Transmittal

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS

1111 Lincoln Mall • P.O. Box 84608 • Lincoln, Nebraska 68501-4608 • 402/474-6311

To: Mr. Brian A. Kramer, Supt. of Collections
Lincoln Wastewater System
2400 Theresa St.
Lincoln, NE 68521

Re: Beal Slough Trunk Sewer, Phase II

Project #: 2003-0356

From: Holly Johnson HCJ

Date: October 6, 2004

Material:	Quantity	Date	Description
☐ Correspondence	3 Copies	9/27/04	Preliminary Geotechnical Information
☐ Plans			
☒ Reports			
☐ Specifications			
☐ Other			

Remarks:

- ☐ For Your Approval — For your records.
- ☒ For Your Use
- ☐ As Requested
- ☐ For Review & Comment
- ☐ Other
- ☐ Comments

cc: File (w/1 copy of report)
Mr. Gary Brandt, LWWS
Mr. Roger Krull, LWWS

F:\Projects\20030356\doc\transLWWS.o04.wpd

MEMO

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS

1111 Lincoln Mall ■ P.O. Box 84608 ■ Lincoln, Nebraska 68501-4608 ■ 402/474-6311

DATE: 9/27/04 **RE:** Beal Slough Trunk Sewer Phase II

TO: Holly Johnson, Olsson Associates **PROJECT NO:** 2003-0356

FROM: Ryan Beckman, Olsson Associates

The following services were completed for preliminary geotechnical purposes. The current subsurface conditions were evaluated to determine the soil properties at potential trenchless locations. The services did not include any environmental assessment for the presence of wetlands, hazardous materials or toxic materials in the soil, groundwater or air around, on or below this site.

Field Exploration

We drilled a total of five soil test borings, evenly spaced across the Beal Slough Trunk Sewer-Phase II which is to begin just south of the intersection of 27th Street and Nebraska Highway 2 and will extend east to the northwest corner of the intersection of 56th Street and Nebraska Highway 2 in Lincoln, Nebraska. An attached map shows the approximate location of the five soil test borings, which were drilled to depth ranging from 19 to 25.5 feet.

During drilling operations, soil samples were obtained at selected intervals in the test borings. Soil samples designated as "U" samples on the Boring Logs were obtained in general accordance with ASTM D-1587 (Thin-Walled Tube Sampling of Soils). Soil samples designated as "SS" samples were obtained in general accordance with ASTM D-1586 (Penetration Test and Split-Barrel Sampling of Soils). Recovered samples were extruded in the field, sealed in plastic containers, labeled, and protected for transportation to the laboratory for testing.

Test boring logs were prepared which delineate the various subsurface strata and provide soil descriptions, groundwater conditions, and other related information.

We obtained data on groundwater levels in the test borings at the time of drilling and after completion of the drilling operations. The boreholes were then backfilled with the native soil auger cuttings.

Laboratory Services

The laboratory testing included visual soil classification (ASTM D-2488), moisture contents, density determinations, unconfined compression tests (ASTM D-2166), and a hydrometer analysis. In addition, standard penetration tests were performed near the base of the borings in the soft alluvial soils to obtain an 'N' value. The 'N' value, which is the summation of the number of blows per the last twelve inches of penetration, can be utilized to interpret the friction and cohesive values of the in-situ granular soil.

A summary of the laboratory test results defining the existing strength and moisture conditions of the soil is attached.

Ground Water Summary

Ground water was only encountered in the soil test borings on the dates and under conditions and depths noted on the Boring Logs and as summarized in Table 1. We note that ground water levels will fluctuate depending on seasonal variations of precipitation and other factors. As a result, it is possible that this could cause higher ground water elevations at sometime in the future.

TABLE 1

Ground Water Conditions

Boring	Ground Water Depth Below Existing Ground Surface	Ground Water Elevation at Completion of Drilling
	Depth (ft)	USGS
B-1	19.3	1180.0
B-2	22.3	1184.7
B-3	9.2	1203.7
B-4	12.0	1209.4
B-5	17.7	1206.8

Horizontal Boring

Horizontal borings will likely be necessary at street and creek crossings along the alignment. The majority of the trenchless installation will likely encounter saturated lean clays and lean to fat clays. Per the soil test borings B-3 and B-4, less than 25 percent of the soil should consist of fine to medium sand near the anticipated flowline elevation. The pits for the potential tunneling will likely encounter ground water.

In areas identified for tunneling, excessive settlement (settlement that causes impairment or disruption of use) is to be avoided or minimized by the contractor through diligent efforts to minimize loss of ground. Such efforts will be most diligent if the contractor is made responsible for repair of damage and restoration of surface grade caused by the entire construction process-including dewatering and actual pipe installation.

