US Army Corps of Engineers ®
St. Paul District

Appendix D: Geotechnical Engineering and Geology

Kinnickinnic River Continuing Authorities Program Section 206 Feasibility Report and Integrated Environmental Assessment

May 2025

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Appendix D: Geotechnical Engineering and Geology

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1 Project Description

This Feasibility Report is evaluating the potential removal of two existing dams, the Junction Falls Dam and the Powell Falls Dam, along the Kinnickinnic River in River Falls, Wisconsin.

The Junction Falls Dam is located upstream of the Powell Falls Dam and has been in place since the 1879. In 1912, the Junction Falls Dam height was increased creating Lake George the upstream reservoir with a max storage of 142 acre feet. The Junction Falls Dam is approximately 140 feet long and 32.5 feet tall. The National Inventory of Dams list the Junction Falls dam as a significant hazard dam. Features crossing Lake George include two bridges open to car traffic, a pedestrian bridge, retaining wall, and multiple utilities. A recreational walking path encircles Lake George with multiple overlooks and park benches.

The Powell Falls Dam is located downstream of the Junction Falls Dam. The Powell Falls Dam was constructed in 1903. During 1964 to 1965, a concrete gravity dam was constructed to replace the timber dam spillway. The Powell Falls Dam is 110 feet long and 22 feet high. The impounded reservoir for Powell Falls is Lake Louise with a max storage of 120 acre feet. The National Inventory of Dams lists the Powell Falls Dam as a low hazard dam. No bridges cross Lake Louise. There are two sanitary sewer line crossings upstream of the Powell Falls Dam in Lake Louise that service the publicly owned wastewater treatment plant (WWTP). The primary permitted outfall for the WWTP discharges into Lake Louise. On June 29, 2020, a large precipitation event, 7 inch rainfall, caused damage to the Powell Falls Dam. After an engineering review of the Powell Falls Dam, it was recommended to dewater the dam until repairs were made to the components (Ayres, 2020). Lake Louise was drawn down in October 2020 and is currently in a drawn down condition with wa ter freely flowing through the open sluice gate.

In 2020, the City of River Falls has adjusted its FERC licensing of the two dams. The adjusted licensing proposes to maintain the Junction Falls Dam and decommission and remove the Powell Falls Dam.

2 Existing Studies

There has been significant local stakeholder support for the removal of the Junction Falls Dam and the Powell Falls Dam. Below is an outline of the pertinent existing studies that were used to support this feasibility effort.

- Ayres Associates, 2020. Post-Flood Dam Safety Inspection and Repair Options Letter for Powell Falls Dam. December 18, 2020.
- Ayres Associates, 2021. City of River Falls Hydroelectric Project, FERC Project P-10489: Powell Falls Decommissioning Plan. January 30, 2021.
- Inter-Fluve, Inc., 2016. Lake George and Lake Louise Sediment Assessment Report. March 14, 2016.
- Inter-Fluve, Inc., 2017. Restoration of the Kinnickinnic River through Dam Removal, Feasibility Report. January, 2017.

3 Regional Geology and Physiography

3.1 Topography

River Falls is located in the Western Uplands area of Wisconsin and within the Western Prairie Ecological Landscape. This region is characterized by rolling till plains crosscut by incised streams and rivers that have removed the near surface glacial drift and carved into the underlying bedrock. The City of River Falls is located on the high, rolling ground, and the

Kinnickinnic River flows through the city in an alluvial valley that varies from 40 feet to 80 feet deep from the higher areas surrounding the river. Note these height differences are obscured by the impoundment of Lake George and Lake Louise. The downcutting action of the Kinnickinnic River at the City of River Falls is controlled by the two existing dams. Downstream of the dam the downcutting is limited by the bedrock elevation, water level of the St. Croix River, and the nearby junction with the Mississippi River.

3.2 Geology

The surficial soil deposits within the Kinnickinnic River Valley consist of incised and eroded bedrock mixed with rounded glacial outwash gravels and cobbles. Sedimentation and siltation upstream of Powell Falls Dam is evident in that the existing riverbed has been partially buried with alluvial or lacustrine sediments deposited from erosion of the overburden and adjacent sedimentary bedrock units (Figure D-2). The depth to bedrock map indicates that overburden soils can range between approximately 5 to 50 feet in thickness. Previous explorations in the area for the bridge crossings indicate that the channel of the Kinnickinnic River has a few feet of sandy alluvium over bedrock with the soil thickness being thicker in the terrace with soil ranging from 5 to 10 feet thick at the Division Street Bridge. At the Winter Street Bridge similar, thin soil sequences were observed in the terrace areas, but approximately 15 feet of loose organic silt was encountered above bedrock just upstream of the dam. In 2015, probing was performed in Lake George and Lake Louise to estimate the sediment thicknesses (Inter-Fluve, 2015). This study indicated that much of the eastern area of Lake George has sediment thickness of 4 to 6 feet, but the western side of Lake George has sediment thicknesses of 6 to 12 feet. For Lake Louise the soundings indicated sediment thicknesses of 4 to 6 feet for the majority of the lakebed with areas increasing to 12 feet in thickness. These thicknesses have not been confirmed since lowering the water levels in Lake Louise.

There has not been an extensive soil boring exploration program to determine the localized soil stratigraphy, but observations made during a site visit on 9 June 2023 and borings taken on 25 October 2023, suggest that recent deposits consist of thin beds of poorly graded alluvial sands with poorly defined laminations of sand with silt were deposited near the current river banks and generally overly a thin lacustrine organic clayey soil. These alluvial and lacustrine deposits were observed to overly gravels and cobbles comprising the valley floor and river bottom (Figure D-2). Sedimentation upstream of Powell Falls Dam likely occurred after construction of the dam.

A total of 5 hand augured soil borings and 1 test pit were conducted as part of the sediment quality exploration on 25 October 2023 (Attachment D-2). These borings were drilled to depths of 4 to 6 feet below the existing ground surface. Soils encountered in these borings were classified in the field as primarily silty clay with fine sand with slight laminations and was dark grey in color. Minor constituents include occasional roots and vegetation, occasional silty sand pockets or lenses with traces of iron oxide staining and shell fragments. Five bag samples were collected for chemical analysis of metals and holes were backfilled with the existing nearby soils. One jar sample was collected near the stream bank from a shallow test pit.

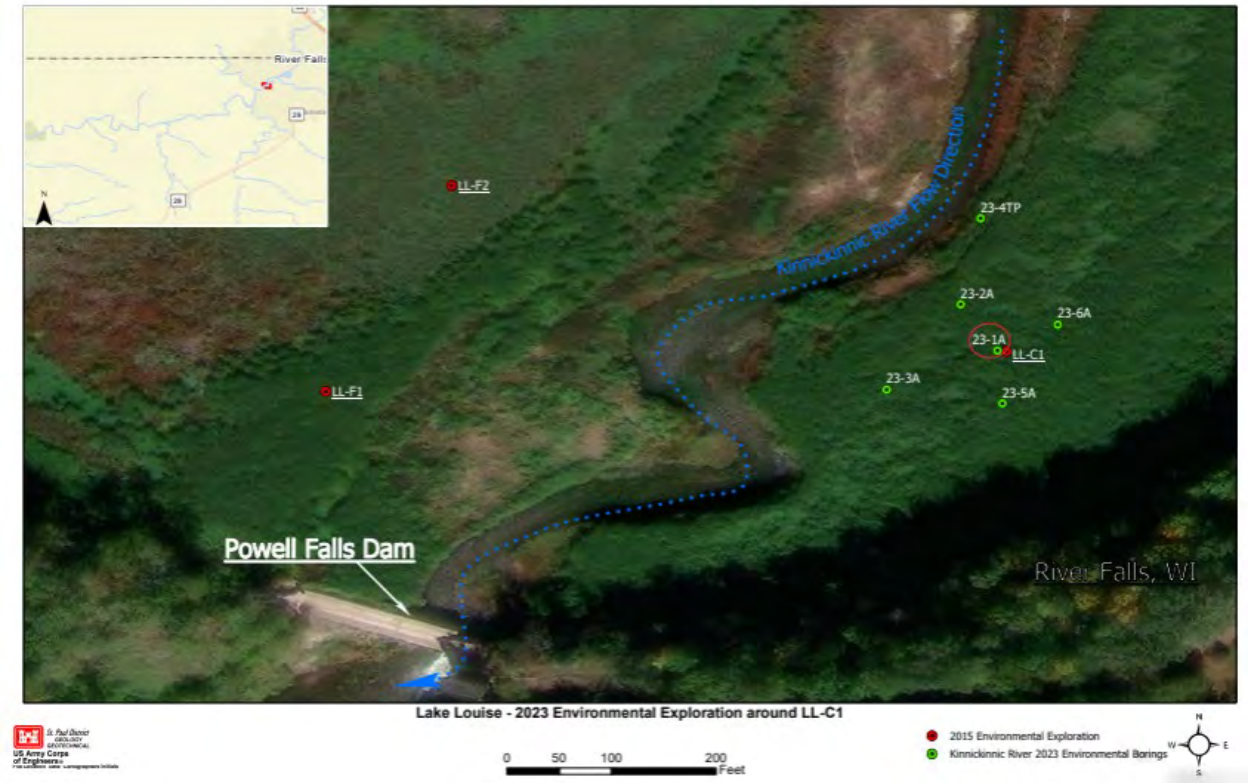


Figure D-1: Map of Lake Louise USACE environmental boring locations taken in 2023 around boring LL-C1.

Bedrock in the project vicinity primarily consists of either dolomite, sandy dolomite, or dolomitic sandstone (Figure D-4). An approximate 40-foot bedrock outcrop adjacent to the junction of the Kinnickinnic River with the South Fork River were described in sequence as massive to thinly bedded sedimentary rocks of sandy dolostone, thinly interbedded mudstone with sandstone, and sandy dolostone, sandstone with traces of iron oxide staining, dolomitic sandstone, and sandy dolostone with traces of chert above the existing water surface. Physical properties were described as slightly crystalline and moderately hard with some interbedded soft friable rock, tan to buff in color, horizontal bedding planes and possible ripple mark textures within the mudstone and sandstone units. Bedding varied from massive, 4 to 5 foot thick beds, to thinly bedded and blocky in fractures. Undercutting of approximately up to 1 foot to 4 feet vertically and up to 4 feet to 5 feet horizontally into material near the thinly bedded units of interbedded mudstone, and sandy dolostone was observed beneath the falls near the existing and past water surface. Small, weathered pockets with iron oxide staining were scattered within the outcrops. It was noted in document review that there were small abandoned and reclaimed quarries in the vicinity of Lake Louise that utilized the Prairie du Chien Group dolomites.

Figure D-2: Photo looking southwest at the left cut bank showing alluvial sands actively eroding and deposited above gravels and cobbles along the existing riverbed at the Kinnickinnic River valley floor.

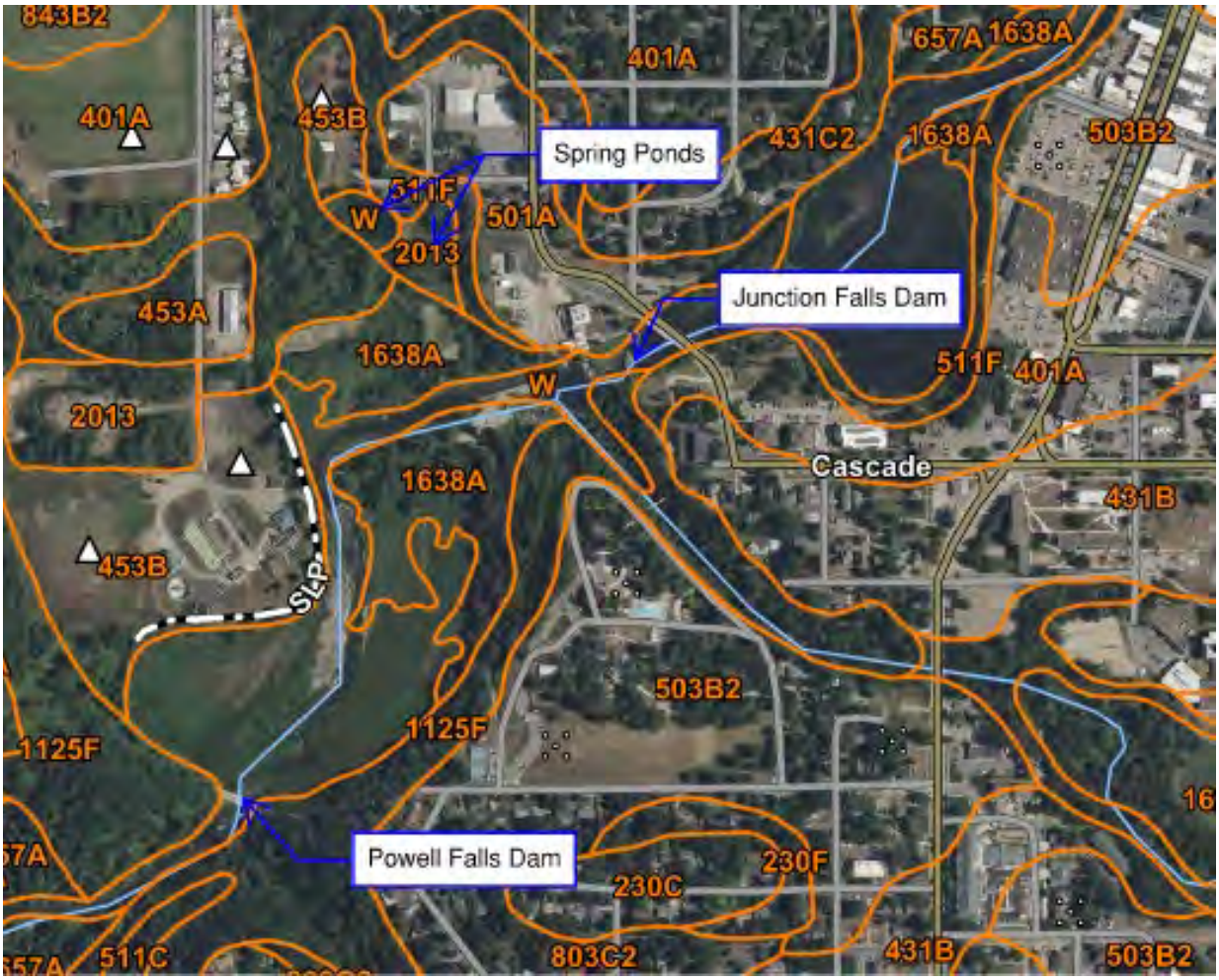


Figure D-3: Web Soil Survey for the project area consisting of glacial and alluvial materials with adjacent finer soils. The mapped units around the project area include water (W) along the Kinnickinnic River, Lake George, Lake Louise, and the northern spring pond; river valley material (1638A); loam and sandy loam terrace deposits (401A, 431C2); sand slopes (511F); loamy sand (501A); silt loam (657A); and stony soils (1125F). The area near the spring ponds is identified as gravel pits (2013).

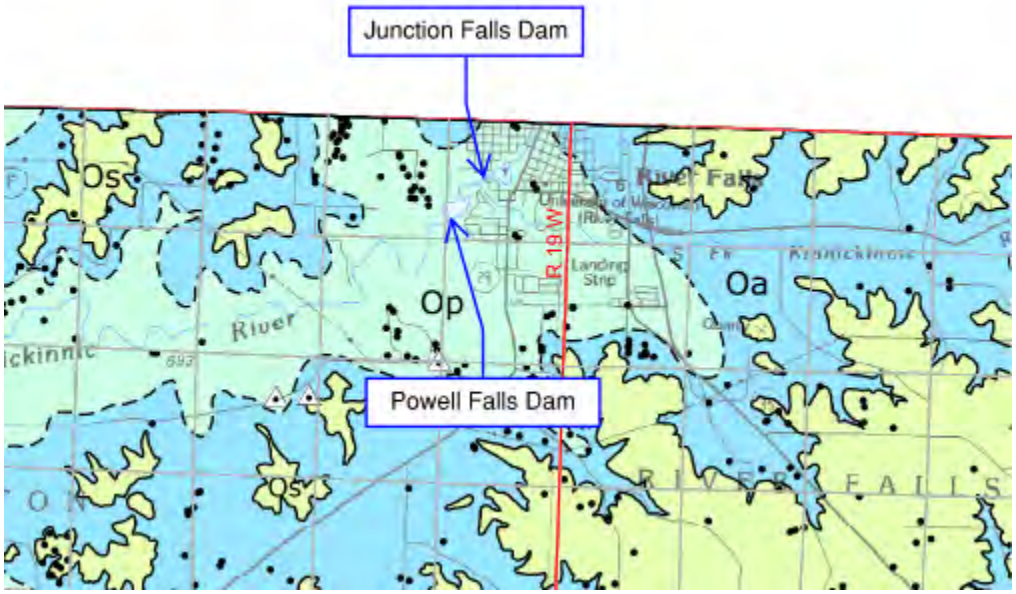


Figure D-4: Bedrock Map for Pierce County, Wisconsin (Evans et al., 2007) showing the project area consisting of Prairie du Chien Group dolomite (Op).

3.3 Site Hydrogeology

Although site specific groundwater data is not available from nearby soil borings, groundwater can be interpreted to flow east to west from River Falls, WI into the St. Croix River along the Kinnickinnic River and valley floor. Adjacent to the Kinnickinnic River, groundwater levels likely follow topography flowing toward the river valley. Groundwater levels can be interpreted to be near the water surface of the Kinnickinnic River or of Lake George. Removal of the Junction Falls Dam would lower the groundwater levels in Lake George to the river bed elevation. Lake Louise has been dewatered since 2020, so it is anticipated that groundwater levels are near the elevation that would be achieved with removal of the Powell Falls Dam. These assumed groundwater trends are confirmed by Generalized water-table elevation map of Pierce County (Figure D-5).

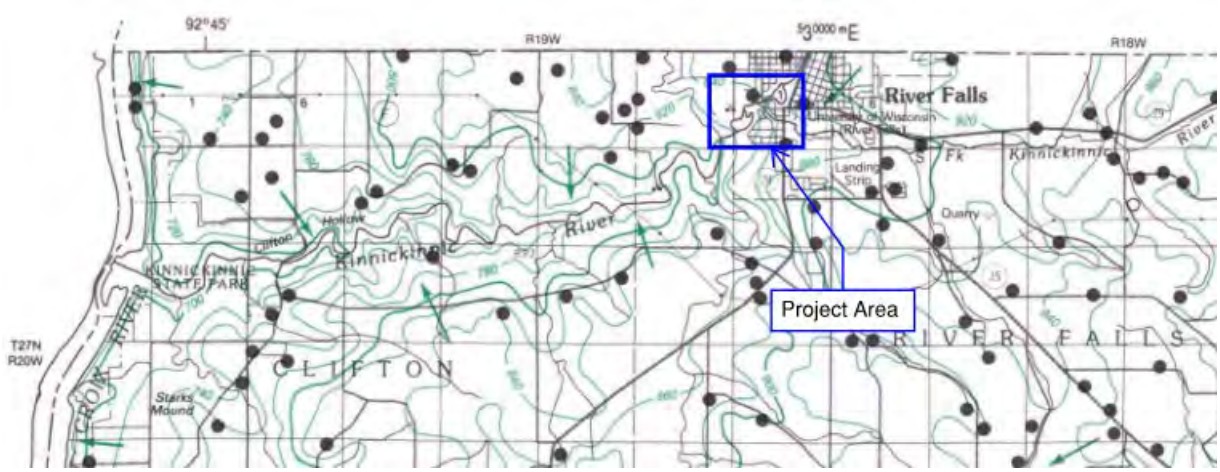


Figure D-5: Generalized water-table elevation map for the project area (Lippelt, 1990). Green contours represent elevation of the groundwater level and green arrows show direction of groundwater flow

3.4 Seismic Risk and Earthquake History

The Kinnickinnic Dam removal study is in a low seismically active region in the United States. A seismic analysis was not completed for the design of features to be included in the dam removal study given the low risk of seismic activity. Seismic activity is not anticipated to impact site conditions after removal of the dams.

4 HTRW – Environmental Site Assessment

The Phase I ESA conducted at the subject property was in accordance with ASTM Standard Practice E1527-21 and further defined below:

- USACE has gathered and reviewed available historical data, including fire insurance maps, survey plat maps, aerial photography, topographic maps from the United States Geological Survey (USGS), the 2016 Lake George and Lake Louise Sediment Assessment Report, the 2021 Powell Falls Decommissioning Plan, and the Wisconsin Department of Natural Resources RR Sites Map.

- USACE has reviewed state and federal environmental databases including the WI DNR BRRTs database.

- USACE has physically inspected the subject property via walking survey, looking for signs of recognized environmental conditions such as stressed vegetation, soil staining, dumping, and evidence of aboveground and underground storage Tanks.

- USACE physically observed adjoining properties, paying particular attention to evidence of underground storage tanks, questionable housekeeping practices, or unusual business practices.

This assessment revealed that there are potential risks for contamination due to three historic recognized environmental conditions (HRECs), and several findings identified on the subject property. The project area lies within a FEMA 100-year special flood hazard area. Site reconnaissance and localized confirmation sediment quality sampling and testing were completed in 2023 by USACE. Prior sampling efforts in 2015 were completed by Inter-Fluve Inc.

to assess the sediment quality within the impoundments upstream of Powell Falls and Junction Falls Dams. The USACE has conducted an interview with Wayne Ciberling, the Dam Operator at Junction Falls Dam for the City of River Falls, WI. The Dam Operator provided additional information that some diesel tanks at the power substation nearby to Junction Falls Dam were leaking. It was mentioned that the contaminants had migrated approximately up to 200 yards from the Kinnickinnic River. These tanks were removed, and the surrounding soils were mitigated around 2013 or 2014. Mr. Ciberling also mentioned that the power plant does have asbestos and lead based paint within the window caulking and the paint applied inside and outside of the building. The purpose of conducting interviews is to determine if there are any known past or present environmental concerns associated with the site. Referenced photos can be found in Attachment D-1 of this report.

Findings from the site reconnaissance include:

1. Concrete and construction debris in lower areas around Glen Park, particularly below the Municipal Power Plant (Attachment D-1: Photos 1 and 2).

2. Red and oily staining within soils at the water surface, possibly related to iron bacteria (Attachment D-1: Photos 3 and 4).

3. Discharge pipe downstream of Junction Falls Dam (Attachment D-1: Photos 5).

4. Wastewater effluent discharging into Kinnickinnic River upstream of Powell Falls Dam (Attachment D-1: Photos 6).

5. An adjacent Municipal Power Plant and substation near Junction Falls Dam (Attachment D-1: Photos 7).

6. An abandoned storage tank in the Kinnickinnic River just upstream of the Powell Falls Dam (Attachment D-1: Photo 8).

7. Pending demolition and removal of the two nearby powerhouses, there is a likelihood that asbestos and PCB material are present in the two powerhouses. These findings have been recognized during the prior Kinnickinnic River Restoration Feasibility Report submitted by Inter-Fluve in 2017 regarding dam removal.

Historic Recognized Environmental Conditions (HRECs) include:

1) Inter-Fluve Inc.'s 2016 Lake George and Lake Louise Sediment Assessment Report

In 2015, one sediment sample taken in Lake Louise showed arsenic concentrations above the WI DNR background levels of 8.3 mg/kg. At sample location LL-C1, arsenic concentrations of 35.4 mg/kg were discovered. The sampling results were reviewed during the 2021 Powell Falls Decommissioning Plan by Ayres Associates in consultation with the WI DNR following the drawdown of Lake Louise. The WI DNR recommended that additional sediment confirmation sampling around LL-C1 should be conducted to determine if the elevated levels of arsenic are reproducible or if the sample results were an anomaly. These data are summarized in Attachment D-3.

Subsequently in 2023, USACE collected additional samples for metals near boring location LL-C1. The results from the 2023 USACE confirmation sampling indicated that the prior arsenic levels in 2016 were not reproducible, arsenic was not found above background levels. These data are summarized in Attachment D-4.

2) Rapid Service Bulk PLT (former Skoglund – Heutmaker Bulk Plant site):

Facilities ID: 648006040. This property, located north of Lake George and adjacent to the Kinnickinnic Pathway, contained two former fuel oil ASTs, a former kerosene AST, and three former unleaded gas ASTs. Petroleum contamination was discovered in 2004. The adjacent property to the north, Hove Autobody, was also impacted due to this release. Remediation actions were taken in 2005 and included excavating approximately 552 tons of soil from the site, (represented by the dashed line in Figure 4 within the 2025 Phase I ESA Report), a surface area that measured approximately 50 feet by 55 feet and depth down to the water table (8 to 9 feet below the ground surface). The excavated soil was transported to Onyx Biopile in Eau Claire, Wisconsin for off-site disposal.

Following the remediation activities, including additional soil and groundwater testing, residual soil and groundwater contamination was found. However, the environmental consultants conducting the investigation and remediation determined that the contamination plume was stable or receding and would naturally attenuate over time. Due to this, the WI Department of Commerce, the state regulatory authority at the time, determined that the site did not pose a significant threat to the environment and human health. In 2006, the Department of Commerce “closed” the site meaning no further investigation or remediation action was necessary. Residual contamination may still be present at this property and thus Continuing Obligations (CO) remain. These have been applied since 2006 and restrict the development of a well for water supply.

3) New Richmond Farmers Union Coop Oil Company Bulk site (Farmers Union Coop):

Facilities ID: 648058290. Petroleum contamination was discovered at this property in 1998. Also located north of Lake George and adjacent to the Kinnickinnic Pathway, this site formerly contained three fuel oil ASTs, three unleaded gasoline ASTs, one diesel AST, and one waste oil AST. All tanks were removed by 2001. Figure 6 and Figure 7 within the 2025 Phase I ESA Report show an interpretation of soil conditions, groundwater elevations, and GRO/DRO results as they were when post-remediation sampling occurred in 2002, prepared by the environmental consultants who managed the site (West Central Environmental Consultants).

Of note is the residual contamination above 100 mg/kg. However, the consultants also noted that natural attenuation of the contamination appeared to be occurring and would continue to occur. The Wisconsin Department of Commerce granted the site conditional closure in 2002, with final closure pending filing of a deed notice notifying future property owners of the residual contamination. Final closure was granted in 2008 when the Department of Commerce received the final paperwork and determined that this site does not pose a significant threat to the environment and human health. Residual contamination may still be present at this property and, as such, continuing obligations have been applied since 2008 and restrict water supply well development.

The USACE has conducted a Phase I Environmental Site Assessment of the subject property in conformance with the scope and limitations of ASTM Standard Practice E1527-21. This assessment revealed that there is the potential for residual contamination on adjoining properties due to historic recognized environmental conditions.

The removal of Junction Falls Dam and the associated drop in water levels at Lake George would likely cause localized changes in groundwater flow. At the time that the Farmers Union Coop and Rapid Service Bulk Plant petroleum spill sites were assessed (circa the year 2000), groundwater appeared to be flowing away from the river and the proposed project area. A drop in water levels and a potential reversal in groundwater flow could have the potential to transport any residual contamination that may remain on those properties towards the proposed project area. However, although the current extent and concentration of the residual contamination on these properties outside the project area is unknown, the remaining extents and concentrations of contamination remaining post-remediation were considered sufficiently low as to not pose a significant threat to the environment and human health – both sites were closed by the WI Department of Commerce with continuing restrictions on water supply wells. Considering that the contamination has been naturally attenuating for over 20 years, and that petroleum compounds do not readily dissolve in water, the risk to the project posed by these sites is low. Risk would be further reduced by ensuring the proposed project area is not expanded upon or modified to affect or include these properties and by maintaining the current TSP plan of no excavation in the Kinnickinnic Pathway area adjacent to these properties. In the event that modification of the proposed project footprint is considered during PED, these sites should still be avoided unless further testing confirms no contaminants of concern.

Existing information on sediment/soil quality in both lakes indicate limited concerns for the project, but sampling during PED would confirm whether conditions have changed and if avoidance is needed. Sediment sampling conducted in 2015 demonstrated concerns over certain contaminants exceeding RCL soil standards for direct contact in residential settings, as well as TEC exceedances in others. Additional sediment sampling conducted by USACE in 2023 to confirm arsenic levels indicated that it is no longer a concern. Sediment that exceeded hexavalent chromium RCL soil standards for direct contact in 2015 falls outside of the main channel area and would remain undisturbed under the TSP design; soil from the main channel would be placed on top of it under the feasibility-level design and, if necessary, such areas would be avoided in PED or the sponsor would be responsible to provide clean sites. Concentrations for all PAH compounds now fall below the RCLs for direct contact soil under Wis. Administrative Code NR 720 since the standards were updated in October 2024. Sediment that demonstrated TEC exceedances in Lake George and Louise is now absent or falls outside of the main channel area.

During PED, testing compliant with anticipated conditions of Section 401 certification would be reviewed to confirm that materials are suitable for reuse/disposal. In accordance with Department of the Army HTRW policy, lands with contaminants of concern would be avoided by the project footprint through design refinement or, if they cannot be avoided, the project sponsor would be responsible for providing clean sites.

Prior to dam and appurtenant structure demolition, the construction contractor would sample and test for asbestos, lead based paint, and PCB-containing materials in accordance with applicable federal and state laws and regulations and dispose of them in compliance with such laws.

A Phase II Environmental Site Assessment is not recommended for the subject property.

5 Geotechnical Considerations

5.1 Dam Removal

Due to the historical prevalence of dams in the region there are analogs to successful dam removal projects. Adjacent to the project site, along the South Fork of the Kinnickinnic the Cascade Mill operated a dam that was washed out after a long period of idleness. This feature was located below the existing swinging bridge and has reverted back to a natural appearance with a series of existing falls. In the region, the Little Falls Dam was removed from Willow River in the early 1990's. This area is currently located in the Willow River State Park and provides a natural appearance with a set of falls in the Prairie du Chien group. These past removals provide positive analogs for the removal of the Junction Falls Dam and Powell Falls Dam that are consistent with the goals of the City of River Falls.

5.2 Stability of the Rock Walls

The existing dolostone outcrops on the side of the alluvial valley walls currently appear stable. The rock face conditions were observed by the PDT during a site visit on 9 June 2023. The rock conditions were described as slightly weathered, hard crystalline dolostone with layers of sandstone. There were more recessive areas of the rock outcrop that were moderately weathered, soft to moderately hard, sandstone interbedded with mudstone, that was weakly cemented. These more recessive layers in the Prairie du Chien formation were evident in areas near the waterline where the rock has been eroded by water flow along the sidewall forming an overhanging block of rock, refer to Figure D-6. These are natural occurrences that are ongoing around the project under the current condition with the dams in place.

Figure D-6: Photo looking south at the alluvial valley rock face downstream of the Junction Falls Dam. Yellow line highlighting areas where recessive layers have been undercut by water flow. This natural erosion will progress until the overhanging rock block becomes unstable and falls into the valley.

Over time, on the order of 100s of years or more, this erosion will ultimately lead to instability of portions of the rock wall which will result in a slide. There are remnants of a previous rock slide on the north valley wall downstream of the Junction Falls Dam, refer to Figure D-7. A systematic evaluation of jointing in the Prairie du Chien formation was not performed for this study. Based on the observations during the site visit, these undercutting conditions are limited to the area near the Junction Falls Dam. Removal of the Junction Falls Dam is not anticipated to increase the occurrence of undercutting. From a risk perspective, the erosion on the existing rock face appears to be progressive with the overhang becoming larger as erosion occurs, but instability of the overhanging block of rock is anticipated to be a brittle failure occurring without deformation of the wall. In addition, there did not appear to be structures constructed at the top of the valley walls where undercutting was observed. Although there were no indications of imminent slides, additional exploration and study may provide insight to the likelihood of future slides.

Figure D-7: Photo looking north to the alluvial valley rock wall downstream of the Junction Falls Dam showing the scar from a rock slide, inside of yellow oval.

Based on the existing rock cliffs downstream of the Junction Falls Dam, it is anticipated that the rock walls will be stable after removal of the dam. Evaluation of the condition of the bedrock concurrent with removal of the concrete dam structures will be needed to evaluate the surface conditions of the rock and determine the need for local stabilization of the rock face, e.g., rock anchors. Additional exploratory drilling on the uplands adjacent to the Junction Falls Dam would provide data on the rock conditions adjacent to the dam structure.

Removal of the dam is not anticipated to increase the erosion of the recessive layers of the rock units as long as care is taken not do direct additional stream flow up against the walls of the alluvial valley. The design team should consider leaving the lower portions of the concrete abutment walls in place to divert water flow away from the rock face and provide additional scour protection. Additional protection can be provided to the rockface at the alluvial valley wall if needed in the form of riprap placement or training walls to direct flow. These mitigation features should consider visual impacts to the natural look of the restored Kinnickinnic River.

5.3 Global Stability Analysis

The existing slope conditions in Lake Louise were considered during this evaluation because the reservoir has been lowered due to concerns of the integrity of the Powell Falls Dam after the 2020 flood event. The reservoir lakebed is exposed, and the stream channel has incised into the lakebed due to the open sluice gate at the Powell Falls Dam. During a survey in spring 2023, USACE measured bank slopes ranging from approximately 3H:1V to 8H:1V at design cross section locations. In cut banks, the observed slopes were steeper ranging between 1.5H:1V to 1H:1.2V.

The cut banks represent a marginally stable condition, existing factor of safety of 1 for the water levels experienced, and are likely to become unstable with rising and lowering water levels. The flatter slopes ranging from 3H:1V to 8H:1V appeared more stable during the site visit with vegetation establishing on these slopes.

The proposed channel geometry global stability was analyzed using the program Slope/W within Geostudio 2021.4 version 11.3.0.23668. The Spencer Method was utilized to evaluate the global stability of the potential channel geometry considering a range of flow depths and assuming rapid drawdown of the channel.

The guidance in EM 1110-2-1903 (USACE, 2003) for other slopes was considered to establish the following criteria considering the level of uncertainty of the parameters and the consequences of failure.

- End of construction conditions – 1.3
- Long term loading conditions – 1.5
- Rapid drawdown conditions – 1.1

The global stability model geometry represents

- the current conditions of Lake Louise, top of bank elevation of 820 feet and a river channel elevation of 810 feet; and
- the minimum PDT selected trapezoidal channel geometry of approximately 60 feet wide with 4H:1V side slopes.

This geometry represents the critical proposed slope conditions in both Lake George and Lake Louise. One set of global stability analyses has been developed because the available gradation information indicated similar conditions for the lake bed sediments in both lakes. Preliminary global stability analyses are provided in Attachment D-5.

5.3.1 Assumed Foundation Conditions

During the site visit, USACE observed the surface of the lakebed to be loose, fine-grained, poorly graded sand. Where the river had incised into the lakebed, we observed a layer of soft organic silt below beds of the loose poorly graded sand.

The sediment cores performed by Inter-Fluve (2016) were visually evaluated and sieve analyses were performed. Logs of the sediment cores were not provided in the report, and the summarized description indicated that the flood plain stratification showed more obvious detrital and organic layer. These samples were submitted as whole cores and 24 sieve tests were performed. The results of the sieve tests indicate that one sediment core (LL-C2A and LLC-2B) categorizes as a fine-grained poorly graded sand. This location was near the bank cut logged by USACE during the site visit. Two of the samples, LL-C3B and LL-F28, with fines contents of 7.4% and 9.3% categorize as SW-SM and SP-SM, respectively, assuming that the fines are silt. The remainder of the cores categorize as silty sand or clayey sand with fines contents ranging from 17% to 48% fines. Generally, the samples from Lake George indicate a more consistent gradation with fines contents ranging from 19.4% to 27.5%, categorizing as silty sand or clayey sand.

There inconsistency between the observed stratification and reported sieve results from Inter-Fluve (2016). It is assumed that there were layers of sand and clay or silt that were mixed for the sieve analysis. USACE observations from the site visit were used to develop conservative soil inputs to evaluate the global stability of the proposed channel section. Two soil sections were evaluated, a sand profile and a clay/silt profile. During the site visit the channel in Lake Louise had a base of gravel or sand. It was feasible to push a probe into the channel bed where it was sand. Comparing the recent survey to the refusal surface presented by Inter-Fluve (2016) indicates that the channel in Lake Louise has cut down to the refusal surface where gravel stream bed was observed. Based on these data, the stability model includes 5 feet of soil below the base of the channel underlain by bedrock. Bedrock was included to provide a base to

potential slip surfaces. Bedrock is anticipated to be closer to the channel base elevation in the field.

The following engineering parameters were assumed for the soil inputs into the global stability model to represent the conditions in both Lake George and Lake Louise.

Loose Fine Sand:

- Total Unit Weight, γ_{total} = 110 pounds per cubic foot (pcf)
- Long-Term, Drained Conditions:
    - Internal Friction Angle, ϕ' = 30 degrees
- Rapid Drawdown Analysis
    - Effective Cohesion c = 0 psf
    - Effective Friction Angle, ϕ' = 30 degrees
    - Cohesion intercept, c_R = 1 psf
    - Internal Friction Angle, ϕ_R = 28 degrees

Soft Clay/Silt:

- Total Unit Weight, γ_{total} = 112 pcf
- End of Construction, Undrained Conditions:
    - Undrained Shear Strength, s_u = 200 pounds per square foot (psf)
- Long-Term, Drained Conditions:
    - Internal Friction Angle, ϕ' = 24 degrees
    - Effective cohesion intercept, c'= 20 psf
- Rapid Drawdown Analysis
    - Effective Cohesion c = 20 psf
    - Effective Friction Angle, ϕ' = 24 degrees
    - Cohesion intercept, c_R = 200 psf
    - Internal Friction Angle, ϕ_R = 0 degrees

Bedrock:

- Total Unit Weight, γ_{total} = 140 pcf
- Shear Strength, s_u = 10,000 psf

5.3.2 Results

The results of the global stability model are compared against the minimum factor of safety criteria for the clay/silt profile in Table D-1 and the sand profile in Table D-2. The output plates from the global stability model are provided in Attachment D-5. The calculated factors of safety exceed the minimum criteria for the conditions analyzed.

Table D-1: Global Stability Results for Silt/Clay Profile Over Bedrock

Condition	Depth of River (feet)	Minimum Factor of Safety Criteria	Calculated Factor of Safety
End of Construction	1	1.3	1.42
Long-Term	1	1.5	1.83
Long-Term	5	1.5	1.82
Long-Term	10	1.5	2.48

Rapid Drawdown	10 feet to 1 foot	1.1	1.07

Table D-2: Global Stability Results for Sand Profile Over Bedrock

Condition	Depth of River (feet)	Minimum Factor of Safety Criteria	Calculated Factor of Safety
End of Construction	1	1.3	Not Applicable
Long-Term	1	1.5	1.98
Long-Term	5	1.5	1.93
Long-Term	10	1.5	2.31
Rapid Drawdown	10 feet to 1 foot	1.1	1.27

The critical slip surfaces for the sand profile analyses represent shallow seated slip surfaces less than 6 inches deep. The deeper slip surfaces evaluated resulted in larger factors of safety. For the silt/clay profile, the critical slip surfaces are deeper seated. For both soil profiles under long-term conditions, the critical factor of safety was calculated at water depths of 5 feet. The rapid drawdown condition will have the most control over the stability of the slopes because the results are nearest to the minimum criteria for this loading condition. Rapid drawdown was analyzed for 10 feet, bank full, to 1 foot of water and 5 feet to 1 foot of water to confirm the anticipated range of conditions were considered. The rapid drawdown case of 10 feet to 1 foot of water was the more critical condition presented in the tables above, but both results are provided in Attachment D-5.

The silt/clay evaluation results in a factor of safety at criteria for the rapid drawdown condition. Note that the strength for the silt/clay soils were assumed using conservative assumptions. Additional exploration and laboratory testing of the clay soils will verify the design inputs presented. In addition, the modeling assumed that the clay soils would be inundated for a sufficient duration to have the water level reflect the top of bank elevation. This assumed fine-grained soil profile would require a significant time, weeks of inundation, to reach this state of equilibrium.

The global stability analyses presented do not account for the geomorphic stability of the slopes and do not account for the forces of water flowing transverse to the channel cross section. A slope can be stable from a geotechnical perspective but can be eroded by the flow of water. Therefore, additional measures such as riprap lined slopes in key areas will be needed based on the flow patterns indicated by the hydraulic modeling.

5.4 Access Road Stability

The nearest access point to the Junction Falls Dam is the River Falls Municipal Utility power plant building located on the North bank of the Kinnickinnic River. The PDT determined that this was the most practical access location considering multiple other approaches. The power plant building and adjacent parking lot are approximately elevation 872 feet and the bedrock at the base of the dam ranges between elevation 830 and 836 feet. There is approximately 40 feet of vertical drop between this access point and the toe of the dam. A preliminary layout of the access road was developed assuming a max 15% road grade, 18 foot width, and max side

slopes of 1.5H:1V. Considering that this access route would be used by heavy construction equipment, a 16 foot wide 400 psf distributed load was considered in the analysis.

It is anticipated that the access road would be constructed out of large rock fill or riprap. A global stability model was setup to evaluate the assumed conditions. For in-situ materials it was assumed that the bedrock would have a shallow cover of colluvium. The following engineering parameters were assumed for the soil inputs into the global stability model:

Bedrock:

- Total Unit Weight, γ_{total} = 140 pcf
- Shear Strength, s_u = 10,000 psf

Colluvium:

- Total Unit Weight, γ_{total} = 125 pcf
- Shear Strength, s_u = 1,000 psf

Riprap:

- Total Unit Weight, γ_{total} = 135 pcf
- Internal Friction Angle, ϕ' = 40 degrees

Due to the temporary nature of this slope, the minimum acceptable factor of safety criteria considered for this slope was 1.2. The intent is that this slope will provide access during construction and will not perform as a flood control feature.

Results:

One global stability model was performed near the start of the access road to evaluate the longest 1.5H:1V slope. The calculated critical factor of safety was 1.27 meeting the criteria (Attachment D-5). This slip surface was shallow and represents an infinite stability type slip surface. Deeper seated slip surfaces that intersected the distributed equipment load resulted in higher factors of safety. The slip surfaces evaluated in the slope stability analysis were primarily located in the riprap fill indicating that materials selected and construction practices will control the factor of safety of the slope.

The civil design team will refine the layout of the road potentially allowing for flatter slopes, but this analysis indicates a steep practical slope for an access road from the north side of the Junction Falls Dam.

5.5 Lakebed Stability

The proposed modifications to the lakebeds of Lake George and Lake Louise will consist of grading to move lakebed deposits to the periphery of the reservoir areas and construction of wooded upland areas and stormwater management wetlands. The slopes of these areas will be limited to 4H:1V slopes and will be excavated from the lakebed sediments. The stability of these areas is addressed by the channel analysis; therefore, additional analysis is not needed.

5.6 Dewatering Impacts

5.6.1 Lake George

There are multiple structures located upstream of the Junction Falls Dam in Lake George including the Winter Street Bridge, a pedestrian bridge (~2,200 feet upstream of the dam), the Maple Street Bridge (~2,500 feet upstream of the dam), a retaining wall on the south side of the Kinnickinnic River (river appeared to be flowing at this location), and the Division Street Bridge.

Our understanding is that the bridges are owned by the City of River Falls and modifications to the bridges due to changing water conditions are the responsibility of the City of River Falls.

The Winter Street Bridge is approximately 100 feet upstream of Junction Falls Dam and may be impacted by the draining of Lake George. This bridge, WisDOT structure number B-47-102, was constructed in 1992. Based on review of the bridge as-builts, refer to Attachment D-6, the abutments and central pier are supported on shallow foundations excavated to bedrock.

- South Abutment: Bottom of footing elevation 866.47 feet Mean Sea Level (MSL). Leveling concrete was installed at the base of a portion of the abutment footing. Bottom of heavy riprap protection approximately elevation 859 feet USGS.
- Center Pier: Bottom of concrete seal elevation 841.5 feet MSL which appears to be constructed into dolomite bedrock. Pier footings founded above concrete seal at elevation 852.67 feet MSL. No riprap protection shown around footing.
- North Abutment: Bottom of footing elevation 864.45 feet MSL. A rock ledge was identified in the as-builts trending north-northeast within the abutment footing footprint. Approximately 12 HP 14x73 H-piles were installed to span above the rock ledge. Bottom of heavy riprap protection approximately elevation 860 feet USGS.
- Sediment thickness near the Winter Street Bridge is anticipated to be approximately 15 feet based on the bedrock elevation from the bridge plans and spring 2023 bathymetric data.

Because the foundations are anchored to bedrock, we do not anticipate that lowering the water levels will impact the bearing capacity of the foundations or cause settlement. Reducing the water levels may impact the likelihood of scour impacting the center pier or abutment footings. The foundation scour conditions should be evaluated during design phases. Based on the anticipated conditions of lowering the water level approximately 18 feet at this location, additional scour protection is considered warranted. For this feasibility effort it is assumed that an inspection of the center pier will be performed, and that concrete will be placed around the foundation seal with bedrock at the center pier with additional riprap protection placed around the pier.

At approximately 2,200 feet upstream of the Junction Falls Dam, the Veteran's Park pedestrian bridge crosses Lake George. The pedestrian bridge abutments are founded at the top of the valley walls and therefore are not likely to be impacted by lowering the water level. There is a center pier that was constructed by forming the reinforced concrete pier around existing H-piles. Part of the proposed design includes riffle structures and rock arch rapids downstream of the pedestrian bride which will provide some grade control of the Kinnickinnic at the pedestrian bridge. This grade control will limit impacts to the water levels at the pedestrian bridge and upstream. The center pier should be evaluated for scour during the design phase. For this feasibility effort it is assumed that rock scour protection will be placed around the center pier.

At the Maple Street bridge, Lake George is much narrower, but the flow conditions and water elevations appear to be impacted by the Junction Falls Dam. It is anticipated that removal of the Junction Falls Dam will result in lowered water elevations at this bridge crossing. Information on the foundation conditions for the Maple Street Bridge was not available. Additional evaluation for this bridge may be warranted depending on the results of the scour evaluation for the Veteran's Park pedestrian bridge.

Upstream of the Maple Street bridge, the flow of the Kinnickinnic appeared to be free flowing and not impacted by the Junction Falls Dam. There was a riffle located just downstream of the Division Street bridge. The Division Street bridge, WisDOT structure number B-47-64, is located approximately 3,700 feet upstream of the Junction Falls dam and the bridge was constructed in 1994. Due to the observed flow conditions, it is not anticipated that removal of the Junction Falls

Dam will impact the Kinnickinnic River water levels at this bridge, but H&H modeling should confirm if there is no impact with dam removal.

5.6.2 Lake Louise

Lake Louise is currently dewatered and the Kinnickinnic River flows out of the open sluice gate. No additional impacts on the Lake Louise lakebed are anticipated except for fluvial deposition and erosion processes on the lakebed material. On the upstream side of Lake Louise on the north bank are two spring fed ponds that discharge into the Kinnickinnic River, refer to Figure D-8. These ponds have culvert outlets to manage the existing pond levels. These culverts were deteriorated at the time of the site visits and the PDT discussed rehabilitating the outlets. A more natural outlet solution such as stone weirs or porous weirs would provide a more natural outlet condition.

Figure D-8: Location of the spring ponds.

5.7 Seepage Considerations

Seepage is not anticipated to have a significant impact on the project. There is anticipated seepage at the rock face along the valley walls. This seepage is natural and is not anticipated to impact the design approach. During removal of the dam features, seepage from the rock face will not be obstructed. If retaining walls or abutment walls are left in-place, it should be confirmed that drains are present and functional to prevent the buildup of pore pressures behind the walls.

The stormwater management features proposed in the lakebed areas of the reservoirs will likely need to meet some infiltration criteria. These infiltration criteria will be based on the stormwater

design calculations and the construction specifications for the basins will need to consider meeting the required infiltration rates.

6 Proposed Recreational Improvements

A recreational access point is proposed in the master plan at the Junction Falls Dam. This access point would allow access to the foot of the existing dam to the tailrace area and would provide an opportunity for canoe portage. Limited details were provided with this feature beyond visualizations of the final restored Junction Falls area. Based on this information, it is assumed that a stair access way or ramp from the parking lot area on the north bank of the Kinnickinnic River just downstream of the Winter Street bridge. This will be constructed in the assumed footprint of the access road to remove Junction Falls dam and may consist of access road materials reshaped and left in place after completion of dam removal. Some items to consider is whether vehicular access is needed to the foot of the Junction Falls area and impacts of river flooding on infrastructure installed.

Due to the unknown site constraints at this time, a design was not developed for this feature. It is anticipated that the access can be constructed of stairs supported on shallow footings or drilled piers. An alternative would be to construct a gravel or paved walkway down to this area. Both of these approaches would need minimal geotechnical input. Additional permanent fill placed in this use should include some form of drainage that will allow seepage from the rock wall and river flow to easily drain from the fill.

The site restoration plans also identify recreational bridge crossings for pedestrian traffic around the project area. These features were not addressed in this study. These features should be designed and installed by the City of River Falls.

7 Future work

The following items should be considered during future design steps associated with the project.

HTRW:

- At the request of the Wisconsin Department of Natural Resources, additional sediment assessment for sediment quality sampling and testing consisting of environmental borings with analytical testing of each sample collected from the Lake Louise and Lake George sediments.

Dam Removal:

- Provide geotechnical support for the proposed access road design and potential temporary conveyance pipes.
- Perform topographic survey at the Junction Falls Dam to assist with design of the access road.

Recreational Features:

- Identify the scope of the access to the base of Junction Falls and provide geotechnical support for the design of this component of the project.

Stormwater Management:

- Provide geotechnical assistance with the design of the treatment wetlands and stormwater infiltration practices proposed for the project.

Channel Design:

- Confirm soil design parameters based on the visual descriptions from the proposed sediment quality sampling.
    - Perform additional soil borings in the lakebed areas to confirm engineering properties of fine-grained soils including Atterberg limits, moisture contents and shear strength testing. Also use additional soil boring data to support the design of the infiltration practices. Additional testing needs may be warranted for these features.
    - Perform exploration of the depth to rock on the north bank of the Kinnickinnic River downstream of the Junction Falls bridge to see how far the access road can be benched into the slope. Test pits into the sidewall or probing with heavy equipment to identify the depth to bedrock would assist finalize the design of the access road.
- Confirm final slopes geometry for the channel banks based on confirmation of soil parameters and evaluation of the rapid drawdown conditions.
- Perform additional topographic survey near the spring ponds area to support rehabilitating the outlet conditions for these ponds.
- Provide geotechnical support with the design of the riprap lined slopes along the Kinnickinnic River, lunker structures, and other features as needed.

Bridge modifications:

- Perform a scour analysis of impacted bridge piers during the project design phase.
- Bridges with significant changes to water conditions, e.g. the Winter Street bridge, dewater and visually inspect foundation conditions during dam removal. Rehabilitate foundation interface with dam removal and implementation of scour mitigation as appropriate.
- City of River Falls to consider additional coordination with the WisDOT Northeast Region Inspection Program Manager, Kyle Harris.
- Continue bridge inspections with removal of dams. Bridges with minimal change to scour conditions can be monitored to determine needs for scour mitigation, e.g., Division Street bridge. Mitigation for scour will need to be addressed by the City of River Falls as observed.

8 Peer Review

The geotechnical calculations were peer reviewed during the development of the DDR. The peer review is documented in Attachment D-7.

9 References

Ayres Associates, 2020. Post-Flood Dam Safety Inspection and Repair Options Letter for Powell Falls Dam. December 18, 2020.

Ayres Associates, 2021. City of River Falls Hydroelectric Project, FERC Project P-10489: Powell Falls Decommissioning Plan. January 30, 2021.

Evans, T. J., W.S. Cordua, and D.L. LePain, 2007. Preliminary Geology of the Buried Bedrock Surface, Pierce County, Wisconsin. Map Scale 1:100,000. Wisconsin Geological and Natural History Survey. Open-File Report 2007-08.

Inter-Fluve, Inc., 2016. Lake George and Lake Louise Sediment Assessment Report. March 14, 2016.

Inter-Fluve, Inc. 2017. Restoration of the Kinnickinnic River through Dam Removal, Feasibility Report. January, 2017.

Lippelt, I.D., 1990. Generalized Water-Table Elevation Map of Pierce County, Wisconsin. Map Scale 1:100,000. Wisconsin Geological and Natural History Survey. Miscellaneous Map 31.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online http://websoilsurvey.sc.egov.usda.gov/. Accessed 04/07/2025.

U.S. Army Corps of Engineers (USACE), 2023. Engineer Manual EM 1110-2-1902, Slope Stability. Washington D.C.

10 Attachments

Attachment D-1: HTRW Phase I ESA - Site Reconnaissance Photos

Attachment D-2: Scanned images of 2023 Field Logs and Maps

Attachment D-3: Sediment Quality Part I Lab Test Chemical Data Results

Attachment D-4: Summary of 2023 Sediment Quality Chemical Data

Attachment D-5: Preliminary Slope Stability Calculations

Attachment D-6: Existing Bridge Information

Attachment D-1: HTRW Phase I ESA - Site Reconnaissance Photos

1.0 LIST OF ACRONYMS

ACM	Asbestos Containing Material
AIRS	Aerometric Information Retrieval System
AST	Aboveground Storage Tank
AUL	Activity and Use Limitation
ASTM	American Society for Testing Materials
BRRTS	Bureau for Remediation and Redevelopment Tracking System
CDL	Clandestine Drug Labs
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CONSENT	Superfund Consent Decrees
CORRACTS	Corrective Action Report
DMMP	Dredged Material Management Program
DOD	Department of Defense Sites
DRO	Diesel Range Organics
EDR	Environmental Data Resources
EPA	United States Environmental Protection Agency
ERNS	Emergency Response Notification System
ERP	Environmental Repair Program
ESA	Environmental Site Assessment
FIFRA	Federal Insecticide, Fungicide, & Rodenticide Act
FINDS	Facility Index System
FOIA	Freedom of Information Act
FTTS	FIFRA/TSCA Tracking System
FUDS	Formerly Used Defense Sites
FR	Federal Register
GRO	Gasoline Range Organics
HMIRS	Hazardous Materials Information Reporting System
HREC	Historic Recognized Environmental Condition
LQG	Large Quantity Generators
LAST	Leaking Aboveground Storage Tank
LG	Lake George
LHE	Low-Hazard Exemption
LL	Lake Louise
LUCIS	Land Use Control Information System
LUST	Leaking Underground Storage Tank
MEC	Midpoint Effect Concentration
MLTS	Material Licensing Tracking System
NFRAP	Former CERCLIS Sites
NPDES	National Pollutant Discharge Elimination
NPL	National Priorities List

NPL LIENS	Federal Superfund Liens
NWI	National Wetlands Inventory
ODI	Open Dump Inventory
PADS	PCB Activity Database System
PCBs	Polychlorinated Biphenyls
PDF	Portable Digital Format
PLP	Permanent List of Priorities
RAATS	RCRA Administrative Action Tracking System
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
REC	Recognized Environmental Condition
PED	Preconstruction Engineering and Design
ROD	Records of Decision
RCL	Residual Contaminant Level
RSL	Regional Screening Levels
SEMS	Superfund Enterprise Management System Archive
SHWS	State Hazardous Waste Sites
SPILLS	Spills Database
SQG	Small Quantity Generators
SSTS	Section 7 Tracking Systems
SWF	Solid Waste Facility
SWRCY	Solid Waste Recycling
TEC	Threshold Effect Concentration
TRIS	Toxic Chemical Release Inventory System
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facilities
TSP	Tentatively Selected Plan
UMTRA	Uranium Mill Tailings Sites
USACE	United States Army Corps of Engineers
USC	United States Code
USGS	United States Geological Survey
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
WI DNR	Wisconsin Department of Natural Resources

2.0 LIABILITY STATEMENT

The following excerpts, unless otherwise noted, are from ASTM E 1527-21; Appendix X1.1.5.2; CERCLA Operator Liability:

'A person may be liable as a CERCLA operator when they exercise control over a facility.'

