O'BRIEN & ASSOCIATES, INC.
CONSULTING ENGINEERS
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April 2, 2014
Revised July 31, 2014
Revised October 21, 2014
Revised April 16, 2015

HNTB
One South Wacker Drive
Suite 900
Chicago, Illinois 60606

Attention: Mr. John Lukowski, P.E.

Job No. 13657

Re: Structure Geotechnical Report _Revision 4
Existing SN 016-2124/Proposed SN 016-2280
East River Road Bridge over I-90
Section (1517R-1&1617B)13, Station 73+75
Cook County, Illinois

Dear Mr. Lukowski:

The following report presents the geotechnical analysis and recommendations for the new East River Road Bridge over I-90. A total of seven (7) borings (SB-07 to SB-13) were completed for the proposed improvement. In addition, pressuremeter testing was performed at two (2) boring locations (SB-10 and SB-11). The results of the borings and pressuremeter testing, along with a site diagram, location diagram, soil profiles and laboratory test results, are included in this report.

SITE AND PROJECT DESCRIPTION

The proposed improvement involves the construction of a new lengthened roadway bridge to accommodate the future widening of I-190. The project site is shown on the site location map included in Appendix A. The work is being performed as part of the construction of the new Cumberland Flyover. The roadway will be closed and traffic detoured for construction of the new bridge.

The existing bridge was constructed in 1958 and was a 40'-0" wide five span structure with a 12'-0' equestrian lane supported on concrete piers and bent type abutments with pile foundations. The bridge was widened to the east an additional 23'-7" in 1981. Plans from the 1980 bridge widening 1981 show the footing elevation of the widened piers at 628 (3.5' thick footing) with the piers supported on 30 ton concrete piles. The original plans show that the columns at each pier (five columns per pier) are supported on individual pile supported footings 9'-6" x 12'-6" in size with 3'-3" spacing between each footing. The bottom of footing elevation is also 628 (3.5' thick footing). The original piles are 30 ton metal shell cast-in-place concrete piles that have a design length of 16'-0". The existing piles and foundations will remain in place unless there is a conflict with the new foundations.

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Existing piers 2 and 4 will only need to be partially removed because no new piers are to be constructed at these locations. Existing Pier 1 will need to be removed to install the new foundations. The existing abutments are in cut areas and will require removal of the existing foundations including the existing piles.

The new structure will be a 78'-7" wide 3-span structure with a concrete slope wall and stub abutment on the south and a tall closed abutment with concrete wingwalls on the north. Pier 2 will be adjacent to the CTA tracks (north side) at the location of existing pier 3 and driven pile foundation cannot be used at this location because of access, utility and CTA tracks limitations. The bottom of foundation elevation is 648.0 for the south abutment, 632.08 for Pier 1, 632.5 for Pier 2 and 631.56 for the north abutment.

Factored foundation loads are 1668 kips for the south abutment, 3947 kips for pier 1, 4243 kips for pier 2 and 3324 kips for the north abutment. The Type, Size and Location (TS&L) drawings for the East River Road Bridge are included in Appendix G.

SUBSURFACE INVESTIGATION PROCEDURES

The soil boring program was developed based on the requirements in the Illinois Department of Transportation Geotechnical Manual. The soil boring locations and depths were reviewed and approved by IDOT. The boring locations were field located by O'Brien & Associates, Inc. personnel at the proposed locations using hand held GPS equipment. The boring elevations and stations and offsets were obtained from topographic information provided by HNTB. The boring locations are shown on the location diagram included in Appendix B and the borings logs are included in Appendix C.

The borings were performed during the period December 9 through December 18, 2013, using ATV or truck mounted drill rigs equipped with a CME automatic hammer. Borings were advanced by hollow stem augers to 10 to 15 feet; below this depth, rotary-wash techniques were used to advance the boreholes until bedrock was encountered. Representative samples were obtained by employing split spoon sampling procedures in accordance with AASHTO T-206. Cohesive samples were tested for unconfined compressive strength using an IDOT modified RIMAC test device and/or calibrated penetrometer in the field. At all boring locations, with the exception of boring SB-10, the borings were extended an additional 0.5' to 4.0' into apparent bedrock until what appeared to be sound bedrock was present, where rock cores were obtained using a 10' long NX size double tube swivel type core barrel. Samples obtained in the field were returned to our laboratory for further examination and testing.

The pressuremeter testing was performed on March 21 and 22, 2014 at the boring SB-10 and SB-11 locations. The soil conditions encountered in the pressuremeter borings was similar to the soil conditions encountered in borings SB-10 and SB-11. The results of the pressuremeter testing are included in Appendix D.

LAB TESTING PROGRAM

The soil test procedures were performed in accordance with the procedures discussed in the Illinois Department of Transportation (IDOT) Geotechnical Manual. The results of the soils

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testing program, along with a visual classification of the material based upon both the IDOT textural classification and an estimate of the AASHTO soil group classification system are indicated on the boring logs. All split spoon soil samples obtained from the drilling operation were visually classified in the field and in the laboratory.

In addition to the moisture content testing in the laboratory, Particle Size Analysis (AASHTO T-88) or Grain Size Analysis (AASHTO T-311) tests were performed on representative samples obtained in the borings. The results are included in Appendix E.

SOIL AND GROUNDWATER CONDITIONS

The results of the borings are summarized on the soil profiles presented in Appendix B and presented on the boring logs included in Appendix C. As indicated on the logs, variable clay and granular fills were encountered to a depth range of 6.5' to 30.5' below ground surface which corresponds to an approximate elevation of 618 to 629. At borings SB-07 and SB-12 an approximately 1.0' thick layer of asphalt and stone was encountered at elevation 632 to 633 which may be related to a buried, remnant pavement structure or pavement section not removed during the original embankment construction. None of the fill materials were noted to have high contents of topsoil, organics, wood, debris or rubble. The fill materials were generally underlain by stiff to hard clay and silty clay loam soils that were generally underlain by dense to very dense silts to sandy loams that were encountered within an elevation range of 563 to 570. At all borings except for boring SB-08, a 4.0' to 6.0' layer of medium dense to dense sand and/or sand and gravel was encountered within an elevation range of 623 to 626 and at borings SB-09 to SB-11 and SB-13, a 5.0' to 13.0' thick layer of medium to very dense silt to silty loam was encountered within an elevation range of 588 to 594. What appeared to be bedrock was encountered within a depth range of 78.5' to 106.0' below ground surface which corresponds to an elevation of 542.6 at boring SB-13 to 557.9 at boring SB-08. The bedrock was noted to be a slightly to moderately fractured Niagarian Dolomite that was variably fractured with Rock Quality Description (RQDs) ranging from 24% to 69% and compressive strengths ranging from 570 tsf to 1,190 tsf.

Accurate water level readings could not be obtained because rotary drilling methods were used to perform the borings. However, based on local hydrogeologic information and the soil color change from brown and gray to gray noted in the native soils, it is estimated that the phreatic surface is at or below a depth of approximately 11.5' to 32.0' below the existing ground surface which corresponds to an elevation of approximately 618 to 626. Longer term observations using piezometers would be necessary to more accurately establish groundwater conditions at the site. Fluctuations in the amount of water accumulated and in the hydrostatic water table can be anticipated depending upon variations in precipitation and surface runoff.

ANALYSIS AND RECOMMENDATIONS

General Geotechnical Analysis

According to the AASHTO LRFD Bridge Design Specification 2012, the project site has a horizontal Response Spectral Acceleration Coefficient of 0.035 (S_1, AASHTO Figure: 3.10.2.1-3) at a period of 1.0 second and 5% critical dampening and 0.089 (S_s, AASHTO Figure: 3.10.2.1-2)

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at a period of 0.2 seconds and 5% critical dampening and a Site Class: C according to the soil conditions. This results in a Design Spectral Acceleration at 1.0 second S_{D1} = 0.060 and at 0.2 seconds S_{Ds} = 0.108 and a Seismic Performance Zone = 1. The project site is considered to be in a low seismic area and is considered a non-extreme event. A summary of the seismic data to be used for design is summarized below:

Seismic Data Summary

Site Class	C
S_{D1}	0.060
S_{Ds}	0.108
Seismic Performance Zone	1

No significant new fill will be placed during the construction of the proposed improvements, with cuts occurring at both the north and south abutments, and settlement is not expected to be a concern. Downdrag is not expected to impact the design of the new bridge.

Slope stability analyses were performed using the Xstabl slope stability program based on the results of the borings and the embankment heights provided on the plans. We calculate a minimum Factor of Safety greater than 1.7. This is greater than the Factor of Safety (FOS) of 1.7 for a cut embankment per IDOT requirements. Liquefiable layers and scour (no waterways present) will not impact the design of the new bridge.

Bridge Foundation Recommendations

The borings show that the soil stratigraphy typically consist of an upper layer of higher moisture content stiff to very stiff clays underlain by medium dense to very dense sand layer with generally very stiff clays below this upper sand. The very stiff clays extended to approximately elevation 625 to 630 where a medium dense to very dense silt was present. The silt was underlain by stiff to hard clays that extended to an elevation of approximately 563 to 570, where very dense silt to sandy loam was encountered. An apparent old pavement was encountered in borings SB-07 and SB-12, and it is possible that the original East River Road pavement was left in place when the bridge and bridge embankments were originally constructed in 1957.

Based on the soil conditions, abutment and pier locations, and site construction constraints, footing foundations are not considered to be a feasible foundation type.

Pier 2 Foundation Recommendations

It is our understanding that piles foundations are not considered feasible because of site constraints, including utilities, maintenance of traffic limitations and the CTA tracks. Feasible foundation types include drilled shaft or micropile foundations. Based on information regarding the existing bridge foundation, a micropile foundation is the preferred foundation alternative.

For a drilled shaft foundation at Pier 2, the base of the shafts should be situated within the very stiff clay present at a depth of 25-ft below ground surface is recommended. Based on the results of the pressuremeter testing, the foundation design can be based on a nominal bearing resistance of 30 ksf and a factored bearing resistance of 12 ksf. Temporary casing will be required to depths of 20-ft to 23-ft below ground surface, which may require the drilled shaft to be extended slightly deeper that 25-ft to form a bell. The drilled shaft should also be founded at

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the highest elevation possible to avoid encountering the underlying silt soils. The calculated settlements from the pressuremeter results for a drilled shaft foundation (assuming 8 shafts at 7'-0" bell and a total load of 3650 kips) is 0.5-in, not including any elastic deformation of the caisson. It is also recommended that the shafts be a minimum diameter of 3'-0" in case any widening of the bell is required because of field conditions. Copies of the bearing and settlement calculations are included in Appendix D. A portion of the existing footings and a number of the existing piles will need to be removed for a drilled shaft foundation. In addition, additional temporary earth retention will be required for the removal of the existing foundations.

If micropiles are used, removal of the existing footing will not be required. In addition, the micropile drilling equipment will have less of an impact on adjacent CTA services. The plans show that the top of the existing footings for both the original and widened portions are at elevation 631.5 and the proposed bottom of the new footing is at elevation 632.5. The existing concrete footings will need to be cored for locations where the micropiles are located over the existing footings, but the footings will not need to be removed. It may also be necessary to slightly offset the location of some micropiles where the locations conflict with the existing piles. Provisions should be included in the design so that the micropiles can be offset or additional micropiles installed in case a conflict occurs. A plan note should be included on the drawings indicating that the micropiles may need to be relocated.

Micropiles can be extended into the stiff to very stiff clays, dense to very dense silts and loams or the underlying bedrock. Micropiles founded in bedrock will minimize the amount of coring through the existing foundations.

Gravity grouted micropiles can be evaluated using a nominal side friction value of 1.0 ksf in the stiff to very stiff clay soils, 2.0 ksf in the dense to very dense silts and 2.5 ksf in the very dense loams. Pressure grouted micropiles can be evaluated using a nominal side friction value of 1.5 ksf in the stiff to very stiff clay soils, 3.0 ksf in the dense to very dense silts and 3.5 ksf in the very dense loams. For micropiles drilled into the dolomite bedrock, the micropiles can be evaluated using a nominal side resistance of 25 ksf and nominal tip resistance of 260 ksf.

The factored resistance available should be based on a side resistance factor of 0.55 and a tip resistance factor of 0.50. If the micropile extends a sufficient distance into the rock, then the structural capacity of the micropile will govern the design.

If permanent steel reinforcement casing is used, the micropile pipe pile should have internal flush couple threaded joints and no external couplers should be allowed. For micropiles in bedrock, we recommend the pile be drilled at least two feet into dolomite bedrock. The settlement of rock-socketed micropiles is estimated to be less than ¼ inch or less in addition to the elastic deformation of the concrete in the micropile.

A special provision should be included for the installation and testing of the micropiles. As preferred by IDOT, a proof test should be performed on a production micropile and the verification test can be waved in favor of the proof test due to the uniformity of the soil and rock conditions and limited number of micropiles.

N. and S. Abutment and Pier 1 Foundation Recommendations

For the abutments and pier 1, friction pile foundations are recommended. Metal shell piles are preferred over H-piles because of the longer lengths required for H-piles and potential for

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greater variability in pile lengths due to the variability in density of the sand and silt deposits. The modified IDOT static method spreadsheet was used to estimate the pile lengths. The IDOT Pile Tables for both metal shell and H-piles are included in Appendix F.

At Pier 1, the existing concrete footing will be removed as required for the installation of the new piles. Where the existing piles conflict with the new piles, it will be necessary to remove the existing piles or include provisions in the design to offset the piles, possibly with the addition of additional piles. The plans should include provisions for pulling the existing piles or relocating existing piles and adding additional piles if needed.

Because of the upper dense sand layer encountered between approximately elevation 618 and 626, the design bearing resistance may be achieved before sufficient embedment is obtained at the north abutment. This sand layer was not found to be as dense at Pier 1 (borings SB-08 and SB-09), however, the displacement of the soil next to the existing Pier 1 piles may also result in resistance being achieved before sufficient embedment is obtained. We recommend that the plans show a minimum tip elevation for Pier and the North Abutment at an elevation 10' below the bottom of footing elevation and that all piles have a minimum shell wall thickness of 0.25". The piles should not be overstressed during driving to achieve the tip elevation and provisions should be included for pre-drilling if the pile cannot achieve the minimum tip elevation without being overstressed. The need for pre-drilling can be evaluated during the installation of the test pile. We do not recommend pre-drilling initially because, based on the estimated pile lengths from the IDOT pile tables, it should be possible to reach the minimum tip elevation without overstressing the piles.

An apparent pavement was encountered in borings SB-07 and SB-12 at what appears to be the old roadway elevation (approximately elevation 632 to 633). The pavement section did not appear to be very thick; however, split spoon refusal occurred in the apparent old pavement in both borings. Unless additional borings are performed to better determine the composition of the old pavement section (if present), we recommend that the piles at the south abutment be pre-drilled to elevation 630. Pre-drilling is only required at the south abutment. It should not be required at the north abutment because the pile foundation elevation is much lower (elevation 631.56). However, during excavation operations for the north abutment, the pile cap area should be potholed to elevation 630 to assure that no old pavement sections are present. If any old pavement sections are present, the old pavement should be removed prior to pile driving operations.

As per the IDOT Design Guide AGMU Memo 10.2, dated October 2011, the Washington State DOT (WSDOT) formula has replaced the FHWA Gates Formula as the standard method of construction verification. The modified IDOT static method was used to develop the SGR pile design tables using the IDOT Static Method spreadsheet. Nominal required bearing was calculated from LRFD skin-friction (with pile type correction factors) and end-bearing calculations. A value of 1.04 is used for Bias Factor Ratio (IG). A geotechnical resistance factor (ΦG) of 0.55 was used in the calculations.

The pile tables and graphs provided in this report are estimates and test piles should be used for final pile length selections. For the south abutment (SB-07), pile tables and graphs have been provided for the no pre-drill and pre-drill conditions.

We recommend that a minimum of one test pile be performed at each substructure unit. The

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piles should be driven until satisfactory driving resistance is developed in accordance with an appropriate pile driving formula. The test piles shall be driven to 110 percent of the Nominal Required Bearing indicated in the pile data information.

Lateral Soil Parameters

For the evaluation of the lateral loads on the pile foundations and the wingwall structures, we recommend that the soil properties on the following table be used:

Material	Approximate Elevation of Material	Unit Weight (pcf)	Drained Friction Angle (°)	Undrained Cohesion (psf)	Lateral Modulus of Subgrade Reaction (pci)	Strain
Clay Fill	Above 630	130	28	1000	230	0.008
Stiff to Very Stiff Clay	630 to 625	120	28	2000	700	0.006
Med Dense to Dense Sands	625 to 618	120	30	-	100	0.004
Stiff to Very Stiff Clay	618 to 595	130	28	2000	700	0.006
Medium Dense to Dense Silts	595 to 585	130	32	-	130	0.004
Stiff to Hard Clay	585 to 565	130	28	2000	700	0.006
Very Dense Silts and Sand	Below 565	130	35	-	175	0.004

Notes: Values recommended for use in design from L-pile Software Manual. Elevations are approximate, see boring logs for specific elevations

For the design of yielding walls, it is recommended that a lateral active earth pressure of 40 psf per foot of depth be used above the water table assuming a free-draining granular backfill is utilized. For cohesive soils, a lateral active earth pressure of 55 psf per foot should be used. For non-yielding walls with granular backfill, a lateral at-rest pressure of 50 psf per foot should be used, assuming proper drainage. For cohesive soils, a lateral at-rest pressure of 65 psf per foot should be used. Allowances should be made for any surcharge loads adjacent to the retaining structure. Permanent retaining walls should be provided with a drainage system placed against the back of the wall, and the bottom portion should be connected to a drain system.

Construction Considerations

During construction of the drilled shafts, care should be taken to assure that soils do not slough into the shaft and that voids do not occur during concrete placement. After the bearing material has been reached, belling, cleaning, testing and concrete placement should occur as quickly as possible. The caissons should be excavated and backfilled with concrete in one work-day shift. The actual foundation levels at each caisson location will need to be adjusted in the field based on observation and testing at each base.

The drilled shaft bell should have a base angle of at least 60 degrees (from horizontal) and the bell diameter should not exceed 3 times the shaft diameter. Drilled shaft construction should be performed in accordance with IDOT Standard Specifications, Section 516, Drilled Shafts.

For excavations for new Pier 1 (Existing Pier 1) and Existing Pier 4, the results of the borings indicate that a Temporary Soil Retention System should be used if a sloped excavation cannot

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be used or the existing embankment is not removed prior to excavation. At Existing Pier 2, the pier will be cut flush with the roadway or top of parapet/barrier wall and no earth retention will be required. The roadway adjacent to Existing Pier 2 will be resurfaced (up to 3-4 inches of scarification and overlay) and reconstructed. At Existing Pier 3 (new Pier 2), a Temporary Soil Retention System will be required, likely consist of braced sheet piling driven to the top of the existing footing. Depending upon the equipment used and work area available, it may be necessary to stage the temporary earth retention along with the installation of the micropiles. The chosen retaining wall type should be designed by an Illinois-licensed Structural Engineer.

At Pier 1, it appears that the piles will have to be driven after removal of the existing footings but before the fill material is placed on the existing piles that will remain. If the location of the new piles can be determined and any necessary adjustments in the new pile locations made or existing piles removed as required, it may be possible to backfill prior to driving the new piles. It should also be feasible to use a sloped excavation on the south side of the Pier to allow equipment access. If a granular backfill is used around the new piles, hand compaction techniques will likely be required. As an alternative, a controlled low strength fill material can be used to backfill around the new piles.

All excavations that extend greater than 4 feet in depth should be designed in accordance with OSHA regulations with properly sloped or braced sides to prevent excavation instability. Excavation safety is the responsibility of the contractor; however, we recommend that excavation sides be sloped at 1-1/2H:1V or flatter above the water table for this purpose. Stockpiles of material or equipment should not be placed near the top of excavation slopes.

All soils which become softened or loosened at the base of foundation excavation areas or subgrade areas should be carefully recompacted or removed prior to placement of foundation concrete or fill material. No foundation concrete or structural fill should be placed in areas of ponded water or frozen soil.

GENERAL QUALIFICATIONS

The analysis and recommendations presented in this report are based upon the data obtained from our soil borings performed at the indicated locations. This report does not reflect any variations that may occur between borings or across the site. In addition, the soil samples cannot be relied on to accurately reflect the strata variations that usually exist between sampling locations. The nature and extent of such variations may not become evident until construction. If variations appear evident, it will be necessary to reevaluate the recommendations of the report. In addition, it is recommended that O'Brien & Associates, Inc. be retained to perform construction observation and thereby provide a complete professional geotechnical engineering service through the observational method.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranties, either expressed or implied, are intended or made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by the geotechnical engineer. Also note that O'Brien & Associates, Inc. is not

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responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of the report's subsurface data or engineering analyses without the express written authorization of O'Brien & Associates, Inc.

If there are any questions regarding the information submitted herein, please do not hesitate to contact us.

Very truly yours,

O'BRIEN & ASSOCIATES, INC.

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Vice-President
dixonobrien@comcast.net
DOB/ck
enc.

11/30/15

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LIST OF APPENDICES

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APPENDIX A

Site Location Map

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

PLANS FOR PROPOSED

Section No.: (1517R-1&1617B)13
I-190 CUMBERLAND FLYOVER
EAST RIVER ROAD ROAD OVER I-90
STRUCT. NO. 016-2124
COOK COUNTY
OBA JOB NO.: 13657

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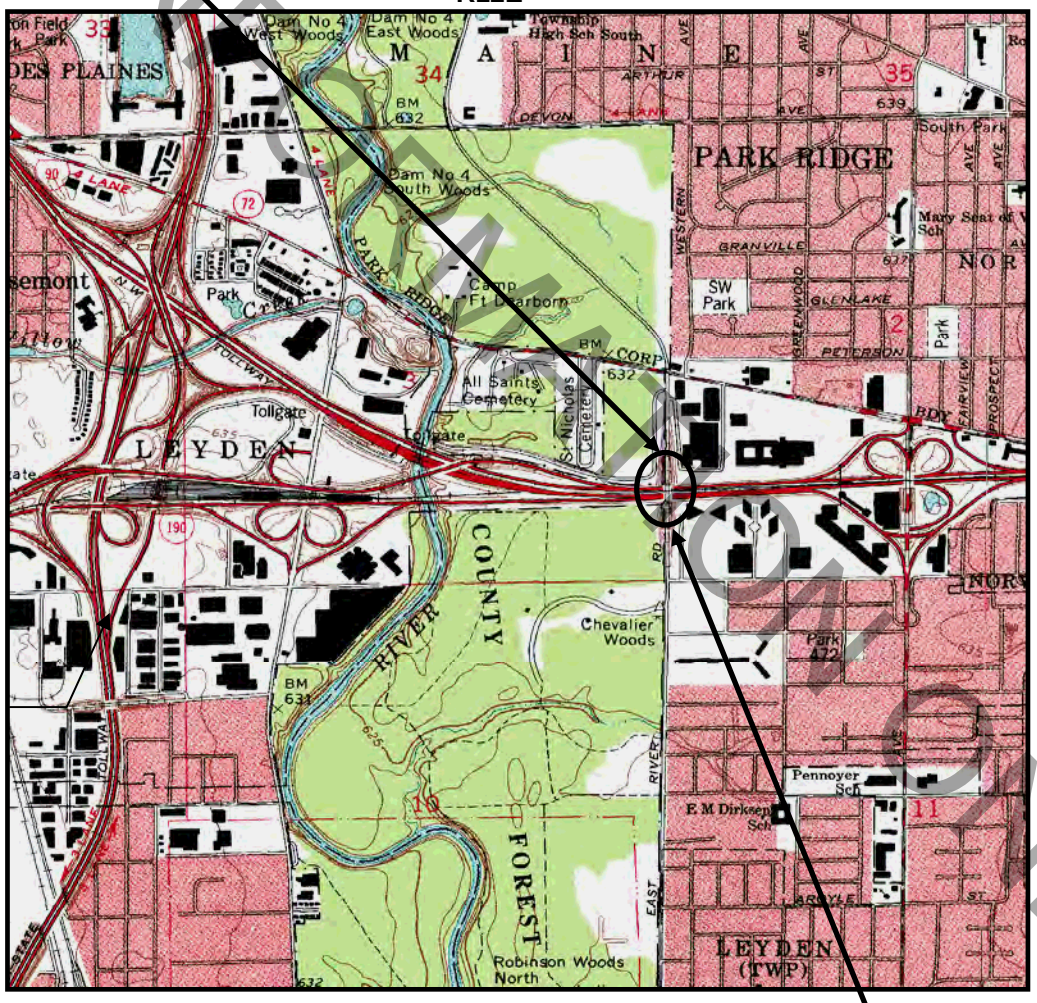
PROJECT ENDS
STA. 75 + 55

R12E

T40N



PROJECT STARTS
STA. 71 + 47

LOCATION MAP

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APPENDIX B

Location Diagram and Soil Profiles

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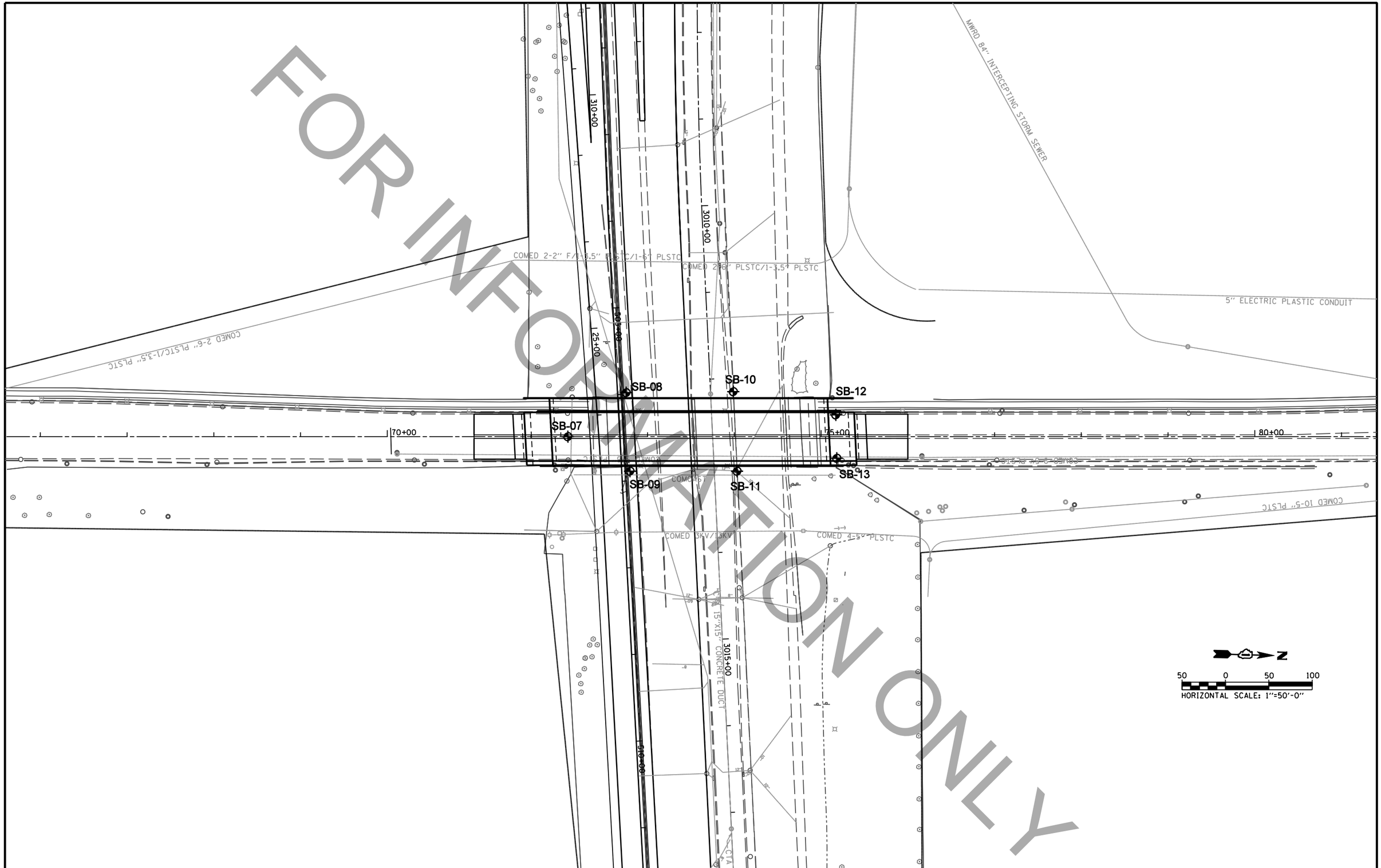
PLAN		BY	DATE
	SURVEYED		
	PLOTTED		
	DRAWN / CHECKED		
	ALIGNMENT CHECKED		
	RT. OF WAY CHECKED		
NOTE BOOK	CADD FILE NAME		
NO.			

PROFILE		BY	DATE
	SURVEYED		
	PLOTTED		
	DRAWN / CHECKED		
NOTE BOOK	BLM. NOTED		
NO.	STRUCTURE NOTATNS CHKD		



O'BRIEN & ASSOCIATES, INC. CONSULTING ENGINEERS	USER NAME =	DESIGNED - RWC	REVISED -
		DRAWN - RWC	REVISED -
	PLOT SCALE =	CHECKED - DOB	REVISED -
	PLOT DATE =	DATE - 3/14/2014	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

PROPOSED EAST RIVER ROAD BRIDGE
SOIL BORING PLAN

SCALE: 1" = 50' | SHEET NO. 1 OF 1 SHEETS | STA. TO STA.

F.A.U RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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		CONTRACT NO. 60X56		
	ILLINOIS FED. AID PROJECT			

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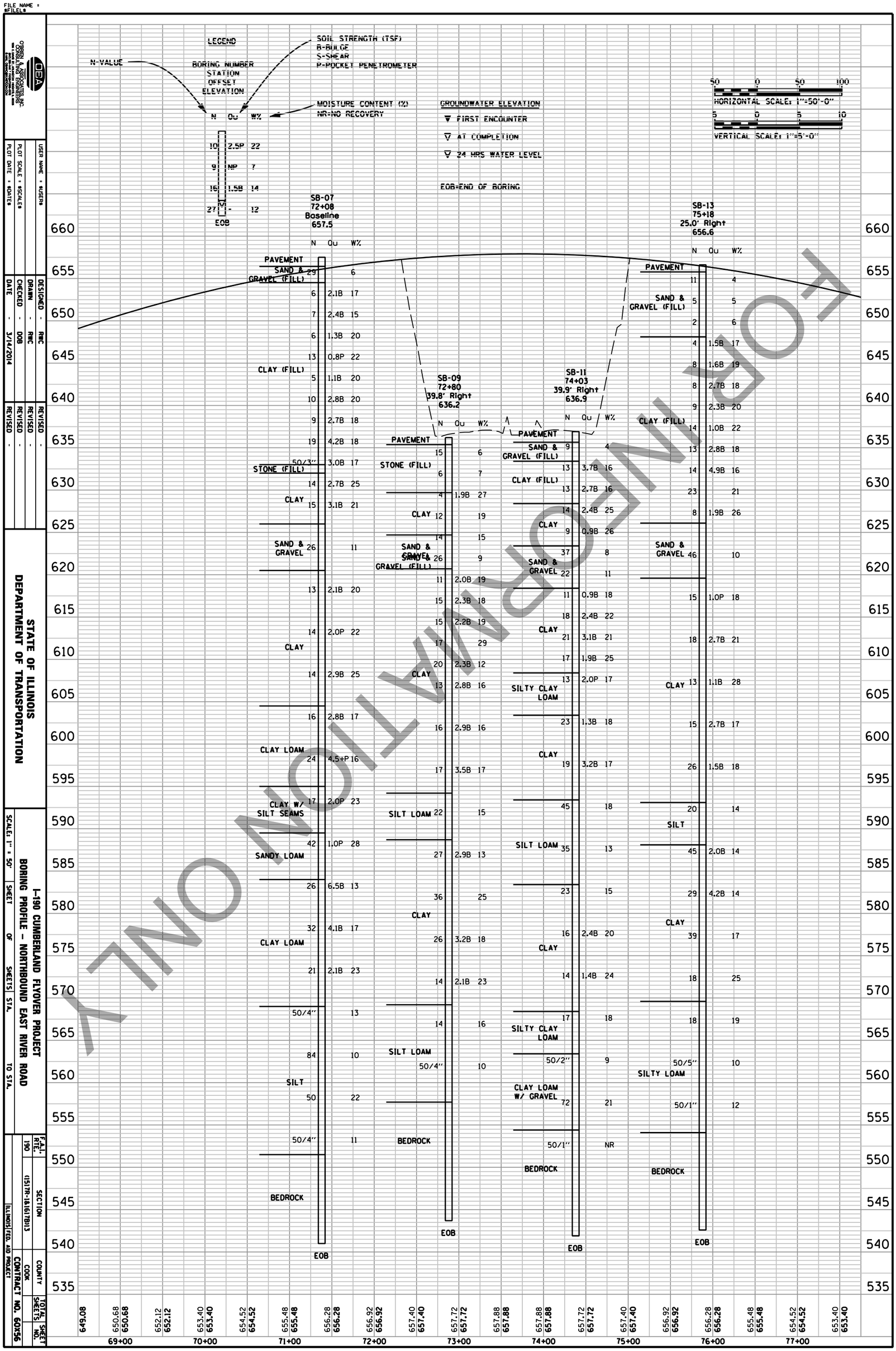

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OSBA ARCHITECTS, INC.

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PLOT DATE = $DATE$

	DESIGNED	-	RWC	REVISED	-
	DRAWN	-	RWC	REVISED	-
	CHECKED	-	DDB	REVISED	-
DATE	-	3/14/2014		REVISED	-

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

I-190 CUMBERLAND FLYOVER PROJECT
BORING PROFILE – NORTHBOUND EAST RIVER ROAD

SCALE: 1" = 50' | SHEET | OF | SHEETS | STA. | TO STA.

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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ILLINOIS FED. AID PROJECT		CONTRACT NO. 60X56		

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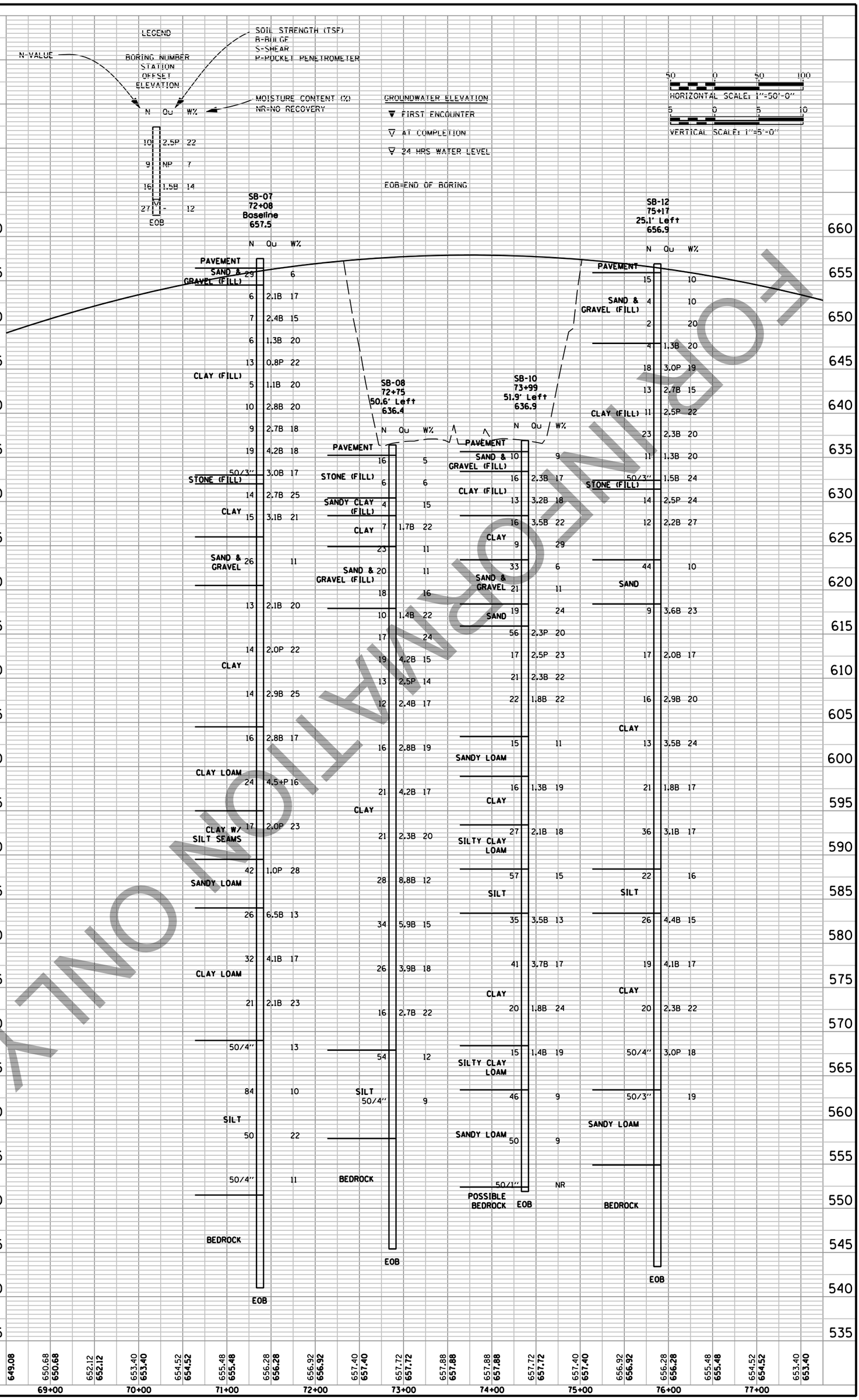

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

I-190 CUMBERLAND FLYOVER PROJECT
BORING PROFILE – SOUTHBOUND EAST RIVER ROAD

SCALE: 1" = 50' | SHEET | OF | SHEETS | STA. | TO STA.

F.A.I. RTE. 190 | SECTION (151TR-1&161TB)13 | COUNTY COOK | TOTAL SHEETS | SHEET NO.