A major decision for the contractor, which affects both overall settlement and the choice of the pipe installation method, is whether to dewater or to operate within the existing ground water environment. Dependent on the depth the ground water table is lowered, the settlement magnitudes should be evaluated by the contractor as to how the magnitudes relate to potential damage.

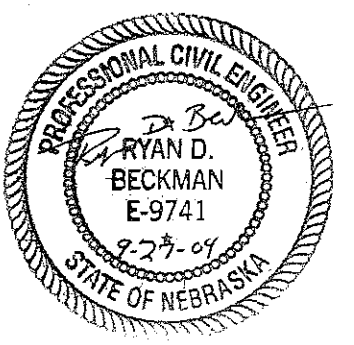
Before dewatering and pipe installation, the contractor should perform a condition survey of any existing infrastructure along the tunneling alignment. The initial condition survey should include video images and elevations of pavement surface. All elevation reference points should be monitored during dewatering, pipe construction, and at the end of construction. If the contractor does monitoring, elevation data that deviates more than an inch from the original elevation should be provided to the engineer within 24 hours of any measurement.

After installation of the casing and sewer pipe, all overlying pavements should be inspected from damage related to pipe installation. Any pavement found to be damaged should be repaired by the contractor for appearance and restored to full pre-construction use. This may require concrete crack repair, replacement of concrete, and/or mudjacking. If settlement from dewatering or from loss of soil results in voids beneath the existing pavement, it may be necessary to have truck traffic find alternate routes to avoid pavement breakup prior to mudjacking.

Previous utility installations within the vicinity of this alignment encountered soft areas related to the abandonment of oxbow channels from near-by creeks. Along isolated sections of this alignment, the on-site representative may need to implement stabilization methods. The contractor at a minimum would likely need to install six inches of crushed rock foundation aggregate below the bedding material. This thickness assumes that only light construction, such as a track-type bobcat, would travel directly on the foundation material. It is recommended, contingency funds and/or bid unit prices be included in the contract documents should stabilization methods be necessary.

The gradation for the crushed rock foundation aggregate should at a minimum have 100 percent the 3.0-inch sieve, 0 to 5 percent greater than 2.0 inches, 0 to 15 percent greater than 1.5 inches, 10 to 40 percent greater than 0.75 inches, 40 to 65 percent greater than the No. 4 sieve and no more than 5 to 20 percent passing the No. 200 sieve. The installation of a crushed rock foundation aggregate base should be based on actual field conditions. The cost associated with stabilization of soft subgrades resulting from inadequate dewatering techniques should be bome by the contractor.

F:\Projects\20030356\geotech\memobeal_slough.doc



N

SCALE: 1" = 500'

0 125 250 500
SCALE IN FEET

DWG: F:\Projects\20030356\geotech\dwg\BORE_LOCATION.dwg USER: jsemin
DATE: Nov 04, 2004 10:07am XREFS:

PROJECT: 2-2003-0356	
DRAWN BY: JRM	REVISIONS:XXX
DATE: 09/02/04	XX/XX/XX

BEAL SLOUGH PHASE II - BORE LOCATION MAP

OLSSON ASSOCIATES
ENGINEERS - PLANNERS - SCIENTISTS - SURVEYORS
1111 LINCOLN MALL - LINCOLN, NEBRASKA 68508
PH. 402-474-6311 - FAX 402-474-5160
www.oaconsulting.com

FIGURE 1

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS

TEST BORING REPORT

BORING NO. B-1 (Sta. 25+75)

PROJECT: Beal Slough Trunk Sewer Phase II
CLIENT: City of Lincoln
DRILLING CONTRACTOR: HWS
EQUIPMENT USED: CME 55

JOB NO. 2003-0356
PAGE NO. 1 of 2
LOCATION: See Plans
ELEVATION: 1199.3 (USGS)
DATE START: 3/26/04
DATE FINISH: 3/26/04
DRILLER: JL
PREPARED BY: A. Phillips

GROUNDWATER		DEPTH TO:			CASING	SAMPLER	CORE BARREL
DATE	HRS AFTER COMP	WATER	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE		
3/26	0	19.3'	-	25.0'	SIZE ID		
					HAMMER WT		
					HAMMER FALL		