As defined in 42 U.S.C. 9601 (20) (A) The term "owner or operator" means (ii) in the case of an onshore facility or an offshore facility, any person owning or operating such facility.

As defined in 42 U.S.C. 9601 (9) (A) The term "facility" means any building, structure, installation, equipment, pipe or pipeline, well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, or aircraft, or (B) any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located.

'Some courts have held that **a person may be liable as a current CERCLA operator where the person did not exercise control over historic operations that caused the contamination but dispersed or moved around contaminated soil**…'

'Like a past CERCLA owner, a past operator must have exercised control over the site "at the time of disposal" to be liable as a CERCLA operator. Many courts have held that **disposal is not limited to the original release but can encompass subsequent dispersal or movement of hazardous substances.**'

3.0 GENERAL INFORMATION

Project Information:	Kinnickinnic River CAP 206 Feasibility Study	
Site Information:	Junction Falls Dam 401 S Winter Street River Falls, Wisconsin 54022	Powell Falls Dam River Falls, Wisconsin 54022
County:	Pierce County	Pierce County
Latitude, Longitude:	44.855275°, -92.633446°	44.850942°, -92.638747°

Site Assessor: _____

Michael M. Davis
Geologist

Senior Review: _____

Colin A. Riddick, P.G.
Geologist

Environmental Professional Qualification:

I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in § 312.10 of 40 CFR 312.

I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. I have developed and performed all the appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

_____

Colin A. Riddick, P.G.
Geologist

4.0 EXECUTIVE SUMMARY

4.1 Subject Property Description

The subject property is owned and managed by the City of River Falls, Wisconsin and located within the city limits along the Kinnickinnic River near Junction Falls Dam and Powell Falls Dam. This area has dimensions that are roughly 1,000 feet by 4,300 feet and encompass approximately 43 acres. The subject property is being reviewed for the Kinnickinnic River Restoration Study (**Figure 1**). The study includes proposed dam removals of the Junction Falls Dam (upstream) and the Powell Falls Dam (downstream), stream restoration, and habitat restoration.

Predominant land use in the immediate vicinity is primarily agricultural, residential, industrial, commercial, and recreational with some forested land. The property has primarily been used for recreational purposes, power generation, and water impoundment.

The subject property does contain several large structures, to include two concrete dams with hydroelectric plants and their associated appurtenant structures. The site is generally low lying and within the Kinnickinnic River valley.

4.2 Environmental Report Summary

Two Historic Recognized Environmental Conditions (HRECs) were identified on adjoining properties due to petroleum leaks. These sites were closed by the state regulatory agency, Wisconsin DNR, but residual contamination remains, and continuing obligations were applied to these areas. A PAL exemption for pyrene was granted for one site and natural attenuation was the chosen method to obtain site closures. These sites have had all structures removed from the property and observations made during site reconnaissance did not show evidence of distress to the environment.

4.3 Recommendations

Based on the information obtained during the USACE investigation, **a Phase II Environmental Site Assessment would not be necessary during feasibility** for the subject property in connection with any RECs and their applicability to constructability of the TSP.

During Preconstruction Engineering and Design (PED), sediment sampling would be conducted to confirm whether conditions in channel/impounded sediments have changed and if avoidance of contaminants of concern is necessary. This sampling is also anticipated to be required for compliance with likely section 401 Water Quality Certification conditions. Existing information to date demonstrates that the risk of encountering contaminated materials is low under the TSP. It should be noted that

the complete report must be read to fully understand the findings associated with the subject property.

5.0 INTRODUCTION

5.1 Purpose

The purpose of the Phase I ESA is to evaluate the current and historical conditions of the subject property to identify recognized environmental conditions in connection with the subject property and surrounding operations.

A recognized environmental condition is defined by ASTM E 1527-21 as:

"Recognized Environmental Conditions—The goal of the processes established by this practice is to identify recognized environmental conditions. The term recognized environmental condition means (1) the presence of hazardous substances or petroleum products in, on, or at the subject property due to a release to the environment; (2) the likely presence of hazardous substances or petroleum products in, on, or at the subject property due to a release or likely release to the environment; or (3) the presence of hazardous substances or petroleum products in, on, or at the subject property under conditions that pose a material threat of a future release to the environment. A de minimis condition is not a recognized environmental condition."

5.2 Scope of Work

The Phase I ESA conducted at the subject property was in accordance with ASTM Standard Practice E1527-21 and further defined below:

- USACE has gathered and reviewed available historical data, including fire insurance maps, survey plat maps, aerial photography, topographic maps from the United States Geological Survey (USGS), the 2016 Lake George and Lake Louise Sediment Assessment Report, the 2021 Powell Falls Decommissioning Plan, and the Wisconsin Department of Natural Resources RR Sites Map.

- USACE has reviewed state and federal environmental databases including the WI DNR BRRTs database.

- USACE has physically inspected the subject property via walking survey, looking for signs of recognized environmental conditions such as stressed vegetation, soil staining, dumping, and evidence of aboveground and underground storage tanks.

- USACE physically observed adjoining properties, paying particular attention to evidence of underground storage tanks, questionable housekeeping practices,

or unusual business practices.

5.3 Limitations and Exceptions

The information, conclusions, and recommendations stated in the report are based upon work undertaken by trained professional and technical staff working for the U.S. Army Corps of Engineers, and upon information provided by others. We have accepted as true and accurate the information provided by other sources, and we cannot be held responsible for the accuracy of this information. Limiting conditions include a minimal project budget and time constraints that hindered a thorough investigation.

The Phase I ESA was conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the environmental profession under similar conditions. No other warranty or guarantee, expressed or implied, is included or intended in this report or otherwise.

The scope of this assessment does not purport to encompass every report, record, or other form of documentation relevant to the subject property being evaluated. The observations contained herein are made during site reconnaissance, review of ownership records, discussions with local government personnel, and review of readily accessible environmental databases. The Phase I ESA is based upon our professional judgment concerning the significance of the data collected and in no way attempts to forecast future site conditions.

6.0 SITE DESCRIPTION

6.1 Location and Legal Description

Site Information:	Junction Falls Dam 401 S Winter Street River Falls, Wisconsin 54022	Powell Falls Dam River Falls, Wisconsin 54022
County:	Pierce County	Pierce County
Latitude, Longitude:	44.855275°, -92.633446°	44.850942°, -92.638747°

Legal Description: Fourth Principal Meridian, Wisconsin
Township 27 North, Range 19 West
Section 1, N ½, SW ¼ and Section 2, SE ¼

The areas described contains 43.0 acres of land, more or less.

6.2 Site and Vicinity Description

The property is currently uninhabited and is primarily used as a recreational park. The property is bound by the City of River Falls, agricultural fields, forest land, and is bisected by the Kinnickinnic River.

Some of the earliest uses of the site were mining quarry stone, petroleum storage, and hydropower with additional agricultural land use surrounding the site. Historical aerial photography reveals that after 1945, the adjoining subject property had increased development. By 1973, much of the surrounding agricultural land to the south of the project area appears to have been developed for residential purposes, similar to the present-day usage. Lake Louise has since been drained by leaving the dam gates open at the Powell Dam, and the Kinnickinnic River flows through an established channel incised through fine grained sands and fine grained organic, silty, clayey materials down to erosion resistant gravels, cobbles, boulders and bedrock.

The proposed USACE project features and boundaries are shown in **Figure 1.**

Figure 1: Kinnickinnic CAP Tentatively Selected Plan.

6.3 Current Use of the Property

The subject properties are currently owned by the City of River Falls, Wisconsin. The sites are within the city limits of River Falls with predominant land use as recreational, open water, urban, forest and agricultural lands.

6.4 Adjoining Property Information

The adjoining properties are predominately urban and agricultural lands with some open water and forested lands. During the site reconnaissance the following properties were identified in the immediate vicinity:

Direction from Site	Use	Comments
North	Open Water/Urban/ Forest/Agricultural	Private/Public
South	Open Water/Urban/ Forest/Agricultural	Private/Public
East	Open Water/Urban/ Forest/Agricultural	Private/Public
West	Open Water/Urban/ Forest/Agricultural	Private/Public

6.5 Provided Information

The USACE has conducted an interview with Wayne Ciberling, the Dam Operator at Junction Falls Dam for the City of River Falls, WI. The Dam Operator provided additional information that some diesel tanks at the power substation nearby to Junction Falls Dam were leaking. It was mentioned that the contaminants had migrated approximately up to 200 yards from the Kinnickinnic River. These tanks were removed, and the surrounding soils were mitigated around 2013 or 2014. Mr. Ciberling also mentioned that the power plant does have asbestos and lead based paint within the window caulking and the paint applied inside and outside of the building. The purpose of conducting interviews is to determine if there are any known past or present environmental concerns associated with the site.

7.0 RECORDS REVIEW

7.1 Standard Environmental Records Sources

At the request of the USACE in August 2023, Environmental Data Resources, Inc. (EDR) conducted a search of Federal and State databases containing potential or known sites of environmental contamination. The number of listed sites identified within a one-mile search radius are summarized in the following table. For a detailed listing of databases and findings, a copy of the EDR Radius Map Report with GeoCheck is available upon request for Appendix A of this report.

Due to the presence of HRECs on adjoining properties, additional records review of the Wisconsin DNR Remediation and Redevelopment (RR) Sites and Bureau for Remediation and Redevelopment Tracking System (BRRTS) occurred, these are discussed in further detail below (7.1.2).

Database List	Subject Property Listings	Total Number of Listings	Environmental Concerns Posed to Subject Property
ECHO	N	40	None
EDR Hist Auto	N	15	None
EDR Hist Cleaner	N	2	None
EDR MGP	N	1	None
EPA WATCH LIST	N	1	None
ERNS	N	2	None
FINDS	N	49	None
HMRS	N	1	None
MINES MRDS	N	6	None
MLTS	N	1	None
MN MANIFEST	N	14	None
NY MANIFEST	N	1	None
PADS	N	2	None
RCRA NonGen / NLR	N	11	None
RCRA-VSQG	N	19	None
US AIRS	N	1	None
WI AIRS	N	4	None
WI AGSPILLS	N	1	None
WI ASBESTOS	N	49	None
WI AST	Y	12	Yes
WI AUL	N	8	None
WI BROWNFIELDS	N	2	None
WI BRRTS	N	20	None
WI CRS	N	7	None
WI ERP	N	4	None
WI Financial Assurance	N	6	None
WI LAST	N	4	None
WI LEAD	N	1	None
WI LUST	N	17	None
WI MANIFEST	N	12	None
WI NPDES	N	1	None
WI RGA LUST	N	29	None

Database List	Subject Property Listings	Total Number of Listings	Environmental Concerns Posed to Subject Property
WI SHWIMS	N	36	None
WI SPILLS	N	20	None
WI SWRCY	N	1	None
WI TIER 2	N	27	None
WI UST	N	133	None
WI WDS	N	2	None
WI WRRSER	N	5	None

7.1.1 Historic Recognized Environmental Site Conditions (HREC):

1) In 2015, Inter-Fluve Inc, sampled sediments for contaminants throughout the impoundments in preparation for dam removal feasibility study efforts. The study randomly sampled 12 locations, (6 per lake), using vibrating coring and grab sample devices. Sample locations were selected in what would be presumed to be the main river channel under restored conditions, and thus potentially mobile. Samples were also taken outside of the main channel in what would be above the ordinary high water mark and were split into two samples, one (A) representing the top 6 inches of soil and the other (B) representing all soil below that top sample to the refusal surface by the sampling apparatus. The contaminants sampled for are typical of urban environments and included inorganics (e.g. metals), PAHs, GROs, and DROs at all sample locations, as well as PCBs, organochlorine pesticides, and chlorinated herbicides at some locations. Results of this analysis are published in Inter-Fluve's 2016 Lake George and Lake Louise Sediment Assessment Report. The contaminants of potential concern are discussed in turn below.

   In 2015, one sediment sample taken in Lake Louise showed arsenic concentrations above the WI DNR background levels of 8.3 mg/kg. At sample location LL-C1 (**Figure 2)**, arsenic concentrations of 35.4 mg/kg were discovered. The sampling results were reviewed during the 2021 Powell Falls Decommissioning Plan by Ayres Associates in consultation with the WI DNR following the drawdown of Lake Louise. The WI DNR recommended that additional sediment confirmation sampling around LL-C1 should be conducted to determine if the elevated levels of arsenic are reproducible or if the sample results were an anomaly.

   Subsequently in 2023, USACE collected additional samples for metals near this location (**Figure 3**). The results from the 2023 USACE confirmation sampling indicated that the prior arsenic levels in 2016 were not reproducible, arsenic was not found above background levels. These data and prior studies are summarized in Appendix F.

   PAH contamination appeared in most of the samples that were collected in both impoundments in 2015 and included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluroanthene, and indeno(1,2,3-cd)pyrene. At the time, concentrations of these PAHs exceeded Wisconsin's soil RCLs (EPAs RSLs) for residential sites. However, the WI DNR has since updated their soil RCLs as of October 2024, and all PAH concentrations now fall below the soil RCLs for residential settings.

   As part of the same 2015 sampling effort, concentrations of hexavalent chromium that exceed the soil RCLs for residential sites, but are below industrial RCLs, were discovered in in two B samples and one A sample in Lake

George in what would be outside of the main channel under restored conditions. Both A and B samples at one location outside the main channel in Lake Louise (LL-F3) also had hexavalent chromium at similar concentrations. One sample (LG-C3) in Lake George in what is presumed to be the main channel under restored conditions showed pyrene concentrations that exceeded WI Sediment Quality Guidelines for TEC. Field reconnaissance indicates that significant sediment mobilization caused by the 2020 flood have likely removed the sediment from this location. Similarly, one sample (LL-C3) in what has become the main channel under drawn-down conditions showed concentrations of several PAHs that exceeded WI Sediment Quality Guidelines for TEC. Another sample in the main channel (LL-C2) showed TEC exceedances for the organochlorine pesticides 4,4'-DDD and lindane; it should be noted that this was the only sample tested for pesticides and chlorinated herbicides in either lake as that location was recommended by the WI DNR as being representative of the conditions downstream of the treatment plant effluent discharging into the Kinnickinnic River; however, these main channel Lake Louise samples are likely no longer representative of these locations following the drawdown of the lake, as most main channel sediment is now gone.

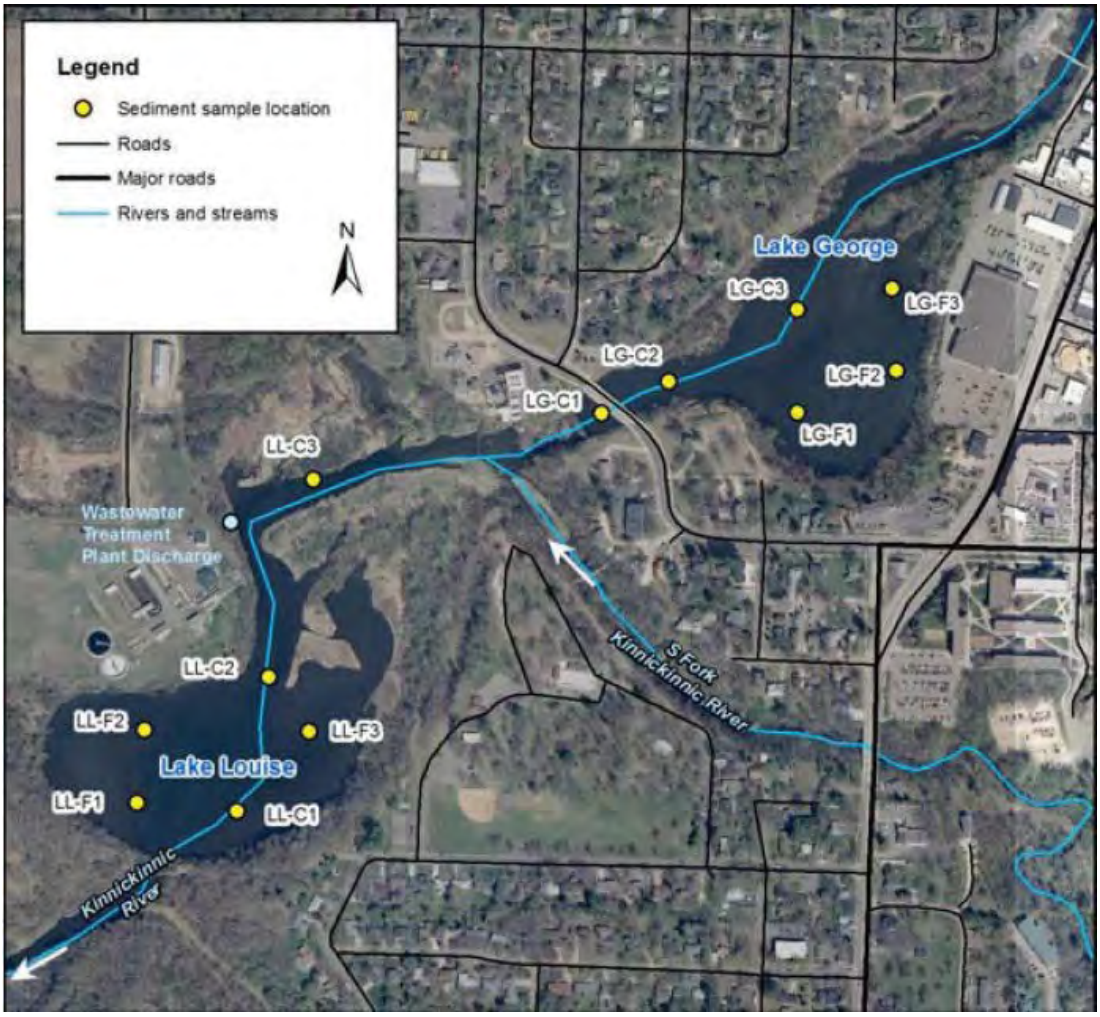


Figure 2: Sediment sampling locations within Lake George and Lake Louise (Inter-Fluve Inc., Lake George and Lake Louise Sediment Assessment Report, 2016).

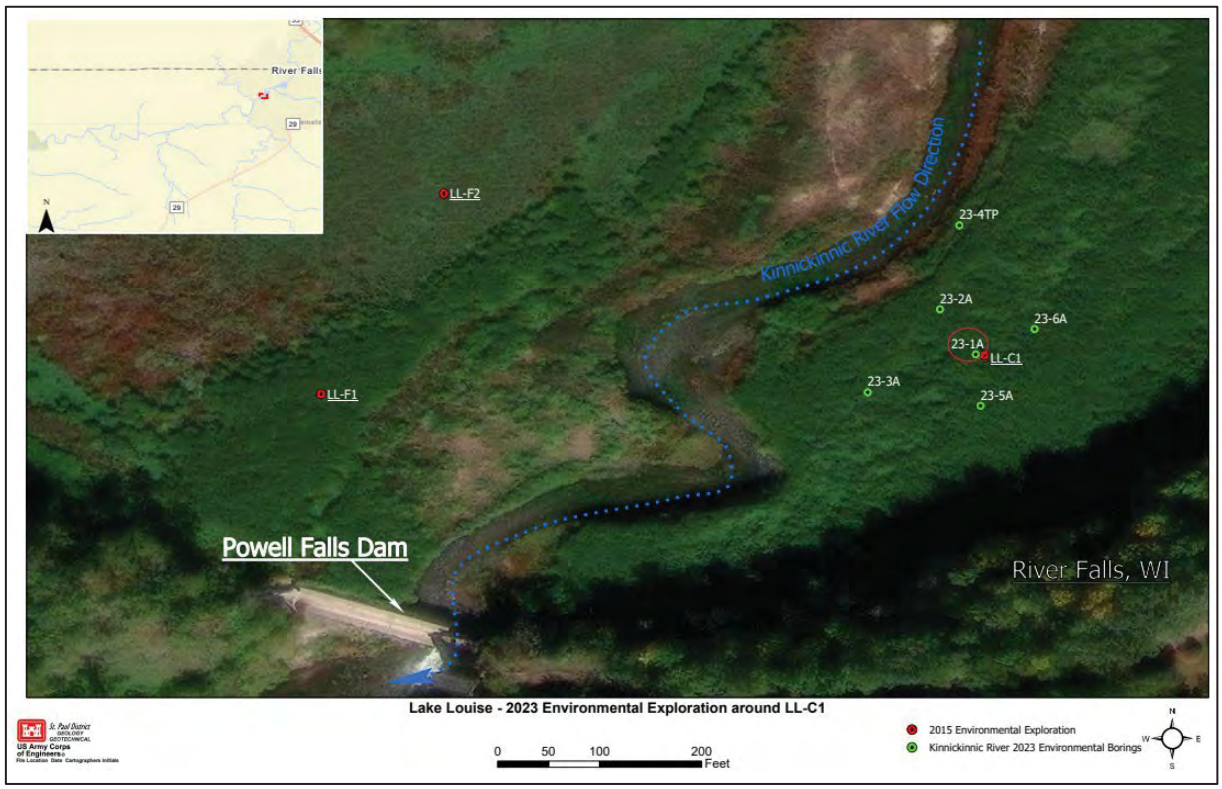


Figure 3: Map showing five hand augers conducted by USACE for chemical analysis to investigate arsenic contamination at the previous Inter-Fluve Inc. sampling location (LL-C1).

2) Rapid Service Bulk PLT (former Skoglund – Heutmaker Bulk Plant site):

Facilities ID: 648006040. This property, located north of Lake George and adjacent to the Kinnickinnic Pathway, contained two former fuel oil ASTs, a former kerosene AST, and three former unleaded gas ASTs. Petroleum contamination was discovered in 2004. The adjacent property to the north, Hove Autobody, was also impacted due to this release (**Figure 4**). Remediation actions were taken in 2005 and included excavating approximately 552 tons of soil from the site, (represented by the dashed line in Figure 4), a surface area that measured approximately 50 feet by 55 feet and depth down to the water table (8 to 9 feet below the ground surface). The excavated soil was transported to Onyx Biopile in Eau Claire, Wisconsin for off-site disposal.

Following the remediation activities, including additional soil and groundwater testing, residual soil and groundwater contamination was found. However, the environmental consultants conducting the investigation and remediation determined that the contamination plume was stable or receding and would naturally attenuate over time. Due to this, the WI Department of Commerce, the state regulatory authority at the time, determined that the site did not pose a significant threat to the environment and human health. In 2006, the Department of Commerce

"closed" the site meaning no further investigation or remediation action was necessary. Residual contamination may still be present at this property and thus Continuing Obligations (CO) remain. These have been applied since 2006 and restrict the development of a well for water supply.

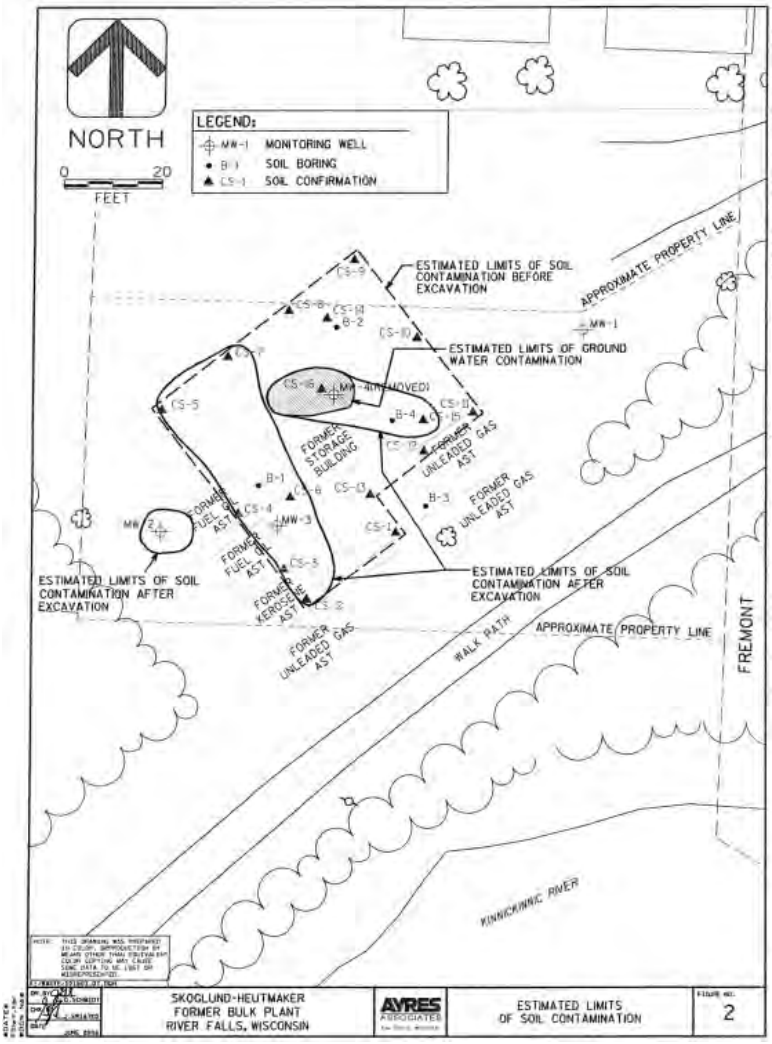


Figure 4: Estimated limits of soil contamination at the former Bulk Plant (Ayres Associates, 2005).

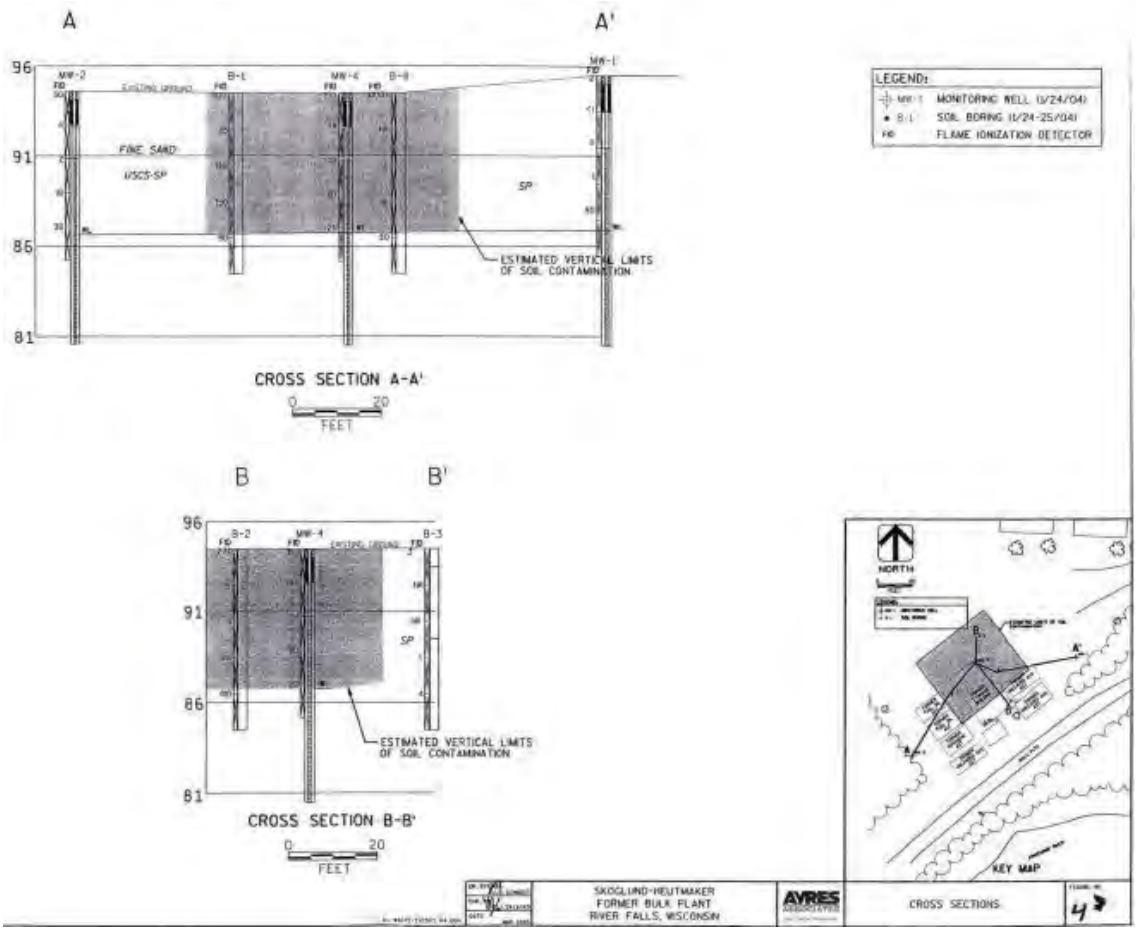


Figure 5: Geologic cross sections showing the estimated vertical limits of soil contamination at the former Bulk Plant in River Falls, WI (Ayres Associates, 2005).

3) New Richmond Farmers Union Coop Oil Company Bulk site (Farmers Union Coop):

   Facilities ID: 648058290. Petroleum contamination was discovered at this property in 1998. Also located north of Lake George and adjacent to the Kinnickinnic Pathway, this site formerly contained three fuel oil ASTs, three unleaded gasoline ASTs, one diesel AST, and one waste oil AST. All tanks were removed by 2001. **Figure 6** and **Figure 7** show an interpretation of soil conditions, groundwater elevations, and GRO/DRO results as they were when post-remediation sampling occurred in 2002, prepared by the environmental consultants who managed the site (West Central Environmental Consultants).

   Of note is the residual contamination above 100 mg/kg. However, the consultants also noted that natural attenuation of the contamination appeared to be occurring and would continue to occur. The Wisconsin Department of Commerce granted the site conditional closure in 2002, with final closure pending filing of a deed notice notifying future property owners of the residual contamination. Final closure was granted in 2008 when the

Department of Commerce received the final paperwork and determined that this site does not pose a significant threat to the environment and human health. Residual contamination may still be present at this property and, as such, continuing obligations have been applied since 2008 and restrict water supply well development.

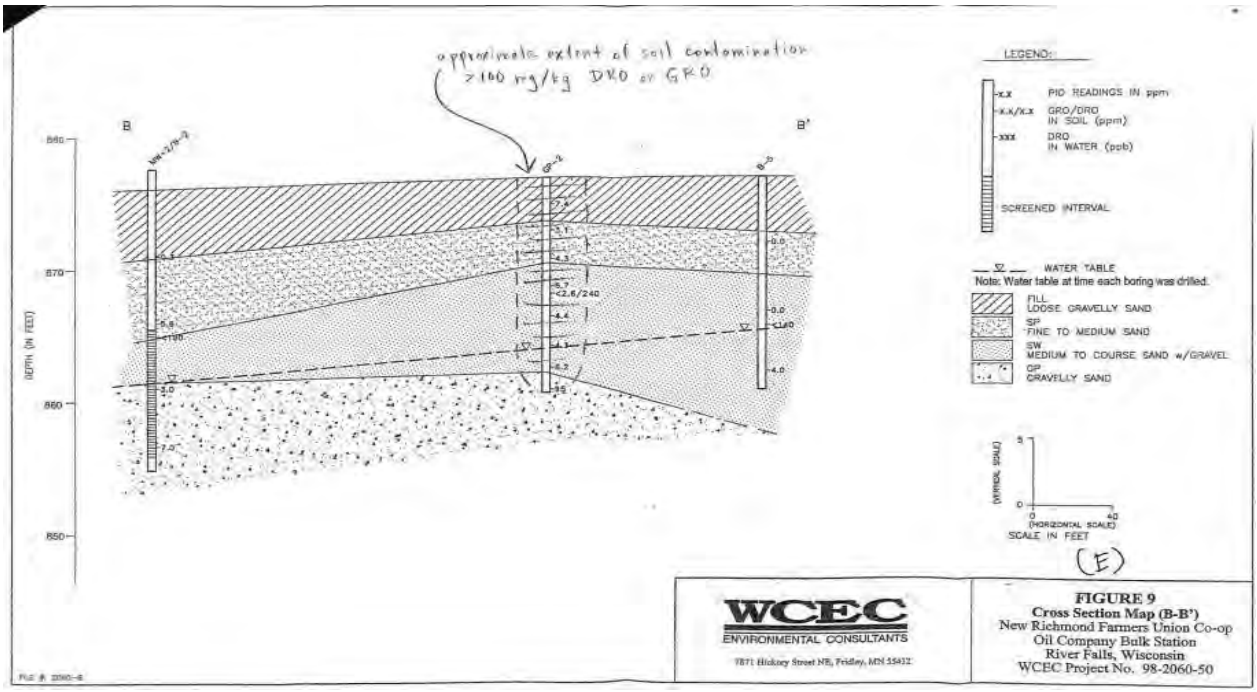


Figure 6: The approximate location of the Farmers Union Coop Oil Company Bulk Station petroleum leak site showing the approximate horizontal extent of residual soil contamination (WCEC, 2000).

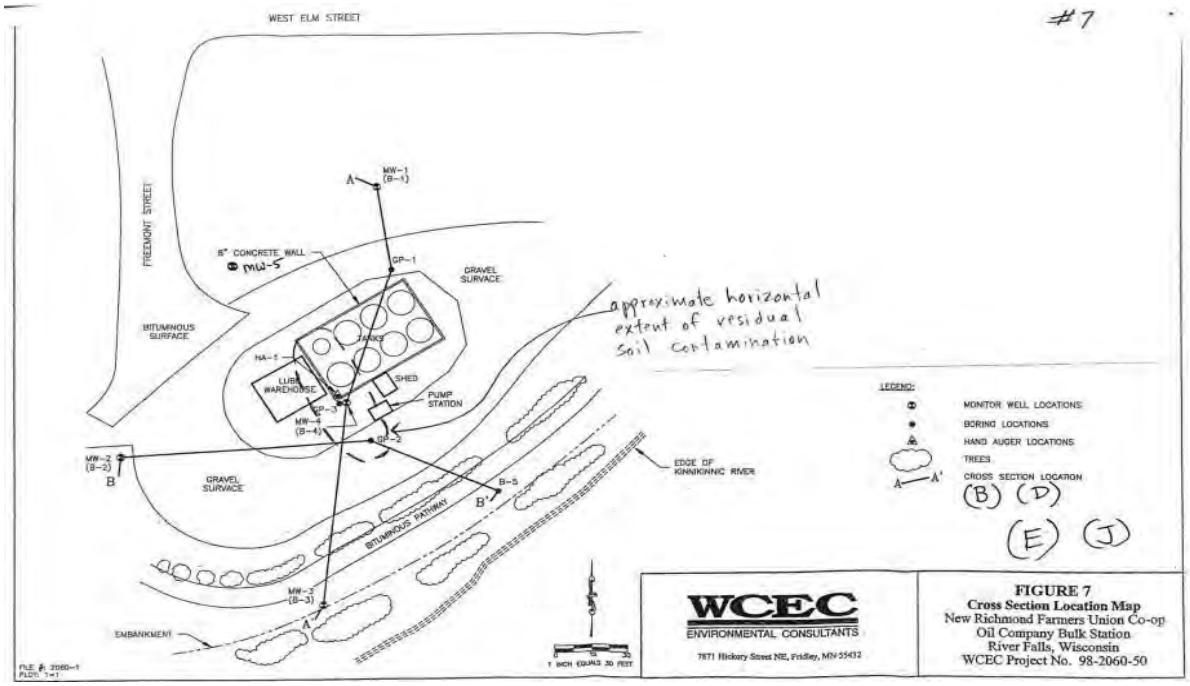


Figure 7: Geologic cross section of the approximate location of the Farmers Union Coop Oil Company Bulk Station petroleum leak site showing the approximate extent of residual soil contamination. (WCEC, 2000).

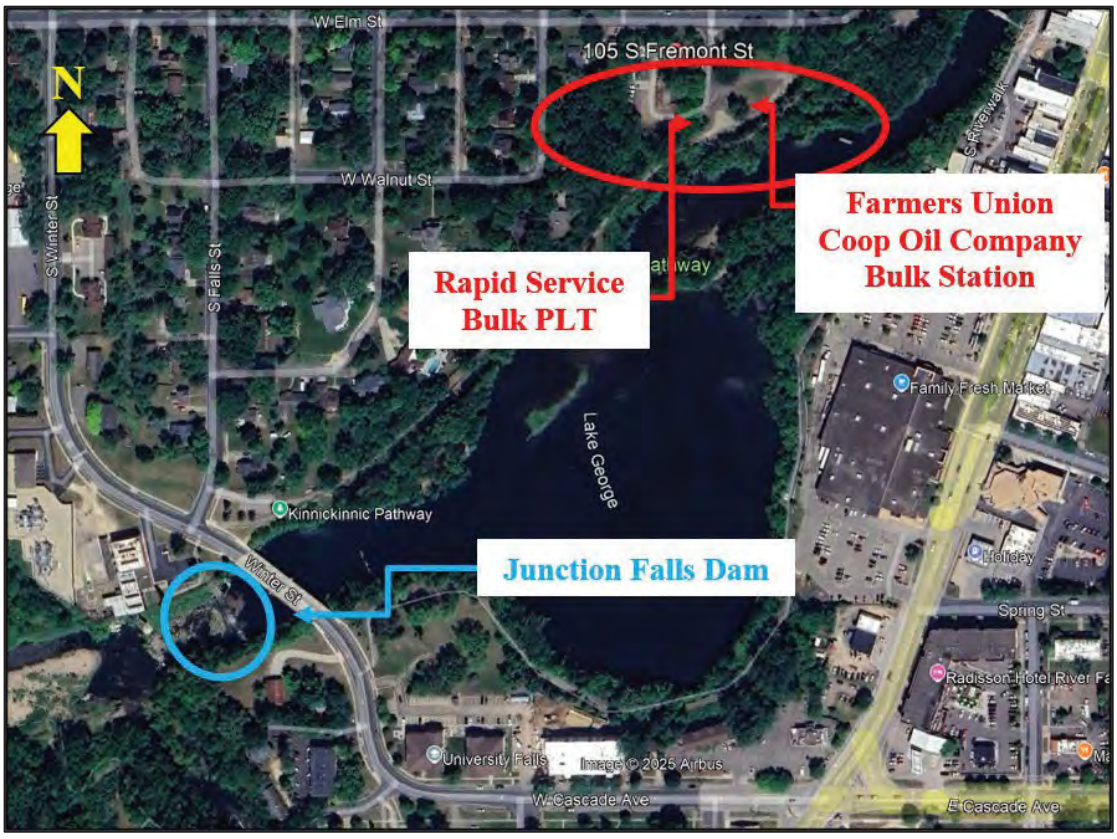


Figure 8: Known HREC locations (denoted in red) around Lake George with petroleum contamination.

7.1.2 Recognized Environmental Site Conditions:

The Phase I ESA did not identify Recognized Environmental Site Conditions associated with the subject property.

7.2 Physical Setting Sources

Physical setting sources were provided by the EDR GeoCheck Physical Setting Source Addendum unless otherwise noted. A copy of the GeoCheck report is available upon request for Appendix A of this report.

Groundwater flow direction was not reported by the EDR AQUIFLOW Information System, but the shallow groundwater regime likely follows the topography and discharges towards drainage sources, lakes and streams.

Lake George and Lake Louise impoundments likely have caused changes in local groundwater gradients that may vary outside of the typical regional groundwater regime. On the north end of Lake George, site specific data from WCEC and Ayers Associates, indicates that the groundwater is flowing away from Lake George (losing stream). Removal of the Junction Falls Dam would lower the groundwater levels in

the vicinity of Lake George. Lake Louise has been dewatered since 2020, so it is anticipated that groundwater levels are near the elevation that would be achieved with removal of the Powell Falls Dam. Localized groundwater trends on the northern perimeter of Lake George are shown in **Figure 9**.

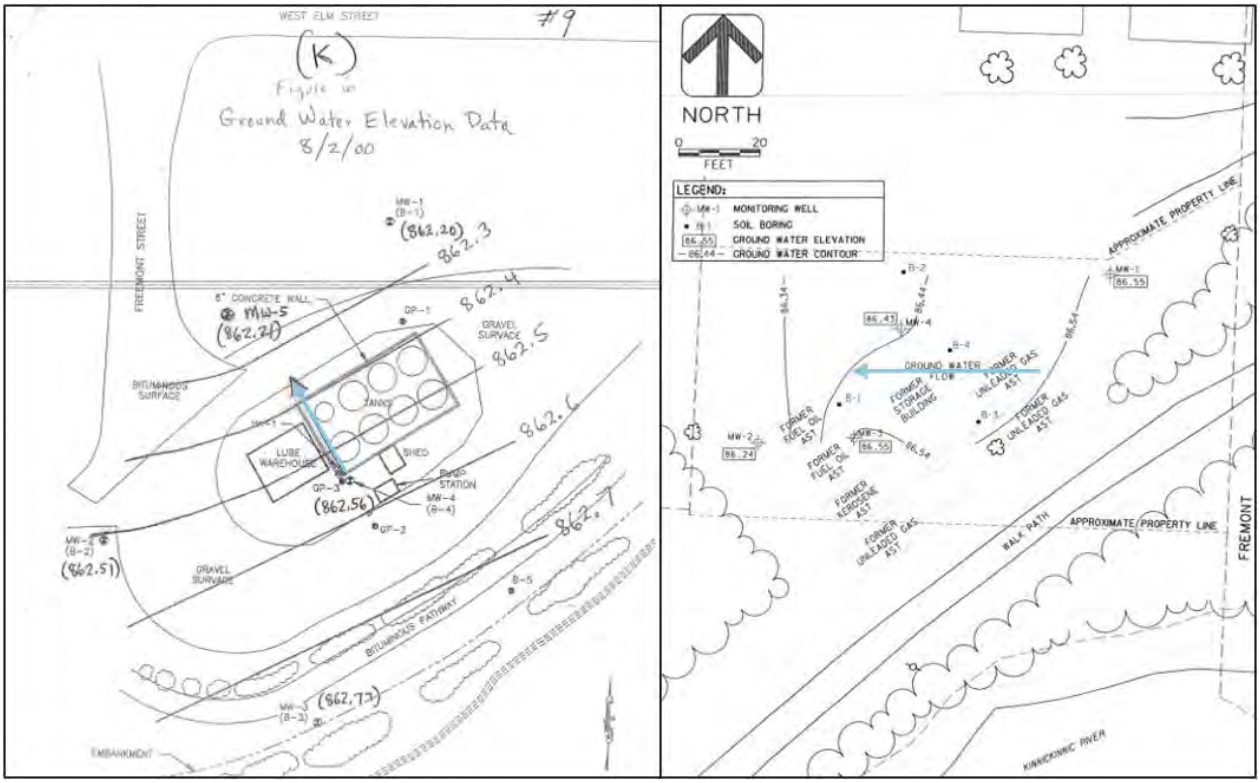


Figure 9: Groundwater contour maps, flow directions shown with blue arrow. Left: Farmers Union Coop Oil Company Bulk Station (WCEC, 2000) Right: Bulk Plant (Ayers Associates, 2005).

The topographical gradients vary across the subject property but are generally towards the Kinnickinnic River. The subject property is mapped within the Special Flood Hazard Area, Regulatory Floodway zone (**Figure 10**).

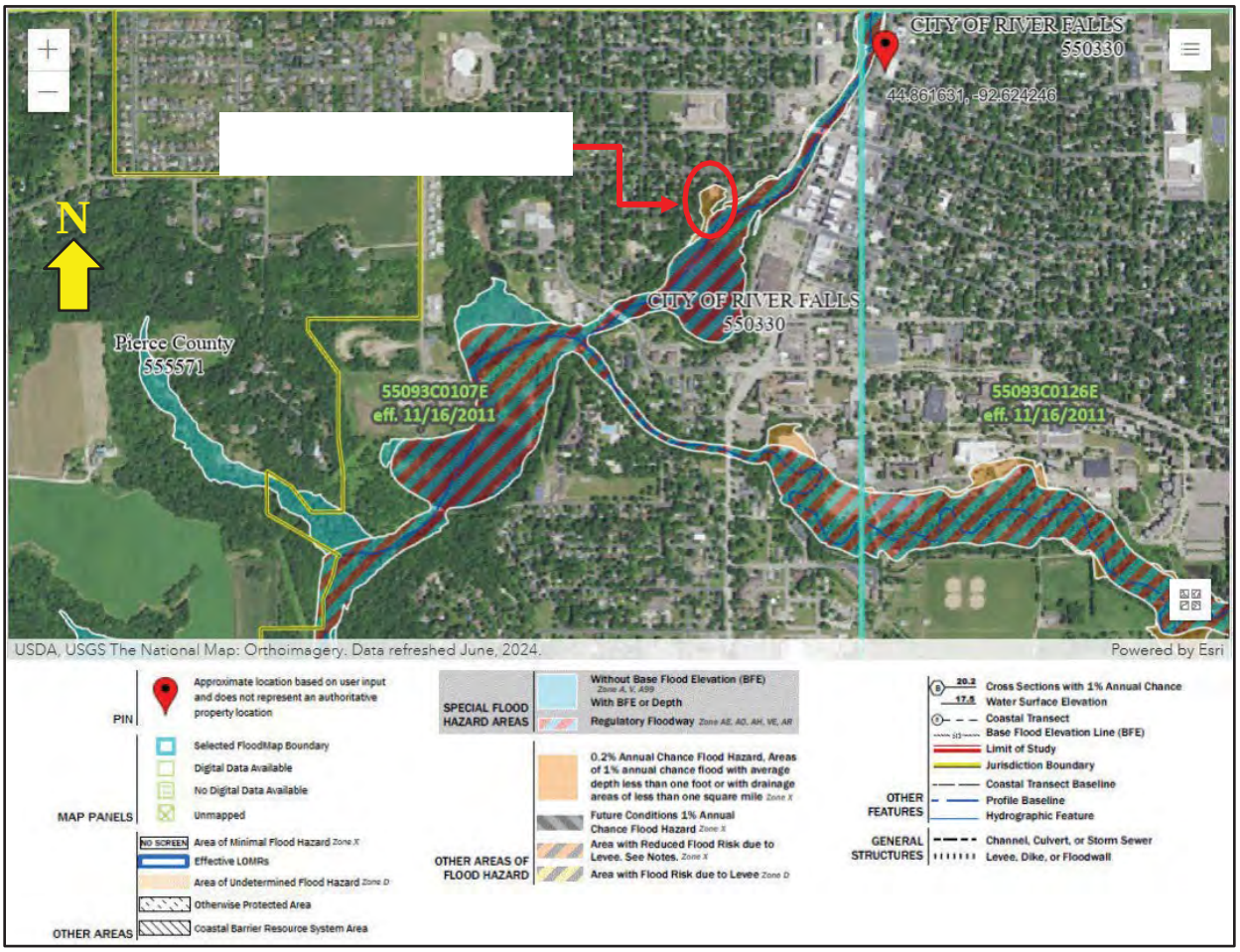


Figure 10: FEMA Flood Map (2024) of project area at dam removal sites in River Falls, Wisconsin (https://msc.fema.gov/portal/).

The EDR Radius Map Report with GeoCheck revealed that no water supply or monitoring wells were identified on the subject property or adjoining properties. A copy of the EDR Radius Map Report with GeoCheck is available upon request (Appendix A).

7.3 Historical Use

7.3.1 Certified Sanborn Map Report

Historical fire insurance maps were requested from EDR and a search of the Sanborn Library, LLC was conducted. Historical maps are detailed drawings that show the locations and use of structures on a given property during a specific year. The maps were originally used by insurance companies to assess fire risk. A copy of the Certified Sanborn Map Report is available upon request (Appendix B).

EDR reported these as mapped properties.

There were no unusual conditions identified from the Certified Sanborn Map Report.

7.3.2 The EDR-City Directory Image Report

Historical and current city directories of the subject property and subject property street were requested from EDR. City directories were not obtained through the EDR report on City Directories. City directories have been published for cities and towns across the United States since the 1700s. Originally a list of residents, the city directory developed into a tool for locating individuals and businesses. While city directory coverage is comprehensive for major cities, it may be limited for rural areas and small towns. A copy of the EDR-City Directory Image Report for the subject property is available upon request (Appendix C).

There were no unusual entries identified within the EDR-City Directory Image Report.

7.3.3 EDR Historical Topo Map Report

Historical topographic map coverage of the subject property was requested from EDR. 1946 and 1949 USGS 15 Minute Topographic quadrangles, and 1974, 2013, 2015, and 2018 USGS 7.5 Minute Topographic quadrangles were obtained. Between 1949 and 1974 the City of River Falls expands, adding a new powerplant and sewage disposal adjacent to Lake Louise. Since then, the city continues to grow in population by adding residential structures upland of the lake. Currently, Lake Louise has been drained and the Kinnickinnic River flows through the lake bottom. A copy of the EDR Historical Topo Map Report is available upon request (Appendix D).

There were no unusual conditions identified within the EDR Historical Topo Map Report.

7.3.4 The EDR Aerial Photo Decade Package

Historical aerial photos of the subject property were requested from EDR. Photo coverage was available for the following years: 1938, 1945, 1953, 1958, 1965, 1973, 1980, 1986, 1992, 1998, 2006, 2010, 2013, 2017, and 2020. A copy of the EDR Aerial Photo Decade Package is available upon request (Appendix E).

There are unusual conditions identified within the EDR Aerial Photo Decade Package. The unusual site conditions include but are not limited to:

- Chicago railroad along the north side of Lake George, currently a day use area and walking path along the Kinnickinnic River.

- Multiple bulk oil stations along the north perimeter of Lake George including the New Richmond Farmers Union Coop Oil Company Bulk Station and the Rapid Service Bulk PLT (former Skoglund – Heutmaker Bulk Plant site).

8.0 SITE RECONNAISSANCE

8.1 Methodology and Limiting Conditions

The site reconnaissance was conducted on 9 June 2023 and 25 October 2023 by Michael Davis, Geologist, with the U.S. Army Corps of Engineers, St. Paul District. Weather conditions at the time of the site reconnaissance were partly sunny and dry. Prior knowledge of the listed HRECs in this report were not known at the time and ground truthing or evidence of impacts of these adjoining property HRECs were not looked at in detail and rather, general site conditions of the subject property were observed.

8.2 General Site Setting

The subject properties are in the floodplain of the Kinnickinnic River valley near the city center of River Falls, Wisconsin. The land within the project area is primarily undeveloped or open water for recreational purposes. The soils are generally alluvium consisting of sands, gravels, fines, and organics the overlie unconsolidated glacial sediments and sedimentary bedrock.

8.3 Site Reconnaissance

Below are the observations made during the site reconnaissance on 9 June 2023 and 25 October 2023. There were no unusual conditions observed during the site reconnaissance. Findings from the site reconnaissance are below:

a) Concrete and construction debris in lower areas around Glen Park, particularly below the Municipal Power Plant (Photos 1 and 2).

b) Red and oily staining within soils at the water surface, possibly related to iron bacteria (Photos 3 and 4).

c) Discharge pipe downstream of Junction Falls Dam (Photo 5).

d) Wastewater effluent discharging into Kinnickinnic River upstream of Powell Falls Dam (Photo 6).

e) An adjacent Municipal Power Plant and substation near Junction Falls Dam (Photo 7).

f) An abandoned storage tank in the Kinnickinnic River just upstream of the Powell Falls Dam (Photo 8).

Note: All referenced site reconnaissance photos are in Appendix G.

General conditions found during site reconnaissance of the areas around Powell Falls and Junction Falls Dams of River Falls, WI were de minimis but removal of the debris should be taken into account within the project area.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The USACE has conducted a Phase I Environmental Site Assessment of the subject property in conformance with the scope and limitations of ASTM Standard Practice E1527-21. This assessment revealed that there is the potential for residual contamination on adjoining properties due to historic recognized environmental conditions.

The removal of Junction Falls Dam and the associated drop in water levels at Lake George would likely cause localized changes in groundwater flow. At the time that the Farmers Union Coop and Rapid Service Bulk Plant petroleum spill sites were assessed (circa the year 2000), groundwater appeared to be flowing away from the river and the proposed project area. A drop in water levels and a potential reversal in groundwater flow could have the potential to transport any residual contamination that may remain on those properties towards the proposed project area. However, although the current extent and concentration of the residual contamination on these properties outside the project area is unknown, the remaining extents and concentrations of contamination remaining post-remediation were considered sufficiently low as to not pose a significant threat to the environment and human health – both sites were closed by the WI Department of Commerce with continuing restrictions on water supply wells. Considering that the contamination has been naturally attenuating for over 20 years, and that petroleum compounds do not readily dissolve in water, the risk to the project posed by these sites is low. Risk would be further reduced by ensuring the proposed project area is not expanded upon or modified to affect or include these properties and by maintaining the current TSP plan of no excavation in the Kinnickinnic Pathway area adjacent to these properties. In the event that modification of the proposed project footprint is considered during PED, these sites should still be avoided unless further testing confirms no contaminants of concern.

Existing information on sediment/soil quality in both lakes indicate limited concerns for the project, but sampling during PED would confirm whether conditions have changed and if avoidance is needed. Sediment sampling conducted in 2015 demonstrated concerns over certain contaminants exceeding RCL soil standards for direct contact in residential settings, as well as TEC exceedances in

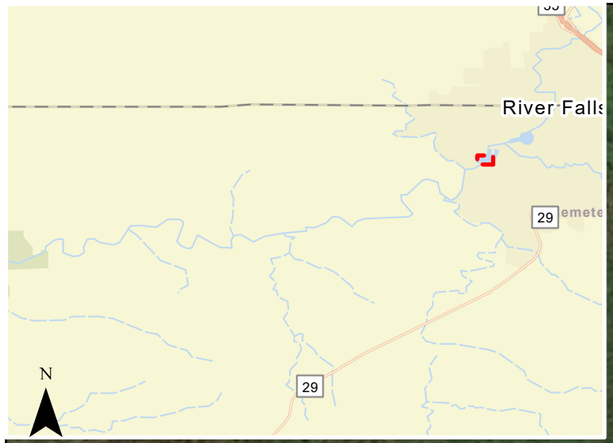
others. Additional sediment sampling conducted by USACE in 2023 to confirm arsenic levels indicated that it is no longer a concern. Sediment that exceeded hexavalent chromium RCL soil standards for direct contact in 2015 falls outside of the main channel area and would remain undisturbed under the TSP design; soil from the main channel would be placed on top of it under the feasibility-level design and, if necessary, such areas would be avoided in PED or the sponsor would be responsible to provide clean sites. Concentrations for all PAH compounds now fall below the RCLs for direct contact soil under Wis. Administrative Code NR 720 since the standards were updated in October 2024. Sediment that demonstrated TEC exceedances in Lake George and Louise is now absent or falls outside of the main channel area.

During PED, testing compliant with anticipated conditions of Section 401 certification would be reviewed to confirm that materials are suitable for reuse/disposal. In accordance with Department of the Army HTRW policy, lands with contaminants of concern would be avoided by the project footprint through design refinement or, if they cannot be avoided, the project sponsor would be responsible for providing clean sites.

Prior to dam and appurtenant structure demolition, the construction contractor would sample and test for asbestos, lead based paint, and PCB-containing materials in accordance with applicable federal and state laws and regulations and dispose of them in compliance with such laws.

A Phase II Environmental Site Assessment is not recommended for the subject property.