ILLINOIS FED. AID PROJECT | CONTRACT NO. 60X56

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PLOT SCALE = $SCALE$ | DRAWN - RMC
PLOT DATE = $DATE$ | CHECKED - DDB
DATE - 3/14/2014
REVISED - | REVISED - | REVISED -

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APPENDIX C

Boring Logs

O'BRIEN & ASSOCIATES, INC.
CONSULTING ENGINEERS
1235 E. DAVIS ST./ARLINGTON HTS., IL 60005
(847)398-1441 * FAX(847) 398-2376

SOIL BORING LOG

DATE December 17, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. **SB-07**
Station 72+08
Offset Centerline
Ground Surface Elev. 657.5

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter *Dry to -10.0'*
Upon Completion *NA*
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
				13.0" CONCRETE
				656.3
	12			SAND & GRAVEL FILL-brown-
	16			medium dense
	13	NP	6	
				654.5
	4		***111***	CLAY-brown & gray-
	3			stiff to very stiff (FILL)
-5	3	2.1B	17	
	1		***119***	
	3			
	4	2.4B	15	
	1		***107***	
	3			
-10	3	1.3B	20	
	5			
	6			
	7	0.75P	22	
	2		***109***	
	2			
-15	3	1.1B	20	
	5		***109***	
	5			
	5	2.8B	20	
	3		***114***	
	3			
-20	6	2.7B	18	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
	5		***114***	CLAY-brown & gray-
	8			hard (FILL)
	11	4.2B	18	
	5		***115***	
	36	3.0B	17	
-25	50	NP	13	
	5		***99***	
	6			
	8	2.7B	25	
	4		***107***	
	6			
-30	9	3.1B	21	
	12			
	13			
-35	13	NP	11	
	4		***110***	
	5			
-40	8	2.1B	20	

633.0 ASPHALT & STONE FILL

632.0 CLAY-mottled dark gray-
very stiff, wet

629.0 CLAY-brown & gray-
very stiff

626.0 SAND & GRAVEL-gray-
medium dense

620.5 CLAY-gray-
very stiff

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery NP-Nonplastic D-Disturbed

O'BRIEN & ASSOCIATES, INC.
CONSULTING ENGINEERS
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SOIL BORING LOG

DATE December 17, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-07
Station 72+08
Offset Centerline
Ground Surface Elev. 657.5

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -10.0'
Upon Completion NA
After n/a Hrs. n/a

FOR INFORMATION ONLY

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
				CLAY-gray-very stiff
	4			
	6			
-45	8	2.0P	22	
	3		100	
	5			wet
-50	9	2.9B	25	
604.5				
	4		116	
	6			CLAY LOAM-gray-very stiff to hard
-55	10	2.8B	17	
	7			
	10			
-60	14	4.5+P	16	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
				CLAY LOAM-gray-very stiff to hard
595.0				
				CLAY w/Silt lenses & seams-gray-very stiff
	5		105	
	9			
-65	8	2.0P	23	
589.5				
	7			SANDY LOAM to SANDY CLAY LOAM-gray-dense wet
	19			
-70	23	1.0P	28	
584.0				
	8		126	
	11			CLAY-gray-very stiff to hard
-75	15	6.5B	13	
	9		115	
	12			
-80	20	4.1B	17	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery NP-Nonplastic D-Disturbed

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SOIL BORING LOG

DATE December 17, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-07
Station 72+08
Offset Centerline
Ground Surface Elev. 657.5

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter *Dry to -10.0'*
Upon Completion *NA*
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CLAY-gray- very stiff to hard
	6		*104*	
	9			
-85	12	2.1B	23	
				569.0
	5			
	50 /4"	NP	13	SILT-gray- very dense
-90				
				w/fractured stone
	14			
	34			
-95	50	NP	10	
	11			
	27			
-100	23	NP	22	
				SILT-gray- very dense
	50 /4"	NP	11	
-105				
				551.5
				Driller's Observation: Possible Bedrock
				Run 1 (-106.5' to -116.5') Silurian System Niagaran Series Dolomite Light gray; horizontal bedding; numerous horizontal fractures full depth; cherty zones @ -108.4', -109.5', -109.9', -110.7', from -111.5' to -111.9', -113.0' to -113.4' and -114.6' to -114.9'
-110				
				98% Recovery RQD=29%
-115				
				541.0
				END OF BORING @ -116.5' 4.0" Hollow Stem to -10.0' Rotary Drilling Started at -10.0'
-120				

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
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NR-No Recovery NP-Nonplastic D-Disturbed

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ROCK CORE LOG

DATE December 17, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook CORING METHOD Rotary Wash

STRUCT. NO. 016-2124 CORING BARREL TYPE & SIZE NX Double Swivel-5 ft

Station 73+25 Core Diameter 2.0 in

BORING NO. SB-07 Top of Rock Elev. 551.5

Station 72+08 Begin Core Elev. 551.0

Offset Centerline

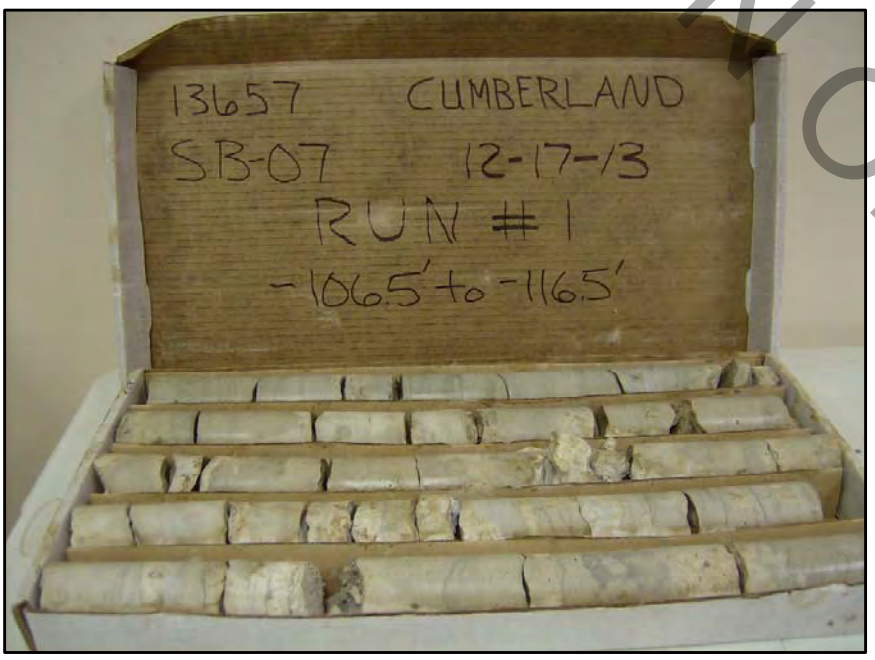
Ground Surface Elev. 657.5

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	98	29	2.9	780 @ -112.0'

Run 1 (-106.5' to -116.5')
Silurian System
Niagaran Series Dolomite
Light gray; horizontal bedding; numerous horizontal fractures full depth; cherty zones @ -108.4', -109.5', -109.9', -110.7', from -111.5' to -111.9', -113.0' to -113.4' and -114.6' to -114.9'

-5

-10



FOR INFORMATION ONLY

Color pictures of the cores xx Cores will be stored for examination for xx

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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SOIL BORING LOG

DATE December 13, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-08
Station 72+75
Offset 50.6'L
Ground Surface Elev. 636.4

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -10.0'
Upon Completion NA
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				10.0" ASPHALT, 4.0" STONE FILL
				635.2
	25			
	11			CRUSHED STONE, apparent FA-6
	5	NP	5	gradation-loose to medium dense (FILL)
	4			
	4			
-5	2	NP	6	
				630.4
	2			
	2			SANDY CLAY LOAM-gray-
	2	NP	15	very loose (FILL)
				628.4
	3		101	
	3			CLAY-brown & gray-
-10	4	1.7B	22	stiff
	3			
				624.9
	10			SANDY LOAM-brown-
	13	NP	11	medium dense
				622.9
	7			SAND GRAVEL-gray-
	10			medium dense
-15	10	NP	11	
	7			
	8			
	10	NP	16	
				617.9
	3		107	CLAY-gray-
	3			stiff to very stiff
-20	7	1.4B	22	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CLAY-gray-
	4			stiff to very stiff
	7			
	10	1.75P	24	
	4		120	
	8			
-25	11	2.5P	15	
	6			
	6			
	7	2.5P	14	
	4		116	
	5			
-30	7	2.4B	17	
	4		112	
	6			
-35	10	2.8B	19	
				597.9
	5		115	CLAY-gray-
	8			very stiff to hard
-40	13	4.2B	17	

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery NP-Nonplastic D-Disturbed

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SOIL BORING LOG

DATE December 13, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-08
Station 72+75
Offset 50.6'L
Ground Surface Elev. 636.4

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -10.0'
Upon Completion NA
After n/a Hrs. n/a

FOR INFORMATION ONLY

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CLAY-gray- very stiff to hard
	12		*110*	
-45	9 12	2.3B	20	
	5		*128*	
-50	11 17	8.8B	12	
	9		*121*	
-55	13 21	5.9B	15	
	8		*113*	
-60	11 15	3.9B	18	
				567.9
				SILTY LOAM-gray- very dense
				557.9
				Driller's Observation: Possible Bedrock
				see next page

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CLAY-gray- very stiff to hard
	4		*106*	
-65	6 10	2.7B	22	
	5			
-70	11 43	NP	12	
	50			
-75	50 /4"	NP	9	
-80				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
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SOIL BORING LOG

DATE December 13, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-08
Station 72+75
Offset 50.6'L
Ground Surface Elev. *636.4*

Surface Water Elev. n/a
Stream Bed Elev. n/a

Groundwater Elevation:
First Encounter *Dry to -10.0'*
Upon Completion *NA*
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-85			
-90			
-95			
-100			
-105			
-110			
-115			
-120			

Run 1 (-81.0' to -91.0')
Silurian System
Niagaran Series Dolomite
Medium gray; horizontal bedding; slightly weathered; moderately fractured throughout; cherty zones @ -82.6', from -83.1' to -83.9', -85.0', -85.5', -86.1', -87.4', -87.8' & -89.3'

92% Recovery RQD=56%

545.4

END OF BORING @ -91.0'
3.25" Hollow Stem to -10.0'
Rotary Drilling Started at -10.0'

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
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ROCK CORE LOG

DATE December 13, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook CORING METHOD Rotary Wash

STRUCT. NO. 016-2124 CORING BARREL TYPE & SIZE NX Double Swivel-5 ft

Station 73+25 Core Diameter 2.0 in

BORING NO. SB-08 Top of Rock Elev. 557.9

Station 72+75 Begin Core Elev. 555.4

Offset 50.6'L

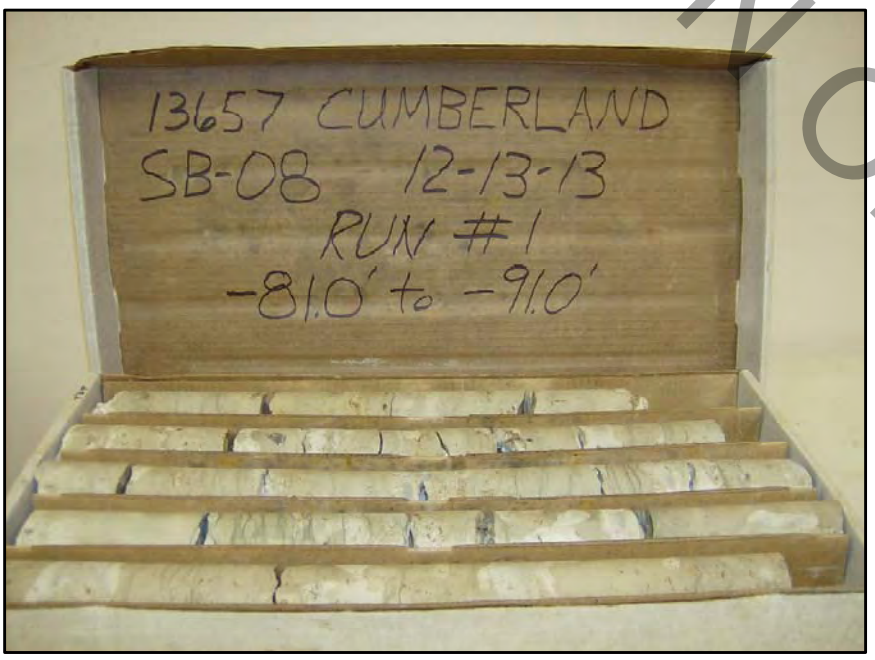
Ground Surface Elev. 636.4

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	92	56		740 @ -87.3'

Run 1 (-81.0' to -91.0')
Silurian System
Niagaran Series Dolomite
Medium gray; horizontal bedding; slightly weathered; moderately fractured throughout; cherty zones @ -82.6', from -83.1' to -83.9', -85.0', -85.5', -86.1', -87.4', -87.8' & -89.3'

-5

-10



Color pictures of the cores xx Cores will be stored for examination for xx

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

FOR INFORMATION ONLY

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SOIL BORING LOG

DATE December 16, 2013

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OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25
BORING NO. SB-09
Station 72+80
Offset 39.8'R
Ground Surface Elev. 636.2

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -10.0'
Upon Completion NA
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
				10.0" ASPHALT 635.4
	8			
	7			CRUSHED STONE, apparent FA-6 gradation-loose to medium dense (FILL)
	8	NP	6	
	5			
-5	3			
	3	NP	7	
	2		95	629.7
	1			CLAY-brown & gray- wet
	3	1.9B	27	stiff to very stiff
	5			
	6			
-10	6	3.5P	19	
	2			624.7
	7			
	7	NP	15	SAND & GRAVEL-gray- medium dense
	9			
	13			
-15	13	NP	9	
				620.7
	6		112	
	5			CLAY-gray- very stiff
	6	2.0B	19	
	3		111	
	5			
-20	10	2.3B	18	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
				CLAY-gray- stiff to very stiff
	3		112	
	6			
	9	2.2B	19	
	5			
	7			
wet -25	10	1.0P	29	
	4		127	
	8			
	12	2.3B	12	
	6		118	
	5			
-30	8	2.8B	16	
	3		118	
	6			
-35	10	2.9B	16	
	4		115	
	7			
-40	10	3.5B	17	

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
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SOIL BORING LOG

DATE December 16, 2013

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OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-09
Station 72+80
Offset 39.8'R
Ground Surface Elev. 636.2

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -10.0'
Upon Completion NA
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CLAY-gray-stiff to very stiff
594.2				
	6			SILTY LOAM-gray-medium dense
	12			
-45	10	NP	15	
588.7				
	5		125	CLAY-gray-very stiff
	11			
-50	16	2.9B	13	
	13			
	15			
wet -55	21	D	25	
	6		113	
	11			
-60	15	3.2B	18	
				CLAY-gray-very stiff
569.2				
	4		104	SILTY LOAM-gray-medium dense
	6			
-65	8	2.1B	23	
562.7				
	5			
	6			
-70	8	NP	16	
	48			
	50/4"	NP	10	SILT-gray-very dense
557.7				
-80				Driller's Observation: Possible Bedrock

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
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SOIL BORING LOG

DATE December 16, 2013

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OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-09
Station 72+80
Offset 39.8'R
Ground Surface Elev. *636.2*

Surface Water Elev. n/a
Stream Bed Elev. n/a

Groundwater Elevation:
First Encounter *Dry to -10.0'*
Upon Completion *NA*
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Driller's Observation: Possible Bedrock			
553.7			
Run 1 (-82.5' to -92.5') Silurian System Niagaran Series Dolomite Light gray; horizontal bedding; moderately fractured in upper 2.0', 4.0" vertical fracture @ -83.4'; cherty zones from -83.7' to -83.9', -84.9, -88.4', -88.7', -89.2', -89.8', -90.7' & -91.8' 100% Recovery RQD=68%			
-85			
-90			
543.7			
END OF BORING @ -92.5' 3.25" Hollow Stem to -10.0' Rotary Drilling Started at -10.0'			
-95			
-100			
-105			
-110			
-115			
-120			

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
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ROCK CORE LOG

DATE December 16, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook CORING METHOD Rotary Wash

STRUCT. NO. 016-2124 CORING BARREL TYPE & SIZE NX Double Swivel-5 ft

Station 73+25 Core Diameter 2.0 in

BORING NO. SB-09 Top of Rock Elev. 557.7

Station 72+80 Begin Core Elev. 553.7

Offset 39.8'R

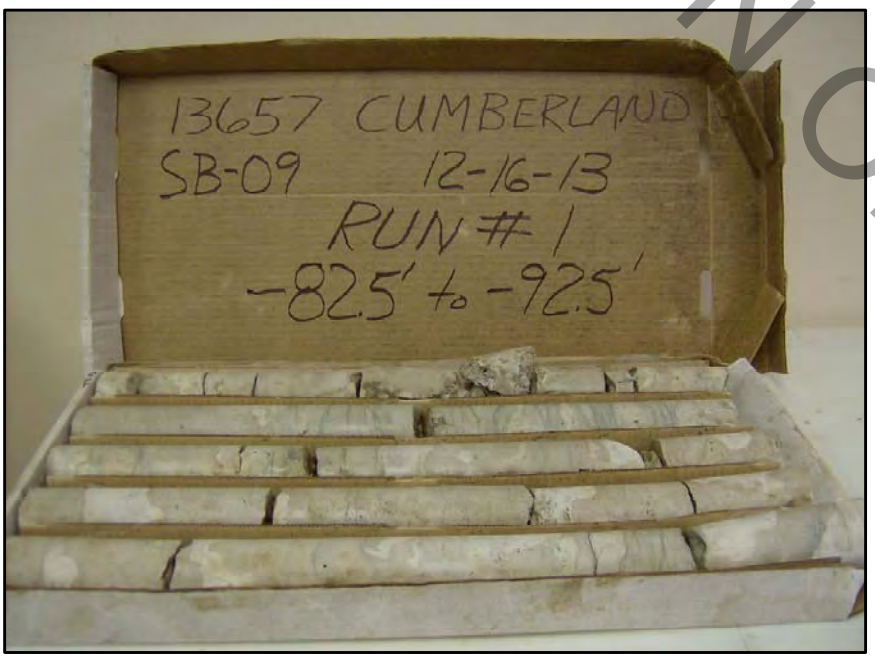
Ground Surface Elev. 636.2

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	100	68	2.3	660 @ -85.8'

Run 1 (-82.5' to -92.5')
Silurian System
Niagaran Series Dolomite
Light gray; horizontal bedding;
moderately fractured in upper 2.0', 4.0" vertical fracture @-83.4';
cherty zones from -83.7' to -83.9', -84.9, -88.4', -88.7', -89.2', -89.8',
-90.7' & -91.8'

-5

-10



FOR INFORMATION ONLY

Color pictures of the cores xx Cores will be stored for examination for xx

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

O'BRIEN & ASSOCIATES, INC.
CONSULTING ENGINEERS
1235 E. DAVIS ST./ARLINGTON HTS., IL 60005
(847)398-1441 * FAX(847) 398-2376

SOIL BORING LOG

DATE December 18, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE CME Automatic

STRUCT. NO. 016-2124
Station 73+25
BORING NO. SB-10
Station 73+99
Offset 51.9L
Ground Surface Elev. 636.9

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -10.0'
Upon Completion NA
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				5.0" ASPHALT, 10.0" CONCRETE
				635.6
	7			SAND & GRAVEL FILL-brown-
	4			medium dense
	6	NP	9	
				633.4
	5		***111***	CLAY FILL-brown, gray & black-
	7			very stiff
-5	9	2.3B	17	
	4		***110***	
	5			
	8	3.2B	18	
				628.4
	4		***100***	
	6			CLAY -brown & gray-
-10	10	3.5B	22	stiff to very stiff
	3			
	4			
wet	5	1.0P	29	
				623.4
	12			SAND & GRAVEL-gray-
	14			dense to medium dense
-15	19	NP	6	
	9			
	10			
	11	NP	11	
				618.4
	7			SAND-gray-
	8			medium dense
-20	11	NP	24	
				615.9
	13			CLAY-gray-
	27			stiff to very stiff (A-6)
	29	2.3P	20	
	5		***104***	
	8			
-25	9	2.5P	23	
	7		***106***	
	10			
	11	2.3B	22	
	7		***105***	
	9			
-30	13	1.8B	22	
				603.4
	5			SANDY LOAM-gray-
	7			medium dense (A-4)
-35	8	NP	11	
				598.9
	6		***112***	CLAY-gray-
	7			stiff (A-6)
-40	9	1.3B	19	

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery NP-Nonplastic D-Disturbed

O'BRIEN & ASSOCIATES, INC.
CONSULTING ENGINEERS
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SOIL BORING LOG

DATE December 18, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE CME Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-10
Station 73+99
Offset 51.9L
Ground Surface Elev. 636.9

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -10.0'
Upon Completion NA
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CLAY-gray-stiff (A-6)
				593.4
	7		*114*	
	12			SILTY CLAY LOAM-gray-very stiff (A-6)
-45	15	2.1B	18	
				588.4
	14			
	25			SILT-gray-very dense
-50	32	NP	15	
				583.4
	8		*123*	
	14			CLAY-gray-stiff to very stiff
-55	21	3.5B	13	
	8		*115*	
	15			
-60	26	3.7B	17	
				CLAY-gray-stiff to very stiff
				568.4
	8		*103*	
	10			
-65	10	1.8B	24	
	6		*112*	
	7			SILTY CLAY LOAM-gray-stiff (A-6)
-70	8	1.4B	19	
				563.4
	9			
	14			SANDY LOAM w/intermittent boulders-gray-dense to very dense (A-4)
-75	32	NP	9	
	9			
	16			
-80	34	NP	9	

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
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SOIL BORING LOG

DATE December 18, 2013

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OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE CME Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-10
Station 73+99
Offset 51.9L
Ground Surface Elev. *636.9*

Surface Water Elev. n/a
Stream Bed Elev. n/a

Groundwater Elevation:
First Encounter *Dry to -10.0'*
Upon Completion *NA*
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SANDY LOAM w/intermittent boulders-gray-dense to very dense (A-4)							
	50 /1"	NR					
552.4 Driller's Observation: Possible Bedrock -85				-105			
END OF BORING @ -85.0'							
4.0" Hollow Stem to -10.0'							
Rotary Drilling Started at -10.0'							
-90				-110			
-95				-115			
-100				-120			

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery NP-Nonplastic D-Disturbed

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SOIL BORING LOG

DATE December 17, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE CME Automatic

STRUCT. NO. 016-2124
Station 73+25
BORING NO. SB-11
Station 74+03
Offset 39.9'R
Ground Surface Elev. 636.9

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter *Dry to -10.0'*
Upon Completion *NA*
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				5.0" ASPHALT, 10.0" CONCRETE
				635.7
	7			
	5			SAND & GRAVEL FILL-brown-
	4	NP	4	loose
				633.4
	5		***113***	
	6			CLAY FILL-brown, gray & black-
-5	7	3.7B	16	very stiff
	5		***113***	
	5			
	8	2.7B	16	
				628.4
	5		***97***	
	6			CLAY-brown & gray-
-10	8	2.4B	25	stiff to very stiff wet
	3		***100***	
	4			
	5	1.25P	26	
				623.4
	14			
	18			SAND & GRAVEL-brown-
-15	19	NP	8	dense
	8			
				620.4
	11			
	11	NP	11	SAND & GRAVEL-gray-
				medium dense
				618.4
	9		***113***	
	6			CLAY-gray-
-20	5	1.0P	18	stiff to very stiff

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CLAY-gray-
	5		***105***	stiff to very stiff (A-6)
	7			
	11	2.4B	22	
	6		***107***	
	9			
-25	12	3.1B	21	
	5		***101***	
	7			
wet	10	1.9B	25	
				608.4
	5			SILTY CLAY LOAM-gray-
	6			very stiff (A-6)
-30	7	2.0P	17	
				603.4
	5		***113***	CLAY-gray-
	7			stiff to very stiff
-35	16	1.3B	18	
	5		***115***	
	7			
-40	12	3.2B	17	

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
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NR-No Recovery NP-Nonplastic D-Disturbed

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SOIL BORING LOG

DATE December 17, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE CME Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-11
Station 74+03
Offset 39.9'R
Ground Surface Elev. 636.9

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -10.0'
Upon Completion NA
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CLAY-gray- stiff to very stiff
				593.4
	11			SILTY LOAM-gray- dense (A-4)
	18			
-45	27	NP	18	
	10			
	16			
-50	19	NP	13	
				583.4
	6		120	CLAY-gray- stiff to very stiff
	8			
-55	15	2.4B	15	
	4		110	
	7			
-60	9	1.4B	20	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CLAY-gray- stiff to very stiff
	4		103	
	6			
-65	8	1.9B	24	
				568.4
	5			SILTY CLAY LOAM-gray- medium dense (A-6)
	7			
-70	10	NP	18	
				563.4
	50/2"	NP	9	CLAY LOAM w/rock fragments-gray- very dense (A-4)
-75				
	42			
	43			
-80	29	NP	21	

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery NP-Nonplastic D-Disturbed

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SOIL BORING LOG

DATE December 17, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE CME Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-11
Station 74+03
Offset 39.9'R
Ground Surface Elev. *636.9*

Surface Water Elev. n/a
Stream Bed Elev. n/a

Groundwater Elevation:
First Encounter *Dry to -10.0'*
Upon Completion *NA*
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY LOAM w/rock fragments-gray-very dense (A-4)							
554.4	50/1"						
Driller's Observation: Possible Bedrock							
551.9 -85				-105			
Run 1 (-85.0' to -95.0') Silurian System Niagaran Series Dolomite Light gray; numerous horizontal fractures throughout core; cherty zones @ -85.5', -87.6', -88.1, -88.6', -from -89.2' to -89.5', -90.0', -90.6', -91.2', -92.7', -93.6 & from -94.3' to -94.7'- 100% Recovery RQD=24%							
-90				-110			
541.9 -95				-115			
END OF BORING @ -95.0' 4.0" Hollow Stem to -10.0' Rotary Drilling Started at -10.0'							
-100				-120			

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
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O'BRIEN & ASSOCIATES, INC.
CONSULTING ENGINEERS
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(847)398-1441 * FAX(847) 398-2376

ROCK CORE LOG

DATE December 17, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook CORING METHOD Rotary Wash

STRUCT. NO. 016-2124 CORING BARREL TYPE & SIZE NX Double Swivel-5 ft

Station 73+25 Core Diameter 2.0 in

BORING NO. SB-11 Top of Rock Elev. 554.4

Station 74+03 Begin Core Elev. 551.9

Offset 39.9'R

Ground Surface Elev. 636.9

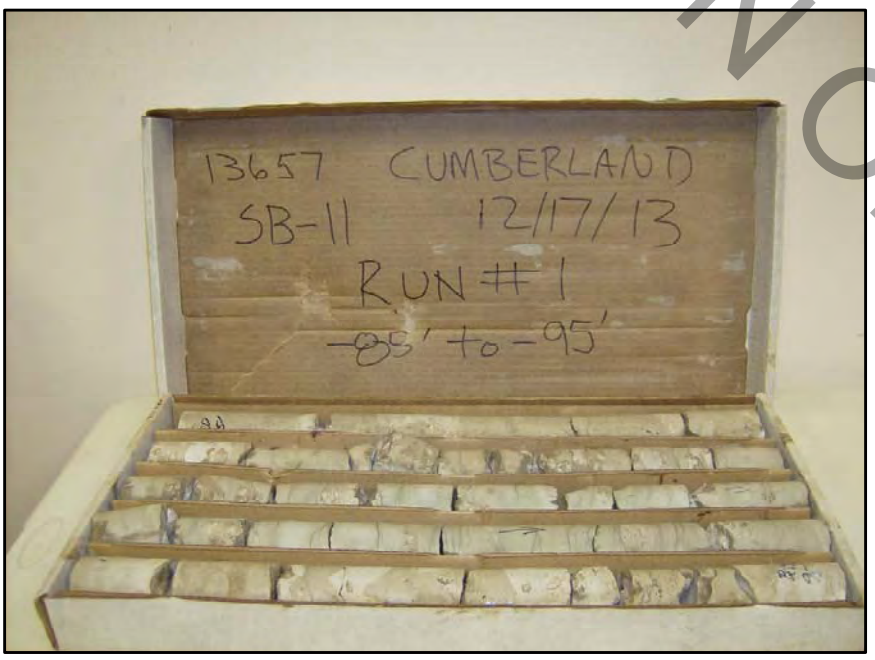
DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	100	24		830 @ -86.0'

Run 1 (-85.0' to -95.0')
Silurian System
Niagaran Series Dolomite
Light gray; numerous horizontal fractures throughout core; cherty zones @ -85.5', -87.6', -88.1, -88.6', -from -89.2' to -89.5', -90.0', -90.6', -91.2', -92.7', -93.6 & from -94.3' to -94.7'

100% Recovery RQD=24%

-5

-10



FOR INFORMATION ONLY

Color pictures of the cores xx Cores will be stored for examination for xx

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

O'BRIEN & ASSOCIATES, INC.
CONSULTING ENGINEERS
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SOIL BORING LOG

DATE December 10, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-12
Station 75+17
Offset 25.1'L
Ground Surface Elev. 656.9

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -10.0'
Upon Completion NA
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
				12.0" CONCRETE
				655.9
	6			
	8			SAND-brown-
	7	NP	10	very loose to medium dense (FILL)
	3			
	2			
-5	2	NP	10	
	1			
	1			
	1	NP	20	
	1		*106*	
				647.9
	1			CLAY-trace topsoil-brown, gray & black-
-10	3	1.3B	20	stiff to very stiff (FILL)
	3			
	8			
	10	3.0P	19	
	5		*121*	
	6			
-15	7	2.7B	15	
	4			
	5			
	6	2.5P	22	
	4		*110*	
	6			
-20	17	2.3B	20	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
	4		*109*	CLAY-trace topsoil-brown, gray & black-
	5			stiff to very stiff (FILL)
	6	1.3B	20	
	2			
	4			
				632.4
-25	50/3"	NP	24	ASPHALT & STONE
				631.4
	5			CLAY-black-
	6			very stiff
	8	2.5P	24	
				628.9
	4		*95*	
	4			CLAY-mottled gray to dark gray-
-30	8	2.2B	27	very stiff, wet
	22			623.4
	23			
-35	21	NP	10	SAND-gray-
				dense
	7		*105*	618.4
	4			
-40	5	3.6B	23	CLAY-brown & gray-
				very stiff

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery NP-Nonplastic D-Disturbed

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SOIL BORING LOG

DATE December 10, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-12
Station 75+17
Offset 25.1'L
Ground Surface Elev. 656.9

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -10.0'
Upon Completion NA
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
				CLAY-brown & gray- very stiff
				613.4
	5		115	
	7			CLAY-gray- very stiff
-45	10	2.0B	17	
	4		109	
	6			
-50	10	2.9B	20	
	4		102	
	5			
-55	8	3.5B	24	
	5		116	
	9			
-60	12	1.8B	17	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
	13		116	
	16			
-65	20	3.1B	17	
	7			
	10			SILT-gray- medium dense
-70	12	NP	16	
				583.4
	9		121	
	11			CLAY-gray- very stiff to hard
-75	15	4.4B	15	
	9		122	
	14			
-80	21	3.6B	14	

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery NP-Nonplastic D-Disturbed

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SOIL BORING LOG

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ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-12
Station 75+17
Offset 25.1'L
Ground Surface Elev. 656.9

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -10.0'
Upon Completion NA
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
				CLAY-gray- very stiff to hard
	7		115	
-85	9 10	4.1B	17	
	7		107	
-90	9 11	2.3B	22	
563.4				
-95	50 /4"	NP	18	SANDY LOAM-gray- very dense
-100	20 46 50 /3"	NP	19	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
				SANDY LOAM-gray- very dense
554.9				
				Driller's Observation: Possible Bedrock
553.4				
-105				Run 1 (-103.5' to -113.5') Silurian System Niagaran Series Dolomite Light gray; horizontal bedding; 5.0" vertical fracture @ -110.8', highly fractured in bottom foot; cherty zones @ -105.5', -106.3', -108.0 & from -111.7' to -112.4'
				100% Recovery RQD=53%
-110				
543.4				
-115				END OF BORING @ -113.5' 3.25" Hollow Stem to -10.0' Rotary Drilling Started at -10.0'
-120				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery NP-Nonplastic D-Disturbed

FOR INFORMATION ONLY

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CONSULTING ENGINEERS
1235 E. DAVIS ST./ARLINGTON HTS., IL 60005
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ROCK CORE LOG

DATE December 10, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook CORING METHOD Rotary Wash

STRUCT. NO. 016-2124 CORING BARREL TYPE & SIZE NX Double Swivel-5 ft

Station 73+25 Core Diameter 2.0 in

BORING NO. SB-12 Top of Rock Elev. 554.9

Station 75+17 Begin Core Elev. 553.4

Offset 25.1'L

Ground Surface Elev. 656.9

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	100	53	3.5	1080 @ -106.7'

Run 1 (-103.5' to -113.5')
Silurian System
Niagaran Series Dolomite
Light gray; horizontal bedding; 5.0" vertical fracture @ -110.8', highly fractured in bottom foot; cherty zones @ -105.5', -106.3', -108.0 & from -111.7' to -112.4'

-5

-10

FOR INFORMATION ONLY

Color pictures of the cores xx Cores will be stored for examination for xx

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

O'BRIEN & ASSOCIATES, INC.
CONSULTING ENGINEERS
1235 E. DAVIS ST./ARLINGTON HTS., IL 60005
(847)398-1441 * FAX(847) 398-2376

SOIL BORING LOG

DATE December 9, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-13
Station 75+18
Offset 25.0'R
Ground Surface Elev. 656.6

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -15.0'
Upon Completion NA
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				10.0" CONCRETE
				656.0
	7			
	6			SAND-brown
	5	NP	4	very loose to medium dense (FILL)
	2			
	1			
-5	4	NP	5	
	1			
	1			
	1	NP	6	
				648.1
	1		115	
	2			
-10	2	1.5B	17	
				CLAY-trace topsoil-brown, gray & black-
				stiff to very stiff (FILL)
	2		111	
	3			
	5	1.6B	19	
	3		113	
	4			
-15	4	2.7B	18	
	2		110	
	4			
	5	2.3B	20	
	3			
	6			
-20	8	1.0B	22	
	2			CLAY-trace topsoil-brown, gray & black-
	5			
	8	2.75P	18	stiff to very stiff (FILL)
	3		116	
	4			
hard -25	10	4.9B	16	
	7			
	10			
	13		21	
	3		99	
	3			
wet -30	5	1.9B	26	
				626.1
				SAND & GRAVEL-gray-
				dense
	20			
	23			
-35	23	NP	10	
				619.6
				CLAY-gray-
				stiff to very stiff
	4			
	7			
-40	8	1.0P	18	

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery NP-Nonplastic D-Disturbed

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SOIL BORING LOG

DATE December 9, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-13
Station 75+18
Offset 25.0'R
Ground Surface Elev. 656.6

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter Dry to -15.0'
Upon Completion NA
After n/a Hrs. n/a

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY-gray-stiff to very stiff				
		4		108
		7		
	-45	11	2.7B	21
		3		96
wet	-50	5 8	1.1B	28
		3		115
		6		
	-55	9	2.7B	17
		6		114
		9		
	-60	17	1.5B	18
CLAY-gray-stiff to very stiff				
	593.1			
		11		
SILT-gray-medium dense		9		
	-65	11	NP	14
	588.1			
		12		123
		17		
	-70	28	4.5P	14
CLAY-gray-hard				
		7		122
		12		
	-75	17	4.2B	14
		10		115
		16		
	-80	23	4.25P	17

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery NP-Nonplastic D-Disturbed

O'BRIEN & ASSOCIATES, INC.
CONSULTING ENGINEERS
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(847)398-1441 * FAX(847) 398-2376

SOIL BORING LOG

DATE December 9, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook DRILLING METHOD Rotary Wash HAMMER TYPE Mobile Automatic

STRUCT. NO. 016-2124
Station 73+25

BORING NO. SB-13
Station 75+18
Offset 25.0'R
Ground Surface Elev. 656.6

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter *Dry to -15.0'*
Upon Completion *NA*
After n/a Hrs. n/a

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
				CLAY-gray- hard
				569.6
-85	8 10	D	25	SILTY LOAM-gray- medium dense to very dense
				554.1
	5			Driller's Observation: Possible Bedrock
				552.6
-90	7 11	NP	19	Run 1 (-104.0' to -114.0') Silurian System Niagaran Series Dolomite Light gray; horizontal bedding; highly fractured from -112.0' to -112.7', 2.5" transverse fracture @ -110.2'; vuggy zones @ -108.7', -110.2' & -113.1' 96% Recovery RQD=69%
	5			SILTY LOAM-gray- medium dense to very dense
	33			*542.6*
-95	50 /5"		10	END OF BORING @ -114.0' 3.25" Hollow Stem to -15.0' Rotary Drilling Started at -15.0'
	50 /1"		12	
-100				
-105				
-110				
-115				
-120				

FOR INFORMATION ONLY

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery NP-Nonplastic D-Disturbed

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(847)398-1441 * FAX(847) 398-2376

ROCK CORE LOG

DATE December 9, 2013

LOGGED BY TB

OBA JOB No. 13657

ROUTE 190 DESCRIPTION I-190 Cumberland Flyover "East River Road Over I-90"

SECTION (1517R-1&1617B)13 LOCATION Chicago, IL Township 40N R12E Section 3

COUNTY Cook CORING METHOD Rotary Wash

STRUCT. NO. 016-2124 CORING BARREL TYPE & SIZE NX Double Swivel-5 ft

Station 73+25 Core Diameter 2.0 in

BORING NO. SB-13 Top of Rock Elev. 554.1

Station 75+18 Begin Core Elev. 552.6

Offset 25.0'R

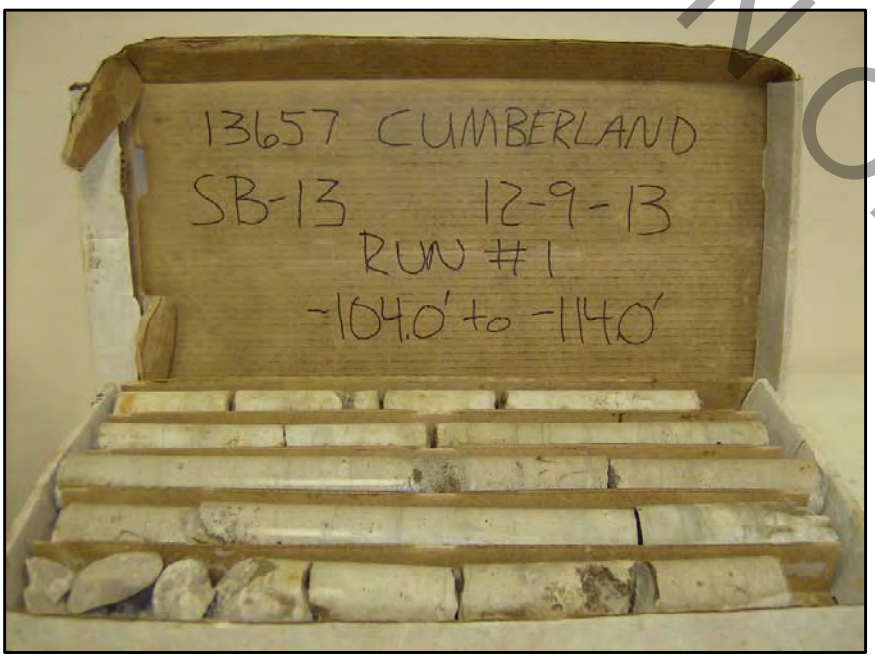
Ground Surface Elev. 656.6

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	96	69	2.3	890 @ -106.3'

Run 1 (-104.0' to -114.0')
Silurian System
Niagaran Series Dolomite
Light gray; horizontal bedding; highly fractured from -112.0' to -112.7',
2.5" transverse fracture @ -110.2'; vuggy zones @ -108.7', -110.2' & -113.1'

-5

-10



Color pictures of the cores xx Cores will be stored for examination for xx

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

FOR INFORMATION ONLY

FOR INFORMATION ONLY

APPENDIX D

Pressuremeter Test Results and Calculations

AECOM

PROJECT NAME: I-90 (Kennedy) at East River Road
AECOM JOB NO.: 60318823
OPERATOR: Seiler
DATE: 03/24/14

PRESSUREMETER TEST RESULTS

BORING NUMBER	DEPTH (ft)	P_o (tsf)	P_f (tsf)	P_l (tsf)	E_d (tsf)	E^+ (tsf)	E_d/E^+	E_d/P_l	P_l/P_f
10	25.0-27.5	1.5	6.5	11.8	113	176	0.64	9.6	1.8
	27.5-30.0	2.0	7.0	13.5	132	213	0.62	9.8	1.9
	32.5-35.0	2.0	6.0	10.5	105	147	0.71	10.0	1.8
11	25.0-27.5	1.5	7.5	14.5	128	205	0.62	8.8	1.9
	27.5-30.0	1.5	7.5	14.0	111	245	0.45	7.9	1.9
	32.5-35.0	2.0	7.0	13.6	96	168	0.57	7.1	1.9
					AVERAGE		0.60	8.9	1.9

FOR INFORMATION ONLY

AECOM

Pressuremeter Data Reduction (BX)

AECOM Job No.: 60318823
Boring No.: 10
Test Depth: 25.0-27.5 Feet

Water Correction: 0.97 Bars

No.	Pressure Readings (bars)	Inertia Correction (bars)	Corrected Pressure (tsf)	30 Sec. Volume (cc)	60 Sec. Volume (cc)	Creep (cc)	Corrected 30 Sec. Volume (cc)	Corrected 60 Sec. Volume (cc)	Incremental Modulus (tsf)
1	0.00	0.01	1.0	3	5	2	2.1	4.1	
2	0.25	0.06	1.2	18	20	2	17.0	19.0	21
3	0.75	0.16	1.6	62	62	0	60.8	60.8	15
4	1.50	0.20	2.4	85	85	0	83.4	83.4	52
5	2.50	0.24	3.4	105	105	0	103.0	103.0	86
6	3.50	0.27	4.4	120	120	0	117.6	117.6	119
7	4.50	0.30	5.4	137	137	0	134.3	134.3	107
8	2.00	0.27	2.8	118	118	0	116.2	116.2	251
9	3.25	0.29	4.1	130	130	0	127.7	127.7	195
10	4.50	0.31	5.4	145	145	0	142.3	142.3	157
11	5.50	0.34	6.4	162	162	0	158.9	158.9	111
12	6.50	0.39	7.4	193	195	2	189.7	191.6	57
13	8.00	0.46	8.9	250	255	5	246.3	251.3	50
14	9.50	0.59	10.3	345	360	15	340.9	355.9	31
15	10.50	0.77	11.2	460	530	70	455.8	525.7	13

E_d= 113 TSF E^+= 176 TSF P_l= 11.8 TSF

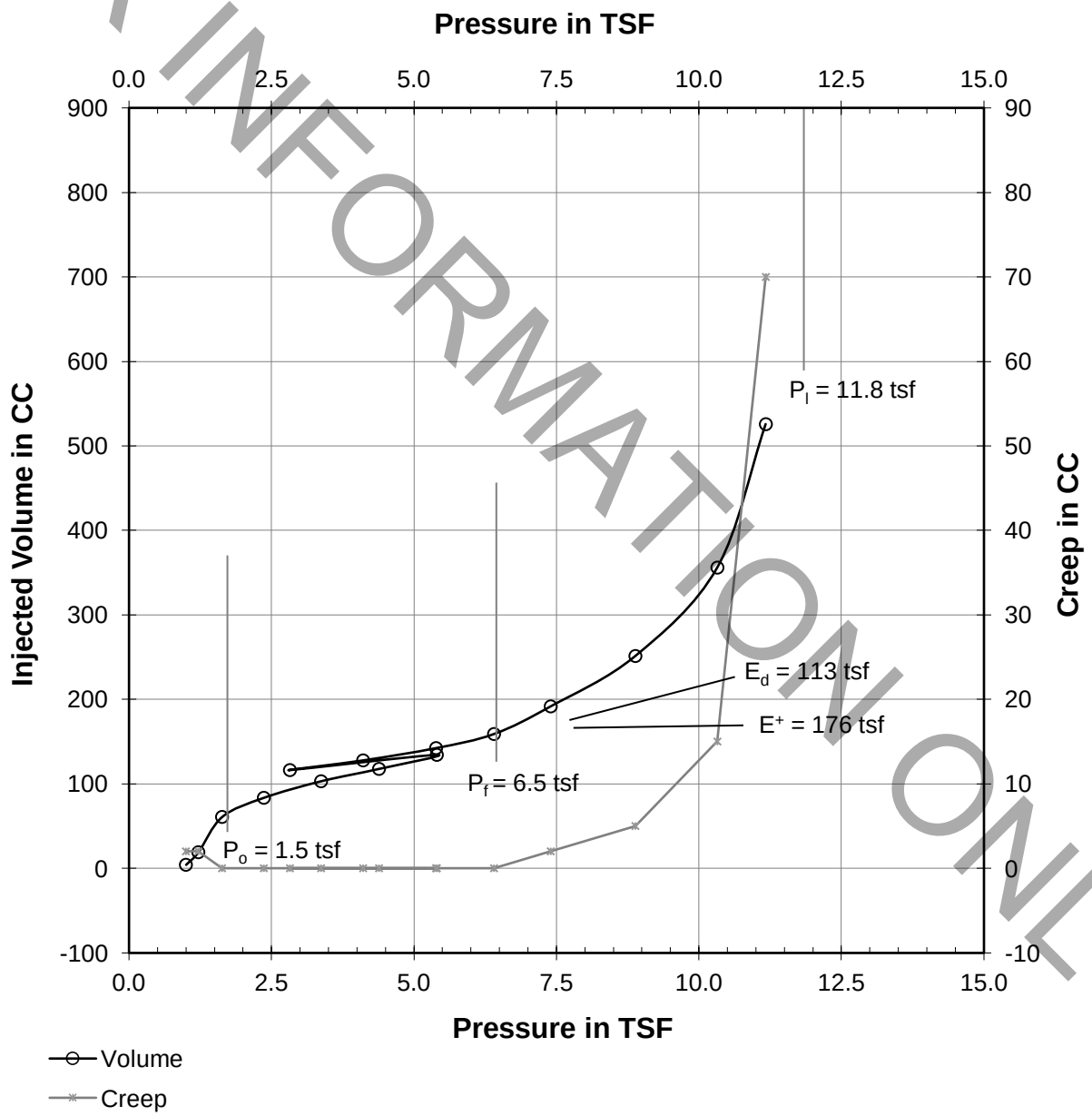
FOR INFORMATION ONLY

AECOM

Pressuremeter Data Reduction (BX)

FOR INFORMATION ONLY

AECOM Job Number: 60318823 Date: 03-22-14
Boring No.: 10
Test Depth: 25.0-27.5 Feet



AECOM

Pressuremeter Data Reduction (BX)

AECOM Job No.: 60318823
Boring No.: 10
Test Depth: 27.5-30.0 Feet

Water Correction: 1.04 Bars

No.	Pressure Readings (bars)	Inertia Correction (bars)	Corrected Pressure (tsf)	30 Sec. Volume (cc)	60 Sec. Volume (cc)	Creep (cc)	Corrected 30 Sec. Volume (cc)	Corrected 60 Sec. Volume (cc)	Incremental Modulus (tsf)
1	0.00	0.01	1.1	3	5	2	2.0	4.0	
2	0.25	0.08	1.3	25	30	5	23.9	28.9	11
3	0.75	0.25	1.6	110	110	0	108.8	108.8	7
4	1.50	0.30	2.3	140	140	0	138.4	138.4	43
5	2.50	0.32	3.4	153	153	0	151.0	151.0	147
6	3.50	0.34	4.4	166	166	0	163.6	163.6	150
7	4.50	0.37	5.4	183	183	0	180.3	180.3	115
8	2.50	0.36	3.3	174	174	0	172.0	172.0	477
9	3.50	0.37	4.4	182	182	0	179.6	179.6	257
10	4.50	0.38	5.4	194	194	0	191.3	191.3	169
11	5.50	0.41	6.4	210	210	0	206.9	206.9	127
12	6.50	0.44	7.4	237	240	3	233.7	236.6	68
13	8.00	0.51	8.9	290	295	5	286.3	291.3	58
14	9.50	0.59	10.4	345	360	15	340.9	355.9	53
15	11.00	0.73	11.8	440	490	50	435.6	485.6	28