DEPTH IN FEET	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	FIELD CLASSIFICATION AND REMARKS
				LEAN CLAY (CL); trace of fine to coarse sand; medium plasticity; very dark grayish brown mixed with olive brown and dark yellowish red; moist; stiff. -FILL- 1.0'
				LEAN CLAY(CL) ; trace of fine to coarse sand ; medium plasticity ; very dark brown mixed with very dark gray and dark yellowish brown ; moist ; stiff. 3.0'
				Same as above except medium stiff. (CL) 3.5'
5				Same as above except stiff. (CL) 5.0'
		U-1	5.0' ---- 7.0'	LEAN CLAY (CL); trace of fine to coarse sand; medium plasticity; very dark grayish brown mixed with dark olive brown and black; moist; stiff. 8.0'
10				LEAN CLAY (CL); medium plasticity, very dark brown mixed with dark yellowish red and olive brown ; moist ; stiff . 10.0'
				LEAN CLAY (CL); medium plasticity; dark yellowish brown heavily mixed with very dark gray and gray and strong brown; moist; stiff. 11.5'
				LEAN CLAY (CL); medium plasticity; dark grayish brown slightly mixed with very dark grayish brown; moist; stiff. 13.5'
15		U-2	13.5' ---- 15.0'	LEAN CLAY (CL) ; medium plasticity ; very dark grayish brown mottled with dark olive brown ; moist ; medium stiff. -ALLUVIUM-, next to POORLY-GRADED SAND (SP) ; fine to medium sand ; very pale brown ; moist ; loose. -FILL- 15.0'
				Same as above. (CL) 16.5'
				LEAN CLAY (CL); medium plasticity; very dark grayish brown; moist; medium stiff. -ALLUVIUM- 19.3'
20				Same as above except wet. (CL)

BLOWS/FT	DENSITY
0-3	VERY LOOSE
4-9	LOOSE
10-29	MEDIUM DENSE
30-49	DENSE
>49	VERY DENSE

BLOWS/FT	CONSISTENCY
0-1	VERY SOFT
2-4	SOFT
5-8	FIRM
9-15	STIFF
16-30	VERY STIFF
>30	HARD

SAMPLE ID.	
SS	SPLIT SPOON
U	TUBE
CA	CALIFORNIA
G	GRAB SAMPLE
X	OTHER
NR	NO RECOVERY

COMPONENT %	
MOSTLY	50-100 %
SOME	30-45 %
LITTLE	15-25 %
FEW	5-10 %
TRACE	< 5 %

GROUNDWATER ABBREV
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
UR - NOT READ

BORING NO. B-1

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS

TEST BORING REPORT

BORING NO. B-1

DEPTH IN FEET	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	FIELD CLASSIFICATION AND REMARKS
				LEAN CLAY (CL); medium plasticity; very dark grayish brown mottled with very dark gray and dark grayish brown slightly mottled with dark red; wet; stiff. 21.0'
				LEAN CLAY (CL); medium plasticity; grayish brown mottled with dark yellowish red and gray; wet; stiff. 22.0'
	2 4 6 6	SS-3	22.0' ---- 24.0'	LEAN TO FAT CLAY (CL/CH); medium plasticity; gray heavily mottled with dark yellowish red; wet; stiff.
25				
				Base of boring @ 25.0 feet
30				
35				
40				
45				

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE ID.		COMPONENT %		GROUNDWATER ABBREV
0-3	VERY LOOSE	0-1	VERY SOFT	SS	SPLIT SPOON	MOSTLY	50-100 %	WD - WHILE DRILLING
4-9	LOOSE	2-4	SOFT	U	TUBE	SOME	30-45 %	NE - NOT ENCOUNTERED
10-29	MEDIUM DENSE	5-8	FIRM	CA	CALIFORNIA	LITTLE	15-25 %	UR - NOT READ
30-49	DENSE	9-15	STIFF	G	GRAB SAMPLE	FEW	5-10 %	
>49	VERY DENSE	16-30	VERY STIFF	X	OTHER	TRACE	< 5 %	
		>30	HARD	NR	NO RECOVERY			BORING NO. B-1

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS

TEST BORING REPORT

BORING NO. B-2 (Sta. 50+50; 10' Rt.)

PROJECT: Beal Slough Trunk Sewer Phase II
CLIENT: City of Lincoln
DRILLING CONTRACTOR: HWS
EQUIPMENT USED: CME 55

JOB NO. 2003-0356
PAGE NO. 1 of 2
LOCATION: See Plans
ELEVATION: 1207.0 (USGS)
DATE START: 3/31/04
DATE FINISH: 3/31/04
DRILLER: JL
PREPARED BY: A. Phillips

GROUNDWATER		DEPTH TO:			CASING	SAMPLER	CORE BARREL
DATE	HRS AFTER COMP	WATER	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE		
3/31	0	22.3'	-	25.5'	SIZE ID		
					HAMMER WT		
					HAMMER FALL		

