

Original Report Date: 4/30/2022 **Proposed SN:** 051-2011 **Route:** FAP 332
Revised Date: 12/14/22 **Existing SN:** 051-0001 **Section:** 18B-1
Geotechnical Engineer: Bill Kramer **County:** Lawrence
Structural Engineer: Josué D. Ortiz-Varela **Contract:** 74858

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The proposed structure is a triple-cell CIP concrete box culvert with horizontal wings. Per the structure report, a cast-in-place culvert is preferred by the district over a precast box. The existing structure (051-0001) was constructed in 1921 consisting of a reinforced concrete slab superstructure spanning between closed abutments supported by untreated timber piles. It was widened in 1962 and has a back-to-back abutment length of 30'-0" and an out-to-out width of 46'-4". The existing and proposed structures both have no skew. The structures carry FAP 332 (ILL-1) over an unnamed stream.

Discuss the existing boring data, existing plans foundation information, new subsurface exploration and need for any additional exploration to be provided with SGR Technical Memo (attach all data and subsurface profile plot): No existing boring data was obtained due to having two new borings obtained in 2020 which extend about 25 feet below the shoulder which is more than adequate for this structure. The first 20 to 22 feet of soil consists of soft silty clay below which is a stiff clay shale.

Provide the location and maximum height of any new soil fill or magnitude of footing bearing pressure. Estimate the amount and time of the expected settlement. Indicate if further testing, analysis, and/or ground improvement/treatment is necessary: Although the grade is not being raised, the soft alluvial stream channel has never been loaded which makes these soil susceptible to settlement. The new loading of the culvert and soil above the culvert would result in substantial settlement. However, the culvert footprint extends over some of the existing piles which will tend to keep the outer portions of the box from settling. To avoid the uneven foundation soil support for the culvert, which could cause culvert cracking over time, we recommend removing 2 feet of soil (and existing piles) below the proposed box and placing rock fill capped by CA7 as shown in the Bridge Manual (BM). The 2 feet should make the removal equal to the depth of the wings and cutoff wall, which don't need removal below them. In addition, the BM notes shown below should also be shown on the contract plans:

The limits and quantities of removal and replacement shown are based on the boring data and may be modified by the District Geotechnical and Field Engineers for variable subsurface conditions encountered in the field.

The Rockfill shall be capped with 6 in. of CA7 and satisfy the Standard Specifications unless otherwise indicated in the Special Provisions. The cost of the capping material shall be included in the pay item for "Rockfill".

Identify any new cuts or fill slope angles and heights. Estimate the factor of safety against slope failure. Indicate if further testing, analysis or ground improvement/treatment is necessary: No slope stability issues anticipated by inspection.