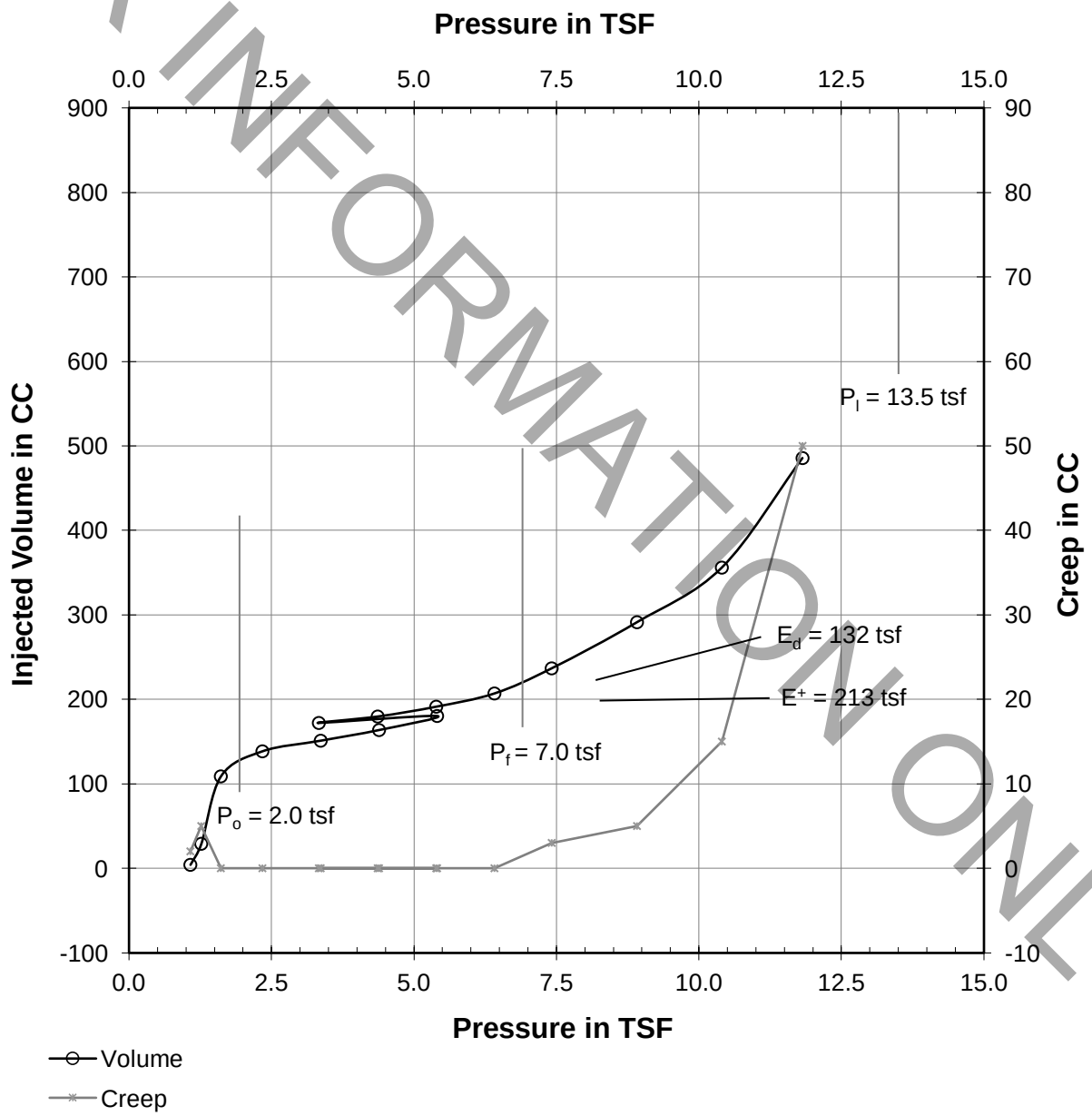
E_d= 132 TSF E^+= 213 TSF P_l= 13.5 TSF

FOR INFORMATION ONLY

Pressuremeter Data Reduction (BX)

FOR INFORMATION ONLY

AECOM Job Number: 60318823 Date: 03-22-14
Boring No.: 10
Test Depth: 27.5-30.0 Feet



AECOM

Pressuremeter Data Reduction (BX)

AECOM Job No.: 60318823
Boring No.: 10
Test Depth: 32.5-35.0 Feet

Water Correction: 1.19 Bars

No.	Pressure Readings (bars)	Inertia Correction (bars)	Corrected Pressure (tsf)	30 Sec. Volume (cc)	60 Sec. Volume (cc)	Creep (cc)	Corrected 30 Sec. Volume (cc)	Corrected 60 Sec. Volume (cc)	Incremental Modulus (tsf)
1	0.00	0.08	1.2	23	30	7	22.0	29.0	
2	0.25	0.29	1.2	110	130	20	109.0	129.0	1
3	0.75	0.36	1.7	176	176	0	174.8	174.8	18
4	1.50	0.38	2.4	190	190	0	188.4	188.4	107
5	2.50	0.41	3.4	210	210	0	208.0	208.0	101
6	3.50	0.43	4.5	230	230	0	227.6	227.6	104
7	4.50	0.46	5.5	250	250	0	247.2	247.2	106
8	2.50	0.44	3.4	240	240	0	238.0	238.0	465
9	3.50	0.46	4.4	255	255	0	252.6	252.6	146
10	4.50	0.48	5.4	270	270	0	267.2	267.2	148
11	5.50	0.53	6.4	310	315	5	306.9	311.9	49
12	6.50	0.61	7.4	370	380	10	366.7	376.6	35
13	7.50	0.70	8.4	440	460	20	436.4	456.4	30

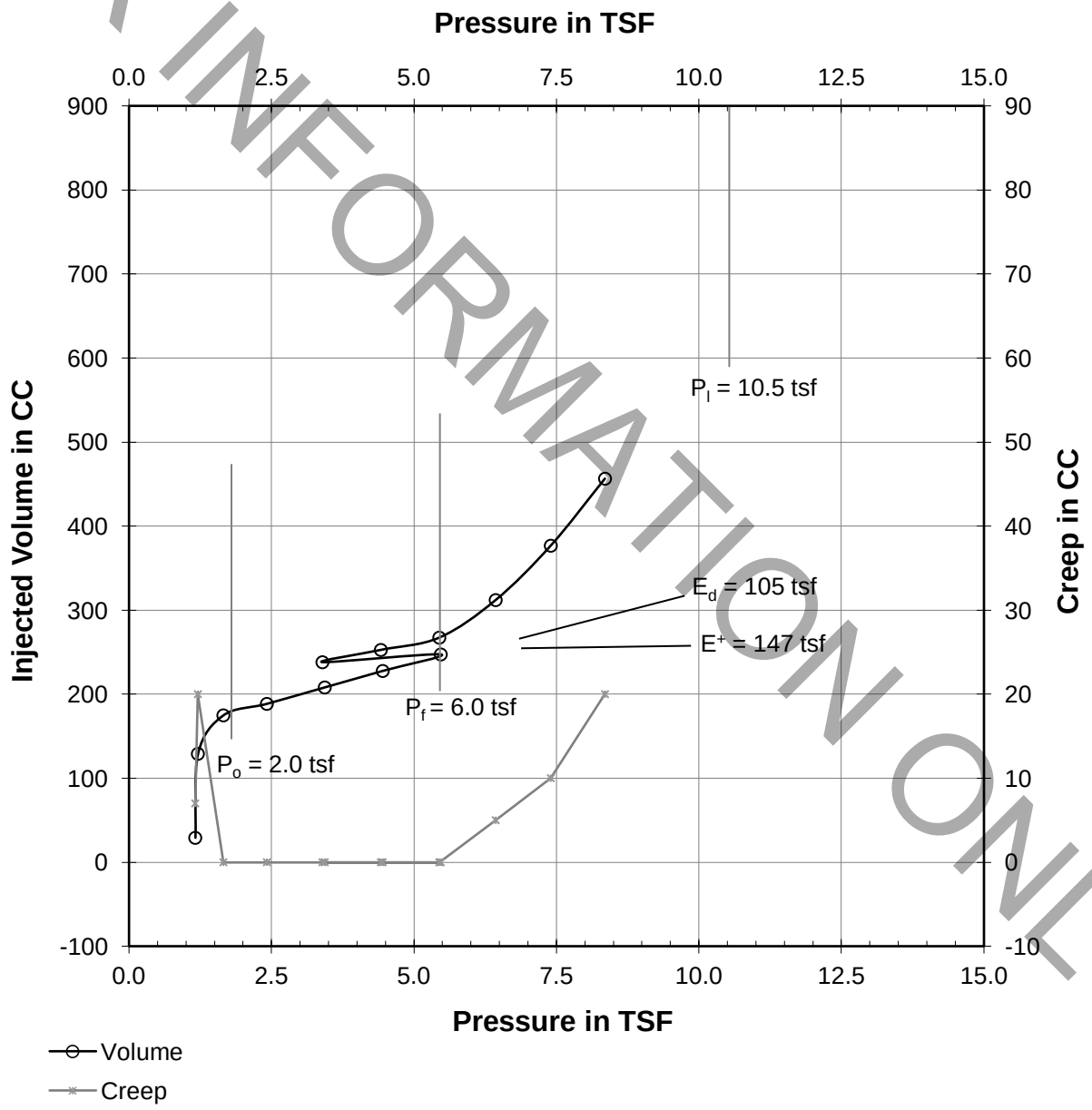
E_d= 105 TSF E^+= 147 TSF P_l= 10.5 TSF

FOR INFORMATION ONLY

Pressuremeter Data Reduction (BX)

FOR INFORMATION ONLY

AECOM Job Number: 60318823 Date: 03-22-14
Boring No.: 10
Test Depth: 32.5-35.0 Feet



AECOM

Pressuremeter Data Reduction (BX)

AECOM Job No.: 60318823
Boring No.: 11
Test Depth: 25.0-27.5 Feet

Water Correction: 0.97 Bars

No.	Pressure Readings (bars)	Inertia Correction (bars)	Corrected Pressure (tsf)	30 Sec. Volume (cc)	60 Sec. Volume (cc)	Creep (cc)	Corrected 30 Sec. Volume (cc)	Corrected 60 Sec. Volume (cc)	Incremental Modulus (tsf)
1	0.00	0.01	1.0	3	5	2	2.1	4.1	
2	0.25	0.09	1.2	30	35	5	29.0	34.0	9
3	0.75	0.22	1.6	93	93	0	91.8	91.8	11
4	1.50	0.27	2.3	120	120	0	118.5	118.5	47
5	2.50	0.30	3.3	135	135	0	133.0	133.0	123
6	3.50	0.32	4.3	150	150	0	147.6	147.6	125
7	4.50	0.34	5.4	165	165	0	162.3	162.3	128
8	5.50	0.36	6.4	180	180	0	177.0	176.9	130
9	2.50	0.33	3.3	160	160	0	158.0	158.0	307
10	4.00	0.35	4.8	173	173	0	170.5	170.5	232
11	5.50	0.38	6.4	190	190	0	187.0	186.9	177
12	6.50	0.43	7.4	220	225	5	216.7	221.7	56
13	8.00	0.48	8.9	260	270	10	256.3	266.3	70
14	9.50	0.55	10.4	320	330	10	315.9	325.9	55
15	11.00	0.66	11.8	405	430	25	400.6	425.6	35

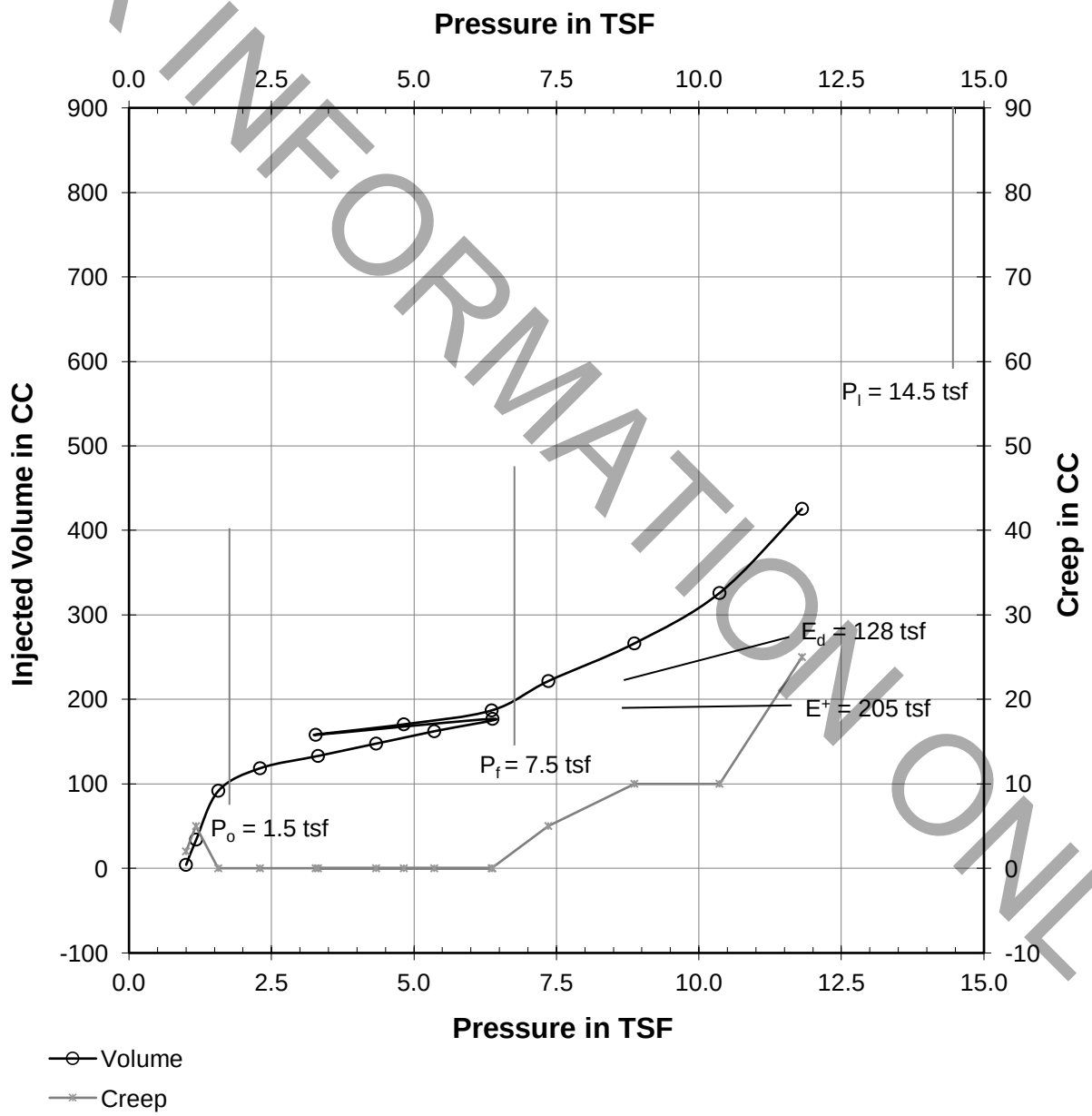
E_d= 128 TSF E^+= 205 TSF P_l= 14.5 TSF

FOR INFORMATION ONLY

Pressuremeter Data Reduction (BX)

FOR INFORMATION ONLY

AECOM Job Number: 60318823 Date: 03-21-14
Boring No.: 11
Test Depth: 25.0-27.5 Feet



AECOM

Pressuremeter Data Reduction (BX)

AECOM Job No.: 60318823
Boring No.: 11
Test Depth: 27.5-30.0 Feet

Water Correction: 1.04 Bars

No.	Pressure Readings (bars)	Inertia Correction (bars)	Corrected Pressure (tsf)	30 Sec. Volume (cc)	60 Sec. Volume (cc)	Creep (cc)	Corrected 30 Sec. Volume (cc)	Corrected 60 Sec. Volume (cc)	Incremental Modulus (tsf)
1	0.00	0.09	1.0	33	35	2	32.1	34.1	
2	0.25	0.21	1.1	80	90	10	79.0	89.0	4
3	0.75	0.41	1.4	215	215	0	213.9	213.9	5
4	1.50	0.44	2.2	240	240	0	238.5	238.5	62
5	2.50	0.47	3.2	260	260	0	258.1	258.1	109
6	3.50	0.49	4.2	280	280	0	277.7	277.7	111
7	4.50	0.52	5.3	300	300	0	297.3	297.3	114
8	2.00	0.50	2.7	288	288	0	286.3	286.3	519
9	3.50	0.52	4.2	307	307	0	304.7	304.7	186
10	4.50	0.53	5.2	315	315	0	312.3	312.3	304
11	5.50	0.56	6.3	335	335	0	332.0	332.0	118
12	6.50	0.59	7.3	360	365	5	356.7	361.7	80
13	7.50	0.62	8.3	390	393	3	386.4	389.4	88
14	9.00	0.68	9.8	433	440	7	429.1	436.0	82
15	10.50	0.76	11.3	500	520	20	495.7	515.7	50

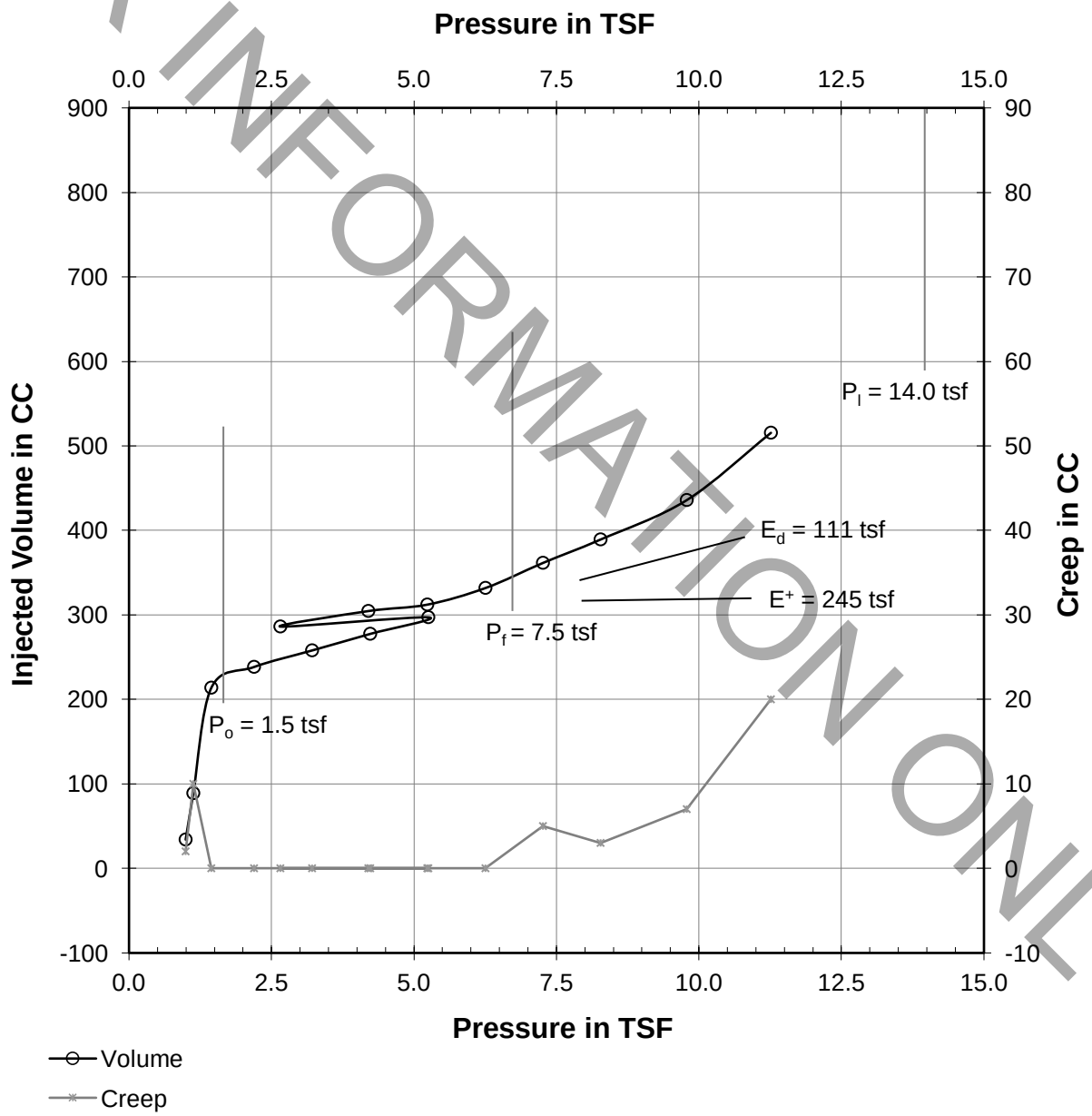
E_d= 111 TSF E^+= 245 TSF P_l= 14.0 TSF

FOR INFORMATION ONLY

Pressuremeter Data Reduction (BX)

FOR INFORMATION ONLY

AECOM Job Number: 60318823 Date: 03-21-14
Boring No.: 11
Test Depth: 27.5-30.0 Feet



AECOM

Pressuremeter Data Reduction (BX)

AECOM Job No.: 60318823
Boring No.: 11
Test Depth: 32.5-35.0 Feet

Water Correction: 1.19 Bars

No.	Pressure Readings (bars)	Inertia Correction (bars)	Corrected Pressure (tsf)	30 Sec. Volume (cc)	60 Sec. Volume (cc)	Creep (cc)	Corrected 30 Sec. Volume (cc)	Corrected 60 Sec. Volume (cc)	Incremental Modulus (tsf)
1	0.00	0.01	1.2	3	5	2	2.0	4.0	
2	0.25	0.07	1.4	20	25	5	18.9	23.9	15
3	0.75	0.20	1.8	82	82	0	80.7	80.7	11
4	1.50	0.23	2.6	100	100	0	98.3	98.3	70
5	3.00	0.30	4.1	140	140	0	137.7	137.7	66
6	4.50	0.35	5.6	170	170	0	167.2	167.2	94
7	5.50	0.38	6.6	190	190	0	186.9	186.9	98
8	3.00	0.35	4.0	170	170	0	167.8	167.7	256
9	4.25	0.37	5.3	185	185	0	182.3	182.3	167
10	5.50	0.39	6.6	200	200	0	196.9	196.9	170
11	7.00	0.46	8.1	245	250	5	241.5	246.5	61
12	8.50	0.53	9.6	305	315	10	301.1	311.1	50
13	10.00	0.65	11.0	390	420	30	385.8	415.8	33

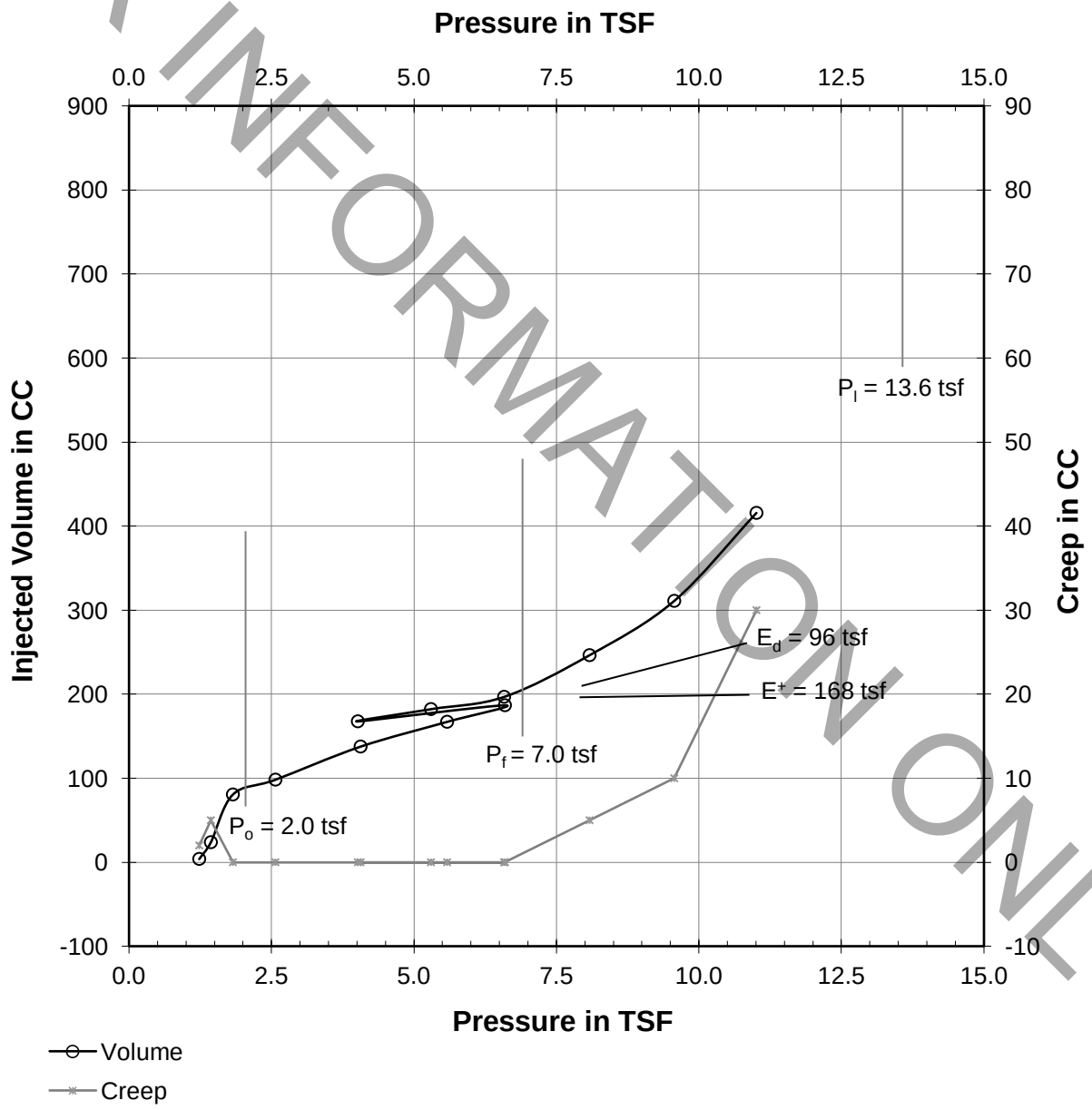
E_d= 96 TSF E^+= 168 TSF P_l= 13.6 TSF

FOR INFORMATION ONLY

Pressuremeter Data Reduction (BX)

FOR INFORMATION ONLY

AECOM Job Number: 60318823 Date: 03-21-14
Boring No.: 11
Test Depth: 32.5-35.0 Feet



PRESSUREMETER - NOMINAL TIP RESISTANCE

FROM FHWA GEOTECHNICAL ENG CIRCULAR NO 5 p 180

$S_u = (P_L - P_o)/N_c \qquad N_c = 5.5$

use average $P_L + P_o$ from B-10

$P_L = \left(\frac{11.8 + 13.5 + 10.5}{3}\right) tsf = 11.9\ tsf$

$P_o = \left(\frac{1.5 + 2.0 + 2.0}{3}\right) tsf = 1.8\ tsf$

$S_u = (11.9\ tsf - 1.8\ tsf)/5.5 = 1.84\ tsf$

$= 3.67\ ksf$

nominal tip resistance

$q_p = N_c \cdot S_u \qquad N_c = 6\left[1 + 0.2\left(\frac{25}{8}\right)\right] = 9.75$

use $N_c = 9.0$

assume 5' diameter

$q_p = 9 \cdot 3.67\ ksf = 33.0\ ksf$ nominal tip resistance

resistance factor = 0.40

allowable bearing resistance = $0.40\,(33.0\ ksf) = 13.2\ ksf$

check caisson size - assume 8 shafts

$\frac{3650\ kips}{8} = 456.25\ kips \qquad \sqrt{\frac{456.25\ kips}{\pi(13.2\ ksf)}} = r = 3.3\ ft$

use 7.0 ft diameter shaft

FOR INFORMATION ONLY

FOR INFORMATION ONLY

Briaud and Baker Method

$q_p = k(P_L - p_o) + q_o$

$q_o = 10\,ft \times 125\,pcf + (125-62.4)pcf \times 15\,ft = 2114\,psf$
$= 2.1\,ksf$
$= 1.05\,tsf$

From Briaud $k = 1.4$

'nominal resistance

$q_p = 1.4(11.9-1.8)\,tsf + 1.05\,tsf$

$q_p = 15.2\,tsf = 30.4\,ksf$

allowable resistance $= 0.40\,(30.4\,ksf) = 12.15\,ksf$

Check caisson size

$\sqrt{\frac{456.25\,kips}{\pi\,(12.15\,ksf}} = 3.45\,ft = r$

bell diameter = 7.0 ft

for allowable = 12 ksf

$\sqrt{\frac{456.25\,kips}{\pi\,(12)ksf}} = 3.48\,ft = r$

bell diameter = 7.0 ft

Use allowable resistance = 12.0 ksf

SETTLEMENT

$$S = \frac{1.33}{3E_B} p R_0 \left(\lambda_2 \frac{R_{bell}}{R_0}\right)^{\alpha} + \frac{\alpha}{4.5 E_A} p \lambda_3 R$$

$$E_1 = \frac{176 + 213 + 205 + 245}{4} = 210 \text{ tsf}$$

$$E_2 = \frac{147 + 168}{2} = 157.5 \text{ tsf} =$$

$$E_B = \frac{2}{\frac{1}{210} + \frac{1}{157.5}} = 180.0 \text{ tsf}$$

$.00476 + .00635 = .01111$

Live Load Total 184.5 kips ÷ 8 = 23 kips

$$p_0 = \frac{433.25 + 23(0.5)\text{kips}}{\pi (3.5 \text{ ft})^2} = 11.55 \text{ ksf} = 5.77$$

$R_{bell} = 3.5$ ft $R_0 = 1$ ft $\lambda_2 = \lambda_3 = 1$ for circle (Calsson)

$$S = \frac{1.33 (5.77 \text{ tsf})(3.5)^{0.6}}{3 \times 210} + \frac{0.6 (3.5)(5.77)}{4.5 (180)}$$

$S = 0.0258 + 0.0150 = 0.0408$ ft $= \underline{0.49}$ in

FOR INFORMATION ONLY

3/26/14
settlement

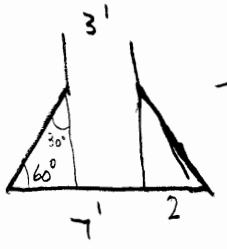
AECOM

PROJECT NAME: I-90 (Kennedy) at East River Road
AECOM JOB NO.: 60318823
OPERATOR: Seiler
DATE: 03/24/14

FOR INFORMATION ONLY

PRESSUREMETER TEST RESULTS

BORING NUMBER	DEPTH (ft)	P_o (tsf)	P_f (tsf)	P_l (tsf)	E_d (tsf)	E^+ (tsf)	E_d/E^+	E_d/P_l	P_l/P_f	
10	25.0-27.5	1.5	6.5	11.8	113	176	0.64	9.6	1.8	E_1
	27.5-30.0	2.0	7.0	13.5	132	213	0.62	9.8	1.9	E_1
	32.5-35.0	2.0	6.0	10.5	105	147	0.71	10.0	1.8	E_2
11	25.0-27.5	1.5	7.5	14.5	128	205	0.62	8.8	1.9	E_1
	27.5-30.0	1.5	7.5	14.0	111	245	0.45	7.9	1.9	E_1
	32.5-35.0	2.0	7.0	13.6	96	168	0.57	7.1	1.9	E_2
					AVERAGE		0.60	8.9	1.9	



3.5

25.0' ±

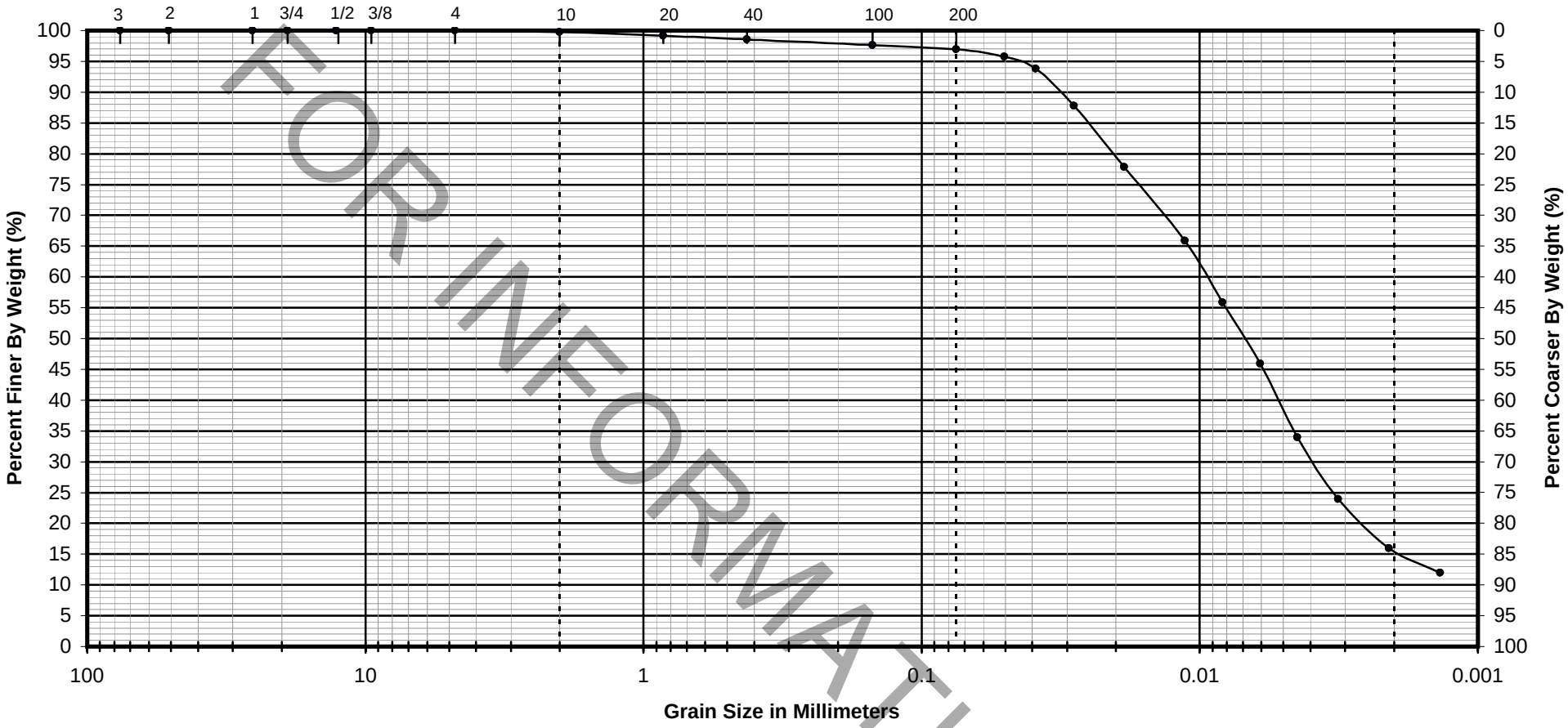
32

$E_1 = E_A$

FOR INFORMATION ONLY

APPENDIX E

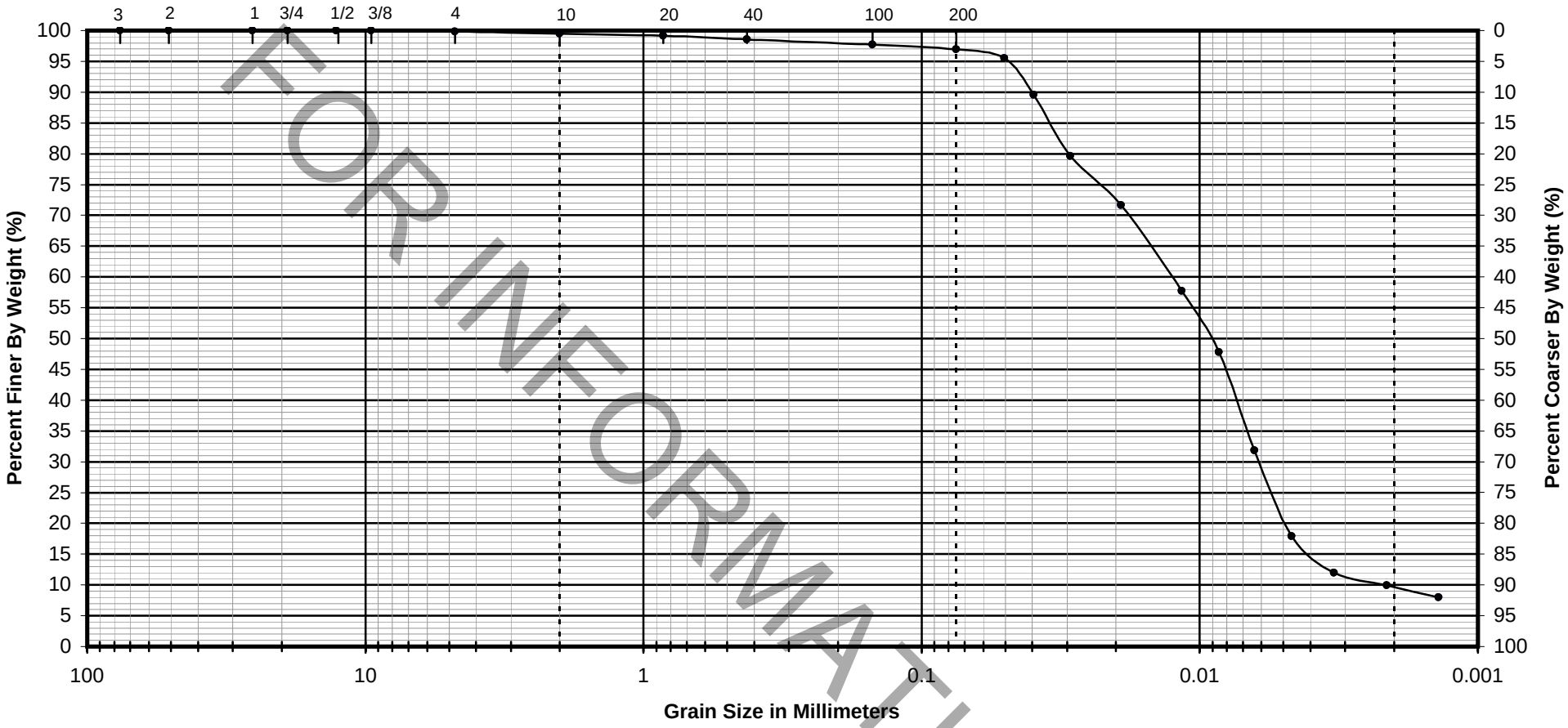
Laboratory Test Results



GRAVEL	SAND		SILT	CLAY
	COARSE	FINE		

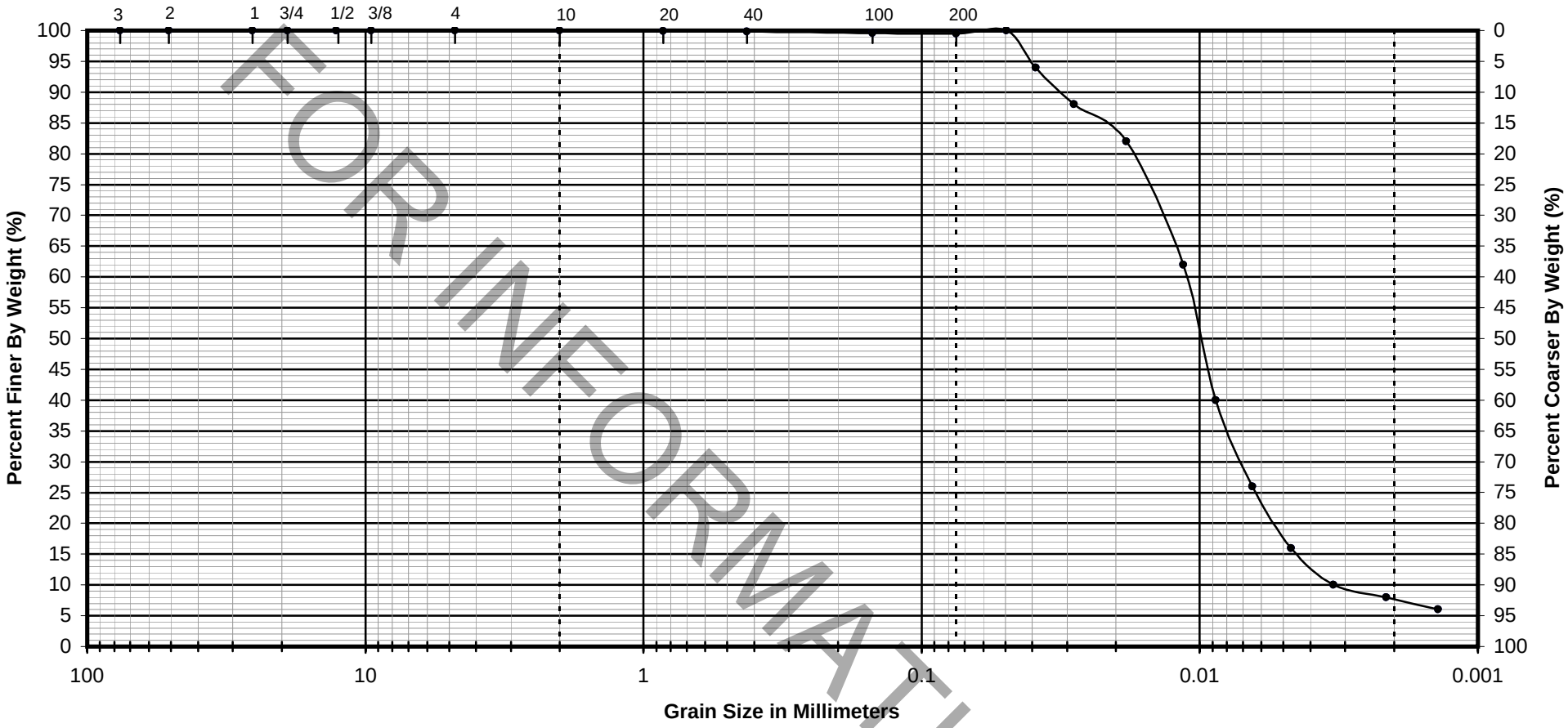
FOR INFORMATION ONLY

Boring No.	SB-02	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	13			
Depth	28.5'-30.0'	SILT		Cumberland Flyover Ramp
Liquid Limit	24	A-4		Chicago, Illinois
Plastic Limit	18	gray		
Plasticity Index	6	Group Index	4	
Test By	CC	% Gravel	0.2	O'BRIEN & ASSOCIATES, INC.
Date	12/18/13	% Sand	2.8	1235 East Davis Street
Reviewed By	VB	% Silt	81.0	Arlington Heights, IL 60005
Job No	13657	% Clay	16.0	Phone 847-398-1441 ● Fax 847-398-2376



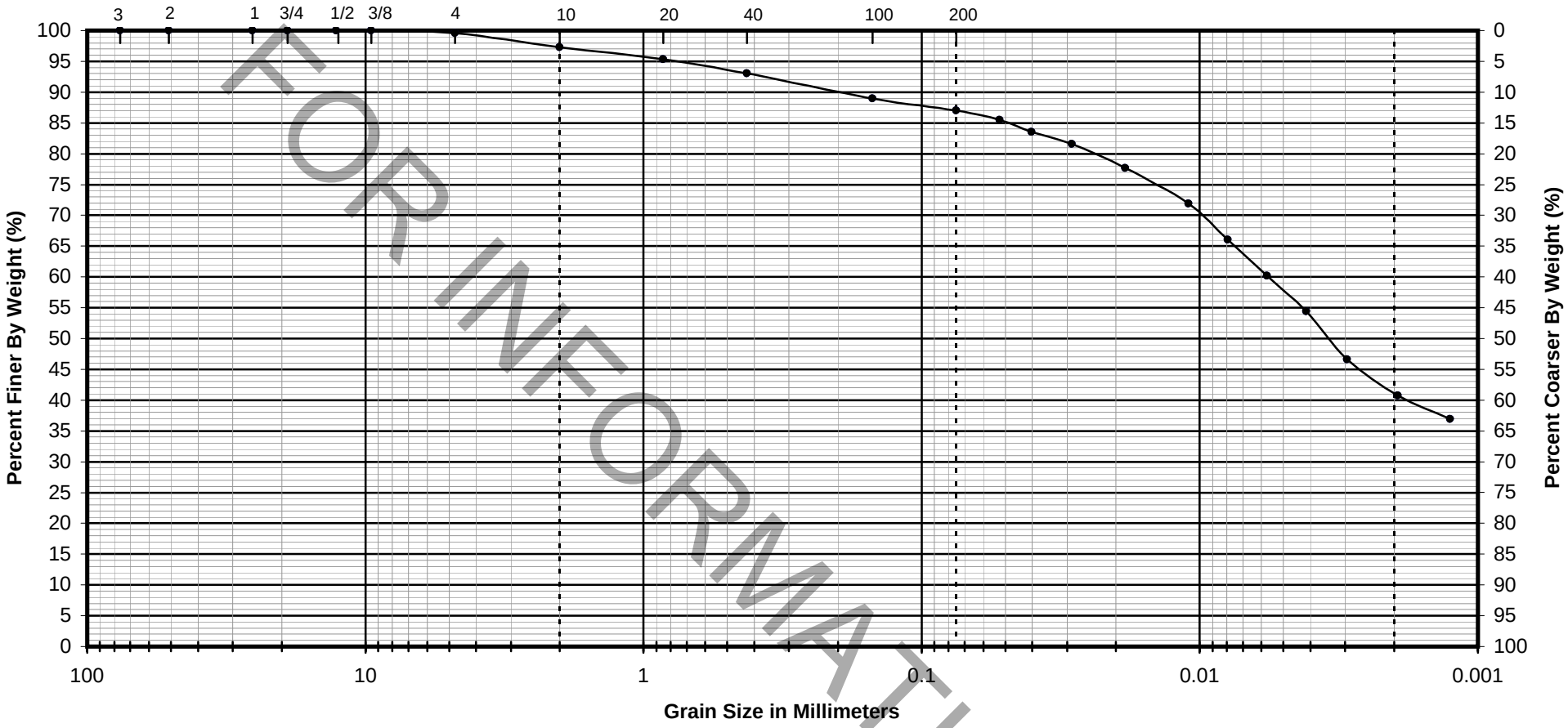
FOR INFORMATION ONLY

Boring No.	SB-04	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	15			
Depth	38.5'-40.0'	SILT		Cumberland Flyover Ramp
Liquid Limit	22	A-4		Chicago, Illinois
Plastic Limit	18	gray		
Plasticity Index	4	Group Index	2	
Test By	CC	% Gravel	0.5	O'BRIEN & ASSOCIATES, INC.
Date	12/18/13	% Sand	2.6	1235 East Davis Street
Reviewed By	VB	% Silt	87.0	Arlington Heights, IL 60005
Job No	13657	% Clay	10.0	Phone 847-398-1441 • Fax 847-398-2376