DEPTH IN FEET	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	FIELD CLASSIFICATION AND REMARKS
				LEAN CLAY (CL); trace of fine sand; medium plasticity; very dark grayish brown to black mottled with dark grayish brown; moist; stiff. -MODERN ALLUVIUM- 2.7'
				LEAN CLAY (CL) ; medium plasticity; black ; moist ; firm ; very porous. -ALLUVIAL TOPSOIL- 5.0'
5				LEAN CLAY (CL); medium plasticity; very dark grayish brown; very moist; firm. -ALLUVIUM- 7.0'
				LEAN CLAY (CL); with few thin silt seams; medium plasticity; very dark grayish brown mottled with grayish brown; very moist; firm. 8.8'
		U-1	8.0' ---- 10.0'	LEAN CLAY (CL) ; medium plasticity ; very dark brown slightly mottled with dark grayish brown and grayish brown ; moist, firm. 10.5'
10				LEAN CLAY (CL); with abundant silt sand seams; medium plasticity; dark brownish gray mottled with very dark grayish brown; moist; medium stiff. 11.5'
				LEAN CLAY (CL); trace of gravel; 10-15% fine to coarse sand; medium plasticity; very dark gray slightly mottled with yellowish brown; moist; firm. 12.5'
				LEAN CLAY (CL); with few thin silt seams; medium plasticity; grayish brown heavily mottled with brown and dark grayish brown ; moist ; firm. 15.0'
15				Same as above. (CL) 15.5'
				LEAN TO FAT CLAY (CL/CH); medium to high plasticity; dark gray heavily mottled with olive brown and gray; moist; stiff. 17.0'
		U-2	17.0' ---- 19.0'	Same as above except dark grayish brown mottled with very dark gray, dark yellowish red and grayish brown. (CL/CH) 17.8'
20				LEAN CLAY (CL); medium plasticity; very dark grayish brown mottled with dark grayish brown, very dark gray and dark yellowish red ; very moist, stiff.

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE ID.		COMPONENT %		GROUNDWATER ABBREV
0-3	VERY LOOSE	0-1	VERY SOFT	SS	SPLIT SPOON	MOSTLY	50-100 %	WD - WHILE DRILLING
4-9	LOOSE	2-4	SOFT	U	TUBE	SOME	30-45 %	NE - NOT ENCOUNTERED
10-29	MEDIUM DENSE	5-8	FIRM	CA	CALIFORNIA	LITTLE	15-25 %	UR - NOT READ
30-49	DENSE	9-15	STIFF	G	GRAB SAMPLE	FEW	5-10 %	
>49	VERY DENSE	16-30	VERY STIFF	X	OTHER	TRACE	< 5 %	
		>30	HARD	NR	NO RECOVERY			BORING NO. B-2

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS

TEST BORING REPORT

BORING NO. B-2

DEPTH IN FEET	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	FIELD CLASSIFICATION AND REMARKS
				LEAN TO FAT CLAY (CL/CH); medium to high plasticity; very dark gray mottled with dark yellowish red and black; moist; stiff to very stiff. 21.5'
				FAT CLAY (CH); high plasticity; brownish gray heavily mottled with very dark gray and strong brown; moist; stiff to very stiff. 22.3'
				Same as above except wet. (CH) 24.5'
25	3 3 4 4	SS-3	23.5' ---- 25.5'	LEAN CLAY (CL); medium plasticity; light brownish gray slightly mottled with black and yellowish red; wet; firm.
				Base of boring @ 25.5 feet
30				
35				
40				
45				

BLOWS/FT	DENSITY
0-3	VERY LOOSE
4-9	LOOSE
10-29	MEDIUM DENSE
30-49	DENSE
>49	VERY DENSE

BLOWS/FT	CONSISTENCY
0-1	VERY SOFT
2-4	SOFT
5-8	FIRM
9-15	STIFF
16-30	VERY STIFF
>30	HARD

SAMPLE ID.	
SS	SPLIT SPOON
U	TUBE
CA	CALIFORNIA
G	GRAB SAMPLE
X	OTHER
NR	NO RECOVERY

COMPONENT %	
MOSTLY	50-100 %
SOME	30-45 %
LITTLE	15-25 %
FEW	5-10 %
TRACE	< 5 %

GROUNDWATER ABBREV
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
UR - NOT READ

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS

TEST BORING REPORT

BORING NO. B-3 (Sta. 61+50)

PROJECT: Beal Slough Trunk Sewer Phase II
CLIENT: City of Lincoln
DRILLING CONTRACTOR: HWS
EQUIPMENT USED: CME 55

JOB NO. 2003-0356
PAGE NO. 1 of 2
LOCATION: See Plans
ELEVATION: 1212.9 (USGS)
DATE START: 3/31/04
DATE FINISH: 3/31/04
DRILLER: JL
PREPARED BY: A. Phillips

GROUNDWATER		DEPTH TO:			CASING	SAMPLER	CORE BARREL
DATE	HRS AFTER COMP	WATER	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE		
3/31	0	9.2'	-	25.5'	SIZE ID		
					HAMMER WT		
					HAMMER FALL		

