ADDENDUM NO. 1

TO: PLANS AND SPECIFICATIONS FOR STATE OF MISSOURI

Paved Bike/Pedestrian Trail, Trail Network
Knob Noster State Park
Knob Noster, Missouri
PROJECT NO.: X2226-01

Bid Opening Date: 9:00 AM, Thursday, October 5, 2023

Bidders are hereby informed that the construction Plans and/or Specifications are modified as follows:

SPECIFICATION CHANGES:

1. Section 00 0110 – Table of Contents

    a. REVISE Table of Contents to include Appendices, appendices attached.

2. Section 01 3300 – Submittals

    a. REVISE Concrete Paving submittals to provide clarification, see new version attached.

3. Section 03 3000 – Cast-In-Place

    a. REVISE specification Submittals and added Quality Assurance and Field Quality Control, see new version attached.

4. Section 32 3413 – Fabricated Pedestrian Bridges

    a. REMOVE and REPLACE Section 1.3 Section C. as follows:

        A. Structural Performance: The pedestrian truss bridge and related components, including but not necessarily limited to, the substructure and decking, shall withstand the effects of gravity and live loads as well as any lateral loads in accordance with applicable portions of the AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges. Vehicular and pedestrian live loads shall be applied separately and the maximum load between the two shall control.

        Additional design parameters, related to Section 7.1 of the AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges manual, shall be incorporated into the superstructure design as applicable.

DRAWINGS CHANGES:

1. Sheet C-001 – See Attached Revised Sheet C-001

    a. REMOVE reference to STA. 100+87 through STA. 137+40 as concrete trail, see new version attached.

2. Sheet C-104 – See Attached Revised Sheet C-104

    a. REMOVE reference to RCP for Pipe-A, see new version attached.

3. Sheet C-108 – See Attached Revised Sheet C-108

    a. REVISE replace existing inlet note to include dimensions and details, see new version attached.

4. Sheet C-111 – See Attached Revised Sheet C-111

    a. ADD details regarding size and length of pipes, see new version attached.

GENERAL COMMENTS:

1. The Pre-Bid Meeting was held September 21, 2023. The sign-in sheet is attached.
2. Please contact Paul Girouard, Contract Specialist, at (573) 751-4797, Paul.Girouard@oa.mo.gov for questions about bidding procedures, MBE\WBE\SDVE Goals, and other submittal requirements.
3. Changes to, or clarification of, the bid documents are only made as issued in the addenda.
4. All correspondence with respect to this project must include the State of Missouri project number as indicated above.
5. Current Planholders list is available on the Division of Facilities Management, Design and Construction's web site: https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans.
6. Prospective Bidders contact American Document Solutions, 1400 Forum Blvd Suite 7A, Columbia MO 65203, (573) 446-7768 to get plans and specifications.
7. **All bids shall be submitted on the bid form without additional terms and conditions, modifications, or stipulations. Each space on the bid form shall be properly filled. Failure to do so will result in rejection of the bid.**
8. **MBE/WBE/SDVE participation requirements can be found in DIVISION 00. The MBE/WBE/SDVE participation goals are 10%/10%/3%, respectively. Only certified firms as of the bid opening date can be used to satisfy the MBE/WBE/SDVE participation goals for this project. If a bidder is unable to meet a participation goal, a Good Faith Effort Determination Form must be completed. Failure to complete this process will result in rejection of the bid.**

CLARIFICATIONS/COORDINATION:

1. Contractor shall provide one-week advance notification to the State Parks Archeologist prior to excavation operations for construction of the east concrete abutment, STA 168+56, of the 150' single span pedestrian bridge. Other work and areas requiring advance notification to State Parks Archeologist are noted in the plans.

2. State Parks Burning Requirements – Be sure fires are confined to the identified locations as shown on the plans. Verify weather conditions are safe for burning and that while burning someone monitors the burning at all times.

3. **The Contractor shall pay not less than the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed, as determined by the Missouri Department of Labor and Industrial Relations**. Bidders are to adhere to Prevailing Wage Hourly Rate of Wages, and the Department of Labor and Industrial Relations can be contacted to determine the applicable wage rate for the work on this project.

ATTACHMENTS:

A. X2226-01 Pre-Bid Meeting Sign-In Sheet (1 Page)
B. Revised Specification 00 0110 Table of Contents (2 Pages)
C. Appendix 1: DNR General Operating Permit (33 Pages)
D. Appendix 2: SWPPP (Storm Water Pollution Prevention Plan) (38 Pages)
E. Appendix 3: Geotechnical Engineering Report (42 Pages)
F. Revised Specification 01 3300 Submittals (7 Pages)
G. Revised Specification 03 3000 Cast-In-Place Concrete (14 Pages)
H. C-001 Addendum 01 Revision (1 Page)
I. C-104 Addendum 01 Revision (1 Page)
J. C-108 Addendum 01 Revision (1 Page)
K. C-111 Addendum 01 Revision (1 Page)

END ADDENDUM 01

Name	Company	Minority?	Phone	Email
Ryan Abbott	OA-FMDC	NO	(573) 298-1967	ryan.abbott@oa.mo.gov
Rick Howard	OA-FMDC	No	(816) 728-0385	Ricky.Howard@OA.MO.GOV
Daniel Brigman	KN State Park	No	660-563-2463	daniel.brigman@dnr.mo.gov
Dustin Webb	State Parks	NO	573-418-7332	dustin.webb@dnr.mo.gov
Don Stier	State Parks	N	573.522.9525	Don.Stier@DNR.MO.GOV
Justin Beasley	State Parks	N	231-620-7515	Justin.Beasley@DNR.MO.GOV
Kevin Jones	Capital	N	573.645.2583	kjones@capitalpavingmo.com
Tom Wegener	Tracy & Wegener	No	660-641-1252	tracywegenerinc@gmail.com
Cale Seymour	Cale Seymour Const LLC	NO	660-909-7492	Cale.Seymour@Gmail.com
Andrew Richardson	MegaKC Corporation	NO	816-872-8722	Bids@megakc.com
WAYNE SMITH	TRI SMITH CONSTRUCTION	NO	816-809.7738	tscmissouri@gmail.com
Shannon Jenkins	Mera Exc.	yes	573-418-6755	shannon@meraexcavating.com
Grayson Peneston	Sand A Equipment and Builders	NO	573-544-8749	gpeneston@saequipmentbuilders.com
Patty Lemongelli	Bartlett + West	NO	573-230-1730	patty.lemongelli
Stan Schaltz	Better By Design	Yes	573-776-8736	sschaltz@bartwest.com
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Scott Hicks	RBE	NO	816-982-6929	shicks@rbemidwest.com

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MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Michael L. Parson
Governor

Dru Buntin
Director

August 1, 2022

Leanne Mattern
Office of Administration, Facilities Management Design & Construction
Harry S. Truman SOB,
301 West High Street, Room 730
Jefferson City, MO 65102

Dear Permittee:

Pursuant to the Federal Water Pollution Control Act, under the authority granted to the State of Missouri and in compliance with the Missouri Clean Water Law, we have issued and are enclosing your Missouri State Operating Permit for Office of Administration, MOR-100038.