FOR INFORMATION ONLY

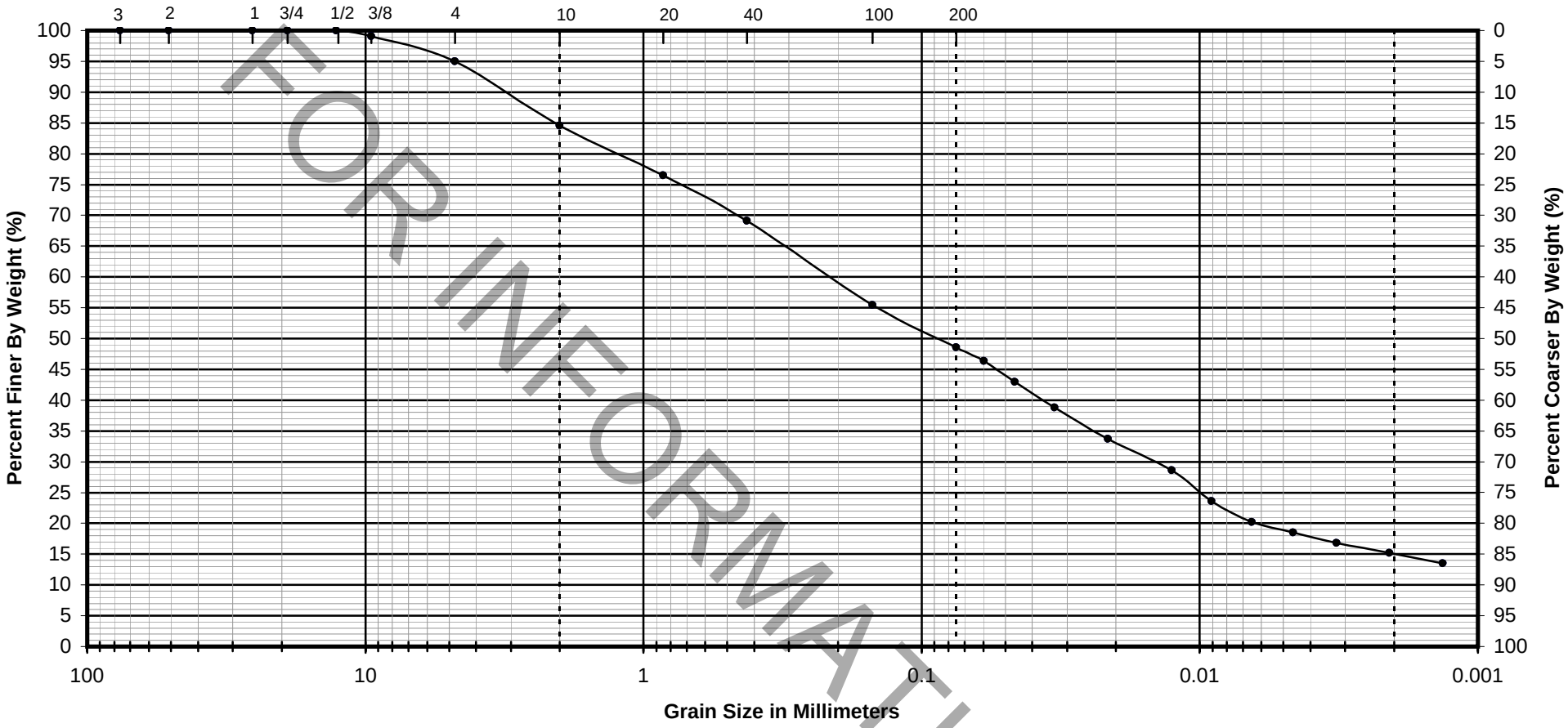
Boring No.	SB-06	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	14			
Depth	33.5'-35.0'	SILT		Cumberland Flyover Ramp
Liquid Limit	21	A-4		Chicago, Illinois
Plastic Limit	18	gray		
Plasticity Index	3	Group Index	0	
Test By	CC	% Gravel	0.0	O'BRIEN & ASSOCIATES, INC.
Date	12/18/13	% Sand	0.5	1235 East Davis Street
Reviewed By	VB	% Silt	91.5	Arlington Heights, IL 60005
Job No	13657	% Clay	8.0	Phone 847-398-1441 ● Fax 847-398-2376



GRAVEL	SAND		SILT	CLAY
	COARSE	FINE		

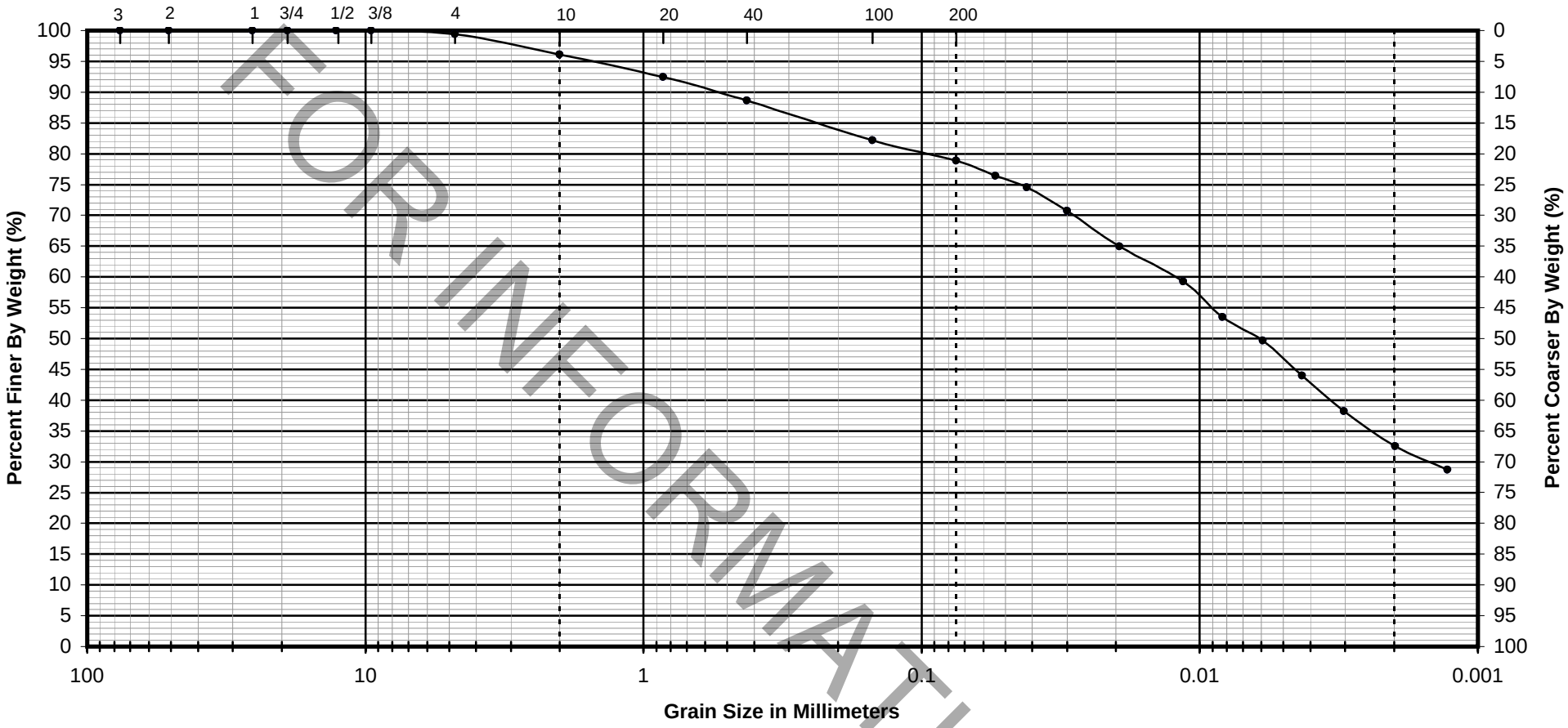
FOR INFORMATION ONLY

Boring No.	SB-10	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	13			
Depth	28.5'-30.0'	CLAY		Cumberland Flyover Ramp
Liquid Limit	-	A-6		East River Road Bridge
Plastic Limit	-	gray		Cook County, Illinois
Plasticity Index	-	Group Index	13	
Test By	CC	% Gravel	2.7	O'BRIEN & ASSOCIATES, INC.
Date	3/10/14	% Sand	10.3	1235 East Davis Street
Reviewed By	VB	% Silt	46.2	Arlington Heights, IL 60005
Job No	13657	% Clay	40.8	Phone 847-398-1441 • Fax 847-398-2376



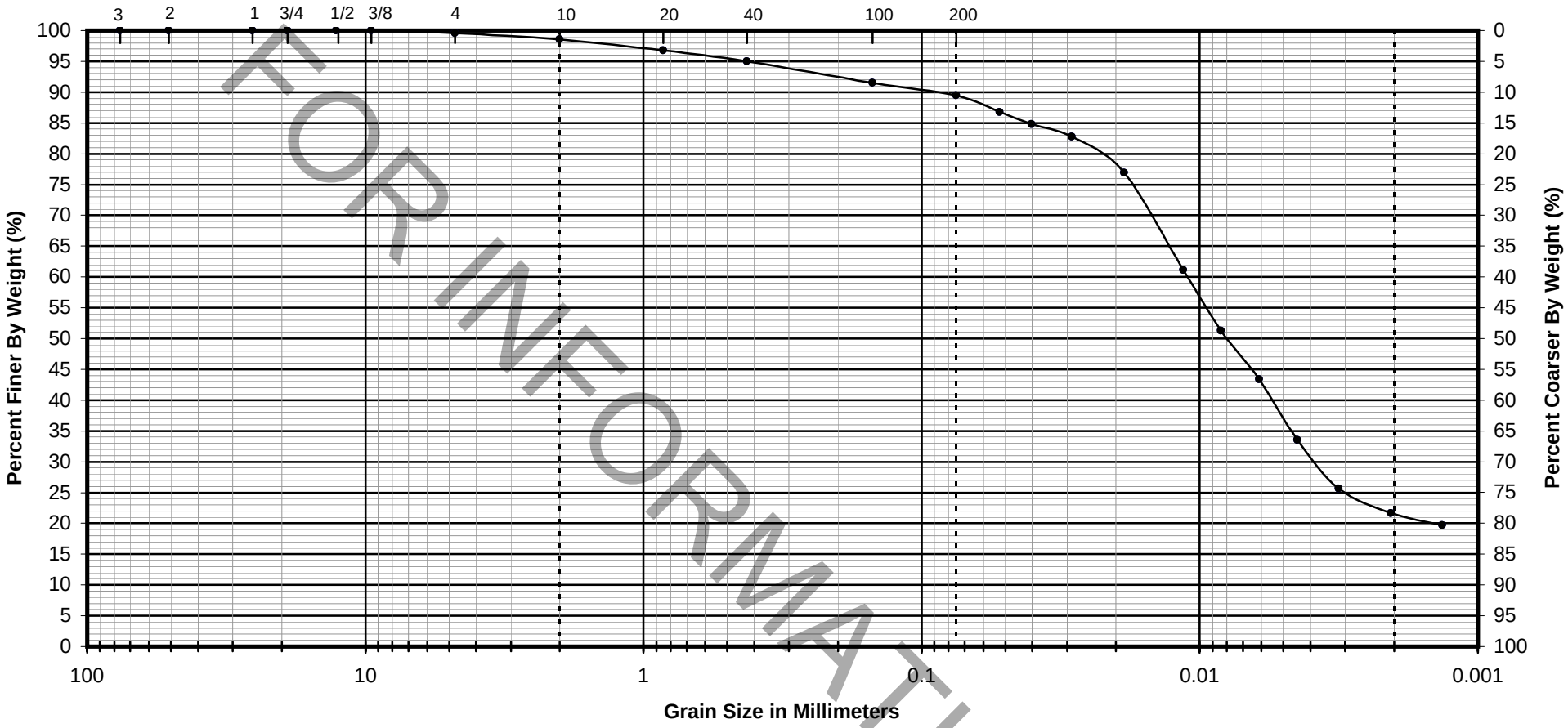
FOR INFORMATION ONLY

Boring No.	SB-10	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	14			
Depth	33.5'-35.0'	SANDY LOAM		Cumberland Flyover Ramp
Liquid Limit	-	A-4		East River Road Bridge
Plastic Limit	-	gray		Cook County, Illinois
Plasticity Index	-	Group Index	0	
Test By	CC	% Gravel	15.4	O'BRIEN & ASSOCIATES, INC.
Date	3/10/14	% Sand	36.1	1235 East Davis Street
Reviewed By	VB	% Silt	33.4	Arlington Heights, IL 60005
Job No	13657	% Clay	15.2	Phone 847-398-1441 • Fax 847-398-2376



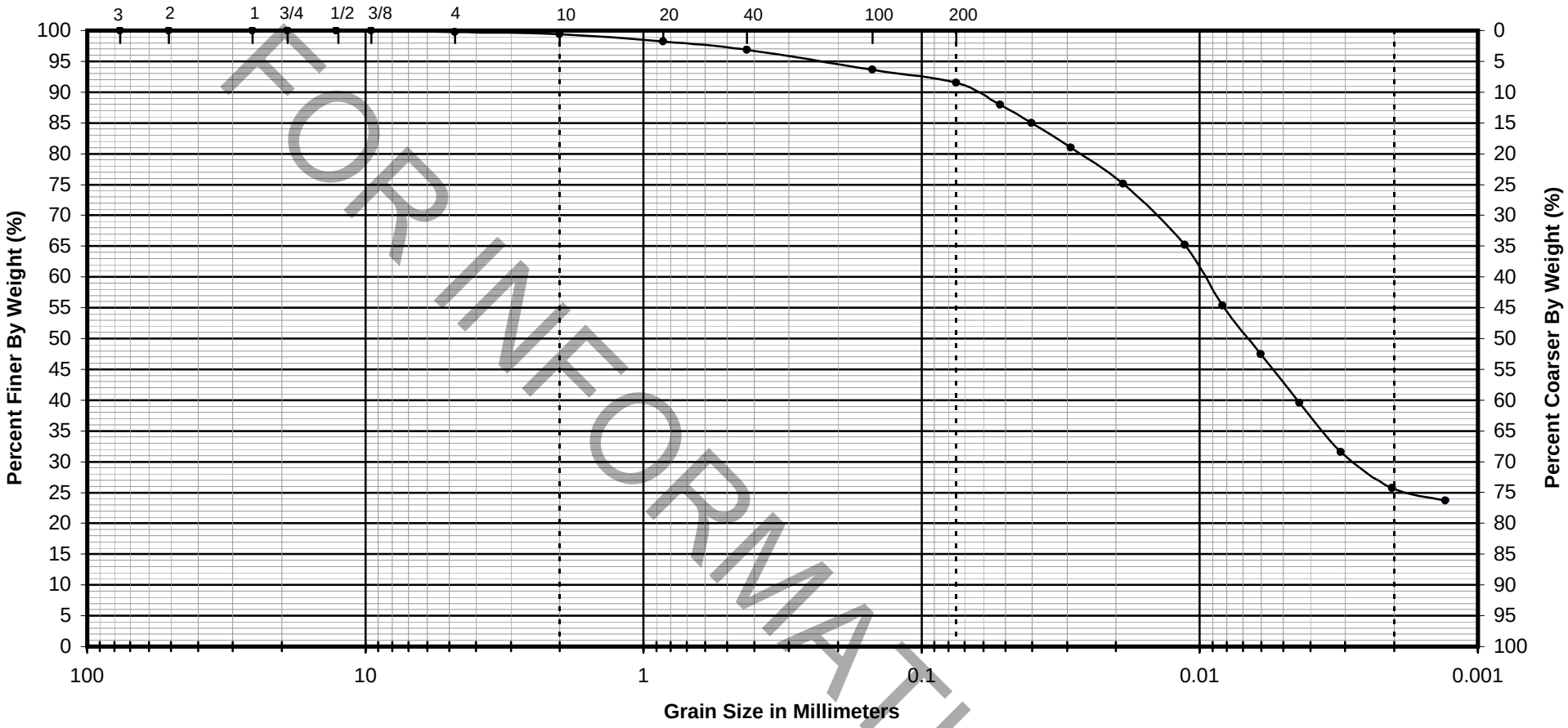
FOR INFORMATION ONLY

Boring No.	SB-10	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	15			
Depth	38.5'-40.0'	CLAY		Cumberland Flyover Ramp
Liquid Limit	-	A-6		East River Road Bridge
Plastic Limit	-	gray		Cook County, Illinois
Plasticity Index	-	Group Index	11	
Test By	CC	% Gravel	3.9	O'BRIEN & ASSOCIATES, INC.
Date	3/10/14	% Sand	17.2	1235 East Davis Street
Reviewed By	VB	% Silt	46.4	Arlington Heights, IL 60005
Job No	13657	% Clay	32.5	Phone 847-398-1441 • Fax 847-398-2376



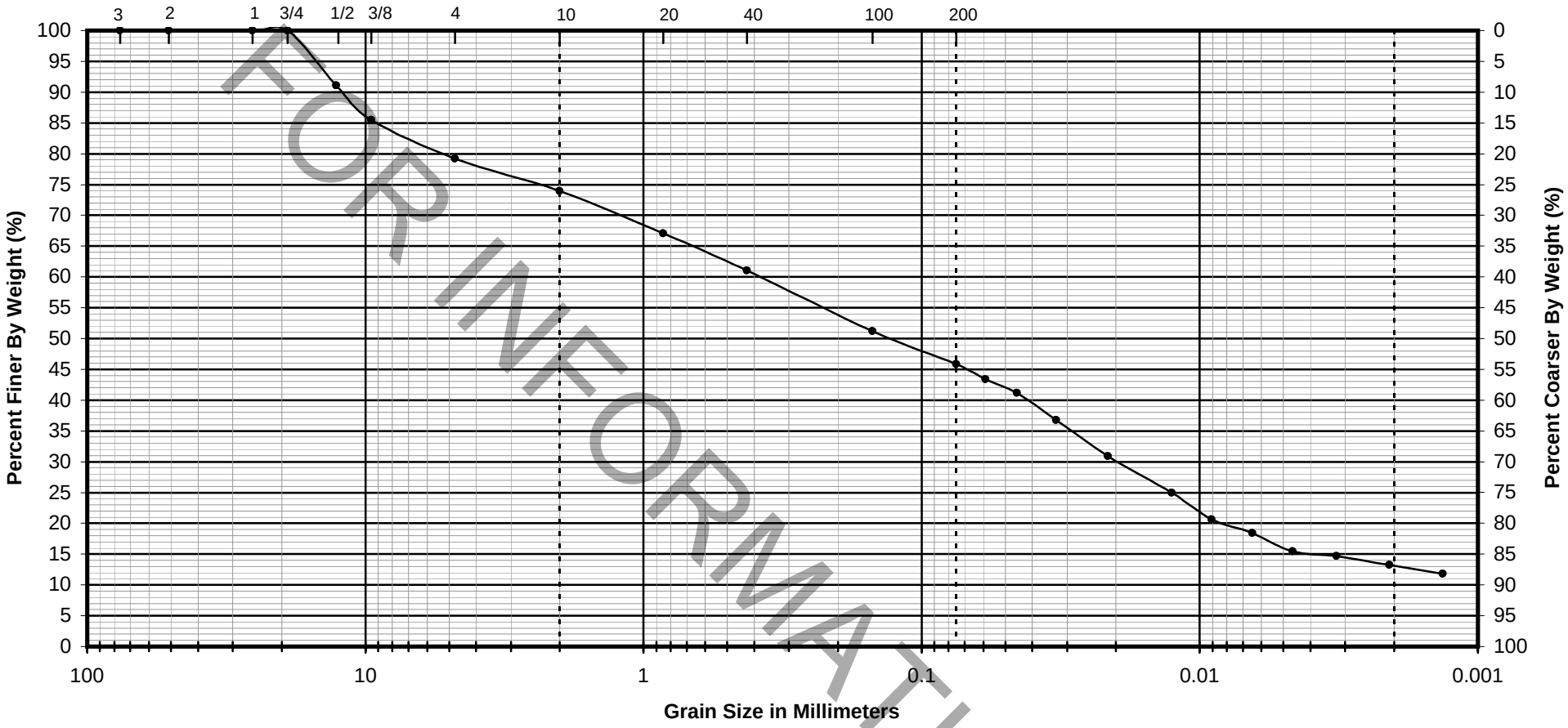
FOR INFORMATION ONLY

Boring No.	SB-10	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	16			
Depth	43.5'-45.0'	SILTY CLAY LOAM		Cumberland Flyover Ramp
Liquid Limit	-	A-6		East River Road Bridge
Plastic Limit	-	gray		Cook County, Illinois
Plasticity Index	-	Group Index	8	
Test By	CC	% Gravel	1.4	O'BRIEN & ASSOCIATES, INC.
Date	3/10/14	% Sand	9.1	1235 East Davis Street
Reviewed By	VB	% Silt	67.8	Arlington Heights, IL 60005
Job No	13657	% Clay	21.7	Phone 847-398-1441 • Fax 847-398-2376



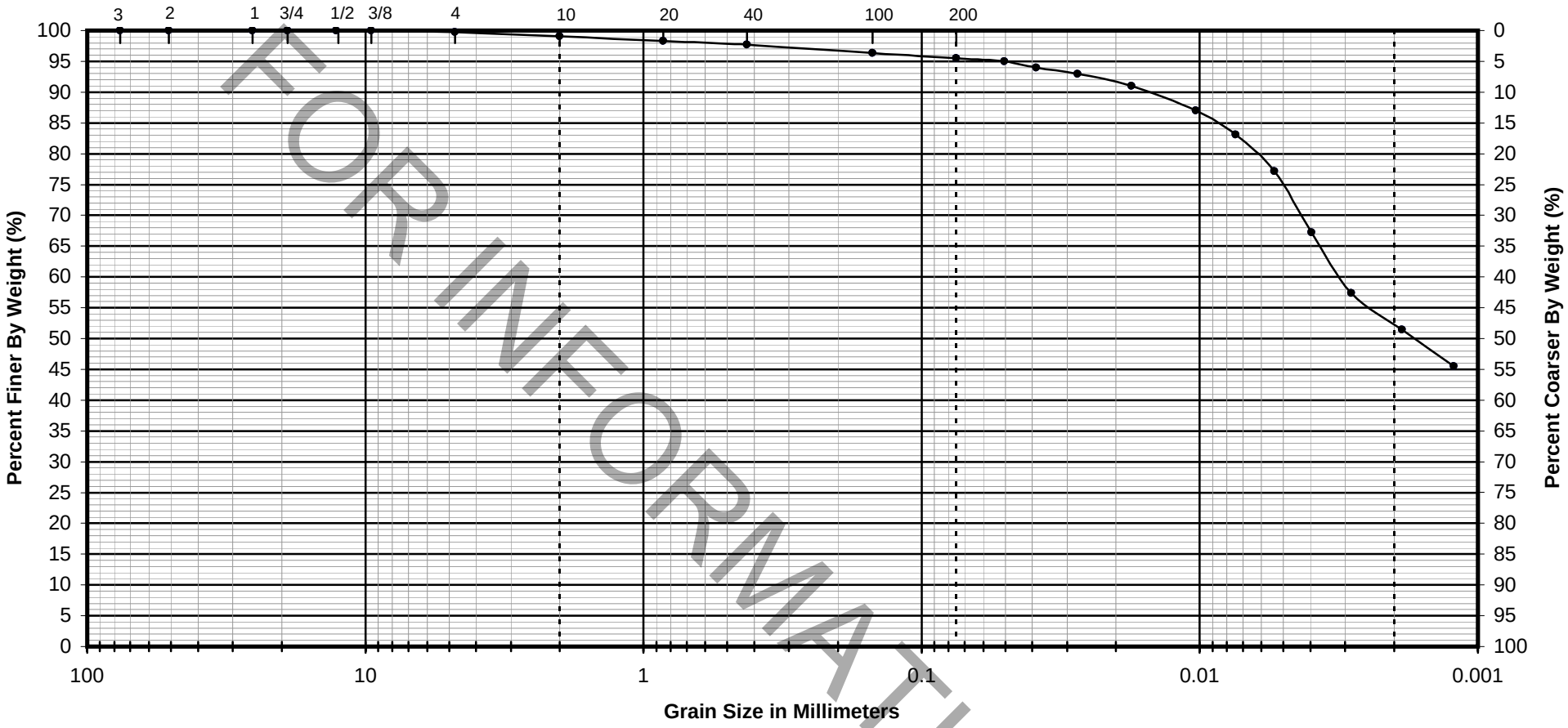
FOR INFORMATION ONLY

Boring No.	SB-10	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	21			
Depth	68.5'-70.0'	SILTY CLAY LOAM		Cumberland Flyover Ramp
Liquid Limit	-	A-6		East River Road Bridge
Plastic Limit	-	gray		Cook County, Illinois
Plasticity Index	-	Group Index	9	
Test By	CC	% Gravel	0.6	O'BRIEN & ASSOCIATES, INC.
Date	3/10/14	% Sand	7.9	1235 East Davis Street
Reviewed By	VB	% Silt	65.8	Arlington Heights, IL 60005
Job No	13657	% Clay	25.7	Phone 847-398-1441 ● Fax 847-398-2376



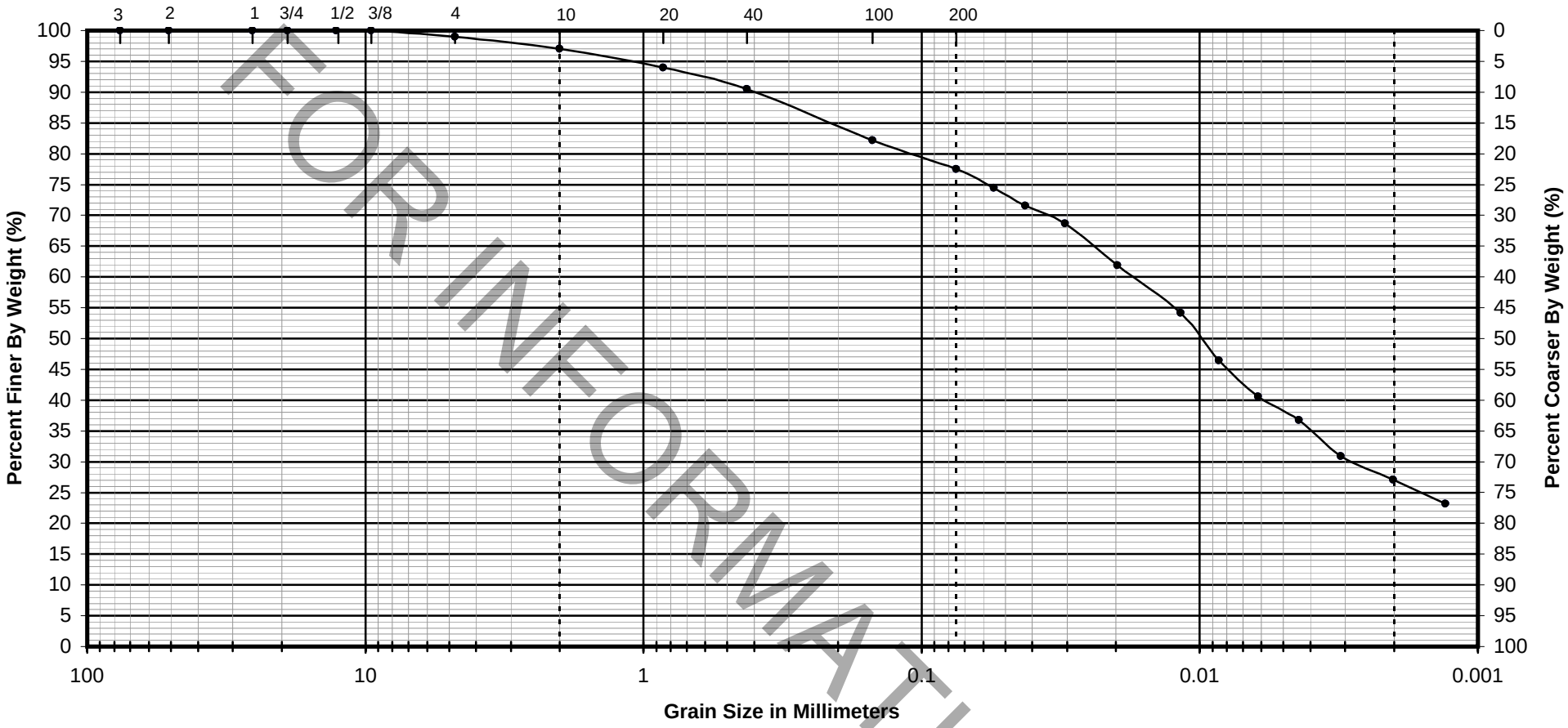
FOR INFORMATION ONLY

Boring No.	SB-10	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	22			
Depth	73.5'-75.0'	SANDY LOAM		Cumberland Flyover Ramp
Liquid Limit	-	A-4		East River Road Bridge
Plastic Limit	-	gray		Cook County, Illinois
Plasticity Index	-	Group Index	0	
Test By	CC	% Gravel	26.0	O'BRIEN & ASSOCIATES, INC.
Date	3/10/14	% Sand	28.1	1235 East Davis Street
Reviewed By	VB	% Silt	32.6	Arlington Heights, IL 60005
Job No	13657	% Clay	13.2	Phone 847-398-1441 • Fax 847-398-2376



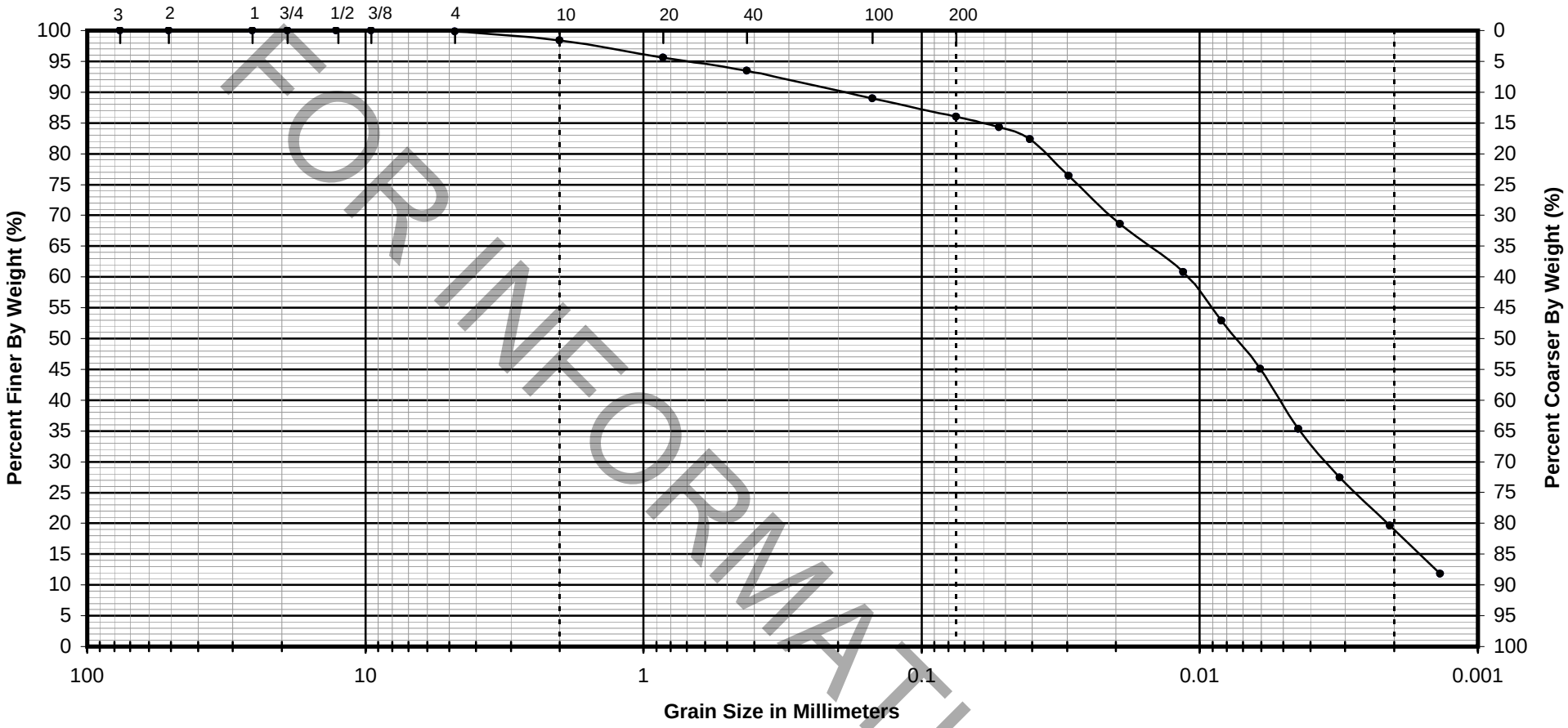
FOR INFORMATION ONLY

Boring No.	SB-11	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	12			
Depth	26.0'-27.5'	CLAY		Cumberland Flyover Ramp
Liquid Limit	-	A-6		East River Road Bridge
Plastic Limit	-	gray		Cook County, Illinois
Plasticity Index	-	Group Index	14	
Test By	CC	% Gravel	0.9	O'BRIEN & ASSOCIATES, INC.
Date	3/10/14	% Sand	3.6	1235 East Davis Street
Reviewed By	VB	% Silt	44.1	Arlington Heights, IL 60005
Job No	13657	% Clay	51.4	Phone 847-398-1441 • Fax 847-398-2376



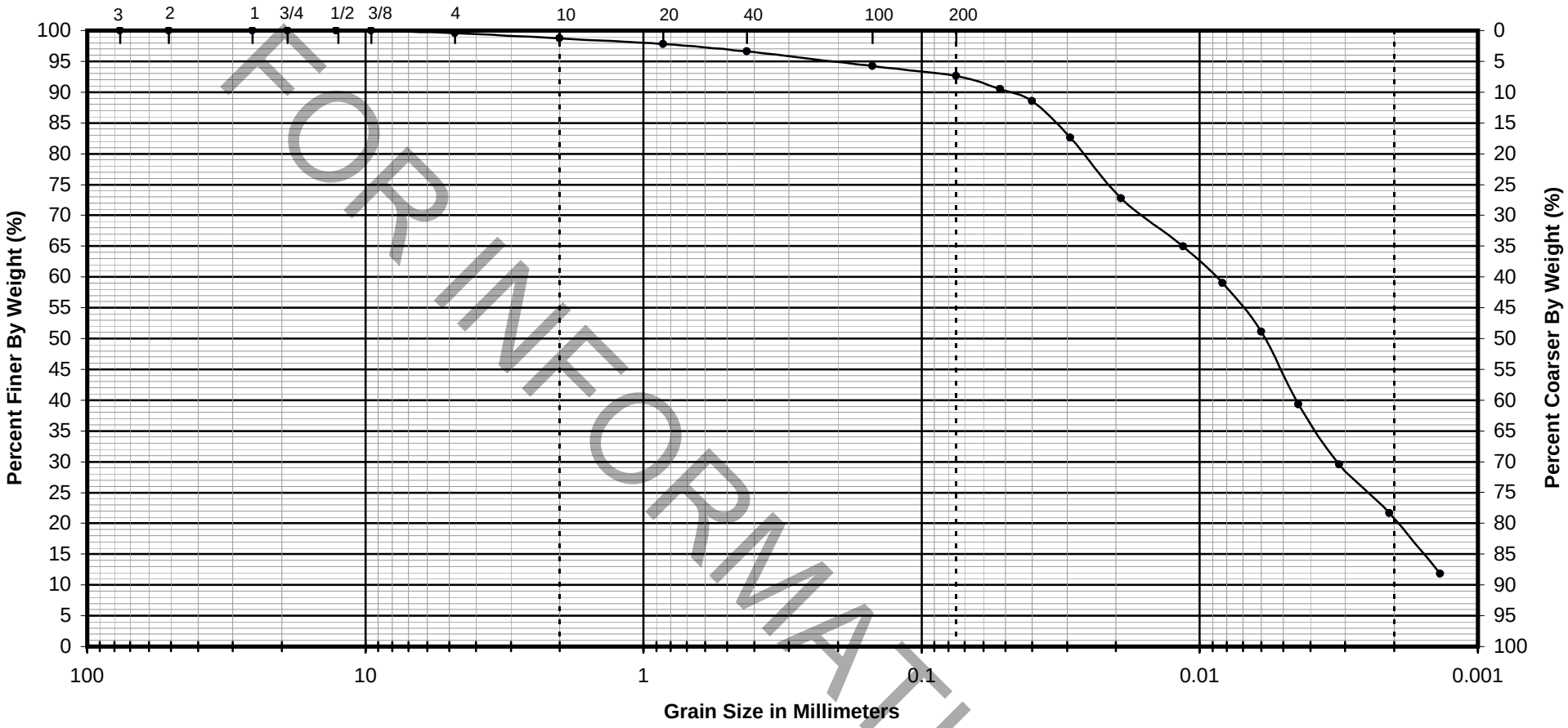
FOR INFORMATION ONLY

Boring No.	SB-11	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	13			
Depth	28.5'-30.0'	SILTY CLAY LOAM		Cumberland Flyover Ramp
Liquid Limit	-	A-6		East River Road Bridge
Plastic Limit	-	gray		Cook County, Illinois
Plasticity Index	-	Group Index	7	
Test By	CC	% Gravel	2.9	O'BRIEN & ASSOCIATES, INC.
Date	3/10/14	% Sand	19.5	1235 East Davis Street
Reviewed By	VB	% Silt	50.5	Arlington Heights, IL 60005
Job No	13657	% Clay	27.1	Phone 847-398-1441 • Fax 847-398-2376



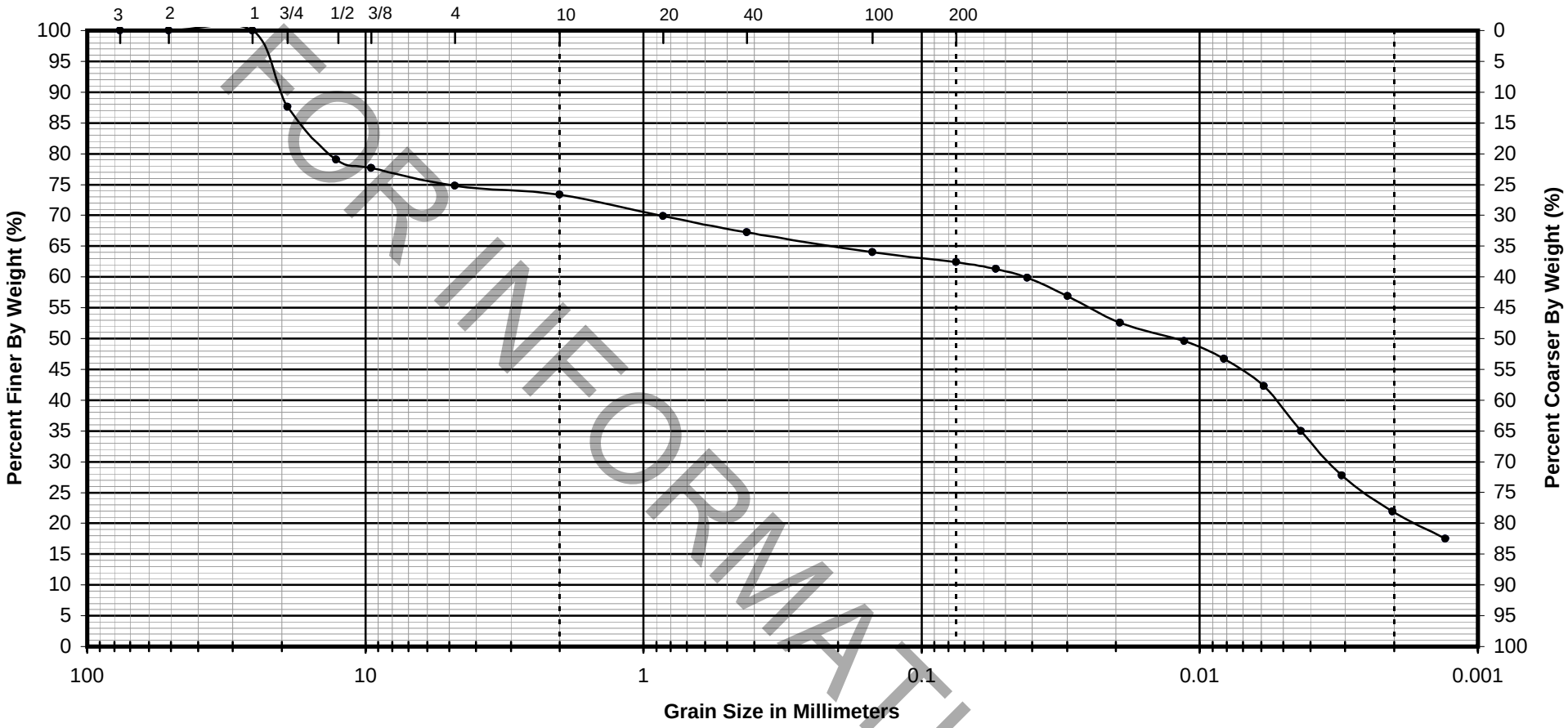
FOR INFORMATION ONLY

Boring No.	SB-11	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	16			
Depth	43.5'-45.0'	SILTY LOAM		Cumberland Flyover Ramp
Liquid Limit	-	A-4		East River Road Bridge
Plastic Limit	-	gray		Cook County, Illinois
Plasticity Index	-	Group Index	7	
Test By	CC	% Gravel	1.6	O'BRIEN & ASSOCIATES, INC.
Date	3/10/14	% Sand	12.3	1235 East Davis Street
Reviewed By	VB	% Silt	66.4	Arlington Heights, IL 60005
Job No	13657	% Clay	19.6	Phone 847-398-1441 • Fax 847-398-2376



FOR INFORMATION ONLY

Boring No.	SB-11	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	21			
Depth	68.5'-70.0'	SILTY CLAY LOAM		Cumberland Flyover Ramp
Liquid Limit	-	A-6		East River Road Bridge
Plastic Limit	-	gray		Cook County, Illinois
Plasticity Index	-	Group Index	12	
Test By	CC	% Gravel	1.2	O'BRIEN & ASSOCIATES, INC.
Date	3/10/14	% Sand	6.1	1235 East Davis Street
Reviewed By	VB	% Silt	71.0	Arlington Heights, IL 60005
Job No	13657	% Clay	21.6	Phone 847-398-1441 • Fax 847-398-2376



FOR INFORMATION ONLY

Boring No.	SB-11	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	23			
Depth	78.5'-80.0'	CLAY LOAM		Cumberland Flyover Ramp
Liquid Limit	-	A-4		East River Road Bridge
Plastic Limit	-	gray		Cook County, Illinois
Plasticity Index	-	Group Index	0	
Test By	CC	% Gravel	26.6	O'BRIEN & ASSOCIATES, INC.
Date	3/10/14	% Sand	10.9	1235 East Davis Street
Reviewed By	VB	% Silt	40.6	Arlington Heights, IL 60005
Job No	13657	% Clay	21.9	Phone 847-398-1441 • Fax 847-398-2376

O'BRIEN & ASSOCIATES. INC.
CONSULTING ENGINEERS
1235 E. DAVIS STREET
ARLINGTON HEIGHTS, ILLINOIS 60005
(847) 398-1441 FAX (847) 398-2376

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

AASHTO T89/T90

Project Name Cumberland Flyover Ramp Job No 13657

Location Chicago, Illinois Date 1/7/14

Client HNTB Corporation

Boring No./Sample No.	RW-02	RW-09	RW-16	SB-02	SB-04	SB-06		
Depth	33.5'-35.0'	38.5'-40.0'	43.5'-45.0'	28.5'-30.0'	38.5'-40.0'	33.5'-35.0'		
LIQUID LIMIT (LL)	19	21	19	24	22	21		
PLASTIC LIMIT (PL)	16	16	14	18	18	18		
PLASTICITY INDEX (PI)	3	5	5	6	4	3		

Tested by VH

FOR INFORMATION ONLY

O'Brien & Associates
Consulting Engineers
1235 E. Davis Street
Arlington Heights, Illinois 60005
Phone: (847) 398-1441 Fax: (847) 398-2376

FOR INFORMATION ONLY

UNCONFINED COMPRESSIVE STRENGTH of INTACT ROCK CORE SPECIMENS - ASTM D 7012 METHOD C

Project Name	Cumberland Flyover Ramp	Date	2/7/14
Location	I-90 & Cumberland Ave., Chicago, Illinois	Job No.	13657
Sample Description	Drilled Bedrock Core Sample	Tested By:	AB

Sample No	Depth (ft)	Dimensions Length (in)	Diameter (in)	Area (in^2)	Unit Weight ($lbs\ ft^3$)	Maximum Load (lbs)	Compressive Strength (psi)	Compressive Strength (tsf)
SB-01	86' 6"	4.08	2.04	3.27	156.7	54,200	16,582	1194
SB-02-1	85' 6"	4.14	2.04	3.27	148.1	25,900	7,924	571
SB-02-2	89' 3"	4.08	2.04	3.27	156.7	37,950	11,611	836
SB-03	82' 9"	4.07	2.04	3.27	150.6	33,580	10,274	740
SB-04	82' 7"	4.10	2.04	3.27	159.8	44,610	13,648	983
SB-05	78' 0"	4.14	2.06	3.33	157.7	52,250	15,677	1129
SB-06	79' 0"	4.16	2.06	3.33	158.2	33,780	10,135	730
SB-07	112' 0"	4.26	2.11	3.50	157.7	37,660	10,770	775
SB-08	87' 3"	4.18	2.10	3.46	157.5	35,650	10,293	741
SB-09	84' 9"	4.27	2.10	3.46	157.7	31,870	9,201	662
SB-11	86' 0"	4.11	2.04	3.27	149.1	37,480	11,467	826
SB-12	106' 8"	4.20	2.08	3.40	159.7	50,980	15,003	1080
SB-13	106' 4"	4.10	2.08	3.40	153.7	42,190	12,416	894

FOR INFORMATION ONLY

APPENDIX F

Pile Calculation Tables and Graphs

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-07 (PREDRILL)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 648.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 647.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 1270 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 64.63 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 24.24 KIPS

PILE TYPE AND SIZE ========== Metal Shell 12"Φ w/.25" walls
Pile Perimeter========== 3.142 FT.
Pile End Bearing Area========== 0.785 SQFT.