DEPTH IN FEET	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	FIELD CLASSIFICATION AND REMARKS
				LEAN CLAY (CL); trace of fine sand; medium plasticity; very dark grayish brown mottled with black; moist; firm. -FILL- 1.5'
				LEAN CLAY (CL) ; medium plasticity ; black ; moist ; firm ; porous. -ALLUVAIL TOPSOIL- 3.0'
5				LEAN CLAY (CL) ; medium plasticity ; very dark grayish brown ; moist ; very stiff ; porous. -ALLUVIUM- 5.0'
				FAT CLAY (CH); high plasticity; black; moist; very stiff. 6.5'
				LEAN CLAY (CL); medium plasticity; very dark grayish brown; dry to moist; very stiff. 7.5'
				LEAN CLAY (CL); medium plasticity; dark grayish brown heavily mottled with very dark gray and dark yellowish red; moist; stiff. 9.2'
10				Same as above except wet. (CL) 10.0'
				Same as above except firm. (CL) 12.0'
		U-1	12.0' --- 14.0'	LEAN CLAY (CL); with few thin silt seams; medium plasticity; dark grayish brown mottled with very dark grayish brown and light grayish brown; wet; firm. 13.2'
15				LEAN CLAY (CL); medium plasticity; very dark grayish brown mottled with grayish brown slightly mottled with very dark gray and dark red ; wet ; firm. 15.0'
				LEAN TO FAT CLAY (CL/CH); medium to high plasticity; dark grayish brown heavily mottled with very dark grayish brown slightly mottled with very dark gray and dark yellowish red; wet; stiff. 17.4'
		U-2	16.0' --- 18.0'	SILTY SAND (SM); 70-80% fine to medium sand; 20-30% silty nonplastic fines; dark grayish brown; wet; medium dense. 17.7'
20				FAT CLAY (CH); high plasticity; very dark grayish brown mottled with very dark gray; wet ; stiff.

BLOWS/FT	DENSITY
0-3	VERY LOOSE
4-9	LOOSE
10-29	MEDIUM DENSE
30-49	DENSE
>49	VERY DENSE

BLOWS/FT	CONSISTENCY
0-1	VERY SOFT
2-4	SOFT
5-8	FIRM
9-15	STIFF
16-30	VERY STIFF
>30	HARD

SAMPLE ID.	
SS	SPLIT SPOON
U	TUBE
CA	CALIFORNIA
G	GRAB SAMPLE
X	OTHER
NR	NO RECOVERY

COMPONENT %	
MOSTLY	50-100 %
SOME	30-45 %
LITTLE	15-25 %
FEW	5-10 %
TRACE	< 5 %

GROUNDWATER ABBREV
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
UR - NOT READ

BORING NO. B-3

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS

TEST BORING REPORT

BORING NO. B-3

DEPTH IN FEET	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	FIELD CLASSIFICATION AND REMARKS
				LEAN CLAY (CL); medium plasticity; dark grayish brown; wet; stiff.
				22.5'
				FAT CLAY (CH); high plasticity; very dark gray mottled with dark red; wet; stiff.
				23.5'
	3		23.5'	Same as above except gray heavily mottled with dark yellowish red and black; very stiff. (CH)
25	4	SS-3	----	
	5		25.5'	
	6			25.0'
				LEAN CLAY(CL);medium plasticity; gray mottled with dark yellowish red and black;wet;stiff.
				Base of boring @ 25.5 feet
30				
35				
40				
45				

BLOWS/FT	DENSITY
0-3	VERY LOOSE
4-9	LOOSE
10-29	MEDIUM DENSE
30-49	DENSE
>49	VERY DENSE

BLOWS/FT	CONSISTENCY
0-1	VERY SOFT
2-4	SOFT
5-8	FIRM
9-15	STIFF
16-30	VERY STIFF
>30	HARD

SAMPLE ID.	
SS	SPLIT SPOON
U	TUBE
CA	CALIFORNIA
G	GRAB SAMPLE
X	OTHER
NR	NO RECOVERY

COMPONENT %	
MOSTLY	50-100 %
SOME	30-45 %
LITTLE	15-25 %
FEW	5-10 %
TRACE	< 5 %

GROUNDWATER ABBREV
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
UR - NOT READ

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS

TEST BORING REPORT

BORING NO. B-4 (Sta. 89+50)

PROJECT: Beal Slough Trunk Sewer Phase II
CLIENT: City of Lincoln
DRILLING CONTRACTOR: HWS
EQUIPMENT USED: CME 55

JOB NO. 2003-0356
PAGE NO. 1 of 2
LOCATION: See Plans
ELEVATION: 1221.4 (USGS)
DATE START: 3/31/04
DATE FINISH: 3/31/04
DRILLER: JL
PREPARED BY: A. Phillips

GROUNDWATER		DEPTH TO:			CASING	SAMPLER	CORE BARREL
DATE	HRS AFTER COMP	WATER	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE		
3/31	0	12.0'	-	24.5'	SIZE ID		
					HAMMER WT		
					HAMMER FALL		