Attachment D-2: Scanned images of 2023 Field Logs and Maps



LL-F2

LL-F1

23-4TP

23-2A

23-6A

23-1A

LL-C1

23-3A

23-5A

Kinnickinnic River Flow Direction

Powell Falls Dam

River Falls, WI

Lake Louise - 2023 Environmental Exploration around LL-C1

St. Paul District GEOLOGY GEOTECHNICAL
US Army Corps of Engineers®
File Location Date Cartographers Initials

0 50 100 200 Feet

2015 Environmental Exploration
Kinnickinnic River 2023 Environmental Borings

N W E S

Hole No. 23-64

DRILLING LOG | DIVISION: MVD | INSTALLATION: St. Paul District | SHEET 1 OF 2 SHEETS

1. PROJECT: Kinnickinnic River Restoration
2. LOCATION (Coordinates or Station): See Map on Pg. 2
3. DRILLING AGENCY: USACE
4. HOLE NO. (as shown on drawing and file number): B-1
5. NAME OF DRILLER: Mike Davis
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: —
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 5.0'
10. SIZE AND TYPE OF BIT: 3 1/4" Slotless Hand Auger
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): WGS 84
12. MANUFACTURER'S DESIGNATION OF DRILL: Hand Auger - AMS
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 EnV; UNDISTURBED —
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: —
16. DATE HOLE: STARTED 25 OCT 23; COMPLETED 25 OCT 23
17. ELEVATION TOP OF HOLE: 835.0'
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: Mike Davis

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
835.0	0.0		Ground Surface			1) Location: LAT: 44.851766°N LONG: -92.637265°E
		OH	Silty Clay (CH) - Soft - Moist - Mr. Plast. - Dark Grey w/ Sl. Fe Staining - 90% Fines - 10% f. Sand - Some roots, wood & organics			2) All samples taken for env. analysis
	2.0				EnV SN 1	3) S, N, 1 EnV
	3.0	CH	- occ. silty sand (F.) Pockets or lenses - Tr. Shell fragments		0.0/5.0	Time: 11:50 Composite bag sample taken for env. testing.
	4.0					4) Pulled Sampler & allowed hole to cave & back-filled w/ excess soils.
830.0	5.0		End of Boring			5) Elevations estimated from Google Earth.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: Kinni River Restoration | HOLE NO. 23-64

Hole No. 23-5A

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 1 OF 2 SHEETS

1. PROJECT: Kinni River Restoration
2. LOCATION (Coordinates or Station): See map on Pg. 2
3. DRILLING AGENCY: USACE
4. HOLE NO. (as shown on drawing and file number): B-5
5. NAME OF DRILLER: Caitlyn Piotrowski
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: —
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 5.0'
10. SIZE AND TYPE OF BIT: 3"/4" Stainless Hand Auger
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): WGS 84
12. MANUFACTURER'S DESIGNATION OF DRILL: Hand Auger - AMS
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 - Env; UNDISTURBED —
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: —
16. DATE HOLE: STARTED 25 OCT 23; COMPLETED 25 OCT 23
17. ELEVATION TOP OF HOLE: 835.0'
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
835.0	0.0		Ground Surface			
		OH/CH	Silty Clay (OH/CH) - Soft - M. Plast. - Moist - Dark grey w/ Sl. Fe staining - 90% Fines - 10% F. Sand - some roots & organics - Occ. laminated F. Sandy silt Pockets		Env S.N. 1	1) Location: Lat: 44.851560°N Long: -92.637410°E 2) All Samples taken for Env. analysis. 3) Env S.N. 1 Time: 3:30 1 composite bag sample for env testing 4) Pulled Sampler & allowed hole to cave & backfilled w/ excess soils. 5) Elevations estimated from Google Earth.
831.5	3.5	CH	- wet below ~3.5'			
830.0	5.0		End of Boring		0.0/5.0	

Hole No. 23-4TP

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 1 OF 2 SHEETS

1. PROJECT	Kinnickinnic River Restoration
2. LOCATION (Coordinates or Station)	See Map on Page 2
3. DRILLING AGENCY	USACE
4. HOLE NO. (as shown on drawing and file number)	—
5. NAME OF DRILLER	Bryn L.
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	—
8. DEPTH DRILLED INTO ROCK	—
9. TOTAL DEPTH OF HOLE	~0.5'
10. SIZE AND TYPE OF BIT	Shovel (Spade)
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	WGS 84
12. MANUFACTURER'S DESIGNATION OF DRILL	Shovel
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED 1 SAR / UNDISTURBED —
14. TOTAL NUMBER CORE BOXES	—
15. ELEVATION GROUND WATER	—
16. DATE HOLE	STARTED 25 Oct 23 / COMPLETED 25 Oct 23
17. ELEVATION TOP OF HOLE	830.0'
18. TOTAL CORE RECOVERY FOR BORING	— %
19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
831.a	0.0b	—	Ground Surface			
		CH	Silty Clay (CH) - Soft - M. to H Plast. - Moist - Dark Grey w/ FE Staining - 90% Fines - 10% F. Sand		S.N. 1	1) Location: LAT: 44.852044°N LONG: -92.637467°E
830.5	0.5		End of Boring		0.0/0.5	2) Test Pit near River ~4' below top of bank. 3) Elevations estimated from Google Earth. 4) Collapsed test Pit w/ nearby soils

Hole No. 23-3A

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 1 OF 2 SHEETS

1. PROJECT	Kinnickinnic River Restoration
2. LOCATION (Coordinates or Station)	River Falls, WI See Map on B-2
3. DRILLING AGENCY	USACE
4. HOLE NO. (as shown on drawing and file number)	B-2
5. NAME OF DRILLER	Beth Post
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	—
8. DEPTH DRILLED INTO ROCK	—
9. TOTAL DEPTH OF HOLE	4.0'
10. SIZE AND TYPE OF BIT	3 1/4" Hand Auger
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	WGS 84
12. MANUFACTURER'S DESIGNATION OF DRILL	Hand Auger - AMS
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED 1 EnV / UNDISTURBED —
14. TOTAL NUMBER CORE BOXES	—
15. ELEVATION GROUND WATER	—
16. DATE HOLE	STARTED 25 OCT 23 COMPLETED 25 OCT 23
17. ELEVATION TOP OF HOLE	835.0'
18. TOTAL CORE RECOVERY FOR BORING	— %
19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
835.0	0.0		Ground Surface			
		OH/CH	Silty Clay (OH/CH)			1) Location:
			- soft to V. soft			LAT: 44.851596°N
			- Low to M. Plast.			LONG: -92.637713°E
	1.0	CH	- Sl. moist to moist			2) All samples
			- Black to Dark grey			taken for Env.
			- 90% Fines		EnV. S.N. 1	Analysis.
			- 10% F. sand			
			- Some roots, wood,			
832.9	2.0 2.1	SM	& vegetation			
832.7	2.3		- Tr. Fe staining		0.0/4.0	3) S.N. 1 EnV
		OH/CH	- Sl. laminated			
	3.0		below 2.1			Time: 2:15 PM
			- ~M, stiff below			1 composite Bag
			2.5'			Sample taken for
831.0	4.0		End of Boring			Env. Testing.
						4) Pulled sampler
						& hole collapsed
						& backfilled w/
						excess soil.
						5) Elevations
						estimated from
						Google Earth.

Hole No. 23-2A

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 1 OF 2 SHEETS

1. PROJECT: Kinnickinnic River Restoration
2. LOCATION (Coordinates or Station): River Falls, WI See Map on Pg. 2
3. DRILLING AGENCY: USACE
4. HOLE NO. (as shown on drawing and file number): B-4
5. NAME OF DRILLER: Patrick Stieve
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED — DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: —
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 6.0'
10. SIZE AND TYPE OF BIT: 3"/4" Hand Auger S.S.
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): WGS 84
12. MANUFACTURER'S DESIGNATION OF DRILL: Hand Auger - AMS
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 Env; UNDISTURBED —
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: —
16. DATE HOLE: STARTED 25 Oct 23; COMPLETED 25 Oct 23
17. ELEVATION TOP OF HOLE: 835.0'
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
835.0	0.0		Ground Surface			1) Location: LAT: 44.851819°N LONG: 92, 637518°E
		CH	Silty Clay w/ organics (CH) - Soft to V. Soft - Sl. Moist - Low to M. plast. - Black to Dark grey - 10% Fines - 10% F. Sand - Occ. Roots & organics - Tr. Fe Staining		S.N. 1	2) All samples taken for Env. Analysis
	1.0					
	2.0				0% / 6.0	3) S.N. 1 Env Time: 13:00 composite bag Environmental Sample.
	3.0	CH	- Occ. F. sand & silt lenses & P.			
831.0	4.0		~ Wet around 4.0			
830.3	4.7		- - - Sand Pocket			4) Pulled sampler & allowed hole to cave & Backfilled w/ excess soils.
	5.0	SP-SM				
829.6	5.4		- - -			
		CH				5) Elevations estimated from Google Earth.
829.0	6.0		End of Boring			

Hole No. 23-1A

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 1 OF 2 SHEETS

1. PROJECT: Kinnickinnic River Restoration
2. LOCATION (Coordinates or Station): River Falls, See Map on Pg 2
3. DRILLING AGENCY: USACE
4. HOLE NO. (as shown on drawing and file number): B-3
5. NAME OF DRILLER: Patrick Stieve
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED — DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: —
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 6.0'
10. SIZE AND TYPE OF BIT: Hand Auger
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): WGS 84
12. MANUFACTURER'S DESIGNATION OF DRILL: Hand Auger 3'4"
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 Env; UNDISTURBED —
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: —
16. DATE HOLE: STARTED 25 OCT 23; COMPLETED 25 OCT 23
17. ELEVATION TOP OF HOLE: 835.0'
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
835.0	0.0		Ground Surface			1) Location: LAT: 44.851698° N LONG: -92.637423E NAD83
	1.0	OL/CL	Silty Clay w/ occ sands (OL/CL) - Soft to V. Soft CL - Moist to Sl. moist - No Plast to Low Plast. - Black - 90% fines - 10% F. sand - Roots & organics - Occ. sand (Fine) lenses - Tr. FE staining - Tr. Shell fragments - Occ. Dry brown Sand & silt Pockets w/ red staining		Env S.N. 1	2) All samples taken for Environmental analysis.
	2.0				0.0/6.0	3) Env. S.N. 1 Time: 11:00 am composite bag sample.
831.5	3.5		Silty Clay (CH)			4) Elevations estimated from Google Earth.
	4.0	CH	- Soft - Moist - M. to H. Plast. - Dark Grey - 95% Fines - 5% F. sand - Tr. Fe staining - Wet around ~4.5'			
830.5	4.5					
	5.0					
829.0	6.0		End of Boring			5) Pulled sampler & backfilled hole w/ excess soils & collapsed soils.

Attachment D-3: Sediment Quality Part I Lab Test Chemical Data Results

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www.ctlaboratories.com

g ANALYTICAL Y PO RT

This report at a minimum contains the followin information:

Analytical eport of Test esults
Description of QC Qualifiers A
Chain of Custody (copy)
Quality Control ummary (if applicable) g
Case Narrative (if applicable)
Correspondence with Client (if applicable) g

This report has been specifically prepared to satisfy project or program requirements. These results are in compliance with NELAC requirements for parameters where accreditation is required or available, unless otherwise noted in the case narrative. g

nless specifically stated to the contrary, soil/sediment/slud e sample results reported on a Dry Wei ht Basis g

ANALYTICAL SAMPLE DATA

USACE - ST PAUL F
JAMES NOREN F
332 MINNESOTA ST F
SUITE E1500
ST PAUL, MN 55101 F

P o e Name: KINNICKINNIC RIVER RESTORATION F
P o e Phase: F
P o e #: W912ES23D0007 F
olde #: 181755
Pu hase O de #: W912ES24 0003 F
Con a #: 3559

A ival Tempe a u e: See COC
Repo Da e: 11/13/2023
Da e Re eived: 10/27/2023
Rep in Da e: 11/13/2023 F

CT LAB#: 13902 F Sample Des ip ion: 23-1A,SN1 Clien Sample #: 23-1A,SN1,DEPTH 0.0/ .0 Sampled: 10/25/2023 11:00

Analyte	Result	Units	DL F	DOD LOD	DOD LOQ	RL	DF	Qualifier	Leach Date	Prep Date/Time	Analysis Date/Time	Analyst	Method
Inorganic Results F													
Solids, Pe en	***70.2*** F	% F					1.00 F				11/2/23 F 14:01	BMM	EPA 8000C
Metals Results													
A seni	***3.0***	mg/kg	0.3	0.71	1.4	1.4	1.00			10/30/23 10:28	10/31/23 1 :35	NAH	EPA 010C
Cadmium F	***0.20*** F	mg/kg	0.038	0.19	0.3	0.3 F	1.00	J F		10/30/23 10:28	10/31/23 1 :35	NAH F	EPA 010C
Ch omium F	***16*** F	mg/kg	0.10	0.3	0.71	0.71	1.00			10/30/23 10:28	10/31/23 F 1 :35	NAH	EPA 010C
Coppe	***12***	mg/kg	0.17 F	0.3	0.71	0.71	1.00			10/30/23 10:28	10/31/23 1 :35	NAH F	EPA 010C
Lead F	***12*** F	mg/kg	0.11	0.3	0.71	0.71F	1.00			10/30/23 10:28	10/31/23 1 :35	NAH	EPA 010C
Magnesium F	***3700*** F	mg/kg	5.3	19	3	3 F	1.00			10/30/23 10:28	10/31/23 1 :35	NAH	EPA 010C
Ni keF F	***13***	mg/kg	0.093	0.3	0.71	0.71	1.00			10/30/23 10:28	10/31/23 1 :35	NAH	EPA 010C
Zin	***43***	mg/kg	0.14	0.3	0.71	0.71	1.00 F			10/30/23 10:28	10/31/23 1 :35	NAH	EPA 010C
Sub Lab Results F													
Hyd ome e	***attached*** F						1.00 F				11/13/23 00:00	SUB F	

Unless spe ifi ally s a ed o he on a y, soil/sedimen /sludge sample esul s epo ed on a D y Weigh Basis

CT LAB#: 1390281 Sample Description: 23-2A,SN1 Client Sample #: 23-2A,SN1,DEPTH 0.0/.0 Sampled: 10/25/2023 13:00

Analyte	Result	Units	DL	DOD LOD	DOD LOQ	RL	DF	Qualifier	Leach Date	Prep Date/Time	Analysis Date/Time	Analyst	Method
Inorganic Results													
Solids, Percent	***69.3***	%					1.00				11/2/23 14:01	BMM	EPA 8000C
Metals Results													
Arsenic	***2.6***	mg/kg	0.35	0.70	1.4	1.4	1.00			10/30/23 10:28	10/31/23 17:40	NAH	EPA 010C
Cadmium	***0.31***	mg/kg	0.038	0.18	0.35	0.35	1.00	J		10/30/23 10:28	10/31/23 17:40	NAH	EPA 010C
Chromium	***16***	mg/kg	0.099	0.35	0.70	0.70	1.00			10/30/23 10:28	10/31/23 17:40	NAH	EPA 010C
Copper	***15***	mg/kg	0.17	0.35	0.70	0.70	1.00			10/30/23 10:28	10/31/23 17:40	NAH	EPA 010C
Lead	***20***	mg/kg	0.11	0.35	0.70	0.70	1.00			10/30/23 10:28	10/31/23 17:40	NAH	EPA 010C
Magnesium	***4500***	mg/kg	5.2	18	35	35	1.00			10/30/23 10:28	10/31/23 17:40	NAH	EPA 010C
Nickel	***11***	mg/kg	0.091	0.35	0.70	0.70	1.00			10/30/23 10:28	10/31/23 17:40	NAH	EPA 010C
Zinc	***60***	mg/kg	0.14	0.35	0.70	0.70	1.00			10/30/23 10:28	10/31/23 17:40	NAH	EPA 010C
Sub Lab Results													
Hydrometer	***attached***						1.00				11/13/23 00:00	SUB	

CT LAB#: 1390282 Sample Description: 23-3A,SN1 Client Sample #: 23-3A,SN1,DEPTH 0.0/4.0 Sampled: 10/25/2023 14:15

Analyte	Result	Units	DL	DOD LOD	DOD LOQ	RL	DF	Qualifier	Leach Date	Prep Date/Time	Analysis Date/Time	Analyst	Method
Inorganic Results													
Solids, Percent	***74.1***	%					1.00				11/2/23 14:01	BMM	EPA 8000C
Metals Results													
Arsenic	***2.8***	mg/kg	0.35	0.70	1.4	1.4	1.00			10/30/23 10:28	10/31/23 17:47	NAH	EPA 010C
Cadmium	***0.19***	mg/kg	0.038	0.18	0.35	0.35	1.00	J		10/30/23 10:28	10/31/23 17:47	NAH	EPA 010C
Chromium	***15***	mg/kg	0.099	0.35	0.70	0.70	1.00			10/30/23 10:28	10/31/23 17:47	NAH	EPA 010C

Unless specified otherwise on any soil/sediment/sludge sample results reported on a Dry Weight Basis

CT LAB#: 1390282 Sample Des ip ion: 23-3A,SN1 Clien Sample #: 23-3A,SN1,DEPTH 0.0/4.0 Sampled: 10/25/2023 14:15

Analyte	Result	Units	DL F	DOD LOD	DOD LOQ	RL	DF	Qualifier	Leach Date	Prep Date/Time	Analysis Date/Time	Analyst	Method
Coppe F	***12***	mg/kg	0.17	0.35 F	0.70	0.70	1.00			10/30/23 10:28	10/31/23 F 17:47	NAH	EPA 010C
Lead F	***12*** F	mg/kg	0.1 F 1	0.35 F	0.70 F	0.70 F	1.00			10/30/23 F 10:28 F	10/31/23 17:47	NAH	EPA 010C
Magnesium F	***3700*** F	mg/kg	5.1 F	18 F	35 F	35 F	1.00 F			10/30/23 F 10:28 F	10/31/23 F 17:47	NAH	EPA 010C
Ni kel F	***11*** F	mg/kg	0.090	0.35 F	0.70	0.70	1.00			10/30/23	10:28 10/31/23 17:47	NAH	EPA 010C
Zin F	***43***	mg/kg	0.14	0.35	0.70	0.70	1.0 F 0			10/30/23	10:28 10/31/23 17:47	NAH	EPA 010C
Sub Lab Results F													
Hyd ome e	***attached*** F						1.00 F				11/13/23 00:00	SUB	

CT LAB#: 139028 3 Sample Des ip ion: 23-5A F ,SN1 Clien Sample #: 23-5A F ,SN1,DEPTH 0.0/5.0 F Sampled: 10/25/2023 15:3 F 0

Analyte	Result	Units	DL F	DOD LOD	DOD LOQ	RL	DF	Qualifier	Leach Date	Prep Date/Time	Analysis Date/Time	Analyst	Method
Inorganic Results													
Solids, Pe en F	***69.3*** F	% F					1.0 F 0				11/2/23 14:01	BMM	EPA 8000C
Metals Results F													
A seni	***2.7*** F	mg/kg	0.37 F	0.74 F	1.5 F	1.5 F	1.0 F 0			10/30/23	10:28 10/31/23 17:55	NAH	EPA 010C
Cadmium	***0.21***	mg/kg	0.040 F	0.19 F	0.37 F	0.37 F	1.00	J F		10/30/23	10:28 10/31/23 17:55	NAH	EPA 010C
Ch omium F	***17***	mg/kg	0.11	0.37	0.74	0.74	1.00			10/30/23	10:28 10/31/23 17:55	NAH	EPA 010C
Coppe	***13*** F	mg/kg	0.18	0.37	0.74	0.74	1.00			10/30/23 F	10:28 F 10/31/23 F 17:55 F	NAH	EPA 010C
Lead F	***12*** F	mg/kg	0.12 F	0.37	0.74	0.74	1.00			10/30/23	10:28 10/31/23 17:55	NAH	EPA 010C
Magnesium F	***3900***	mg/kg	5.5	19	37	37 F	1.00			10/30/23	10:28 10/31/23 17:55	NAH	EPA 010C
Ni kel F	***13*** F	mg/kg	0.09	0.37 F	0.74	0.74	1.0 F 0			10/30/23	10:28 10/31/23 17:55	NAH	EPA 010C
Zin	***45***	mg/kg	0.15	0.37	0.74	0.74	1.0 F 0			10/30/23	10:28 10/31/23 17:55	NAH	EPA 010C F
Sub Lab Results F													
Hyd ome e	***attached***						1.00 F				11/13/23 00:00	SUB F	

Unless spe ifi ally s a ed o he on a y, soil/sedimen /sludge sample esul s epo ed on a D y Weigh Basis F

CT LAB#: 1390283 Sample Description: 23-5A,SN1 Client Sample #: 23-5A,SN1,DEPTH 0.0/5.0 Sampled: 10/25/2023 15:30

Analyte	Result	Units	DL I	DOD LOD	DOD LOQ	RL	DF	Qualifier	Leach Date	Prep Date/Time	Analysis Date/Time	Analyst	Method I

CT LAB#: 1390284 Sample Description: 23- A,SN1 Client Sample #: 23- A,SN1,DEPTH 0.0/5.0 Sampled: 10/25/2023 1 :50

Analyte	Result	Units	DL I	DOD LOD	DOD LOQ	RL	DF	Qualifier	Leach Date	Prep Date/Time	Analysis Date/Time	Analyst	Method
Inorganic Results I													
Solids, Percent	***68.9*** I	% I					1.00 I				11/2/23 14:01	BMM	EPA 8000C
Metals Results I													
Arsenic	***3.3***	mg/kg	0.35	0.71	1.4	1.4	1.00			10/30/23 10:28	10/31/23 18:02	NAH	EPA 6010C
Cadmium	***0.23***	mg/kg	0.038	0.18	0.35	0.35	1.00	J I		10/30/23 10:28	10/31/23 18:02	NAH	EPA 6010C
Chromium	***17*** I	mg/kg	0.10	0.35	0.71	0.71	1.00			10/30/23 10:28	10/31/23 18:02	NAH	EPA 6010C
Copper I	***13***	mg/kg	0.17 I	0.35 I	0.71	0.71 I	1.00 I			10/30/23 10:28	10/31/23 18:02	NAH	EPA 6010C
Lead	***12*** I	mg/kg	0.11	0.35	0.71 I	0.71	1.00			10/30/23 10:28	10/31/23 18:02	NAH	EPA 6010C
Magnesium I	***3700***	mg/kg	5.2	18	35	35	1.00			10/30/23 10:28	10/31/23 18:02	NAH	EPA 6010C
Nickel	***14***	mg/kg	0.092	0.35	0.71	0.71	1.00			10/30/23 10:28	10/31/23 18:02	NAH	EPA 6010C
Zinc	***46***	mg/kg	0.14	0.35	0.71	0.71	1.00 I			10/30/23 10:28	10/31/23 18:02	NAH	EPA 6010C
Sub Lab Results I													
Hydrometer I	***attached*** I						1.00 I				11/13/23 00:00	SUB I	

Unless specifically noted on any soil/sediment/sludge sample results reported on a Dry Weight Basis

Notes: O
^ ates the laboratory s NELAP a re te for th s a alyte by the ate matr x a metho DL (ete t o l m t), L (l m t of ete t o), loq (l mit of qua t tat o) as ef e by most re e t DOD QSM vers o .

All samples were re e ve ta t a properly preserve u less otherw se ote The results reporte relate o ly to the samples teste . Th s report O shall ot be repro u e , ex ept full, w thout wr tte approval of th s laboratory. The Cha of Custo y s atta he .

Subm tte by: Er T. Korthals
Proje t Ma ager O
608-356-2760

This report has been specifically prepared to satisfy project or program requirements. These results are ompl a e w th NELAC requ reme ts for the parameters where a re tat o s requ re or ava lable, u less ote the ase arrat ve.

QC Qualifiers

Code	Description
B O	Analyte detected in the associated Method Blank.
C O	Toxicity present in BOD sample.
D O	Diluted Out.
E O	Safe, No Total Coliform detected.
F O	Unsafe, Total Coliform detected, no E. Coli detected.
G O	Unsafe, Total Coliform detected and E. Coli detected.
H O	Holding time exceeded.
I O	Incubator temperature was outside acceptance limits during test period.
J O	Estimated value.
L O	Significant peaks were detected outside the chromatographic window.
M O	Matrix spike and/or Matrix Spike Duplicate recovery outside acceptance limits.
N O	Insufficient BOD oxygen depletion.
O O	Complete BOD oxygen depletion.
P O	Concentration of analyte differs more than 40% between primary and confirmation analysis.
Q O	Laboratory Control Sample outside acceptance limits.
R O	See Narrative at end of report.
S O	Surrogate standard recovery outside acceptance limits due to apparent matrix effects.
T O	Sample received with improper preservation or temperature.
U O	Analyte concentration was below detection limit.
V O	Raised Quantitation or Reporting Limit due to limited sample amount or dilution for matrix background interference.
W O	Sample amount received was below program minimum.
X O	Analyte exceeded calibration range.
Y O	Replicate/Duplicate precision outside acceptance limits.
Z O	Specified calibration criteria was not met. O

urrent T Laboratories ertifications

Wis o s (WDNR Chem istry D# 157066030
Wis o s (DA CP Ba ter ology D# 289
Lou s a a NELAP (pr mary) D# ACC20190002
Il o s NELAP Lab D# 200073
Ka sas NELAP Lab D# E-10368
V rg a NELAP Lab D# 460203
S EC 17025-2005 A2LA Cert # 3806.01
DoD-ELAP A2LA 3806.01
GA EPD St pulat o D ACC20190002 O

Q CS mmary R p rt

USA E - ST PAUL s

Pr j ct Name: KINNI KINNI RIVER RESTORATION

SDG #: 181755 s **F ld r #: 181755 s**

Pr j ct #: W912ES23D0007

***Duplicate*s**

Analytical Run #:	276810	Analysis Date:	11/2/2023	Prep Batch #:		Matrix:	SOIL
CTLab #:	1393183	Analysis Time:	14:01	Prep Date/Time:		Method:	SW8000C
Parent Sample #:	1390266	Analyst:	BMM	Prep Analyst:			

Analyt	QC ampl r lt	Unit	Par nt ampl r lt	Qualifi r( )	Spik Amo nt Add d	R c v ry	ntr l Limit	RPD	RPD Limit s
Solids, Percent s	70.9	%s	70.2 s					1	8 s

Duplicate

Analytical Run #:	276823	Analysis Date:	10/31/2023	Prep Batch #:	131889 D	Matrix:	SOIL
CTLab #:	1390696	Analysis Time:	16:49	Prep Date/Time:	10/30/2023 10:28	Method:	SW6010
Parent Sample #:	1390266	Analyst:	NAH	Prep Analyst:	NAH		

Analyte	QC sample esult	Units	a ent sample esult	Qualifie (s)	Spike Am ount Added	% Rec ve y	C nt l imits	R	R imit
Arsenic D	3.16	mg/kg	3.0				40	5	20
Cadmium	0.203 D	mg/kg	0.20 D				10D	1	20
Chromium	16.4	mg/kg	16 D				20	2	20
Copper	12.7 D	mg/kg	12				20	6	20
Lead	11.8	mg/kg	12				20 D	2	20
Magnesium DD	3740 D	mg/kg	<5.27 D				100D	1	20
Nickel D	13.5D	mg/kg	13D				20	4	20
Zinc	44.5 D	mg/kg D	43 D				20 D	3 D	20 D

Lab Control Spike Soil

Analytical Run #:	276823	Analysis Date:	10/31/2023	Prep Batch #:	131889 D	Matrix:	SOLID
CTLab #:	1390695	Analysis Time:	16:20	Prep Date/Time:	10/30/2023 10:28	Method:	SW6010
Parent Sample #:		Analyst:	NAH	Prep Analyst:	NAH		

Analyte	QC sample esult	Units	a ent sample esult	Qualifie (s)	Spike Am ount Added	% Rec ve y	C nt l imits	R	R imit
Arsenic D	101 D	mg/kg			100	101	82 --- 118 D		
Cadmium	2.42	mg/kg			2.50	97	82 --- 113		
Chromium	10.2	mg/kg D			10.0	102	85 --- 113		
Copper	12.1	mg/kg			12.5	97	81 --- 117		
Lead	23.6	mg/kg			25.0	94	81 --- 112		
Magnesium DD	4730	mg/kg D D			5000	95	78 --- 115		
Nickel D	23.5	mg/kg			25.0	94	83 --- 113		
Zinc D	23.5	mg/kg D			25.0	94	82 --- 113 D		

Method Blank Soil

Analytical Run #:	276823	Analysis Date:	10/31/2023	Prep Batch #:	131889 D	Matrix:	SOLID
CTLab #:	1390694	Analysis Time:	16:27	Prep Date/Time:	10/30/2023 10:28	Method:	SW6010
Parent Sample #:		Analyst:	NAH	Prep Analyst:	NAH		

Analyte	QC sample esult	Units	a ent sample esult	Qualifie (s)	Spike Am ount Added	% Rec ve y	C nt l imits	R	R imit
Arsenic D	0.25	mg/kg		U	0		0.50		
Cadmium	0.027 D	mg/kg		U	0		0.13		
Chromium	0.071 D	mg/kg D		U D	0		0.25		
Copper	0.12	mg/kg		U	0		0.25		
Lead	0.078 D	mg/kg		U	0 D		0.25		
MagnesiumDD	3.7	mgDkg		U	0		13		
Nickel D	0.065 D	mg/kg		U	0		0.25		
Zinc D	0.10 D	mg/kg D		U D	0 D		0.25 D		

Matrix Spike Duplicate Soil

Analytical Run #: D	276823 D	Analysis Date: D	10/31/2023	Prep Batch #:	131889 D	Matrix: D	SOIL
CTLab #:	1390698	Analysis Time:	17:25	Prep Date/Time:	10/30/2023 10:28	Method:	SW6010
Parent Sample #:	1390697	Analyst:	NAH	Prep Analyst:	NAH		

Analyte	QC sample esult	Units	a ent sample esult	Qualifie (s)	Spike Amount Added	% Rec ve y	C nt l imits	R	R imit D
Arsenic D	136	mg/kg	3.0		142	94	82 --- 111	2	20
Cadmium	3.37 D	mg/kg	0.20 D		3.54	90	82 --- 113	2	20
Chromium D	31.4	mg/kg D	16		14.2	108	85 --- 113	2	20
Copper	28.6	mg/kg	12 D		17.7	94	81 --- 117	2	20
Lead	50.3	mg/kg	12 D		35.4	108	81 --- 112	20	20
Magnesium D	10200	mg/kg D	<5.24 D		7090	92	78 --- 115	3	20
Nickel D	46.4 D	mg/kg	13 D		35.4	94	83 --- D13	1	20
Zinc	76.9	mg/kg D	43		35.4	96	82 --- 113	0	20 D

Matrix Spike Soil

Analytical Run #:	276823	Analysis Date:	10/31/2023	Prep Batch #:	131889 D	Matrix:	SOIL
CTLab #:	1390697	Analysis Time:	17:18	Prep Date/Time:	10/30/2023 10:28	Method:	SW6010
Parent Sample #:	1390266	Analyst:	NAH	Prep Analyst:	NAH		

Analyte	QC sample esult	Units	a ent sample esult	Qualifie (s)	Spike Am ount Added	% Rec ve y	C nt l imits	R	R imit
Arsenic	136	mg/kg	3.0		143	93	82 --- 111		20
Cadmium	3.34	mg/kg	0.20 D		3.58	88	82 --- 113		20
Chromium D	32.4	mg/kg D	16		14.3	115	85 --- 113		20
Copper	29.5	mg/kg	12		17.9	98	81 --- 117		20
Lead	41.5	mg/kg	12		35.8	82	81 --- 112		20
Magnesium D D	9990	mg/kg D D	<5.30 D D		7160	88	78 --- 115		20
Nickel	47.2	mg/kg	13		35.8	96	83 --- 113		20
Zinc D	78.0	mg/kg D	43 D		35.8	98	82 --- 113 D		20 D

CT LABORATORIES
delivering more than data from your environmental analyses

Sample Condition Report

Folder #: 181755
Print Date / Time: 10/27/2023 12:41
Client: USACE - ST PAUL
Received Date / Time / By: 10/27/2023 11:30 DJL
Project Name: KINNICKINNIC RIVER RESTORATION
Log-In Date / Time / By: 10/27/2023 12:41 erc
Project Phase:
Project #: W912ES23D0007 PM: ETK
Coolers: XXX
Temperature: AMBIENT C On Ice: **N**
Custody Seals Present : **Y**
COC Present:? **Y** Complete? **Y**
Seal Intact? **Y**
Numbers: DATED AND SIGNED
Ship Method: FEDEX PRIORITY
Tracking Number: 817921802965
Adequate Packaging: **Y**
Temp Blank Enclosed? **N**

Notes: SAMPLES RECEIVED IN GOOD CONDITION. NO ICE PRESENT. 1 CUSTODY SEAL PRESENT AND INTACT ON COOLER, DATED 26 OCT 2023 AND SIGNED.

Sample ID / Description	Container Type	Cond. Code	pH OK?/Filtered?	Tests
1390266 23-1A,SN1	SOLIDS	1	/	%SOL,ICP
		Total # of Containers of Type (*SOLIDS*) = 1		
1390266 23-1A,SN1	SOLIDS	1	N / N	SUB
		Total # of Containers of Type (*SOLIDS*) = 1		
Sample ID / Description	**Container Type**	**Cond. Code**	**pH OK?/Filtered?**	**Tests**
1390281 23-2A,SN1	SOLIDS	1	/	%SOL,ICP
		Total # of Containers of Type (*SOLIDS*) = 1		
1390281 23-2A,SN1	SOLIDS	1	N / N	SUB
		Total # of Containers of Type (*SOLIDS*) = 1		
Sample ID / Description	**Container Type**	**Cond. Code**	**pH OK?/Filtered?**	**Tests**
1390282 23-3A,SN1	SOLIDS	1	/	%SOL,ICP
		Total # of Containers of Type (*SOLIDS*) = 1		
1390282 23-3A,SN1	SOLIDS	1	N / N	SUB
		Total # of Containers of Type (*SOLIDS*) = 1		
Sample ID / Description	**Container Type**	**Cond. Code**	**pH OK?/Filtered?**	**Tests**

1390283 23-5A,SN1

	SOLIDS	1	/	%SOL,ICP

Total # of Containers of Type (*SOLIDS*) = 1

1390283 23-5A,SN1

	SOLIDS	1	N	/ N	SUB

Total # of Containers of Type (*SOLIDS*) = 1

Sample ID / Description	Container Type	Cond. Code	pH OK?/Filtered?	Tests

1390284 23-6A,SN1

	SOLIDS	1	/	%SOL,ICP

Total # of Containers of Type (*SOLIDS*) = 1

1390284 23-6A,SN1

	SOLIDS	1	N	/ N	SUB

Total # of Containers of Type (*SOLIDS*) = 1

Condition Code	*Condition Description*
1	Sample Received OK

Form #FPM3-04 Rev. 09/2020

CHAIN OF CUSTODY

Page 1 of 1

Company: USACE
Project Contact: Mike Davis
Telephone: 612 214 8997
Project Name: Kinnickinnic River Restoration
Project #: -
Location: River Falls, WI
Sampled By: Mike Davis

CT LABORATORIES
1230 Lange Court, Baraboo, WI 53913
608-356-2760 Fax 608-356-2766
www.ctlaboratories.com

Folder #: 181755
Company: USACE - ST PAUL
Project: KINNICKINNIK RIVER RESTOR.
Logged By: erc PM: ETK

Program:
QSM RCRA SDWA NPDES
Solid Waste Other _____
PO #

Report To: Jim Noren usace.
EMAIL: James.B.Noren@army.mil
Company: USACE
Address: 332 Minnesota St, Suite 1500 ST. Paul MN 55101
Invoice To:* JIM Noren
EMAIL: James.B.Noren@usace.army.mil
Company: USACE
Address: 332 Minnesota St, Suite 1500 St. Paul, MN. 55101

*Party listed is responsible for payment of invoice as per CT Laboratories' terms and conditions

Client Special Instructions

Matrix:
GW – groundwater SW - surface water WW - wastewater DW - drinking water
S - soil/sediment SL - sludge A - air M - misc/waste

Turnaround Time
Normal RUSH*
Date Needed: _____
Rush analysis requires prior CT Laboratories' approval
Surcharges:
24 hr 200%
2-3 days 100%
4-9 days 50%

Collection Date	Collection Time	Matrix	Grab/ Comp	Sample #	Sample ID Description	Filtered? Y/N	ANALYSES REQUESTED	Total # Containers	Designated MS/MSD	CT Lab ID # (Lab use only)
							Fill in Spaces with Bottles per Test			
25Oct23	11:06	S	Comp	1	23-1A, SNI, DOPH 0/6.0					1390266
"	13:00	S	"	1	23-2A, SNI, DOPH 0.0/6.0					81
"	14:15	S	"	1	23-3A, SNI, DOPH 0.0/4.0					82
"	15:30	S	"	1	23-5A, SNI, DOPH 0.0/4.0					83
"	16:50	S	"	1	23-6A, SNI, DOPH 0.0/5.0					84

Relinquished By:	Date/Time	Received By:	Date/Time
Michael Davis, Mike Davis	26OCT23 11:00	[signature]	10/27/23 1130
Received by:	Date/Time	Received for Laboratory by:	Date/Time
		[signature]	10/27/23 1345

Lab Use Only
Ice Present Yes (No)
Obs. Temp Avg IR Gun —
Act. Temp — Cooler —

4. Required Products

The contractor shall deliver the .pdfs of the laboratory report and the analysis data in a spreadsheet format (Microsoft Excel), including the results of all quality control checks performed on that set of samples to the Corps within thirty (30) days after receiving the samples. Results shall include data, methods used, quality control/assurance results, and explanations of any problems encountered during the analysis.

The Contractor shall deliver the required coolers, jars, labels, and Chain of Custody forms within five (5) days from the execution of this Task Order.

Deliveries should be sent to:
U.S. Army Corps of Engineers, St. Paul District
Attn: James Noren
332 Minnesota Street, Suite El500
St. Paul, MN 55101

Table 1. Bulk Chemical Parameter List and Analytical Methods

PRICE SCHEDULE

BASE YEAR							
Item	Description	Matrix	Method	U/I	Estimated Quantity	Unit Price	Total Cost
0012	Metals - EPA 6010 Test must include, at a minimum, all of the following: Arsenic Cadmium Chromium Copper Lead Magnesium Nickel Zinc	Solid	EPA 6010	EA	5	$64	$320
0021	Grain Size Analysis (Hydrometer & Sieve)	Solid	ASTM D4222	EA	5	$150	$750
						total	$1070

Cooler Receipt Form

Ice Present YES NO

Observed Temperature ambt

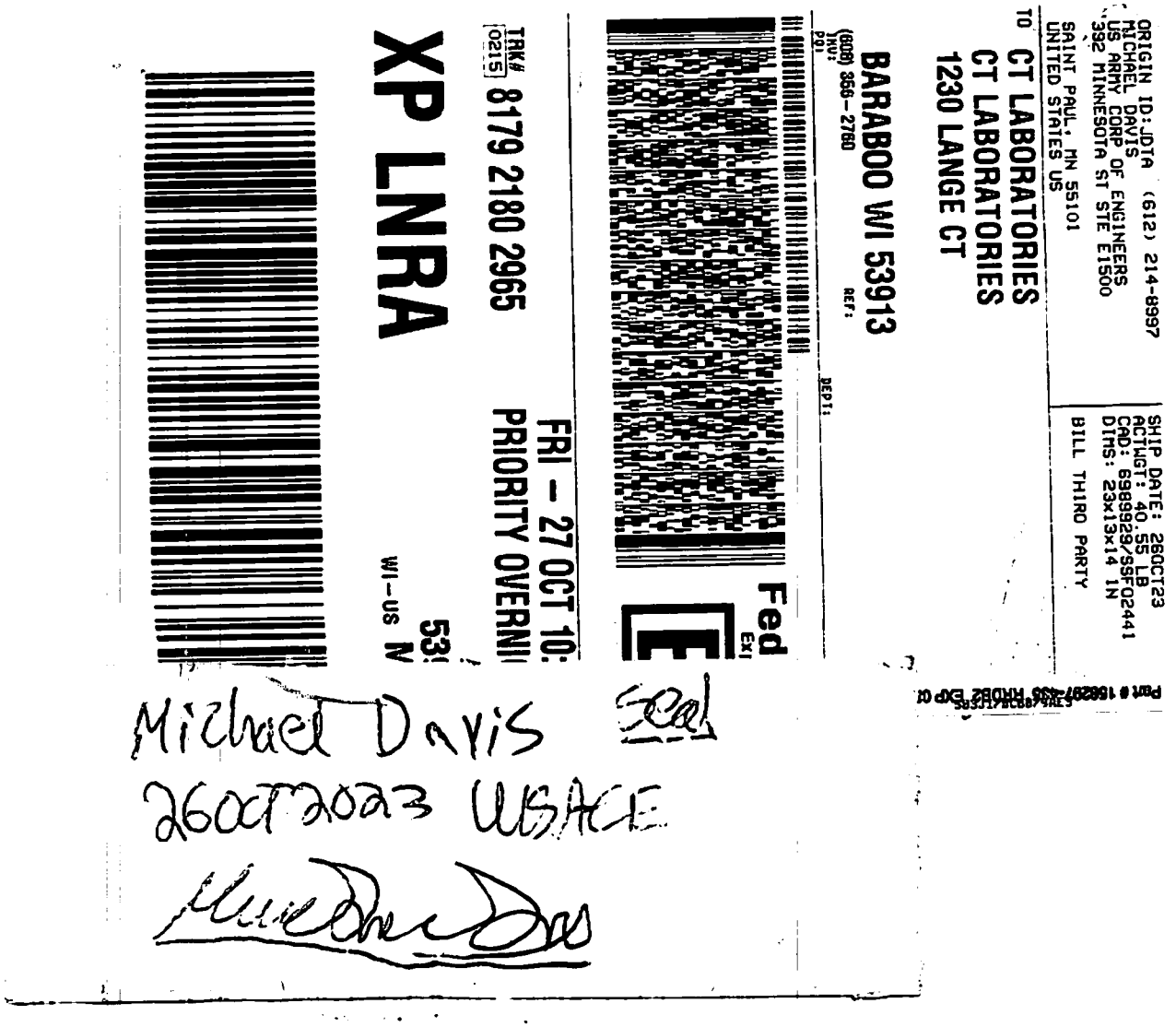
Actual Temperature _____

IR Gun # _____

Initials _____

Date 10/27/23 Time 11:30

Cooler #: _____



Michael Davis
26OCT2023 USACE

Attachment D-4: Summary of 2023 Sediment Quality Chemical Data

Kinnickinnic River (Lake Louise) Sediment Samples

On 10/25/2023, US Army Corps of Engineers, St. Paul District staff collected 5 hand augured core samples from the dried-out channel of Lake Louise in River Falls, WI. These core samples were collected around the location previously detected to have high levels of arsenic up to 35.4 mg/kg. If verified, all contaminated material would most likely require remediation prior to any future land changes.

Upon collection, the samples were immediately sent to CT Labs, Baraboo, WI for several metal constituents and grain size testing. Results from this round of sampling (Table 1.) showed that arsenic was still above the EPA's regional screening levels (RSL) but were an order of magnitude less than what was previously reported and below the Consensus-Based Sediment Quality Guidelines of Wisconsin (CBSQG).

According to the EPA website[1], "RSLs are used for site "screening" and as initial cleanup goals, if applicable. RSLs are not de facto cleanup standards and should not be applied as such."

As a result of this testing, the sediment that had previously detected high levels of arsenic, have either moved downstream or had its concentrations erroneously reported.

https://www.epa.gov/risk/regional-screening-levels-rsls-frequent-questions#FQ1

Table 1. Analytical Results of Kinnickinnic (Lake Louise Channel) sediment samples

Kinickinnic (Lake Louise) Sediment Samples													
Sample									1390266	1390281	1390282	1390283	1390284
Sample Description									23-1A,SN1	23-2A,SN1	23-3A,SN1	23-5A,SN1	23-6A,SN1
Depth									0.0/6.0'	0.0/6.0'	0.0/4.0'	0.0/5.0'	0.0/5.0'
Matrix									Soil	Soil	Soil	Soil	Soil
Sampled									10/25/2023	10/25/2023	10/25/2023	10/25/2023	10/25/2023
Lab									CT Labs	CT Labs	CT Labs	CT Labs	CT Labs
Constituents	Units	Analytical Method	CAS #	WI CBSQG (TEC)	WI CBSQG (MEC)	WI CBSQG (PEC)	EPA RSL (Resident)	EPA RSL (Indust)					
Arsenic	mg/kg	SW6010	7440-38-2	9.8	21.4	33	0.68	3	3	2.6	1.4	2.7	3.3
Cadmium	mg/kg	SW6010	7440-43-9	0.99	3	5	71	980	0.20	0.31	0.19	0.21	0.23
Chromium	mg/kg	SW6010	7440-47-3	43	76.5	110			16	16	15	17	17
Hexavalent Chromium	mg/kg	EPA 3060A/7	18540-29-9				0.03	63					
Trivalent Chromium	mg/kg	EPA 6010C	16065-83-1				120000	1800000					
Copper	mg/kg	SW6010	7440-50-8	32	91	150	3100	47000	12	15	12	13	13
Lead	mg/kg	SW6010	7439-92-1	36	83	130	400	800	12	20	12	12	12
Mercury	mg/kg	EPA 7471B	7439-97-6	0.18	0.64	1.1	11	46					
Nickel	mg/kg	SW6010	7440-02-0	23	36	49	1500	20000	13	11	11	13	14
Zinc	mg/kg	SW6010	7440-66-6	120	290	460	23000	350000	43	60	43	45	46
Solids, Percent	%	A2540G	SOLID						70.2	69.3	74.1	69.3	68.9
Magnesium	mg/kg	SW6010	7439-95-4						3700	4500	3700	3900	3700

Attachment D-5: Preliminary Slope Stability Calculations

US Army Corps of Engineers Saint Paul District	PROJECT TITLE: Kinnickinnic River - Feasibility Study	COMPUTED BY: J. Hotstream	DATE: 11-Aug-23
	SUBJECT TITLE: Assumed Soil Parameters	CHECKED BY: J. Schneider	DATE: 16-Oct-23

Purpose: Assign assumed engineering properties to the lakebed deposits to perform feasibility level stability analyses on the proposed channel geometry.

Method: Use published correlations for sand and clay to assume soil properties for input into the global stabiltiy model. Sand and clay will be characterized based on the 2016 Sediment Assessment Report by Inter-Fluve, Inc. and observations by MVP staff during a site visit on 6/9/23. Intent is to pick conservative conditions so that analysis results in a stable streambank from a global stability perspective.

From the Inter-Fluve, Inc. 2016 Sediment Assessment Report:
24 samples of the sediment were collected from Lake George and Lake Louise for gradations (mechanical sieves through the #230 sieve). The samples were medium to fine grained sands generally with greater than 12% fines (% passing the # 200 sieve). The samples from Lake George were well graded. The samples collected from Lake Louise had 2 different general gradations. The well graded samples were similar to the Lake George samples. But four of the Lake Louise samples were clean sands and 2 samples had less than 12 percent fines. These six samples with less fines were also poorly graded. These poortly graded sands were used to determine the engineering properties for the slope stability analysis.

Conditions of the exposed lakebed in Lake Louise:
fine grained, Poorly Graded Sand (SP), 95% fine sand, few fines, loose, dry, roughly 4 to 6 inch thick sequences of sand layers with organics and shells at the top of each layer. Angle repose of the disturbed, dry sand collected at the surface and poured to a pile: 33 degrees.
Sand layer above fine grained soil, Organic Silt (OL), silt with some clay, some fibrous organics, few debris and trash medium to low plasticity, soft, moist, assumed to be soft

The stream bed varied between sand and gravel to cobble bed conditions at different locations along the flowpath.

US Army Corps of Engineers Saint Paul District	PROJECT TITLE: Kinnickinnic River - Feasibility Study	COMPUTED BY: J. Hotstream	DATE: 11-Aug-23
	SUBJECT TITLE: Assumed Soil Parameters	CHECKED BY: J. Schneider	DATE: 16-Oct-23

Soil Properties - Sand and Gravel

UFC 3-220-10
1 February 2022

A correlation for the drained friction angle as a function of relative density, dry unit weight and soil type is presented in Figure 8-1.

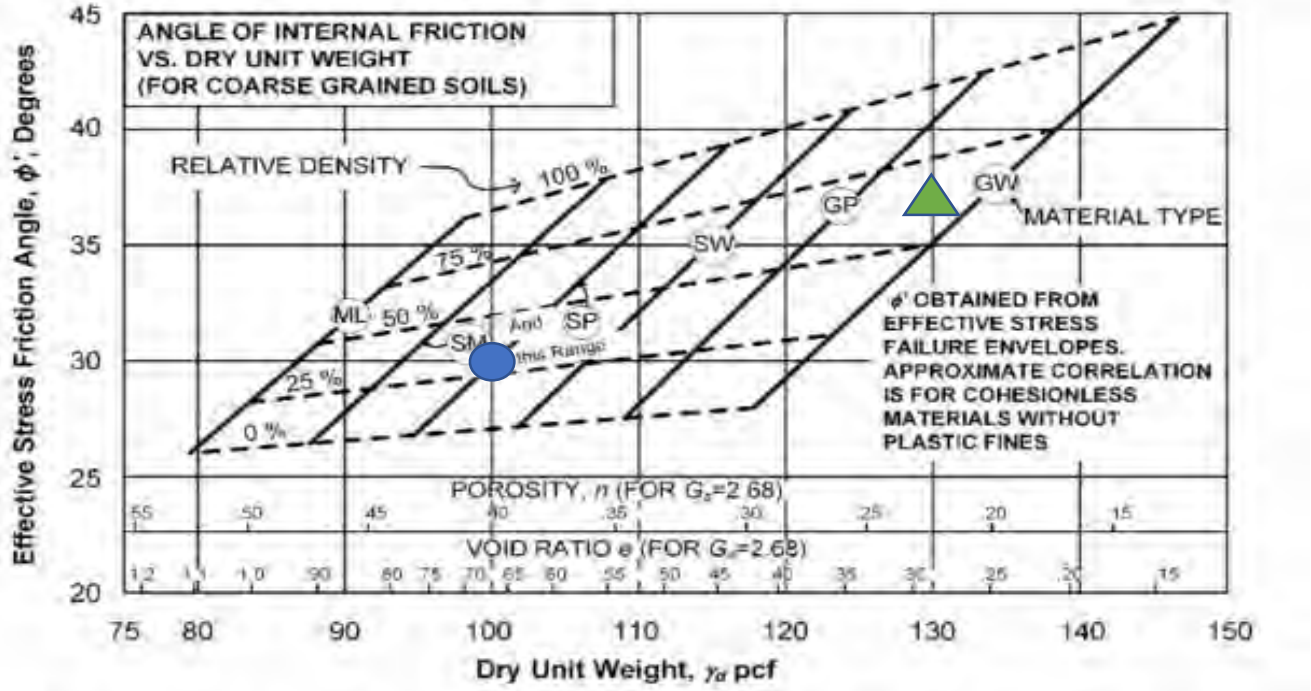


Figure 8-1 Approximate Relationship between the Effective Stress Friction Angle and Dry Unit Weight for Various Relative Densities and Types of Soil

Notes: Correlations for drained friction angle of fine-grained soils based on Unified Facilities Criteria Soil Mechanics DM 7.1 (2022)

Assuming a loose, poorly graded, fine-grained sand (blue dot in the reference graph above) results in the following properties:

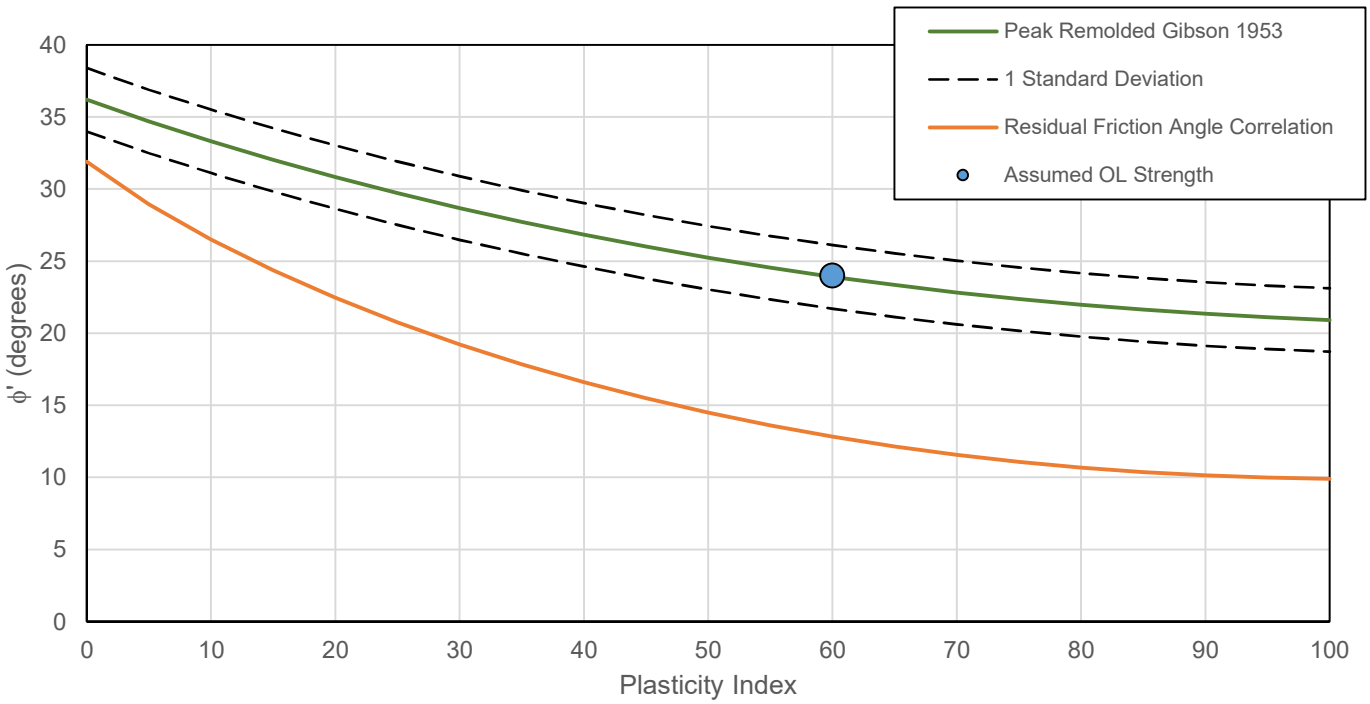
ϕ' = 30 degrees
γ_{dry} = 100 pcf
n = 0.4
γ_{sat} = 125 pcf
γ_{total} = 110 pcf (m_c=10%, assumed)

Assuming a medium dense, poorly graded to well graded gravel (green triangle in the reference graph above) results in the following properties:

ϕ' = 37 degrees
γ_{dry} = 130 pcf
n = 0.225
γ_{sat} = 144 pcf
γ_{total} = 140 pcf (m_c=8%, assumed)

US Army Corps of Engineers Saint Paul District	PROJECT TITLE: Kinnickinnic River - Feasibility Study	COMPUTED BY: J. Hotstream	DATE: 11-Aug-23
	SUBJECT TITLE: Assumed Soil Parameters	CHECKED BY: J. Schneider	DATE: 16-Oct-23

Soil Properties - Organic Silt



Notes: Correlations for drained friction angle of fine-grained soils based on Unified Facilities Criteria Soil Mechanics DM 7.1 (2022) and Carter and Bentley, Soil Properties and Their Correlations, 2nd. Ed. (2016).