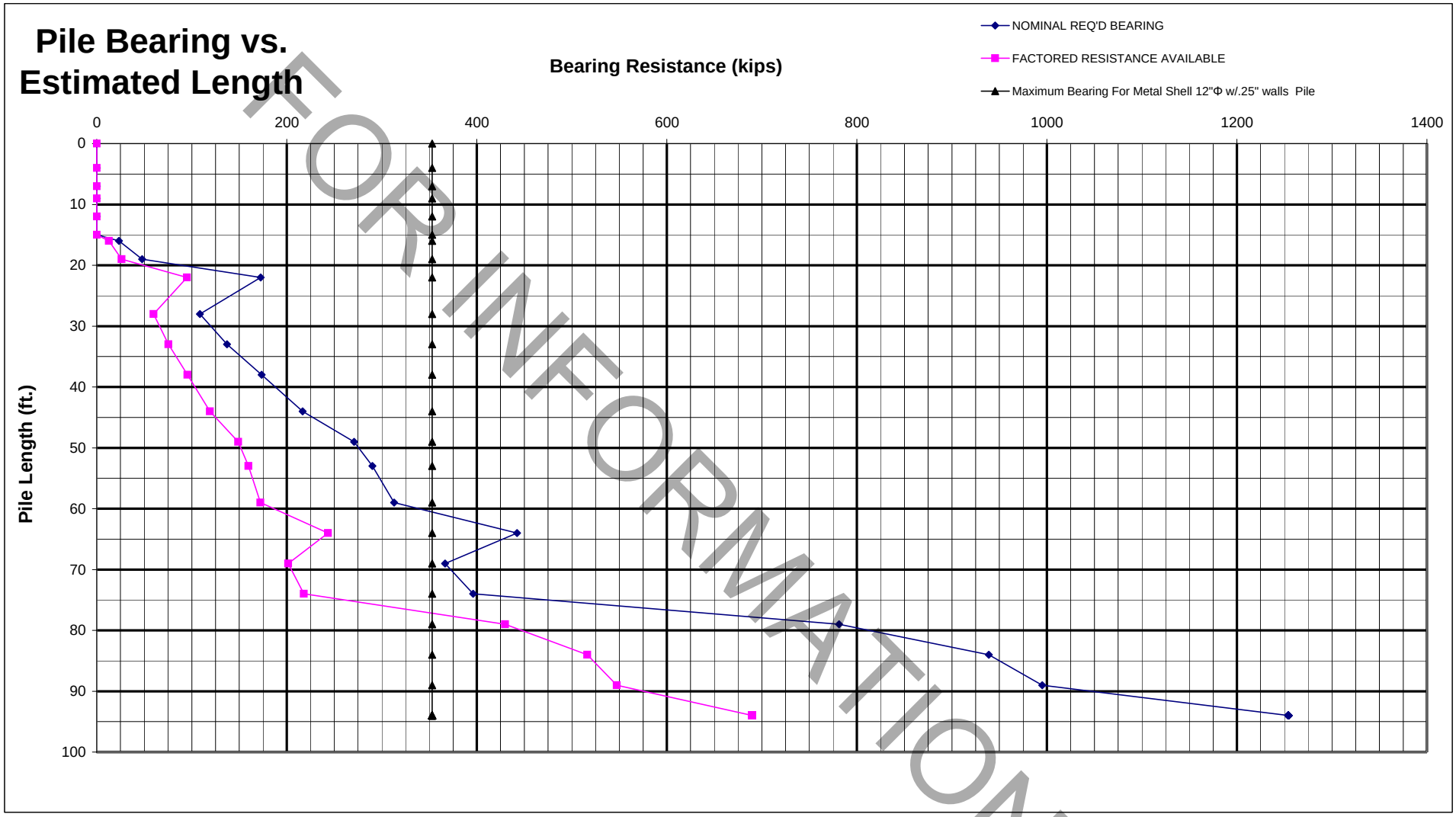
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
353 KIPS	**313** KIPS	**172** KIPS	**59** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
644.00	3.00	0.00			0.0		0.0				0	0	0	0	4
641.50	2.50	0.00			0.0	0.0	0.0				0	0	0	0	7
639.00	2.50	0.00			0.0	0.0	0.0				0	0	0	0	9
636.50	2.50	0.00			0.0	0.0	0.0				0	0	0	0	12
633.00	3.50	0.00			0.0	0.0	0.0				0	0	0	0	15
632.00	1.00	0.00			0.0	0.0	23.3				23	0	0	13	16
629.00	3.00	2.70			21.0	23.3	47.7				48	0	0	26	19
626.00	3.00	3.10	21		23.1	26.7	172.6				173	0	0	95	22
620.50	5.50		26	Clean Coarse Sand	46.4	128.5	108.5				109	0	0	60	28
615.50	5.00	2.10			29.5	18.1	137.2				137	0	0	75	33
610.50	5.00	2.00			28.6	17.2	173.6				174	0	0	95	38
604.50	6.00	2.90			44.1	25.0	216.8				217	0	0	119	44
599.00	5.50	2.80			39.4	24.1	270.8				271	0	0	149	49
595.00	4.00	4.50	24		40.9	38.8	290.2				290	0	0	160	53
589.50	5.50	2.00			31.5	17.2	313.0				313	0	0	172	59
584.00	5.50	1.00	42		19.2	8.6	442.3				~~442~~	~~0~~	~~0~~	~~243~~	~~64~~
579.50	4.50		32	Hard Till	24.9	118.7	366.6				~~367~~	~~0~~	~~0~~	~~202~~	~~69~~
574.50	5.00	2.10	21		29.5	18.1	396.2				~~396~~	~~0~~	~~0~~	~~218~~	~~74~~
569.00	5.50	2.10	21		32.5	18.1	781.3				~~781~~	~~0~~	~~0~~	~~430~~	~~79~~
564.50	4.50		100	Very Fine Silty Sand	216.9	370.8	938.9				~~939~~	~~0~~	~~0~~	~~516~~	~~84~~
559.50	5.00		84	Very Fine Silty Sand	182.3	311.5	995.1				~~995~~	~~0~~	~~0~~	~~547~~	~~89~~
554.50	5.00		50	Very Fine Silty Sand	73.5	185.4	1254.1				~~1254~~	~~0~~	~~0~~	~~690~~	~~94~~
549.50	5.00		100	Very Fine Silty Sand		370.8									

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-07 (PREDRILL)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 648.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 647.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 1270 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 64.63 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 24.24 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.25" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 SQFT.

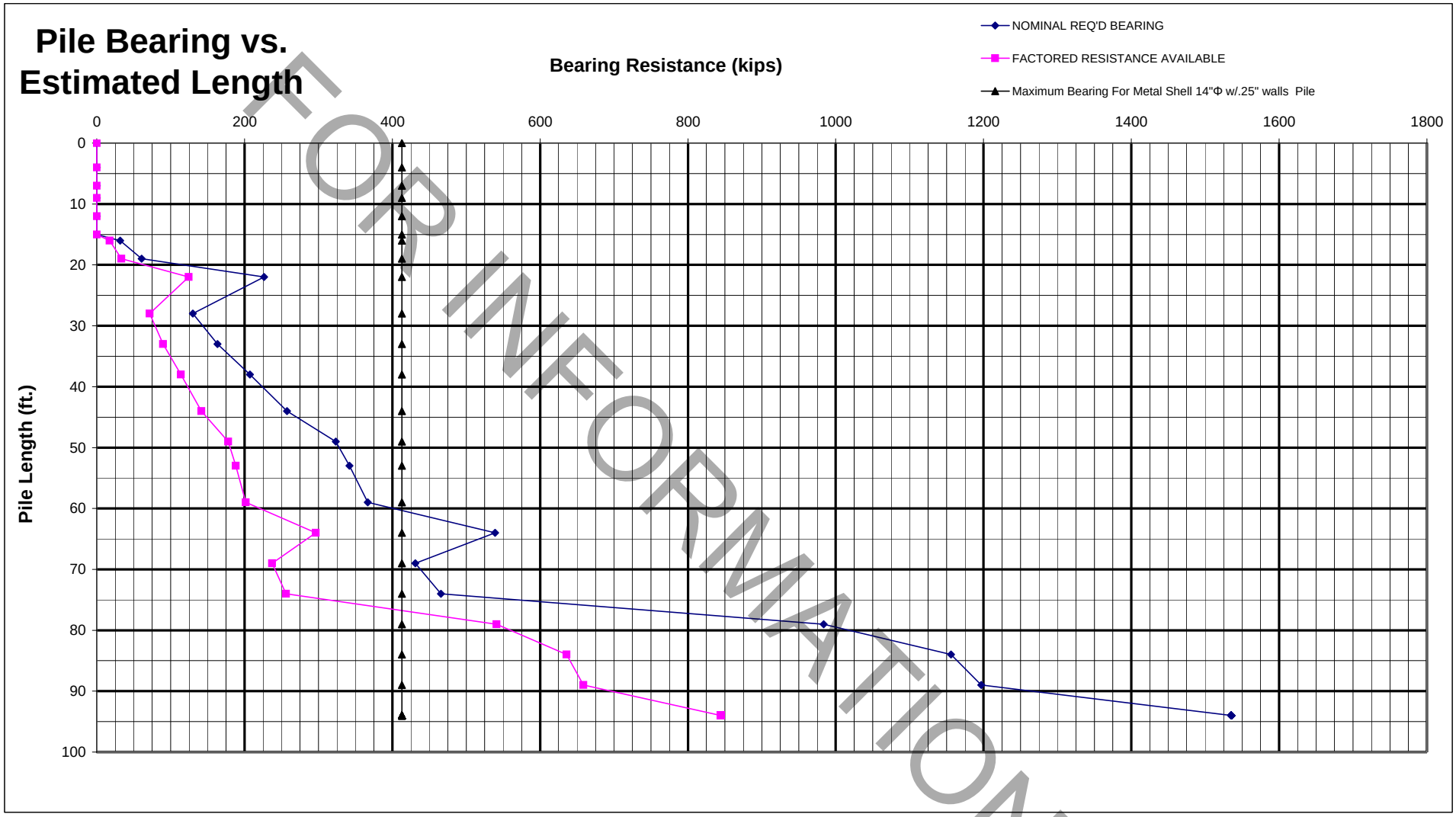
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	**367** KIPS	**202** KIPS	**59** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
644.00	3.00	0.00			0.0		0.0				0	0	0	0	4
641.50	2.50	0.00			0.0	0.0	0.0				0	0	0	0	7
639.00	2.50	0.00			0.0	0.0	0.0				0	0	0	0	9
636.50	2.50	0.00			0.0	0.0	0.0				0	0	0	0	12
633.00	3.50	0.00			0.0	0.0	0.0				0	0	0	0	15
632.00	1.00	0.00			0.0	0.0	31.7				32	0	0	17	16
629.00	3.00	2.70			24.4	31.7	60.8				61	0	0	33	19
626.00	3.00	3.10	21		27.0	36.3	226.4				226	0	0	125	22
620.50	5.50		26	Clean Coarse Sand	54.1	175.0	130.1				130	0	0	72	28
615.50	5.00	2.10			34.4	24.6	163.4				163	0	0	90	33
610.50	5.00	2.00			33.4	23.5	207.4				207	0	0	114	38
604.50	6.00	2.90			51.4	34.0	257.6				258	0	0	142	44
599.00	5.50	2.80			46.0	32.8	323.5				323	0	0	178	49
595.00	4.00	4.50	24		47.7	52.8	341.9				342	0	0	188	53
589.50	5.50	2.00			36.7	23.5	366.9				367	0	0	202	59
584.00	5.50	1.00	42		22.4	11.7	539.1				~~539~~	~~0~~	~~0~~	~~296~~	~~64~~
579.50	4.50		32	Hard Till	29.1	161.5	431.3				~~431~~	~~0~~	~~0~~	~~237~~	~~69~~
574.50	5.00	2.10	21		34.4	24.6	465.7				~~466~~	~~0~~	~~0~~	~~256~~	~~74~~
569.00	5.50	2.10	21		37.9	24.6	983.7				~~984~~	~~0~~	~~0~~	~~541~~	~~79~~
564.50	4.50		100	Very Fine Silty Sand	253.1	504.7	1156.0				~~1156~~	~~0~~	~~0~~	~~636~~	~~84~~
559.50	5.00		84	Very Fine Silty Sand	212.7	424.0	1197.1				~~1197~~	~~0~~	~~0~~	~~658~~	~~89~~
554.50	5.00		50	Very Fine Silty Sand	85.8	252.4	1535.2				~~1535~~	~~0~~	~~0~~	~~844~~	~~94~~
549.50	5.00		100	Very Fine Silty Sand		504.7									

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-07 (PREDRILL)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 648.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 647.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 1270 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 64.63 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 24.24 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area===== 0.108 SQFT.

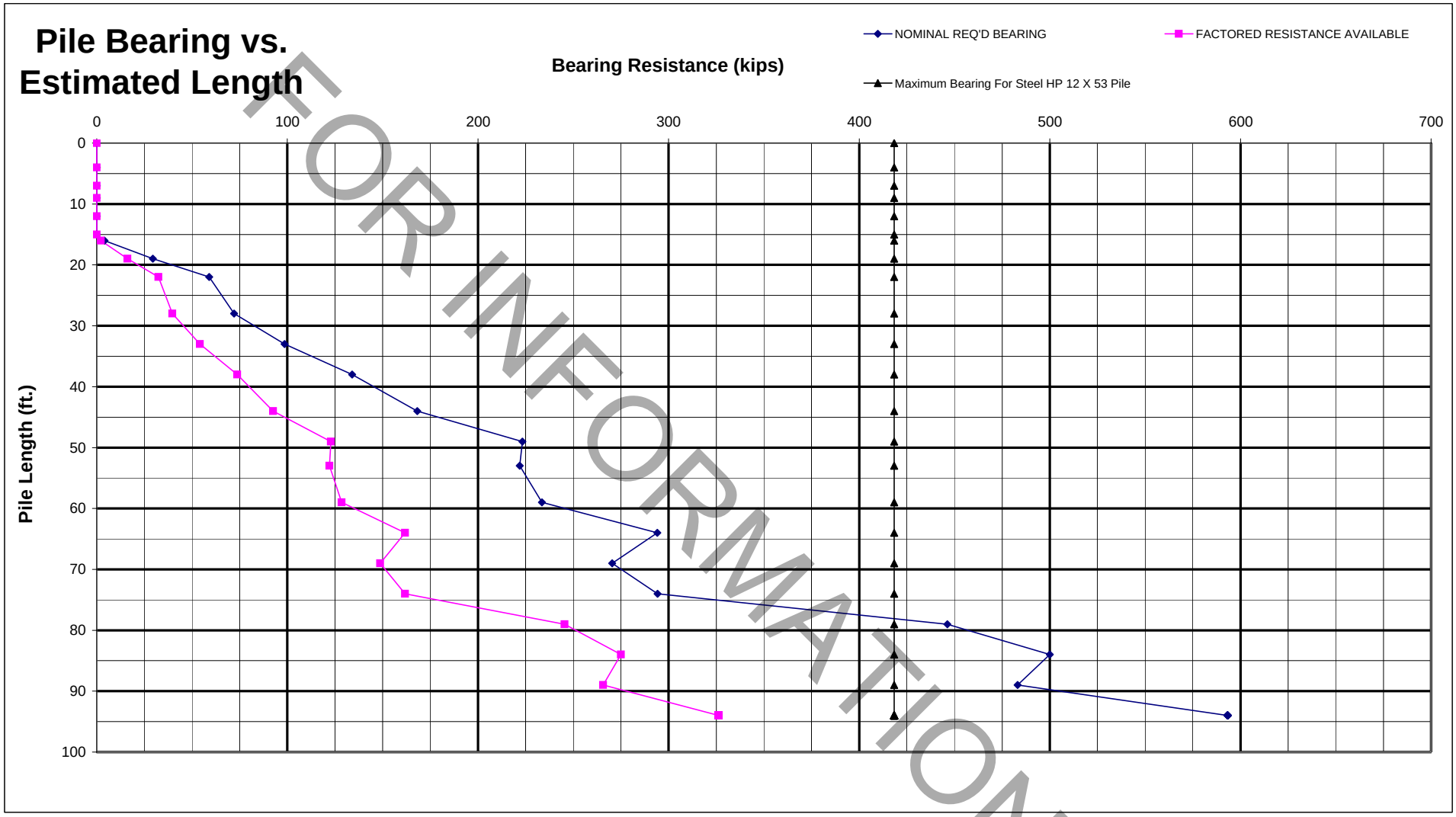
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	**294** KIPS	**162** KIPS	**74** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
644.00	3.00	0.00			0.0		0.0	0.0		0.0	0	0	0	0	4
641.50	2.50	0.00			0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	7
639.00	2.50	0.00			0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	9
636.50	2.50	0.00			0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	12
633.00	3.50	0.00			0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	15
632.00	1.00	0.00			0.0	0.0	37.2	0.0	0.0	***4.1***	4	0	0	2	16
629.00	3.00	2.70			16.9	37.2	59.6	24.7	4.1	***29.4***	29	0	0	16	19
626.00	3.00	3.10	21		18.6	42.7	99.2	27.3	4.7	***58.9***	59	0	0	32	22
620.50	5.50		26	Clean Coarse Sand	11.6	63.7	76.1	16.9	7.0	***72.1***	72	0	0	40	28
615.50	5.00	2.10			23.8	28.9	***98.5***	34.8	3.2	106.7	99	0	0	54	33
610.50	5.00	2.00			23.1	27.6	***134.0***	33.8	3.0	141.9	134	0	0	74	38
604.50	6.00	2.90			35.5	40.0	***168.2***	52.0	4.4	193.7	168	0	0	92	44
599.00	5.50	2.80			31.8	38.6	***223.4***	46.5	4.2	242.7	223	0	0	123	49
595.00	4.00	4.50	24		33.0	62.0	***221.9***	48.2	6.8	287.2	222	0	0	122	53
589.50	5.50	2.00			25.4	27.6	***233.5***	37.1	3.0	322.8	234	0	0	128	59
584.00	5.50	1.00	42		15.5	13.8	***294.0***	22.7	1.5	350.4	294	0	0	162	64
579.50	4.50		32	Hard Till	6.2	58.8	***270.4***	9.1	6.4	356.2	270	0	0	149	69
574.50	5.00	2.10	21		23.8	28.9	***294.2***	34.8	3.2	391.0	294	0	0	162	74
569.00	5.50	2.10	21		26.2	28.9	475.2	38.3	3.2	***446.3***	~~446~~	~~0~~	~~0~~	~~245~~	~~79~~
564.50	4.50		100	Very Fine Silty Sand	54.2	183.7	***500.0***	79.3	20.1	522.3	~~500~~	~~0~~	~~0~~	~~275~~	~~84~~
559.50	5.00		84	Very Fine Silty Sand	45.5	154.3	***483.1***	66.6	16.9	582.1	~~483~~	~~0~~	~~0~~	~~266~~	~~89~~
554.50	5.00		50	Very Fine Silty Sand	18.4	91.9	***593.3***	26.9	10.1	619.0	~~593~~	~~0~~	~~0~~	~~326~~	~~94~~
549.50	5.00		100	Very Fine Silty Sand		183.7			20.1						

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-07 (PREDRILL)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 648.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 647.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 1270 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 64.63 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 24.24 KIPS

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area===== 0.181 SQFT.

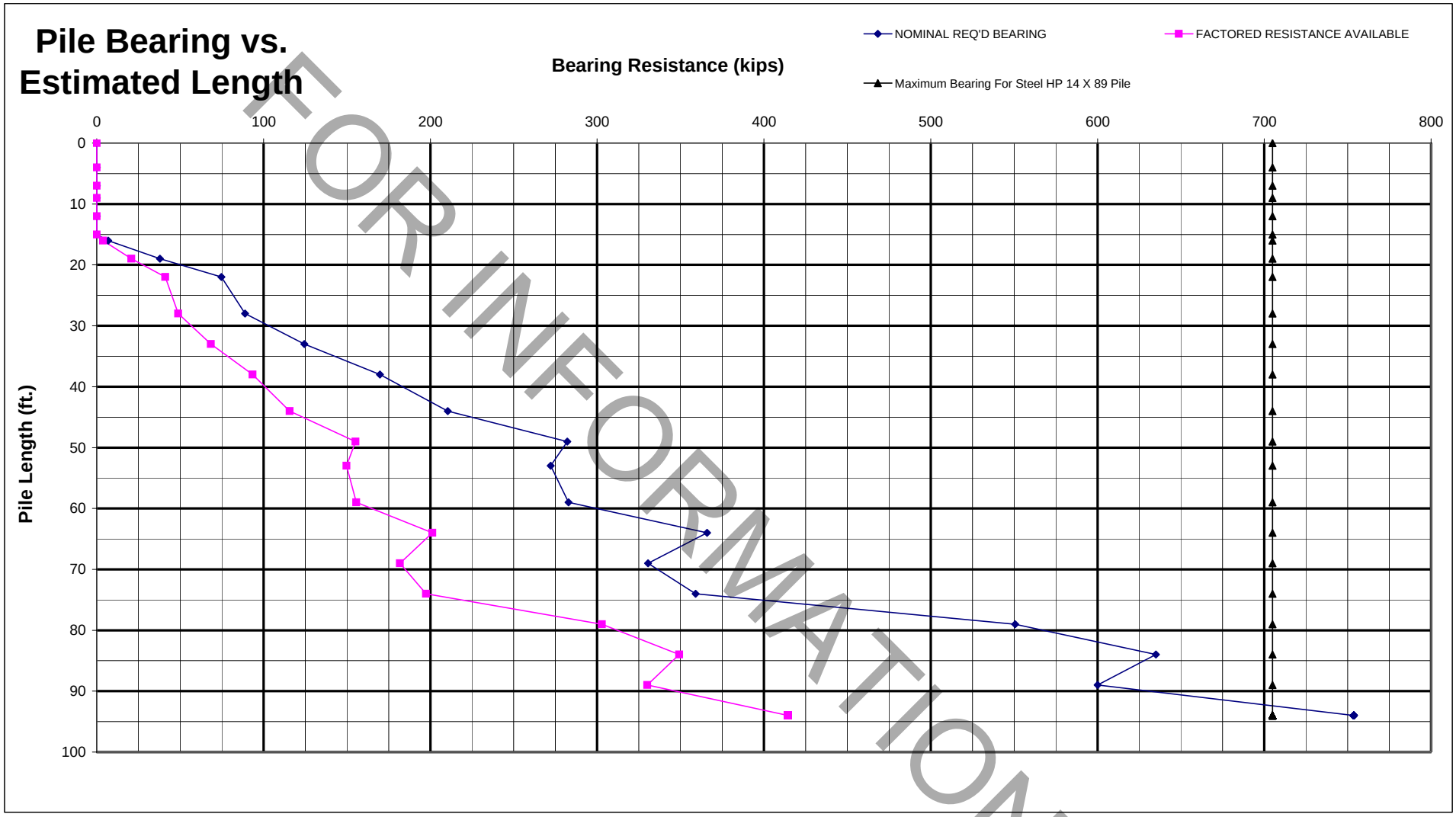
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
705 KIPS	**600** KIPS	**330** KIPS	**89** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
644.00	3.00	0.00			0.0		0.0	0.0		0.0	0	0	0	0	4
641.50	2.50	0.00			0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	7
639.00	2.50	0.00			0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	9
636.50	2.50	0.00			0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	12
633.00	3.50	0.00			0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	15
632.00	1.00	0.00			0.0	0.0	53.3	0.0	0.0	***6.9***	7	0	0	4	16
629.00	3.00	2.70			20.2	53.3	81.4	30.0	6.9	***37.8***	38	0	0	21	19
626.00	3.00	3.10	21		22.3	61.2	133.8	33.1	7.9	***74.8***	75	0	0	41	22
620.50	5.50		26	Clean Coarse Sand	13.9	91.3	97.9	20.6	11.7	***88.9***	89	0	0	49	28
615.50	5.00	2.10			28.5	41.5	***124.4***	42.2	5.3	130.9	124	0	0	68	33
610.50	5.00	2.00			27.6	39.5	***169.8***	40.9	5.1	174.1	170	0	0	93	38
604.50	6.00	2.90			42.6	57.3	***210.4***	63.0	7.4	236.9	210	0	0	116	44
599.00	5.50	2.80			38.1	55.3	***282.1***	56.4	7.1	297.5	282	0	0	155	49
595.00	4.00	4.50	24		39.5	88.8	***272.2***	58.5	11.4	349.7	272	0	0	150	53
589.50	5.50	2.00			30.4	39.5	***282.9***	45.0	5.1	392.1	283	0	0	156	59
584.00	5.50	1.00	42		18.6	19.7	***365.9***	27.5	2.5	427.9	366	0	0	201	64
579.50	4.50		32	Hard Till	7.5	84.2	***330.6***	11.0	10.8	433.5	331	0	0	182	69
574.50	5.00	2.10	21		28.5	41.5	***359.1***	42.2	5.3	475.7	359	0	0	198	74
569.00	5.50	2.10	21		31.4	41.5	612.2	46.4	5.3	***550.7***	551	0	0	303	79
564.50	4.50		100	Very Fine Silty Sand	64.9	263.2	***635.0***	96.1	33.9	641.3	635	0	0	349	84
559.50	5.00		84	Very Fine Silty Sand	54.5	221.1	***600.1***	80.8	28.5	710.6	600	0	0	330	89
554.50	5.00		50	Very Fine Silty Sand	22.0	131.6	***753.7***	32.6	16.9	760.1	~~754~~	~~0~~	~~0~~	~~415~~	~~94~~
549.50	5.00		100	Very Fine Silty Sand		263.2			33.9						

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-07
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 648.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 647.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 1270 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 64.63 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 24.24 KIPS

PILE TYPE AND SIZE ========== Metal Shell 12"Φ w/.25" walls
Pile Perimeter========== 3.142 FT.
Pile End Bearing Area========== 0.785 SQFT.

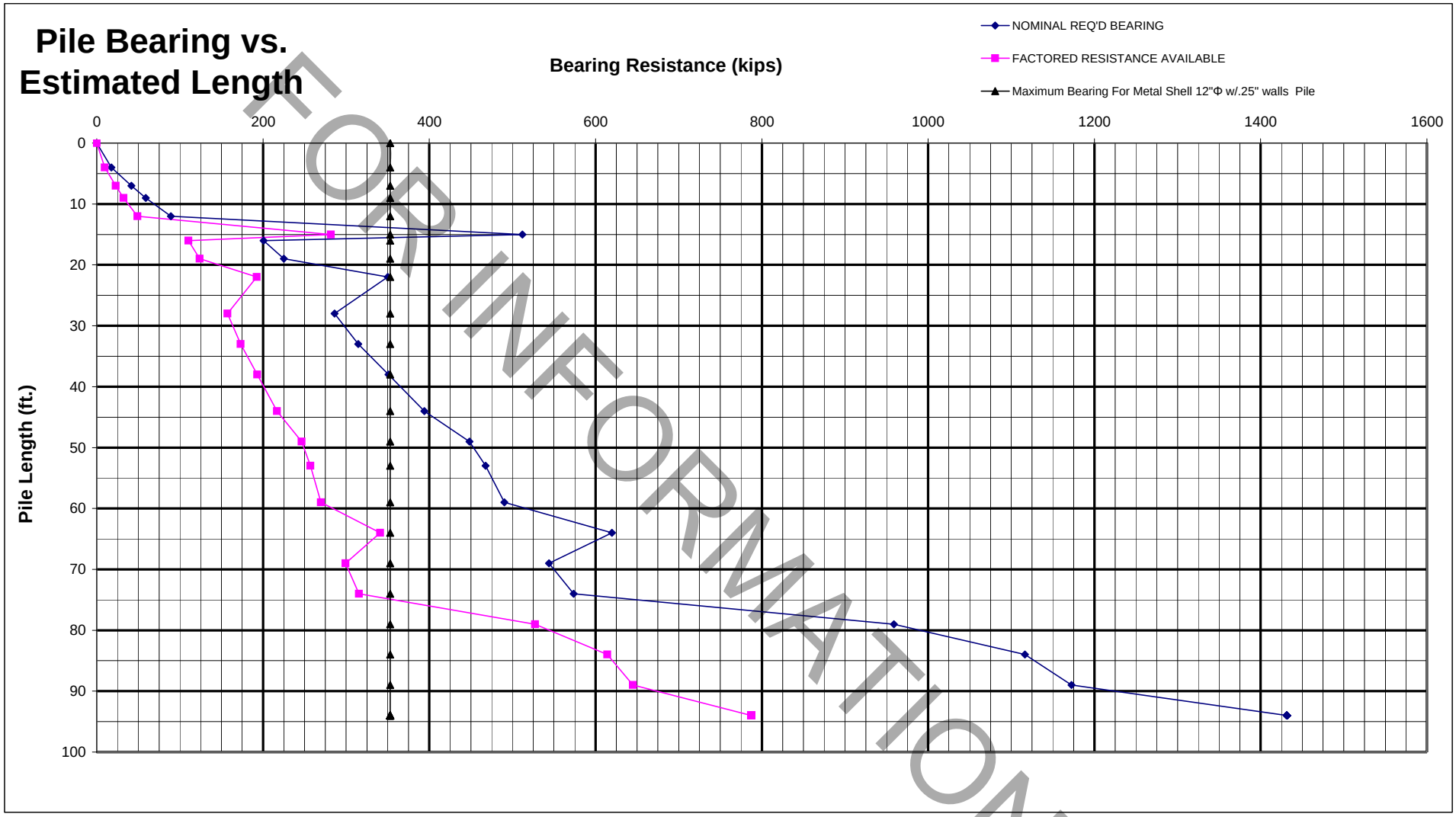
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
353 KIPS	**89** KIPS	**49** KIPS	**12** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
644.00	3.00	0.75			8.2		17.7				18	0	0	10	4
641.50	2.50	1.10			9.4	9.5	41.8				42	0	0	23	7
639.00	2.50	2.80			17.9	24.1	58.8				59	0	0	32	9
636.50	2.50	2.70			17.5	23.3	89.2				89	0	0	49	12
633.00	3.50	4.20	19		33.9	36.2	512.1				~~512~~	~~0~~	~~0~~	~~282~~	~~15~~
632.00	1.00		86	Sandy Gravel	90.5	425.2	200.7				201	0	0	110	16
629.00	3.00	2.70			21.0	23.3	225.1				225	0	0	124	19
626.00	3.00	3.10	21		23.1	26.7	350.0				350	0	0	193	22
620.50	5.50		26	Clean Coarse Sand	46.4	128.5	285.9				286	0	0	157	28
615.50	5.00	2.10			29.5	18.1	314.6				315	0	0	173	33
610.50	5.00	2.00			28.6	17.2	351.0				351	0	0	193	38
604.50	6.00	2.90			44.1	25.0	394.2				~~394~~	~~0~~	~~0~~	~~217~~	~~44~~
599.00	5.50	2.80			39.4	24.1	448.2				~~448~~	~~0~~	~~0~~	~~247~~	~~49~~
595.00	4.00	4.50	24		40.9	38.8	467.6				~~468~~	~~0~~	~~0~~	~~257~~	~~53~~
589.50	5.50	2.00			31.5	17.2	490.4				~~490~~	~~0~~	~~0~~	~~270~~	~~59~~
584.00	5.50	1.00	42		19.2	8.6	619.7				~~620~~	~~0~~	~~0~~	~~341~~	~~64~~
579.50	4.50		32	Hard Till	24.9	118.7	544.0				~~544~~	~~0~~	~~0~~	~~299~~	~~69~~
574.50	5.00	2.10	21		29.5	18.1	573.6				~~574~~	~~0~~	~~0~~	~~315~~	~~74~~
569.00	5.50	2.10	21		32.5	18.1	958.7				~~959~~	~~0~~	~~0~~	~~527~~	~~79~~
564.50	4.50		100	Very Fine Silty Sand	216.9	370.8	1116.3				~~1116~~	~~0~~	~~0~~	~~614~~	~~84~~
559.50	5.00		84	Very Fine Silty Sand	182.3	311.5	1172.5				~~1173~~	~~0~~	~~0~~	~~645~~	~~89~~
554.50	5.00		50	Very Fine Silty Sand	73.5	185.4	1431.5				~~1431~~	~~0~~	~~0~~	~~787~~	~~94~~
549.50	5.00		100	Very Fine Silty Sand		370.8									

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-07
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 648.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 647.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 1270 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 64.63 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 24.24 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.25" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 SQFT.

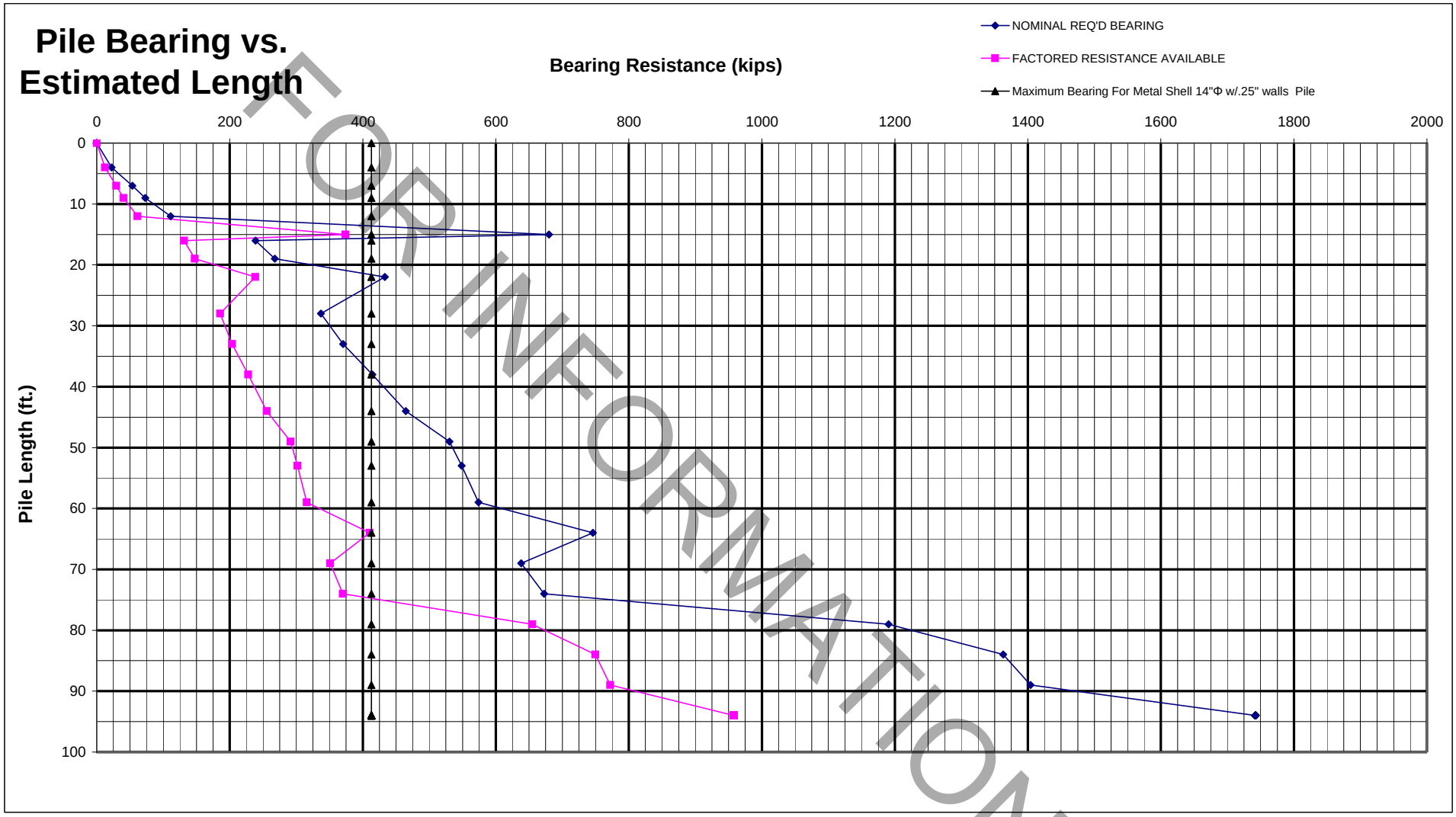
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	**111** KIPS	**61** KIPS	**12** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
644.00	3.00	0.75			9.6		22.5				23	0	0	12	4
641.50	2.50	1.10			11.0	12.9	53.4				53	0	0	29	7
639.00	2.50	2.80			20.9	32.8	73.2				73	0	0	40	9
636.50	2.50	2.70			20.4	31.7	111.1				111	0	0	61	12
633.00	3.50	4.20	19		39.5	49.2	680.1				~~680~~	~~0~~	~~0~~	~~374~~	~~15~~
632.00	1.00		86	Sandy Gravel	105.6	578.7	238.6				239	0	0	131	16
629.00	3.00	2.70			24.4	31.7	267.8				268	0	0	147	19
626.00	3.00	3.10	21		27.0	36.3	433.3				~~433~~	~~0~~	~~0~~	~~238~~	~~22~~
620.50	5.50		26	Clean Coarse Sand	54.1	175.0	337.1				337	0	0	185	28
615.50	5.00	2.10			34.4	24.6	370.4				370	0	0	204	33
610.50	5.00	2.00			33.4	23.5	414.3				~~414~~	~~0~~	~~0~~	~~228~~	~~38~~
604.50	6.00	2.90			51.4	34.0	464.6				~~465~~	~~0~~	~~0~~	~~256~~	~~44~~
599.00	5.50	2.80			46.0	32.8	530.5				~~530~~	~~0~~	~~0~~	~~292~~	~~49~~
595.00	4.00	4.50	24		47.7	52.8	548.8				~~549~~	~~0~~	~~0~~	~~302~~	~~53~~
589.50	5.50	2.00			36.7	23.5	573.9				~~574~~	~~0~~	~~0~~	~~316~~	~~59~~
584.00	5.50	1.00	42		22.4	11.7	746.1				~~746~~	~~0~~	~~0~~	~~410~~	~~64~~
579.50	4.50		32	Hard Till	29.1	161.5	638.2				~~638~~	~~0~~	~~0~~	~~351~~	~~69~~
574.50	5.00	2.10	21		34.4	24.6	672.7				~~673~~	~~0~~	~~0~~	~~370~~	~~74~~
569.00	5.50	2.10	21		37.9	24.6	1190.6				~~1191~~	~~0~~	~~0~~	~~655~~	~~79~~
564.50	4.50		100	Very Fine Silty Sand	253.1	504.7	1362.9				~~1363~~	~~0~~	~~0~~	~~750~~	~~84~~
559.50	5.00		84	Very Fine Silty Sand	212.7	424.0	1404.0				~~1404~~	~~0~~	~~0~~	~~772~~	~~89~~
554.50	5.00		50	Very Fine Silty Sand	85.8	252.4	1742.1				~~1742~~	~~0~~	~~0~~	~~958~~	~~94~~
549.50	5.00		100	Very Fine Silty Sand		504.7									

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-07
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 648.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 647.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 1270 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 64.63 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 24.24 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area===== 0.108 SQFT.