DEPTH IN FEET	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	FIELD CLASSIFICATION AND REMARKS
				LEAN CLAY (CL); trace of gravel; 5-10% fine to coarse sand; medium plasticity; very dark grayish brown mottled with olive brown; moist; firm. -FILL- 1.0'
				LEAN CLAY (CL) ; trace of fine to coarse sand ; medium plasticity ; very dark gray ; moist ; very stiff. 2.0'
				Same as above except stiff. (CL) 4.5'
5				LEAN CLAY (CL) ; trace of fine sand ; medium plasticity ; black ; very moist ; firm ; porous. -ALLUVIAL TOPSOIL- 6.4'
		U-1	5.5' ---- 7.5'	LEAN CLAY (CL); medium plasticity; very dark grayish brown; slightly mottled with black and dark grayish brown; moist; stiff. -ALLUVIUM- 9.5'
10				Same as above except firm. (CL) 10.0'
				LEAN CLAY (CL); 5-10% fine to medium sand; with thin silt and silty sand seams; medium plasticity; very dark brown; very moist; firm. 11.5'
				SILT (ML); low plasticity; dark gray; moist; very loose. 12.0'
				Same as above except wet. (CL) 13.0'
		U-2	13.5' ---- 15.0'	LEAN CLAY (CL); 5-10% fine to medium sand; medium plasticity; light olive brown heavily mottled with light grayish brown and dark brown ; wet ; firm. 14.5'
15				LEAN CLAY WITH SAND(CL); 15-25% fine to medium sand; dark brown; wet; firm. 15.0'
				SANDY LEAN CLAY (CL); trace of fine to coarse gravel; 30-40% fine to coarse sand; medium plasticity; dark reddish brown; wet; firm. 17.5'
				SANDY LEAN CLAY (CL); 30-40% fine sand; medium plasticity; olive brown; wet; stiff. 19.0'
20				CLAYEY SAND (SC); 55-65% fine to medium sand; 35-45% fines with medium plasticity; yellowish brown; wet; medium dense.

BLOWS/FT	DENSITY
0-3	VERY LOOSE
4-9	LOOSE
10-29	MEDIUM DENSE
30-49	DENSE
>49	VERY DENSE

BLOWS/FT	CONSISTENCY
0-1	VERY SOFT
2-4	SOFT
5-8	FIRM
9-15	STIFF
16-30	VERY STIFF
>30	HARD

SAMPLE ID.	
SS	SPLIT SPOON
U	TUBE
CA	CALIFORNIA
G	GRAB SAMPLE
X	OTHER
NR	NO RECOVERY

COMPONENT %	
MOSTLY	50-100 %
SOME	30-45 %
LITTLE	15-25 %
FEW	5-10 %
TRACE	< 5 %

GROUNDWATER ABBREV
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
UR - NOT READ

BORING NO. B-4

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS

TEST BORING REPORT

BORING NO. B-4

DEPTH IN FEET	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	FIELD CLASSIFICATION AND REMARKS
				POORLY-GRADED SAND WITH SILT (SP-SM); 85-95% fine to medium sand with a trace of coarse sand and fine gravel; 5-15% silty nonplastic fines; with clayey sand seams; dark yellowish brown; wet; medium dense.
	5 7 13 6	SS-3	22.5' ---- 24.5'	
25				Base of boring @ 25.0 feet
30				
35				
40				
45				

BLOWS/FT	DENSITY
0-3	VERY LOOSE
4-9	LOOSE
10-29	MEDIUM DENSE
30-49	DENSE
>49	VERY DENSE

BLOWS/FT	CONSISTENCY
0-1	VERY SOFT
2-4	SOFT
5-8	FIRM
9-15	STIFF
16-30	VERY STIFF
>30	HARD

SAMPLE ID.	
SS	SPLIT SPOON
U	TUBE
CA	CALIFORNIA
G	GRAB SAMPLE
X	OTHER
NR	NO RECOVERY

COMPONENT %	
MOSTLY	50-100 %
SOME	30-45 %
LITTLE	15-25 %
FEW	5-10 %
TRACE	< 5 %

GROUNDWATER ABBREV
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
UR - NOT READ

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS

TEST BORING REPORT

BORING NO. B-5 (Sta. 102+25; 5'Rt.)

PROJECT: Beal Slough Trunk Sewer Phase II
CLIENT: City of Lincoln
DRILLING CONTRACTOR: HWS
EQUIPMENT USED: CME 55

JOB NO. 2003-0356
PAGE NO. 1 of 2
LOCATION: See Plans
ELEVATION: 1224.5 (USGS)
DATE START: 3/31/04
DATE FINISH: 3/31/04
DRILLER: JL
PREPARED BY: A. Phillips

GROUNDWATER		DEPTH TO:			CASING	SAMPLER	CORE BARREL
DATE	HRS AFTER COMP	WATER	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE		
3/31	0	17.7'	-	19.0'	SIZE ID		
					HAMMER WT		
					HAMMER FALL		