Carter, Michael Bentley, Stephen P.. (2016). *Soil Properties and Their Correlations (2nd Edition).* John Wiley &

PI	ϕ' (deg.)
60	24

Assuming a soft organic silt, fine-grained sand (blue dot in the reference table above) results in the following properties:

undrained shear strength, s_u = 200 psf, assumed
Plasticity Indiex (PI) = 60, assumed
ϕ' = 24 degrees
c'= 20 psf, assumed
γ_{dry} = 90 pcf, assumed
e = 1.1
γ_{sat} = 112 pcf

CLAY/SILT STABILITY PLATES

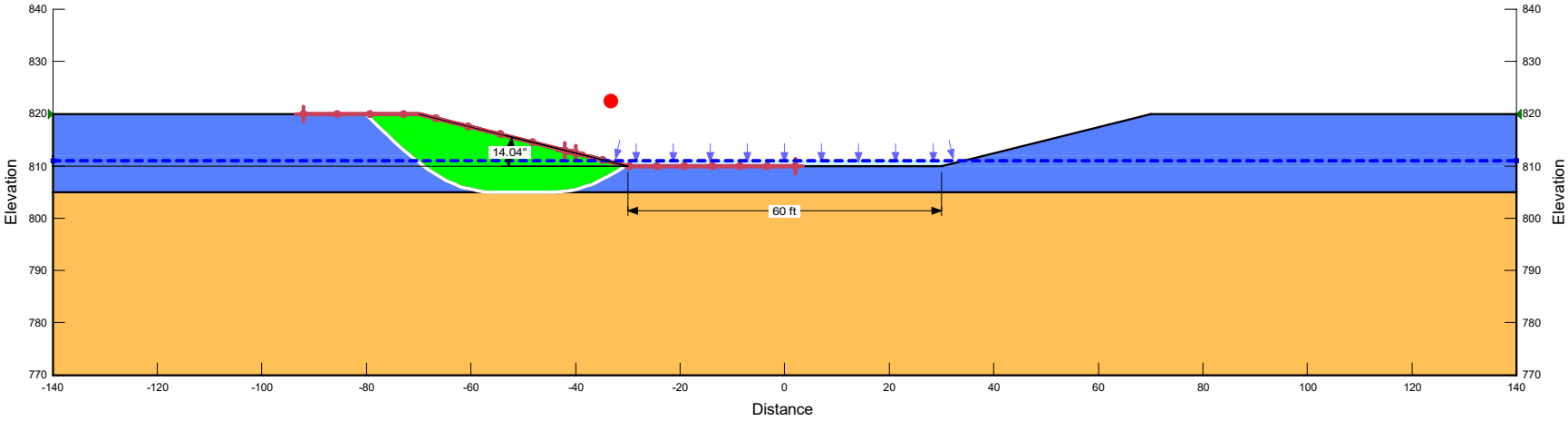
Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Channel Cross Section
Clay/Silt Profile

End of Construction Condition

River Depth: 1 Foot of Water

Analysis Type: Spencer

Factor of Safety: 1.42



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Total Cohesion (psf)	Piezometric Line
	Bedrock	Undrained (Phi=0)	140	10,000	1
	Organic Silt	Undrained (Phi=0)	112	200	1

File Name: clay_EOC.gsz; Analysis:1 Ft H20

12/28/2023 1:400

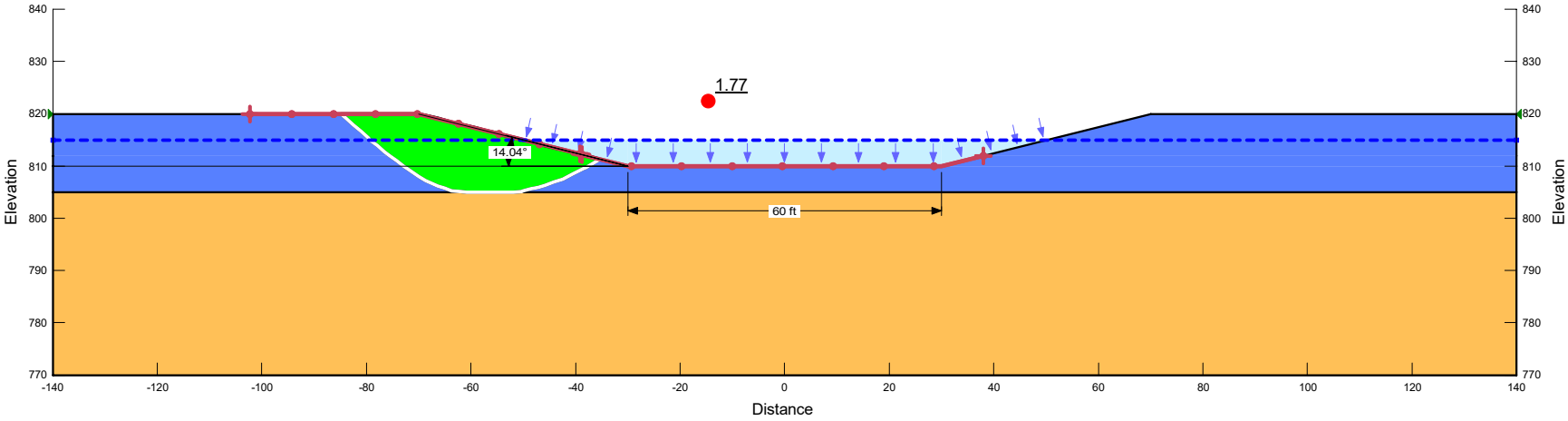
Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Channel Cross Section
Clay/Silt Profile

End of Construction Condition

River Depth: 5 feet of Water

Analysis Type: Spencer

Factor of Safety: 1.77



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Total Cohesion (psf)	Piezometric Line
	Bedrock	Undrained (Phi=0)	140	10,000	1
	Organic Silt	Undrained (Phi=0)	112	200	1

File Name: clay_EOC.gsz; Analysis:5 Ft H20

12/28/2023 1:400

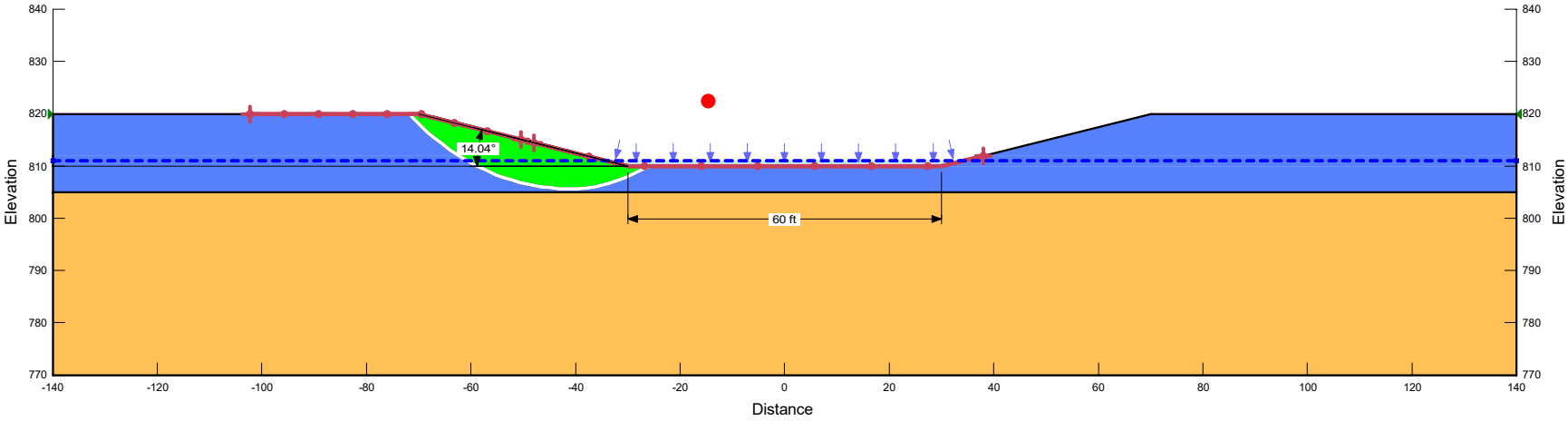
Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Channel Cross Section
Clay/Silt Profile

Long-Term Condition

River Depth: 1 Foot of Water

Analysis Type: Spencer

Factor of Safety: 1.83



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
	Bedrock	Mohr-Coulomb	140	10,000	0	0	1
	Organic Silt	Mohr-Coulomb	112	20	24	0	1

File Name: clay.gsz; Analysis:1 Ft H20

12/28/2023 1:400

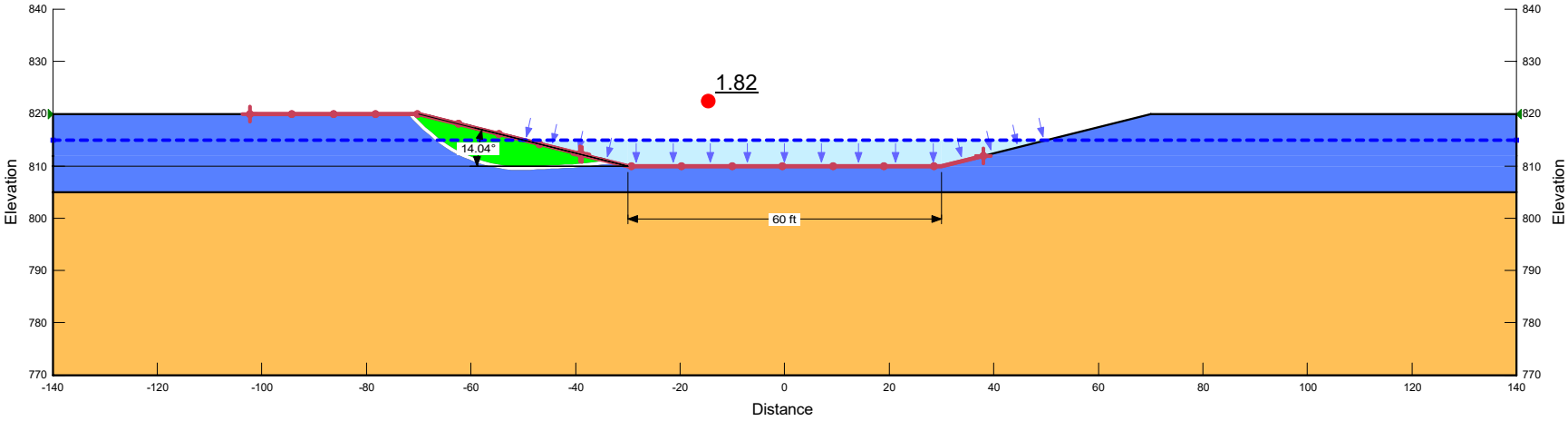
Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Channel Cross Section
Clay/Silt Profile

Long-Term Condition

River Depth: 5 feet of Water

Analysis Type: Spencer

Factor of Safety: 1.82



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
	Bedrock	Mohr-Coulomb	140	10,000	0	0	1
	Organic Silt	Mohr-Coulomb	112	20	24	0	1

File Name: clay.gsz; Analysis:5 Ft H20

12/28/2023 1:400

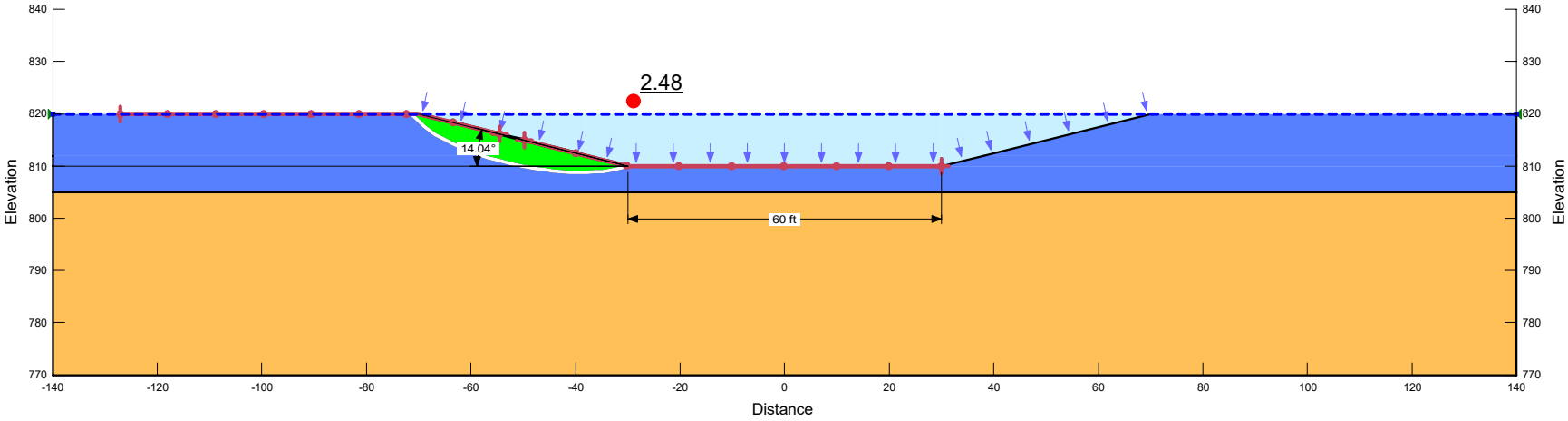
Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Channel Cross Section
Clay/Silt Profile

Long-Term Condition

River Depth: 10 Feet of Water

Analysis Type: Spencer

Factor of Safety: 2.48



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
	Bedrock	Mohr-Coulomb	140	10,000	0	0	1
	Organic Silt	Mohr-Coulomb	112	20	24	0	1

File Name: clay.gsz; Analysis:10 Ft H20

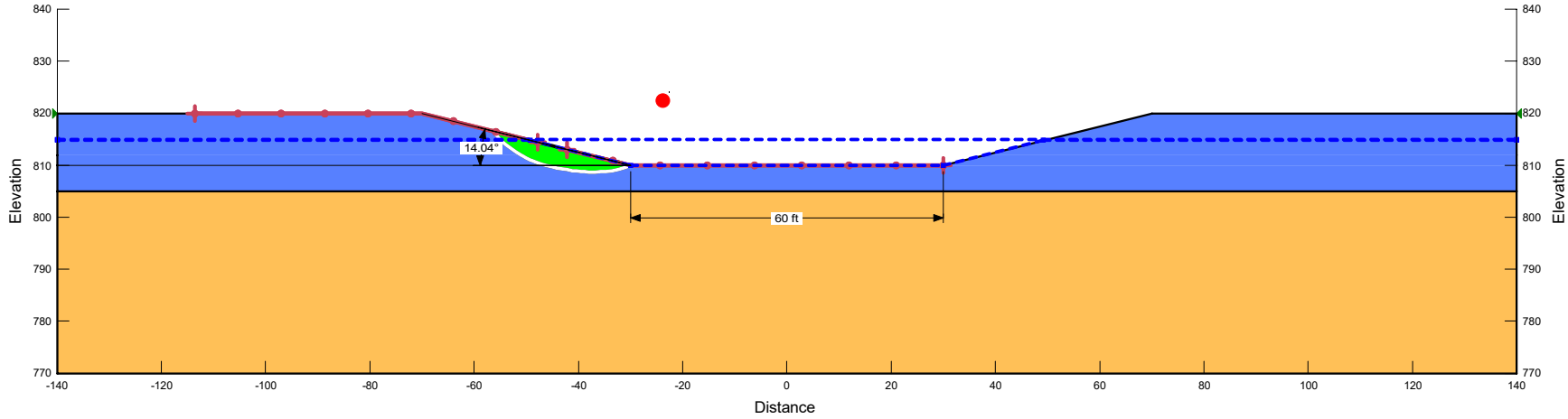
12/28/2023 1:400

Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Channel Cross Section
Clay/Silt Profile

Rapid Drawdown Analysis: 5 Feet of Water to 1 Foot of Water

Analysis Type: Spencer

Factor of Safety: 1.25



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Bedrock	Mohr-Coulomb	140	10,000	0	0	10,000	0	1	2
	Organic Silt	Mohr-Coulomb	112	20	24	0	200	0	1	2

File Name: clay.gsz; Analysis:5 Ft H20 RDD

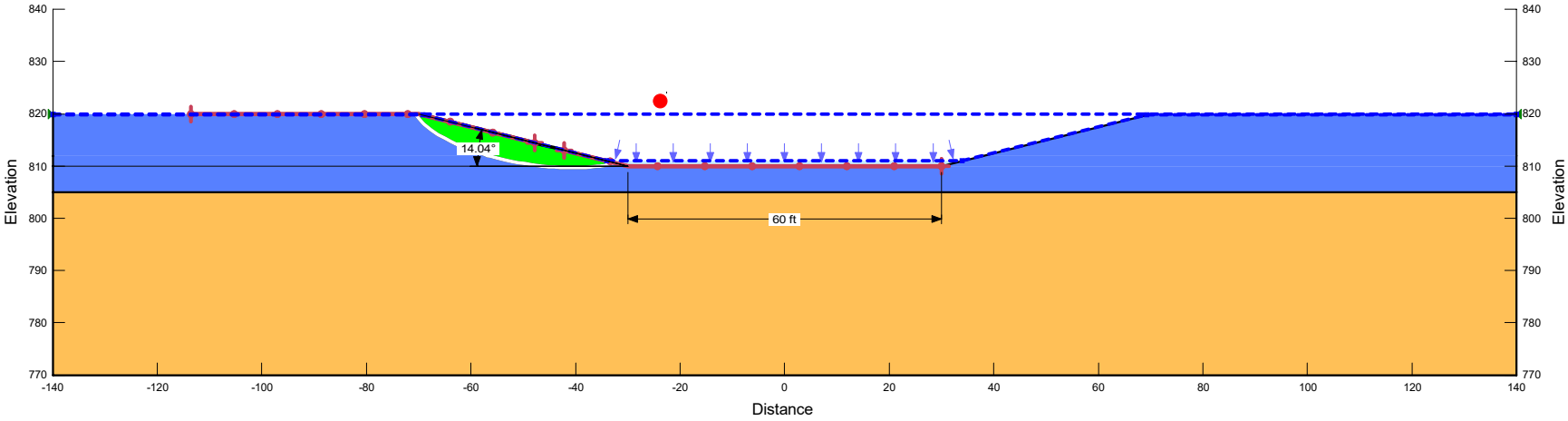
12/28/2023 1:400

Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Channel Cross Section
Clay/Silt Profile

Rapid Drawdown Analysis: Bankfull to 1 Foot of Water

Analysis Type: Spencer

Factor of Safety: 1.07



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Bedrock	Mohr-Coulomb	140	10,000	0	0	10,000	0	1	2
	Organic Silt	Mohr-Coulomb	112	20	24	0	200	0	1	2

File Name: clay.gsz; Analysis:10 Ft H20 RDD

12/28/2023 1:400

SAND STABILITY PLATES

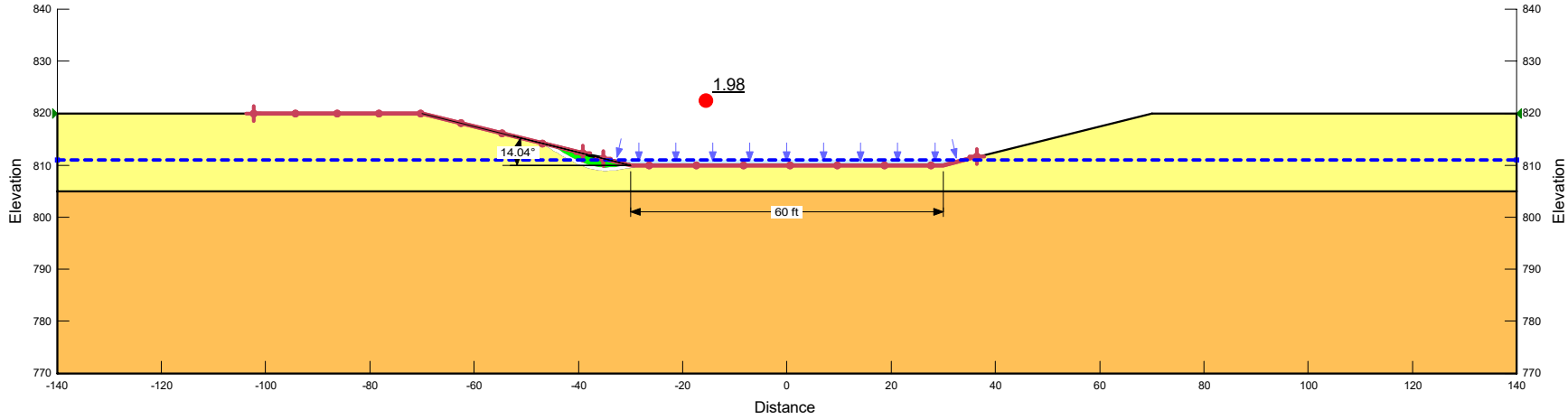
Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Channel Cross Section
Sand Profile

Long-Term Condition

River Depth: 1 Foot of Water

Analysis Type: Spencer

Factor of Safety: 1.98



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
	Bedrock	Mohr-Coulomb	140	10,000	0	0	1
	Loose Poorly Graded Sand	Mohr-Coulomb	110	0	30	0	1

File Name: Sand.gsz; Analysis:1 Ft H20

09/21/2023 1:400

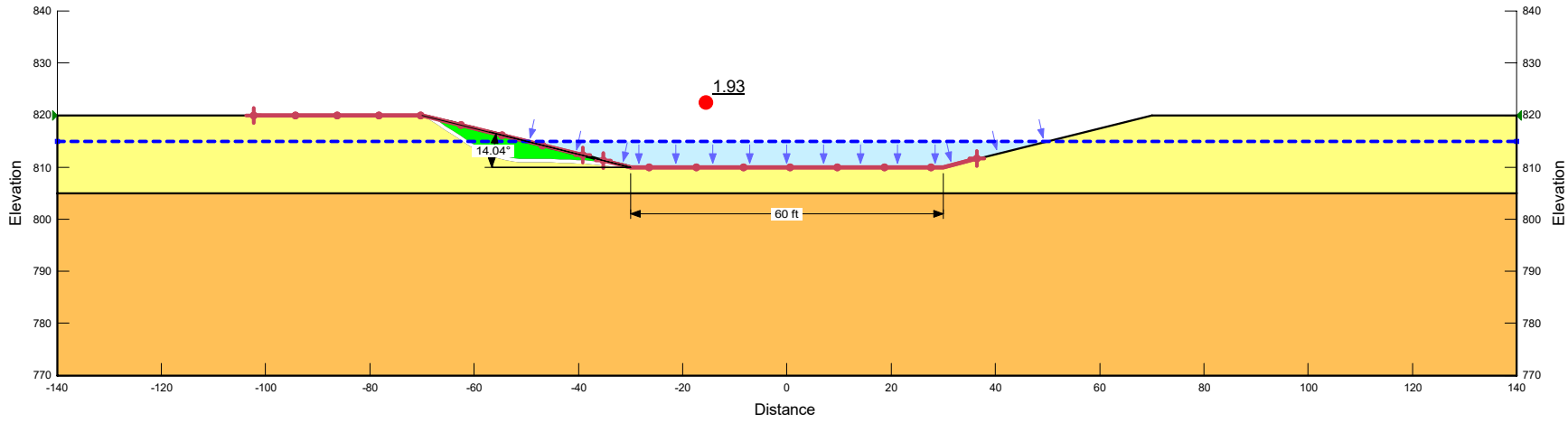
Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Channel Cross Section
Sand Profile

Long-Term Condition

River Depth: 5 feet of Water

Analysis Type: Spencer

Factor of Safety: 1.93



File Name: Sand.gsz; Analysis:5 Ft H20	
09/21/2023	1:400

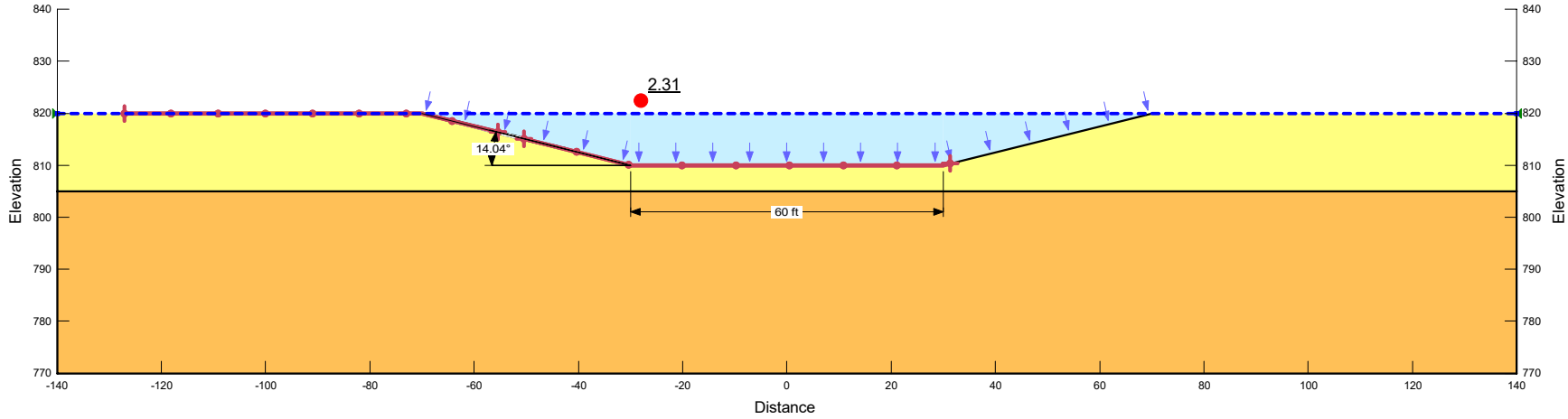
Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Channel Cross Section
Sand Profile

Long-Term Condition

River Depth: 10 Feet of Water

Analysis Type: Spencer

Factor of Safety: 2.31



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
	Bedrock	Mohr-Coulomb	140	10,000	0	0	1
	Loose Poorly Graded Sand	Mohr-Coulomb	110	0	30	0	1

File Name: Sand.gsz; Analysis:10 Ft H20

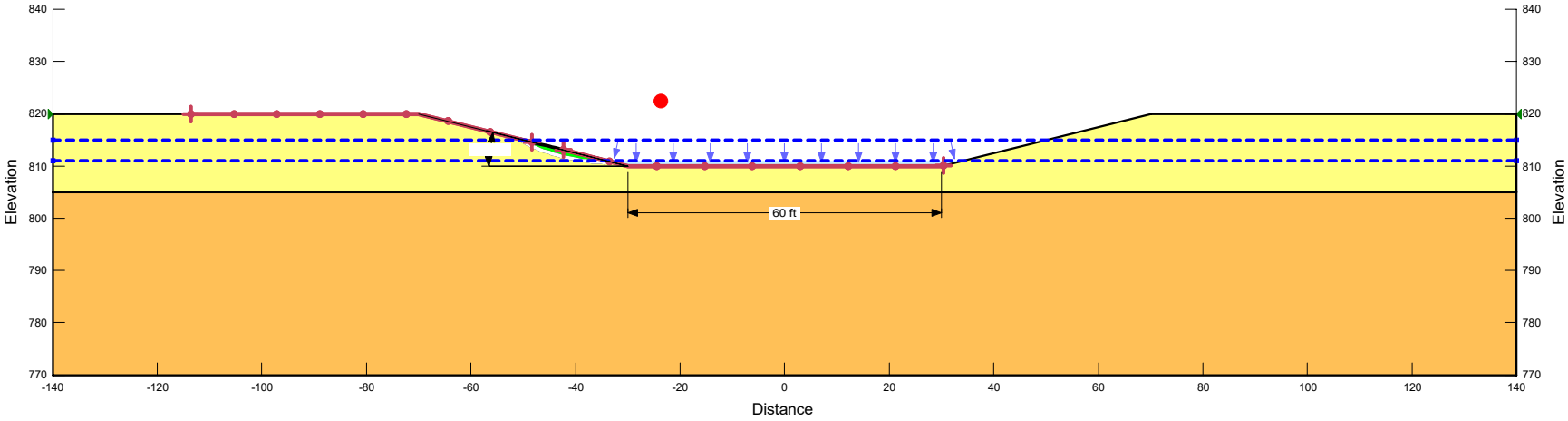
09/21/2023 1:400

Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Channel Cross Section
Sand Profile

Rapid Drawdown Analysis: 5 Feet to 1 Foot of Water

Analysis Type: Spencer

Factor of Safety: 1.30



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Bedrock	Mohr-Coulomb	140	10,000	0	0	10,000	0	1	2
	Loose Poorly Graded Sand	Mohr-Coulomb	110	0	30	0	1	28	1	2

File Name: Sand.gsz; Analysis:5 Ft H20 RDD

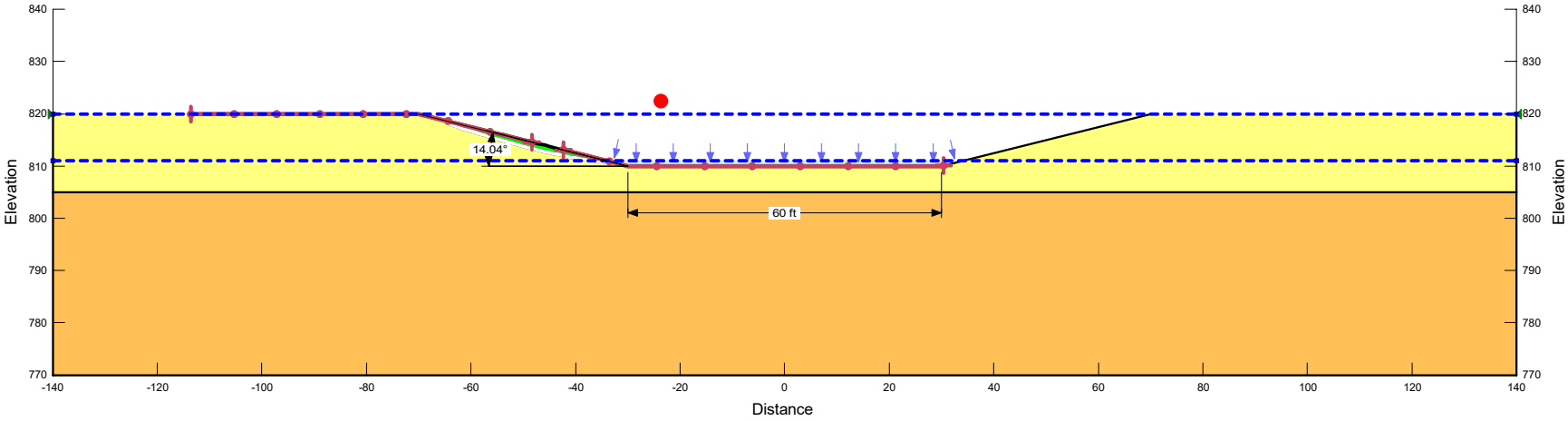
09/21/2023 1:400

Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Channel Cross Section
Sand Profile

Rapid Drawdown Analysis: Bankfull to 1 Foot of Water

Analysis Type: Spencer

Factor of Safety: 1.27



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Bedrock	Mohr-Coulomb	140	10,000	0	0	10,000	0	1	2
	Loose Poorly Graded Sand	Mohr-Coulomb	110	0	30	0	1	28	1	2

File Name: Sand.gsz; Analysis:10 Ft H20 RDD

09/21/2023 1:400

ACCESS ROAD STABILITY

US Army Corps of Engineers Saint Paul District	PROJECT TITLE: **Kinnickinnic River Restoration** By: J. Hotstream
	SUBJECT TITLE: **Preliminary Access Road to Junction Falls**

Introduction

Construction access is needed to the foot of the Junction Falls to support demolition of the dam. This is a preliminary layout of a potential access route from the North bank, at the power plant parking lot. The civil designer should check the assumed road constraints and layout the road following correct geometry when survey data of the slope is available.

Assumptions

Equipment for access:

- Large excavator
  - Tracks 12 feet wide by 18 feet long
- Off-road haul trucks (20 CY capacity) for removal of debris:
  - CAT 725: width 14 feet at mirrors, inside turning radius 12.75 feet, clearance radius 26.5 feet

Live load: Typical AASHTO is 250 psf. Used a 400 psf distributed load at 16 feet wide to account for heavy construction equipment loading. This loading was assumed and can be refined during detailed design.

Max slope of 15%, rough layout attempted a flat bench for the hairpin turn

Access road width 18 feet

Benching: assumed we can bench 2 feet into the slope, remove soil covering rock

Used lidar for topo of existing valley sidewall – USGS, aerial topographic lidar for Pierce County, collected 4/1/22 to 4/22/21, 2 foot digital elevation model (\\mvd\mvp\GIS_Data\dem\lidar\WI_County_2018_2023\Pierce_2021_2ft)

Minimum sideslope of 1.5H:1V used. Assume majority of backfill would be large riprap/rock fill with a finer crushed stone surfacing.

Start elevation at parking lot 872 feet NAVD88

End elevation at the dam 836 feet NAVD88

Access road to be removed at completion of dam removal project and restoration. We may be able to leave some of the rock in place to provide bench for recreational access down to the water.

Analysis

Developed 3 rough cross sections of the road and a cross section for the bench sloping down. Calculated the cross sectional area for each cross section and the bench. Added in volumes for the fill sloping down from the bench and the curve of fill around the corner.

Volume of rockfill approximately 6,500 CY

Volume of aggregate base for gravel road, assumed 2 feet thick, 450 CY

Also need to include a heavy geotextile below the aggregate road 650 square yards

For a less conservative value, consider that the rockfill was estimated near 6,150 CY and we can reduce the rockfill by the aggregate base value so, 6,150 CY – 450 CY = 5,700 CY. Reduce by an additional 100 CY for the volume taken up by the 2, 48-inch diameter culverts for a final rockfill quantity of 5,600 CY.

Discussion

Consider adding erosion and sediment BMPs at the top of slope including: perimeter control and trackout control

Grubbing for the access road entry

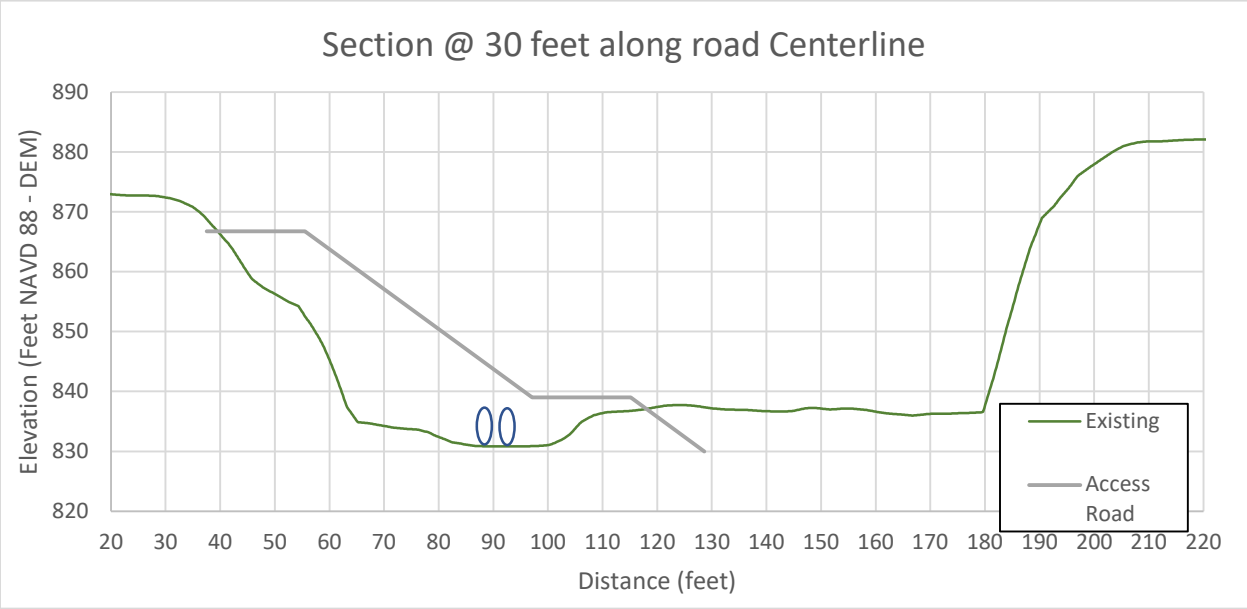
Will need to remove tree near the parking lot.

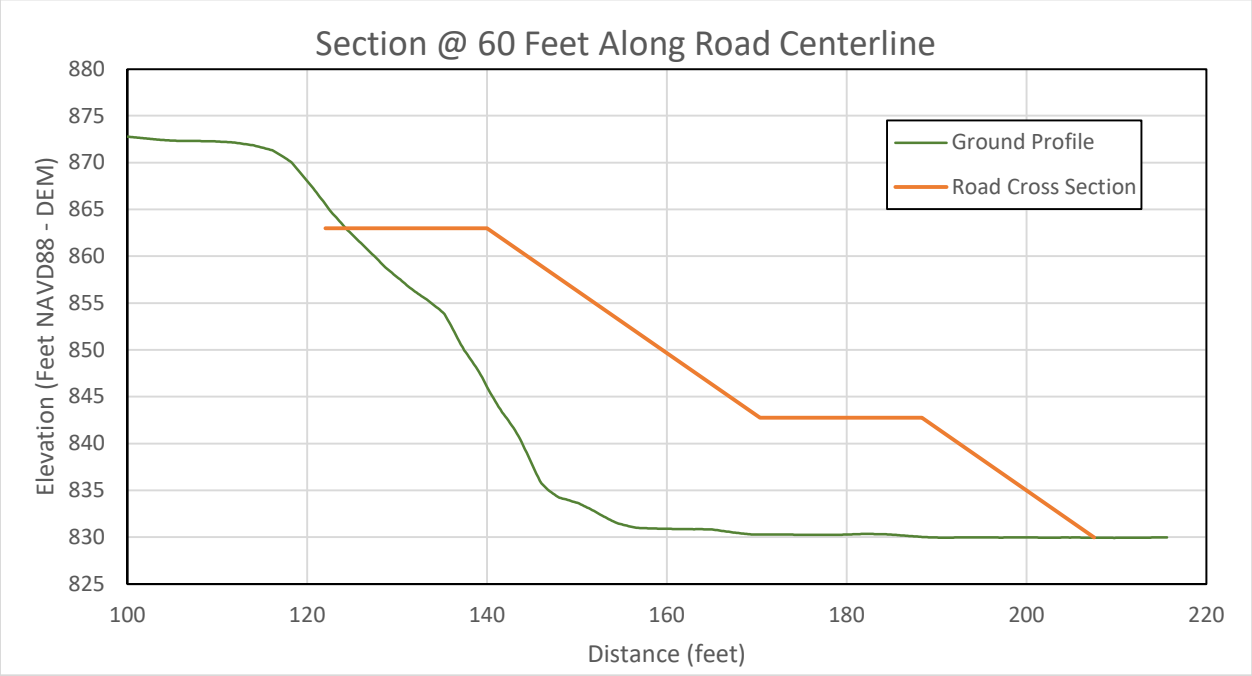
Site restoration will be needed at the top of slope: repair pavement, replace top soil and reseed

Access Road Water Management: Consider adding culverts for 150 feet of the access road. Two 48-inch diameter culverts shown. Note that this was not sized for hydraulic constraints.

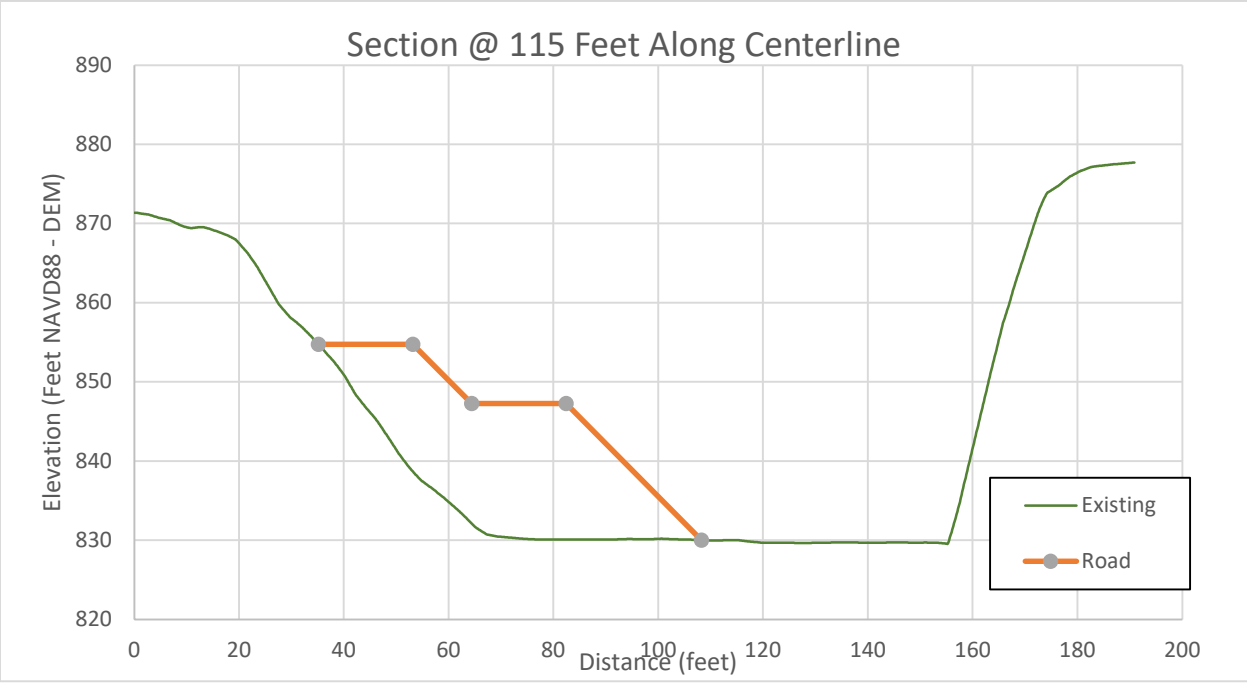
In the river we should include some perimeter controls and sed traps to assist limiting sediment transport downstream.

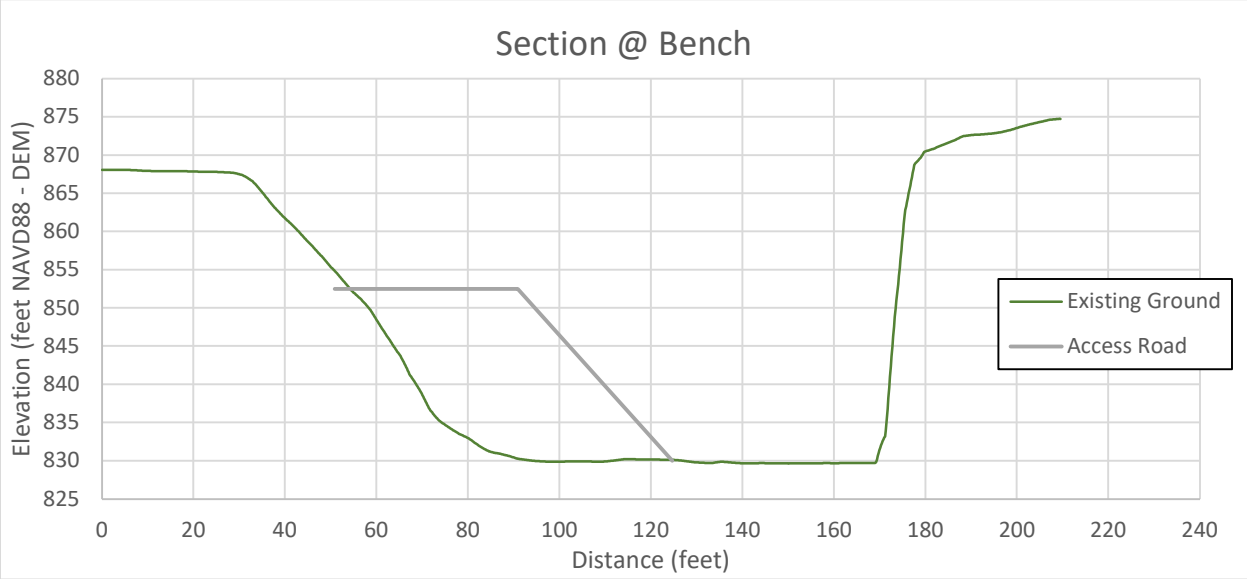
US Army Corps of Engineers Saint Paul District	PROJECT TITLE: **Kinnickinnic River Restoration**	By: J. Hotstream
	SUBJECT TITLE: **Preliminary Access Road to Junction Falls**	





US Army Corps of Engineers Saint Paul District	PROJECT TITLE: **Kinnickinnic River Restoration**	By: J. Hotstream
	SUBJECT TITLE: **Preliminary Access Road to Junction Falls**	





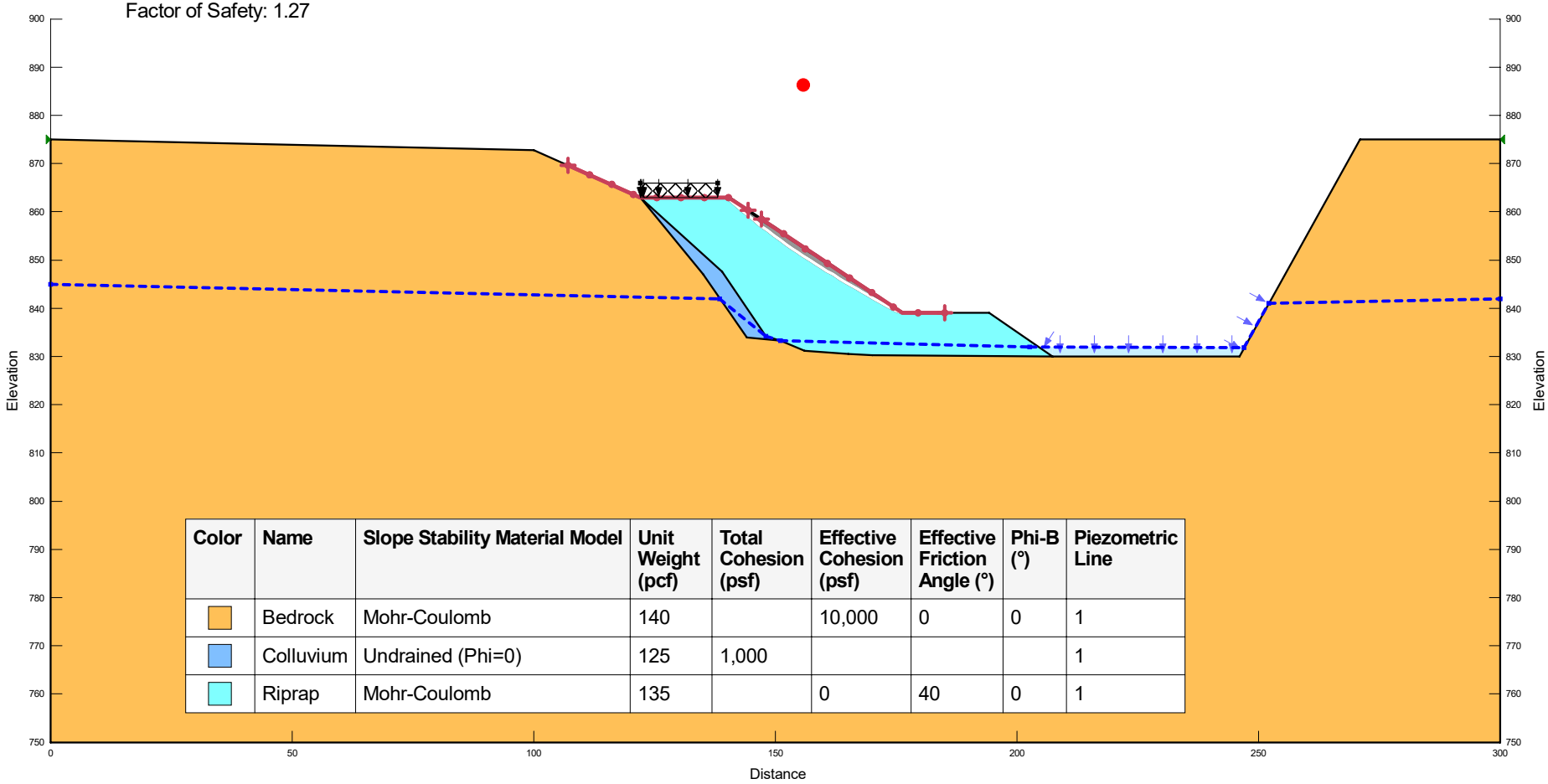
Kinnickinnic River: Aquatic Ecosystem Restoration and Protection Project
Global Stability Analysis: Proposed Access Road

Long-Term Condition

River Depth: 2 Feet of Water

Analysis Type: Spencer

Factor of Safety: 1.27



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Total Cohesion (psf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
	Bedrock	Mohr-Coulomb	140		10,000	0	0	1
	Colluvium	Undrained (Phi=0)	125	1,000				1
	Riprap	Mohr-Coulomb	135		0	40	0	1

File Name: Access Road.gsz; Analysis:Upper Bench, 2 Ft H

09/27/2023 1:400

Attachment D-6: Existing Bridge Information

INDEX OF SHEETS

Sheet No. 1 Title
Sheet No. 2-2.4, 3B Typical Sections and Details
Sheet No. 3-3.3 Estimate of Quantities
Sheet No. 3A-3B Miscellaneous Quantities
Sheet No. 4-4.1 Right of Way Plat
Sheet No. 5-5.4 Plan and Profile
Sheet No. 6-6.12 Standard Detail Drawings
Sheet No. - Sign Plates
Sheet No. 8 -8.2 Structure Plans
Sheet No. - Computer Earthwork Data
Sheet No. 9-9.5 Cross Sections

TOTAL SHEETS = 66

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

PLAN OF PROPOSED IMPROVEMENT

WINTER STREET, CITY OF RIVER FALLS

JUNCTION FALLS/KINNICKINNIC RIVER BRIDGE AND APPROACHES

LOCAL STREET

PIERCE COUNTY

STATE PROJECT	FEDERAL PROJECT	
	PROJECT	CONTRACT
1000-76-42	—	—

AS BUILT

*STATE PROJECT NUMBER
1000-76-42

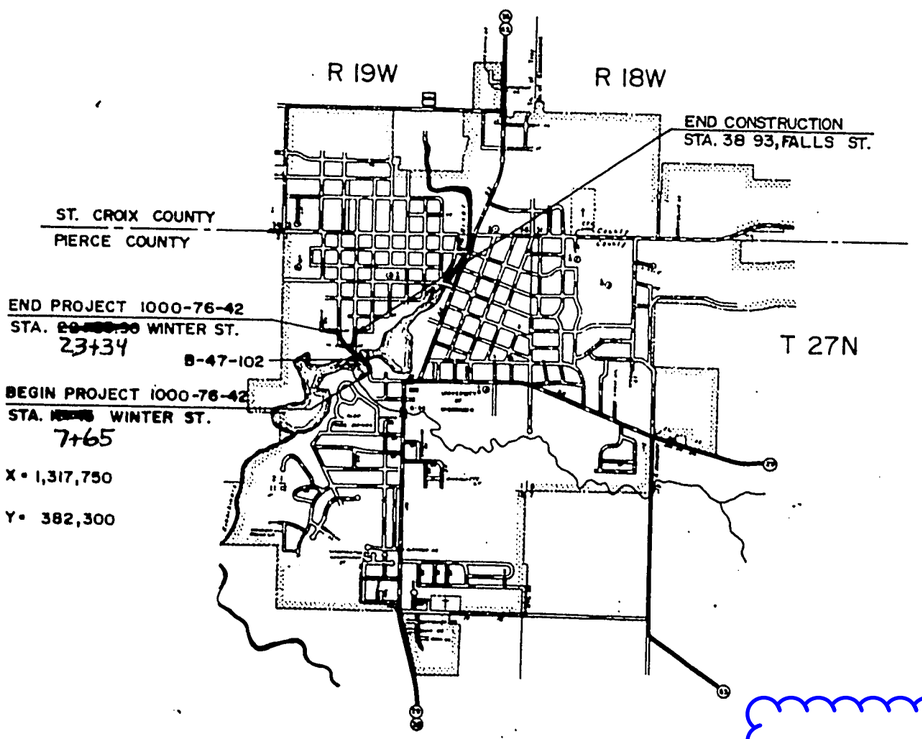
DESIGN DESIGNATION

A.D.T.	1991	=	2450
A.D.T.	2011	=	3200
D.H.V.	2011	=	600
D.	%	=	60-40
T.	%	=	4.0
V.	MPH	=	30
ESAL'S		=	350,400

CONVENTIONAL SIGNS

COUNTY LINE
CORPORATE LIMITS
PROPERTY LINE
LOT LINE
LIMITED EASEMENT
EXISTING RIGHT OF WAY
NEW RIGHT OF WAY
REFERENCE LINE
LOPE INTERCEPT
IGINAL GROUND
ASH OR ROCK PROFILE
.VERT IN PLACE
.VERT REQUIRED
/ERT REQUIRED (Profile)

COMBUSTIBLE FLUIDS (UNDER PRESSURE)
UNDERGROUND UTILITIES
GAS
ELECTRIC
TELEPHONE
SERVICE PEDESTAL
CABLE MARKER
POWER POLE
TELEPHONE POLE
RAILROADS
MARSH
WOODED AREA



TOTAL NET LENGTH OF CENTERLINE = 0.152 MI. PARTICIPATING URBAN
0.058 MI. NON-PARTICIPATING URBAN
0.210 MI. TOTAL

COORDINATE NOTE:
ALL COORDINATES ARE REFERENCED TO THE WISCONSIN COORDINATE SYSTEM CENTRAL ZONE AND SCALED FROM U.S.G.S. TOPOGRAPHIC MAP RIVER FALLS WEST WISCONSIN QUADRANGLE FOR IDENTIFICATION ONLY.