Please read and review your permit and attached Standard Conditions. They contain important information on site management and reporting requirements. Quarterly reports required by this report must be submitted through our eDMR system.

This permit may include requirements with which you may not be familiar. If you would like The Department of Natural Resources to meet with you to discuss how to satisfy the permit requirements, an appointment can be set up by contacting the permit writer at 573-526-1139. These visits are called Compliance Assistance Visits and focus on explaining the requirements to the permit holder.

This permit is both your Federal NPDES Permit and your new Missouri State Operating Permit and replaces all previous State Operating Permits issued for this facility under this permit number. In all future correspondence regarding this facility, please refer to your State Operating Permit number and facility name as shown on page one of the permit.

If you were adversely affected by this decision, you may be entitled to an appeal before the Administrative Hearing Commission (AHC) pursuant to 10 CSR 20-1.020 and 10 CSR 20-6.020; RSMo Section 621.250, 640.013, and 644.051.6. To appeal, you must file a petition with the AHC within thirty days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC. Contact information for the AHC is: Administrative Hearing Commission, Truman State Office Building, Room 640, 301 W. High Street, P.O. Box 1557, Jefferson City, Missouri 65102, phone: (573) 751-2422, fax: (573) 751-5018; website: http://ahc.mo.gov/.

Please be aware that this facility may also be subject to any applicable county or other local ordinances or restrictions. If you have any questions concerning this permit, please do not hesitate to contact the Water Protection Program at P.O. Box 176, Jefferson City, MO 65102, 573-522-4502.

Sincerely,

WATER PROTECTION PROGRAM

Chris Wieberg
Director

CW/qs

Enclosure

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION

MISSOURI STATE OPERATING PERMIT

General Operating Permit

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No	MOR100038
Owner:	OA-Facilities Mgmt, Design, and Construc
Address:	301 West High Street, Hst Rm 370 Jefferson City, MO 65101
Continuing Authority:	OA Facilities Mgmt Design Construction 301 West High St. HST SOB Rm 730 Jefferson City, MO 65102
Facility Name:	Office of Administration
Facility Address:	OA-FMDC, PO Box 809 301 W High street JEFFERSON CITY, MO 65102
Legal Description:	Land Grant 02681, Cole County
UTM Coordinates:	571840.000/4270368.000
Receiving Stream:	Tributary to Wears Creek (U)
First Classified Stream - ID#:	100K Extent-Remaining Streams (C) 3960.00
USGS# and Sub Watershed#:	10300102 - 1304

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein.

FACILITY DESCRIPTION

All Outfalls SIC #1629

All Outfalls - Construction or land disturbance activity (e.g., clearing, grubbing, excavating, grading, filling and other activity that results in the destruction of the root zone and/or land disturbance activity that is reasonably certain to cause pollution of waters of the state)
Issued to a city, county, state or federal agency, other governmental jurisdiction, or other private area-wide projects as determined by the Department on a case-by-case basis

This permit authorizes only wastewater, including storm water, discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System, it does not apply to other regulated areas. This permit may be appealed in accordance with RSMo Section 644.051.6 and 621.250, 10 CSR 20-6.020, and 10 CSR 20-1.020.

August 01, 2022
Issue Date

Chris Wieberg, Director
Water Protection Program

July 04, 2027
Expiration Date

I. APPLICABILITY

A. Permit Coverage and Authorized Discharges

1. This Missouri State Operating Permit (permit) authorizes the discharge of stormwater and certain non-stormwater discharges from land disturbance sites that disturb one or more acres, or disturb less than one acre when part of a larger common plan of development or sale that will disturb a cumulative total of one or more acres over the life of the project.

   A Missouri State Operating Permit must be issued before any site vegetation is removed or the site disturbed. Any site owner/operator subject to these requirements for stormwater discharges and who disturbs land prior to permit issuance from the Missouri Department of Natural Resources (Department) is in violation of both State regulations per 10 CSR 20-6.200(1)(A) and Federal regulations per 40 CFR 122.26. The owner/operator of this permit is responsible for compliance with this permit [10 CSR 20-6.200 (3)(B)].

2. This general permit is issued to a city, county, state or federal agency, other governmental jurisdiction, or other private area-wide projects as determined by the Department on a case-by-case basis, for land disturbance projects performed by or under contract to the permittee.

3. This permit authorizes stormwater discharges from land disturbance support activities (e.g., equipment staging yards, material storage areas, excavated material disposal areas, borrow areas, concrete, or asphalt batch plants) provided appropriate stormwater controls are designed, installed, and maintained and the following conditions are met and addressed in the Stormwater Pollution Prevention Plan (SWPPP). The permittee is responsible for compliance with this permit for any stormwater discharges from construction support activity.
   (a) The support activity is directly related to the construction site required to have permit coverage for stormwater discharges;
   (b) The support activity is not a commercial operation or serve multiple unrelated construction sites;
   (c) The support activity does not continue to operate beyond the completion of the construction activity at the project it supports;
   (d) Sediment and erosion controls are implemented in accordance with the conditions of this permit; and
   (e) The support activity is strictly stormwater discharges or non-stormwater discharges listed in PART I, APPLICABILTY, Condition A.4. Support activities which discharge process water shall apply for separate coverage (e.g.,a concrete batch plant discharging process water shall be covered under a MOG49).