DEPTH IN FEET	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	FIELD CLASSIFICATION AND REMARKS
				LEAN CLAY (CL); trace of fine sand; medium plasticity; very dark grayish brown to black heavily mottled with dark grayish brown; moist; stiff. -FILL- 1.5'
				Same as above except moist and very stiff. (CL) 4.0'
5				LEAN CLAY(CL) ; medium plasticity ; black ; moist ; stiff ; porous. -ALLUVIAL TOPSOIL- 5.5'
				LEAN CLAY (CL); medium plasticity; black; moist to very moist; stiff. -ALLUVIUM- 6.5'
				LEAN CLAY (CL); medium plasticity; black; moist; firm. 9.0'
10		U-1	9.0' ---- 11.0'	LEAN CLAY(CL) ; trace of fine sand ; medium plasticity ; very dark grayish brown to black ; moist ; firm ; porous. 9.7'
				LEAN CLAY (CL); trace of fine sand; medium plasticity; very dark grayish brown slightly mottled with grayish brown and black; moist; firm. 11.0'
				LEAN CLAY (CL); medium plasticity; very dark gray; moist; firm. 13.5'
15				LEAN CLAY WITH SAND (CL) ; trace of fine to coarse gravel ; 15-25% fine to coarse sand ; with clayey sand seams ; medium plasticity ; very dark gray ; moist ; stiff. 15.0'
				LEAN CLAY (CL); medium plasticity; very dark grayish brown; moist; stiff. 17.0'
		U-2	17.0' ---- 19.0'	LEAN CLAY (CL); medium plasticity; very dark grayish brown heavily mottled with dark grayish brown and olive brown; very moist; firm. 17.7'
				LEAN CLAY (CL); medium plasticity; grayish brown mottled with dark yellowish brown slightly mottled with very dark gray and black ; wet, firm.
20				Base of boring @ 19.0 feet

BLOWS/FT	DENSITY
0-3	VERY LOOSE
4-9	LOOSE
10-29	MEDIUM DENSE
30-49	DENSE
>49	VERY DENSE

BLOWS/FT	CONSISTENCY
0-1	VERY SOFT
2-4	SOFT
5-8	FIRM
9-15	STIFF
16-30	VERY STIFF
>30	HARD

SAMPLE ID.	
SS	SPLIT SPOON
U	TUBE
CA	CALIFORNIA
G	GRAB SAMPLE
X	OTHER
NR	NO RECOVERY

COMPONENT %	
MOSTLY	50-100 %
SOME	30-45 %
LITTLE	15-25 %
FEW	5-10 %
TRACE	< 5 %

GROUNDWATER ABBREV
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
UR - NOT READ

BORING NO. B-5

SUMMARY OF LABORATORY TEST RESULTS

Beal Slough Trunk Sewer Phase II
Lincoln, Nebraska
OA Project #: 2003-0356

BORING No.	SAMPLE I.D.	SAMPLE DEPTH (ft.)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	SAT. (%)	UNCONFINED COMPRESSION		ATTERBERG LIMITS			USCS CLASS.	P-200 (% PASSING)
							STRENGTH (tsf)	STRAIN (%)	LL	PL	PI		
B-1	U-1	5.0-6.0'	19.6	91.3	0.846	62.5							
B-2	U-1	8.5-9.5'	29.3	83.4	1.045	75.8			37	18	19	CL	
	U-2	17.5-18.5'	26.5	95.6	0.762	93.9	1.76	3.2					
B-3	U-1	12.0-13.0'	28.8	90.4	0.864	90.0							96.4
B-4	U-1	5.8-6.9'	23.7	91.6	0.839	76.3	0.81	1.6					
	U-2	13.5-14.6'	29.4	90.8	0.856	92.7	0.85	2.6					76.6
B-5	U-1	9.1-10.2'	24.6	84.9	0.984	67.4	0.82	1.7					
	U-2	17.4-18.6'	28.5	93.4	0.803	95.8	0.56	1.4	47	21	26	CL	

Hydrometer Analysis

Beal Slough
Lincoln, Nebraska
Project No.: 2003-0356
B-12 U-2(13.5-14.6')