PLANS PREPARED BY
HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

WISCONSIN
DONALD W. STERNA
E-25405
MINNEAPOLIS
PROFESSIONAL ENGINEER

DATE FEB 27, 1991

APPROVED FOR
CITY OF RIVER FALLS

2/21/91
DATE

MAYOR

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

Surveyor _____ District Checker BJF
Designer _____ C.O. Plan Examiner _____
District Supervisor CBL C.O. Coordinator _____

APPROVED:
DATE: 4/4/91
DISTRICT CHIEF DESIGN ENGINEER

APPROVED:
DATE: 5/15/91
REGIONAL CHIEF ROAD DESIGN ENGINEER

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION 5 WISCONSIN DIVISION

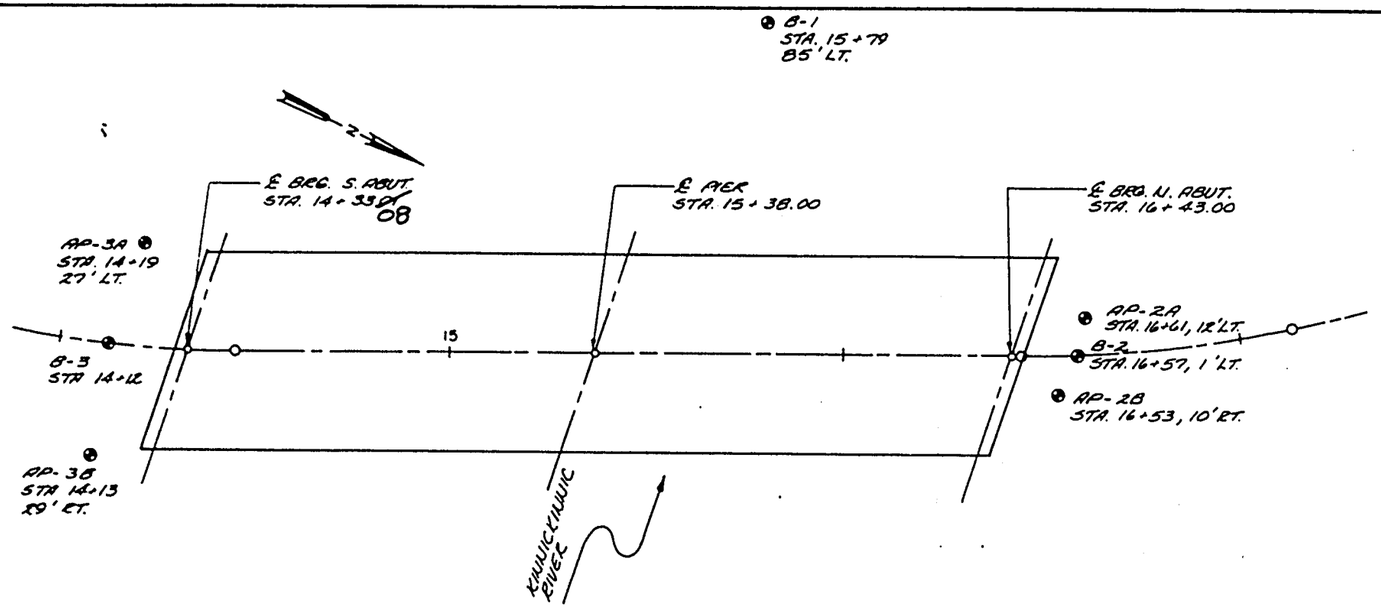
APPROVED:
DATE: _____
DIVISION ADMINISTRATOR

1000CORD.DGN

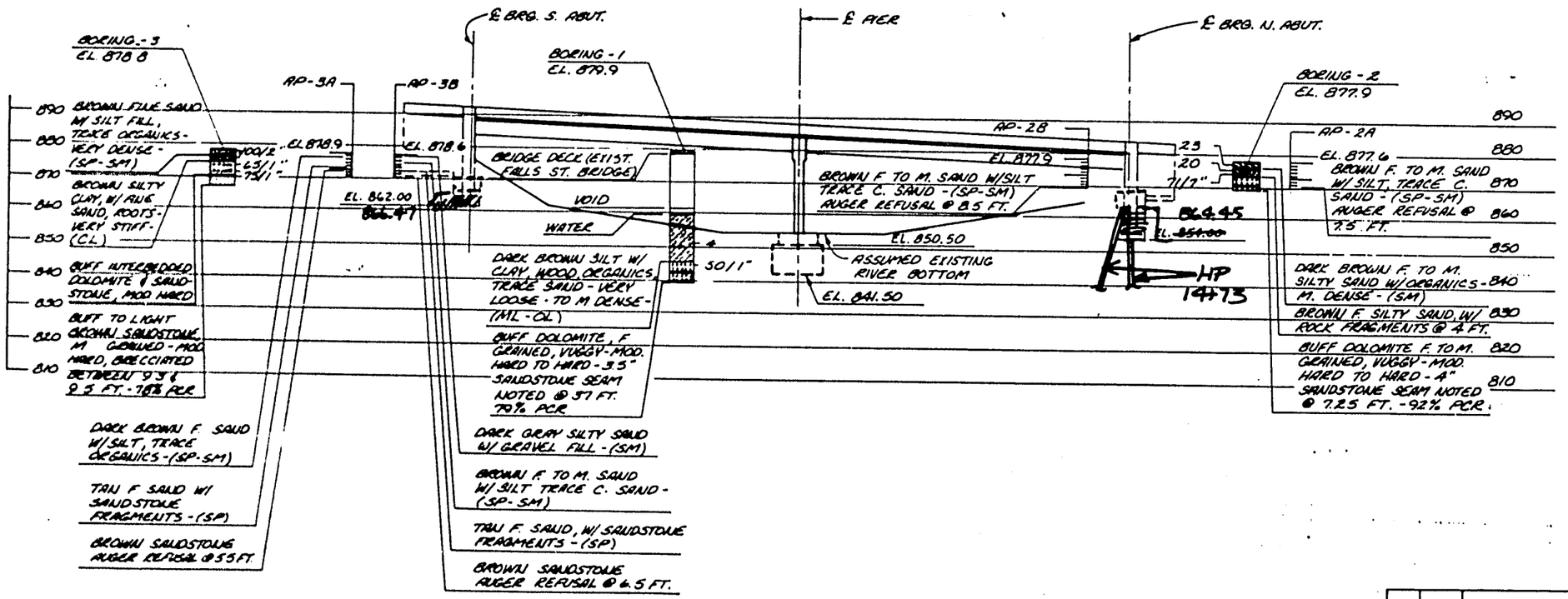
WISDOT/CADDS SHEET 10

10-76-42 PIERCE

STATE PROJECT I.D.	SHEET NUMBER
1000-76-42	8.2



BORING LOCATION PLAN



LOG OF BORINGS

ABBREVIATIONS

F - Fine M - Medium C - Coarse
Ws - Weathered So - Sound

MATERIAL SYMBOLS

Topsoil, Sand, Gravel, Silt, Peat, Clay, Sandstone, Limestone, Igneous Rock

LEGEND OF PROBING

95/6 - 95 Blows for 6" Penetration
Probing taken with a 350# wt. Falling 18" on a 2" O.D. Point.

Probing No.
Sta.
Elevation
7 Average Blows Per Foot
Refusal 95/6

LEGEND OF BORING

Boring No.
Sta.
Elev.
Unconfined Strength — 7.7
Blows Per Ft. Using 140# Wt. Falling 30"
Wash Sample
Shelby Tube — S. T.
Ground Water Elevation
No Ground Water Observed Above This Elevation
Sandy Gravel
F. Sand
Boulders or Cobbles
Silty Clay
So Limestone

Unless otherwise specified, the blows per foot at the locations indicated are based on driving a 2" O. D. x 1.4" I. D. split spoon sampler with a 140# hammer having a free fall of 30". The blow count is taken in undisturbed soil immediately below a cased or open hole eliminating side friction on the drive pipe.

SUBSURFACE EXPLORATION FOR FOUNDATION DESIGN AND BIDDERS INFORMATION

To obtain relative data concerning the character of material in and upon which the foundation might be built, borings and/or soundings were made at points approximately as indicated on this drawing. The data presented herein represents the findings of the subsurface explorations made. However, because the depths investigated are limited and the area of the borings and/or soundings is very small in relation to the entire area, the Division of Highways does not warrant conditions below the depths investigated or that the classification of material encountered in these investigations is necessarily typical of the entire site.

No.	Date	Revisions	By

HOWARD NEEDLES TAMMEN BERGENDOFF

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

STRUCTURE B-47-102

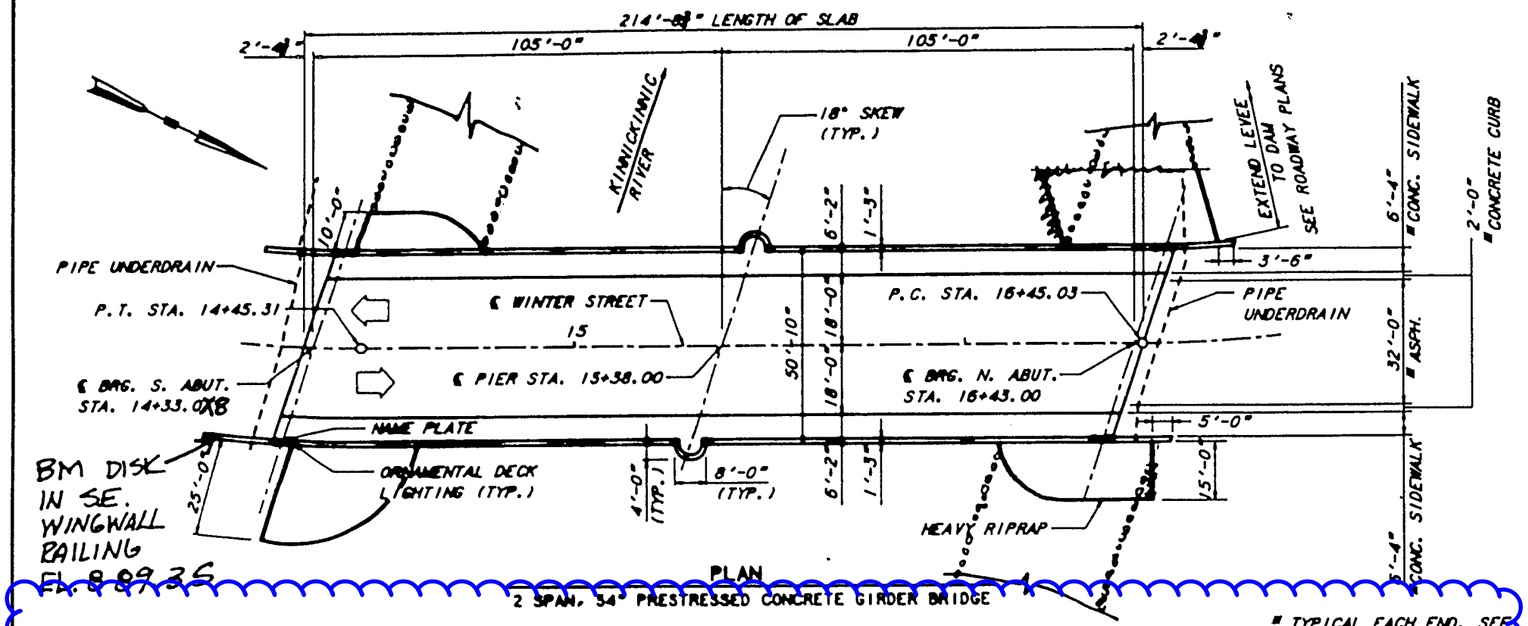
Const. Spec. 1989	Drawn By UCH	Checked By MDS

SUBSURFACE EXPLORATION

SHEET 3 OF 29

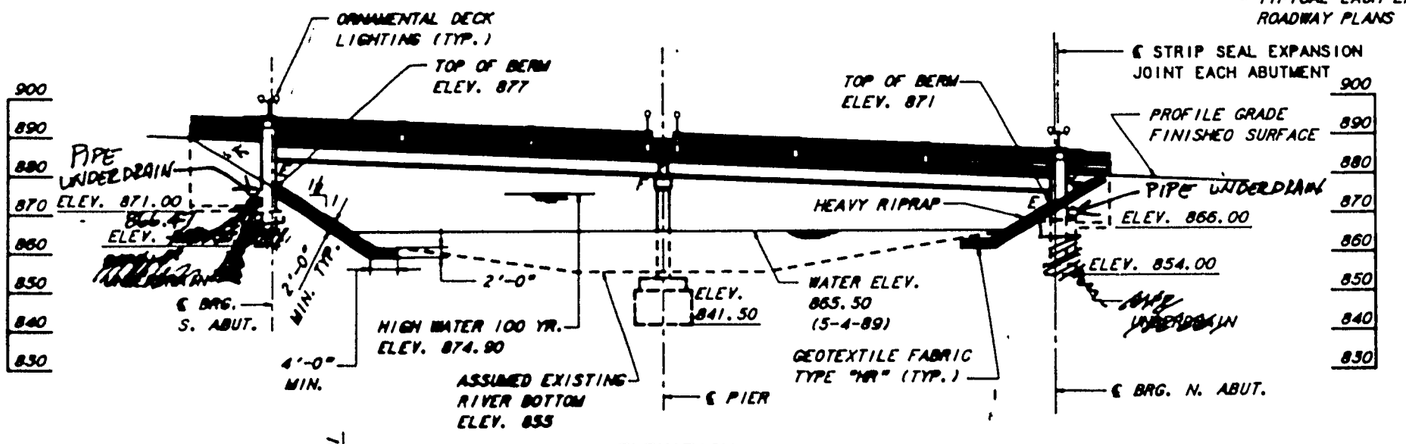
X83342

STATE PROJECT I.D.	SHEET NUMBER
1000-76-42	8.0

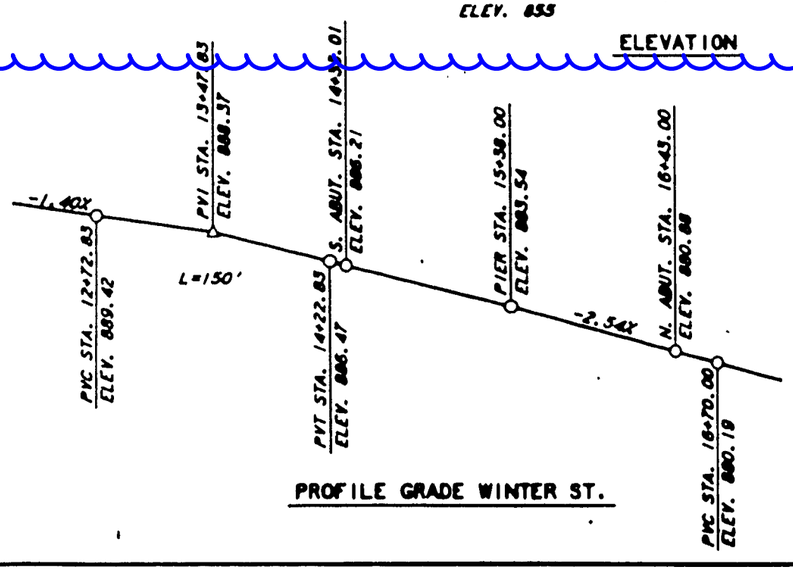


PLAN

2 SPAN, 54" PRESTRESSED CONCRETE GIRDER BRIDGE



ELEVATION



PROFILE GRADE WINTER ST.

℄ WINTER STREET CURVE DATA

CURVE 1		CURVE 2	
P.C.	= 12+02.10	P.C.	= 16+45.03
P.T.	= 14+45.31	P.T.	= 17+13.27
Δ	= 46°12'37.1"	Δ	= 12°57'58.3"
D	= 19°00'00.0"	D	= 19°00'00.0"
L	= 243.21	L	= 68.24'
T	= 128.66'	T	= 34.27'
R	= 301.56	R	= 301.56'

GENERAL NOTES:

DRAWINGS SHALL NOT BE SCALED.

THE SLOPE OF THE FILL IN FRONT OF THE ABUTMENTS SHALL BE COVERED WITH HEAVY RIPRAP TO THE EXTENT SHOWN ON THIS SHEET AND THE ABUTMENT DETAILS.

ALL DETAILS MATERIALS AND FABRICATION SHALL CONFORM TO THE STANDARD SPECIFICATION FOR ROAD AND BRIDGE CONSTRUCTION OF THE STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION, EDITION 1989, EXCEPT AS OTHERWISE NOTED.

ALL ELEVATIONS ARE REFERRED TO USGS DATUM.

NORMAL TEMPERATURE IS 45° F.

BEVEL EXPOSED EDGES OF EXPOSED CONCETE 1" UNLESS OTHERWISE NOTED.

BENDING DIMENSIONS FOR REINFORCEING BARS ARE OUT TO OUT.

THE FIRST DIGIT OF A THREE DIGIT BAR MARK OR THE FIRST TWO DIGITS OF A FOUR DIGIT BAR MARK INDICATES THE SIZE OF BAR.

REINFORCING BARS SHALL BE TAGGED SO THE THE STRUCTURE UNIT IN WHICH THEY ARE TO BE PLACED IS IDENTIFIED.

USE 2" CLEAR FOR ALL REINFORCEMENT UNLESS OTHERWISE NOTED.

THE TOP MAT OF REINFORCING BARS IN THE DECK SLAB, ALL MEDIAN AND PARAPET BARS ON THE BRIDGE AND WING WALLS AND BARS IN THE ABUTMENT PAVING NOTCH SHALL BE EPOXY COATED.

JOINT FILLER SHALL CONFORM TO AASHTO DESIGNATION N153, TYPE I, II AND III, OR AASHTO DESIGNATION M213.

THE FINISHED GRADE SECTION SHALL BE THE UPPER LIMITS OF "EXCAVATION FOR STRUCTURE."

AT ABUTMENTS ALL SPACES EXCAVATED BUT NOT OCCUPIED BY THE NEW STRUCTURE SHALL BE BACKFILLED WITH GRANULAR BACKFILL, GRADE 1.

ELASTOMERIC BEARING PADS NEED NOT BE INDIVIDUALLY MOLDED PROVIDED THE CUTS ARE SMOOTH AND TRUE.

BRIDGE REMOVAL NOTES

THE EXISTING BRIDGE (P-47-714) IS A 179.5 FT. LONG SINGLE SPAN THROUGH STEEL TRUSS WITH A 23.3 FT. CLEAR WIDTH AND A 5.7 FT. SIDEWALK LOCATED WEST OF THE PROPOSED ALIGNMENT.

PLANS FOR THE EXISTING BRIDGE ARE AVAILABLE FOR INSPECTION AT:

WISCONSIN DEPARTMENT OF TRANSPORTATION, DISTRICT 6
718 W. CLAIREMONT AVENUE
EAU CLAIRE, WISCONSIN 54701

BENCH MARK

USC&GS DISK (BM 411-A MARKED "RAILROAD COMMISSION OF WIS." SET IN THE TOP OF THE HIGH POINT OF A ROCK LEDGE AT THE JUNCTION OF THE KINNICKINNIC AND THE SOUTH FORK ON THE LEFT BANK OF THE KINNICKINNIC AND THE RIGHT BANK OF THE SOUTH FORK, EL. 867.176 FEET MSL.

BRIDGE OFFICE CONTACT: DAVE BABLER
(608) 266-8486

WISCONSIN PROFESSIONAL ENGINEER 2-27-91

No.	Date	Revisions	By

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

Structure B-47-102

WINTER STREET OVER KINNICKINNIC RIVER

County	PIERCE	City	RIVER FALLS
Design Spec.	AASHTO 1989	Load	HS20
Const. Spec.	1989		
Designed By	MDS	Design Checked	RMJ
Drawn By	SEO	Plans Checked	MDS

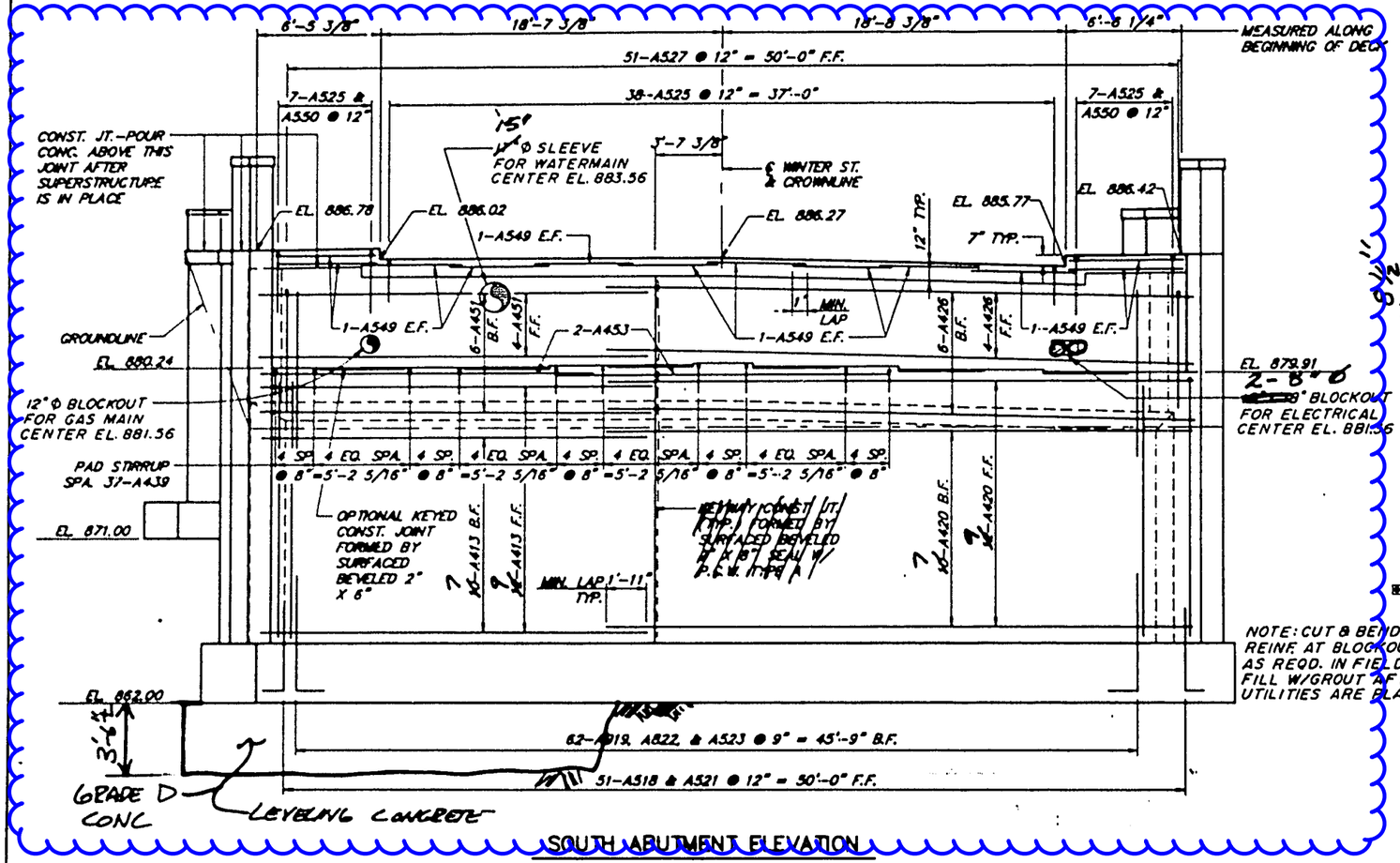
Approved Stanley W. Woods 5/15/91
State Bridge Engineer — Date

GENERAL PLAN AND ELEVATION

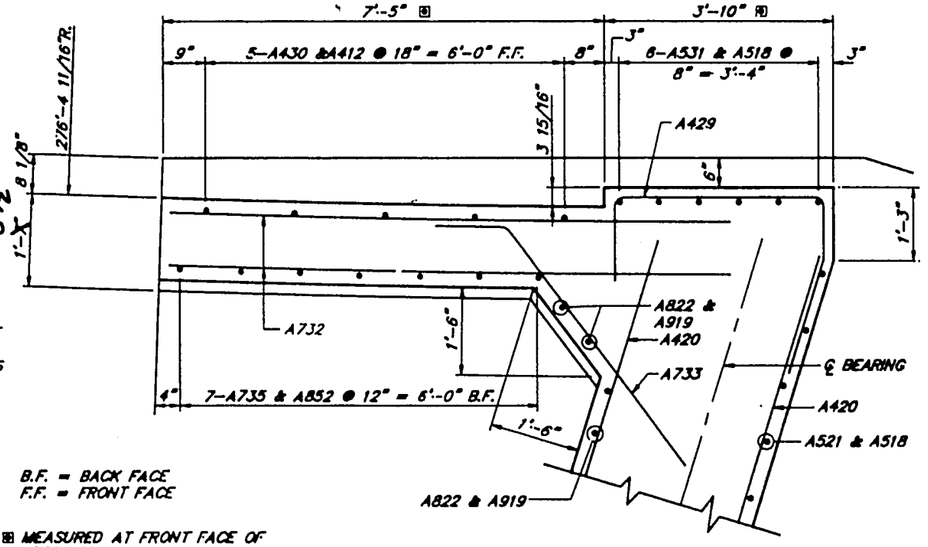
SHEET 1 OF 29

X83342

STATE PROJECT I.D.	SHEET NUMBER
1000-76-42	8.4



SOUTH ABUTMENT ELEVATION

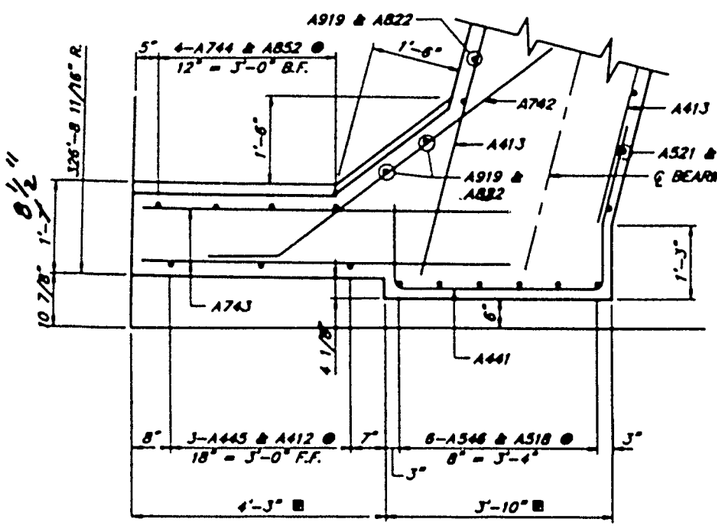


B.F. = BACK FACE
F.F. = FRONT FACE

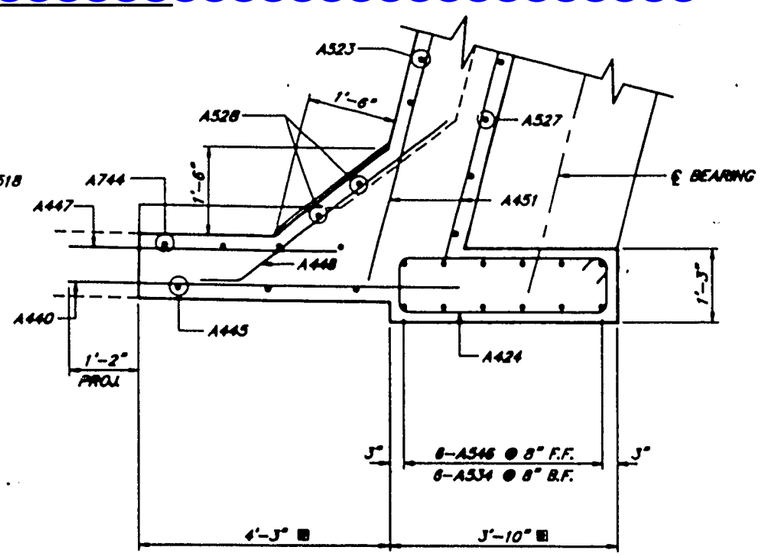
⊞ MEASURED AT FRONT FACE OF WINGWALL

S.W. CORNER STEM SECTION

S.W. CORNER PARAPET SECTION



S.E. CORNER STEM SECTION



S.E. CORNER PARAPET SECTION

No.	Date	Revisions	By

HOWARD NEEDLES TAMMEN BERGENDOFF

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

STRUCTURE B-47-102

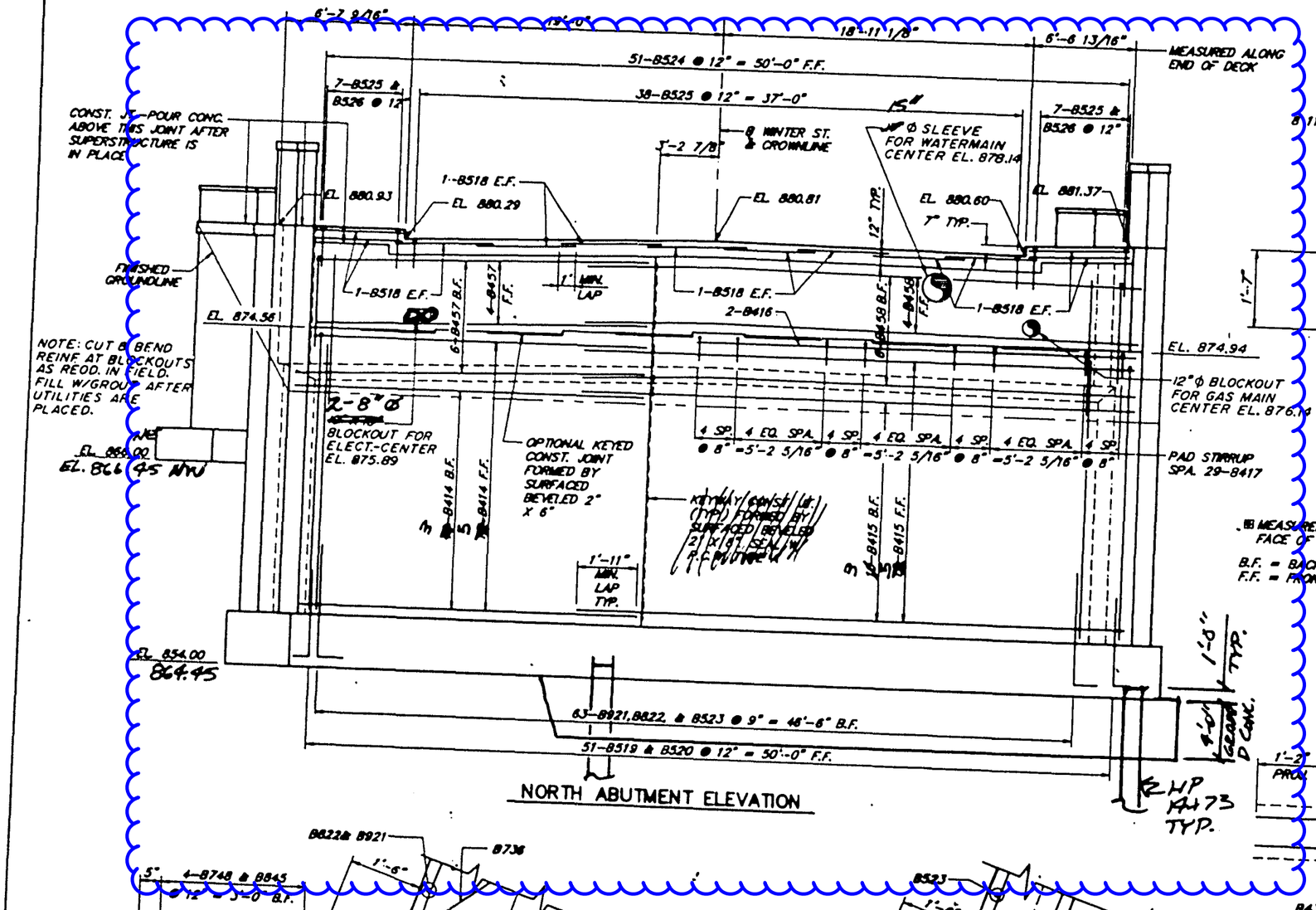
Comm. Spec. 1989 | Drawn By MJF | Checked By DLC

SOUTH ABUTMENT ELEV. & DETAILS

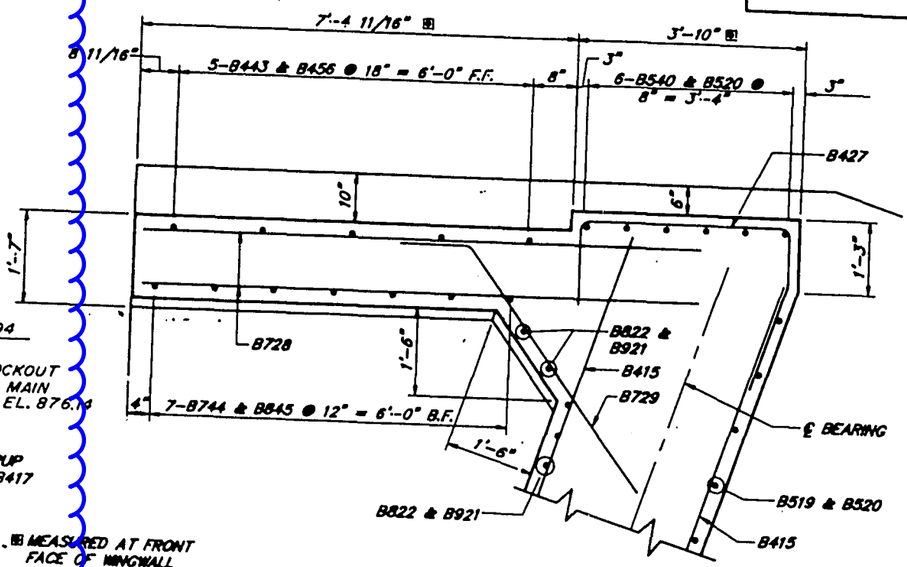
SHEET 5 OF 29

X83342

STATE PROJECT I.D.	SHEET NUMBER
1000-76-42	8.7

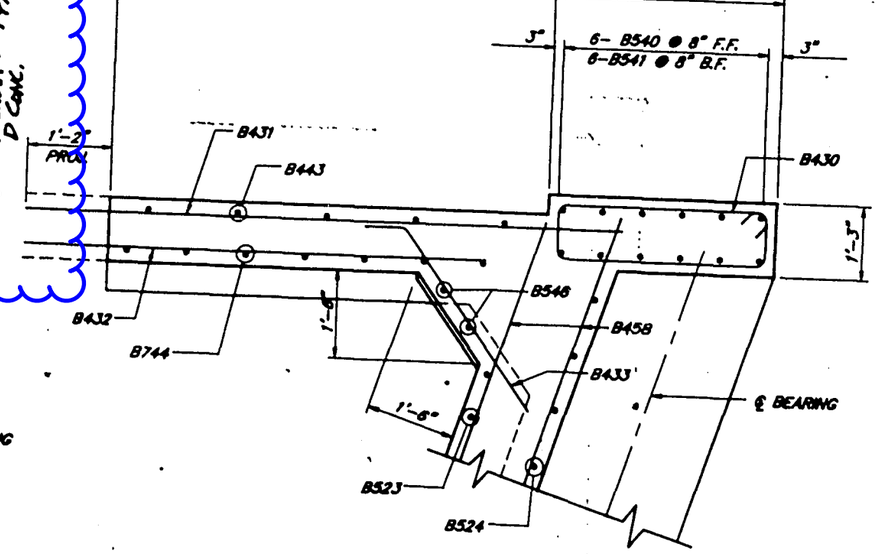


NORTH ABUTMENT ELEVATION

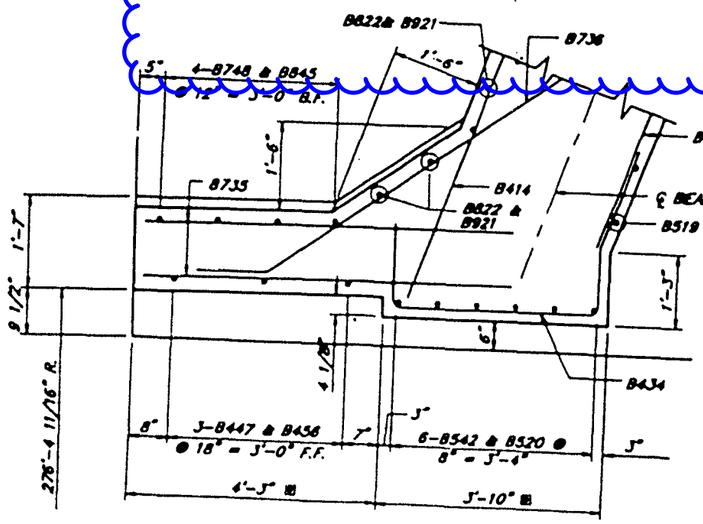


N.E. CORNER STEM SECTION

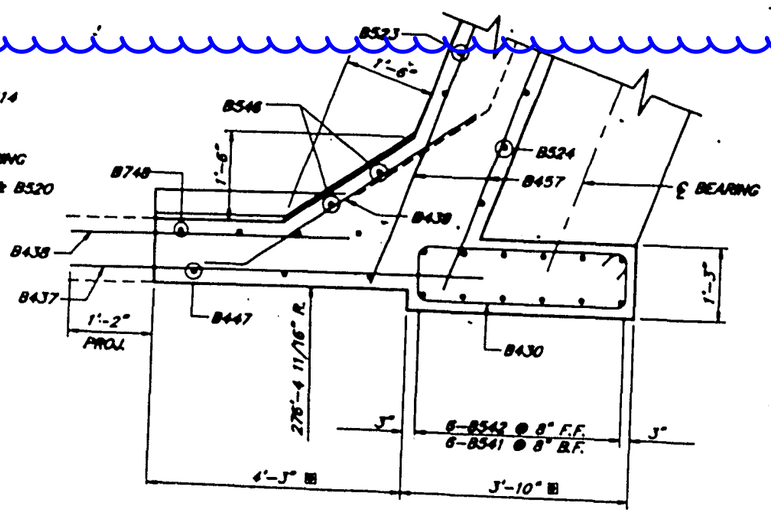
▣ MEASURED AT FRONT FACE OF WINGWALL
B.F. = BACK FACE
F.F. = FRONT FACE



N.E. CORNER PARAPET SECTION



N.W. CORNER STEM SECTION



N.W. CORNER PARAPET SECTION

No.	Date	Revisions	By

HOWARD NEEDLES TAMMEN BERGENDOFF

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

STRUCTURE B-47-102

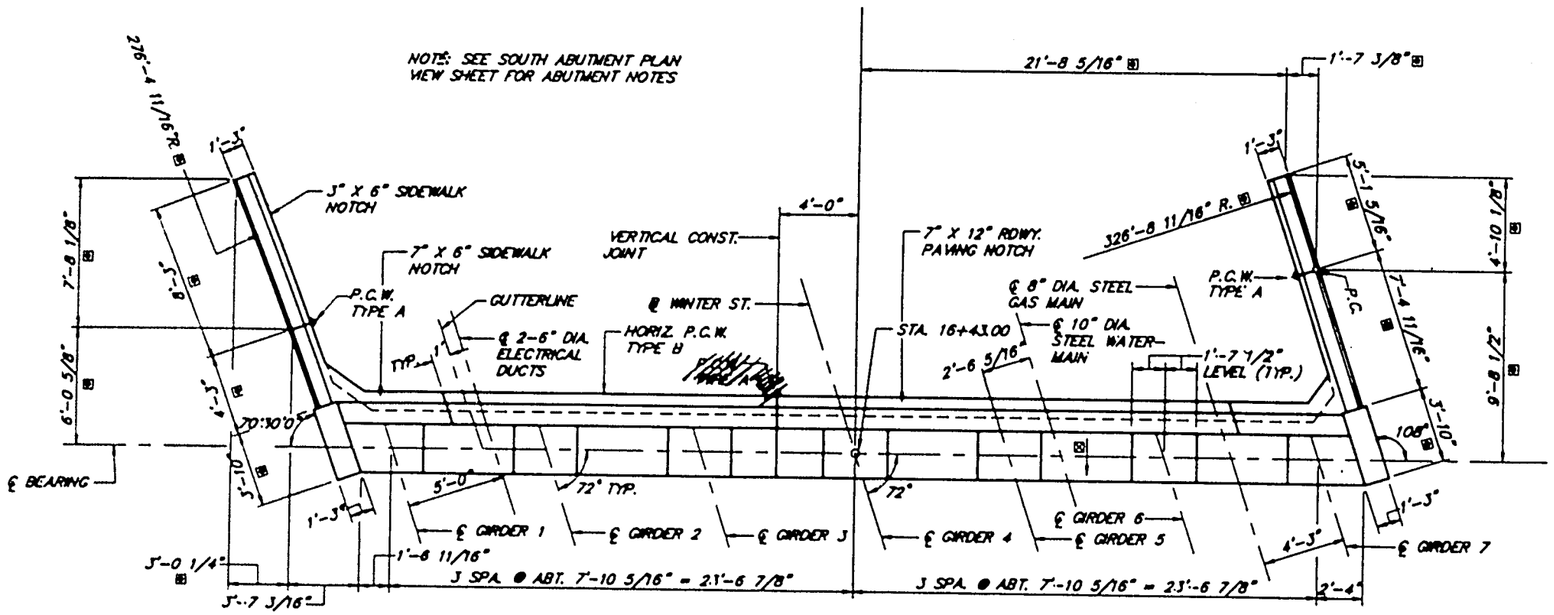
Const. Spec. 1989 | Drawn By MJF | Checked By DLC

NORTH ABUTMENT ELEV. & DETAILS

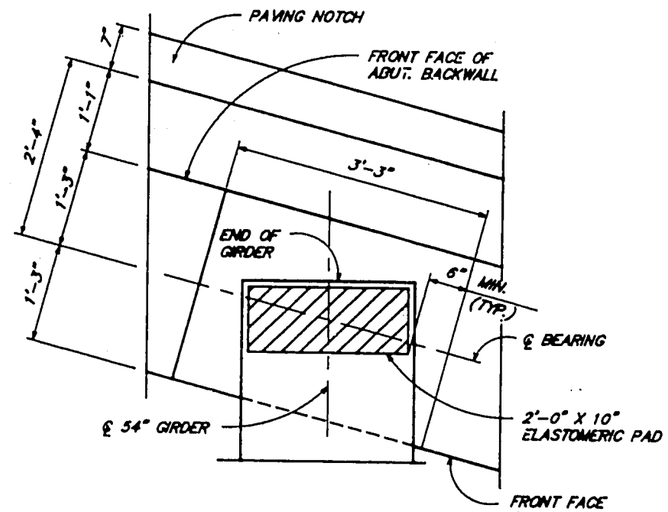
SHEET 8 OF 29

X83342

STATE PROJECT I.D.	SHEET NUMBER
1000-76-42	8.6

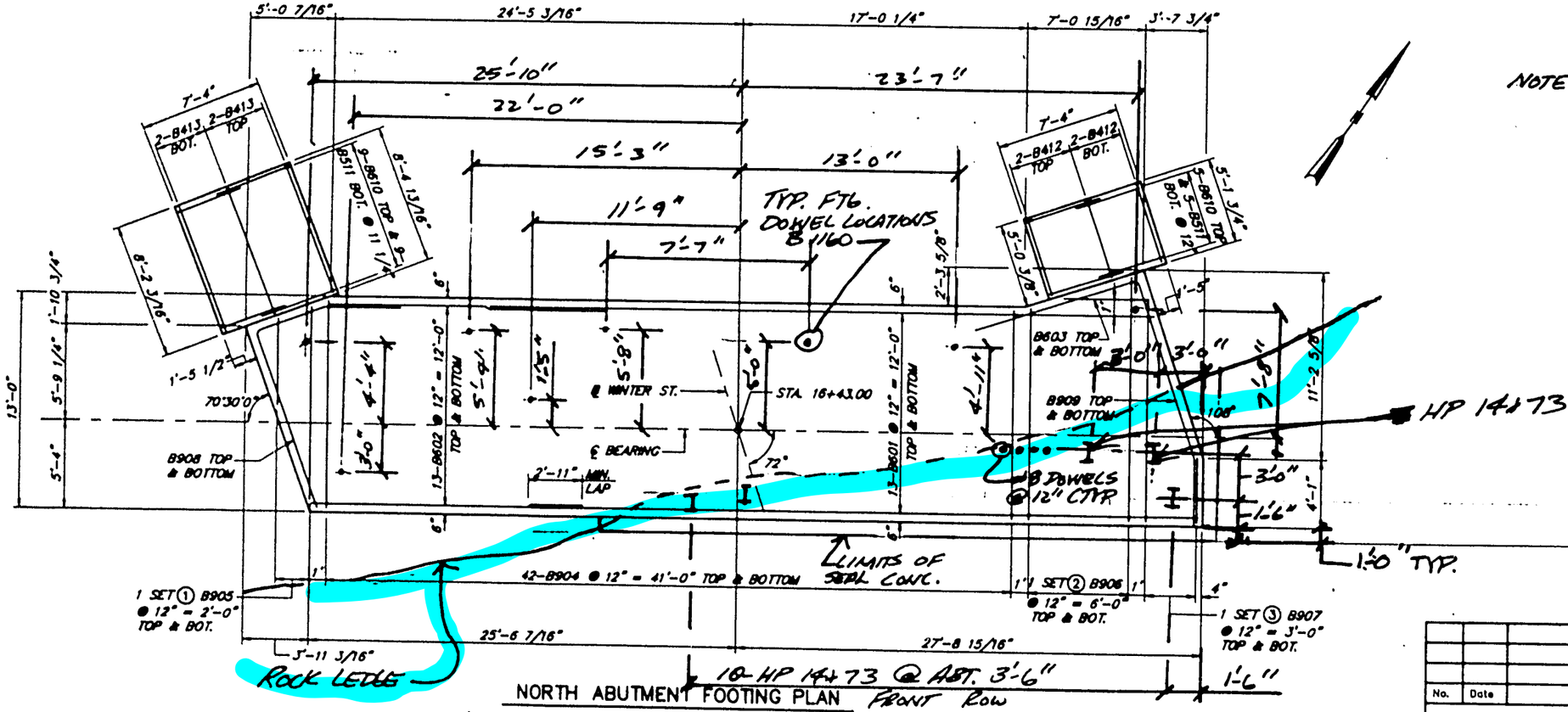


NORTH ABUTMENT PLAN



PLAN AT ABUTMENT

NOTE: HP 14x73 DRIVEN TO EL. 840.0±. ALL H-PILES TO HAVE ROCK TIPS.



NORTH ABUTMENT FOOTING PLAN FRONT ROW

PAD ELEVATIONS	
GIRDER	ELEVATION
1	874.56
2	874.69
3	874.90
4	875.11
5	875.02
6	874.94
7	874.94

No.	Date	Revisions	By

HOWARD NEEDLES TAMMEN BERGENDOFF

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

STRUCTURE B-47-102

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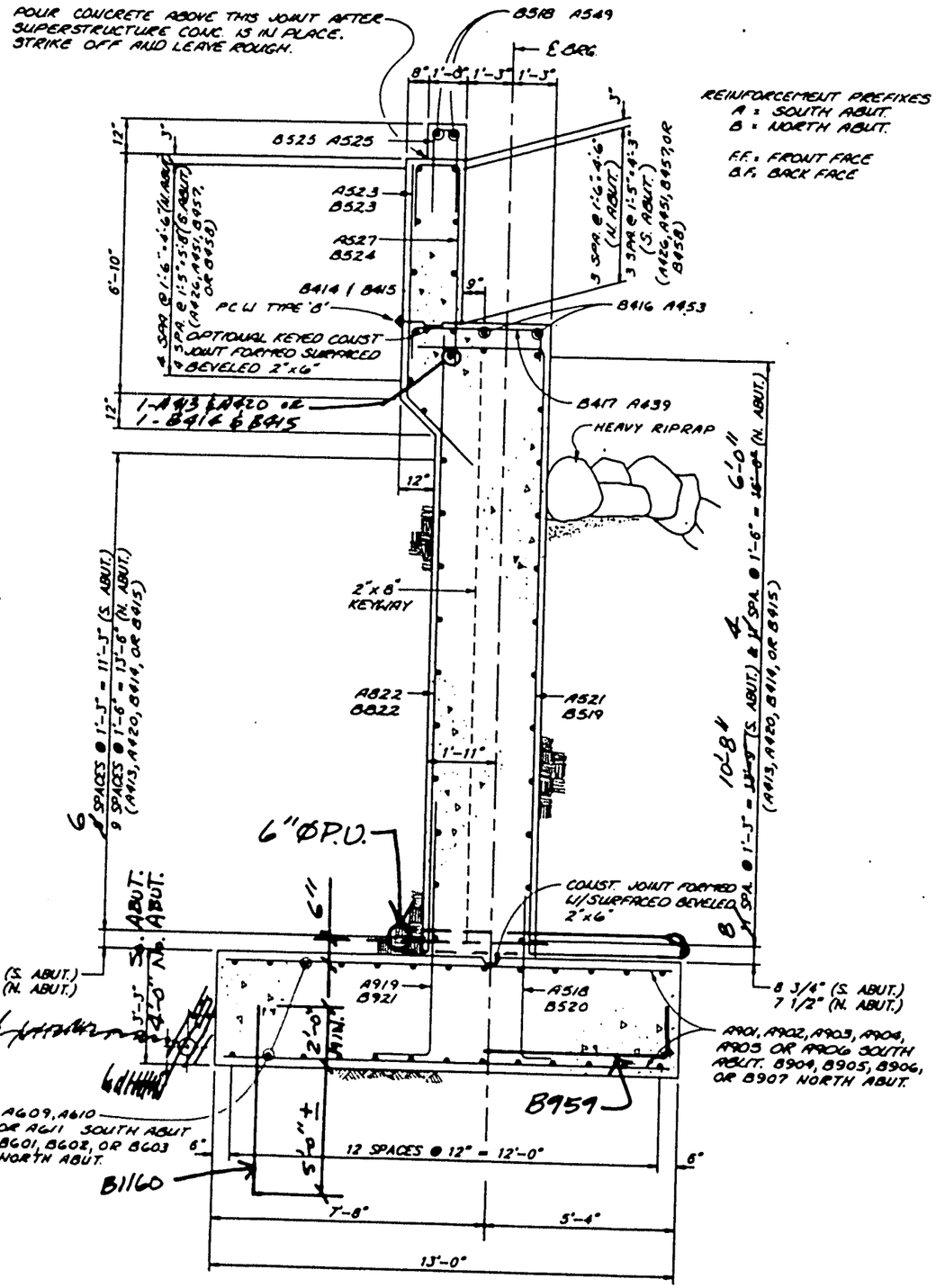
NORTH ABUTMENT PLAN VIEWS

SHEET 7 OF 29

X83342

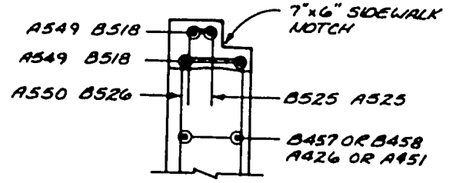
STATE PROJECT I.D.	SHEET NUMBER
1000-76-42	8.1



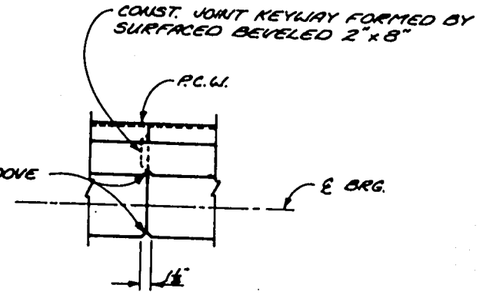
TYPICAL ABUTMENT SECTION

REINFORCEMENT PREFIXES
A = SOUTH ABUT.
B = NORTH ABUT.

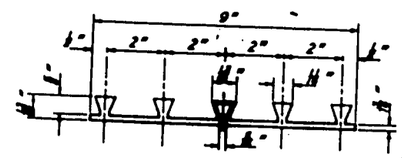
F.F. = FRONT FACE
B.F. = BACK FACE



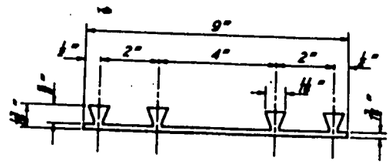
TOP OF PARAPET @ SDWK.



VERTICAL CONST. JOINT

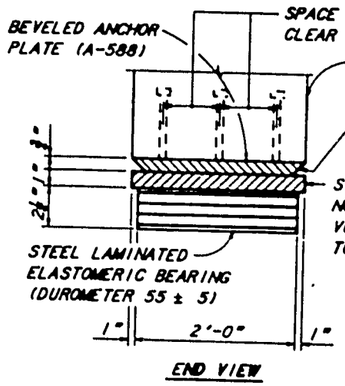


PCW TYPE B

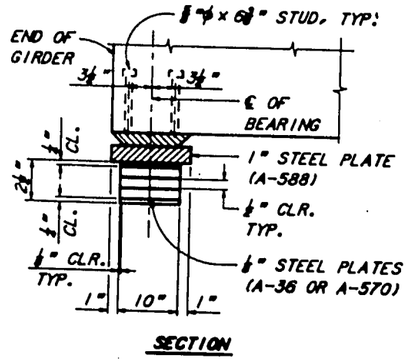


PCW TYPE A

P.C.W. SHALL BE BUTT-SPLICED AT ALL INTERSECTIONS BY USING A HEATED SPLICING IRON. MOLD P.C.W. FLUSH WITH CONCRETE.



END VIEW



SECTION

ELASTOMERIC BEARING DETAILS

NOTES:

BEARINGS SHALL NOT BE PLACED AT A TEMPERATURE GREATER THAN 70° F.

ALL MATERIAL USED FOR BEARINGS SHALL BE PAID FOR AT THE UNIT PRICE BID FOR "LAMINATED ELASTOMERIC BEARING PAD."

ON BEARING REPLACEMENTS, COMPRESSION LOADS AND ADHESION TESTS WILL BE WAIVED WHERE BEARINGS ARE DETAILED TO MEET HEIGHT REQUIREMENTS.

ALL STRUCTURAL STEEL BEARING PLATES SHALL BE FLAT ROLLED STEEL PLATES WITH ALL SURFACES SMOOTH AND FREE FROM WARP. EDGES SHALL BE SMOOTH, STRAIGHT AND VERTICAL.

ALL PLATE CUTS SHALL BE MACHINE OR MACHINE FRAME CUTS.

ALL SURFACES SHALL BE MACHINE FINISHED ANSI 250. ALL BEARING PLATES SHALL CONFORM TO A.S.T.M. SPECIFICATION TYPE A588 STEEL.