4. This permit authorizes non-stormwater discharges associated with your construction activity from the following activities provided that these discharges are treated by appropriate Best Management Practices (BMPs) where applicable and addressed in the permittee's site specific SWPPP required by this general permit:
   (a) Discharges from emergency fire-fighting activities;
   (b) Hydrant flushing and water line flushing, provided the discharged water is managed to avoid instream water quality impacts;
   (c) Landscape watering, including to establish vegetation;
   (d) Water used to control dust;
   (e) Waters used to rinse vehicles and equipment, provided there is no discharge of soaps, solvents, or detergents used for such purposes;
   (f) External building washdown, provided soaps, solvents, and detergents are not used, and external surfaces do not contain hazardous substances (e.g., paint or caulk containing polychlorinated biphenyls (PCBs))
   (g) Pavement wash waters, provided spills or leaks of toxic or hazardous substances have not occurred (unless all spill material has been removed) and where soaps, solvents, and detergents are not used. Directing pavement wash waters directly into any water of the state, storm drain inlet, or stormwater conveyance (constructed or natural site drainage features), unless the conveyance is connected to an effective control, is prohibited;
   (h) Uncontaminated air conditioning or compressor condensate;
   (i) Uncontaminated, non-turbid discharges of ground water or spring water;
   (j) Foundation or footing drains where flows are not contaminated with process materials; and
   (k) Uncontaminated construction dewatering water discharged in accordance with requirements found in this permit for specific dewatering activities.

B. Permit Restrictions and Limitations

1. This permit does not authorize the discharge of process wastewaters, treated or otherwise.

2. For sites operating within the watershed of any Outstanding National Resource Water (which includes the Ozark National Riverways and the National Wild and Scenic Rivers System), sites that discharge to an Outstanding State Resource Water, or facilities located within the watershed of an impaired water as designated in the Clean Water Act (CWA) Section 303(d) list with an impairment for sedimentation/siltation:
   (a) This permit authorizes stormwater discharge provided no degradation of water quality occurs due to discharges from the permitted facility per 10 CSR 20-7.031(3)(C).
   (b) A site with a discharge found to be causing degradation or contributing to an impairment by discharging a pollutant of concern, during an inspection or through complaint investigations, may be required to become a no discharge facility or obtain a site-specific permit with more stringent monitoring and SWPPP requirements.

3. This permit does not allow placement of fill material into any stream or wetland, alteration of a stream channel, or obstruction of stream flow unless the appropriate CWA Section 404 permitting authority provides approval for such actions or determines such actions are exempt from Section 404 jurisdiction. Additionally, this permit does not authorize placement of fill in floodplains unless approved or determined exempt by appropriate federal and/or state floodplain development authorities.

4. This operating permit does not affect, remove, or replace any requirement of the National Environmental Policy Act; the Endangered Species Act; the National Historic Preservation Act; the Comprehensive Environmental Response, Compensation and Liability Act; the Resource Conservation and Recovery Act; or any other relevant acts. Determination of applicability to the above mentioned acts is the responsibility of the permittee. Additionally, this permit does not establish terms and conditions for runoff resulting from silvicultural activities listed in Section 402(l)(3)(a) of the Clean Water Act.

5. Compliance with all requirements in this permit does not supersede any requirement for obtaining project approval from an established local authority nor remove liability for compliance with county and other local ordinances.

6. The Department may require any facility or site authorized by a general permit to apply for a site-specific permit [10 CSR 20-6.010(13)(C)].

7. If a facility or site covered under a current general permit desires to apply for a site-specific permit, the facility or site may do so by contacting the Department for application requirements and procedures.

8. Any discharges not expressly authorized in this permit and not clearly disclosed in the permit application cannot become authorized or shielded from liability under CWA section 402(k) or Section 644.051.16, RSMo, by disclosure to EPA, state, or local authorities after issuance of this permit via any means, including any other permit applications, funding applications, the SWPPP, discharge monitoring reporting, or during an inspection. Discharges at the facility not expressly authorized by this permit must be covered by another permit, be exempt from permitting, or be authorized through some other method.

II. EXEMPTIONS FROM PERMIT REQUIREMENTS

1. Sites that discharge all stormwater runoff directly to a combined sewer system (as defined in 40 CFR 122.26 and 40 CFR 35.2005) connecting to a publicly owned treatment works which has consented to receive such a discharge are exempt from Department stormwater permit requirements.

2. Land disturbance activities that disturb less than one (1) acre of total land area which are not part of a common plan or sale where water quality standards are not exceeded are exempt from Department stormwater permit requirements.

3. Oil and gas related activities as listed in 40 CFR 122.26(a)(2)(ii) where water quality standards are not exceeded are exempt from Department stormwater permit requirements.

4. Linear, strip, or ribbon construction or maintenance operations meeting one (1) of the following criteria are exempt from Department stormwater permit requirements:
   (a) Grading of existing dirt or gravel roads which does not increase the runoff coefficient and the addition of an impermeable surface over an existing dirt or gravel road;
   (b) Cleaning or routine maintenance of roadside ditches, sewers, waterlines, pipelines, utility lines, or similar facilities;
   (c) Trenches two (2) feet in width or less; or
   (d) Emergency repair or replacement of existing facilities as long as BMPs are employed during the emergency repair.

III. REQUIREMENTS

1. The permittee shall post a public notification sign at the main entrance to the site, or a publically visible location, with the specific MOR100 permit number. The public notification sign must be visible from the public road that provides access to the site's main entrance. An alternate location is acceptable provided the public can see it and it is noted in the SWPPP. The public notification sign must remain posted at the site until the site is finalized.

2. The permittee shall be responsible for notifying the land owner and each contractor or entity (including utility crews and city employees or their agents) who will perform work at the site of the existence of the SWPPP and what actions or precautions shall be taken while on site to minimize the potential for erosion and the potential for damaging any BMP. The permittee is responsible for any damage a subcontractor may do to established BMPs and any subsequent water quality violation resulting from the damage.

