvious fossils. 39.8-44.0 Wackestone; light gray, small fossils, bioturbated, becoming softer foram hash with depth, solid, dry core.			
-45	0	2.8/5	LIMESTONE: 44.0-46.0 Wackestone; gray, foram hash continued from above, last 45-45.5' broken and clayey. 44.9 - Slickenslide approx. 45 deg. 46.0-46.8 Very broken, mostly missing. 46.0-48.0 As previous but yellow, occasional orange staining through some apparent bedding, moist. 48.0-48.5 As above but broken, clayey, heavy, orange staining in places.			
-50	0	4.8/5	48.5-49.0 Mudstone-fine wackestone; very pale yellow, hard, dry, grainy, no obvious bedding, rare vug with calcite crystals, small occasional gastropod, pelecypod, foram. LIMESTONE: 49.0-54.0 Fine packstone; pale yellow, mostly dry, hard, occasional very thin clayey zone < 1 cm thick, bioturbated, less grainy, more mudstone-like with depth.			
-55	0	5.5/6	LIMESTONE: 54.0-56.7 Above mudstone continues; very pale yellow, infrequent small vug, some lighter colored areas (whitish) are very hard. 56.7-57.5 Pale yellow above material is weathered to softer, clayey zone, moist, breaks up below 56.9'. 57.5-58.2 As above but light gray color, harder and dryer with depth. Missing most likely from middle broken section, where soft clay zones were washed out (approx. 57.5-58.5'). 58.2-60.0 Mudstone; very light gray, dry, hard, mildly bioturbated. Approx. 45 deg. slickenslide at 60'.			
-60						

P A R S O N S

DRILLING LOG

AOC65-VMP07

Project: AOC-65 Treatability Study/TO58	**Installation:** Camp Stanley Storage Activity, U.S. Army
Geologist: E. Tennyson	**Size and Type of Bit:** 3.25" Carbide Core Barrel
Drilling Agency: Geoprojects International	**Design of Drill:** G-D 1500
Hole Number(s): VMP-7	**Number of Core Boxes:** 5
Name of Driller: Jose Landeros	**Elevation Ground Water:** Not encountered
Northing: 3283811.031701 **Easting:** 535672.382949	**Date Hole Started:** 06/20/02 **Stopped:** 06/20/02
Total Depth of Hole: Cored to 44.0', completed to 40.0'	**Elevation Top of Casing:** NA

Depth (bgs)	PID	Recovery	Lithologic Description (feet)	Lithology	Sample	Gamma (cps) 0 150
0		0/3	LIMESTONE: 0-3.0 Overdrill, no recovery, no soil, soft, highly weathered limestone.			
	0	0.6/4	LIMESTONE: 3.0-7.0 Fine to medium packstone; brownish-yellow, moist, occasional fracture with black and orange staining Yellowish mud as returns.			
-5						
	0	1/7	LIMESTONE: 7.0-14.0 As above with majority of yellow, stiff clay washed out, only hard parts remain, calcite infill of some cracks, and voids; hard rock slightly lighter pale yellow and more mudstone-like with depth. Most of core sample washed out. Driller reports much clay, had to go slower to avoid plugging, yellow grainy mud as returns.			
-10						
	0.2	3/5	LIMESTONE: 14.0-19.0 Fine wackestone; yellow 2.5Y 7/6-7/8 alternating with yellow stiff clay; oblique fractures with orange staining throughout harder zones. Driller reports 17'-19' lost due to clay washing out, lost circulation 14'-19'.			
-15	0.6					
	0.1					
	0.1					
	0					
	0.1	4.7/5	LIMESTONE: 19.0-24.0 Fine wackestone-packstone; various yellow shades, alternating zones of clayey (very yellow) and hard (pale yellows) weathered material, fractured, stained, occasional vug with calcite in middle area 21.0-22.0' 20.9'-21.2' Very broken up, some fractures partially cemented up with calcite. Some fractures show slickenslide striations but weathered and thin clayey seams cross slickenslide without displacement.			
-20	0.2					
	0.1					
	0					
	0					
	0	5/5	LIMESTONE: 24.0-26.2 As above without fractures. 25.8-26.2 Stiff yellow clay. 26.1-26.3 Very broken up, some surfaces fresh, others stained.			
-25						

Depth (bgs)	PID	Recovery	Lithologic Description	Lithology	Sample	Gamma 0 (cps) 150
			26.1-26.3 Very broken up, some surfaces fresh, others stained. 26.2-29.0 Mudstone, various hues of very pale yellow and white, hard, dry, oblique fractures with patchy black and orange staining, fracture at 21.5' has light pinkish coloration on surface. Partial return of circulation 19.0' and to total depth. Slickenslide at 29.0'.			
-30	0	2.8/5	LIMESTONE: 29.0-34.0 29.0-33.0 As above. 33.0-34.0 Mudstone, whitish, very pale yellow 2.5Y 8/2, very hard, dry, one very thin hairline fracture - cemented but with patchy, light orange staining, vugs on top broken surface where contact with clayey zone was. Driller pulled out after 1.0' due to plugging. Reentered and retrieved remainder, part of interval missing - washed out.			
-35	0	4.6/5	LIMESTONE: 34.0-34.7 Clay; yellow, stiff, hard, with occasional wispy thin orange stains and light gray lense-like mottles. 34.7-35.1 Above grading to below: 35.1-36.1 Fine packstone; pale yellow, moderately hard. 36.1-37.2 Mudstone; gray and dark gray, thinly bedded, shaley, splits easily along bedding planes.			
-40	0	4.5/5	37.2-39.0 Wackestone; light gray hues, small fossils 10-15%, moderatley hard, slightly softer with depth. LIMESTONE: 39.0-40.2 As above but softer, clayeyer, more broken. 40.2-40.6 Above texture but whitish color and much orange staining, broken. 40.6-44.0 Wackestone; light gray overall, white fossils, bioturbated, dry, hard. Missing interval most likely from top foot according to driller.			