No.	Date	Revisions	By

HOWARD NEEDLES TAMMEN BERGENDOFF

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

STRUCTURE B-47-102

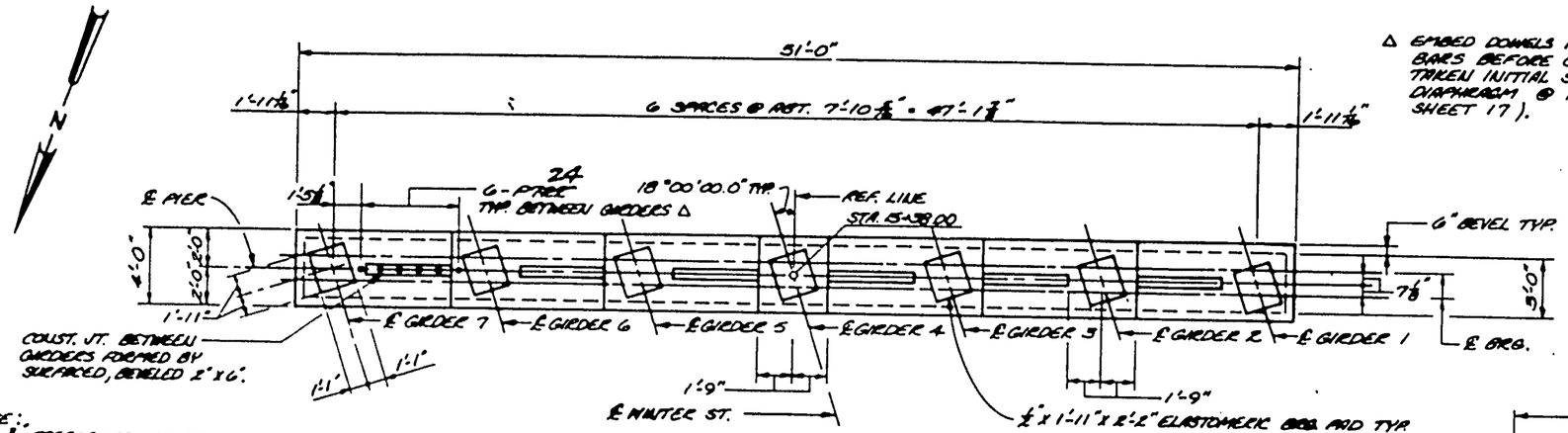
Const. Spec.	Drawn By	Checked By
1989	WAB	DLC

ABUT. SECTION & DETAILS

SHEET 10 OF 29

X83342

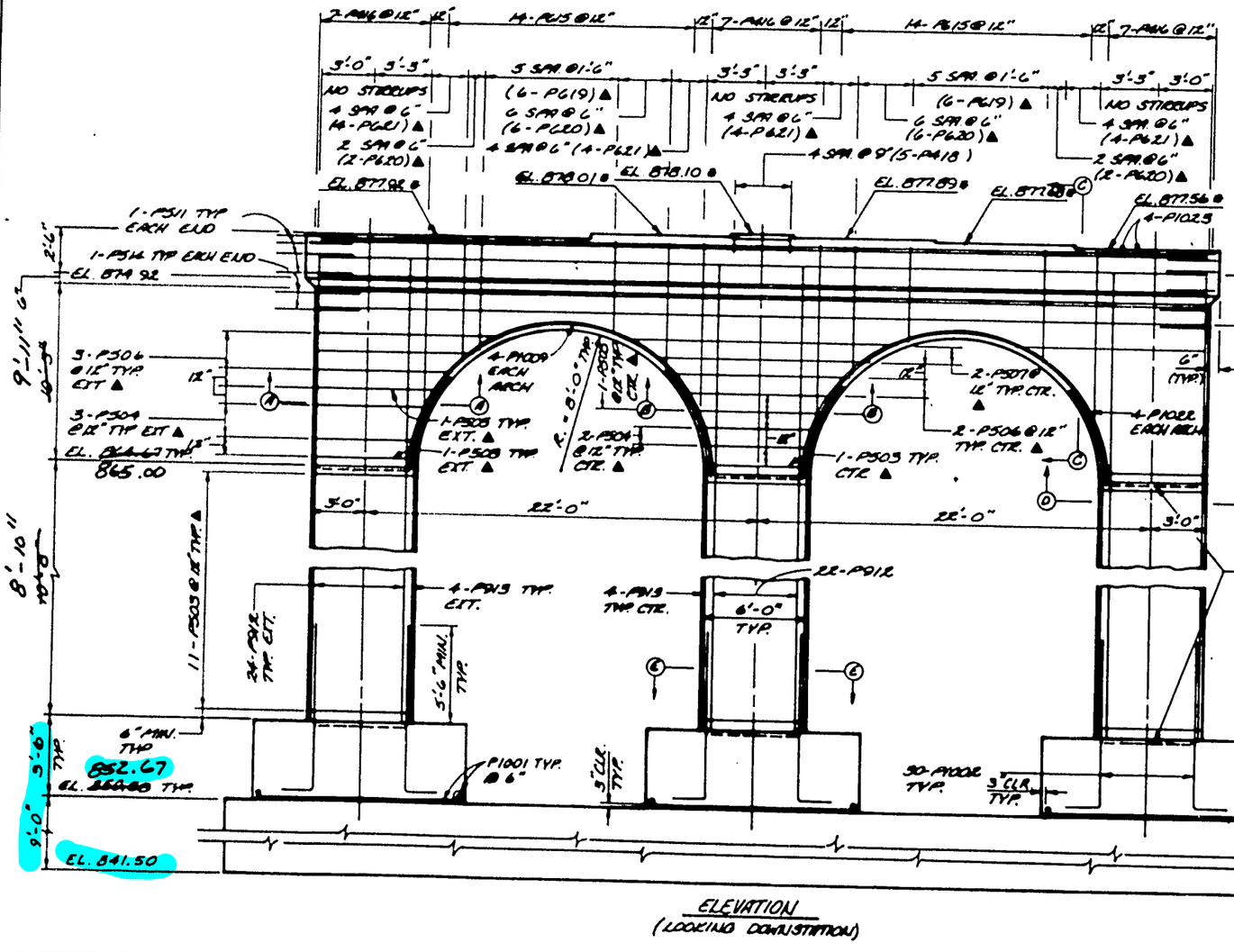
STATE PROJECT I.D.	SHEET NUMBER
1000-76-42	8.11



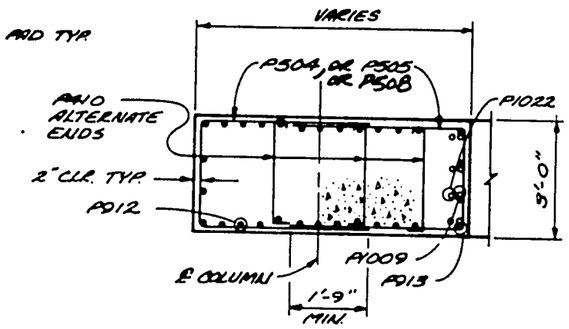
△ EMBED DOWELS 1'-7" PLACE BARS BEFORE CONC. HAS TAKEN INITIAL SET. (SEE DIAPHRAGM @ PIER DETAIL, SHEET 17).

NOTE:
‡ PREFORMED FILLER NOT SHOWN SEE BRG. DETAILS, SHEET 17

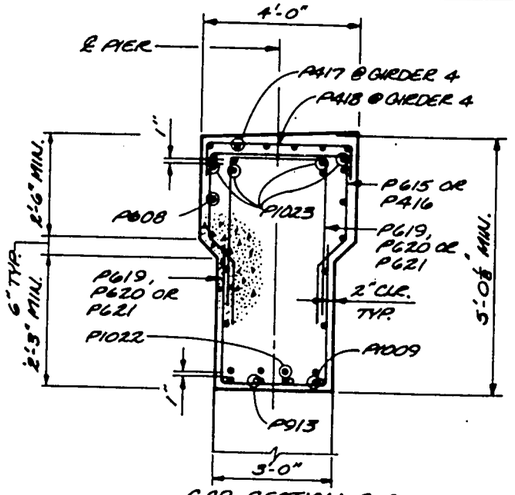
CAP PLAN



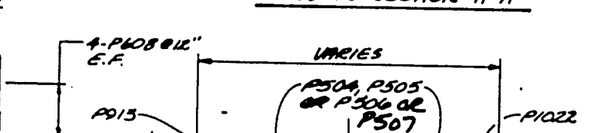
ELEVATION
(LOOKING DOWNSTATION)



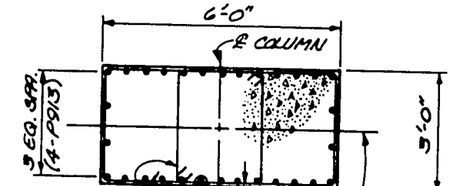
COLUMN SECTION A-A



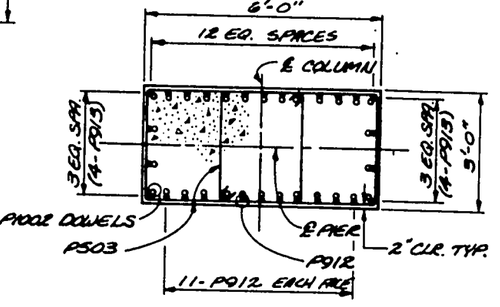
CAP SECTION C-C



COLUMN SECTION B-B



COLUMN SECTION D-D



COLUMN SECTION E-E

No.	Date	Revisions	By

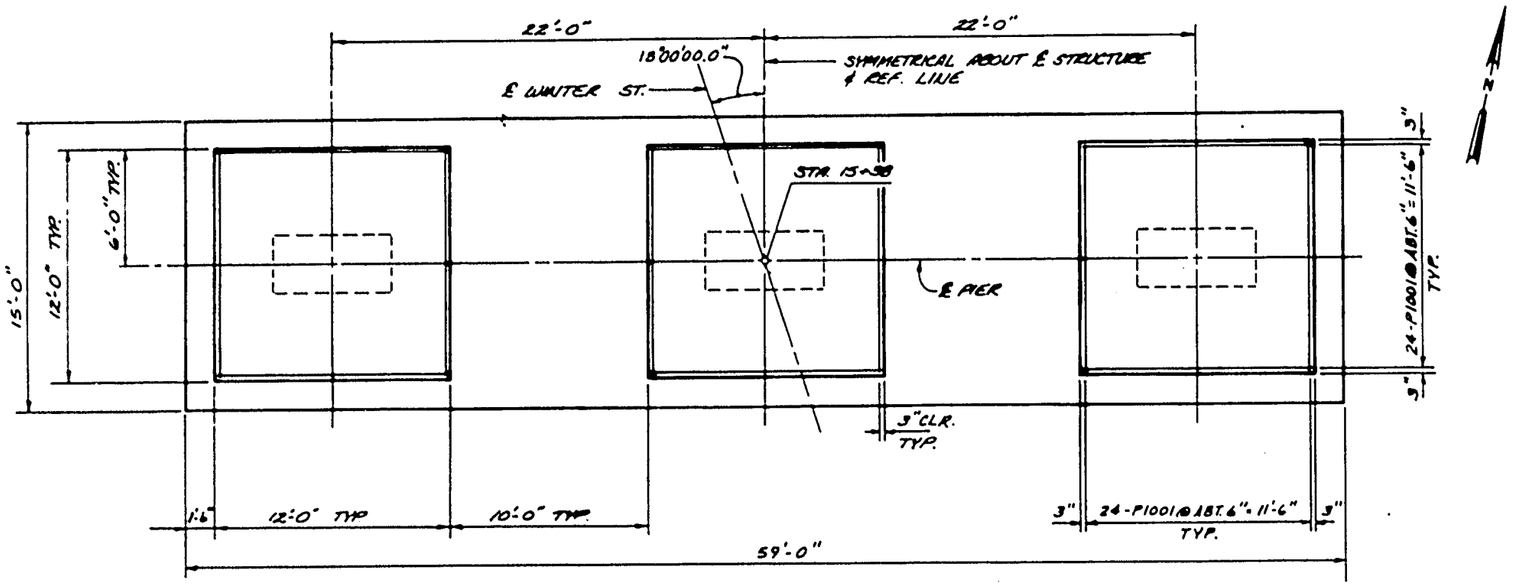
HOWARD NEEDLES TAMMEN BERGENDOFF

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

STRUCTURE B-47-102

Const. Spec. 1989	Drawn By UCH	Checked By DLC
PIER REINFORCEMENT DETAILS		SHEET 12 OF 29
		X83342

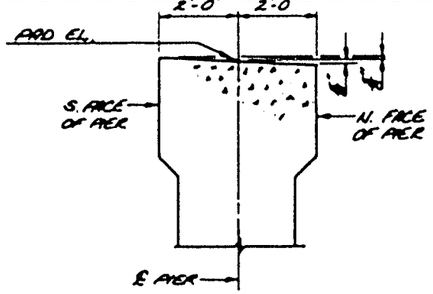
STATE PROJECT I.D.	SHEET NUMBER
1000-76-42	8,12



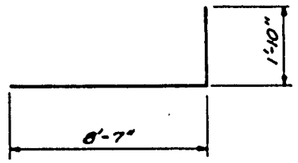
FOOTING PLAN

BILL OF REINFORCEMENT – PIER

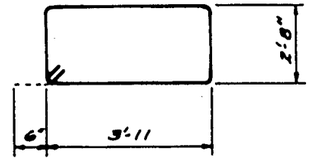
BAR MARK	COAT	NO. REQ'D	LENGTH	BEND	CUT DIAG.	BUNDLE	LOCATION
P1001		144	11' - 6"				FOOTING
P1002		90	10' - 5"				FOOTING DOWELS
P503		72	14' - 2"				COLUMN TIES
P504		16	11' - 0"				COLUMN TIES
P505		8	12' - 0"				COLUMN TIES
P506		16	15' - 2"				COLUMN TIES
P507		4	20' - 2"				COLUMN TIES
P608		8	49' - 8"				CAP
P1009		8	25' - 10"				CAP
P410		70	3' - 7"				COLUMN TIES
P511		8	8' - 8"				END OF CAP
P912		74	22' - 0"				COLUMN VERTICALS
P913		18	18' - 1"				COLUMN VERTICALS
P514		4	8' - 8"				END OF CAP
P615		28	12' - 7"				CAP
P416		21	12' - 7"				CAP
P417		6	5' - 2"				GIRDER & SEAT
P418		5	5' - 8"				GIRDER & SEAT
P619		~~24~~ 36	11' - 4"				CAP STIRRUP
P620		~~32~~ 40	12' - 2"				CAP STIRRUP
P621		~~32~~ 40	15' - 4"				CAP STIRRUP
P1022		8	26' - 5"				CAP
P1023		8	50' - 6"				CAP
~~P729~~		36	3'-2"				DIA PK. (PIER)



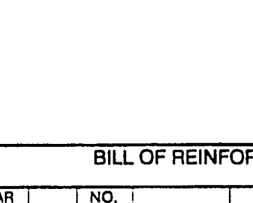
SLOPED CAP DETAIL



P1002

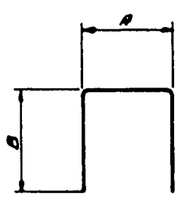


P503



P615, P416

MARK	A	B
~~P503~~	2'-8"	4'-2"
P505	3'-8"	4'-8"
P506	2'-8"	6'-5"
P507	5'-8"	8'-9"
P511	5'-8"	2'-6"
P514	2'-8"	8'-0"
P417	5'-2"	1'-0"
P418	5'-8"	11'-0"
P619	2'-8"	6'-4"
P620	2'-8"	8'-6"
P621	2'-8"	10'-4"

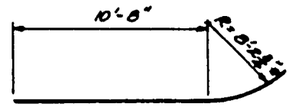


P504, P505, P506, P507, P511, P514
P417, P418, P619, P620, P621

MARK	R
P1009	8'-2 ⅛"
P1022	8'-3"

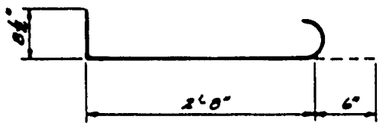
• INSIDE RADIUS

P1009, P1022



• INSIDE RADIUS

P913



P410

NOTES:
ABD ELEVATIONS GIVEN ARE FOR THE ℄ OF PIER.
MAKE BEAM SEATS PARALLEL TO GRADE AS SHOWN IN SLOPED CAP DETAIL.
MAXIMUM DESIGN FOUNDATION PRESSURE IS 8.1 TONS/SQ.FT..

No.	Date	Revisions	By

HOWARD NEEDLES TAMMEN BERGENDOFF

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

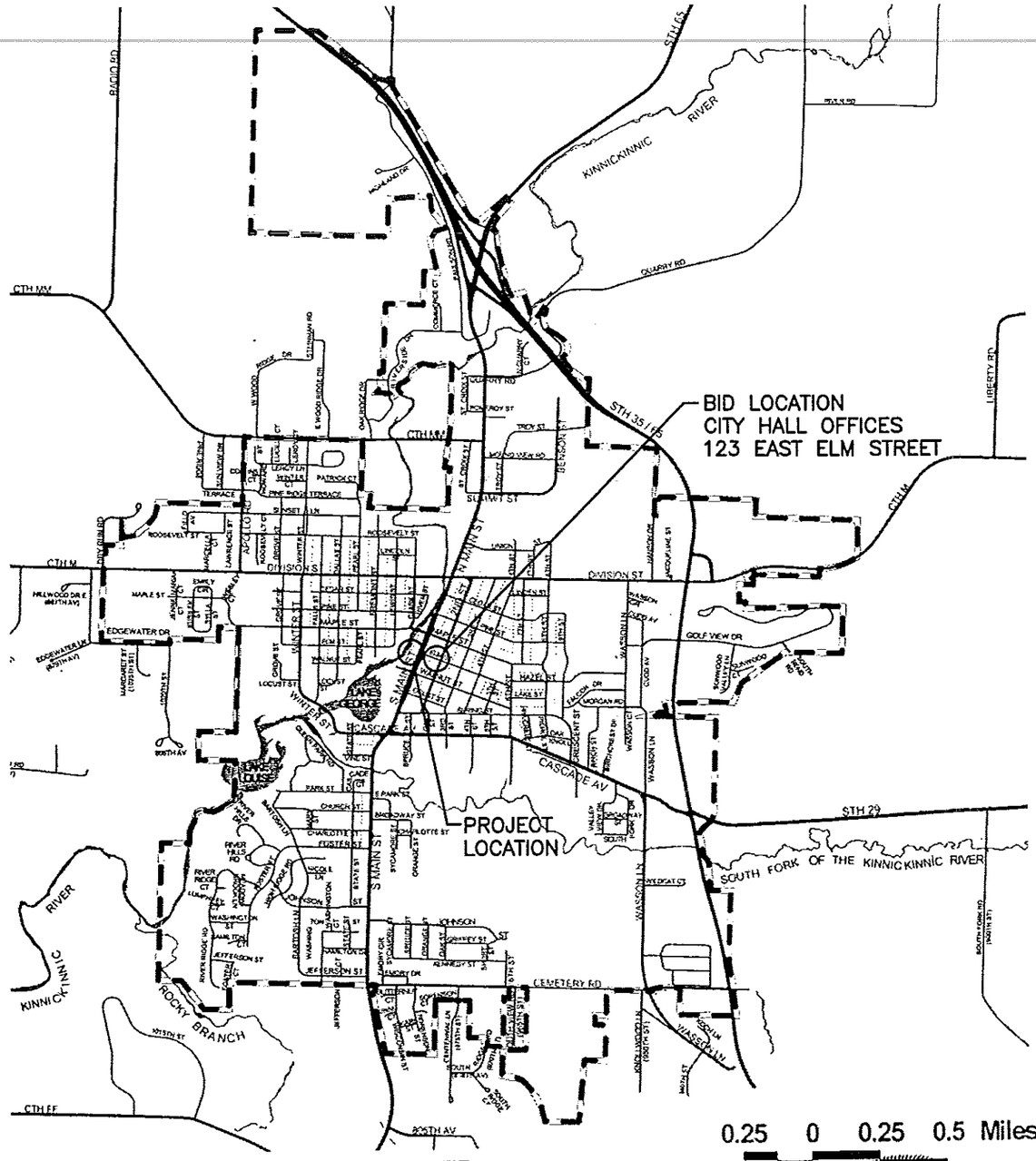
STRUCTURE B-47-102

Const. Spec. 1989	Drawn By JCH	Checked By DLC

PIER FOOTING & BILL OF REINF.

SHEET 13 OF 29

X83342



CITY OF RIVER FALLS WISCONSIN

SITE LOCATION MAP

City of RIVER FALLS

VETERANS PARK PEDESTRIAN BRIDGE

2001

CITY COUNCIL

KATIE CHAFFEE	MAYOR
WAYNE BEEBE	COUNCIL MEMBER
TOM O'CONNELL	COUNCIL MEMBER
BOB EBERT	COUNCIL MEMBER
LORIN FREY	COUNCIL MEMBER
GENE MULHOLLAM	COUNCIL MEMBER
HARRIS KITTELSON	COUNCIL MEMBER
SHARON GRAHAM	COUNCIL MEMBER
BERNIE VAN OSDALE	CITY ADMINISTRATOR
REID WRONSKI	CITY ENGINEER

DRAWING INDEX

1 TITLE SHEET
2 REMOVAL & EROSION CONTROL PLAN
3 EAST & WEST APPROACH PLANS & DETAILS
4 SITE DETAILS
5 LANDSCAPE PLANS, DETAILS AND SCHEDULES
6 BRIDGE GENERAL PLAN, ELEVATION & CROSS SECTION
7 PIER 1 PLAN & SECTIONS
8 PIER 2 PLAN & SECTIONS
9 PIER 3 PLAN & ELEVATION
10 PIER 3 PLAN & SECTIONS
11 EAST ABUTMENT PLAN & SECTIONS
12 ELECTRICAL PLAN
13 ELECTRICAL DETAILS

WISCONSIN JOHN P. CARLSON E-31828 ST. PAUL MN. PROFESSIONAL ENGINEER 8-1-01

WISCONSIN GARY W. MORIEN E-27274 SHOREVIEW, MN PROFESSIONAL ENGINEER 8/1/01

WISCONSIN DAVID P. BURCH LA-171 WAUKESHA, WI LANDSCAPE ARCHITECT 8-1-01

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY IMMEDIATE SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WISCONSIN.
PRINT NAME: GARY W. MORIEN
SIGNATURE: Gary W. Morien
DATE 8/1/01 LIC. NO. E-27274-006

SURVEY PHH
DRAWN DWJ
DESIGNED
APPROVED JDP
DATE
PROJ. NO. 20601101

Bonestroo Rosene Anderlik & Associates
Engineers & Architects
Website: www.bonestroo.com
St. Paul Office Phone: 651-636-4600 Fax: 651-636-1311
Rochester Office Phone: 507-288-3300 Fax: 507-282-1100
Milwaukee Office Phone: 262-241-4555 Fax: 262-241-4951
St. Cloud Office Phone: 320-251-4553 Fax: 320-251-4723
Willmar Office Phone: 320-214-4557 Fax: 320-214-4558
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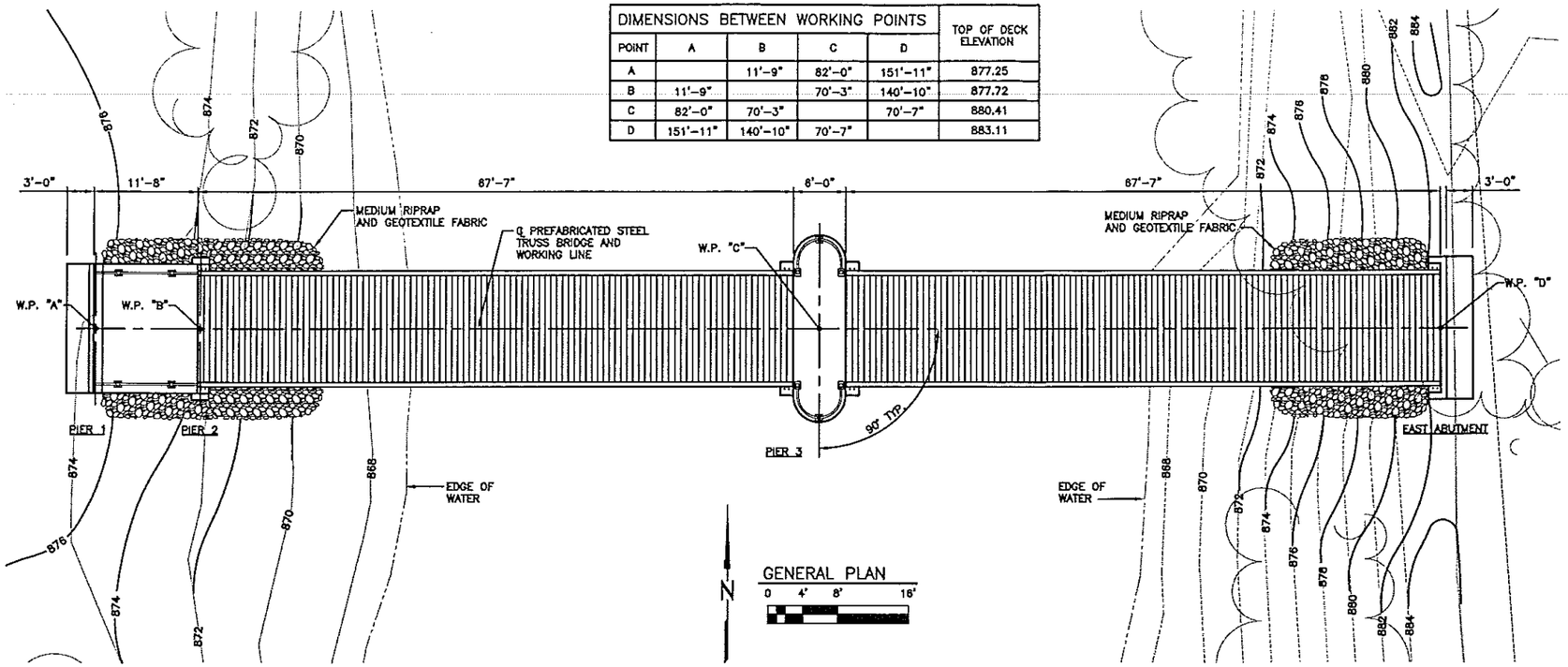
RIVER FALLS, WISCONSIN
VETERANS PARK PEDESTRIAN BRIDGE
TITLE SHEET

20601101ST
SHEET NUMBER
1

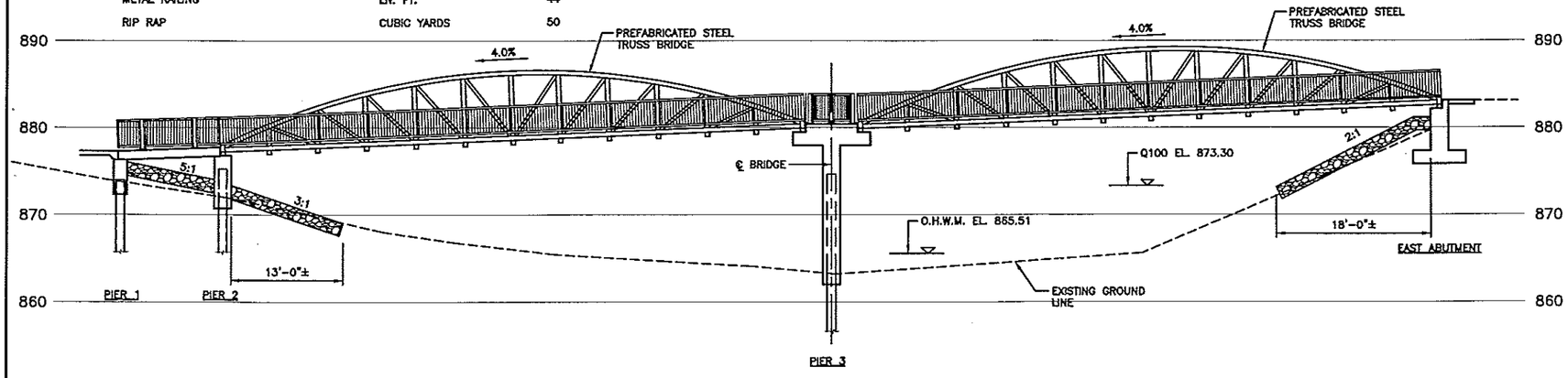
B-25

DIMENSIONS BETWEEN WORKING POINTS					TOP OF DECK ELEVATION
POINT	A	B	C	D	
A		11'-9"	82'-0"	151'-11"	877.25
B	11'-9"		70'-3"	140'-10"	877.72
C	82'-0"	70'-3"		70'-7"	880.41
D	151'-11"	140'-10"	70'-7"		883.11



SCHEDULE OF QUANTITIES FOR ENTIRE BRIDGE

ITEM	UNIT	QUANTITY
REMOVALS	SEE SHEET 2 & SPECS.	
EXCAVATION FOR STRUCTURES-BRIDGE	LUMP SUM	1
CONCRETE ABUTMENT	LUMP SUM	1
CONCRETE APPROACH PANL	LUMP SUM	1
CONCRETE PIER 1	LUMP SUM	1
CONCRETE PIER 2	LUMP SUM	1
CONCRETE PIER 3	LUMP SUM	1
PREFABRICATED STEEL BRIDGE, DELIVERED	EACH	2
PREFABRICATED STEEL BRIDGE, INSTALLED	EACH	2
METAL RAILING	LN. FT.	44
RIP RAP	CUBIC YARDS	50



GENERAL ELEVATION

0 4' 8' 16'

SPECIAL CONSTRUCTION NOTES REGARDING AIR AND WATER POLLUTION

1. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS, AND PERMIT REQUIREMENTS THAT CONTROL THE PREVENTION OF POLLUTION TO THE ENVIRONMENT.
2. THE CONTRACTOR SHALL BE AWARE THE KINNICKINNIC RIVER IS A CLASS 1 PROTECTED TROUT FISHERY.
3. THE CONTRACTOR SHALL NOT OPERATE EQUIPMENT ON THE RIVERBED OF THE KINNICKINNIC RIVER AT ANY TIME.
4. THE CONTRACTOR SHALL USE EXTREME CARE TO PREVENT DEBRIS, CONCRETE MASONRY AND CONSTRUCTION PARTICLES FROM ENTERING THE RIVER.
5. DIRT, DUST AND CONSTRUCTION PARTICLES ACCUMULATING IN THE WORK AREA DURING STRUCTURE REMOVAL SHALL BE REMOVED FROM THE SITE AT SUCH INTERVALS AS DIRECTED BY THE ENGINEER TO PRECLUDE ANY CONTAMINATION OF THE RIVER.
6. THE CONTRACTOR SHALL EMPLOY SPECIAL CONSTRUCTION DEVICES AND TECHNIQUES TO CONSTRUCT PIER 3 AS SHOWN ON THE PLANS, TO MINIMIZE TURBIDITY AND PREVENT CONCRETE FROM ENTERING THE RIVER. FOR EXAMPLE, THE CONTRACTOR MAY CONSTRUCT THE PIER FORMS IN THE MANOR OF A COFFERDAM ON DRY LAND AND MOVE THE FORMS INTO PLACE. THE BOTTOM OF THE FORMS SHALL BE LOCATED AT ELEVATION 862.0 APPROXIMATELY 1-FOOT BELOW THE NATURAL STREAM BED. STREAM BED MATERIALS INSIDE THE FORMS SHALL BE EXCAVATED AND REMOVED FROM THE SITE. PLASTIC CONCRETE PLACED IN THE FORMS SHALL NOT BE ALLOWED TO ESCAPE INTO THE RIVER. ALL FORMS SHALL BE REMOVED AND NO MATERIALS SHALL ESCAPE INTO THE RIVER.
7. IN CASE OF FAILURE ON THE PART OF THE CONTRACTOR TO CONTROL POLLUTION AS ORDERED, THE OWNER RESERVED THE RIGHT TO EMPLOY OUTSIDE ASSISTANCE TO PROVIDE THE NECESSARY CORRECTIVE MEASURES. ALL EXPENSES FOR CORRECTIVE WORK WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.

GENERAL NOTES

DRAWINGS SHALL NOT BE SCALED.

BAR STEEL REINFORCEMENT SHALL BE IMBEDDED 2" CLEAR UNLESS OTHERWISE SHOWN OR NOTED.

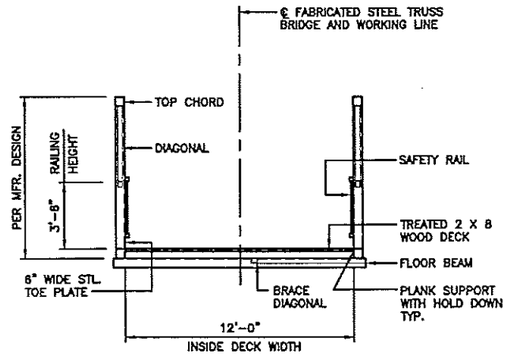
CONTRACTOR SHALL DRESS SLOPES AND PLACE FILTER MATERIALS AND RIPRAP IN AREA SHOWN ON THIS SHEET AND AS DIRECTED BY ENGINEER.

VERIFY ENGINEERED BRIDGE DIMENSIONS BEFORE CONSTRUCTING SUBSTRUCTURE UNITS.

BACKFILL FRONT AND BACK SIDE OF ABUTMENT IN EQUAL LIFTS.

DESIGN NOTES

LIVE LOAD:	85 LBS/SQ. FT. (WITH ALLOWABLE REDUCTION) OR 10,000 LB. VEHICLE (VEHICLE LOAD SHALL BE DISTRIBUTED ON FOUR WHEELS WITH 60% OF THE LOAD ON THE REAR WHEELS.)
WIND LOAD:	30 LBS./SQ. FT.
MATERIAL STRENGTHS:	
CONCRETE	f'c = 4000 PSI
STEEL REINFORCEMENT	f'y = 60,000 PSI
BRIDGE STRUCTURAL STEEL	SELF-WEATHERING STEEL ASTM A847 TUBING ASTM A588 PLATES AND OTHER SHAPES (f'y = 50,000 PSI)
HYDRAULIC DATA:	
Q100	8700 CFS
VELOCITY	7.1 FPS
HIGH-WATER	EL. 873.30
O.H.W.M. (OBSERVED HIGH WATER MARK)	EL. 865.51
FOUNDATION DATA:	
MAXIMUM COMPUTED SOIL PRESSURE IN LBS./SQ. FT.	TOTAL = 3000



TRANSVERSE SECTION

NO SCALE

BENCH MARK ELEVATION: 888.50

LOCATION: SW CORNER OF MAPLE STREET BRIDGE VERIFY WITH ENGINEER

SURVEY
DRAWN PHM
DESIGNED GWM
APPROVED GWM
DATE
PROJ. NO.

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WISCONSIN.
PRINT NAME: GARY W. ANDRIK
SIGNATURE:
DATE: 2/2/24
LIC. NO. 2/2/24 - 006

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St. Cloud Office
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Fax: 320-251-4253

Milwaukee Office
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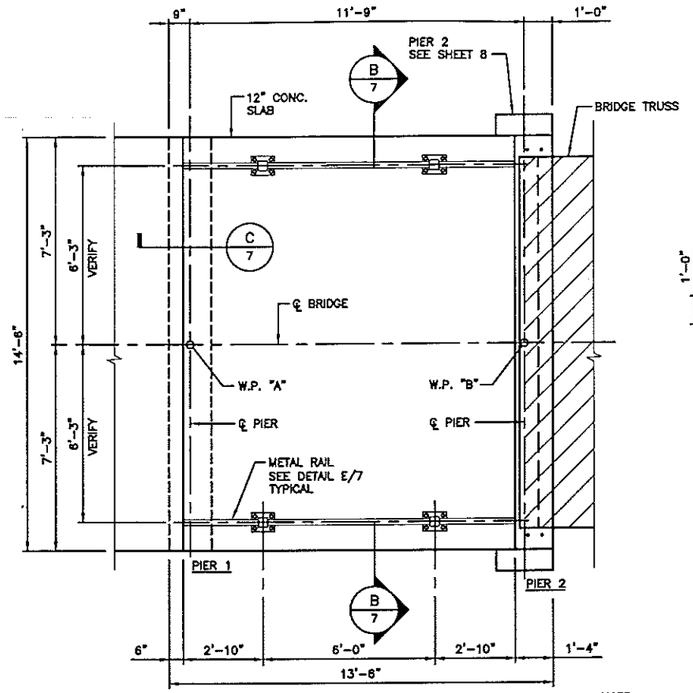
Bonestroo Rosene Anderlik & Associates
Engineers & Architects
Website: www.bonestroo.com

RIVER FALLS, WISCONSIN
VETERANS BRIDGE
BRIDGE GENERAL PLAN, ELEVATION & CROSS SECTION

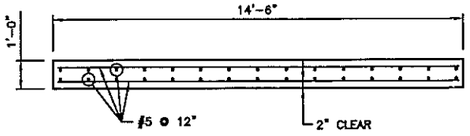
2060110156
SHEET NUMBER
6

B-25

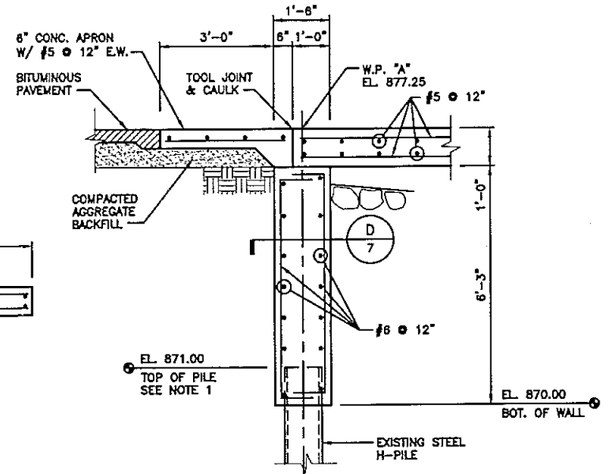


A 7 PLAN
0 2' 4' 6'
Scale in feet

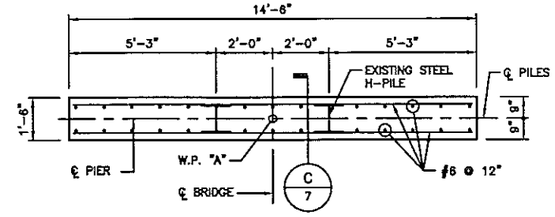
NOTE:
1. REMOVE EXISTING PIER CAP AND CUT PILE TO ELEVATION SHOWN.



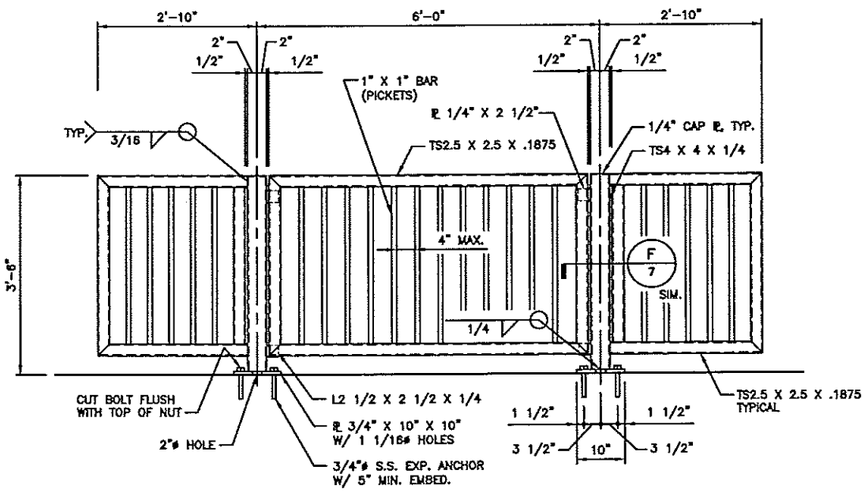
B 7 SECTION
0 2' 4' 6'
Scale in feet



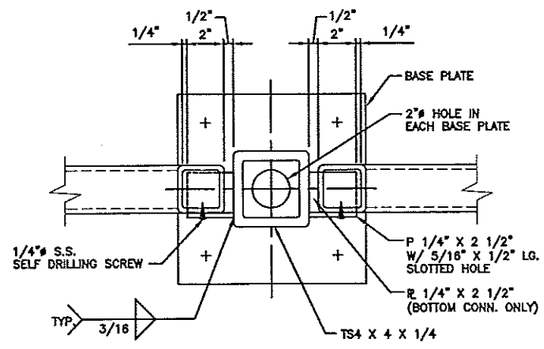
C 7 SECTION
0 1' 2' 4'
Scale in feet



D 7 SECTIONAL PLAN
0 2' 4' 6'
Scale in feet



E 7 RAIL ELEVATION
0 1' 2' 3'
Scale in feet



F 5 SECTION
0 2" 4" 8"
Scale in feet

METAL RAILING NOTES

1. LENGTH OF "METAL RAILING" FOR PAYMENT WILL BE MEASURED FROM END TO END WITH NO DEDUCTION FOR OPENINGS.
2. PRICE BID FOR "METAL RAILING" INCLUDES ALL STEEL SHOWN ON THIS SHEET INCLUDING ANCHORAGES.
3. POSTS AND SPINDLES SHALL BE PLACED NORMAL TO GRADE.
4. ALL STRUCTURAL STEEL TUBING IN THE RAIL SHALL BE A500, GRADE B AND A513, GRADE 2.
5. ALL OTHER MATERIAL USED IN FABRICATION SHALL BE MADE FROM MATERIAL CONFORMING TO ASTM DESIGNATION A 709, GRADE 36 UNLESS NOTED OTHRWISE.
6. ANCHOR RAIL BASE TO CONCRETE WITH 5/8" DIAMETER STAINLESS STEEL EXPANSION ANCHORS. PROVIDE 4 1/2" MINIMUM EMBEDMENT.
7. VENT HOLES SHALL BE DRILLED IN THE RAIL POST BASE AND THE RAIL TUBES AS NECESSARY TO FACILITATE GALVANIZING. GALVANIZE ALL METAL AFTER FABRICATION.
8. PAINT ALL EXPOSED RAIL SURFACES AFTER FABRICATION. SEE SPECIFICATIONS.

SURVEY PHH
DRAWN CWM
DESIGNED JDP
APPROVED
DATE
PROJ. NO. 2060110157

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WISCONSIN.
PRINT NAME: GARY W. MORIEN
SIGNATURE:
DATE:
UC. NO. 27274-005

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Fax: 651-636-1311
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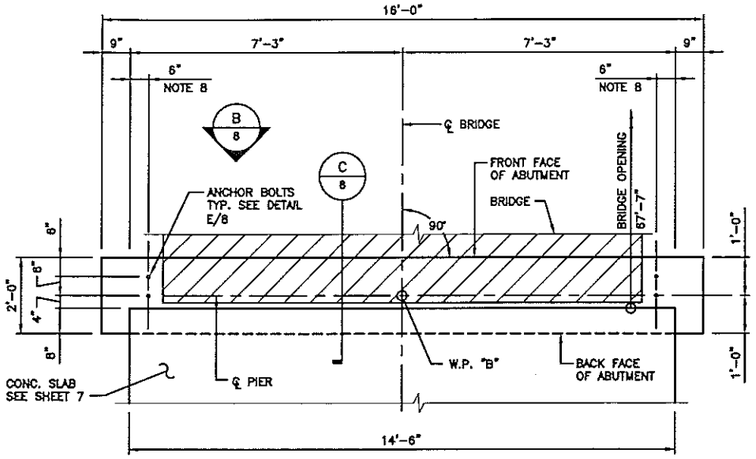
Fax: 262-241-4901
Willmar Office
Phone: 320-214-4557
Fax: 320-214-9459
St. Cloud Office
Phone: 320-251-4553
Fax: 320-251-4332

Bonestroo Rosene Anderlik & Associates
Engineers & Architects
Website: www.bonestroo.com

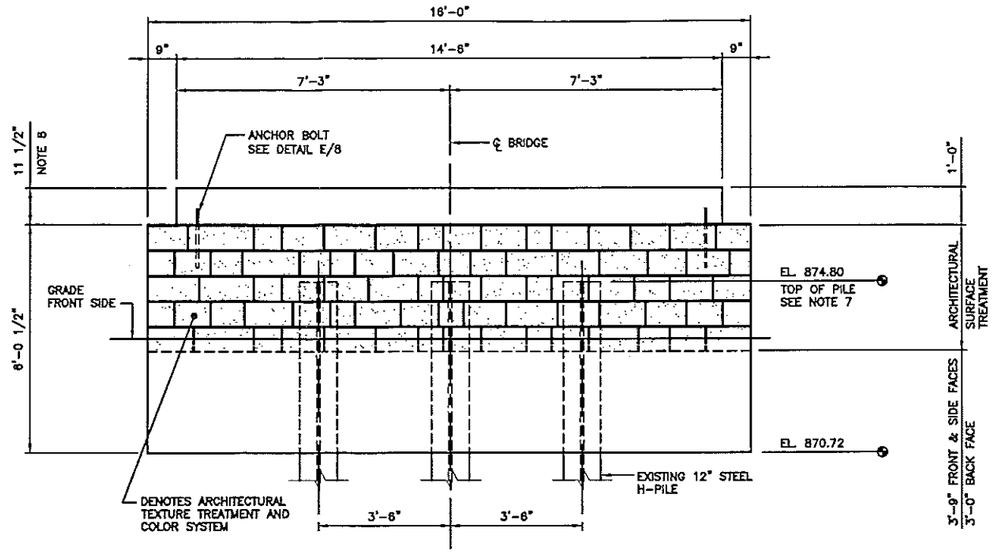
RIVER FALLS, WISCONSIN
VETERANS PARK BRIDGE
PIER 1 PLANS & SECTIONS

2060110157
SHEET NUMBER
7

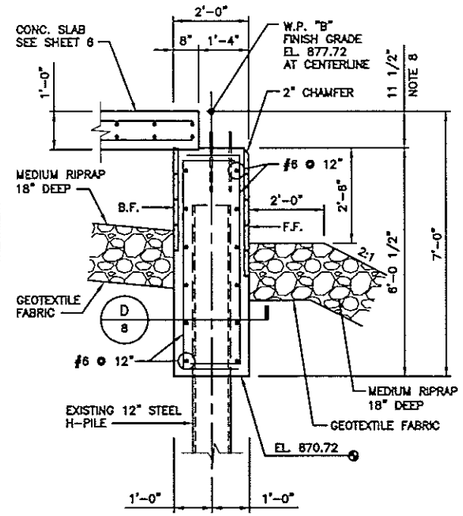
B-25



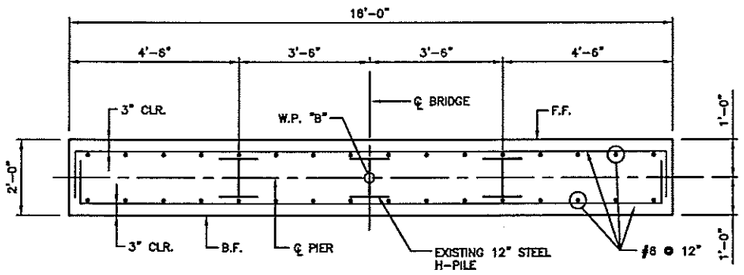
A 8 PLAN
0 1' 2' 4'
Scale in feet



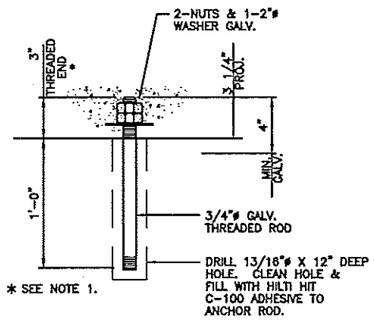
B 8 ELEVATION
0 1' 2' 4'
Scale in feet



C 8 SECTION
0 1' 2' 4'
Scale in feet



D 8 SECTIONAL PLAN
0 1' 2' 4'
Scale in feet



E 8 DETAIL
No Scale

CONSTRUCTION NOTES:

1. VERIFY BRIDGE SEAT DIMENSIONS AND ANCHOR BOLT LOCATIONS WITH BRIDGE SUPPLIER.
2. LAP SPLICES AND 90° DEGREE HOOKS SHALL BE AS SHOWN BELOW UNLESS NOTED.

REINF. BAR SIZE	LAP SPLICE (IN)	90° END HOOK (IN)
#4	24	8
#5	31	10
#6	37	12

3. REINFORCING BARS SHALL HAVE THE FOLLOWING CONCRETE COVER UNLESS NOTED.
   1. CONCRETE CAST AGAINST EARTH 3"
   2. ALL OTHER CONCRETE 2"
4. CONCRETE SHALL BE PLACED WITHOUT CONSTRUCTION JOINTS EXCEPT WHERE SPECIFICALLY SHOWN ON THE DRAWINGS OR AS APPROVED BY THE ENGINEER.
5. BEVEL ALL EXPOSED CORNERS OF CONCRETE 3/4" X 3/4"
6. COAT TOP OF BEARING SEATS WITH SIKA HI-BUILD EPOXY.
7. REMOVE EXISTING CONCRETE PIER AND CUT PILE TO ELEVATION SHOWN.
8. VERIFY WITH BRIDGE FABRICATOR.

SURVEY
DRAWN PJH
DESIGNED CWM
APPROVED JJP
DATE
PROJ. NO. 2060111101

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME, OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WISCONSIN.
PRINT NAME: GARY W. MORIEN
SIGNATURE:
DATE:
LIC. NO. 27274-006

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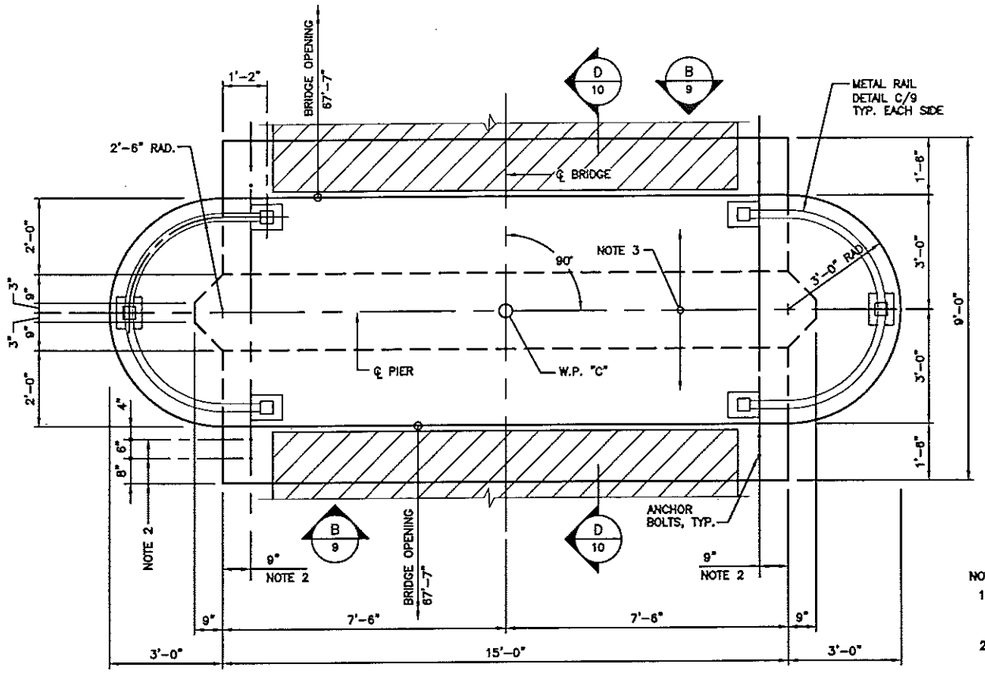
Engineers & Architects
Website: www.bonestroo.com

RIVER FALLS, WISCONSIN
VETERANS PARK PEDESTRIAN BRIDGE
PIER 2 PLAN & SECTIONS

2060111058
SHEET NUMBER
8

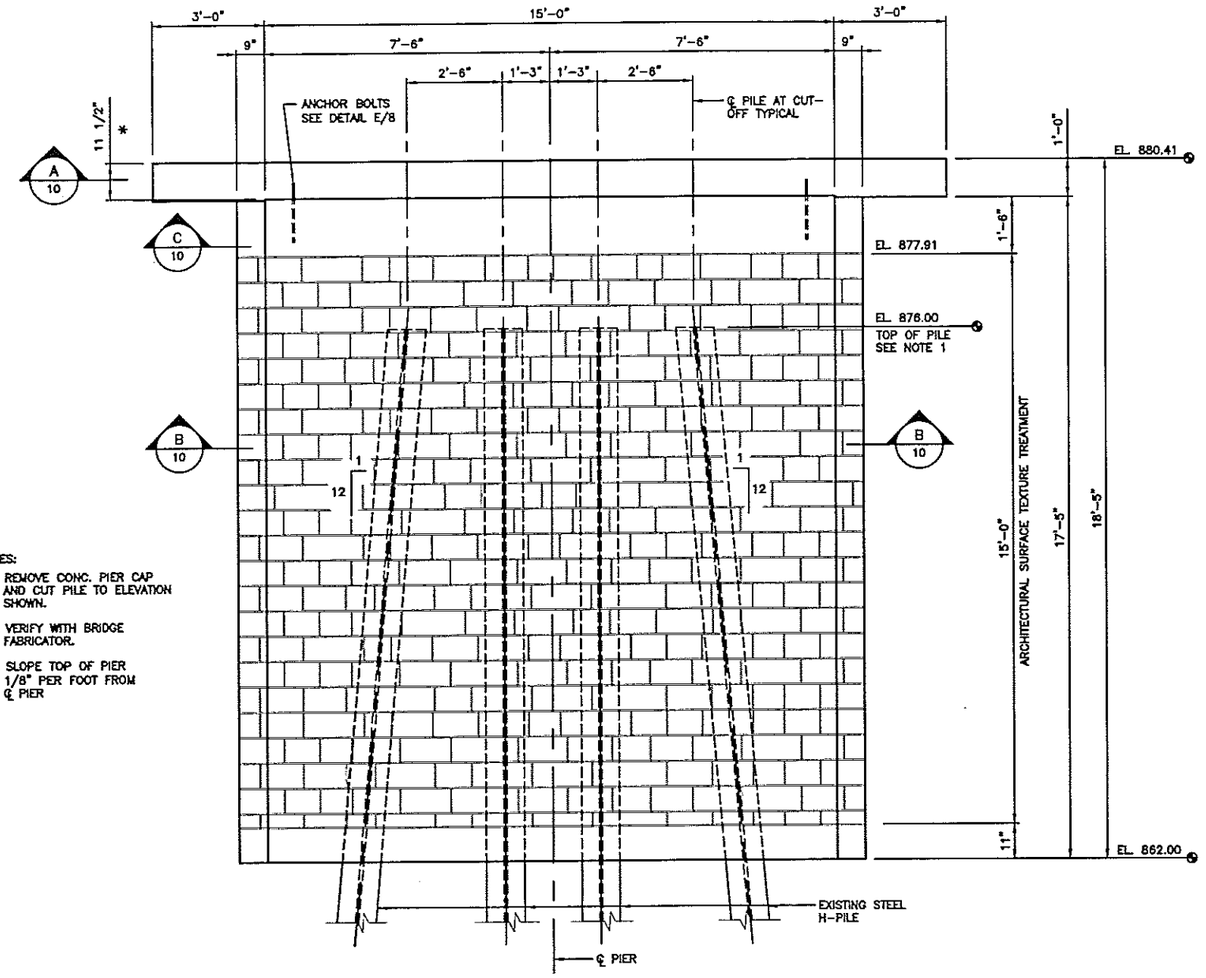
B-25



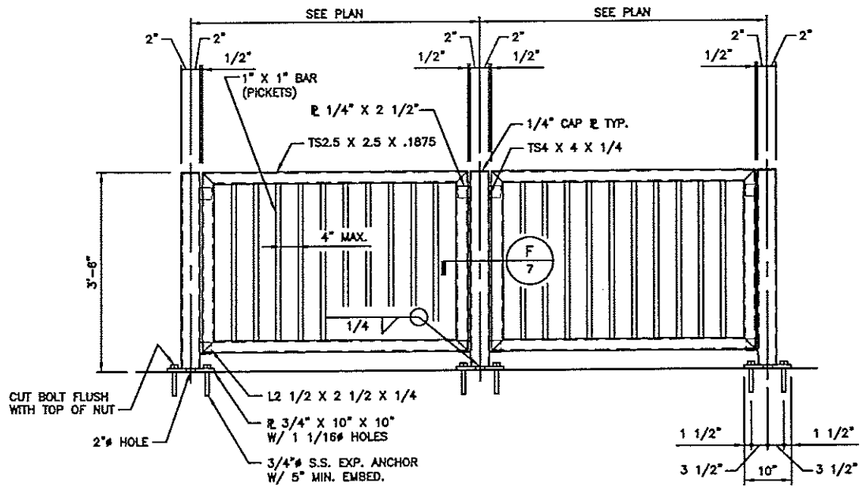
A 9 PLAN
0 1' 2' 4'
Scale in feet

NOTES:

1. REMOVE CONC. PIER CAP AND CUT PILE TO ELEVATION SHOWN.
2. VERIFY WITH BRIDGE FABRICATOR.
3. SLOPE TOP OF PIER 1/8" PER FOOT FROM ℄ PIER



B 9 ELEVATION
0 1' 2' 4'
Scale in feet



C 9 RAIL ELEVATION
0 1' 2' 3'
Scale in feet

METAL RAILING NOTES

1. LENGTH OF "METAL RAILING", FOR PAYMENT WILL BE MEASURED FROM END TO END WITH NO DEDUCTION FOR OPENINGS.
2. PRICE BID FOR "METAL RAILING" INCLUDES ALL STEEL SHOWN ON THIS SHEET INCLUDING ANCHORAGES.
3. POSTS AND SPINDLES SHALL BE PLACED NORMAL TO GRADE.
4. ALL STRUCTURAL STEEL TUBING IN THE RAIL SHALL BE A500, GRADE B AND A513, GRADE 2.
5. ALL OTHER MATERIAL USED IN FABRICATION SHALL BE MADE FROM MATERIAL CONFORMING TO ASTM DESIGNATION A 709, GRADE 36 UNLESS NOTED OTHRWISE.
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8. PAINT ALL EXPOSED RAIL SURFACES AFTER FABRICATION. SEE SPECIFICATIONS.