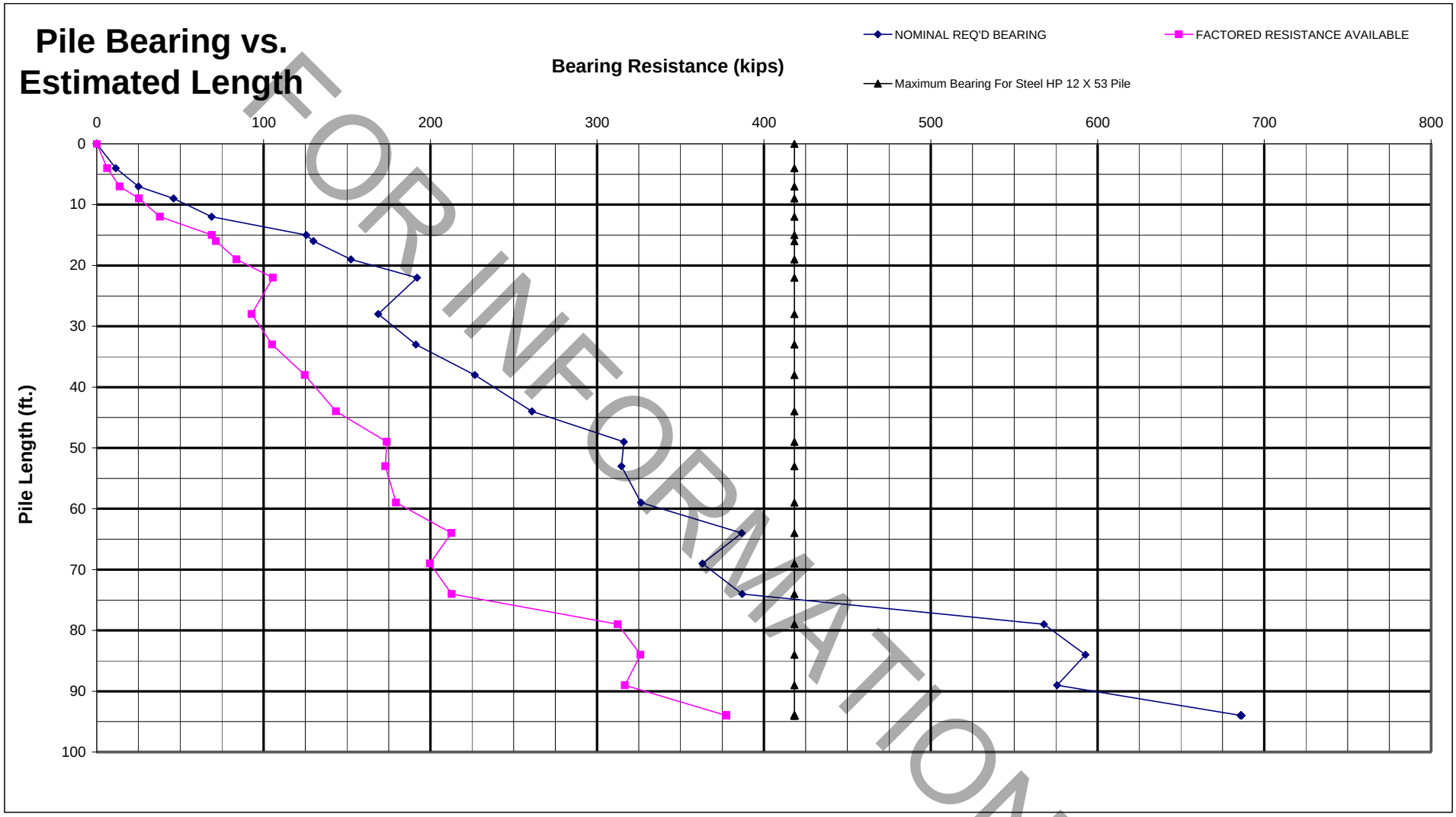
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	**387** KIPS	**213** KIPS	**74** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
644.00	3.00	0.75			6.7		21.8	9.7		***11.4***	11	0	0	6	4
641.50	2.50	1.10			7.6	15.2	52.8	11.1	1.7	***25.1***	25	0	0	14	7
639.00	2.50	2.80			14.4	38.6	65.9	21.1	4.2	***46.0***	46	0	0	25	9
636.50	2.50	2.70			14.1	37.2	100.7	20.6	4.1	***68.9***	69	0	0	38	12
633.00	3.50	4.20	19		27.3	57.9	280.8	40.0	6.3	***125.6***	126	0	0	69	15
632.00	1.00		86	Sandy Gravel	22.6	210.7	***129.9***	33.1	23.1	139.6	130	0	0	71	16
629.00	3.00	2.70			16.9	37.2	***152.3***	24.7	4.1	165.0	152	0	0	84	19
626.00	3.00	3.10	21		18.6	42.7	***192.0***	27.3	4.7	194.5	192	0	0	106	22
620.50	5.50		26	Clean Coarse Sand	11.6	63.7	***168.8***	16.9	7.0	207.7	169	0	0	93	28
615.50	5.00	2.10			23.8	28.9	***191.2***	34.8	3.2	242.3	191	0	0	105	33
610.50	5.00	2.00			23.1	27.6	***226.7***	33.8	3.0	277.4	227	0	0	125	38
604.50	6.00	2.90			35.5	40.0	***260.9***	52.0	4.4	329.3	261	0	0	143	44
599.00	5.50	2.80			31.8	38.6	***316.1***	46.5	4.2	378.3	316	0	0	174	49
595.00	4.00	4.50	24		33.0	62.0	***314.6***	48.2	6.8	422.7	315	0	0	173	53
589.50	5.50	2.00			25.4	27.6	***326.2***	37.1	3.0	458.4	326	0	0	179	59
584.00	5.50	1.00	42		15.5	13.8	***386.7***	22.7	1.5	486.0	387	0	0	213	64
579.50	4.50		32	Hard Till	6.2	58.8	***363.1***	9.1	6.4	491.8	363	0	0	200	69
574.50	5.00	2.10	21		23.8	28.9	***386.9***	34.8	3.2	526.6	387	0	0	213	74
569.00	5.50	2.10	21		26.2	28.9	***567.9***	38.3	3.2	581.8	~~568~~	~~0~~	~~0~~	~~312~~	~~79~~
564.50	4.50		100	Very Fine Silty Sand	54.2	183.7	***592.7***	79.3	20.1	657.9	~~593~~	~~0~~	~~0~~	~~326~~	~~84~~
559.50	5.00		84	Very Fine Silty Sand	45.5	154.3	***575.8***	66.6	16.9	717.6	~~576~~	~~0~~	~~0~~	~~317~~	~~89~~
554.50	5.00		50	Very Fine Silty Sand	18.4	91.9	***686.0***	26.9	10.1	754.5	~~686~~	~~0~~	~~0~~	~~377~~	~~94~~
549.50	5.00		100	Very Fine Silty Sand		183.7			20.1						

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-07
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 648.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 647.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 1270 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 64.63 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 24.24 KIPS

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area===== 0.181 SQFT.

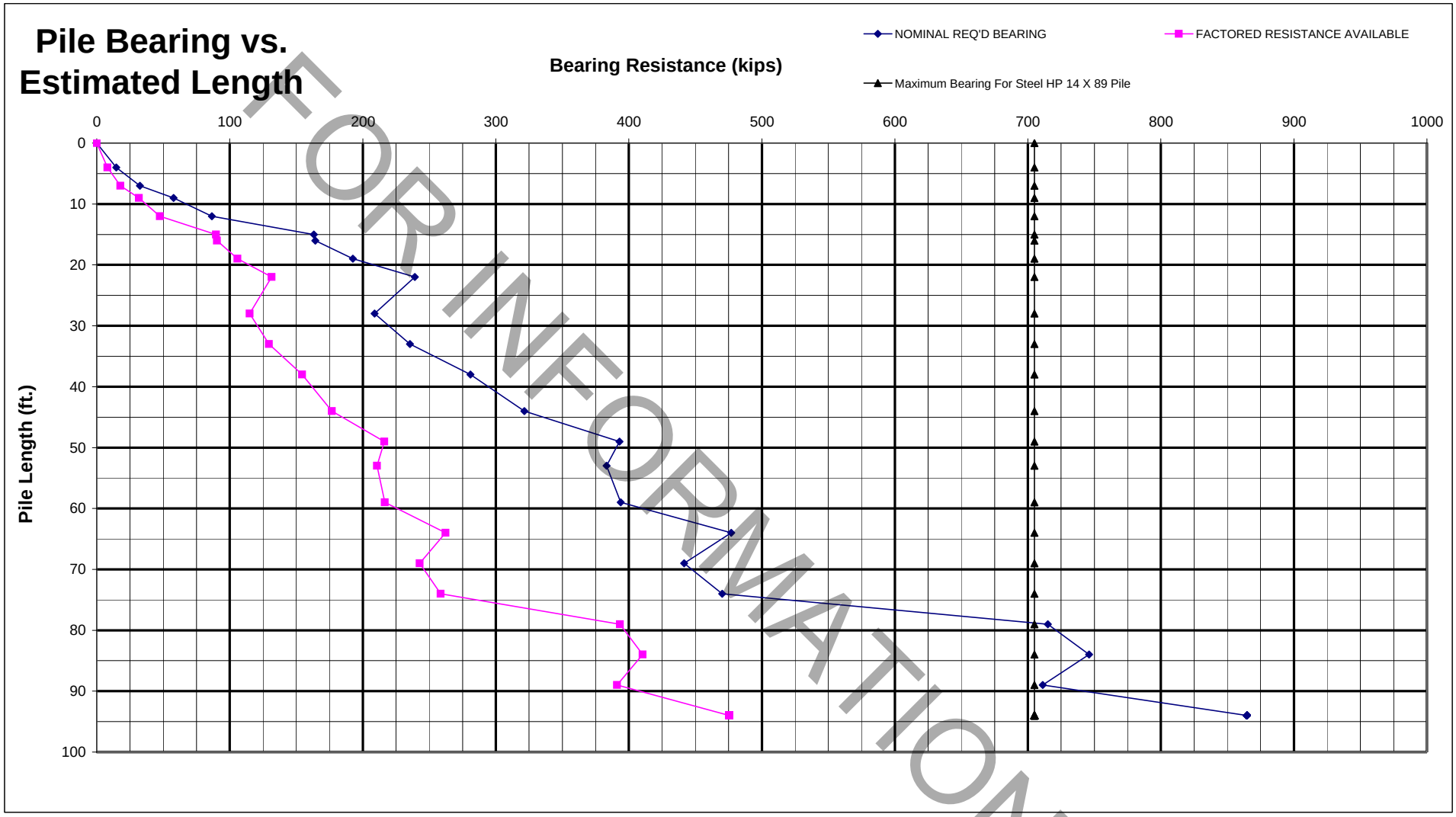
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
705 KIPS	**470** KIPS	**259** KIPS	**74** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
644.00	3.00	0.75			8.0		29.7	11.8		***14.6***	15	0	0	8	4
641.50	2.50	1.10			9.1	21.7	72.3	13.5	2.8	***32.4***	32	0	0	18	7
639.00	2.50	2.80			17.3	55.3	87.7	25.6	7.1	***57.7***	58	0	0	32	9
636.50	2.50	2.70			16.9	53.3	134.1	25.0	6.9	***86.5***	87	0	0	48	12
633.00	3.50	4.20	19		32.7	82.9	385.8	48.5	10.7	***163.2***	163	0	0	90	15
632.00	1.00		86	Sandy Gravel	27.1	301.8	***164.3***	40.1	38.8	171.3	164	0	0	90	16
629.00	3.00	2.70			20.2	53.3	***192.5***	30.0	6.9	202.2	192	0	0	106	19
626.00	3.00	3.10	21		22.3	61.2	244.8	33.1	7.9	***239.2***	239	0	0	132	22
620.50	5.50		26	Clean Coarse Sand	13.9	91.3	***208.9***	20.6	11.7	253.3	209	0	0	115	28
615.50	5.00	2.10			28.5	41.5	***235.5***	42.2	5.3	295.3	235	0	0	130	33
610.50	5.00	2.00			27.6	39.5	***280.9***	40.9	5.1	338.5	281	0	0	154	38
604.50	6.00	2.90			42.6	57.3	***321.5***	63.0	7.4	401.3	321	0	0	177	44
599.00	5.50	2.80			38.1	55.3	***393.1***	56.4	7.1	461.9	393	0	0	216	49
595.00	4.00	4.50	24		39.5	88.8	***383.2***	58.5	11.4	514.1	383	0	0	211	53
589.50	5.50	2.00			30.4	39.5	***393.9***	45.0	5.1	556.5	394	0	0	217	59
584.00	5.50	1.00	42		18.6	19.7	***476.9***	27.5	2.5	592.3	477	0	0	262	64
579.50	4.50		32	Hard Till	7.5	84.2	***441.6***	11.0	10.8	597.9	442	0	0	243	69
574.50	5.00	2.10	21		28.5	41.5	***470.1***	42.2	5.3	640.1	470	0	0	259	74
569.00	5.50	2.10	21		31.4	41.5	723.3	46.4	5.3	***715.1***	~~715~~	~~0~~	~~0~~	~~393~~	~~79~~
564.50	4.50		100	Very Fine Silty Sand	64.9	263.2	***746.1***	96.1	33.9	805.7	~~746~~	~~0~~	~~0~~	~~410~~	~~84~~
559.50	5.00		84	Very Fine Silty Sand	54.5	221.1	***711.1***	80.8	28.5	875.0	~~711~~	~~0~~	~~0~~	~~391~~	~~89~~
554.50	5.00		50	Very Fine Silty Sand	22.0	131.6	***864.7***	32.6	16.9	924.5	~~865~~	~~0~~	~~0~~	~~476~~	~~94~~
549.50	5.00		100	Very Fine Silty Sand		263.2			33.9						

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-08
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 3230 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 164.38 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 61.64 KIPS

PILE TYPE AND SIZE ========== Metal Shell 12"Φ w/.25" walls
Pile Perimeter========== 3.142 FT.
Pile End Bearing Area========== 0.785 SQFT.

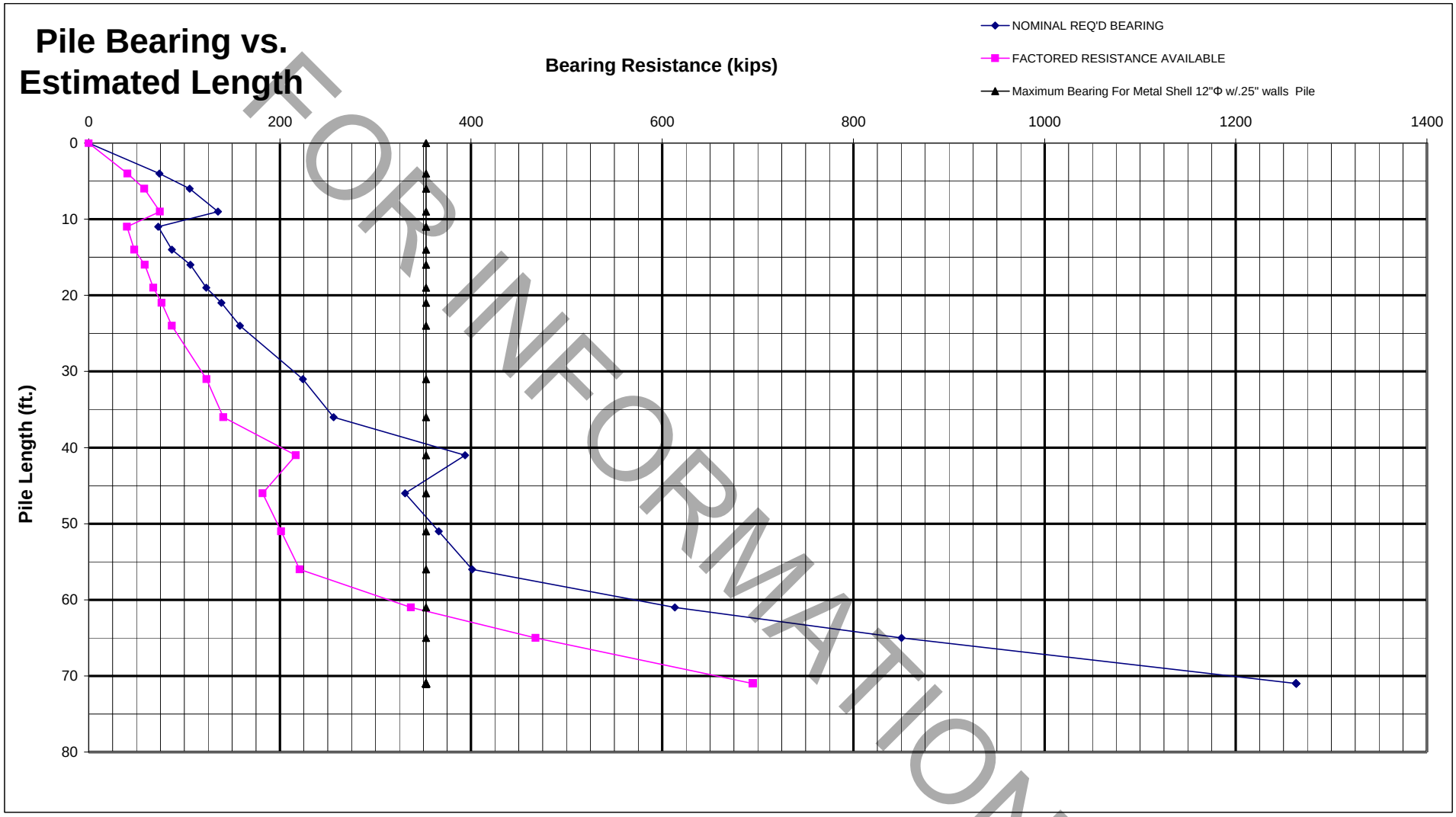
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
353 KIPS	**256** KIPS	**141** KIPS	**36** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
624.90	3.10	1.70	7		16.0		74.0				74	0	0	41	4
622.90	2.00		23	Clean Coarse Sand	14.6	58.0	105.7				106	0	0	58	6
620.40	2.50		20	Clean Coarse Sand	15.8	75.2	135.3				135	0	0	74	9
617.90	2.50		18	Clean Coarse Sand	14.2	89.0	72.6				73	0	0	40	11
615.40	2.50	1.40			11.3	12.1	86.9				87	0	0	48	14
612.90	2.50	1.75			13.1	15.1	106.5				107	0	0	59	16
610.40	2.50	2.50			16.6	21.5	123.1				123	0	0	68	19
607.90	2.50	2.50			16.6	21.5	138.8				139	0	0	76	21
605.40	2.50	2.40			16.1	20.7	158.3				158	0	0	87	24
597.90	7.50	2.80			53.7	24.1	224.1				224	0	0	123	31
592.90	5.00	4.20	21		48.4	36.2	256.2				256	0	0	141	36
587.90	5.00	2.30			31.3	19.8	393.7				~~394~~	~~0~~	~~0~~	~~217~~	~~41~~
582.90	5.00		34	Hard Till	29.7	126.1	330.9				331	0	0	182	46
577.90	5.00	3.90	26		45.7	33.6	366.3				~~366~~	~~0~~	~~0~~	~~201~~	~~51~~
572.90	5.00	2.70			34.9	23.3	401.2				~~401~~	~~0~~	~~0~~	~~221~~	~~56~~
567.90	5.00	2.70			34.9	23.3	613.1				~~613~~	~~0~~	~~0~~	~~337~~	~~61~~
563.90	4.00		54	Very Fine Silty Sand	66.6	200.2	850.3				~~850~~	~~0~~	~~0~~	~~468~~	~~65~~
557.90	6.00		100	Very Fine Silty Sand	289.2	370.8	1263.1				~~1263~~	~~0~~	~~0~~	~~695~~	~~71~~
556.90	1.00			Limestone		494.4									

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-08
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 3230 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 164.38 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 61.64 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.25" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 SQFT.

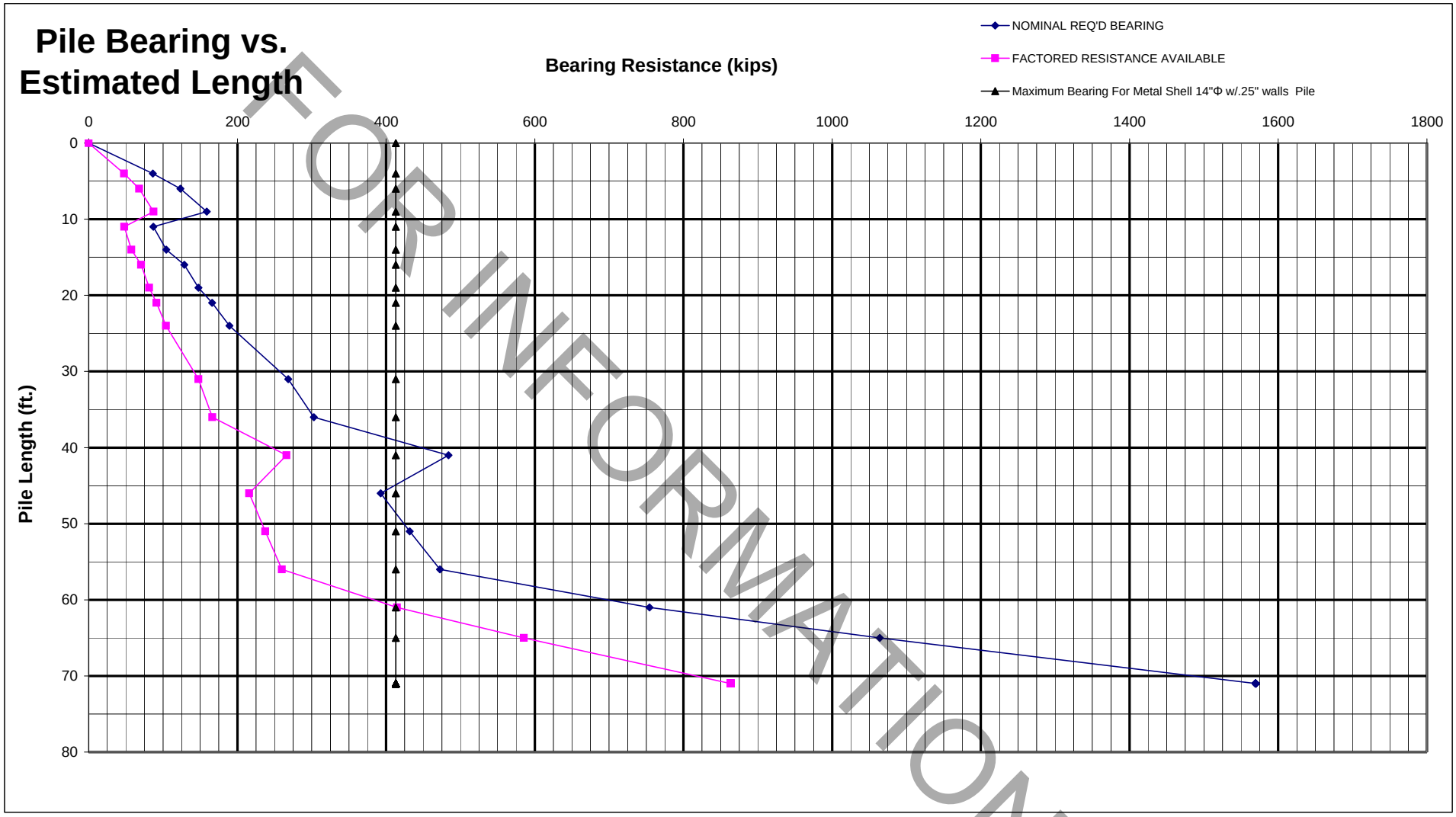
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	**303** KIPS	**166** KIPS	**36** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
624.90	3.10	1.70	7		18.6		86.3				86	0	0	47	4
622.90	2.00		23	Clean Coarse Sand	17.0	67.7	123.3				123	0	0	68	6
620.40	2.50		20	Clean Coarse Sand	18.5	87.7	158.9				159	0	0	87	9
617.90	2.50		18	Clean Coarse Sand	16.6	104.9	87.1				87	0	0	48	11
615.40	2.50	1.40			13.2	16.4	104.3				104	0	0	57	14
612.90	2.50	1.75			15.3	20.5	128.5				128	0	0	71	16
610.40	2.50	2.50			19.3	29.3	147.8				148	0	0	81	19
607.90	2.50	2.50			19.3	29.3	165.9				166	0	0	91	21
605.40	2.50	2.40			18.8	28.1	189.4				189	0	0	104	24
597.90	7.50	2.80			62.7	32.8	268.5				269	0	0	148	31
592.90	5.00	4.20	21		56.5	49.2	302.7				303	0	0	166	36
587.90	5.00	2.30			36.5	27.0	483.9				~~484~~	~~0~~	~~0~~	~~266~~	~~41~~
582.90	5.00		34	Hard Till	34.6	171.6	392.6				393	0	0	216	46
577.90	5.00	3.90	26		53.3	45.7	431.9				~~432~~	~~0~~	~~0~~	~~238~~	~~51~~
572.90	5.00	2.70			40.7	31.7	472.6				~~473~~	~~0~~	~~0~~	~~260~~	~~56~~
567.90	5.00	2.70			40.7	31.7	754.2				~~754~~	~~0~~	~~0~~	~~415~~	~~61~~
563.90	4.00		54	Very Fine Silty Sand	77.7	272.5	1064.1				~~1064~~	~~0~~	~~0~~	~~585~~	~~65~~
557.90	6.00		100	Very Fine Silty Sand	337.4	504.7	1569.7				~~1570~~	~~0~~	~~0~~	~~863~~	~~71~~
556.90	1.00			Limestone		672.9									

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-08
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 3230 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 164.38 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 61.64 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area===== 0.108 SQFT.

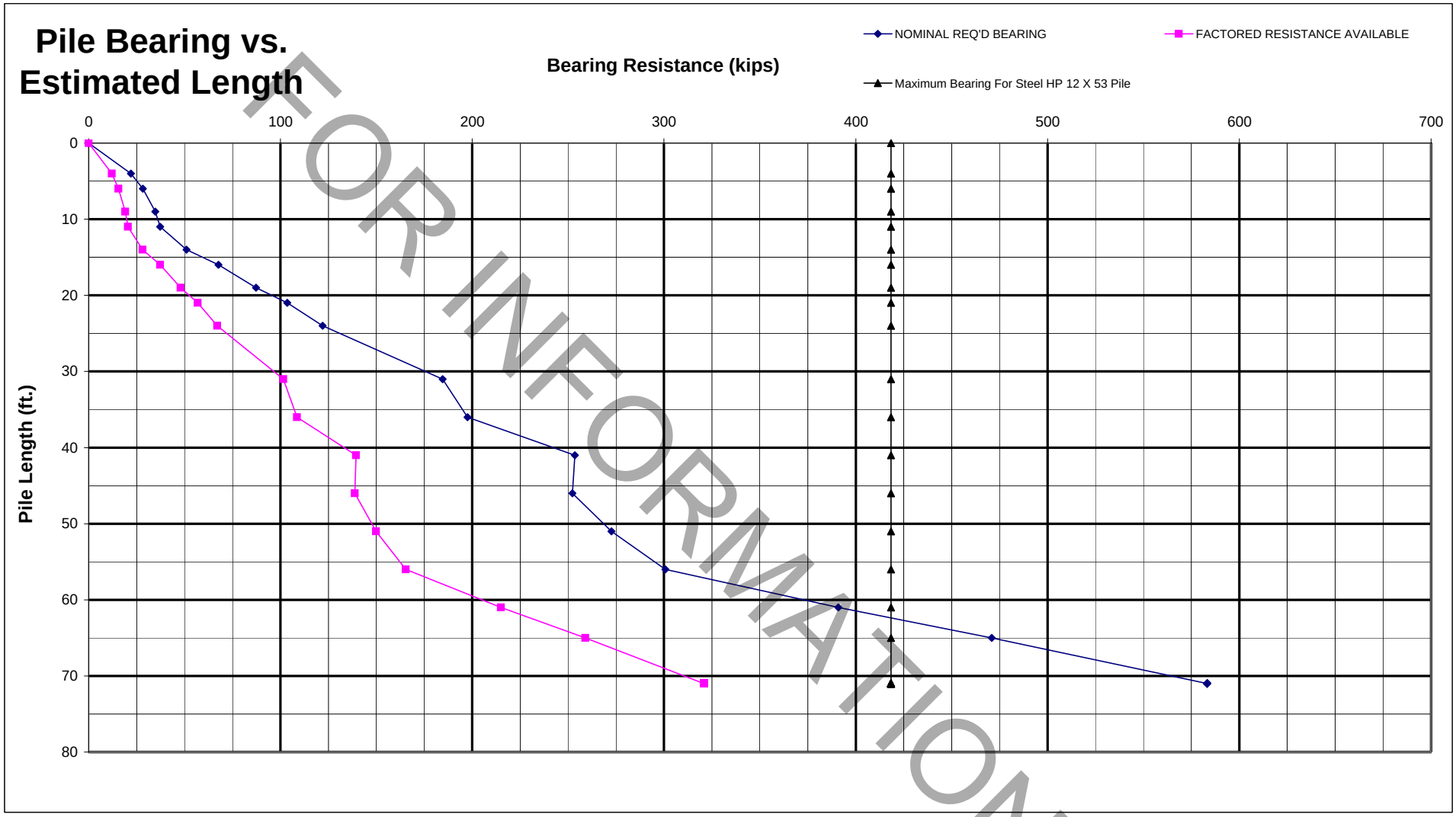
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	**391** KIPS	**215** KIPS	**61** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
624.90	3.10	1.70	7		12.9		41.6	18.8		***22.0***	22	0	0	12	4
622.90	2.00		23	Clean Coarse Sand	3.6	28.7	53.8	5.3	3.1	***28.2***	28	0	0	16	6
620.40	2.50		20	Clean Coarse Sand	4.0	37.2	64.6	5.8	4.1	***34.8***	35	0	0	19	9
617.90	2.50		18	Clean Coarse Sand	3.6	44.1	43.3	5.2	4.8	***37.2***	37	0	0	20	11
615.40	2.50	1.40			9.1	19.3	57.2	13.3	2.1	***51.1***	51	0	0	28	14
612.90	2.50	1.75			10.6	24.1	78.2	15.5	2.6	***67.7***	68	0	0	37	16
610.40	2.50	2.50			13.4	34.5	91.5	19.5	3.8	***87.2***	87	0	0	48	19
607.90	2.50	2.50			13.4	34.5	***103.5***	19.5	3.8	106.6	103	0	0	57	21
605.40	2.50	2.40			13.0	33.1	***122.0***	19.0	3.6	126.2	122	0	0	67	24
597.90	7.50	2.80			43.3	38.6	***184.6***	63.4	4.2	191.7	185	0	0	102	31
592.90	5.00	4.20	21		39.1	57.9	***197.5***	57.1	6.3	245.9	197	0	0	109	36
587.90	5.00	2.30			25.3	31.7	***253.5***	36.9	3.5	286.2	254	0	0	139	41
582.90	5.00		34	Hard Till	7.4	62.5	***252.2***	10.8	6.8	296.1	252	0	0	139	46
577.90	5.00	3.90	26		36.9	53.7	***272.6***	53.9	5.9	348.2	273	0	0	150	51
572.90	5.00	2.70			28.2	37.2	***300.7***	41.2	4.1	389.4	301	0	0	165	56
567.90	5.00	2.70			28.2	37.2	***390.9***	41.2	4.1	437.4	391	0	0	215	61
563.90	4.00		54	Very Fine Silty Sand	16.6	99.2	492.1	24.3	10.9	***470.9***	~~471~~	~~0~~	~~0~~	~~259~~	~~65~~
557.90	6.00		100	Very Fine Silty Sand	72.3	183.7	625.6	105.7	20.1	***583.3***	~~583~~	~~0~~	~~0~~	~~321~~	~~71~~
556.90	1.00			Limestone		245.0			26.8						

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-08
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 3230 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 164.38 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 61.64 KIPS

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area===== 0.181 SQFT.

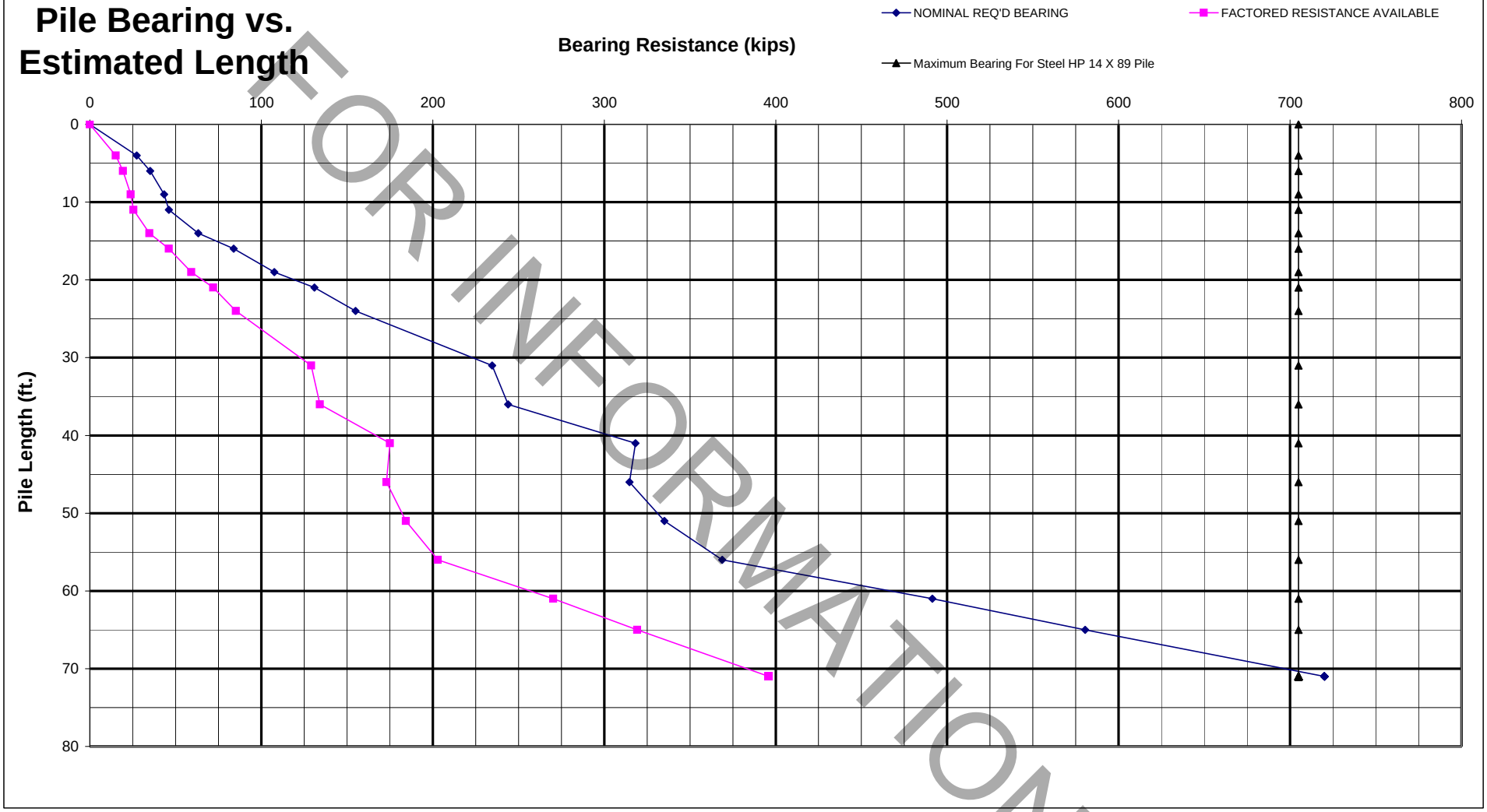
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
705 KIPS	**705** KIPS	**388** KIPS	**71** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
624.90	3.10	1.70	7		15.4		50.7	22.8		***27.4***	27	0	0	15	4
622.90	2.00		23	Clean Coarse Sand	4.4	35.3	65.5	6.4	4.5	***35.2***	35	0	0	19	6
620.40	2.50		20	Clean Coarse Sand	4.7	45.7	79.2	7.0	5.9	***43.3***	43	0	0	24	9
617.90	2.50		18	Clean Coarse Sand	4.3	54.7	56.4	6.3	7.0	***46.2***	46	0	0	25	11
615.40	2.50	1.40			10.9	27.6	74.2	16.1	3.6	***63.2***	63	0	0	35	14
612.90	2.50	1.75			12.7	34.5	101.7	18.8	4.4	***83.8***	84	0	0	46	16
610.40	2.50	2.50			16.0	49.4	117.7	23.7	6.4	***107.5***	108	0	0	59	19
607.90	2.50	2.50			16.0	49.4	131.7	23.7	6.4	***131.0***	131	0	0	72	21
605.40	2.50	2.40			15.6	47.4	155.2	23.0	6.1	***155.0***	155	0	0	85	24
597.90	7.50	2.80			51.9	55.3	***234.7***	76.8	7.1	235.4	235	0	0	129	31
592.90	5.00	4.20	21		46.8	82.9	***244.0***	69.2	10.7	299.8	244	0	0	134	36
587.90	5.00	2.30			30.3	45.4	***318.3***	44.8	5.8	350.3	318	0	0	175	41
582.90	5.00		34	Hard Till	8.9	89.5	***314.7***	13.1	11.5	361.8	315	0	0	173	46
577.90	5.00	3.90	26		44.2	77.0	***335.1***	65.4	9.9	424.2	335	0	0	184	51
572.90	5.00	2.70			33.7	53.3	***368.9***	49.9	6.9	474.1	369	0	0	203	56
567.90	5.00	2.70			33.7	53.3	***491.4***	49.9	6.9	535.5	491	0	0	270	61
563.90	4.00		54	Very Fine Silty Sand	19.9	142.1	632.4	29.5	18.3	***580.6***	581	0	0	319	65
557.90	6.00		100	Very Fine Silty Sand	86.5	263.2	806.7	128.1	33.9	***720.0***	~~720~~	~~0~~	~~0~~	~~396~~	~~71~~
556.90	1.00			Limestone		351.0			45.2						

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-09
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 3230 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 164.38 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 61.64 KIPS

PILE TYPE AND SIZE ========== Metal Shell 12"Φ w/.25" walls
Pile Perimeter========== 3.142 FT.
Pile End Bearing Area========== 0.785 SQFT.

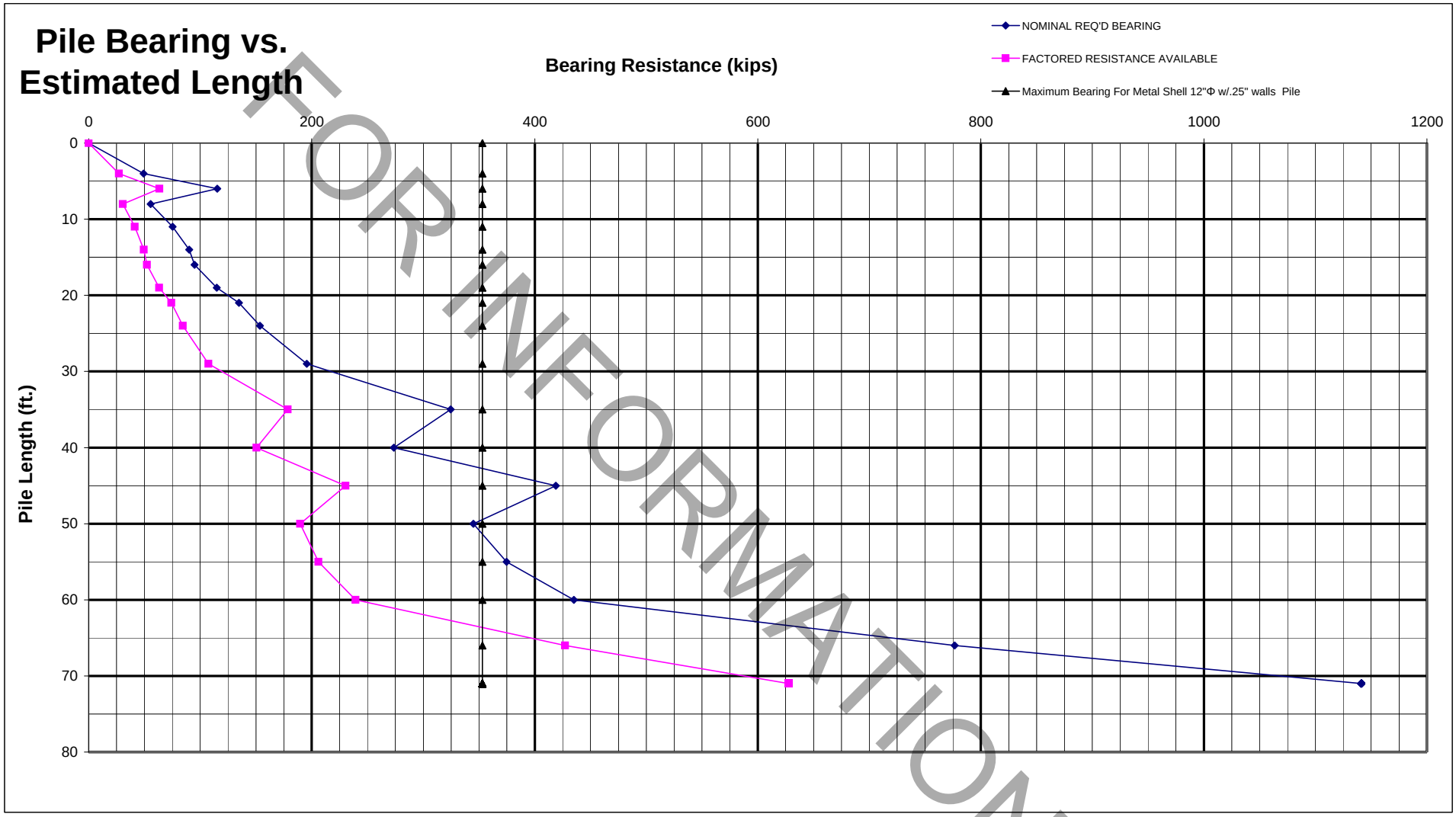
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
353 KIPS	**274** KIPS	**151** KIPS	**40** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
624.70	3.30		12	Clean Coarse Sand	12.5		49.2				49	0	0	27	4
622.70	2.00		14	Clean Coarse Sand	8.9	36.7	115.2				115	0	0	63	6
620.70	2.00		26	Clean Coarse Sand	16.9	93.8	55.5				55	0	0	31	8
617.70	3.00	2.00			17.2	17.2	75.2				75	0	0	41	11
615.20	2.50	2.30			15.7	19.8	90.0				90	0	0	50	14
612.70	2.50	2.20			15.2	19.0	94.9				95	0	0	52	16
610.20	2.50	1.00			8.7	8.6	114.8				115	0	0	63	19
607.70	2.50	2.30			15.7	19.8	134.8				135	0	0	74	21
605.20	2.50	2.80			17.9	24.1	153.6				154	0	0	84	24
600.20	5.00	2.90			36.7	25.0	195.5				195	0	0	108	29
594.20	6.00	3.50	17		50.5	30.2	324.6				325	0	0	179	35
588.70	5.50		22	Fine Sand	32.9	108.8	273.7				274	0	0	151	40
583.70	5.00	2.90			36.7	25.0	419.0				~~419~~	~~0~~	~~0~~	~~230~~	~~45~~
578.70	5.00		36	Hard Till	31.8	133.5	344.8				345	0	0	190	50
573.70	5.00	3.20	26		39.4	27.6	374.8				~~375~~	~~0~~	~~0~~	~~206~~	~~55~~
569.20	4.50	2.10			26.6	18.1	435.2				~~435~~	~~0~~	~~0~~	~~239~~	~~60~~
562.70	6.50		14	Very Fine Silty Sand	22.5	51.9	776.6				~~777~~	~~0~~	~~0~~	~~427~~	~~66~~
557.70	5.00		100	Very Fine Silty Sand	241.0	370.8	1141.2				~~1141~~	~~0~~	~~0~~	~~628~~	~~71~~
556.70	1.00			Limestone		494.4									

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-09
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 3230 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 164.38 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 61.64 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.25" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 SQFT.