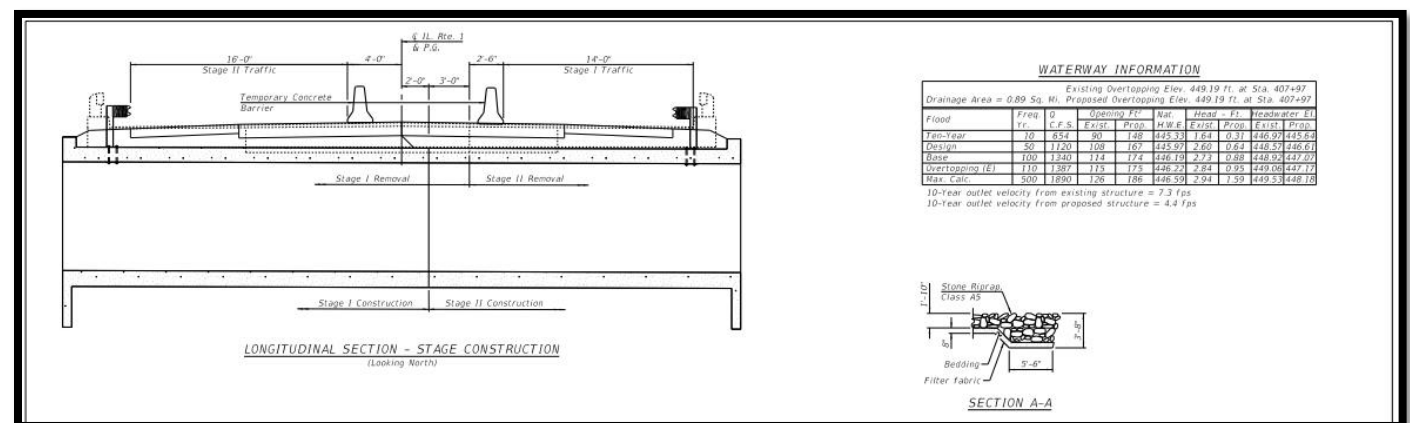
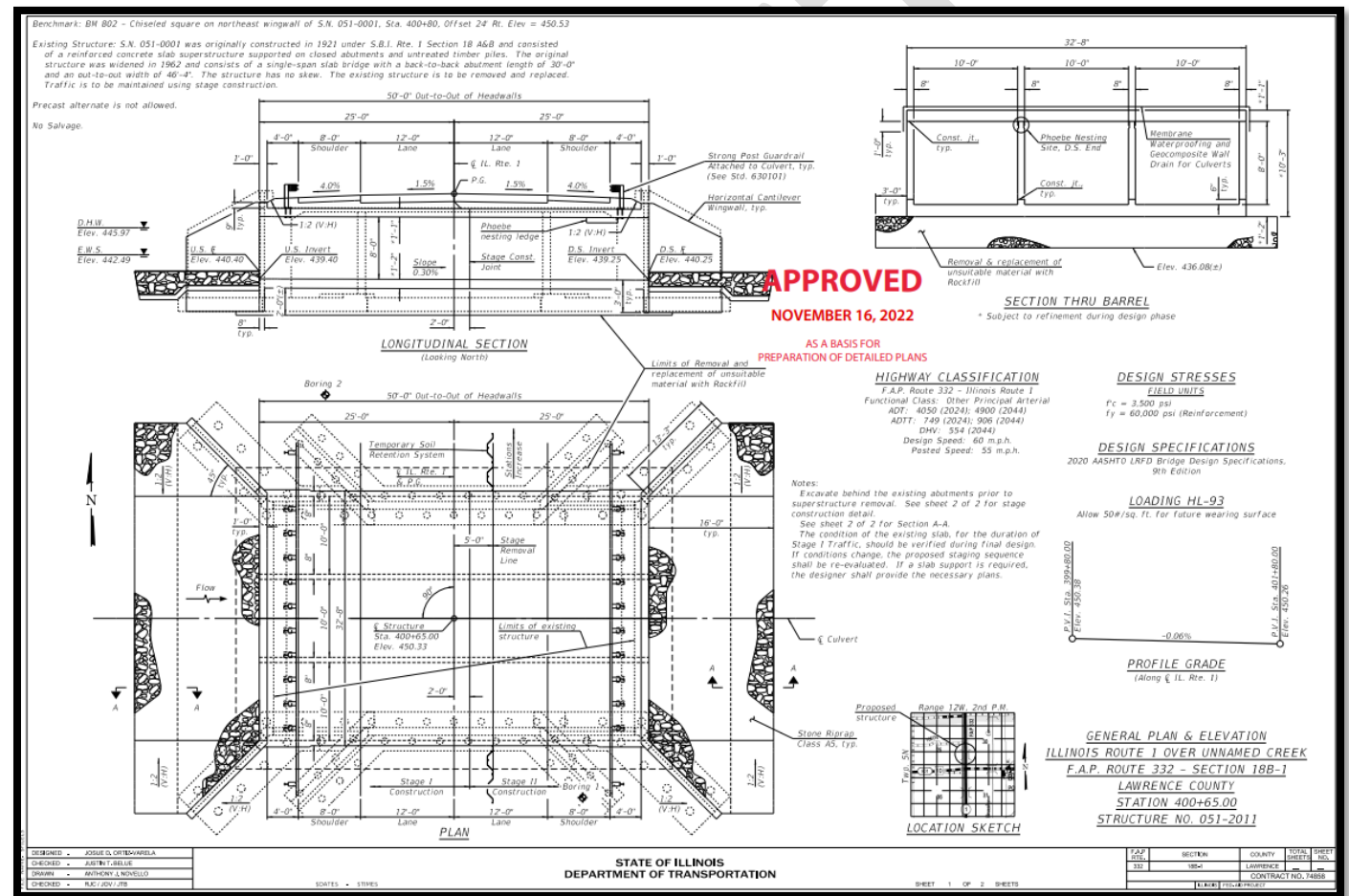
Indicate at each substructure, the 100-year and 200-year total scour depths in the Hydraulics report, the non-granular scour depth reduction, the proposed ground surface, and the recommended foundation design scour elevations: Scour calculations are not required for culverts however, riprap is recommended at both ends of the box to defend against localized scour holes.