SURVEY
DRAWN PHH
DESIGNED CHM
APPROVED JDP
DATE
PROJ. NO. 2060110159

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WISCONSIN.
PRINT NAME: GARY W. MORREN
SIGNATURE: Gary W. Morren
DATE 4/11/07 LIC. NO. 27274-006

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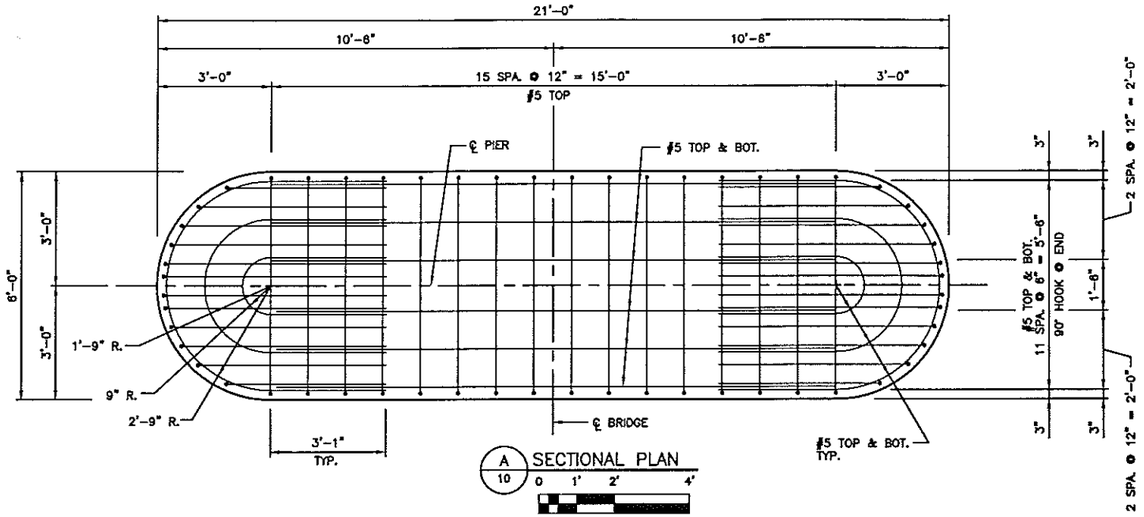
G:\...\BESTROO, ROSENE, ANDERLIK & ASSOCIATES, INC. 2005

RIVER FALLS, WISCONSIN
VETERANS PARK BRIDGE
PIER 3 PLAN & ELEVATION

2060110159
SHEET NUMBER
9

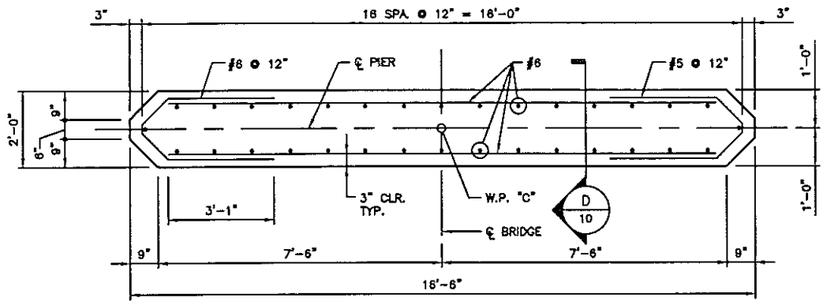
B-25



A/10 SECTIONAL PLAN

0 1' 2' 4'

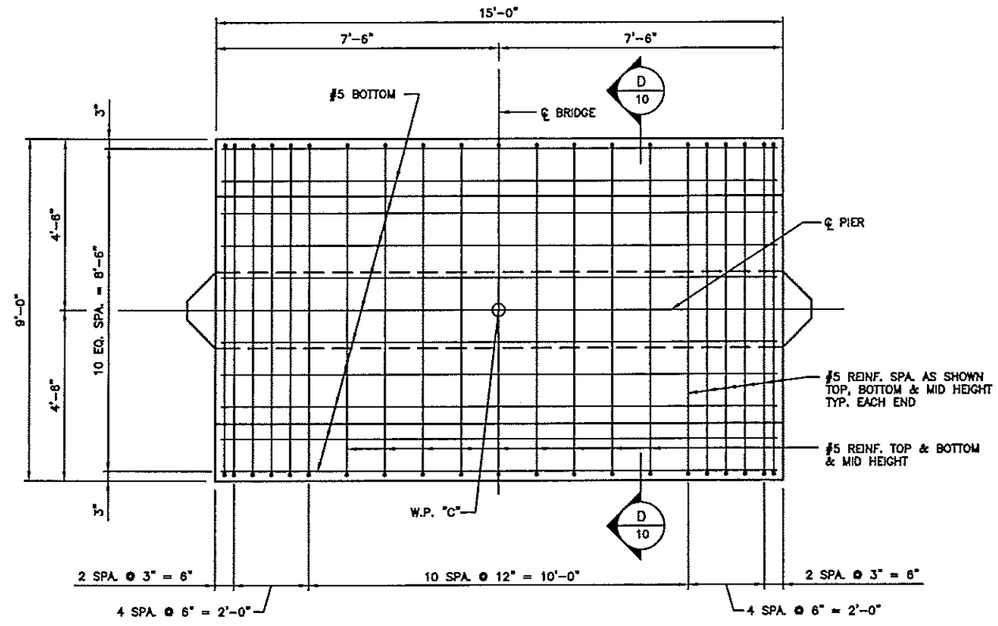
Scale in feet



B/10 SECTIONAL PLAN

0 1' 2' 4'

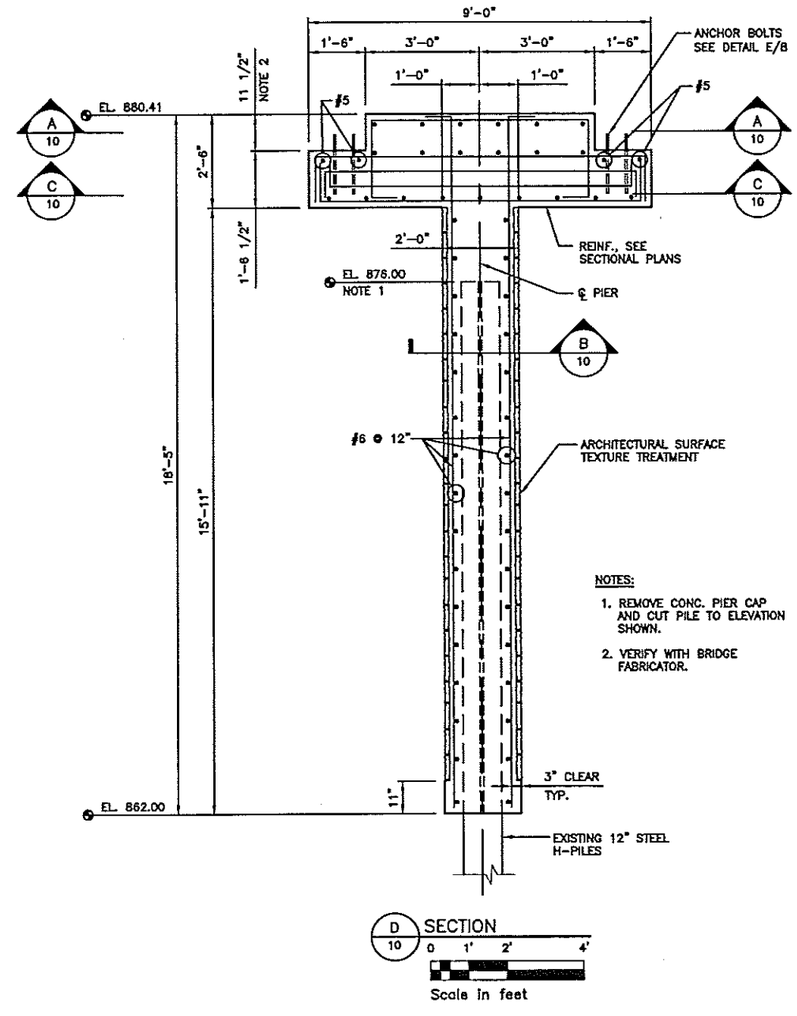
Scale in feet



C/10 SECTIONAL PLAN

0 1' 2' 4'

Scale in feet



D/10 SECTION

0 1' 2' 4'

Scale in feet

SURVEY
DRAWN PHY
DESIGNED CWM
APPROVED JDJ
DATE
PROJ. NO. 20601101

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WISCONSIN.

PRINT NAME: GARY W. MURPIN

SIGNATURE: [signature]

DATE: 3/11/04

LIC. NO. 27274-006

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RIVER FALLS WISCONSIN
VETERANS PARK BRIDGE
PIER 3 PLANS & SECTIONS

20601101S10

SHEET NUMBER
10

B-25

NWL

MAY 07

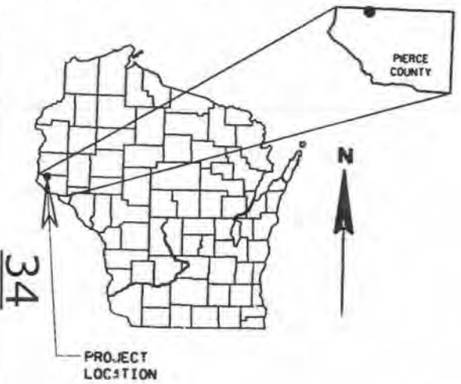
PROJECT ID: 7994-00-48

COUNTY: PIERCE

ORDER OF SHEETS

Section No.	1	Title
Section No.	2	Typical Sections and Details (Includes Erosion Control Plans)
Section No.	3	Estimate of Quantities
Section No.	3	Miscellaneous Quantities
~~Section No.~~	~~4~~	~~Right of Way Plat~~
Section No.	5	Plan and Profile
Section No.	6	Standard Detail Drawings
Section No.	7	Sign Plates
Section No.	8	Structure Plans
~~Section No.~~	~~9~~	~~Computer Earthwork Data~~
~~Section No.~~	~~9~~	~~Cross Sections~~

TOTAL SHEETS = 56



DESIGN DESIGNATION

A.D.T. (2007)	=	2,200
A.D.T. (2027)	=	3,000
D.H.V.	=	220
D.	=	50/50
T.	=	5%
DESIGN SPEED	=	25 MPH
ESALS	=	N/A

CONVENTIONAL SYMBOLS

PLAN		PROFILE	
CORPORATE LIMITS		GRADE LINE	
PROPERTY LINE	PL + 58.1	ORIGINAL GROUND	
LOT LINE		MARSH OR ROCK PROFILE (To be noted as such)	ROCK
LIMITED HIGHWAY EASEMENT		SPECIAL DITCH	LABEL
EXISTING RIGHT OF WAY		GRADE ELEVATION	95.36
PROPOSED OR NEW R/W LINE		CULVERT (Profile View)	
SLOPE INTERCEPT		UTILITIES	
REFERENCE LINE		ELECTRIC	E
EXISTING CULVERT		FIBER OPTIC	FO
PROPOSED CULVERT (Box or Pipe)		GAS	G
COMBUSTIBLE FLUIDS	CAUTION	SANITARY SEWER	SAN
		STORM SEWER	SS
		TELEPHONE	T
MARSH AREA		WATER	W
		UTILITY PEDESTAL	
WOODED OR SHRUB AREA		POWER POLE	
		TELEPHONE POLE	

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

PLAN OF PROPOSED IMPROVEMENT

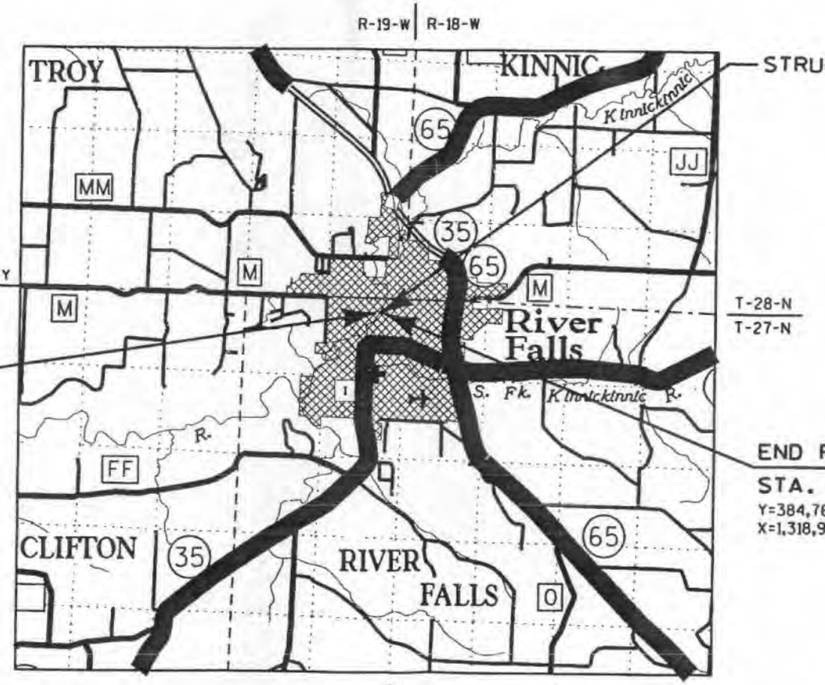
MAPLE STREET, CITY OF RIVER FALLS

(KINNICKINNIC RIVER BRIDGE)

LOCAL STREET
PIERCE COUNTY

STATE PROJECT	FEDERAL PROJECT	
	PROJECT	CONTRAC
7994-00-48		

STATE PROJECT NUMBER
7994-00-48



LAYOUT
SCALE 0 1 MI.

TOTAL NET LENGTH OF CENTERLINE = 0.064 MI.

COORDINATES ON THIS PLAN ARE REFERENCED TO THE WISCONSIN STATE PLANE COORDINATE SYSTEM, NORTH ZONE. SCALED FROM U.S.G.S. TOPOGRAPHIC MAP, RIVER FALLS QUAD. FOR IDENTIFICATION ONLY.

ACCEPTED FOR CITY OF RIVER FALLS

1/19/07 — DATE — CITY ENGINEER

ORIGINAL PLANS PREPARED BY

AYRES ASSOCIATES — Engineers/Architects Scientists/Surveyors
3433 Oakwood Hills Parkway
Eau Claire, WI 54701

WISCONSIN PROFESSIONAL ENGINEER
CHRISTOPHER B. McMAHON
E-29454
EAU CLAIRE
WI

DATE 1/18/07

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

PREPARED BY	
Surveyor	AYRES ASSOCIATES INC
Designer	AYRES ASSOCIATES INC
Consultant Management	KJOHNSON ENGINEERS INC
C.O. Examiner	Gary E. Engebretson

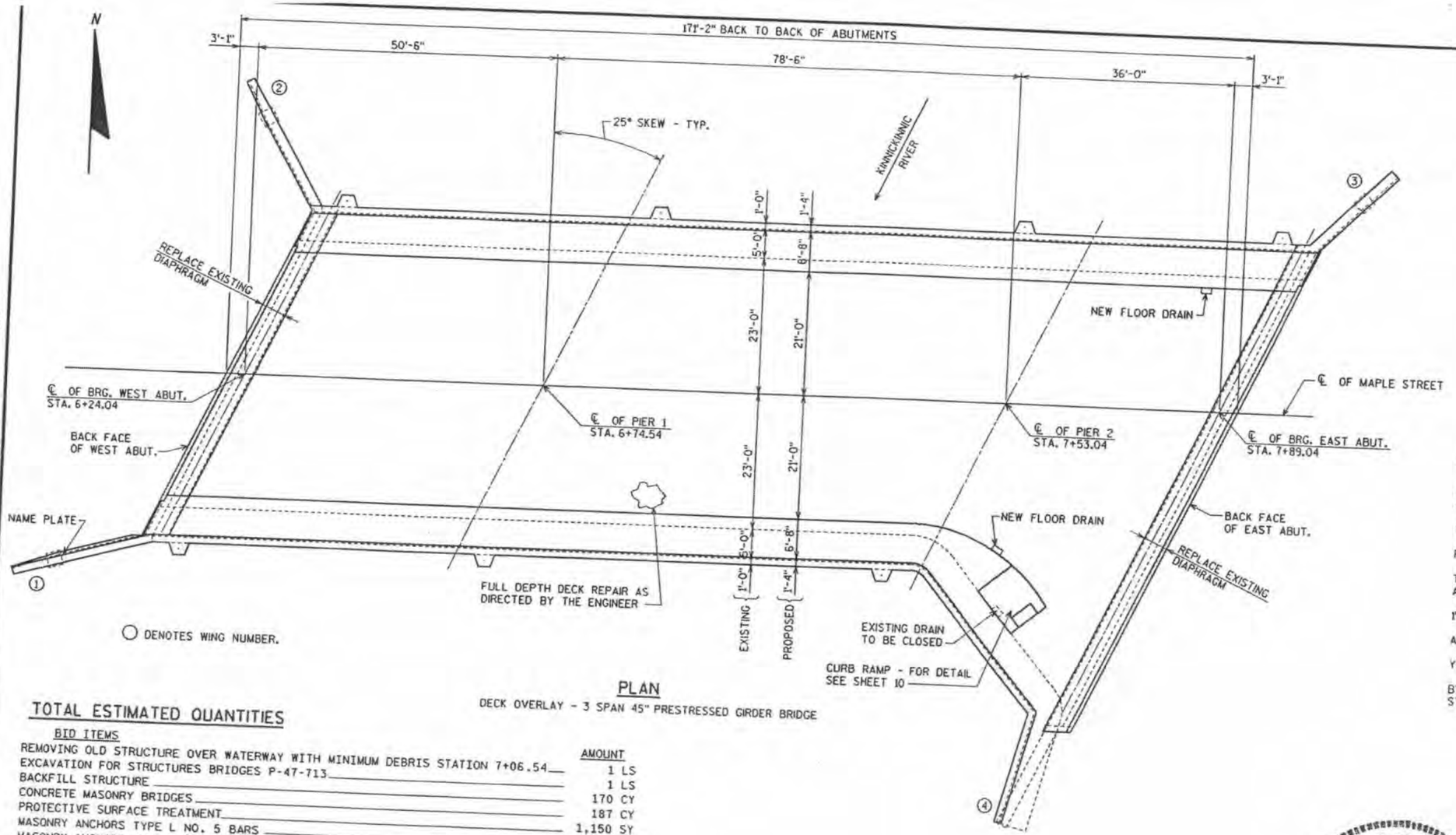
APPROVED FOR REGIONAL OFFICE
DATE: 1/26/07 Jeffrey S. Mikula
(Management Consultant Signature)

E

WISDOT/CADDS SHEET

STATE PROJECT NUMBER	SHEET
7994-00-48	

DATE:
DATE:
DATE:
CHECKED BY:
BACK CHECKED BY:
CORRECTED BY:



○ DENOTES WING NUMBER.

PLAN

DECK OVERLAY - 3 SPAN 45" PRESTRESSED GIRDER BRIDGE

DESIGN DATA

LIVE LOAD: HS-20

RATINGS: INVENTORY = HS-19 OPERATING = HS-31

MAXIMUM STANDARD PERMIT VEHICLE LOAD = 200 KIPS

ULTIMATE DESIGN STRESSES:

CONCRETE MASONRY f'_c = 4,000 p.s.i.

TRAFFIC DATA:

A.D.T. = 2,200 (2007)
A.D.T. = 3,000 (2007)
R.D.S. = 25 M.P.H.

GENERAL NOTES

DRAWINGS SHALL NOT BE SCALED.

PROTECTIVE SURFACE TREATMENT IS TO BE APPLIED TO THE TOP OF DECK, CURB FACES AND TOP OF SIDEWALK.

JOINT FILLER SHALL CONFORM TO THE REQUIREMENTS OF A.A.S.H.T.O. DESIGNATION M 153, TYPE I, II OR III OR A.A.S.H.T.O. DESIGNATION M 213.

THE FIRST DIGIT OF A THREE DIGIT BAR NO. AND THE FIRST TWO DIGITS OF A FOUR DIGIT BAR NO. SIGNIFIES THE BAR SIZE.

ELASTOMERIC BEARING PADS NEED NOT BE INDIVIDUALLY MOLDED PROVIDED THE CUT EDGES ARE SMOOTH AND TRUE.

DIMENSIONS SHOWN ARE BASED ON THE ORIGINAL PLANS. THEREFORE, THE CONTRACTOR SHALL VERIFY DIMENSIONS AND ELEVATIONS IN THE FIELD.

ALL CONCRETE REMOVAL SHALL BE DEFINED BY A 1" DEEP SAW CUT.

UTILIZE EXISTING BAR STEEL REINFORCEMENT WHERE SHOWN AND EXTEND 24 BAR DIAMETERS INTO NEW WORK.

IF A NEW NAME PLATE IS REQUIRED, ORIGINAL CONSTRUCTION YEAR IS 1974.

AT ABUTMENTS, ALL SPACES EXCAVATED AND NOT OCCUPIED BY THE NEW STRUCTURE SHALL BE BACKFILLED WITH BACKFILL STRUCTURE.

TOTAL ESTIMATED QUANTITIES

BID ITEMS	AMOUNT
REMOVING OLD STRUCTURE OVER WATERWAY WITH MINIMUM DEBRIS STATION 7+06.54	1 LS
EXCAVATION FOR STRUCTURES BRIDGES P-47-713	1 LS
BACKFILL STRUCTURE	170 CY
CONCRETE MASONRY BRIDGES	187 CY
PROTECTIVE SURFACE TREATMENT	1,150 SY
MASONRY ANCHORS TYPE L NO. 5 BARS	362 EACH
MASONRY ANCHORS TYPE S 5/8- INCH	1,484 EACH
MASONRY ANCHORS TYPE S 3/4- INCH	14 EACH
BAR STEEL REINFORCEMENT HS COATED BRIDGES	19,070 LB
BEARING PADS ELASTOMERIC NON-LAMINATED	14 EACH
PREPARATION DECKS TYPE 1	45 SY
PREPARATION DECKS TYPE 2	45 SY
CLEANING DECKS	860 SY
CURB REPAIR	5 LF
* CONCRETE SURFACE REPAIR	50 SF
FULL DEPTH DECK REPAIR	45 SY
CONCRETE MASONRY OVERLAY DECKS	50 CY
RAILING STEEL TYPE C1 P-47-713	1 LS
FLOOR DRAINS TYPE GC	2 EACH
DOWNSPOUT 6-INCH	10 LF
RUBBERIZED MEMBRANE WATERPROOFING	36 SY
CURB RAMP DETECTABLE WARNING FIELD YELLOW	8 SF
**RIPRAP HEAVY	40 CY
CONDUIT RIGID METALLIC 2-INCH	25 LF
CONDUIT RIGID NONMETALLIC SCHEDULE 40 2-INCH	360 LF
JUNCTION BOXES 8x8x8-INCH	9 EACH
ANCHOR ASSEMBLIES LIGHT POLES	7 EACH
PRECAST CONCRETE SHIM PADS	14 EACH
ARCHITECTURAL SURFACE TREATMENT	2,475 SF

*QUANTITY IS UNDISTRIBUTED FOR SIDEWALK, PIERS, AND ABUTMENTS.

**QUANTITY IS UNDISTRIBUTED FOR SLOPE AT WEST ABUTMENT AS DIRECTED BY THE ENGINEER AND BOULDER RETARDS AS DETERMINED BY THE WDNR.

LIST OF DRAWINGS

1. GENERAL PLAN
2. TYPICAL SECTIONS
3. WEST ABUTMENT
4. WEST ABUTMENT DETAILS
5. EAST ABUTMENT
6. EAST ABUTMENT DETAILS
7. SHIM & BEARING DETAILS
8. SUPERSTRUCTURE
9. SUPERSTRUCTURE PLAN
10. SUPERSTRUCTURE RAMP DETAILS
11. SUPERSTRUCTURE DETAILS
12. SUPERSTRUCTURE DETAILS
13. SUPERSTRUCTURE BILL OF BARS
14. LIGHTING DETAILS
15. FLOOR DRAIN TYPE "GC"
16. COMBINATION RAIL TYPE "C1"
17. COMBINATION RAIL TYPE "C1"
18. COMBINATION RAIL TYPE "C1"
19. COMBINATION RAIL TYPE "C1"
20. ARCHITECTURAL SURFACE TREATMENT

WISCONSIN
CHRISTOPHER B. McMAHON
E-29454
EAU CLAIRE
WI
PROFESSIONAL ENGINEER
1/31/07

BRIDGE OFFICE CONTACT:
WILLIAM DREHER
(608)-261-8205

CONSULTANT CONTACT:
CHRIS MCMAHON
(715)-834-3161

No.	Date	Revision	By

PLANS PREPARED BY
AYRES ASSOCIATES
Engineers/Architects
Scientists/Surveyors
3433 Oakwood Hills Parkway
Eau Claire, WI 54701

WISDOT
BUREAU OF STRUCTURES

STRUCTURE P-47-713

MAPLE STREET OVER KINNICKINNIC RIVER

County: PIERCE		Name of City, Village or Town: RIVER FALLS	
Design Spec: A.A.S.H.T.O. '02		Load: HS-20	Const. Spec.: 2003
Designed By: DNS	Design Checked:	Drawn By: GLD	Plans Checked: CBM
Approved: William C. Dreher, SDR, Chief Bridge Design Engineer		Date: 2-26-07	

GENERAL PLAN

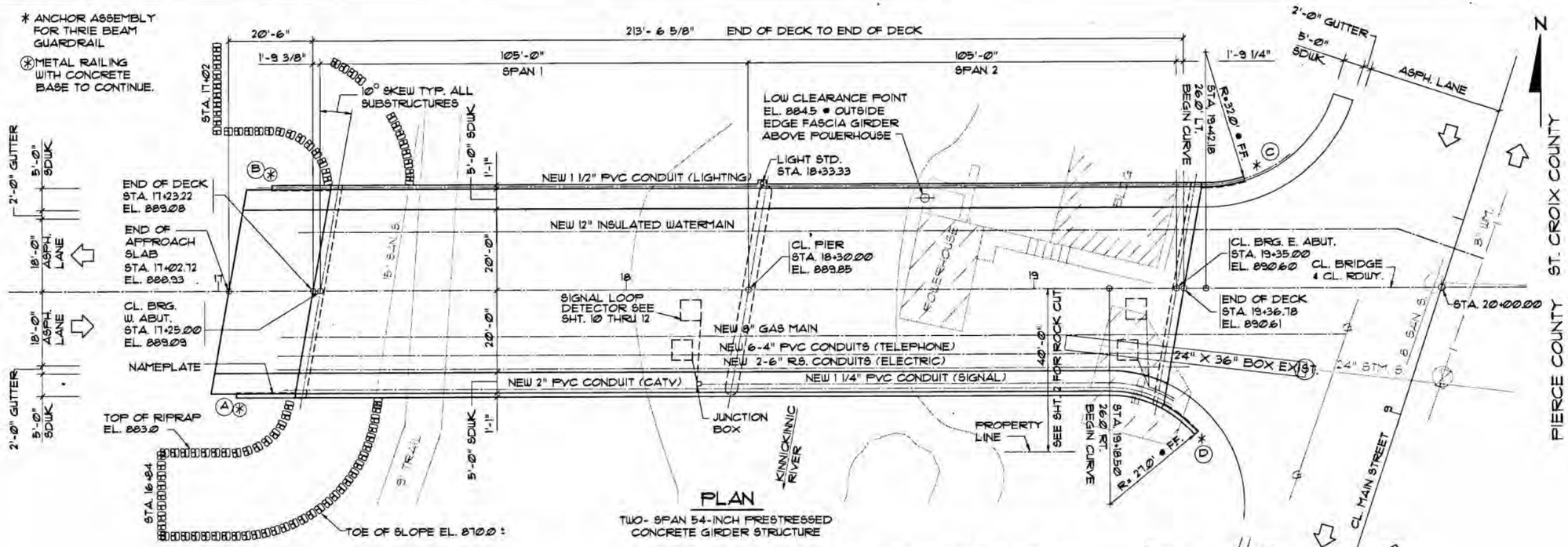
SHEET 1 OF 20

DATE:

8

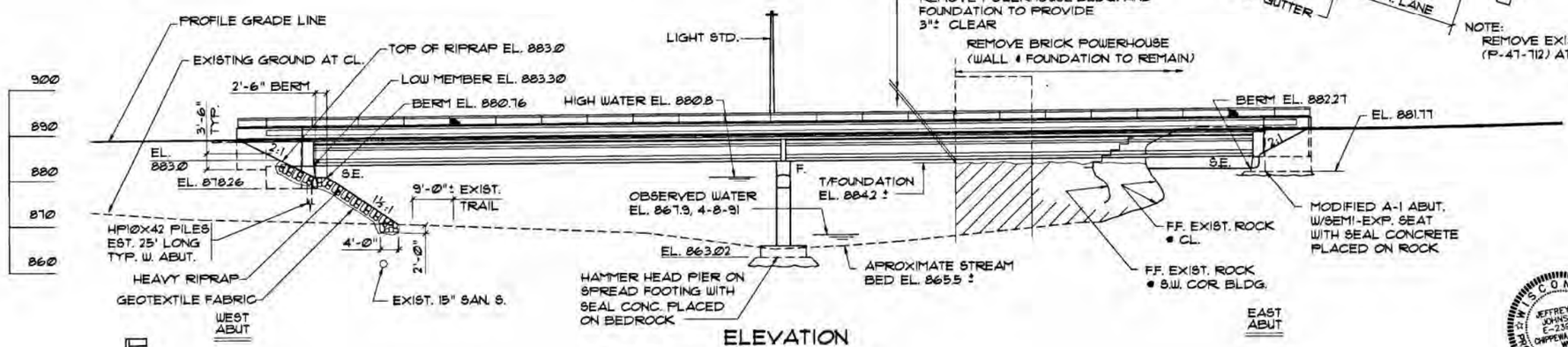
DESIGN FILE IS u:±BRIDGE-2005±420612gp.dgn
$PRFNAME$
DATE OF PLOT = 1/30/2007
PEN TABLE = ±Plot±pentables±laser±smbr.tbl

STATE PROJECT NUMBER	SHEET NO.
7994-00-27	8

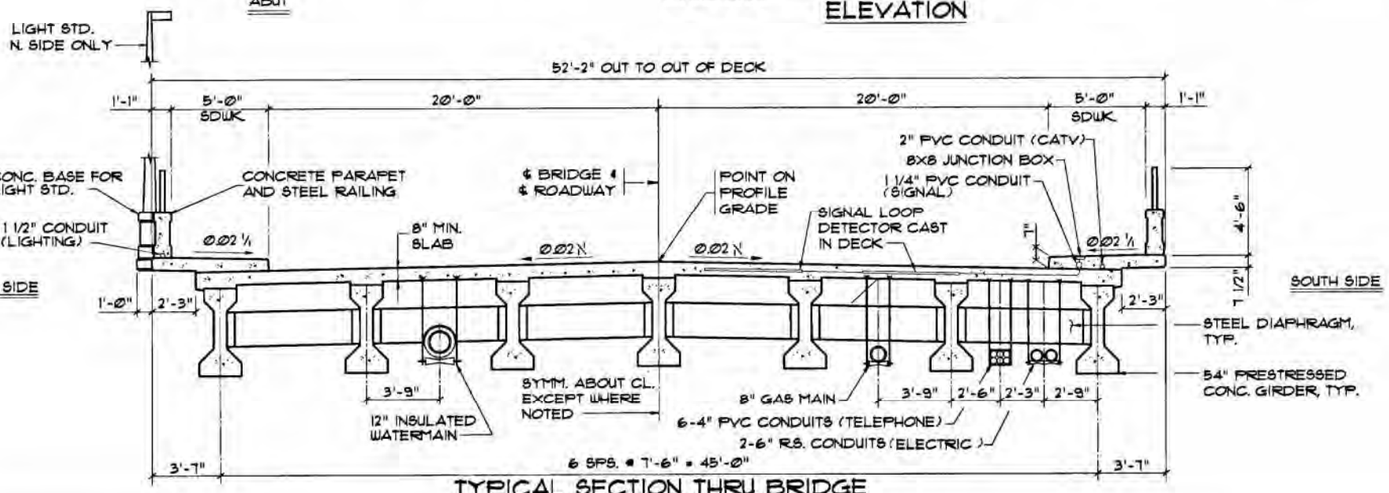


PLAN

TWO- SPAN 54-INCH PRESTRESSED CONCRETE GIRDER STRUCTURE



ELEVATION



TYPICAL SECTION THRU BRIDGE

LOOKING UPSTATION

DESIGN DATA

LIVE LOAD:
- DESIGN RATING = HS20
- INVENTORY RATING = HS22
- OPERATING RATING = HS43
- MAX. STD. PERMIT VEHICLE LOAD = 250 KIPS

STRUCTURE DESIGNED FOR FUTURE WEARING SURFACE OF 20 P.S.F.
INVENTORY, OPERATING, AND STD. PERMIT VEHICLE RATINGS DO NOT INCLUDE FUTURE WEARING SURFACE

ULTIMATE DESIGN STRESSES:
- CONC. MASONRY SLAB: f'c = 4,000 psi
- ALL OTHER: f'c = 3,500 psi
- HIGH STRENGTH BAR STEEL REINFORCEMENT: fy = 60,000 psi
- PRESTRESSED CONCRETE GIRDER (54") CONCRETE: f'c = 6,500 psi
- STRANDS, ½" DIA. ULTIMATE TENSILE STRENGTH: fy = 270,000 psi (LOW RELAXATION)

FOUNDATION DATA

WEST ABUTMENT TO BE SUPPORTED ON HP10X42 PILES ESTIMATED 25 FEET LONG AND DRIVEN TO A MIN. BRG. VALUE OF 55 TONS PER PILE.

EAST ABUTMENT SUPPORTED ON ROCK WITH SEAL CONCRETE. MINIMUM BEARING CAPACITY OF 12 KSF ON ROCK.

PIER SUPPORTED ON SPREAD FOOTING ON ROCK WITH SEAL CONCRETE. MINIMUM BEARING CAPACITY OF 12 KSF ON ROCK.

HYDRAULIC DATA

100 YEAR FREQUENCY

Q_{100}	12,300	C.F.S.
VELOCITY	7.2	F.P.S.
HIGH WATER EL.	880.8	
WATERWAY AREA	1708	SQ. FT.
DRAINAGE AREA	97.4	SQ. MILES
ROAD OVERTOPPING	N/A	
SCOUR CRITICAL CODE	5	

TRAFFIC DATA

ADT (1995)	5500
ADT (2015)	7100
DHV	745
D	55 %
T	5 %
V	25 MPH

WISCONSIN PROFESSIONAL ENGINEER JEFFREY A. JOHNSON E-23938 CHIPPEWA FALLS, WI
8/21/92

BRIDGE OFFICE CONTACT:
C. RAY
(608) 266-8486

LIST OF DRAWINGS

1. GENERAL PLAN
2. QUANTITIES AND GENERAL NOTES
3. SUBSURFACE EXPLORATION
4-5 WEST ABUTMENT
6-7 EAST ABUTMENT
8-9 PIER
10-13 SUPERSTRUCTURE
14. 54" PRESTRESSED GIRDER DETAILS
15. STEEL DIAPHRAGM DETAILS
16. CONCRETE PAVEMENT APPROACH SLAB WITH SIDEWALK
17-19 CONCRETE PARAPET AND STEEL RAILING

ESEH ENGINEERS ARCHITECTS PLANNERS

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STRUCTURE B-47-64

DIVISION STREET OVER KINNICKINNIC RIVER

COUNTY PIERCE/ST. CROIX		TOWN RIVER FALLS	
DESIGN SPEC. 1991 AASHTO		LOAD HS20	CONST. SPEC. 1989
DESIGNED BY JAJ	DESIGN CK'D. MLH	DRAWN BY DLF	PLANS CK'D. MLH

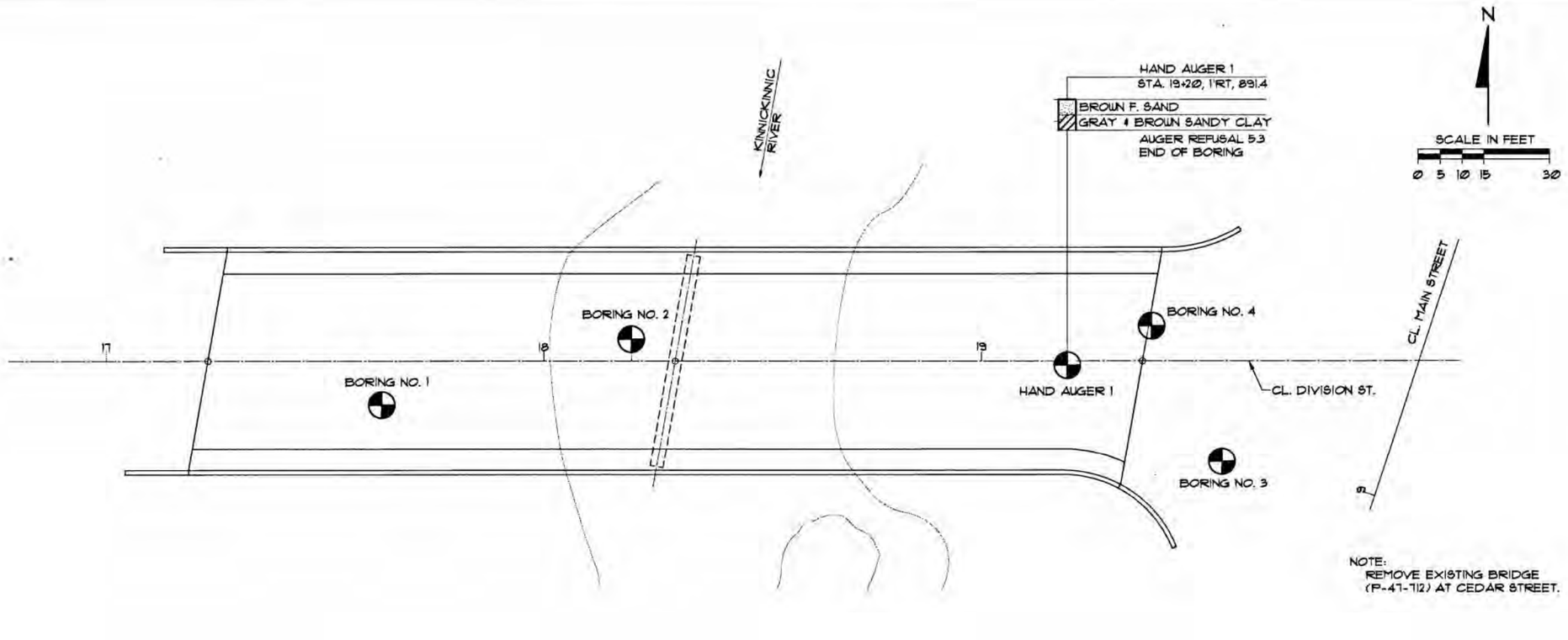
APPROVED Stanley W. Woods STATE BRIDGE ENGINEER 1-21-93 DATE

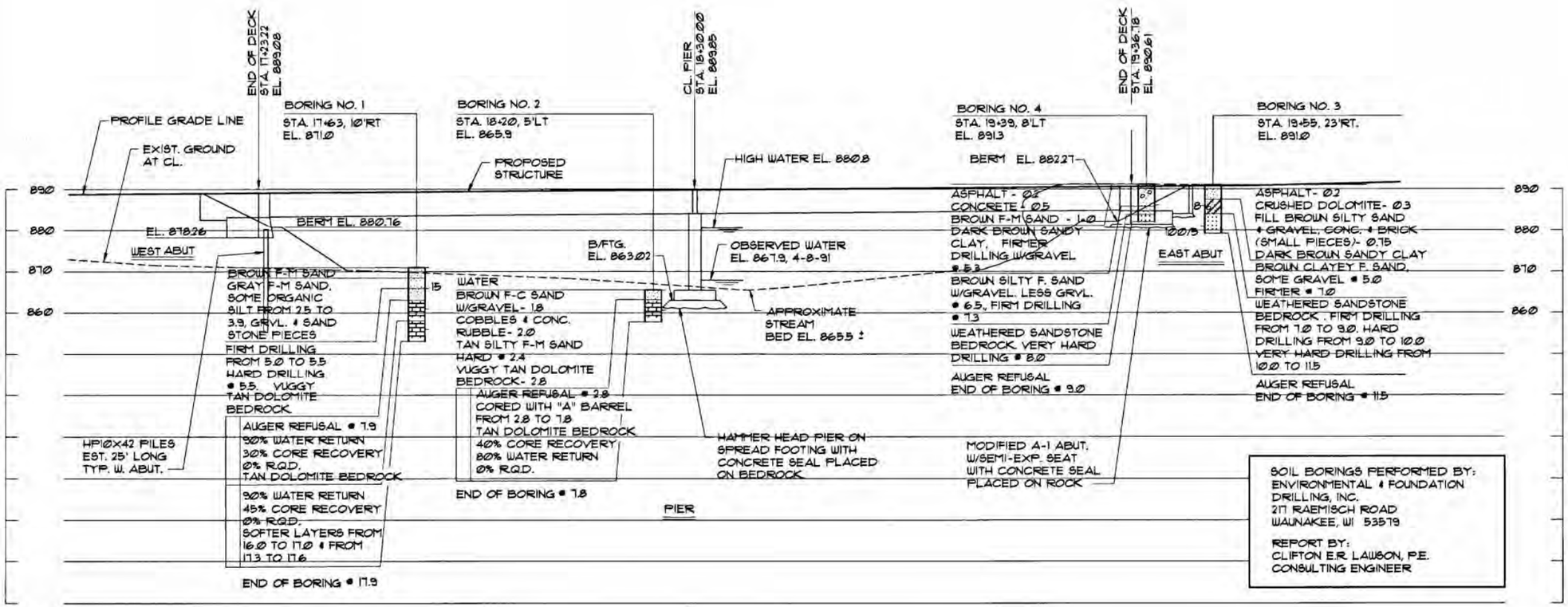
GENERAL PLAN

SHEET 1 OF 19

11360GP1

STATE PROJECT NUMBER	SHEET NO.
7994-00-27	8.2





SOIL BORINGS PERFORMED BY:
ENVIRONMENTAL & FOUNDATION DRILLING, INC.
217 RAEMISCH ROAD
WAUNAKEE, WI 53597

REPORT BY:
CLIFTON E.R. LAWSON, P.E.
CONSULTING ENGINEER

ABBREVIATIONS

F——Fine M——Medium C——Coarse
Ws——Weathered So——Sound

MATERIAL SYMBOLS

Topsoil, Sand, Gravel, Organics, Silt, Silty Clay, Clayey Silt, Clay, Boulders or Cobbles, Sandstone, Limestone, Igneous Rock

LEGEND OF PROBING

95/6=Blows for 6" Penetration
Probing taken with a 350# wt. Falling 18" on a 2" O.D. Point

Probing No.
Sta.
Elevation
7 Average blows Per Ft.
Refusal 95/6

LEGEND OF BORING

Unless otherwise specified, the blows per foot at the locations indicated are based on driving a 2" O.D. x 1.4" I.D. split spoon sampler with a 140# hammer having a free fall of 30". The blow count is taken in undisturbed soil immediately below a cased or open hole eliminating side friction on the drive pipe.

SUBSURFACE EXPLORATION FOR FOUNDATION DESIGN AND BIDDERS INFORMATION

To obtain relative data concerning the character of material in and upon which the foundation might be built, borings and/or soundings were made at points approximately as indicated on this drawing. The data presented herein represents the findings of the subsurface explorations made. However, because the depths investigated are limited and the area of the borings and/or soundings is very small in relation to the entire area, the Division of Highways does not warrant conditions below the depths investigated or that the classification of material encountered in these investigations is necessarily typical of the entire site.

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STRUCTURE B-47-64

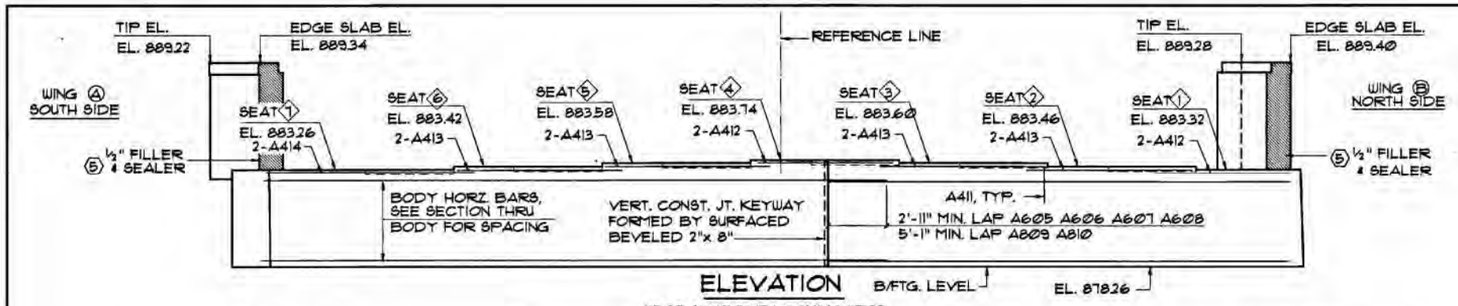
CONST. SPEC.	1989	DRAWN BY	DLF	PLANS CK'D.	MLH

SUBSURFACE EXPLORATION

SHEET 3 OF 19

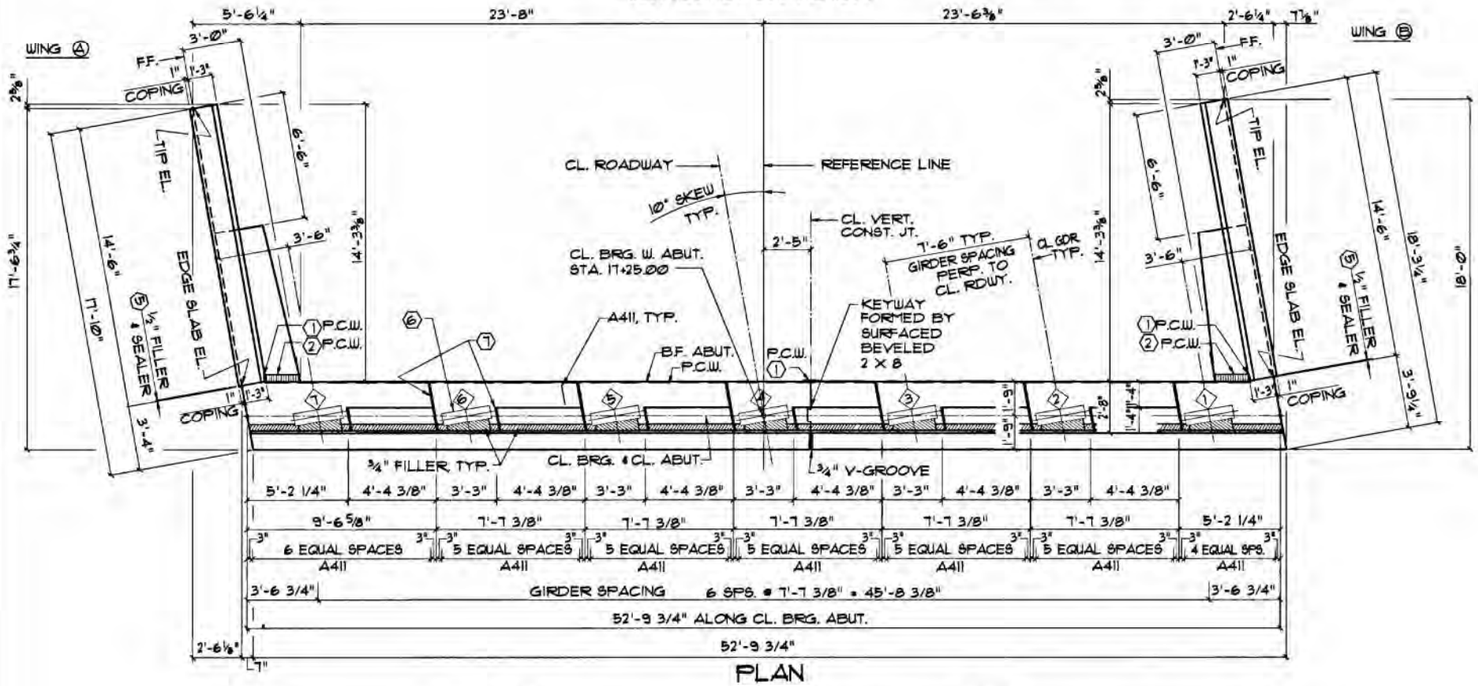
11360SE_

STATE PROJECT NUMBER	SHEET NO.
7994-00-27	8.3

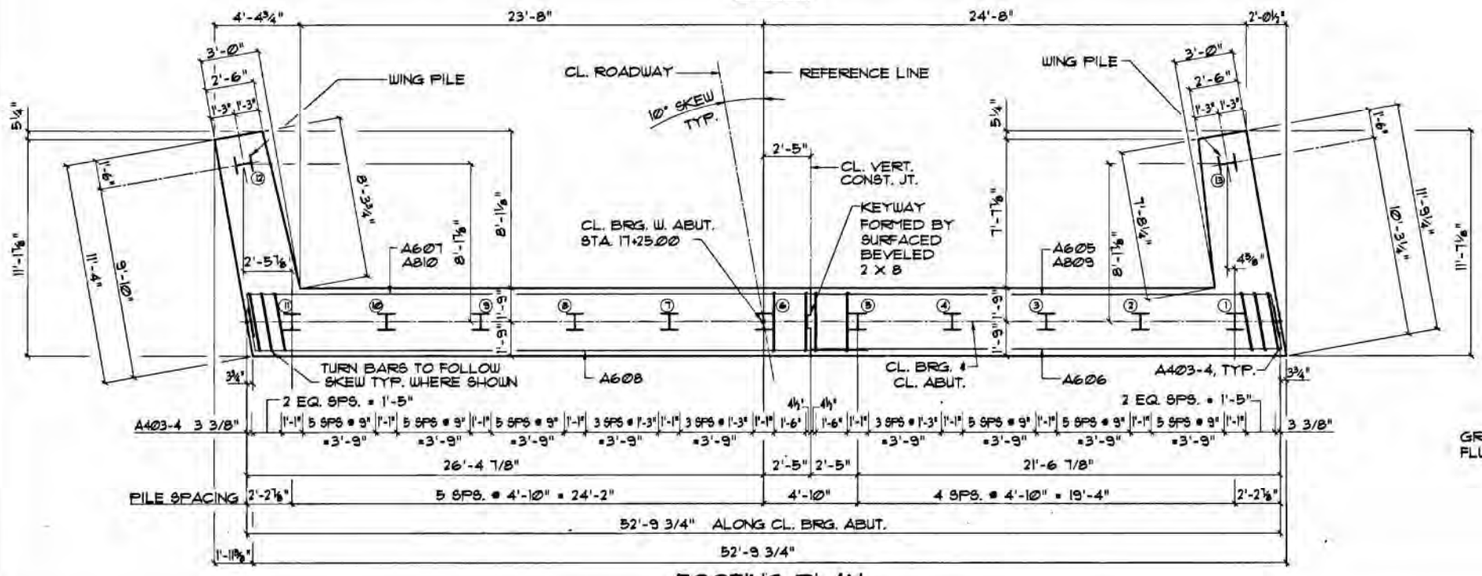


ELEVATION

WEST ABUTMENT LOOKING WEST.



PLAN



FOOTING PLAN

(1) VERTICAL POLYVINYL CHLORIDE WATERSTOP TO EXTEND FROM BRIDGE SEAT TO TOP OF WALL AND TO EXTEND FROM B/FTG. TO BRIDGE SEAT @ THE CONST. JOINT. HEAT-WELD TO HORIZ. P.C.W.

(2) P.C.W. - PLACE BOT. HALF HORIZ. IN THIS AREA.

(3) STEEL TROWEL TOP SURFACE OF ABUTMENT. PLACE MULTIPLE LAYERS OF POLYETHYLENE SHEETS OVER ENTIRE ABUTMENT TOP BEFORE PLACING BEARING PADS AND/OR SUPERSTRUCTURE TOTAL THICKNESS OF SHEETS SHALL BE AT LEAST Ø.03".

(4) TURN BARS UP OR DOWN AND BEND OR TRIM AS NEEDED.

(5) 1/2" FILLER TO EXTEND FROM BRIDGE SEAT & TOP OF WALL TO TOP OF SDWK.

(6) 1/2"x 8"x 2'-6" ELASTOMERIC BRG. PAD, TYP. SEE BEARING PAD PLAN, SHT.12

(7) 3/4" CORK FILLER ON VERT. FACE ONLY, TYP.

ABUTMENT NOTES:

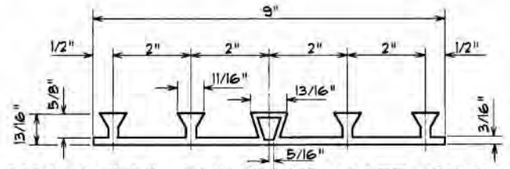
THREADED BAR SPLICES MAY BE USED UPON APPROVAL OF THE ENGINEER WITH NO ADDITIONAL COMPENSATION.

EXCAVATE TO EL. 878.26 W. ABUT. BEFORE DRIVING PILING.

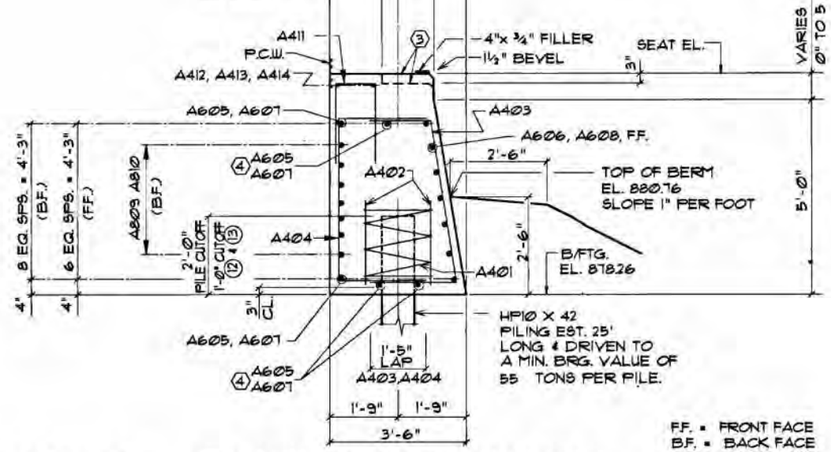
SEAL ALL EXPOSED HORIZONTAL AND VERTICAL SURFACES OF 1/2"AND 3/4" FILLER WITH NON-STAINING GRAY NON-ASPHALTIC JOINT SEALER (1" DEEP AND HOLD 1/8" BELOW SURFACE OF CONCRETE).