3. Ensure the design, installation, and maintenance of effective erosion and sediment controls to minimize the discharge of pollutants. At a minimum, such controls must be designed, installed, and maintained to:
   (a) Control stormwater volume, velocity, and peak flow rates to minimize soil erosion;
   (b) Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion and scour;
   (c) Minimize the amount of exposed soil during construction activity;
   (d) Minimize the disturbance of steep slopes;
   (e) Minimize sediment discharges from the site. Address factors such as:
      1) The amount, frequency, intensity, and duration of precipitation;
      2) The nature of resulting stormwater runoff;
      3) Expected flow from impervious surfaces, slopes, and drainage features; and
      4) Soil characteristics, including the range of soil particle size expected to be present on the site.
   (f) Provide and maintain natural buffers around surface waters as detailed in Part V. BMP REQUIREMENTS Condition 7, direct stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration and filtering, unless infeasible; and
   (g) Minimize soil compaction and preserve topsoil where practicable.

   A 2-year, 24-hour storm event can be determined for the project location using the National Oceanic and Atmospheric Administration's National Weather Service Atlas 14 which can be located at https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html, or the permittee can determine local rainfall distribution for a 2-year, 24 hours storm event using multi-decade local high density rain gauge data, as approved by the Department.

4. BMPs for land disturbance [10 CSR 20-6.200(1)(D)2] are a schedule of activities, practices, or procedures that reduces the amount of soil available for transport or a device that reduces the amount of suspended solids in runoff before discharge to waters of the state. The term BMPs are also used to describe the sediment and erosion controls and other activities used to prevent stormwater pollution. BMPs are divided into two main categories: structural or non-structural; and they are also classified as temporary or permanent.
   Temporary BMPs may be added and removed as necessary with updates to the SWPPP as specified in the requirements below.

5. Installation of BMPs necessary to prevent soil erosion and sedimentation at the downgradient project boundary (e.g. buffers, perimeter controls, exit point controls, storm drain inlet protection) must be complete prior to the start of all phases of construction. By the time construction activity in any given portion of the site begins, downgradient BMPs must be installed and operational to control discharges from the initial site clearing, grading, excavating, and other earth-disturbing activities. Additional BMPs shall be installed as necessary throughout the life of the project.

6. All BMPs shall be maintained and remain in effective operating condition during the entire duration of the project, with repairs made within the timeframes specified elsewhere in this permit, until final stabilization has been achieved.
   (a) Ensure BMPs are protected from activities that would reduce their effectiveness.
   (b) Remove any sediment per the BMP manufacturer's instructions or before it has accumulated to one-half of the above-ground height of any BMP that collects sediment (i.e., silt fences, sediment traps, etc.)
   (c) The project is considered to achieve final stabilization when Part V. BMP REQUIREMENTS, Condition 13 is met.

7. Minimize sediment trackout from the site and sediment transport onto roadways.
   (a) Restrict vehicle traffic to designated exit points.
   (b) Use appropriate stabilization techniques or BMPs at all points that exit onto paved roads or areas outside of the site.
   (c) Use additional controls or BMPs to remove sediment from vehicle and equipment tires prior to exit from facility where necessary.
   (d) Any sediment or debris that is tracked out past the exit pad or is deposited on a roadway after a precipitation event shall be removed by the shorter of either the same business day (for business days only), or by the end of the next business day if track-out occurs on a non-business day, and before predicted rain events. Remove the track-out sediment by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. Sediment or debris tracked out on pavement or other impervious surfaces shall not be disposed of into any stormwater conveyance, storm drain inlet, or water of the state.
   (e) Stormwater inlets susceptible to receiving sediment or other pollutants from the permitted land disturbance site shall have curb inlet protection. This may include inlets off the active area where track out from vehicles and equipment could impact the stormwater runoff to those inlets.

8. Concrete washout facilities shall be used to contain concrete waste from the activities onsite, unless the washout of trucks and equipment is managed properly at an off-site location.
   The washout facility shall be managed to prevent solid and/or liquid waste from entering waters of the state by the following:
   (a) Direct the wash water into leak-proof containers or pits designed so that no overflows can occur due to inadequate sizing or precipitation;
   (b) Locate washout activities away from waters of the state, stormwater inlets, and/or stormwater conveyances where practicable. If not practicable, use BMPs to reduce risk of waste leaving the washout facility;
   (c) Washout facilities shall be cleaned, or new facilities must be constructed and ready for use, once the washout is 75% full;
   (d) Designate the washout area(s) and conduct such activities only in these areas.
   (e) Ensure contractors are aware of the location, such as by marking the area(s) on the map or signage visible to the truck and/or equipment operators.

9. Good housekeeping practices shall be maintained at all times to keep waste from entering waters of the state.
   (a) Provide solid and hazardous waste management practices, including providing trash containers, regular site cleanup for proper disposal of solid waste such as scrap building material, product/material shipping waste, food/beverage containers, spent structural BMPs;
   (b) Provide containers and methods for proper disposal of waste paints, solvents, and cleaning compounds.
   (c) Manage sanitary waste. Portable toilets shall be positioned so that they are secure and will not be tipped or knocked over and so that they are located away from waters of the state and stormwater inlets and stormwater conveyances.
   (d) Ensure the storage of construction materials be kept away from drainage courses, stormwater conveyances, storm drain inlets, and low areas.

10. All fueling facilities present shall at all times adhere to applicable federal and state regulations concerning underground storage, above ground storage, and dispensers.

11. Any hazardous wastes that are generated onsite shall be managed, stored, and transported according to the provisions of the Missouri Hazardous Waste Laws and Regulations.

12. Store all paints, solvents, petroleum products, petroleum waste products, and storage containers (such as drums, cans, or cartons) so they are not exposed to stormwater or provide other prescribed BMPs (such as plastic lids and/or portable spill pans) to prevent the commingling of stormwater with container contents. Commingled water may not be discharged under this permit. Provide spill prevention, control, and countermeasures to contain the spill. Any containment system used to implement this requirement shall be constructed of materials compatible with the substances contained and shall prevent the contamination of groundwater.

13. Implement measures intended to prevent the spillage or loss of fluids, oil, grease, fuel, etc. from vehicles and equipment to thereby prevent the contamination of stormwater from these substances. This may include prevention measures such as, but not limited to, utilizing drip pans under vehicles and equipment stored outdoors, covering fueling areas, using dry clean-up methods, use of absorbents, and cleaning pavement surfaces to remove oil and grease.