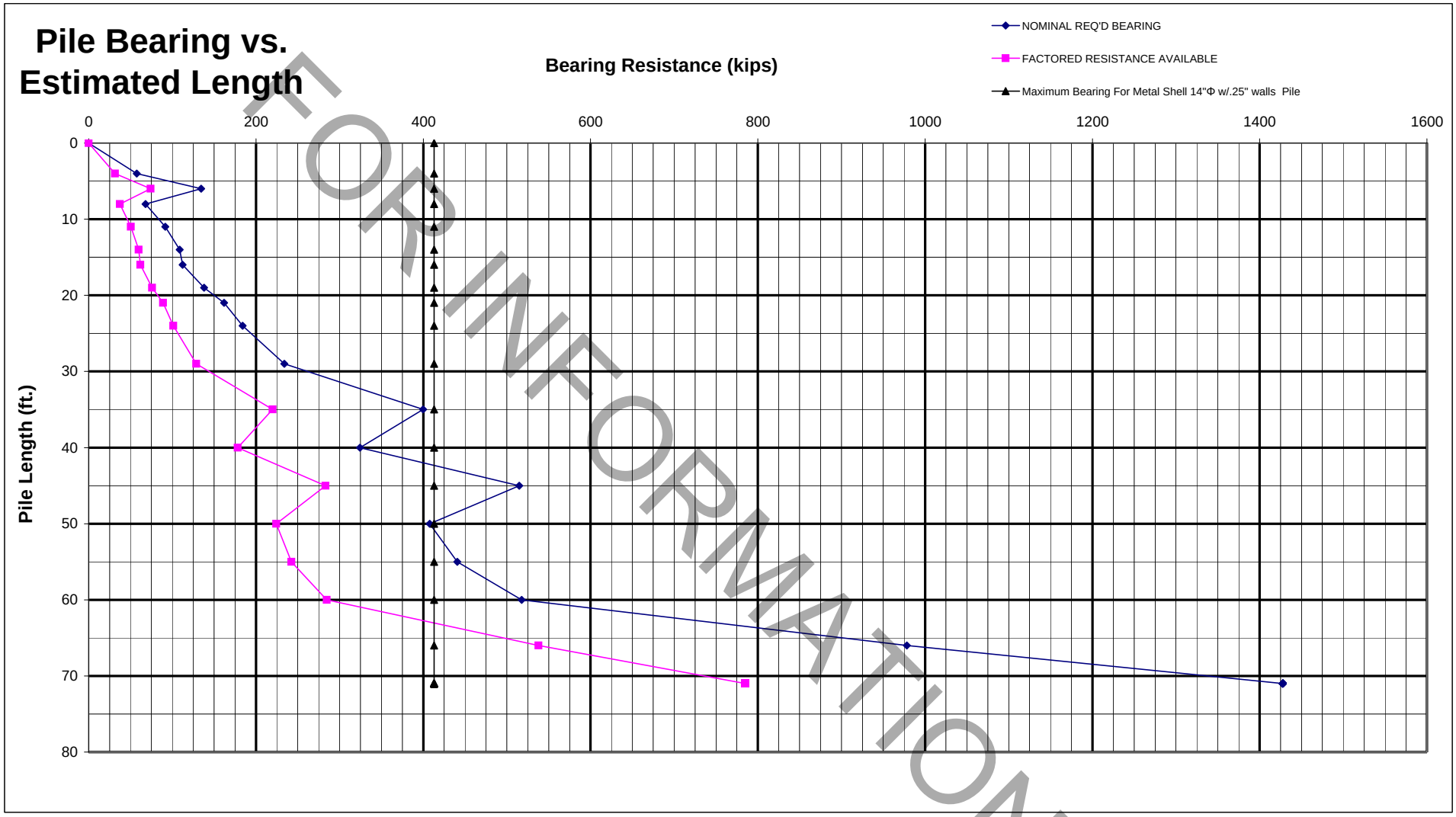
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	**324** KIPS	**178** KIPS	**40** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
624.70	3.30		12	Clean Coarse Sand	14.6		57.4				57	0	0	32	4
622.70	2.00		14	Clean Coarse Sand	10.3	42.8	134.4				134	0	0	74	6
620.70	2.00		26	Clean Coarse Sand	19.7	109.5	68.1				68	0	0	37	8
617.70	3.00	2.00			20.0	23.5	91.6				92	0	0	50	11
615.20	2.50	2.30			18.3	27.0	108.7				109	0	0	60	14
612.70	2.50	2.20			17.7	25.8	112.4				112	0	0	62	16
610.20	2.50	1.00			10.2	11.7	137.8				138	0	0	76	19
607.70	2.50	2.30			18.3	27.0	162.0				162	0	0	89	21
605.20	2.50	2.80			20.9	32.8	184.0				184	0	0	101	24
600.20	5.00	2.90			42.8	34.0	233.9				234	0	0	129	29
594.20	6.00	3.50	17		59.0	41.0	399.9				400	0	0	220	35
588.70	5.50		22	Fine Sand	38.4	148.0	324.2				324	0	0	178	40
583.70	5.00	2.90			42.8	34.0	514.8				~~515~~	~~0~~	~~0~~	~~283~~	~~45~~
578.70	5.00		36	Hard Till	37.1	181.7	407.7				408	0	0	224	50
573.70	5.00	3.20	26		46.0	37.5	440.8				~~441~~	~~0~~	~~0~~	~~242~~	~~55~~
569.20	4.50	2.10			31.0	24.6	517.8				~~518~~	~~0~~	~~0~~	~~285~~	~~60~~
562.70	6.50		14	Very Fine Silty Sand	26.2	70.7	978.1				~~978~~	~~0~~	~~0~~	~~538~~	~~66~~
557.70	5.00		100	Very Fine Silty Sand	281.2	504.7	1427.5				~~1428~~	~~0~~	~~0~~	~~785~~	~~71~~
556.70	1.00			Limestone		672.9									

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-09
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 3230 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 164.38 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 61.64 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area===== 0.108 SQFT.

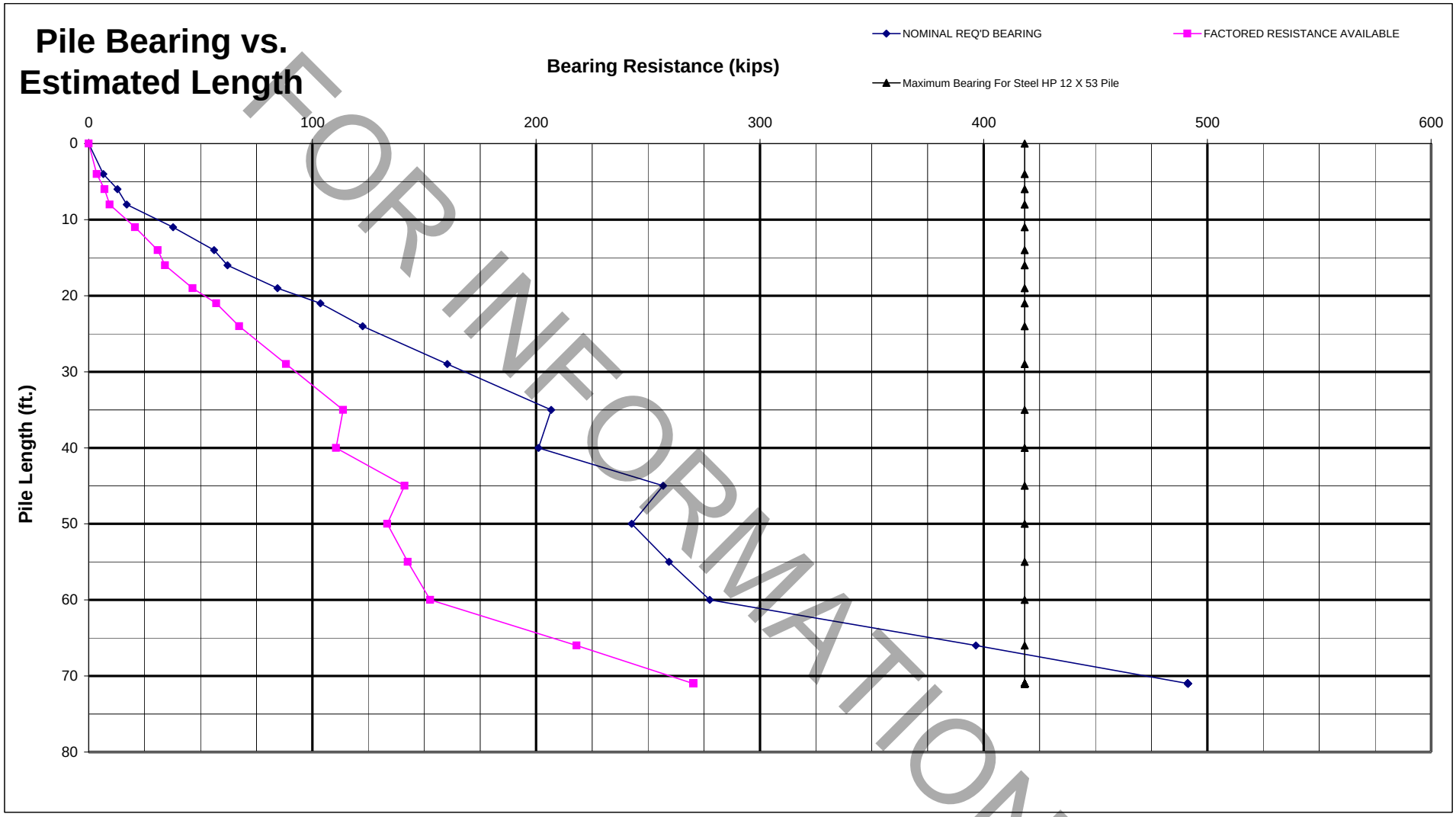
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	**418** KIPS	**230** KIPS	**71** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
624.70	3.30		12	Clean Coarse Sand	3.1		21.3	4.6		***6.6***	7	0	0	4	4
622.70	2.00		14	Clean Coarse Sand	2.2	18.2	51.8	3.2	2.0	***12.9***	13	0	0	7	6
620.70	2.00		26	Clean Coarse Sand	4.2	46.5	37.1	6.2	5.1	***17.0***	17	0	0	9	8
617.70	3.00	2.00			13.9	27.6	55.1	20.3	3.0	***37.7***	38	0	0	21	11
615.20	2.50	2.30			12.6	31.7	66.4	18.5	3.5	***56.0***	56	0	0	31	14
612.70	2.50	2.20			12.3	30.3	***62.1***	17.9	3.3	72.1	62	0	0	34	16
610.20	2.50	1.00			7.0	13.8	87.1	10.3	1.5	***84.4***	84	0	0	46	19
607.70	2.50	2.30			12.6	31.7	106.6	18.5	3.5	***103.6***	104	0	0	57	21
605.20	2.50	2.80			14.4	38.6	***122.4***	21.1	4.2	124.9	122	0	0	67	24
600.20	5.00	2.90			29.6	40.0	***160.3***	43.3	4.4	169.1	160	0	0	88	29
594.20	6.00	3.50	17		40.8	48.2	***206.7***	59.6	5.3	229.3	207	0	0	114	35
588.70	5.50		22	Fine Sand	8.2	53.9	***201.0***	12.0	5.9	239.8	201	0	0	111	40
583.70	5.00	2.90			29.6	40.0	***256.8***	43.3	4.4	286.0	257	0	0	141	45
578.70	5.00		36	Hard Till	7.9	66.1	***242.7***	11.6	7.2	295.2	243	0	0	133	50
573.70	5.00	3.20	26		31.8	44.1	***259.3***	46.5	4.8	340.0	259	0	0	143	55
569.20	4.50	2.10			21.4	28.9	***277.5***	31.3	3.2	371.0	278	0	0	153	60
562.70	6.50		14	Very Fine Silty Sand	5.6	25.7	441.2	8.2	2.8	***396.5***	397	0	0	218	66
557.70	5.00		100	Very Fine Silty Sand	60.2	183.7	562.7	88.1	20.1	***491.3***	~~491~~	~~0~~	~~0~~	~~270~~	~~71~~
556.70	1.00			Limestone		245.0			26.8						

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-09
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 3230 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 164.38 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 61.64 KIPS

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area===== 0.181 SQFT.

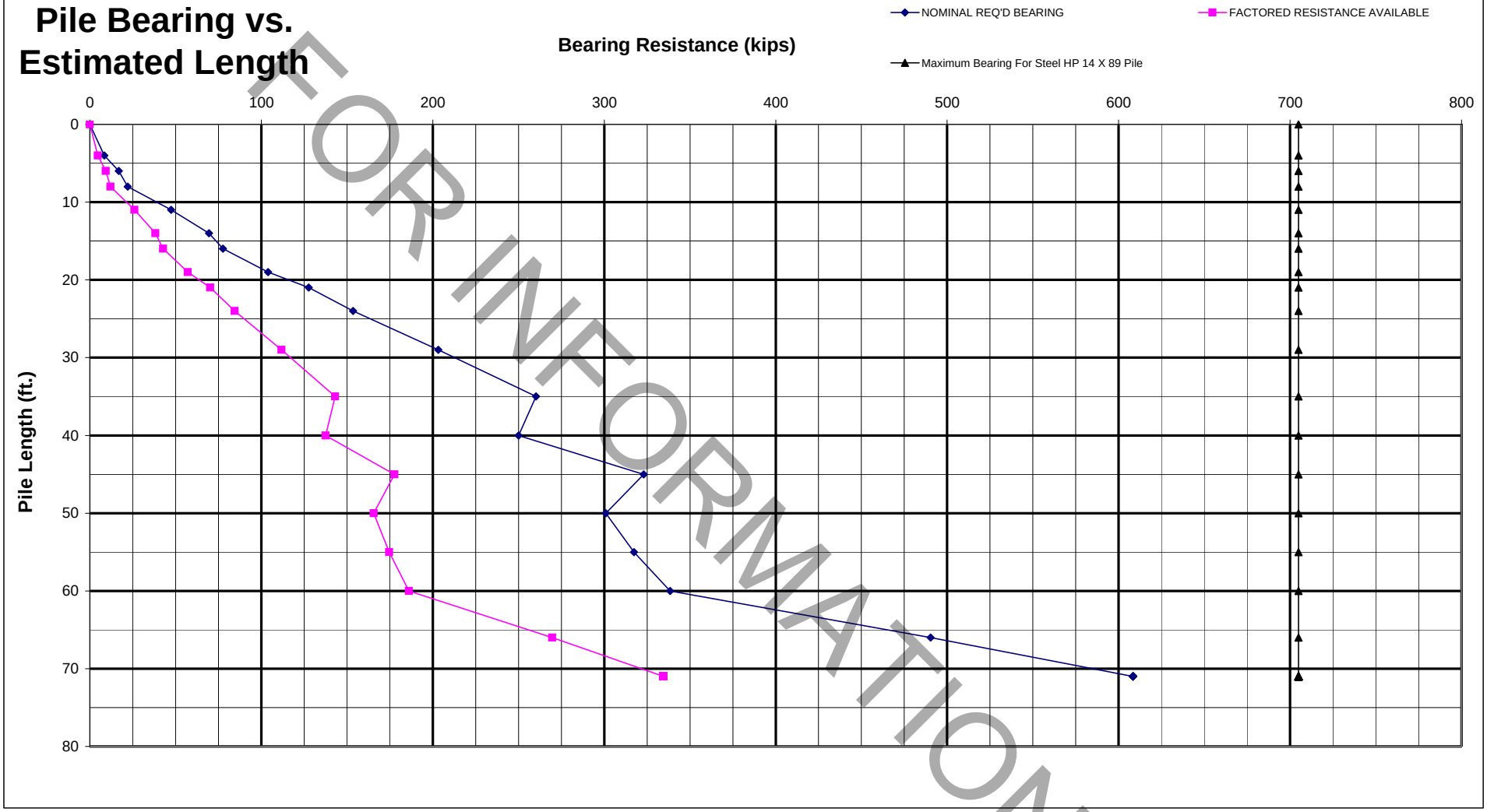
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
705 KIPS	**608** KIPS	**335** KIPS	*** Below Boring

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
624.70	3.30		12	Clean Coarse Sand	3.7		26.1	5.6		***8.4***	8	0	0	5	4
622.70	2.00		14	Clean Coarse Sand	2.7	22.3	63.5	3.9	2.9	***16.8***	17	0	0	9	6
620.70	2.00		26	Clean Coarse Sand	5.0	57.1	50.9	7.5	7.3	***22.0***	22	0	0	12	8
617.70	3.00	2.00			16.6	39.5	73.4	24.6	5.1	***47.4***	47	0	0	26	11
615.20	2.50	2.30			15.1	45.4	86.6	22.4	5.8	***69.5***	69	0	0	38	14
612.70	2.50	2.20			14.7	43.4	***77.6***	21.8	5.6	88.2	78	0	0	43	16
610.20	2.50	1.00			8.4	19.7	111.7	12.5	2.5	***104.0***	104	0	0	57	19
607.70	2.50	2.30			15.1	45.4	136.7	22.4	5.8	***127.7***	128	0	0	70	21
605.20	2.50	2.80			17.3	55.3	156.0	25.6	7.1	***153.5***	154	0	0	84	24
600.20	5.00	2.90			35.5	57.3	***203.3***	52.5	7.4	207.6	203	0	0	112	29
594.20	6.00	3.50	17		48.8	69.1	***260.2***	72.3	8.9	280.9	260	0	0	143	35
588.70	5.50		22	Fine Sand	9.8	77.2	***250.1***	14.6	9.9	292.9	250	0	0	138	40
583.70	5.00	2.90			35.5	57.3	***323.1***	52.5	7.4	350.2	323	0	0	178	45
578.70	5.00		36	Hard Till	9.5	94.8	***301.0***	14.1	12.2	360.3	301	0	0	166	50
573.70	5.00	3.20	26		38.1	63.2	***317.4***	56.4	8.1	413.9	317	0	0	175	55
569.20	4.50	2.10			25.7	41.5	***338.4***	38.0	5.3	451.3	338	0	0	186	60
562.70	6.50		14	Very Fine Silty Sand	6.7	36.9	571.5	10.0	4.7	***490.4***	490	0	0	270	66
557.70	5.00		100	Very Fine Silty Sand	72.1	263.2	731.4	106.8	33.9	***608.4***	608	0	0	335	71
556.70	1.00			Limestone		351.0			45.2						

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-12
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 2660 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 135.37 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 50.76 KIPS

PILE TYPE AND SIZE ========== Metal Shell 12"Φ w/.25" walls
Pile Perimeter========== 3.142 FT.
Pile End Bearing Area========== 0.785 SQFT.

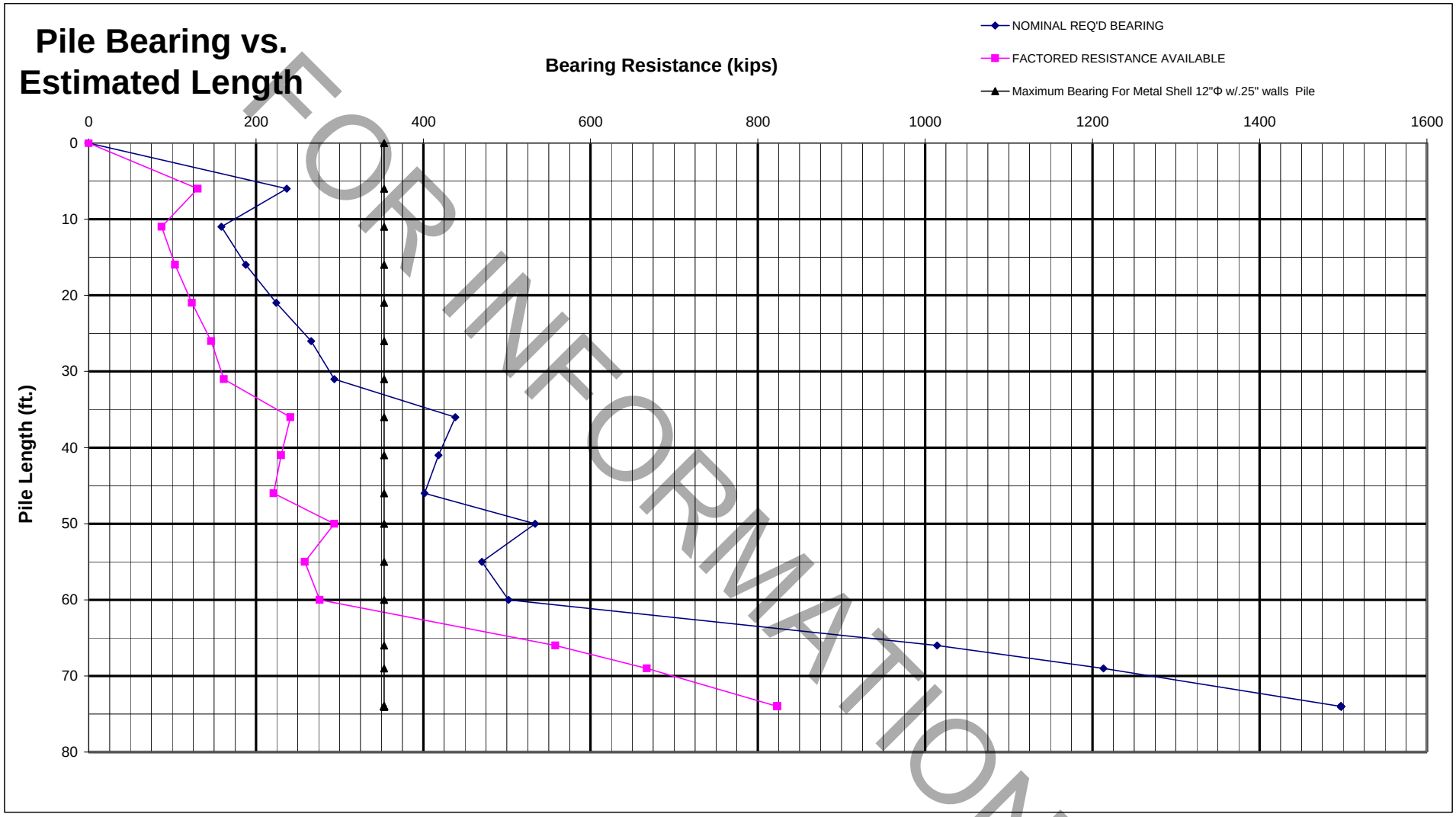
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
353 KIPS	**294** KIPS	**161** KIPS	**31** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
623.40	4.60	2.20			28.0		236.8				237	0	0	130	6
618.40	5.00		44	Clean Coarse Sand	99.6	208.8	158.6				159	0	0	87	11
613.40	5.00	3.60	9		43.0	31.0	187.9				188	0	0	103	16
608.40	5.00	2.00			28.6	17.2	224.2				224	0	0	123	21
603.40	5.00	2.90			36.7	25.0	266.1				266	0	0	146	26
598.40	5.00	3.50	13		42.1	30.2	293.6				294	0	0	161	31
593.40	5.00	1.80			26.7	15.5	438.3				~~438~~	~~0~~	~~0~~	~~241~~	~~36~~
588.40	5.00		36	Hard Till	31.8	133.5	418.2				~~418~~	~~0~~	~~0~~	~~230~~	~~41~~
583.40	5.00		22	Very Fine Silty Sand	27.2	81.6	401.7				~~402~~	~~0~~	~~0~~	~~221~~	~~46~~
579.40	4.00	4.40	26		40.2	37.9	533.8				~~534~~	~~0~~	~~0~~	~~294~~	~~50~~
574.40	5.00		35	Hard Till	30.7	129.8	470.0				~~470~~	~~0~~	~~0~~	~~259~~	~~55~~
569.40	5.00	4.10	19		47.5	35.3	502.0				~~502~~	~~0~~	~~0~~	~~276~~	~~60~~
563.40	6.00	2.30			37.6	19.8	1014.2				~~1014~~	~~0~~	~~0~~	~~558~~	~~66~~
559.90	3.50		100	Fine Sand	198.9	494.4	1213.1				~~1213~~	~~0~~	~~0~~	~~667~~	~~69~~
554.90	5.00		100	Fine Sand	284.2	494.4	1497.3				~~1497~~	~~0~~	~~0~~	~~824~~	~~74~~
553.90	1.00			Limestone		494.4									

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-12
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 2660 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 135.37 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 50.76 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.25" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 SQFT.

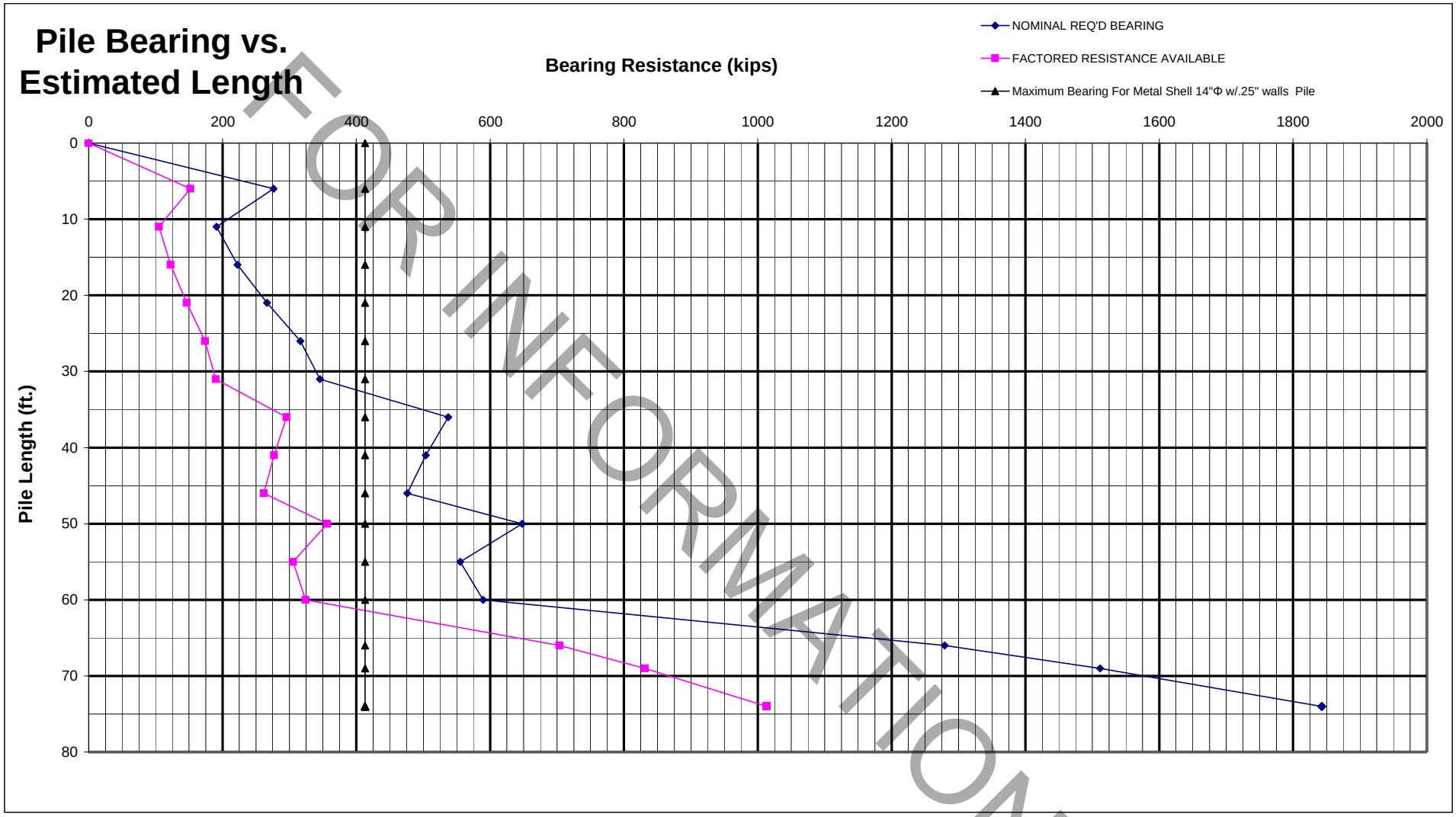
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	**346** KIPS	**190** KIPS	**31** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
623.40	4.60	2.20			32.7		276.3				276	0	0	152	6
618.40	5.00		44	Clean Coarse Sand	116.2	243.6	191.1				191	0	0	105	11
613.40	5.00	3.60	9		50.2	42.2	222.5				223	0	0	122	16
608.40	5.00	2.00			33.4	23.5	266.5				266	0	0	147	21
603.40	5.00	2.90			42.8	34.0	316.3				316	0	0	174	26
598.40	5.00	3.50	13		49.1	41.0	345.5				346	0	0	190	31
593.40	5.00	1.80			31.2	21.1	537.3				~~537~~	~~0~~	~~0~~	~~296~~	~~36~~
588.40	5.00		36	Hard Till	37.1	181.7	503.8				~~504~~	~~0~~	~~0~~	~~277~~	~~41~~
583.40	5.00		22	Very Fine Silty Sand	31.7	111.0	476.1				~~476~~	~~0~~	~~0~~	~~262~~	~~46~~
579.40	4.00	4.40	26		46.9	51.6	648.0				~~648~~	~~0~~	~~0~~	~~356~~	~~50~~
574.40	5.00		35	Hard Till	35.8	176.6	555.2				~~555~~	~~0~~	~~0~~	~~305~~	~~55~~
569.40	5.00	4.10	19		55.4	48.1	589.6				~~590~~	~~0~~	~~0~~	~~324~~	~~60~~
563.40	6.00	2.30			43.8	27.0	1279.4				~~1279~~	~~0~~	~~0~~	~~704~~	~~66~~
559.90	3.50		100	Fine Sand	232.1	672.9	1511.5				~~1511~~	~~0~~	~~0~~	~~831~~	~~69~~
554.90	5.00		100	Fine Sand	331.5	672.9	1843.0				~~1843~~	~~0~~	~~0~~	~~1014~~	~~74~~
553.90	1.00			Limestone		672.9									

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-12
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 2660 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 135.37 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 50.76 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area===== 0.108 SQFT.

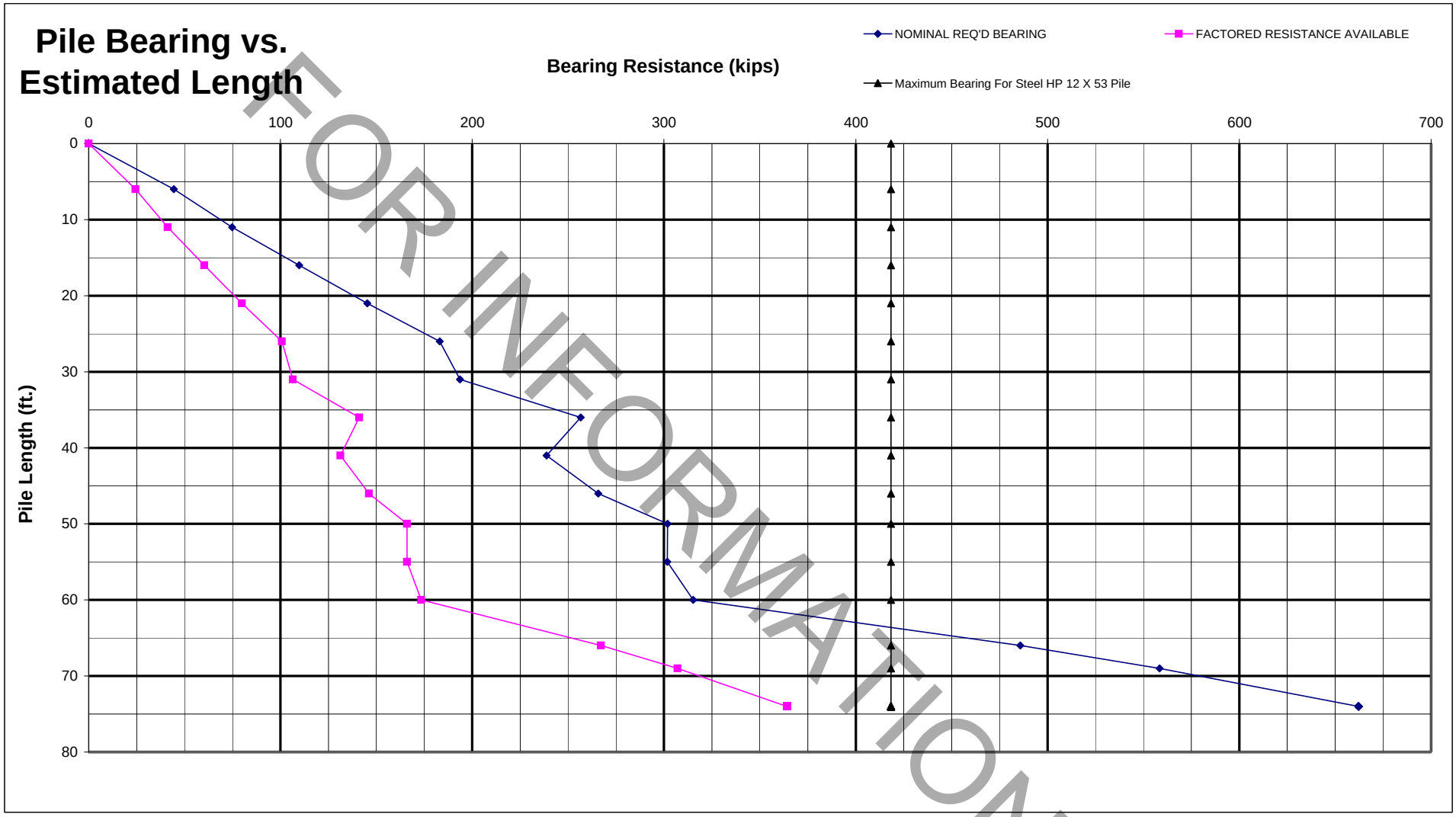
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	**315** KIPS	**173** KIPS	**60** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
623.40	4.60	2.20			22.6		126.1	33.0		***44.3***	44	0	0	24	6
618.40	5.00		44	Clean Coarse Sand	24.9	103.5	97.1	36.4	11.3	***74.8***	75	0	0	41	11
613.40	5.00	3.60	9		34.7	49.6	***109.7***	50.7	5.4	123.2	110	0	0	60	16
608.40	5.00	2.00			23.1	27.6	***145.2***	33.8	3.0	158.3	145	0	0	80	21
603.40	5.00	2.90			29.6	40.0	***183.1***	43.3	4.4	202.5	183	0	0	101	26
598.40	5.00	3.50	13		34.0	48.2	***193.6***	49.7	5.3	249.6	194	0	0	107	31
593.40	5.00	1.80			21.6	24.8	***256.6***	31.5	2.7	285.7	257	0	0	141	36
588.40	5.00		36	Hard Till	7.9	66.1	***238.8***	11.6	7.2	294.5	239	0	0	131	41
583.40	5.00		22	Very Fine Silty Sand	6.8	40.4	***265.8***	9.9	4.4	306.6	266	0	0	146	46
579.40	4.00	4.40	26		32.4	60.6	***301.9***	47.4	6.6	354.4	302	0	0	166	50
574.40	5.00		35	Hard Till	7.7	64.3	***301.7***	11.2	7.0	364.8	302	0	0	166	55
569.40	5.00	4.10	19		38.3	56.5	***315.3***	56.0	6.2	418.1	315	0	0	173	60
563.40	6.00	2.30			30.3	31.7	558.9	44.3	3.5	***485.7***	~~486~~	~~0~~	~~0~~	~~267~~	~~66~~
559.90	3.50		100	Fine Sand	49.7	245.0	608.6	72.7	26.8	***558.4***	~~558~~	~~0~~	~~0~~	~~307~~	~~69~~
554.90	5.00		100	Fine Sand	71.0	245.0	679.6	103.8	26.8	***662.2***	~~662~~	~~0~~	~~0~~	~~364~~	~~74~~
553.90	1.00			Limestone		245.0			26.8						

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-12
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 2660 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 135.37 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 50.76 KIPS

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

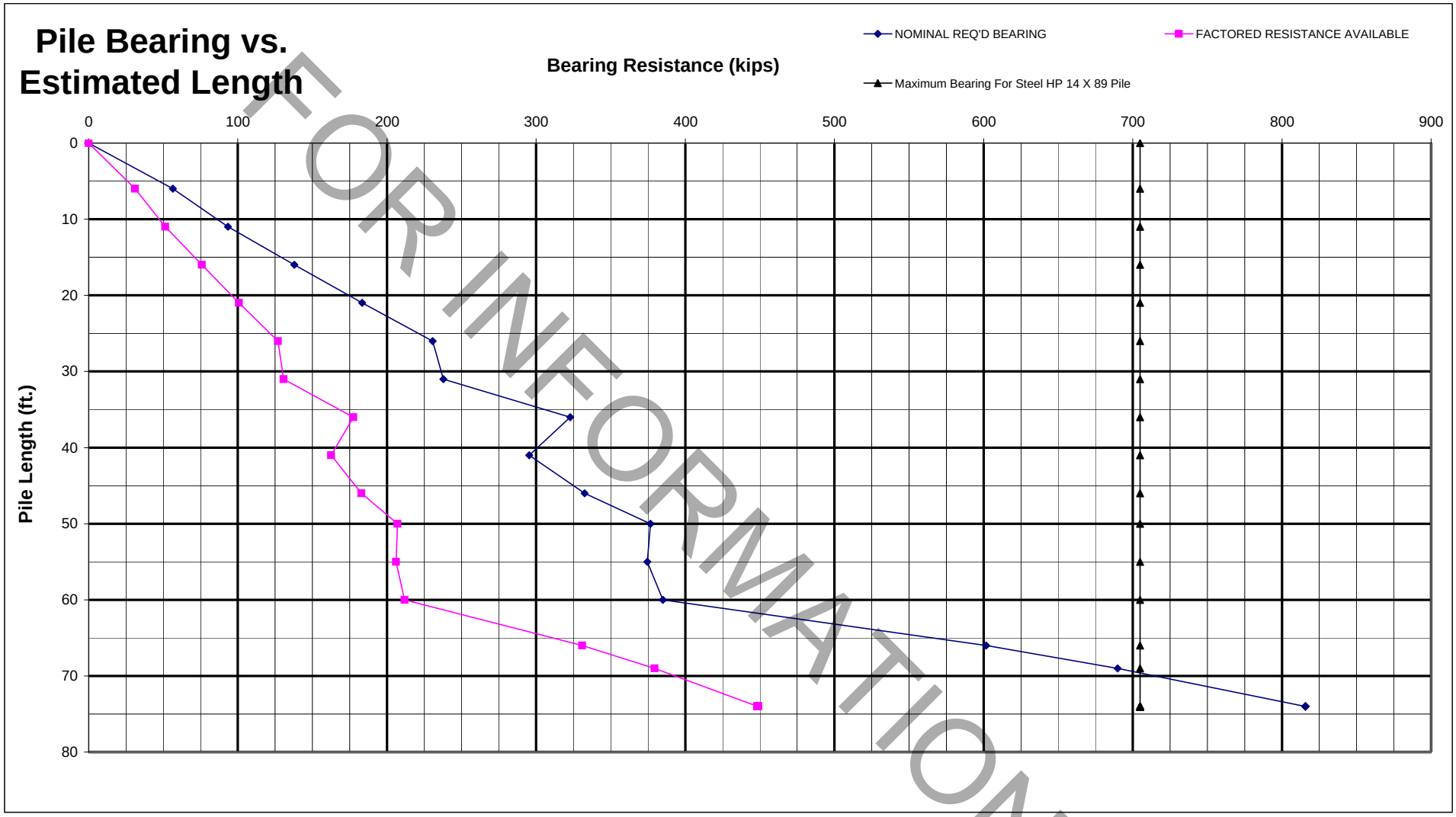
Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
705 KIPS	**705** KIPS	**388** KIPS	**74** FT.

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area===== 0.181 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
623.40	4.60	2.20			27.0		154.1	40.0		***56.4***	56	0	0	31	6
618.40	5.00		44	Clean Coarse Sand	29.8	127.1	127.9	44.1	16.4	***93.3***	93	0	0	51	11
613.40	5.00	3.60	9		41.5	71.1	***137.9***	61.5	9.1	150.8	138	0	0	76	16
608.40	5.00	2.00			27.6	39.5	***183.3***	40.9	5.1	194.0	183	0	0	101	21
603.40	5.00	2.90			35.5	57.3	***230.6***	52.5	7.4	248.0	231	0	0	127	26
598.40	5.00	3.50	13		40.7	69.1	***237.7***	60.2	8.9	303.9	238	0	0	131	31
593.40	5.00	1.80			25.8	35.5	***322.8***	38.2	4.6	349.8	323	0	0	178	36
588.40	5.00		36	Hard Till	9.5	94.8	***295.4***	14.1	12.2	359.2	295	0	0	162	41
583.40	5.00		22	Very Fine Silty Sand	8.1	57.9	***332.5***	12.0	7.5	374.9	333	0	0	183	46
579.40	4.00	4.40	26		38.8	86.9	***376.6***	57.5	11.2	433.1	377	0	0	207	50
574.40	5.00		35	Hard Till	9.2	92.1	***374.6***	13.6	11.9	445.2	375	0	0	206	55
569.40	5.00	4.10	19		45.9	80.9	***385.0***	68.0	10.4	508.6	385	0	0	212	60
563.40	6.00	2.30			36.3	45.4	726.8	53.8	5.8	***601.7***	602	0	0	331	66
559.90	3.50		100	Fine Sand	59.5	351.0	786.3	88.1	45.2	***689.8***	690	0	0	379	69
554.90	5.00		100	Fine Sand	85.0	351.0	871.4	125.9	45.2	***815.7***	~~816~~	~~0~~	~~0~~	~~449~~	~~74~~
553.90	1.00			Limestone		351.0			45.2						

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-13
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 2660 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 270.74 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 101.53 KIPS

PILE TYPE AND SIZE ========== Metal Shell 12"Φ w/.25" walls
Pile Perimeter========== 3.142 FT.
Pile End Bearing Area========== 0.785 SQFT.

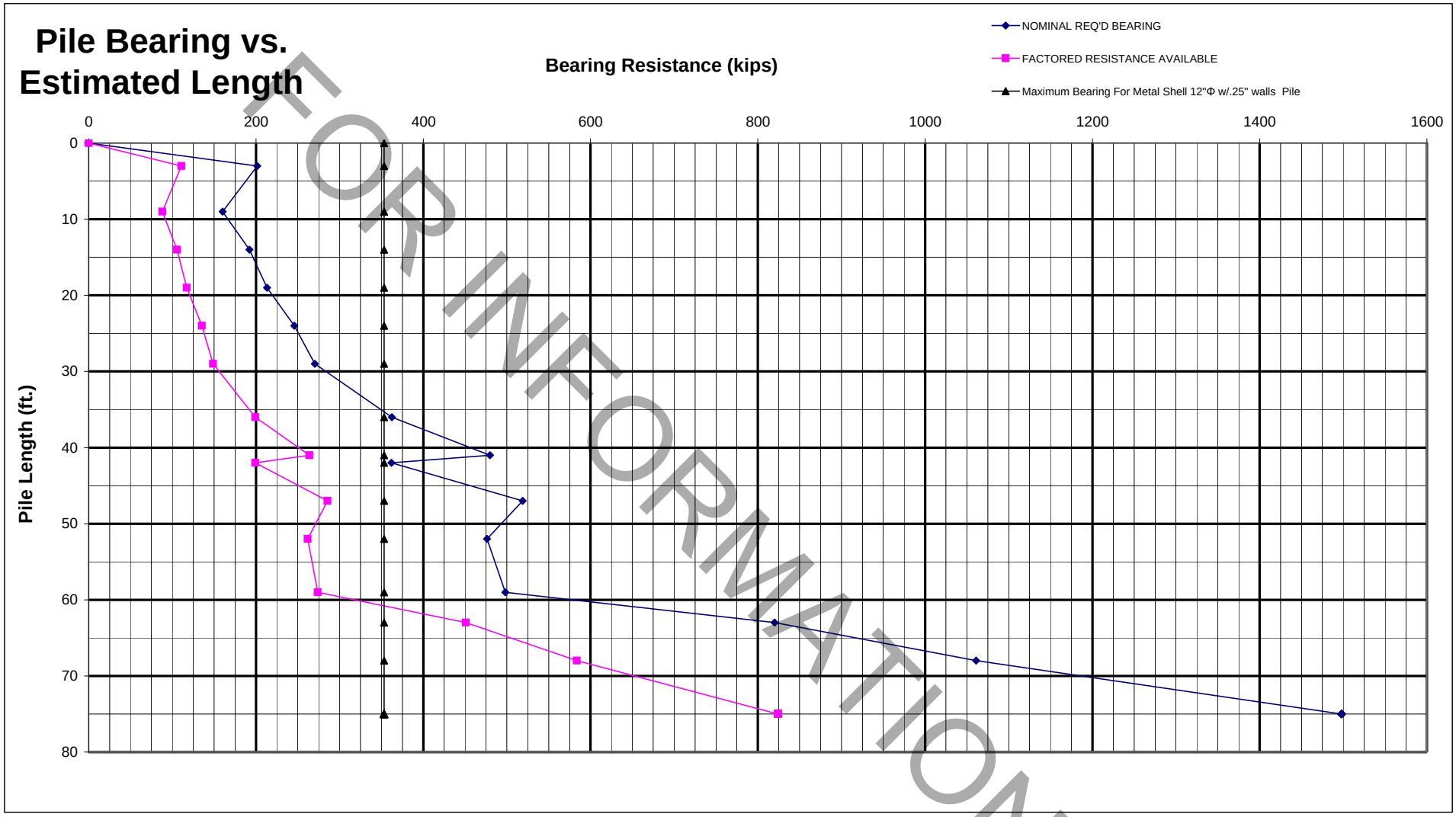
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
353 KIPS	**270** KIPS	**149** KIPS	**29** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
626.10	1.90	1.90			10.5		201.6				202	0	0	111	3
619.60	6.50		46	Clean Coarse Sand	140.8	191.0	160.0				160	0	0	88	9
614.60	5.00	1.00			17.5	8.6	192.1				192	0	0	106	14
609.60	5.00	2.70			34.9	23.3	213.2				213	0	0	117	19
604.60	5.00	1.10			18.8	9.5	245.9				246	0	0	135	24
599.60	5.00	2.70			34.9	23.3	270.4				270	0	0	149	29
593.10	6.50	1.50			30.7	12.9	362.4				~~362~~	~~0~~	~~0~~	~~199~~	~~36~~
588.10	5.00		20	Very Fine Silty Sand	24.7	74.2	479.8				~~480~~	~~0~~	~~0~~	~~264~~	~~41~~
586.60	1.50		45	Hard Till	12.9	166.9	362.1				~~362~~	~~0~~	~~0~~	~~199~~	~~42~~
581.60	5.00	4.20	29		48.4	36.2	518.9				~~519~~	~~0~~	~~0~~	~~285~~	~~47~~
576.60	5.00		39	Hard Till	35.3	144.6	476.3				~~476~~	~~0~~	~~0~~	~~262~~	~~52~~
569.60	7.00		18	Hard Till	21.8	66.7	498.1				~~498~~	~~0~~	~~0~~	~~274~~	~~59~~
565.60	4.00		18	Very Fine Silty Sand	17.8	66.7	820.0				~~820~~	~~0~~	~~0~~	~~451~~	~~63~~
560.60	5.00		100	Very Fine Silty Sand	241.0	370.8	1061.0				~~1061~~	~~0~~	~~0~~	~~584~~	~~68~~
554.10	6.50		100	Very Fine Silty Sand	313.3	370.8	1497.9				~~1498~~	~~0~~	~~0~~	~~824~~	~~75~~
553.10	1.00			Limestone		494.4									

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-13
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 2660 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 270.74 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 101.53 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.25" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 SQFT.