P.C.W. SHALL BE BUTT-SPLICED BY USING A HEATED SPLICING IRON AND HELD FLUSH WITH CONC. AT LOCATIONS SHOWN ON THE PLANS AND AT LOCATIONS SPECIFIED BY THE ENGINEER.

TO ELIMINATE STEPPING & SPLICING OF THE P.C.W., THE TOP OF BODY MAY BE SLOPED BETWEEN THE LEVEL BEAM SEATS.

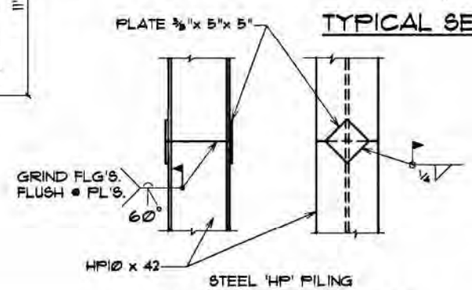


POLYVINYL CHLORIDE WATERSTOP (P.C.W.)



TYPICAL SECTION THRU BODY

F.F. = FRONT FACE
B.F. = BACK FACE
E.F. = EACH FACE



PILE SPLICE DETAIL

NO.	DATE	REVISION	BY

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STRUCTURE B-47-64

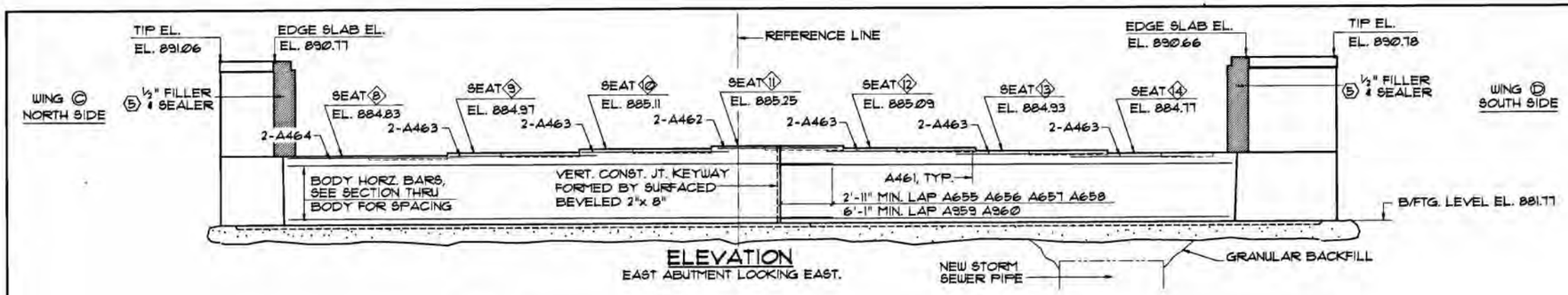
CONST. SPEC.	1989	DRAWN BY	DLF	PLANS CK'D.	MLH

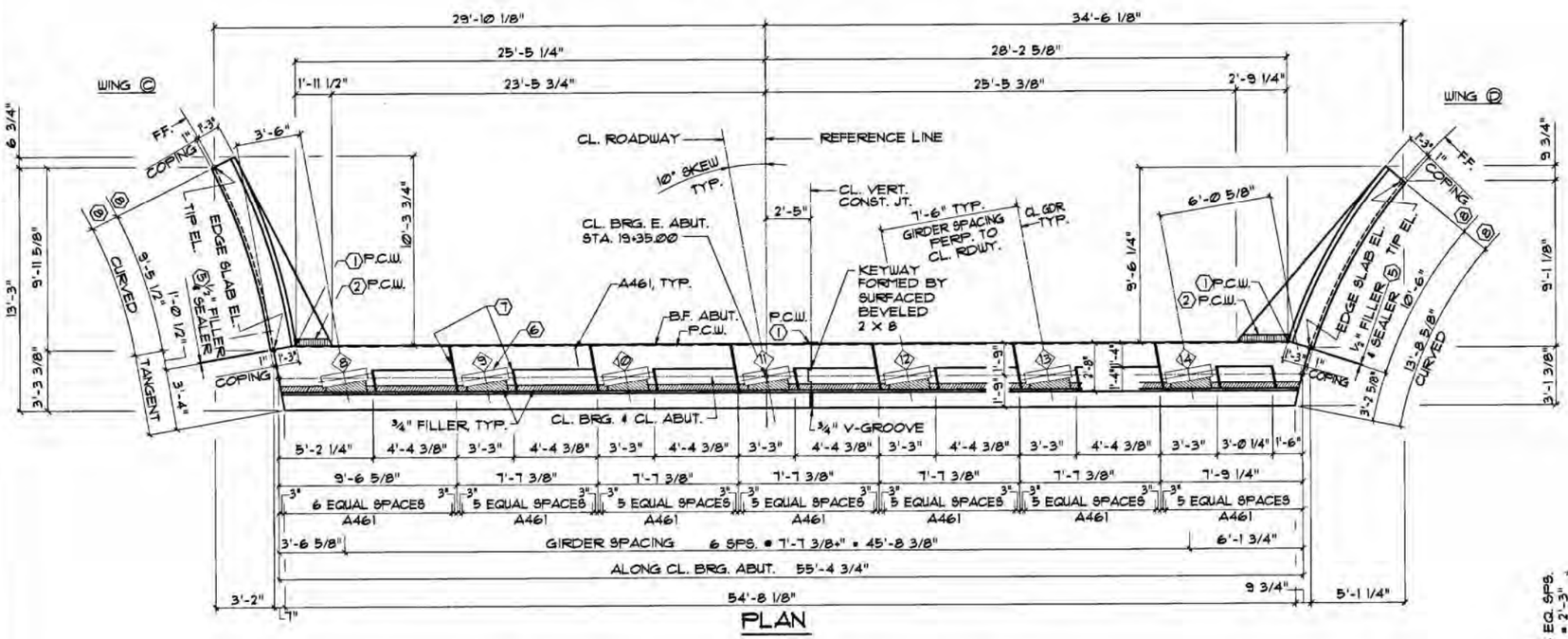
WEST ABUTMENT

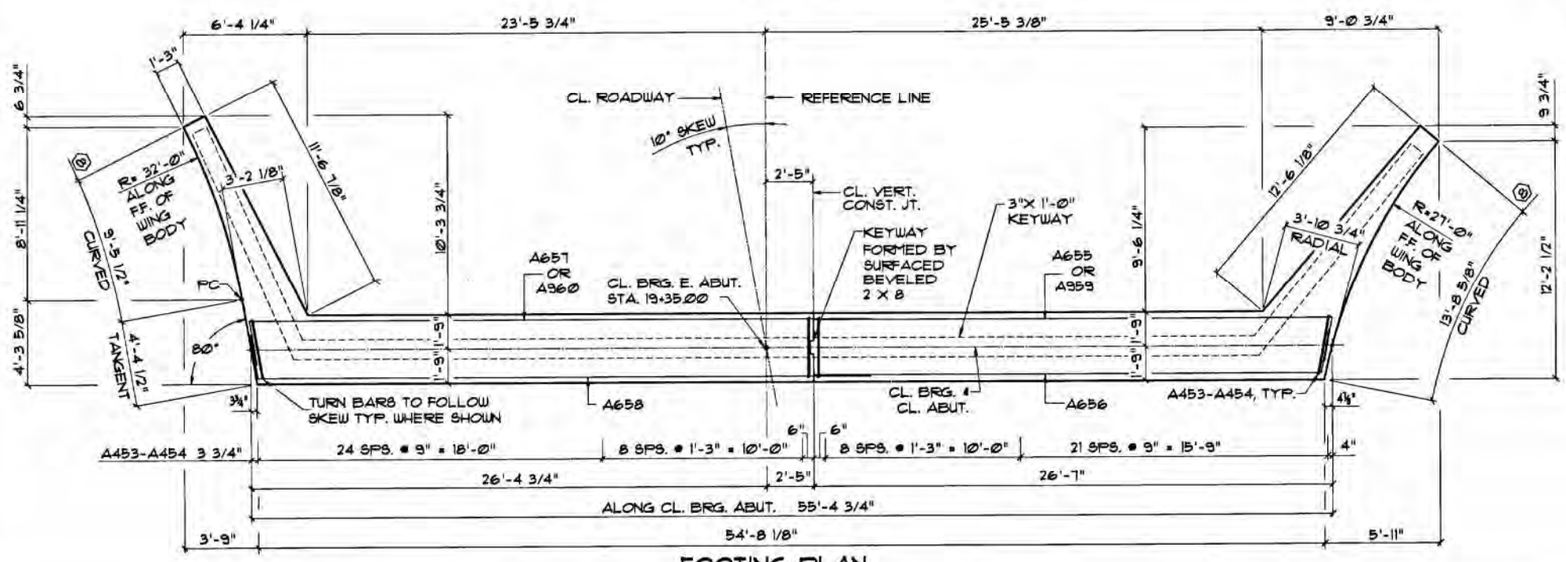
SHEET 4 OF 19

11360WA1

STATE PROJECT NUMBER	SHEET NO.
7994-00-27	8.5







ABUTMENT NOTES:

EXCAVATE TO EL. 880.0±, PLACE SEAL CONCRETE ON ROCK TO EL. 881.77, PROVIDE KEYWAY IN SEAL FOR ABUT. AND WING FOOTINGS.

SEE WEST ABUTMENT FOR ABUTMENT NOTES AND P.C.W. DETAIL.

① VERTICAL POLYVINYL CHLORIDE WATERSTOP TO EXTEND FROM BRIDGE SEAT TO TOP OF WALL AND TO EXTEND FROM B/FTG. TO BRIDGE SEAT @ THE CONST. JOINT. HEAT-WELD TO HORIZ. P.C.W.

② P.C.W. - PLACE BOT. HALF HORIZ. IN THIS AREA.

③ STEEL TROWEL TOP SURFACE OF ABUTMENT. PLACE MULTIPLE LAYERS OF POLYETHYLENE SHEETS OVER ENTIRE ABUTMENT TOP BEFORE PLACING BEARING PADS AND/OR SUPERSTRUCTURE. TOTAL THICKNESS OF SHEETS SHALL BE AT LEAST Ø.03".

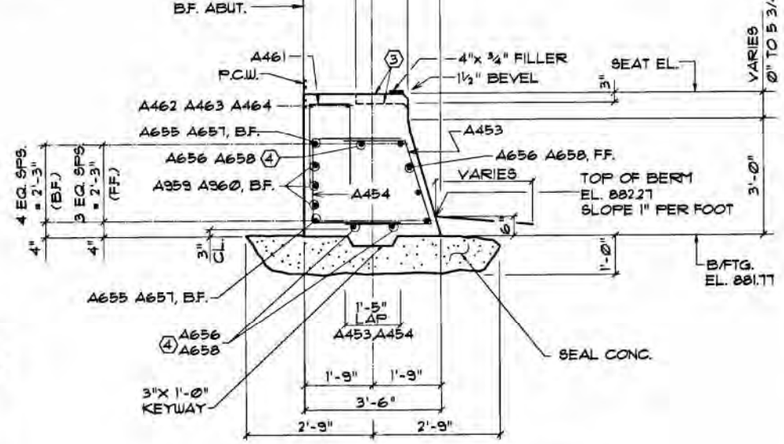
④ TURN BARS UP OR DOWN AND BEND OR TRIM AS NEEDED.

⑤ ½" FILLER TO EXTEND FROM BRIDGE SEAT TO TOP OF WALL & TOP OF SDWK.

⑥ 1/2"x 8"x 2'-6" ELASTOMERIC BRG. PAD, TYP. SEE BEARING PAD PLAN, SHT.12

⑦ 3/4" CORK FILLER ON VERT. FACE ONLY, TYP.

⑧ DIMENSIONS ALONG CURVES ARE MEASURED AT FRONT FACE OF WING



TYPICAL SECTION THRU BODY

F.F. = FRONT FACE
B.F. = BACK FACE
E.F. = EACH FACE

NO.	DATE	REVISION	BY

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STRUCTURE B-47-64

CONST. SPEC.	1989	DRAWN BY	DLF	PLANS CK'D.	MLH

EAST ABUTMENT

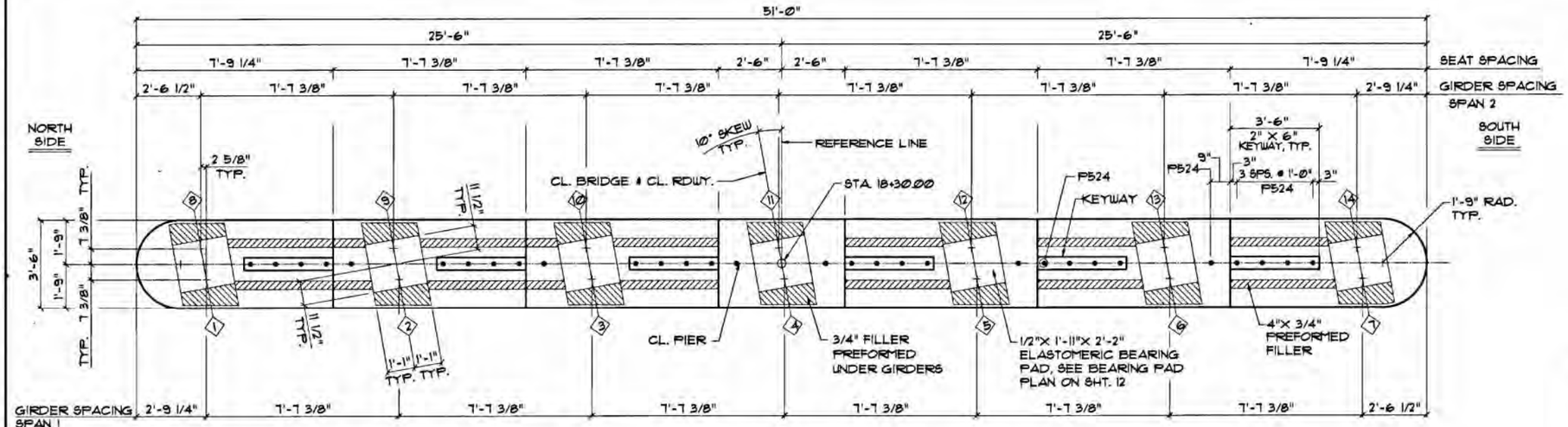
SHEET 6 OF 19

11360EA1

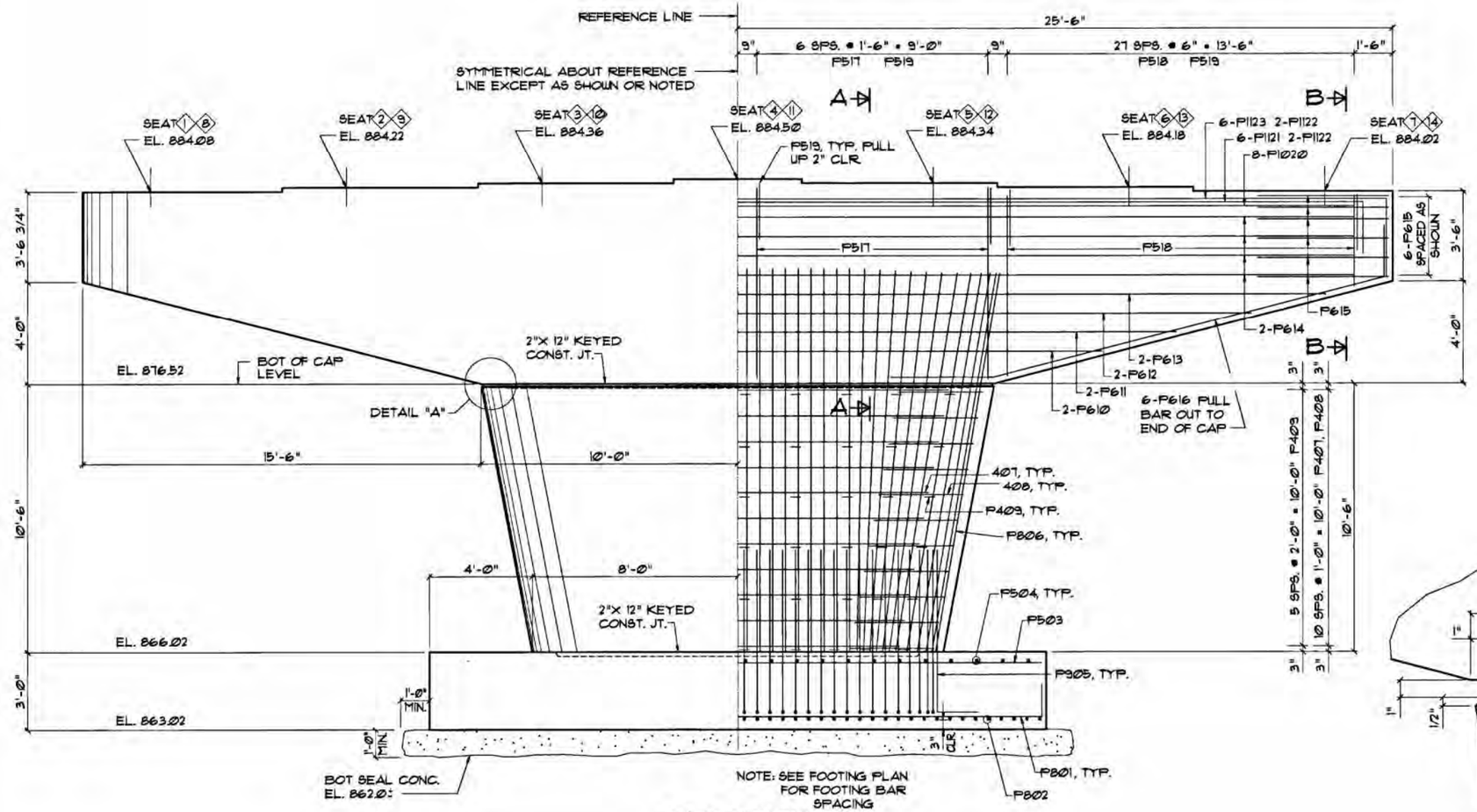
STATE PROJECT NUMBER	SHEET NO.
7994-00-27	8.1

PIER NOTES:

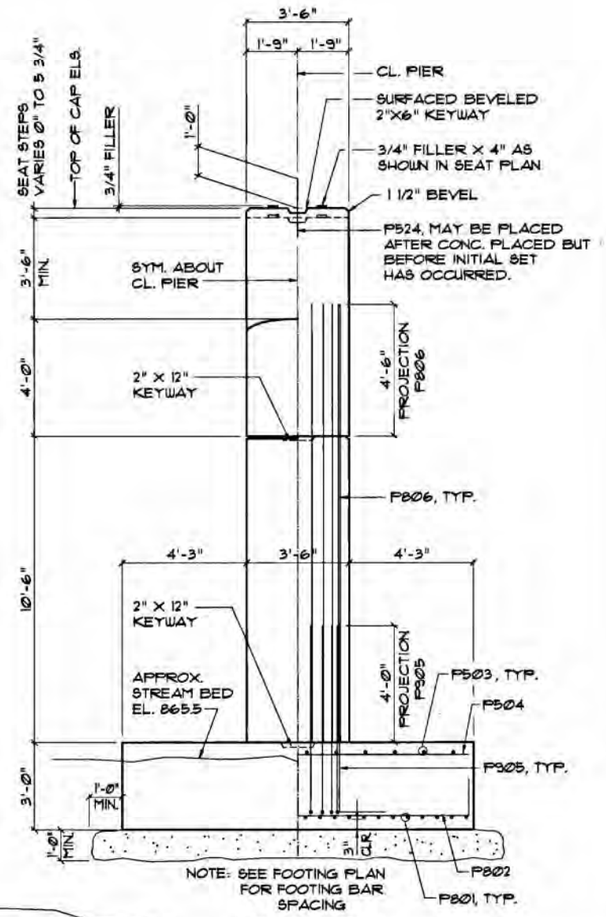
BAR STEEL REINFORCEMENT SHALL BE IMBEDDED 2 1/2" CLEAR UNLESS OTHERWISE SHOWN OR NOTED.



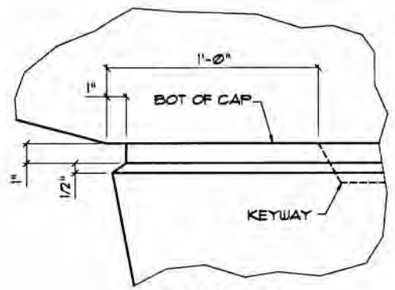
SEAT PLAN



ELEVATION



END VIEW



DETAIL "A"
KEYED CONST. JT.

NO.	DATE	REVISION	BY

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STRUCTURE B-47-64

CONST. SPEC.	1989	DRAWN BY	DLF	PLANS CK'D.	MLH

PIER

SHEET 8 OF 19

11360P1_

SUBSURFACE INVESTIGATION

DIVISION STREET OVER KINNICKINNIC RIVER
CITY OF RIVER FALLS
WISCONSIN

I.D. 7994-00-25

I. INTRODUCTION

This investigation was performed for the purpose of providing design information for the subject structure. This report is based upon a field investigation with test borings and the geotechnical analysis of that information.

The conclusions and recommendations given in this report are based upon our interpretation of available subsurface and project information. The report may not represent variations which may occur between and away from test boring locations. Should the scope of the project be altered or if subsurface variations become evident during construction, it may be necessary to modify our recommendations.

II. PROJECT DESCRIPTION

The project proposed will be a new bridge over the river, with approximately 162 x 40 foot dimensions, two spans. At present there is a power house and other structures on site. Rock is exposed in the nearby areas, implying that bedrock will be close to the surface in the area.

III. FIELD INVESTIGATION

Four standard penetration borings were performed according to ASTM D-1586 procedures on 09/16-17/91 by Environmental and Foundation Drilling, Inc. at the locations shown on the attached drawing. Drilling between samples was by the hollow stem auger technique. Two of the borings were cored into hard material, apparently bedrock (see comments to follow), using ASTM Method D-2113, AX size. One auger boring also was performed (indicated as HA-1) per ASTM Method D-1452. Borings were backfilled with bentonite chips. Boring logs are attached.

The soil samples were examined by a qualified soils technician and the undersigned for classification purposes. Water table readings shown on the logs are considered representative of site conditions at time of boring only.

Elevations refer to Bench Mark No. 3, at 35th and Division Streets, as El. 894.30.

IV. SUBSURFACE CONDITIONS

The site is mapped as glacial ground moraine area. Rock type is mapped as St. Peter sandstones over Prairie du Chien group dolomites.

The borings each encountered apparent weathered rock, under shallow overburden soil. The rock cored in the lower elevations is quite highly weathered dolomite. Recovery is quite poor and quality of rock is considered poor.

While the driller's interpretation of rock drilled into by power auger at higher eastern bank areas is classed as sandstone, this may be the sandier parts of the Prairie du Chien group. The visual appearance of the rock nearby shows hard layers over softer layers, with some obvious erosion of the softer layers by the stream, undermining the harder parts.

Due to the small pieces of rock recovered in the lower elevations, the Rock Quality Designator (RQD) is zero for all rock zones cored. However, the drilling indicated apparently all of the length of coring as being in bed-rock, (as compared to possible boulder zones).

The eastern borings show weathered (apparent) sandstone under a shallow layer of overburden. This is not the St. Peter sandstone, but apparent sandy dolomite zones, highly weathered.

V. DISCUSSION AND RECOMMENDATIONS

A. Footing Foundations

Footings on the rock are considered to be the most suitable foundations.

Weak rock, as apparently present here, has low bearing capacity. Recommended presumptive allowable bearing capacity for the obvious rock on site is 6 tons per square foot. Overburden soil has variable low bearing capacity, near 2,000 pounds per sq. ft.

Footing grades should be set sufficiently low that there is no risk of undermining by stream action, even though they rest on rock.

To avoid the risk of abutments slipping toward the stream, the abutment footings should be set low enough and sufficiently back of the bank that a line drawn down from edge of footing base, at 45° to the vertical, does not emerge from the rock. If there is soil within this zone, lower footings so the line slope is at 2 horizontal to 1 vertical.

It is mandatory that an experienced person examines exposed conditions at footing grades during construction to verify that, in fact, suitable quality rock is present at footing grades. Where the rock has weathered to soil condition, excavate that soil and replace with concrete. This excavation should extend outside the foundation area a distance equal to undercut depth, to provide suitable lateral support at abutment stream side areas. At other areas, this lateral distance of undercut is not considered necessary.

It is possible that pier foundations may not find solid rock at proposed footing grades, due to uneven erosion and weathering in the stream area. In that case, the recommended procedure is to replace all soil below the proposed foundation base with concrete. This may require excavation of some portions of harder rock in order to remove the softer soil zones. At this writing it is not possible to predict exactly what will be experienced, but the undercut and concrete fill appears to be the most suitable method of preparing the site, to avoid changes in planned footing designs, steel, etc.

B. Pile Foundations

The weathered rock may permit pile driving, using high capacity H-piles, fitted with tips. It is unlikely that a full 10 feet of penetration of piles will be possible, but the use of non-displacement piles would be most likely to effect deepest penetration into the rock.

It is expected that H-piles will be the only pile type to achieve good lateral support in the weathered rock, without pre-drilling. That good lateral support situation would reason enough to accept piles at any length over 5 feet below pile cap. It is understood the original 10 foot minimum DOT pile length requirement came from experiences with timber piles driven to hard rock, with no penetration into the dense materials, leaving a loose pile, not having solid lateral support. H-piles in weathered rock would be expected to have excellent lateral support in that interval (5 feet of rock penetration).

Estimates of H-pile lengths should be made considering that at least 10 feet of penetration into rock would be possible, but actual length of penetration may vary significantly from this, possibly being on the short side.

An alternative to trying non-displacement piles and accepting some short of 10 feet penetration would be to drill holes into the rock, to accepted depth, fill them with concrete and immediately **DRIVE** the piles into the fresh concrete. Do not allow the piles to merely be set into the concrete, since bottom of hole is likely to be disturbed, loose soil.

Any of the usual pile types can be used for pre-drilled pile installations, with full DOT allowable design stresses used in the design.

Of the possible alternative foundations indicated herein, this writer would recommend footings founded on rock as the most suitable for the site. However, the final decision depends upon many factors, not only the information obtained in this investigation. There may be possibility to use footings on rock for foundations obviously near rock, and piles to (and into) rock where significant fill thickness is planned (as at the west abutment).

C. Pavements

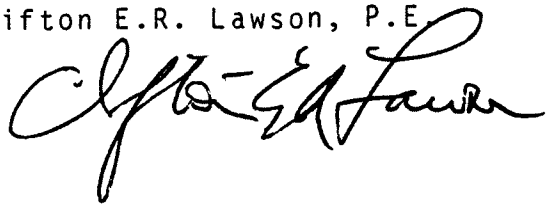
Estimated available fill soil for pavement support is likely to be silty soil, considered to be highly frost susceptible. This material is considered to have a Frost Group designation of F-3 to F-4 resulting in a Design Group Index of 14 and a Soils Support Value of 3.9, considering a Regional Factor of 2.0.

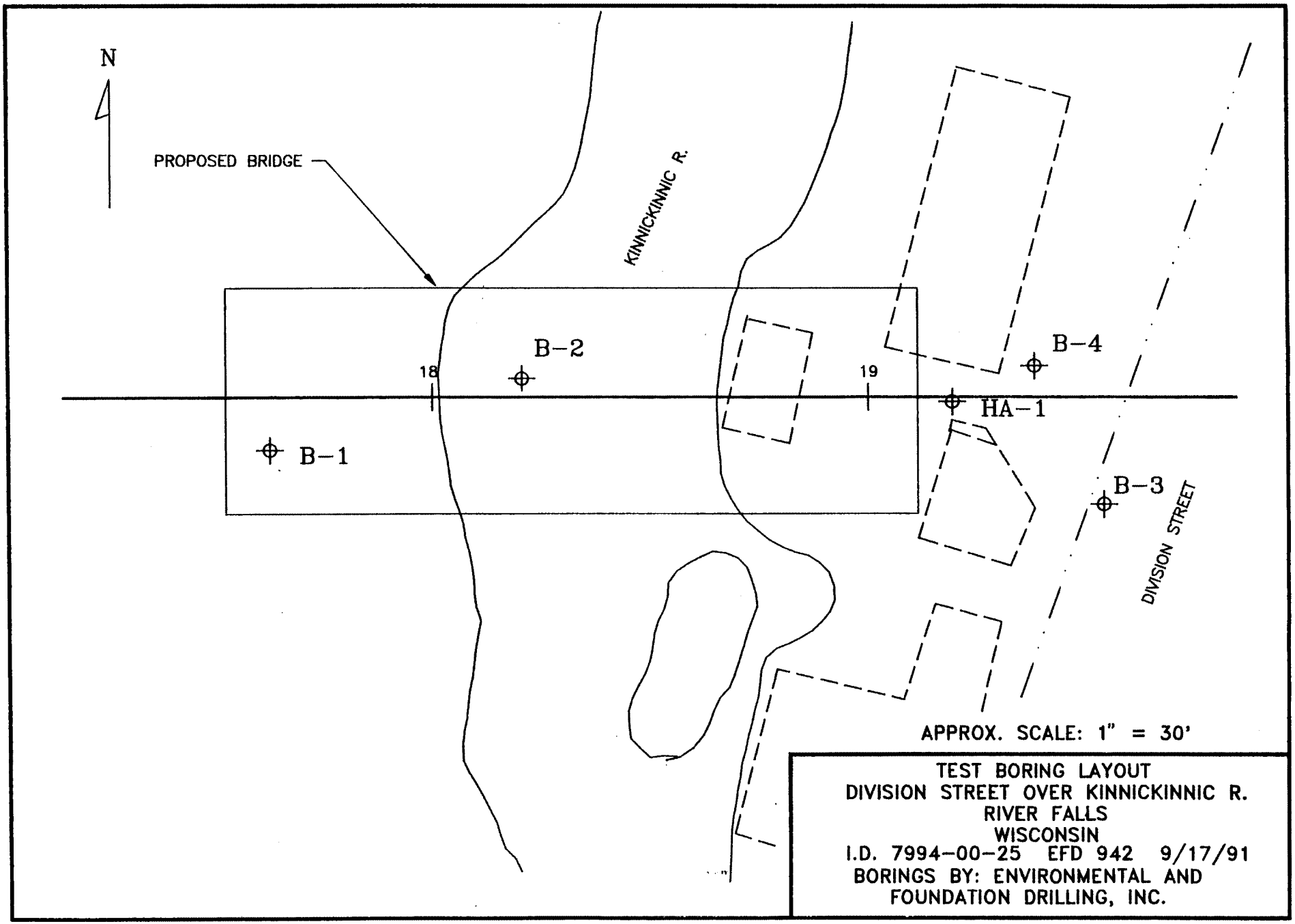
If the District Soil Engineer has more detailed site information, that information should take precedence over the above recommendations.

Recommended compaction control method for the fill work is the DOT Standard Compaction method. If one is unsure of how well the compaction is done, he can perform a series of tests on that fill. Tests of the compaction being achieved should be performed on each 25,000 cubic yards of compacted fill, or fraction thereof, to be at least equal to DOT requirements for Special Compaction. The compaction check should include one laboratory compaction test per field density determination. All nuclear testing shall be calibrated to site soils by ASTM Method D-2922, Section 4.1.2. However, no work should be accepted that does not meet the requirements for Standard Compaction, regardless of test results.

Respectfully submitted,

Clifton E.R. Lawson, P.E.




N
PROPOSED BRIDGE
KINNICKINNIC R.
B-1
B-2
B-3
B-4
HA-1
18
19
DIVISION STREET
APPROX. SCALE: 1" = 30'
TEST BORING LAYOUT
DIVISION STREET OVER KINNICKINNIC R.
RIVER FALLS
WISCONSIN
I.D. 7994-00-25 EFD 942 9/17/91
BORINGS BY: ENVIRONMENTAL AND
FOUNDATION DRILLING, INC.

SOIL BORING LOG

BORING # Hand Auger (1)

PROJECT: Division Street Bridge,
River Falls.

SHEET 1 OF 1

LOCATION: Sta. 19 + 20; 1' Right

ELEVATION: 891.4

depth	SOIL CLASSIFICATION	SAMPLE NUMBER / INTERVAL	MOISTURE "N" VALUE	MOISTURE REC	Q P
0					
1	-Fill-				
	Brown fine sand.				
2					
3	----------3.0				
4	Gray & brown sandy clay.				
5	----------5.3				
	End of boring, auger refusal. Backfilled with bentonite.				
6					
7					
8					
9					
10					

S - Saturated
W - Wet
M - Moist
D - Dry
Qp - Pocket penetrometer (tons per sq.ft.)

WATER LEVEL: Dry @ completion
LOGGER: CGM
DATE STARTED: 09-16-91
DATE FINISHED: 09-16-91
DRILLING METHOD & EQUIP: 2.25" AUGERS/CME-75

ENVIRONMENTAL & FOUNDATION DRILLING, INC.

SOIL BORING LOG

BORING # 1

PROJECT: Division Street Bridge,
River Falls

SHEET 1 OF 1

LOCATION: Sta. 17 + 63; 10' Right

ELEVATION: 871.0

depth	SOIL CLASSIFICATION	SAMPLE NUMBER	INTERVAL	MOISTURE "N" VALUE	MOISTURE REC		Q P
0	Brown F-M sand.						
	2.5						
	Gray F-M sand, some organic silt from 2.5 to 3.9, gravel & sand stone pieces.						
5	5.0	1	3.5-5.0	15	18	S	
	Firm drilling from 5.0 to 5.5 Hard drilling @ 5.5. Vuggy tan dolomite bedrock.						
	7.9						
	Auger refusal @ 7.9. 90% Water return 30% Core recovery 0% R.Q.D. Tan dolomite bedrock						
10	12.9						
	90% Water return 45% Core Recovery 0% R.Q.D. Softer layers from 16.0 to 17.0 & from 17.3 to 17.6.						
15	17.9						
	End of boring. Backfilled with bentonite.						
20							

S - Saturated
W - Wet
M - Moist
D - Dry
Qp - Pocket penetrometer (tons per sq.ft.)

WATER LEVEL: 2.5 @ completion

LOGGER:

DATE STARTED: 09-17-91

DATE FINISHED: 09-17-91

DRILLING METHOD & EQUIP: 2.25" AUGERS/CME-75

ENVIRONMENTAL & FOUNDATION DRILLING, INC.

SOIL BORING LOG

BORING # 2

PROJECT: Division Street Bridge,
River Falls.

SHEET 1 OF 1

LOCATION: Sta. 18 + 20; 5' Left

ELEVATION: 865.9

depth	SOIL CLASSIFICATION	SAMPLE NUMBER / INTERVAL	MOISTURE "N" VALUE	MOISTURE REC	Q P
0					
	Water				
1					
	-Brown F-C sand w/gravel,----1.8				
2	-cobbles & concrete rubble---2.0				
	Tan silty F-M sand. Hard @ 2.4.				
	----------2.4				
	-Vuggy tan dolomite bedrock--2.8				
3	Auger refusal @ 2.8				
	Cored with "A" barrel from 2.8 to 7.8.				
4	Tan dolomite bedrock.				
	40% Core recovery				
5	80% Water return				
	0% R.Q.D.				
6					
7					
	----------7.8				
8	End of boring. Backfilled with bentonite.				
9					
10					

S - Saturated
W - Wet
M - Moist
D - Dry
Qp - Pocket penetrometer (tons per sq.ft.)

WATER LEVEL:

LOGGER: CGM
DATE STARTED: 09-17-91
DATE FINISHED: 09-17-91
DRILLING METHOD & EQUIP: 2.25" AUGERS/CME-75

ENVIRONMENTAL & FOUNDATION DRILLING, INC.

SOIL BORING LOG

BORING # 3

PROJECT: Division Street Bridge,
River Falls

SHEET 1 OF 1

LOCATION: Sta. 19 + 55; 23' Right

ELEVATION: 891.0

depth	SOIL CLASSIFICATION	SAMPLE NUMBER	INTERVAL	MOISTURE "N" VALUE	MOISTURE REC	MOISTURE	Q P
0	Asphalt 0.2						
	Crushed dolomite 0.3						
	Fill-Brown silty sand & gravel, concrete & brick (small pieces) 0.75						
	Dark brown sandy clay. 3.5						
5	Brown clayey fine sand, some gravel @ 5.0.	1	3.5-5.0	8	12	M	
	Firmer @ 7.0. 7.0						
	Weathered sandstone bedrock.						
	Firm drilling from 7.0 to 9.0.						
10	Hard drilling from 9.0 to 10.0. Very hard drilling from 10.0 to 11.5.	2	8.5-10.0	100/5	3	M	
	11.5						
	End of boring, auger refusal. Backfilled with bentonite.						
15							
20							

S - Saturated
W - Wet
M - Moist
D - Dry
Qp - Pocket penetrometer (tons per sq.ft.)

WATER LEVEL: Dry @ completion

LOGGER: CGM
DATE STARTED: 09-16-91
DATE FINISHED: 09-16-91

DRILLING METHOD & EQUIP: 2.25" AUGERS/CME-75

ENVIRONMENTAL & FOUNDATION DRILLING, INC.

SOIL BORING LOG

BORING # 4

PROJECT: Division Street Bridge,
River Falls.

SHEET 1 OF 1

LOCATION: Sta. 19 + 39; 8′ Left

ELEVATION: 891.3

depth	SOIL CLASSIFICATION	SAMPLE NUMBER / INTERVAL	MOISTURE "N" VALUE	MOISTURE REC	Q P
0	----------Asphalt----------0.2				
	----------Concrete----------0.5				
	Brown F-M sand.				
1	----------1.0				
2					
3	Dark brown sandy clay.				
4					
5	Firmer drilling w/gravel @ 5.3.				
	----------5.3				
6					
	Brown silty fine sand w/gravel.				
	Less gravel @ 6.5.				
7	Firm drilling @ 7.3.				
	----------7.3				
8	Weathered sandstone bedrock.				
	Very hard drilling @ 8.0.				
9	----------9.0				
	End of boring, auger refusal.				
	Backfilled with bentonite.				
10					

S - Saturated
W - Wet
M - Moist
D - Dry
Qp - Pocket penetrometer (tons per sq.ft.)

WATER LEVEL: Dry @ completion
LOGGER: CGM
DATE STARTED: 09-16-91
DATE FINISHED: 09-16-91
DRILLING METHOD & EQUIP: 2.25" AUGERS/CME-75

ENVIRONMENTAL & FOUNDATION DRILLING, INC.

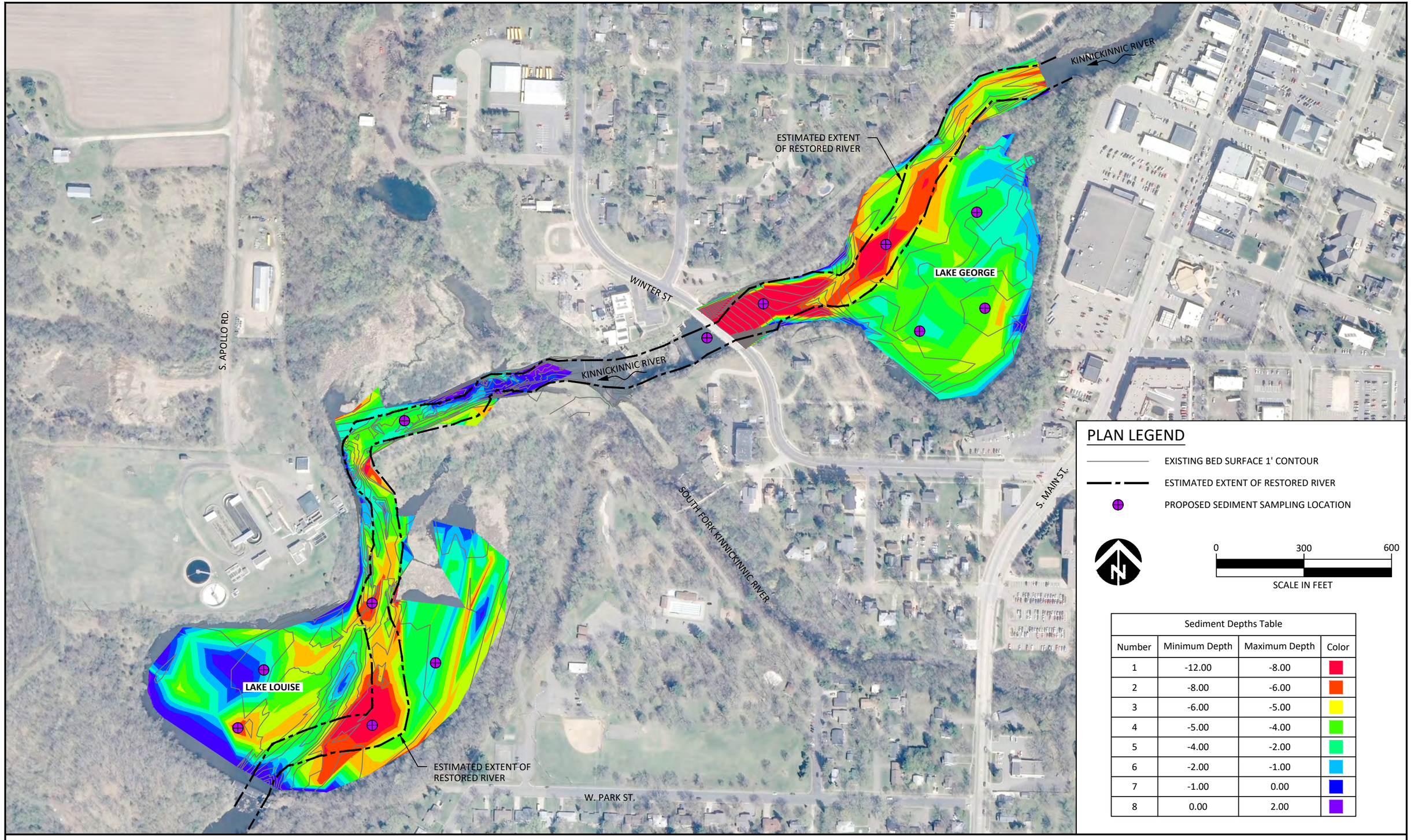
River Falls Dams

Final Sediment Sampling Plan

Submitted to:
Ray French
Management Analyst
City Hall
222 Lewis St.
River Falls, WI 54022

Prepared by:
Inter-Fluve Inc.

November 10th, 2015



PLAN LEGEND

- EXISTING BED SURFACE 1' CONTOUR
- ESTIMATED EXTENT OF RESTORED RIVER
- PROPOSED SEDIMENT SAMPLING LOCATION

N

0 300 600

SCALE IN FEET

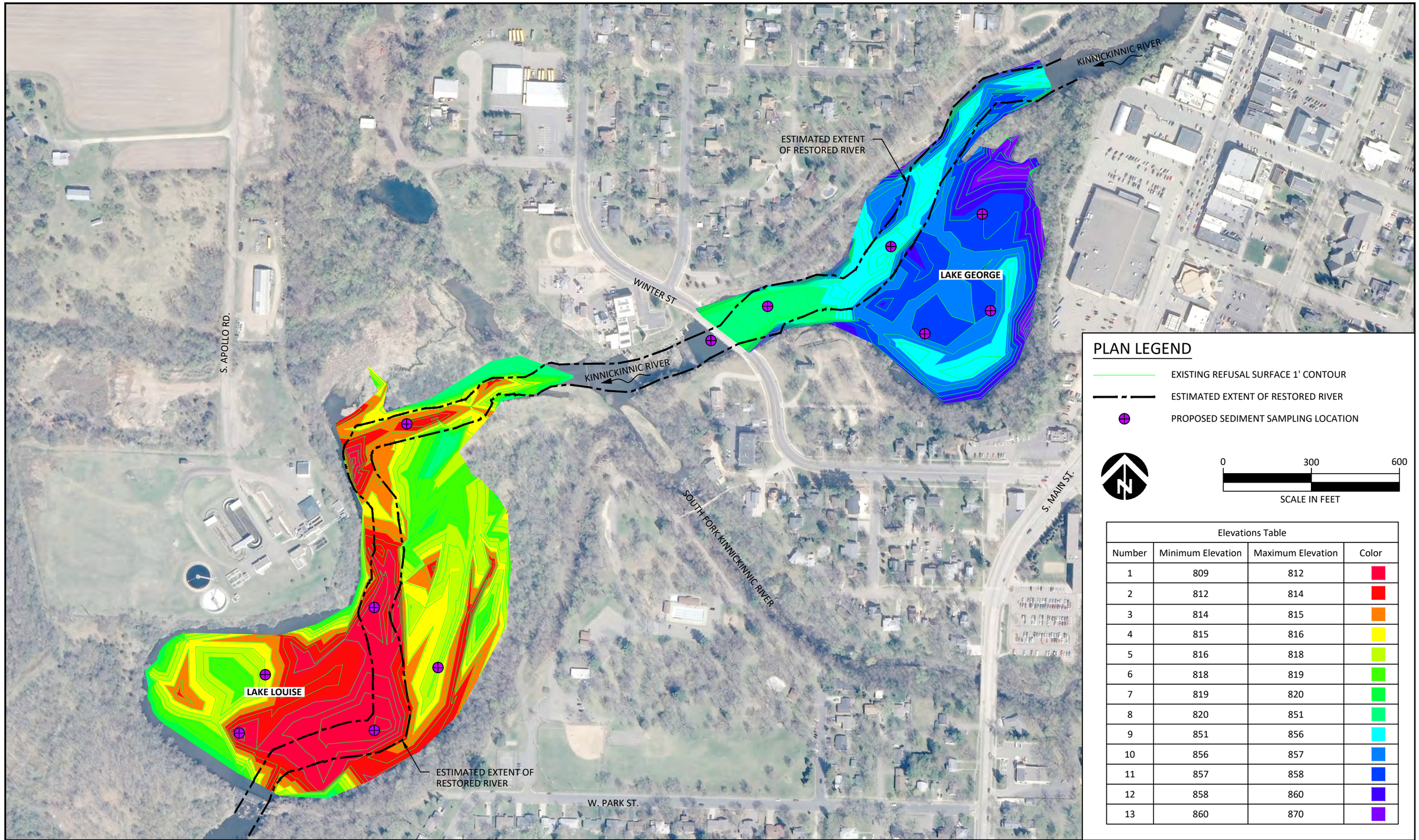
Sediment Depths Table			
Number	Minimum Depth	Maximum Depth	Color
1	-12.00	-8.00	
2	-8.00	-6.00	
3	-6.00	-5.00	
4	-5.00	-4.00	
5	-4.00	-2.00	
6	-2.00	-1.00	
7	-1.00	0.00	
8	0.00	2.00	

inter·fluve INC.
301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

River Falls Sediment Analysis

Sediment Depths

November 3, 2015



PLAN LEGEND

- EXISTING REFUSAL SURFACE 1' CONTOUR
- ESTIMATED EXTENT OF RESTORED RIVER
- PROPOSED SEDIMENT SAMPLING LOCATION

0 300 600

SCALE IN FEET

Elevations Table			
Number	Minimum Elevation	Maximum Elevation	Color
1	809	812	
2	812	814	
3	814	815	
4	815	816	
5	816	818	
6	818	819	
7	819	820	
8	820	851	
9	851	856	
10	856	857	
11	857	858	
12	858	860	
13	860	870	

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608.441.0342
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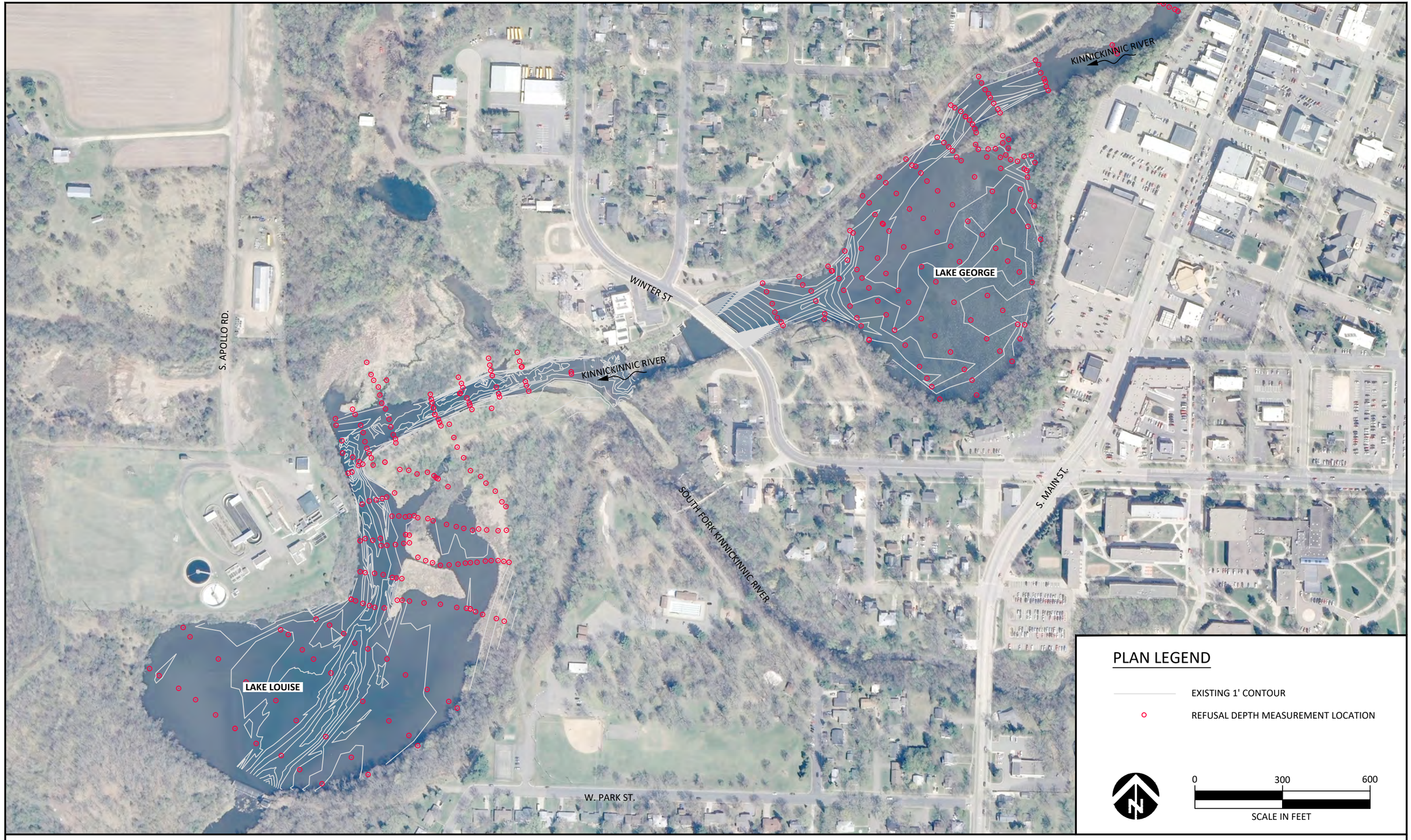
River Falls Sediment Analysis

Refusal Surface

November 3, 2015



PLAN LEGEND

EXISTING 1' CONTOUR

REFUSAL DEPTH MEASUREMENT LOCATION

0 300 600

SCALE IN FEET

301 S. Livingston St., Suite 200
Madison, WI 53703
608.441.0342
www.interfluve.com

River Falls Sediment Analysis

Refusal Measurement Locations

November 4, 2015

Attachment D-7: Geotechnical Peer Review Documentation

Kinnickinnic River CAP 206 Project – Review Documentation – Comment Register

Subject: Peer Review: **Preliminary DQC: Geotechnical Auxiliary Lock Closures**
Project Name: Kinnickinnic River: CAP 206 Aquatic Ecosystem Restoration Project
Report: Design Documentation Report, Appendix X – Geotech & Geology

Name	Initials	Role	Date Completed
Finn Hotstream	JNH	Initiator	29 September 2023
James Schneider	JAS	Reviewer	16 October 2023
Finn Hotstream	JNH	Respondent	29 December 2023
James Schneider	JAS	Back-checker	31 March 2025

Level of Review: **QA Review**

The Geotech PDT has performed the analyses anticipated for the feasibility report prior to the tentatively selected plan process. The geotechnical analysis is primarily stability analysis for the proposed restored stream cross section. The review will include the stability analyses and assumed soil parameter inputs and Section 5 of the DDR. If there is additional time, the review can include the preliminary access road stability in the access road folder.

Files to Be Reviewed:

This folder contains all the calculations needed for this review: \\mvd.ds.usace.army.mil\mvp\EC\JAS\Kinni

a. This peer review .docx
b. Background Information:
    i. Kinni_Restoration_Actions_Overview_All.pdf – project overview
    ii. Lake George.pdf and Lake Louise.pdf – existing conditions plan view
    iii. Cross Sections_Existing Conditions.pdf
    iv. 20230609Photolog_red.pdf – photolog from site visit
c. Review items:
    i. Attachment X2.pdf – stability plates
    ii. Geoslope files: Sand, Clay, and Clay_EOC.gsz
    iii. G_G_Appendix.docx - DDR

Reviewer Scope:

- Confirm that the assumed soil parameters for the stability model are appropriate and stability analyses represent the range of conditions
- Section 5 DDR: review text and comment on the path forward for the stability of the rock walls
- Access road design: assumed soil parameter inputs and analysis results

Kinnickinnic River CAP 206 Project – Review Documentation – Comment Register

Comment Register: Please feel free to include screenshots in comment box.

Comment Number	File Number	Significance (Major or Minor)	Comment	Response & Disposition	Back Check
Preliminary DQC Comments					
1	G_G_Appendix.docx	Minor	Some minor comments on DDR Appendix text included in G_G_Appendix_JAS.docx	Reviewed and responded to comments in the revised version of the appendix text.	
2	*.gsz	None	Reviewed input parameters, water surfaces, and results for stability calculations in clay.gsz, clay_EOC.gsz, and clay_EOC_JAS.gsz. 4:1 slopes are consistent with discussion in DDR. Some of the spacing of entry and exit points seems a little large, however, re-ran the model with finer spacing and has same critical FS. While no lab data are available, soil properties are reasonable, yet conservative. Sand parameters will likely not improve with the limited additional investigation planned. Clay parameters could be improved with vane tested, or a combination of water contents and atterbergs.	Additional Phase II exploration did not have budget to perform additional testing. I added soil borings to future work, but this may be removed based on budget and timing constraints.	
3	Access Road Assumptions.pdf	Minor	Add some discussion to the documents on the vehicle surcharged used. Looks like you used 400 psf, and AASHTO minimum is 250 psf? I guess it does not really matter since only drained parameters with no cohesion influence the critical slip surface.	I increased to 400 psf assuming the use of offroad construction equipment. I added additional description to the DDR text for the access road stability.	
4	Access Road.gsz	None	Your slip surfaces are essentially infinite slope. 1.5*tan(radians(40) = 1.26, GeoStudio = 1.27 / Sensitivity 1.5*tan(radians(37.5) = 1.15, GeoStudio = 1.16. This is fine, and checks out, and I can not think of other failure mechanisms, so, seems OK. You may be able to optimize the access road, but things look good so far.	Agree. I expect that when civil lays out the access road we will have a smaller footprint. I made it large to provide sufficient room for turnarounds and not underestimate the cost of the road.	