14. Spills, Overflows, and Other Unauthorized Discharges.
    (a) Any spill, overflow, or other discharge not specifically authorized in the permit above are unauthorized.
    (b) Should an unauthorized discharge cause or permit any contaminants, other than sediment, or hazardous substance to discharge or enter waters of the state, the unauthorized discharge must be reported to the regional office as soon as practicable but no more than 24 hours after the discovery of the discharge. If the spill or overflow needs to be reported after normal business hours or on the weekend, the facility must call the Department's Environmental Emergency Response hotline at (573) 634-2436. Leaving a message on a Department staff member voice-mail does not satisfy this reporting requirement.
    (c) A record of all spills shall be retained with the SWPPP and made available to the Department upon request.
    (d) Other spills not reaching waters of the state must be cleaned up as soon as possible to prevent entrainment in stormwater but are not required to be reported to the Department.

15. The full implementation of this operating permit shall constitute compliance with all applicable federal and state statutes and regulations in accordance with RSMo 644.051.16 and the CWA §402(k); however, this permit may be reopened and modified or alternatively revoked and reissued to comply with any applicable effluent standard or limitation issued or approved under Clean Water Act §§ 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) if the effluent standard or limitation so issued or approved contains different conditions or is otherwise more stringent than any effluent limitation in the permit or controls any pollutant not limited in the permit. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, termination, notice of planned changes, or anticipated non-compliance does not stay any permit condition.

IV. STORMWATER POLLUTION PREVENTION PLAN (SWPPP) MANAGEMENT REQUIREMENTS

1. The primary requirement of this permit is the development and implementation of a SWPPP which incorporates site specific practices to best minimize the soil exposure, soil erosion, and the discharge of pollutants, including solids for each site covered under this permit.

   The purpose of the SWPPP is to ensure the design, implementation, management, and maintenance of BMPs in order to prevent sediment and other pollutants in stormwater discharges associated with the land disturbance activities [40 CFR 122.44 (k)(4)] from entering waters of the state above established general and narrative criteria; compliance with Missouri Water Quality Standards; and compliance with the terms and conditions of this general permit.

   (a) **The SWPPP must be developed and implemented prior to conducting any land disturbance activities and must be specific to the land disturbance activities at the site.**
   (b) The permittee shall fully implement the provisions of the SWPPP required under this permit as a condition of this general permit throughout the term of the land disturbance project. Failure to develop, implement, and maintain a SWPPP may lead to immediate enforcement action.

(c) The SWPPP shall be updated any time site conditions warrant adjustments to the project or BMPs.
(d) Either an electronic copy or a paper copy of the SWPPP, and any required reports, must be accessible to anyone on site at all times when land disturbance operations are in process or other operational activities that may affect the maintenance or integrity of the BMP structures and made available as specified under Part VIII. STANDARD PERMIT CONDITIONS, Condition 1 of this permit. The SWPPP shall be readily available upon request and should not be sent to the Department unless specifically requested

2. Failure to implement and maintain the BMPs chosen, which can be revised and updated, is a permit violation. The chosen BMPs will be the most reasonable and cost effective while also ensuring the highest quality water discharged attainable for the facility. Facilities with established SWPPPs and BMPs shall evaluate BMPs on a regular basis and change the BMPs as needed if there are BMP deficiencies.

3. The SWPPP must:
   (a) List and describe the location of all outfalls;
   (b) List any allowable non-stormwater discharges occurring on site and where these discharges occur;
   (c) Incorporate required practices identified below;
   (d) Incorporate sediment and erosion control practices specific to site conditions;
   (e) Discuss whether or not a 404 Permit is required for the project; and
   (f) Name the person(s) responsible for inspection, operation, and maintenance of BMPs. The SWPPP shall list the names and describe the role of all owners/primary operators (such as general contractor, project manager) responsible for environmental or sediment and erosion control at the land disturbance site.

4. The SWPPP briefly must describe the nature of the land disturbance activity, including:
   (a) The function of the project (e.g., low density residential, shopping mall, highway, etc.);
   (b) The intended sequence and timing of activities that disturb the soils at the site; and
   (c) Estimates of the total area expected to be disturbed by excavation, grading, or other land disturbance support activities including off-site borrow and fill areas;

5. In order to identify the site, the SWPPP shall include site information including size in acres. The SWPPP shall have sufficient information to be of practical use to contractors and site construction workers to guide the installation and maintenance of BMPs.

6. The function of the SWPPP and the BMPs listed therein is to prevent or minimize pollution to waters of the state. A deficiency of a BMP means it was not effective in preventing or minimizing pollution of waters of the state.

   The permittee shall select, install, use, operate and maintain appropriate BMPs for the permitted site. The following manuals are acceptable resources for the selection of appropriate BMPs.

   Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites, (Document number EPA 833-R-06-004) published by the United States Environmental Protection Agency (USEPA) in May 2007. This manual as well as other information, including examples of construction SWPPPs, is available at the USEPA internet site at https://www.epa.gov/sites/production/files/2015-10/documents/sw_swppp_guide.pdf; and https://www.epa.gov/npdes/developing-stormwater-pollution-prevention-plan-swppp.

   The latest version of *Protecting Water Quality: A field guide to erosion, sediment and stormwater best management practices for development sites in Missouri,* published by the Department. This manual is available at: https://dnr.mo.gov/document-search/protecting-water-quality-field-guide.

   The permittee is not limited to the use of these guidance manuals. Other guidance publications may be used to select appropriate BMPs. However, all BMPs must be described and justified in the SWPPP. Although the use of these manuals or other resources is recommended and may be used for BMP selection, they do not supersede the conditions of this permit. They may be used to inform in the decision making process for BMP selection but they are not themselves part of the permit conditions.

The permittee may retain the SWPPP, inspection reports, and all other associated documents (including a copy of this permit) electronically pursuant to RSMo 432.255. The documents must be made available to all interested persons in either paper or electronic format as required by this permit and the permittee must remit a copy (electronic or otherwise) of the SWPPP and inspection reports to the Department upon request.

7. The SWPPP must contain a legible site map, multiple maps if necessary, identifying:
   (a) Site boundaries of the property;
   (b) Locations of all waters of the state (including wetlands) within the site and half a mile downstream of the site's outfalls;
   (c) Location of all outfalls;
   (d) Direction(s) of stormwater flow (use arrows) and approximate slopes before and after grading activities;
   (e) Areas of soil disturbance and areas that will not be disturbed (or a statement that all areas of the site will be disturbed unless otherwise noted);
   (f) Location of structural and non-structural BMPs, including natural buffer areas, identified in the SWPPP;
   (g) Locations where stabilization practices are expected to occur;
   (h) Locations of on-site and off-site material, waste, borrow, or equipment storage areas and stockpiles;
   (i) Designated points where vehicles will exit the site;
   (j) Location of stormwater inlets and conveyances including ditches, pipes, man-made conduits, and swales; and
   (k) Areas where final stabilization has been achieved.