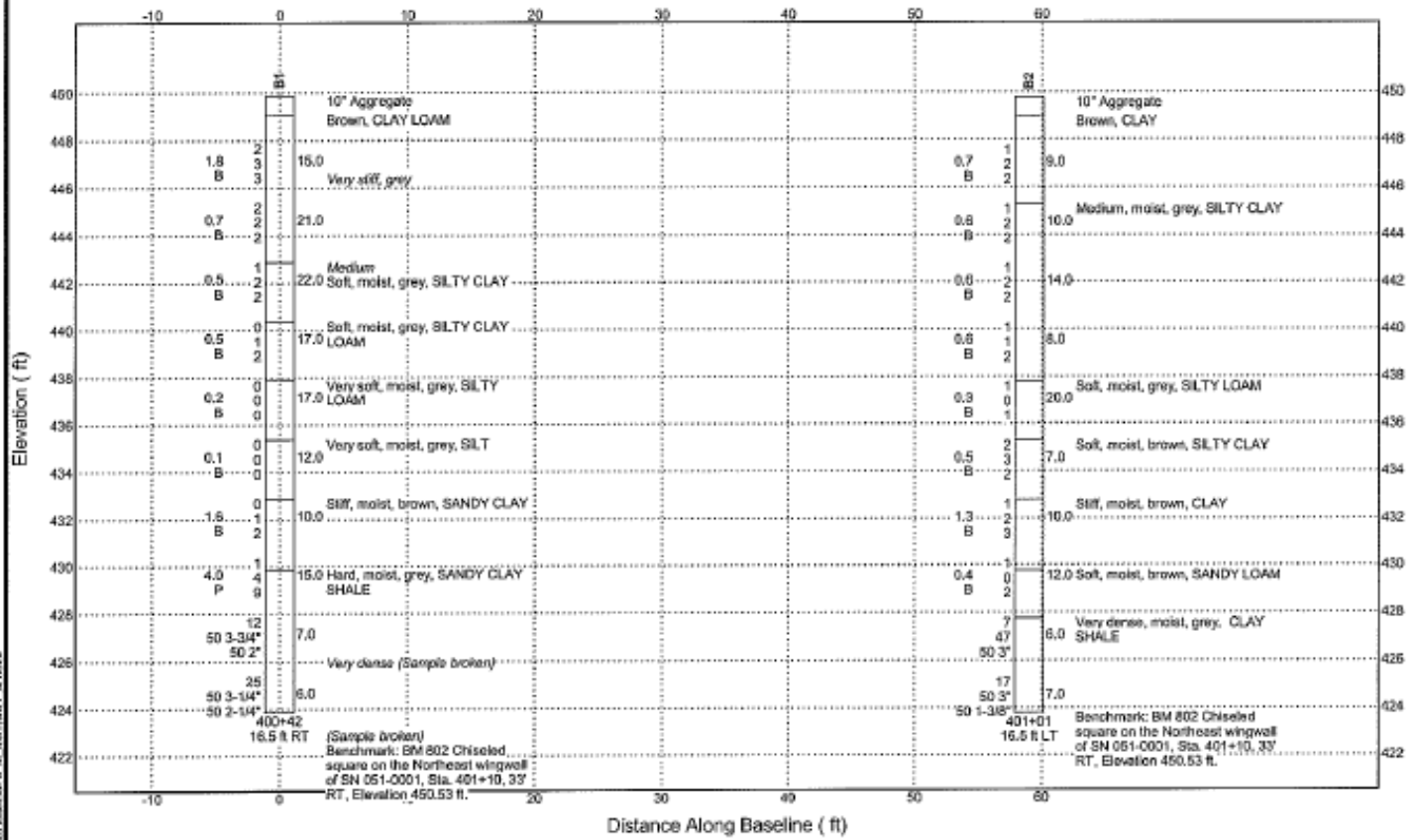
Determining the seismic soil site class, the seismic performance zone, the 0.2 and 1.0 second design spectral accelerations and indicate if that the soils are liquefiable: The seismic soil site class, the seismic performance zone, the 0.2 and 1.0 second design spectral accelerations are not required for Box Culverts and liquefaction is not an issue at this location.