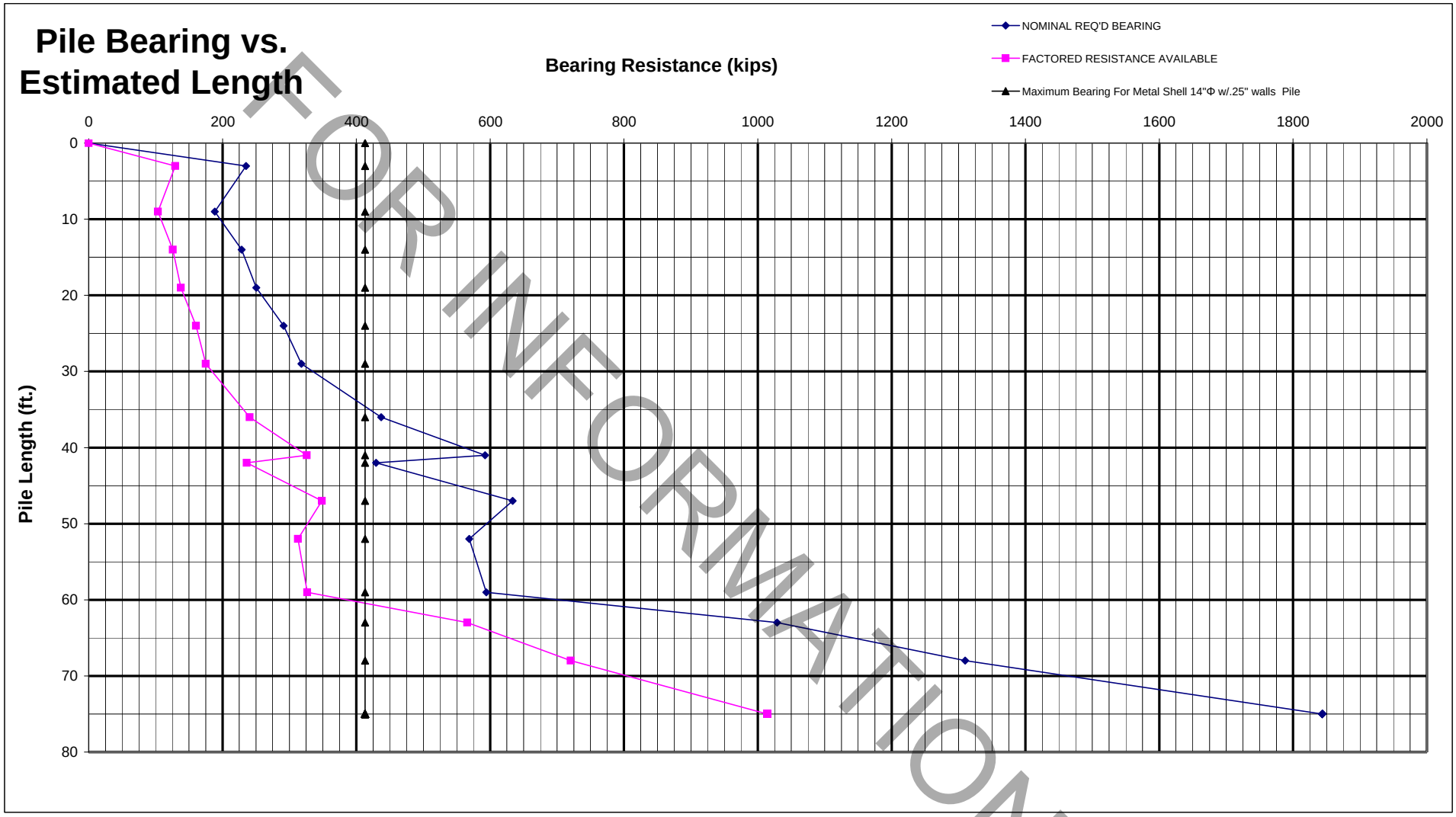
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	**318** KIPS	**175** KIPS	**29** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
626.10	1.90	1.90			12.3		235.2				235	0	0	129	3
619.60	6.50		46	Clean Coarse Sand	164.3	222.9	188.3				188	0	0	104	9
614.60	5.00	1.00			20.4	11.7	228.6				229	0	0	126	14
609.60	5.00	2.70			40.7	31.7	250.6				251	0	0	138	19
604.60	5.00	1.10			22.0	12.9	291.4				291	0	0	160	24
599.60	5.00	2.70			40.7	31.7	318.0				318	0	0	175	29
593.10	6.50	1.50			35.9	17.6	437.2				~~437~~	~~0~~	~~0~~	~~240~~	~~36~~
588.10	5.00		20	Very Fine Silty Sand	28.8	100.9	592.3				~~592~~	~~0~~	~~0~~	~~326~~	~~41~~
586.60	1.50		45	Hard Till	15.1	227.1	429.5				~~429~~	~~0~~	~~0~~	~~236~~	~~42~~
581.60	5.00	4.20	29		56.5	49.2	633.5				~~634~~	~~0~~	~~0~~	~~348~~	~~47~~
576.60	5.00		39	Hard Till	41.1	196.8	568.7				~~569~~	~~0~~	~~0~~	~~313~~	~~52~~
569.60	7.00		18	Hard Till	25.4	90.8	594.1				~~594~~	~~0~~	~~0~~	~~327~~	~~59~~
565.60	4.00		18	Very Fine Silty Sand	20.8	90.8	1028.7				~~1029~~	~~0~~	~~0~~	~~566~~	~~63~~
560.60	5.00		100	Very Fine Silty Sand	281.2	504.7	1309.9				~~1310~~	~~0~~	~~0~~	~~720~~	~~68~~
554.10	6.50		100	Very Fine Silty Sand	365.6	504.7	1843.7				~~1844~~	~~0~~	~~0~~	~~1014~~	~~75~~
553.10	1.00			Limestone		672.9									

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-13
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 2660 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 270.74 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 101.53 KIPS

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

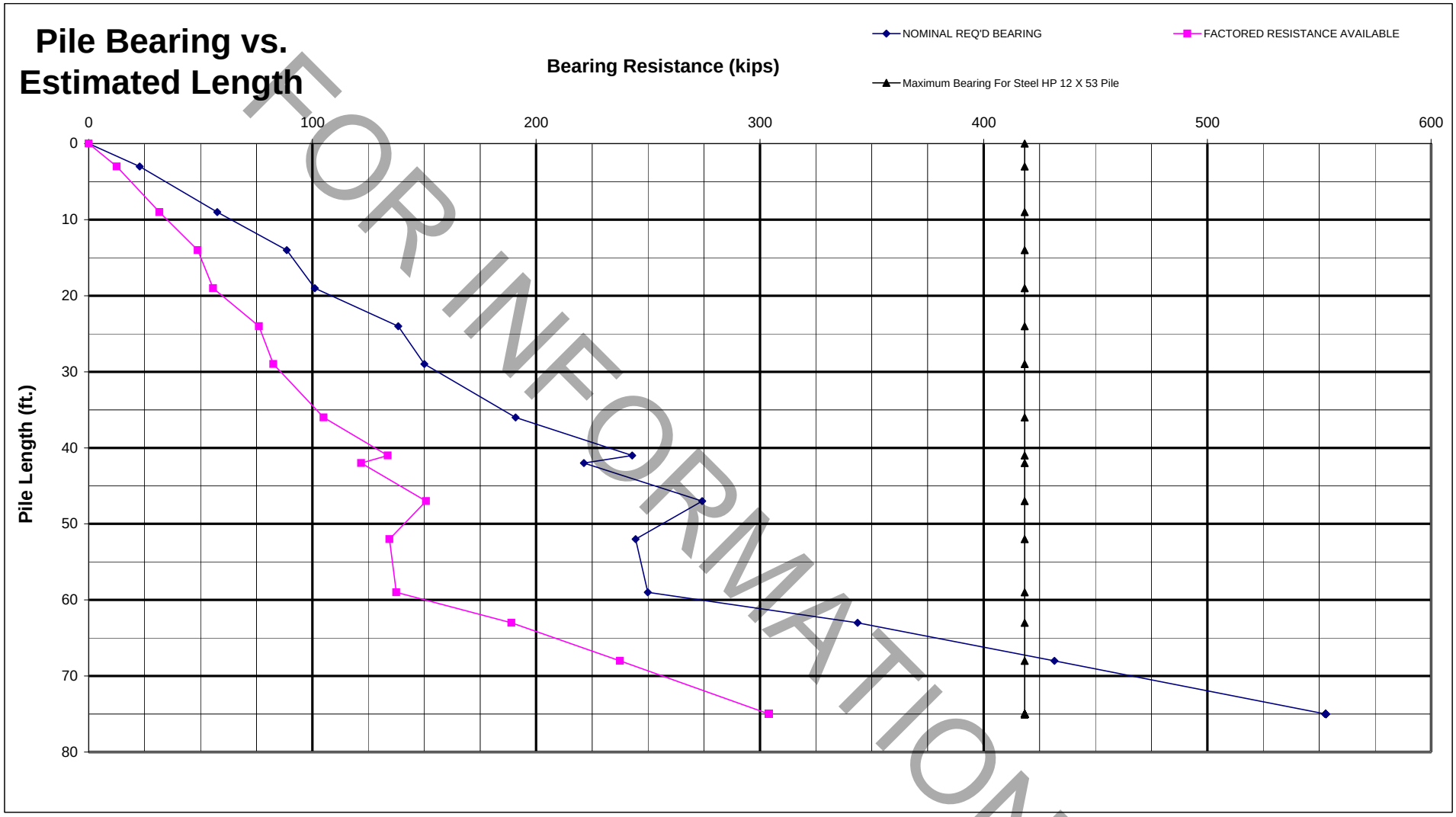
Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	**344** KIPS	**189** KIPS	**63** FT.

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area===== 0.108 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
626.10	1.90	1.90			8.5		103.2	12.4		***22.8***	23	0	0	13	3
619.60	6.50		46	Clean Coarse Sand	35.2	94.7	***57.5***	51.5	10.4	65.4	57	0	0	32	9
614.60	5.00	1.00			14.1	13.8	95.0	20.6	1.5	***88.5***	89	0	0	49	14
609.60	5.00	2.70			28.2	37.2	***101.1***	41.2	4.1	127.3	101	0	0	56	19
604.60	5.00	1.10			15.2	15.2	***138.3***	22.2	1.7	152.0	138	0	0	76	24
599.60	5.00	2.70			28.2	37.2	***150.0***	41.2	4.1	191.3	150	0	0	82	29
593.10	6.50	1.50			24.8	20.7	***190.9***	36.3	2.3	229.3	191	0	0	105	36
588.10	5.00		20	Very Fine Silty Sand	6.2	36.7	***243.0***	9.0	4.0	243.4	243	0	0	134	41
586.60	1.50		45	Hard Till	3.2	82.7	***221.4***	4.7	9.0	245.4	221	0	0	122	42
581.60	5.00	4.20	29		39.1	57.9	***274.2***	57.1	6.3	304.0	274	0	0	151	47
576.60	5.00		39	Hard Till	8.8	71.7	***244.4***	12.9	7.8	312.7	244	0	0	134	52
569.60	7.00		18	Hard Till	5.4	33.1	***249.9***	8.0	3.6	320.6	250	0	0	137	59
565.60	4.00		18	Very Fine Silty Sand	4.4	33.1	405.0	6.5	3.6	***343.6***	344	0	0	189	63
560.60	5.00		100	Very Fine Silty Sand	60.2	183.7	465.2	88.1	20.1	***431.7***	~~432~~	~~0~~	~~0~~	~~237~~	~~68~~
554.10	6.50		100	Very Fine Silty Sand	78.3	183.7	604.8	114.5	20.1	***552.9***	~~553~~	~~0~~	~~0~~	~~304~~	~~75~~
553.10	1.00			Limestone		245.0			26.8						

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== East River Road Bridge
REFERENCE BORING ========== SB-13
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 629.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 628.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 2660 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 78.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 270.74 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 101.53 KIPS

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area===== 0.181 SQFT.

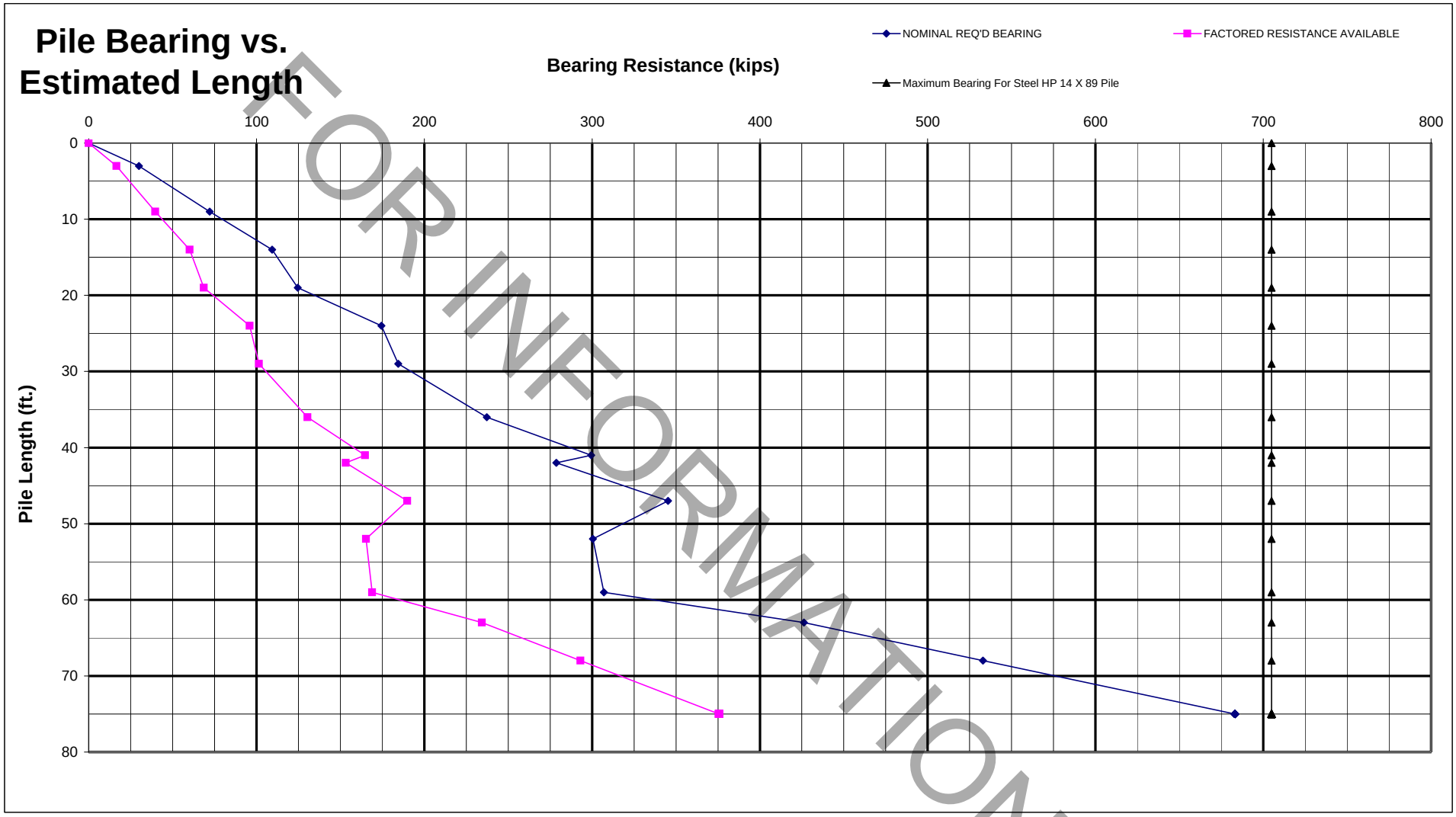
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
705 KIPS	**683** KIPS	**376** KIPS	*** Below Boring

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
626.10	1.90	1.90			10.2		126.4	15.1		***30.0***	30	0	0	17	3
619.60	6.50		46	Clean Coarse Sand	42.1	116.2	***72.1***	62.4	15.0	80.0	72	0	0	40	9
614.60	5.00	1.00			16.9	19.7	122.5	25.0	2.5	***109.3***	109	0	0	60	14
609.60	5.00	2.70			33.7	53.3	***124.6***	49.9	6.9	155.2	125	0	0	69	19
604.60	5.00	1.10			18.2	21.7	***174.4***	26.9	2.8	186.2	174	0	0	96	24
599.60	5.00	2.70			33.7	53.3	***184.5***	49.9	6.9	233.1	184	0	0	101	29
593.10	6.50	1.50			29.7	29.6	***237.2***	44.0	3.8	280.0	237	0	0	130	36
588.10	5.00		20	Very Fine Silty Sand	7.4	52.6	310.4	11.0	6.8	***299.4***	299	0	0	165	41
586.60	1.50		45	Hard Till	3.9	118.5	***278.7***	5.7	15.2	300.6	279	0	0	153	42
581.60	5.00	4.20	29		46.8	82.9	***345.2***	69.2	10.7	372.4	345	0	0	190	47
576.60	5.00		39	Hard Till	10.5	102.7	***300.5***	15.6	13.2	380.9	300	0	0	165	52
569.60	7.00		18	Hard Till	6.5	47.4	***307.0***	9.7	6.1	390.5	307	0	0	169	59
565.60	4.00		18	Very Fine Silty Sand	5.3	47.4	528.2	7.9	6.1	***426.2***	426	0	0	234	63
560.60	5.00		100	Very Fine Silty Sand	72.1	263.2	600.3	106.8	33.9	***533.0***	533	0	0	293	68
554.10	6.50		100	Very Fine Silty Sand	93.7	263.2	781.8	138.8	33.9	***683.1***	683	0	0	376	75
553.10	1.00			Limestone		351.0			45.2						

FOR INFORMATION ONLY

Pile Bearing vs. Estimated Length



FOR INFORMATION ONLY

FOR INFORMATION ONLY

APPENDIX G

TSL Drawings

Bench Mark: Silver survey nail south end of bridge on eastside sta. 72+18.3, 23' right

Existing structure: S.N. 016-2124 built as F.A.I. Route 173 Project BU-265(20) Section 267-1617-15D in 1958. The structure was rehabilitated & widened in 1981 under F.A.I. Route 173 Project IR-000S(12) Section 81-26722-01-GS. The existing bridge has five simple spans which consist of reinforced concrete deck slab resting on 48" PPC I-beams. Span lengths are 34'-6", 84'-9", 40'-0", 67'-0", and 34'-6". The structure width consists of 61'-0" face to face of parapet for vehicular deck and 15'-0" for equestrian deck for a total deck width of 78'-7". The structure has overall length of 266'-1". Traffic to be detoured during Bridge reconstruction.

No salvage

FOR REVIEW
MAY NOT BE USED FOR CONSTRUCTION
INFORMATIONAL ONLY

HIGHWAY CLASSIFICATION

F.A.U Rte. 2729 - East River Road
Functional Class: Major Collector
ADT: 20,500 (2006); 21,300 (2030)
ADTT: 600 (2006); 640 (2030)
DHV: 1,700 (2030)
Speed: 45 m.p.h (posted); 45 m.p.h (design)
Two-way traffic Directional Dist. 50:50

F.A.I Rte. 190 - I-90
Functional Class: Interstate
ADT: 204,100 (2011); 315,000 (2040)
ADTT: 8570 (2011); 13,230 (2040)
DHV: 7415 (One-way)
Speed: 55 m.p.h (posted); 55 m.p.h (design)

DESIGN SPECIFICATIONS

AASHTO LRFD Bridge Design Specifications, 6th Edition (2012) with 2013 Interim Revisions

LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.

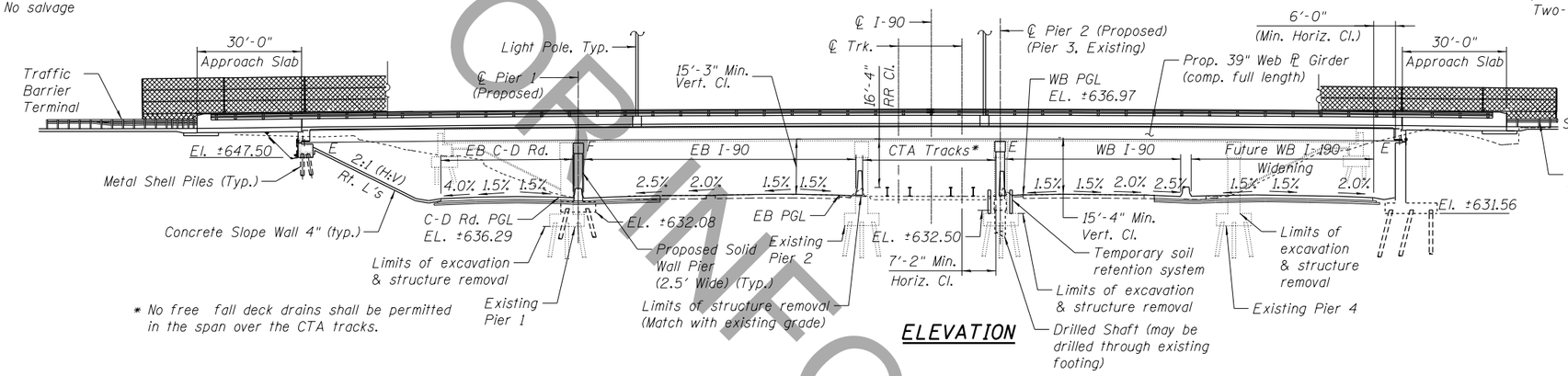
DESIGN STRESSES

FIELD UNITS

f'c = 3,500 psi
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

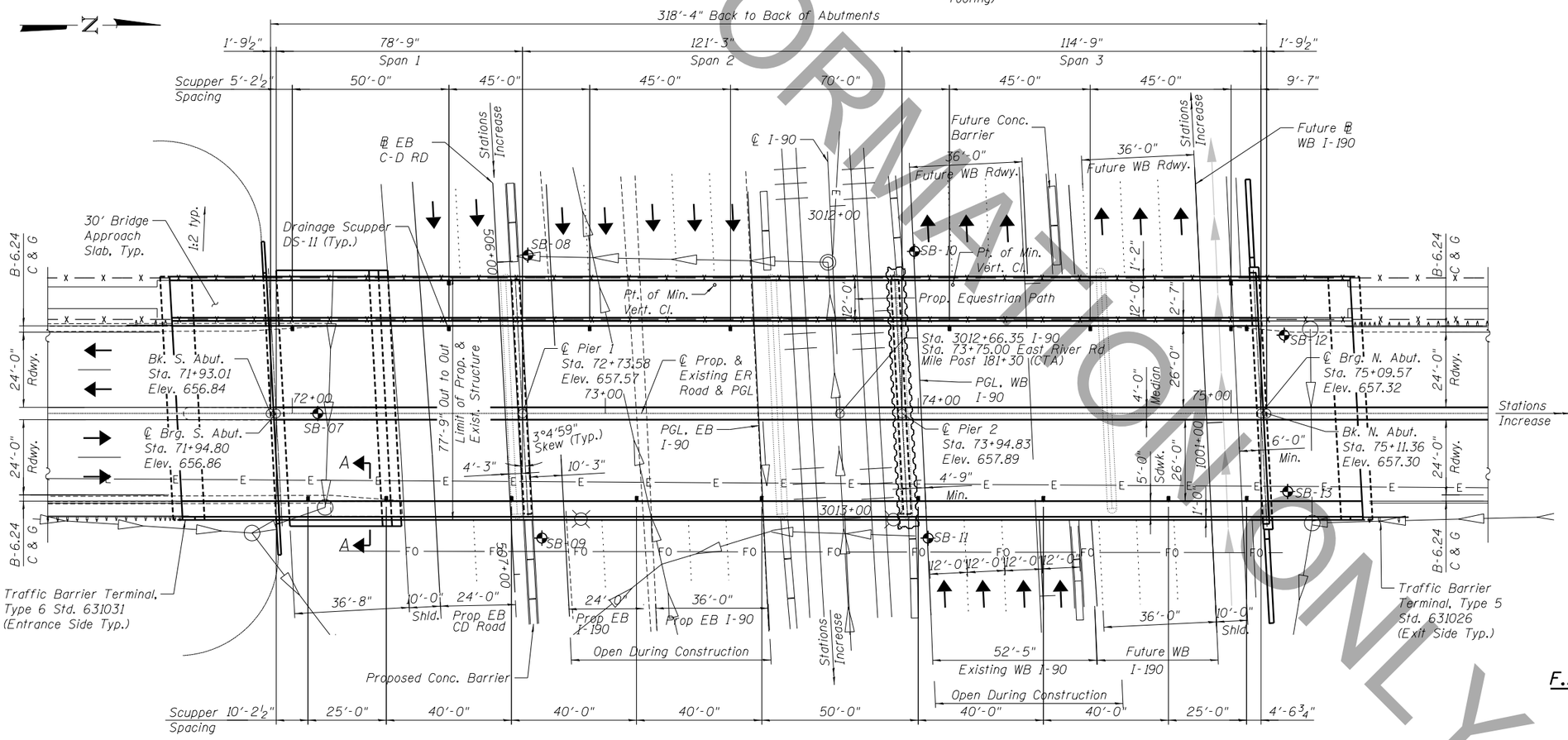
SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.060g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.108g
Soil Site Class = C



* No free fall deck drains shall be permitted in the span over the CTA tracks.

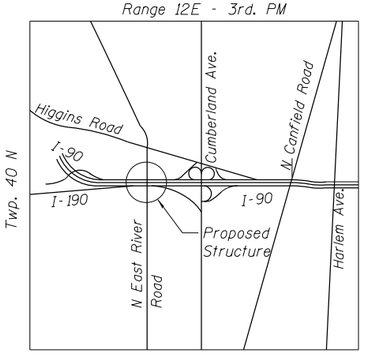
ELEVATION



PLAN

LEGEND

- Soil Boring Locations
- CTA Tracks
- FO – Existing Fiber Optic Line
- E – Existing/Proposed Electric Line
- Existing Storm Sewer
- Proposed Storm Sewer
- Light Pole
- Temporary soil retention system



LOCATION SKETCH

GENERAL PLAN
EAST RIVER ROAD OVER I-90
F.A.I RTE. 190 - SEC. (1517R-1 & 1617B)13
COOK COUNTY
STATION 73+75.00
STRUCTURE NO. 016-2280

exp U.S. Services Inc. Chicago, IL
BUILDINGS•EARTH & ENVIRONMENT•ENERGY INDUSTRIAL•INFRASTRUCTURE•SUSTAINABILITY

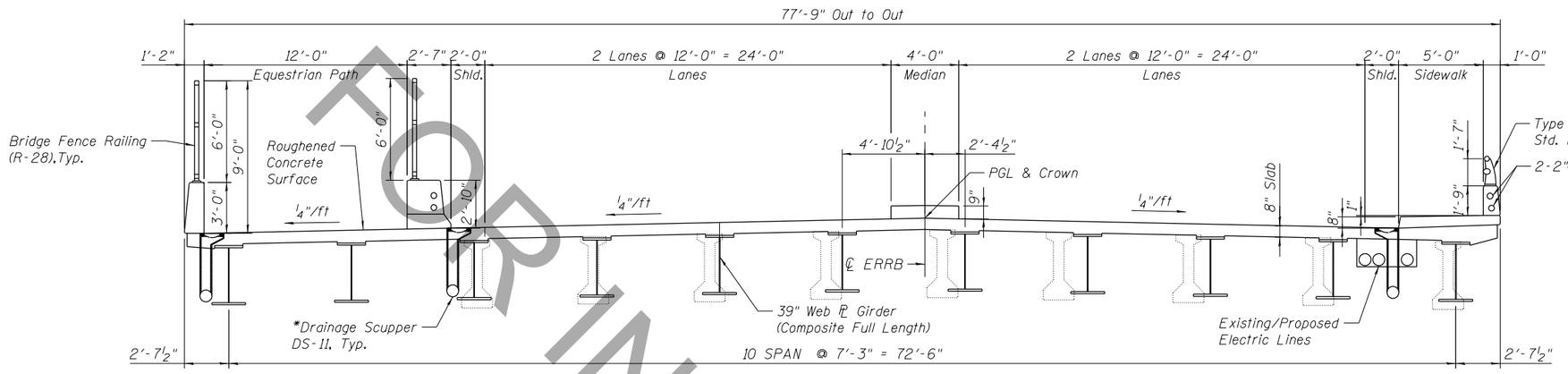
USER NAME = $USER$	DESIGNED - KK	REVISED
	CHECKED - RSN	REVISED
PLOT SCALE = $SCALE$	DRAWN - PK	REVISED
PLOT DATE = 7-21-2014	CHECKED - KK	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GENERAL PLAN
EAST RIVER ROAD OVER I-90
SHEET NO. 1 OF 3 SHEETS

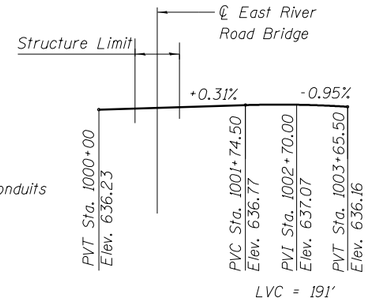
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
190	(1517R-1&1617B)13	COOK		
		CONTRACT NO. 60X56		
	ILLINOIS FED. AID PROJECT			

FILE NAME = $FILEL$

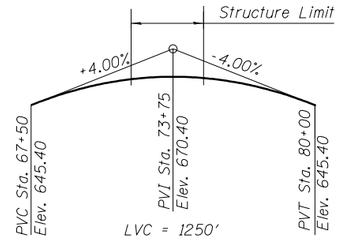


CROSS SECTION
(Looking North)

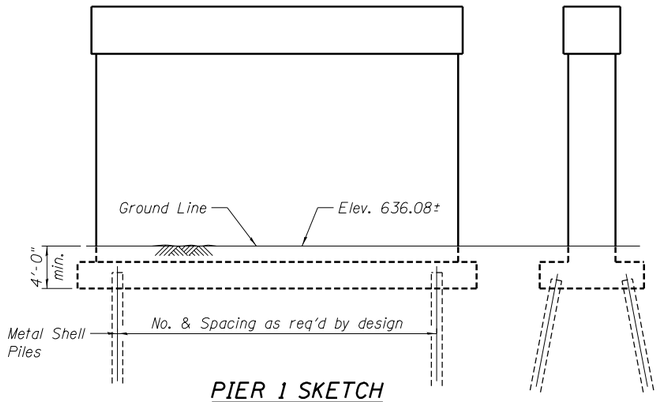
* Drainage scuppers shall be attached to downspouts or to a closed drainage system.



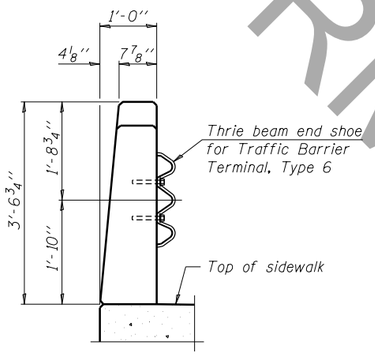
PROFILE GRADE - FUTURE ℄ I-190 WB



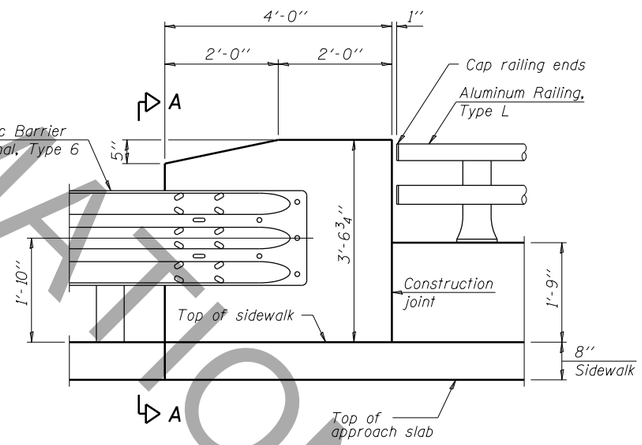
PROFILE GRADE - EAST RIVER ROAD BRIDGE



PIER 1 SKETCH

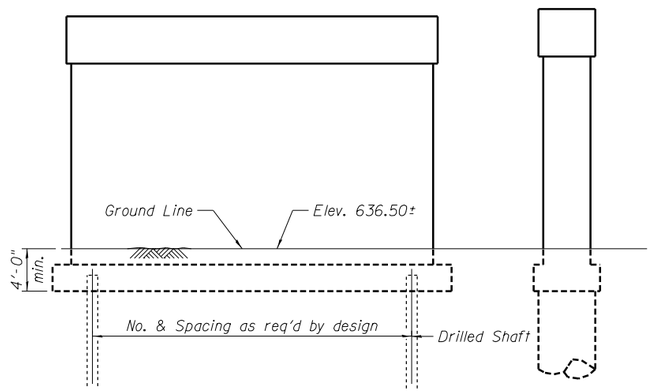


SECTION A-A

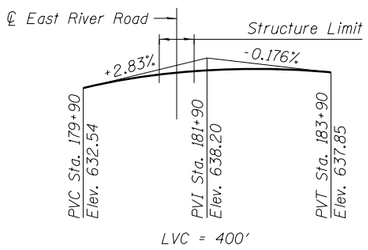


ELEVATION

RAILING END TREATMENT FOR TYPE 6 TERMINAL
(End treatment for Type 5 Terminal is similar but with butt connection)

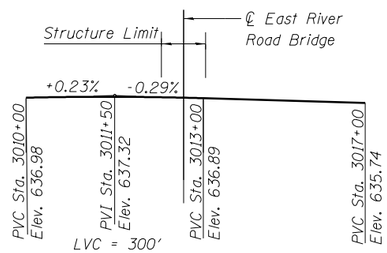


PIER 2 SKETCH

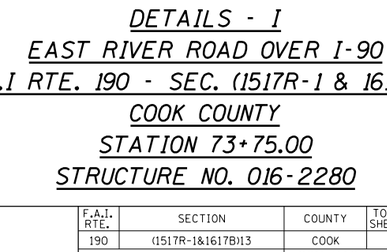


PROFILE GRADE - CTA TRACKS
(Preliminary)

PROFILE GRADE - FUTURE WB I-90



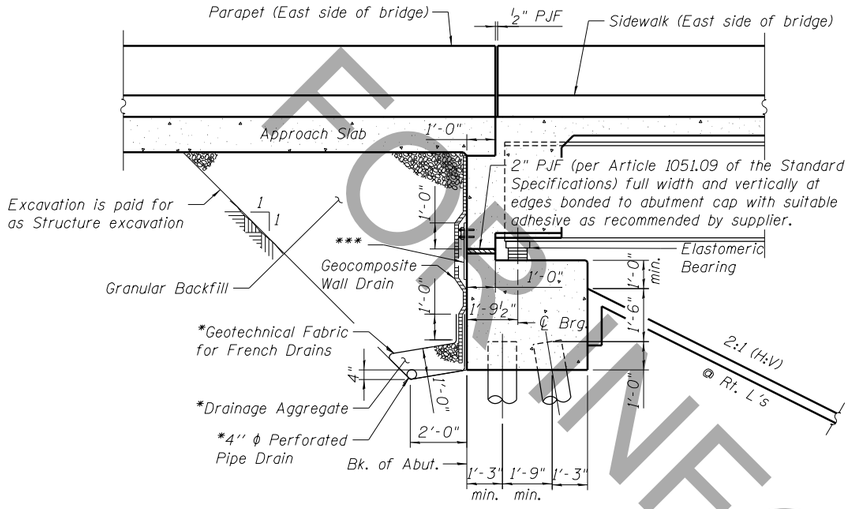
PROFILE GRADE - PROPOSED EB C-D ROAD



PROFILE GRADE - PROPOSED EB I-90

DETAILS - I
EAST RIVER ROAD OVER I-90
F.A.I RTE. 190 - SEC. (1517R-1 & 1617B)13
COOK COUNTY
STATION 73+75.00
STRUCTURE NO. 016-2280

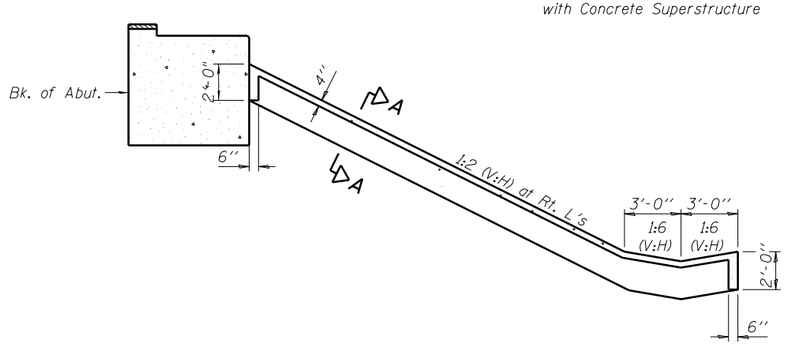
FOR INFORMATION ONLY



SECTION THRU SOUTH ABUTMENT

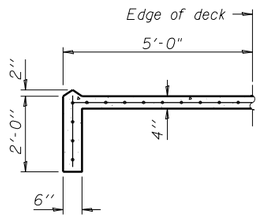
(Horiz. dim. @ Rt. L's)

*** Fabric Reinforced Elastomeric Mat according to Section 1028 of the Std. Specs. Fabric mat shall be 24" wide and attached full width and vertically at edges to the abutment cap with a 3#8" x 5" steel plate and 1#2" ϕ studs with nuts and washer at 12" cts. Cost included with Concrete Superstructure

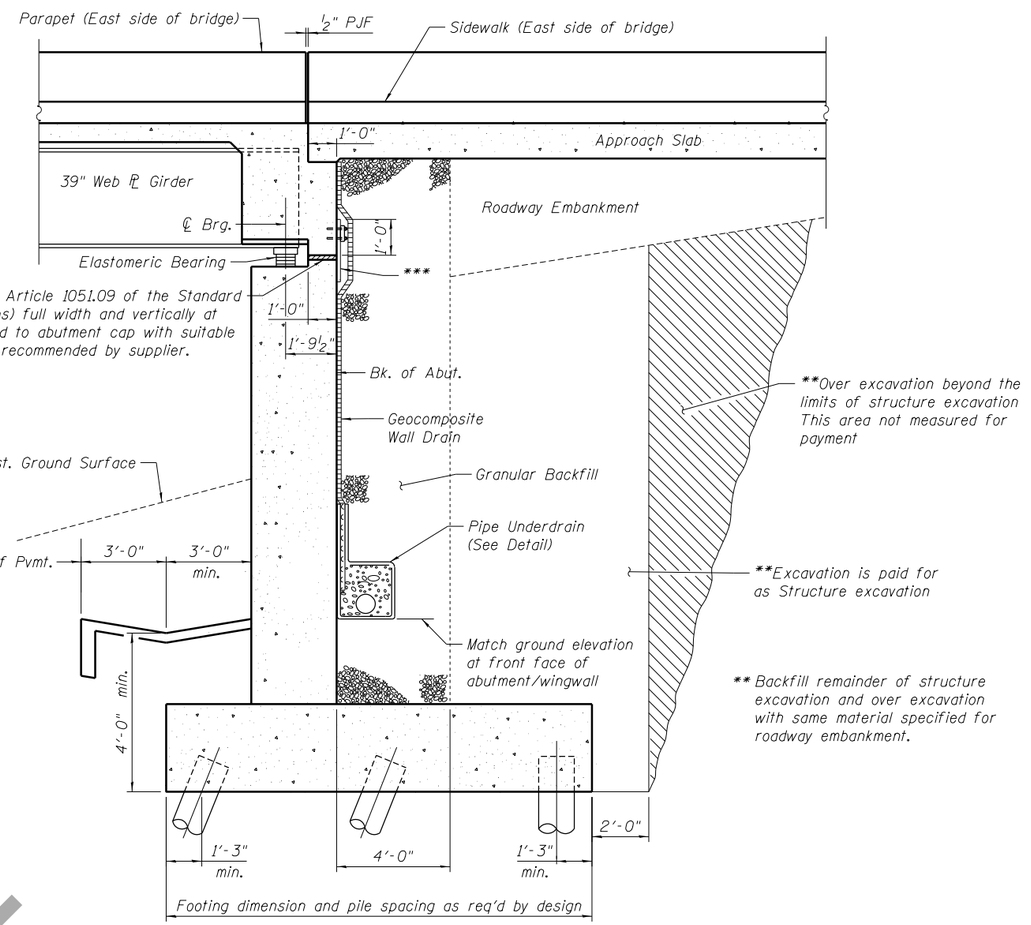


SECTION THRU CONCRETE SLOPEWALL

(South Abutment Only)

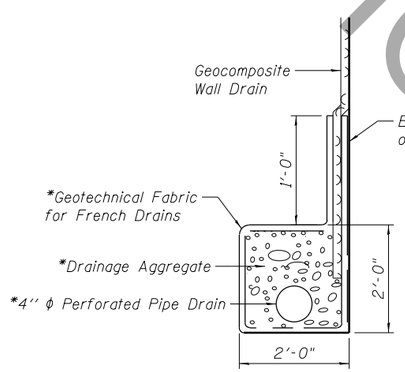


SECTION A-A



SECTION THRU NORTH ABUTMENT

(Horiz. dim. @ Rt. L's)



PIPE UNDERDRAIN DETAIL

* Included in the cost of Pipe Underdrains for Structures.

Note:
All drainage system components shall extend to 2'-0'' from the end of each wingwall except an outlet pipe shall extend until intersecting with the side slopes. The pipes shall drain into concrete headwalls. (See Article 601.05 of the Standard Specifications and Highway Standard 601101).

DETAILS - II
EAST RIVER ROAD OVER I-90
F.A.I RTE. 190 - SEC. (1517R-1 & 1617B)13
COOK COUNTY
STATION 73+75.00
STRUCTURE NO. 016-2280

FOR INFORMATION ONLY

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INDUSTRIAL•INFRASTRUCTURE•SUSTAINABILITY

USER NAME = $USER$	DESIGNED - KK	REVISED
	CHECKED - RSN	REVISED
PLOT SCALE = $SCALE$	DRAWN - KK	REVISED
PLOT DATE = 7-21-2014	CHECKED - RSN	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

DETAILS – II
STRUCTURE NO. 016–2280
SHEET NO. 3 OF 3 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
190	(1517R-1&1617B)13	COOK		
		CONTRACT NO. 60X56		
	ILLINOIS FED. AID PROJECT			

FILE NAME = $FILEL$