8. An individual shall be designated by the permittee as the environmental lead. This environmental lead shall have knowledge in erosion, sediment, and stormwater control principles, knowledge of the permit, and the site's SWPPP. The environmental lead shall ensure all personnel and contractors understand any requirements of this permit may be affected by the work they are doing. The environmental lead or designated inspector(s) knowledgeable in erosion, sediment, and stormwater control principles shall inspect all structures that function to prevent or minimize pollution of waters of the state.

9. Throughout coverage under this permit, the permittee shall amend and update the SWPPP as appropriate during the term of the land disturbance activity. All SWPPP modifications shall be signed and dated. The permittee shall amend the SWPPP to incorporate any significant site condition changes which impact the nature and condition of stormwater discharges. At a minimum, these changes include whenever the:
   (a) Location, design, operation, or maintenance of BMPs is changed;
   (b) Design of the construction project is changed that could significantly affect the quality of the stormwater discharges;
   (c) The permittee's inspections indicate deficiencies in the SWPPP or any BMP;
   (d) Department notifies the permittee in writing of deficiencies in the SWPPP;
   (e) SWPPP is determined to be ineffective in minimizing or controlling erosion and sedimentation (e.g., there is visual evidence of excessive site erosion or sediment deposits in streams, lakes, or downstream waterways, sediment or other wastes off site); and/or
   (f) Department determines violations of water quality standards may occur or have occurred.

10. Site Inspections: The environmental lead, or a designated inspector, shall conduct regularly scheduled inspections. These inspections shall be conducted by a qualified person, one who is responsible for environmental matters at the site, or a person trained by and directly supervised by the person responsible for environmental matters at the site. Site inspections shall include, at a minimum, the following:
   (a) For disturbed areas that have not achieved final stabilization, all installed BMPs and other pollution control measures shall be inspected to ensure they are properly installed, appear to be operational, and are working as intended to minimize the discharge of pollutants.
   (b) For areas on site that have achieved either temporary or final stabilization, while at the same time active construction continues on other areas, ensure that all stabilization measures are properly installed, appear to be operational, and are working as intended to minimize the discharge of pollutants.
   (c) Inspect all material, waste, borrow, and equipment storage and maintenance areas that are covered by this permit. Inspect for conditions that could lead to spills, leaks, or other accumulations of pollutants on the site.
   (d) Inspect all areas where stormwater typically flows within the site, including drainage ways designed to divert, convey, and/or treat stormwater.

(e) All stormwater outfalls shall be inspected for evidence of erosion, sediment deposition, or impacts to the receiving stream. If a discharge is occurring during an inspection, the inspector must observe and document the visual quality of the discharge and take note of the characteristics of the stormwater discharge, including turbidity, color; odor; floating, settled, or suspended solids; foam; oil sheen; and other indicators of stormwater pollutants.
(f) When practicable the receiving stream shall also be inspected for a minimum of 50 feet downstream of the outfall.
(g) The perimeter of the site shall be inspected for evidence of BMP failure to ensure concentrated flow does not develop a new outfall.
(h) The SWPPP must explain how the environmental lead will be notified when stormwater runoff occurs.

11. Inspection Frequency: All BMPs must be inspected in accordance to one of the schedules listed below. The inspection frequency shall be documented in the SWPPP, and any changes to the frequency of inspections, including switching between the options listed below, must be documented on the inspection form:
(a) At least once every seven (7) calendar days and within 48 hours after any storm event equal to or greater than a 2-year, 24-hour storm has ceased during a normal work day or within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday; or
(b) Once every 14 calendar days and within 24 hours of the occurrence of a storm event of 0.25 inches of precipitation or greater, or the occurrence of runoff from snowmelt. To determine if a storm event of 0.25 inches or greater has occurred on the site, the permittee shall either keep a properly maintained rain gauge on site, or obtain the storm event information from a weather station near the site location.
1) Inspections are only required during the project's normal working hours.
2) An inspection must be conducted within 24 hours of a storm event which has produced 0.25 inches. The inspection shall be conducted within 24 hours of the event end, or within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday.
3) If it is elected to inspect every 14 calendar days and there is a storm event at the site that continues for multiple days, and each day of the storm produces 0.25 inches or more of rain, the permittee shall conduct an inspection within 24 hours of the end of the storm or within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday.
(c) Areas on site that have achieved stabilization, while at the same time active construction continues on other areas, may reduce inspection frequency to monthly, for those stabilized areas, if the following conditions exist:
1) For areas where disturbed portions have undergone temporary stabilization, inspections shall occur at least once a month while stabilized and when re-disturbed shall follow either frequency outlined in (a),(b), or (c) above.
2) Areas on site that have achieved final stabilization must be inspected at least once per month until the permit is terminated.
(d) If construction activities are suspended due to frozen conditions, the permittee may temporarily reduce site inspections to monthly until thawing conditions begin to occur if all of the following are met:
1) Land disturbances have been suspended; and
2) All disturbed areas of the site have been stabilized in accordance with Part V. BMP REQUIREMENTS, Condition 13.
3) The change shall be noted in the SWPPP.
(e) Any basin dewatering shall be inspected daily when discharge is occurring. The discharge shall be observed and dewatering activities shall be ceased immediately if the receiving stream is being impacted. These inspections shall be noted on a log or on the inspection report.

If weather conditions or other issues prevent correction of BMPs within seven calendar days, the reasons for the delay must be documented (including pictures), and there must be a narrative explaining why the work cannot be accomplished within the seven day time period. The documentation must be filed with the regular inspection reports. The corrections shall be made as soon as weather conditions or other issues allow.