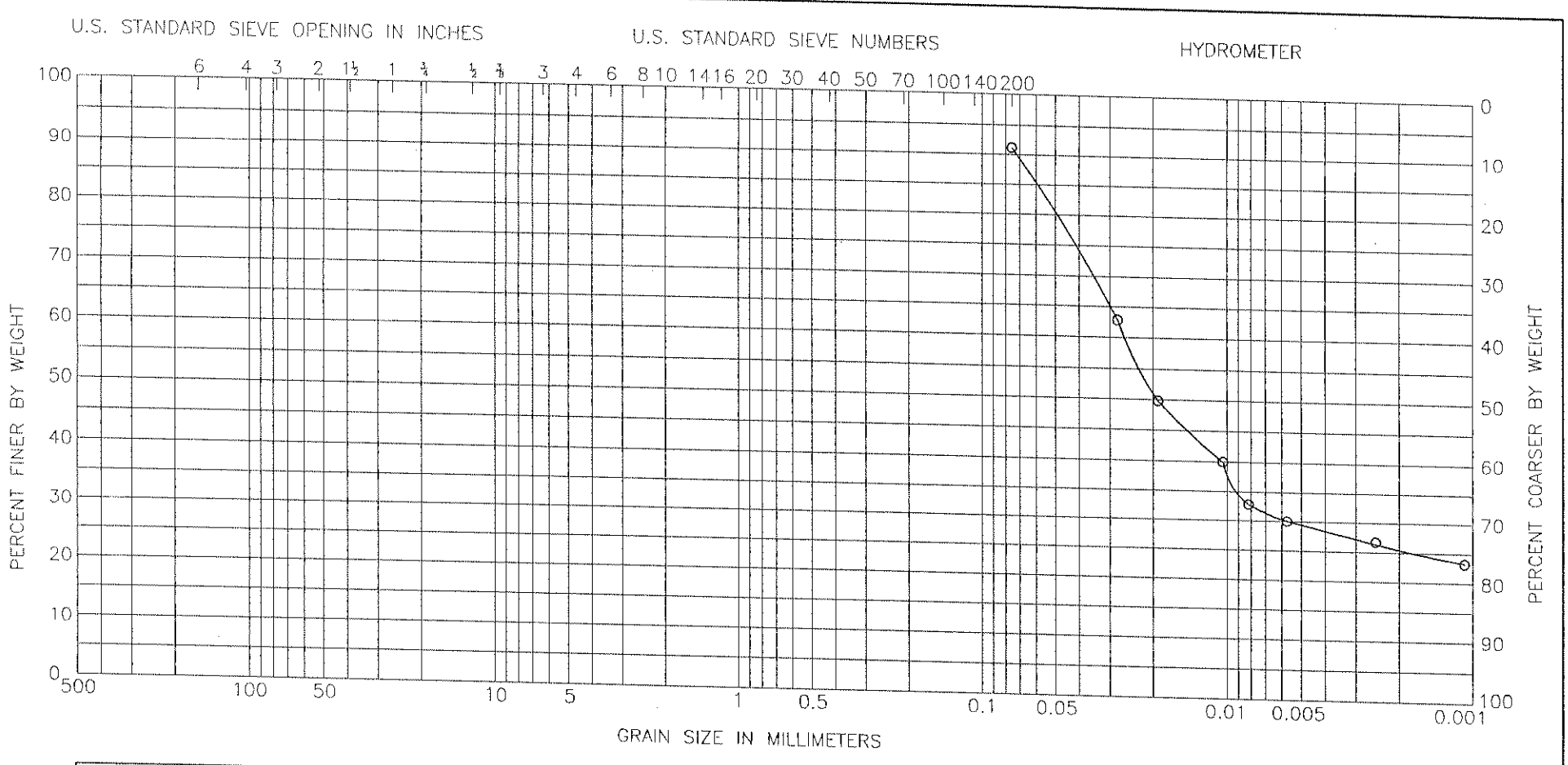
Time (min)	Temperture (celsius)	Actual Hydrometer Reading	Correction Factor	R, Corrected Hydrometer Reading	Ws (grams)	Percent Finer (%)	L (cm)	K	Diameter (mm)
2	25	1.0240	0.004833	1.019167	48.36	62.9	10.00	0.01267	0.0283
5	25	1.0200	0.004833	1.015167	48.36	49.8	11.00	0.01267	0.0188
15	25	1.0170	0.004833	1.012167	48.36	40.0	11.80	0.01267	0.0112
30	25	1.0150	0.004833	1.010167	48.36	33.4	12.30	0.01267	0.0081
60	25	1.0140	0.004833	1.009167	48.36	30.1	12.60	0.01267	0.0058
304	25	1.0130	0.004833	1.008167	48.36	26.8	12.90	0.01267	0.0026
1440	25	1.0120	0.004833	1.007167	48.36	23.5	13.10	0.01267	0.0012

Fractional Components:

Gravel/Sand based on #4 Sieve
Sand/Fines based on #200 Sieve
% +3 in. = 0.0
% Gravel = 0.0
% Sand = 8.5
% Silt = 62.5
% Clay = 29.0

Diameters:

D85 = 0.059
D60 = 0.027
D50 = 0.019
D30 = 0.006
D10 = N.A.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Boring No.	Sample No.	Elev./Depth	Classification	LL	PL	PI	
B-4	U-2	13.5-14.6'	Lean clay with some	N.A.	N.A.	N.A.	Project: Beal Slough
			fine sand				Location: Lincoln, Nebraska
							Job Number: 2003-0356
							Date: 6/7/04

OLSSON ASSOCIATES

REPORT OF SOIL ANALYSIS