Confirm feasibility of the proposed foundation or wall type and provide design parameters. Attach a pile design table indicating feasible pile types, various nominal required bearings, factored resistances available and corresponding estimated lengths at locations where piles will be used. Provide factored bearing resistance and unit sliding resistance at various elevations and confirm no ground improvement/treatment is necessary where spread footings are proposed. Estimated top of rock elevations as well as preliminary factored unit side and tip resistance values shall be indicated when drilled shafts are proposed: With the 2 feet of removal below the bottom slab, the improved foundation soils should be adequate to support the box. The wings being horizontal cantilever do not need foundation soil support so no removal or treatment below or beyond them will be required. In addition, the removal need not extend beyond the bottom slab footprint.

Calculate the estimated water surface elevation and determine the need for Cofferdams (Type 1 or 2), and seal coat: A estimated water surface elevation (EWSE) is not required for Box Culverts and since water dewatering is the responsibility of the contractor.

Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: Traffic is to be maintained using stage construction. Due to the combination of 8 to 10 feet of soil soils below the box and shallow bedrock elevation, we recommend using the pay item of "temporary soil retention system" since we do not believe a cantilever sheet pile design is feasible.





SUBSURFACE DIAGRAM
 Route: FAP 332 (IL 1)
 Section: 18B-1
 County: Lawrence

Illinois Department of Transportation SOIL BORING LOG Page 1 of 1
 Date: 6/4/20

ROUTE: FAP 332 (IL 1) DESCRIPTION: Stream 0.3 miles North of Birds Road LOGGED BY: Sandschafer
 SECTION: 18B-1 LOCATION: SW 1/4, SEC. 30, TWP. 5N, RNG. 11W, 3rd PM
 COUNTY: Lawrence DRILLING METHOD: Hollow stem auger & split spoon HAMMER TYPE: Auto 140#

STRUCT. NO. 051-0001 (Existing) Station: 400+65
 BORING NO. B1 South Abutment Station: 400+42 Offset: 16.5 ft RT
 Ground Surface Elev.: 449.87 ft

DEPTH (ft)	SOIL DESCRIPTION	MOISTURE (%)	CONSISTENCY	TESTS
0	Surface Water Elev. 439.80 ft			
0	Stream Bed Elev. 439.73 ft			
0	Groundwater Elev.: First Encounter 431.9 ft			
0	Upon Completion 430.9 ft			
0	After 24 Hrs. 440.9 ft			
0	10" Aggregate			
0.07	Brown, CLAY LOAM			
2	Very stiff, grey	1.8	B	15
3				
5	Medium	0.7	B	21
2				
2	Soft, moist, grey, SILTY CLAY	0.5	B	22
2				
0	Soft, moist, grey, SILTY CLAY LOAM	0.5	B	17
1				
0	Very soft, moist, grey, SILTY LOAM	0.2	B	17
0				
0	Very soft, moist, grey, SILT	0.1	B	12
0				
0	Stiff, moist, brown, SANDY CLAY	1.6	B	10
1				
1				
1				

Benchmark: BM 802 Chiseled square on the Northeast wingwall of SN 051-0001, Sta. 401+10, 33' RT, Elevation 450.53 ft. End of Boring

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 COUNTY: Lawrence DRILLING METHOD: Hollow stem auger & split spoon HAMMER TYPE: Auto 140#

STRUCT. NO. 051-0001 (Existing) Station: 400+65
 BORING NO. B2 North Abutment Station: 401+01 Offset: 16.5 ft LT
 Ground Surface Elev.: 449.77 ft

DEPTH (ft)	SOIL DESCRIPTION	MOISTURE (%)	CONSISTENCY	TESTS
0	Surface Water Elev. 439.80 ft			
0	Stream Bed Elev. 439.73 ft			
0	Groundwater Elev.: First Encounter 430.3 ft			
0	Upon Completion 430.8 ft			
0	After 24 Hrs. 442.8 ft			
0	10" Aggregate			
0.97	Brown, CLAY			
1	Very dense, moist, grey, CLAY SHALE	0.7	B	9
2				
2	Medium, moist, grey, SILTY CLAY	0.6	B	10
2				
1	Soft, moist, grey, SILTY LOAM	0.3	B	20
1				
2	Soft, moist, brown, SILTY CLAY	0.5	B	7
2				
1	Stiff, moist, brown, CLAY	1.3	B	10
2				
2				

Benchmark: BM 802 Chiseled square on the Northeast wingwall of SN 051-0001, Sta. 401+10, 33' RT, Elevation 450.53 ft. End of Boring

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
 The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)
 BBS, form 137 (Rev. 8-99)

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