12. Site Inspection Reports: A log of each inspection and/or copy of the inspection report shall be kept readily accessible and must be made available upon request by the Department. Electronic logs are acceptable as long as reports can be provided within 24 hours. If inspection reports are kept off site, the SWPPP must indicate where they are stored. The inspection report shall be signed by the environmental lead or designated inspector (electronically or otherwise).
(a) The inspection report is to include the following minimum information:
1) Inspector's name and title.
2) Date and time of inspection.
3) Observations relative to the effectiveness of the BMPs and stabilization measures. The following must be

documented:
a. Whether BMPs are installed, operational, and working as intended;
b. Whether any new or modified stormwater controls are needed;
c. Facilities examined for conditions that could lead to spill or leak;
d. Outfalls examined for visual signs of erosion or sedimentation at outfalls. Excessive erosion or sedimentation may be due to BMP failure or insufficiency. Response to observations should be addressed in the inspection report.

4) Corrective actions taken or necessary to correct the observed problem.
5) Listing of areas where land disturbance operations have permanently or temporarily stopped.

13. Any structural or maintenance deficiencies for BMPs or stabilization measures shall be documented and corrected as soon as possible but no more than seven (7) calendar days after the inspection.
(a) Corrective action documentation shall be stored with the associated site inspection report.
(b) Immediately take all reasonable steps to address the condition, including cleaning up any contaminated surfaces so the material will not discharge in subsequent storm events.
(c) If weather conditions or other issues prevent correction of BMPs within seven calendar days, the reasons for the delay must be documented (this may include pictures) and there must be a narrative explaining why the work cannot be accomplished within the seven day time period. The permittee shall correct the problem as soon as weather conditions or issues allow.
(d) Corrective actions may be required by the Department. The permittee must comply with any corrective actions required by the Department as a result of permit violations found during an inspection.

V. BMP REQUIREMENTS

1. The information, practices, and BMP requirements in this section shall be implemented on site and, where noted, provided for in the SWPPP.

2. Existing vegetation and trees shall be preserved where practicable. The permittee is encouraged to preserve topsoil where practicable.

3. The permittee shall select appropriate BMPs for use at the site and list them in the SWPPP. When selecting effective BMPs, the permittee shall consider stormwater volume and velocity. A BMP that has demonstrated ineffectiveness in preventing or minimizing sediment or other pollutants from leaving a given site shall be replaced with a more effective BMP, or additional and sequential BMPs and treatment devices may be incorporated as site conditions allow. The permittee should consider a schedule for performing erosion control measures when selecting BMPs.

4. The SWPPP shall include a description of both structural and non-structural BMPs that will be used at the site.
(a) The SWPPP shall provide the following general information for each BMP which will be used one or more times at the site:
1) Physical description of the BMP;
2) Site conditions that must be met for effective use of the BMP;
3) BMP installation/construction procedures, including typical drawings; and
4) Operation and maintenance procedures and schedules for the BMP.
(b) The SWPPP shall provide the following information for each specific instance where a BMP is to be installed:
1) Whether the BMP is temporary or permanent;
2) When the BMP will be installed in relation to each phase of the land disturbance procedures to complete the project; and
3) Site conditions that must be met before removal of the BMP if the BMP is not a permanent BMP.

5. Structural BMP Installation: The permittee shall ensure all BMPs are properly installed and operational at the locations and relative times specified in the SWPPP.
(a) Perimeter control BMPs for runoff from disturbed areas shall be installed before general site clearing is started. Note this requirement does not apply to earth disturbances related to initial site clearing and establishing entry, exit, or access of the site, which may require that stormwater controls be installed immediately after the earth

disturbance.
(b) For phased projects, BMPs shall be properly installed as necessary prior to construction activities.
(c) Stormwater discharges which leave the site from disturbed areas shall pass through an appropriate impediment to sediment movement such as a sedimentation basin, sediment traps (including vegetative buffers), or silt fences prior to leaving the land disturbance site.
(d) A drainage course change shall be clearly marked on a site map and described in the SWPPP.
(e) If vegetative stabilization measures are being implemented, stabilization efforts are considered "installed" when all activities necessary to seed or plant the area are completed. Vegetative stabilization is not considered "operational" until the vegetation is established.

6. Install sediment controls along any perimeter areas of the site that are downgradient from any exposed soil or other disturbed areas. Prevent stormwater from circumventing the edge of the perimeter control. For sites where perimeter controls are infeasible, other practices shall be implemented to minimize discharges to perimeter areas of the site.

7. For surface waters of the state, defined in Section 644.016.1(27) RSMo, located on or adjacent to the site, the permittee must maintain a riparian buffer or structural equivalent in accordance with at least one of the following options. The selection and location must be described in the SWPPP.
   (a) Provide and maintain a 50-foot undisturbed natural buffer; or
   (b) Provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer; or
   (c) If infeasible to provide and maintain an undisturbed natural buffer of any size, implement erosion and sediment controls to achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.
   (d) The permittee is not required to comply with (a), (b), or (c) above if one or more of the following exceptions apply and documentation is provided in the SWPPP:
      1) As authorized per CWA Section 404 Department of the Army permit and its associated Section 401 Water Quality Certification from the Department.
      2) If there is no discharge of stormwater to waters of the state through the area between the disturbed portions of the site and waters of the state located within 50 feet of the site. This includes situations where the permittee has implemented permanent control measures that will prevent such discharges, such as a berm or other barrier.
      3) Where no natural buffer exists due to preexisting development disturbances that occurred prior to the initiation of planning for the current development of the site.
         a. Where some natural buffer exists but portions of the area within 50 feet of the waters of the state are occupied by preexisting development disturbances the permittee is required to comply with (a), (b), or (c) above.
      4) For linear projects where site constraints make it infeasible to implement a buffer or equivalent provided the permittee limit disturbances within 50 feet of any waters of the state and/or the permittee provides supplemental erosion and sediment controls to treat stormwater discharges from earth disturbances within 50 feet of the water of the state. The permittee must also document in the SWPPP the rationale for why it is infeasible for the permittee to implement (a), (b), or (c) and describe any buffer width retained and supplemental BMPs installed.
   (e) Where the permittee is retaining a buffer of any size, the buffer should be measured perpendicularly from any of the following points, whichever is further landward from the water:
      1) The ordinary high water mark of the water body, defined as the line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, and/or the presence of litter and debris; or
      2) The edge of the stream or river bank, bluff, or cliff, whichever is applicable.

8. Slopes for disturbed areas must be identified in the SWPPP. A site map or maps defining the sloped areas for all phases of the project must be included in the SWPPP. The disturbance of steep slopes shall be minimized.
9. Manage stockpiles or land clearing debris piles composed, in whole or in part, of sediment and/or soil.
   (a) Locate the piles outside of any natural buffers zones, established under the condition above, and away from any stormwater conveyances, drain inlets, and areas where stormwater flow is concentrated;
   (b) Install a sediment barrier along all downgradient perimeter areas;
   (c) Divert surface flows around stockpiles to reduce and minimize erosion of the stockpile.

(d) For piles that will be unused for 14 or more days, provide cover with appropriate temporary stabilization in accordance with Part V. BMP REQUIREMENTS, Condition 13.
(e) Rinsing, sweeping, or otherwise placing any soil, sediment, debris, or stockpiled product which has accumulated on pavement or other impervious surfaces into any stormwater conveyance, storm drain inlet, or water of the state is prohibited.

10. The site shall include BMPs for pollution prevention measures and shall be noted in the SWPPP. At minimum such measures must be designed, installed, implemented, and maintained to:
(a) Minimize the discharge of pollutants from equipment and vehicle rinsing; no detergents, additives, or soaps of any kind shall be discharged. Rinse waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
(b) Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater;
(c) Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures, including, but not limited to, the installation of containment berms and use of drip pans at petroleum product and liquid storage tanks and containers; and
(d) Prevent discharges from causing or contributing to an exceedance of water quality standards including general criteria.

11. Sedimentation Basins: The SWPPP shall include a sedimentation basin for each drainage area with ten or more acres disturbed at one time.
(a) The sedimentation basin shall be sized, at a minimum, to treat a local 2-year, 24-hour storm.
(b) Sediment basins shall not be constructed in any waters of the state or natural buffer zones.
(c) Discharges from dewatering activities shall be managed by appropriate controls. The SWPPP shall include a description of any anticipated dewatering methods and specific BMPs designed to treat dewatering water.
    1) Appropriate controls include, but are not limited to, sediment socks, dewatering tanks, tube settlers, weir tanks, filtration systems (e.g. bag or sand filters), and passive treatment systems that are designed to remove or retain sediment.
    2) Erosion controls and velocity dissipation devices (e.g., check dams, riprap, and vegetated buffers) to minimize erosion at inlets, outlets, and discharge points from shall be utilized.
    3) Water with an oil sheen shall not be discharged and shall be marked in SWPPP.
    4) Visible floating solids and foam shall not be discharged.
(d) Until final stabilization has been achieved, sediment basins and impoundments shall utilize outlet structures or floating skimmers that withdraw water from the surface when discharging.
    1) Under frozen conditions, it may be considered infeasible to withdraw water from the surface and an exception can be made for that specific period as long as discharges that may contain sediment and other pollutants are managed by appropriate controls. If determined infeasible due to frozen conditions, documentation must be provided in the SWPPP to support the determination, including the specific conditions or time period when this exception applies.
(e) Accumulated sediment shall not exceed 50% of total volume or as prescribed in the design, whichever is less. Note in the SWPPP the locations for disposal of the material removed from sediment basins.
(f) Prevent discharges to the receiving stream causing excessive visual turbidity. For the purposes of this permit, visual turbidity refers to a sediment plume or other cloudiness in the water caused by sediment that can be identified by an observer.
(g) The SWPPP shall require the basin be maintained until final stabilization of the disturbed area served by the basin.

Where use of a sediment basin is infeasible, the SWPPP shall evaluate and specify other similarly effective BMPs to be employed to control erosion and sediment. These similarly effective BMPs shall be selected from appropriate BMP guidance documents authorized by this permit. The BMPs must provide equivalent water quality protection to achieve compliance with this permit. The SWPPP shall require both temporary and permanent sedimentation basins to have a stabilized spillway to minimize the potential for erosion of the spillway or basin embankment.

12. Soil disturbing activities on site that have ceased either temporarily or permanently shall initiate stabilization immediately in accordance with the options below. For soil disturbing activities that have been temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days:
    (a) The permittee shall construct BMPs to establish interim stabilization; and
    (b) Stabilization must be initiated immediately and completed within 14 calendar days.
    (c) For soil disturbing activities that have been permanently ceased on any portion of the site, final stabilization of disturbed areas must be initiated immediately and completed within 14 calendar days.
        1) Allowances to the 14-day completion period for temporary and final stabilization may be made due to weather and equipment malfunctions. The use of allowances shall be documented in the SWPPP. Allowances may be determined unnecessary after review by the Department.
    (d) Until stabilization is complete, interim sediment control shall consist of well-established and maintained BMPs that are reasonably certain to protect waters of the state from sediment pollution over an extended period of time. This may require adding more BMPs to an area than is normally used during daily operations. The types of BMPs used must be suited to the area disturbed, taking into account the number of acres exposed and the steepness of the slopes. If the slope of the area is greater than 3:1 (three feet horizontal to one foot vertical), then the permittee shall establish interim stabilization within seven days of ceasing operations on that part of the site. The following activities would constitute the immediate initiation of stabilization:
        1) Prepping the soil for vegetative or non-vegetative stabilization as long as seeding, planting, and/or installation of non-vegetative stabilization products takes place as soon as practicable;
        2) Applying mulch or other non-vegetative product to the exposed areas;
        3) Seeding or planting the exposed areas;
        4) Finalizing arrangements to have stabilization product fully installed in compliance with the deadlines for completing stabilization.
    (e) If vegetative stabilization measures are being implemented, stabilization is considered “installed” when all activities necessary to seed or plant the area are completed. Installed does not mean established.
    (f) If non-vegetative stabilization measures are being implemented, stabilization is considered “installed” when all such measures are implemented or applied.
        1) Non-vegetative stabilization shall prevent erosion and shall be chosen for site conditions, such as slope and flow of stormwater.
    (g) Final stabilization is not considered achieved until vegetation has grown and established to meet the requirements below.

13. Prior to removal of BMPs, ceasing site inspections, and removing from the quarterly report, final stabilization must be achieved. Final stabilization shall be achieved as soon as possible once land disturbance activities have ceased. Document in the SWPPP the type of stabilization and the date final stabilization is achieved.
    (a) The project is considered to have achieved final stabilization when perennial vegetation (excluding volunteer vegetation), pavement, buildings, or structures using permanent materials (e.g., riprap, gravel, etc.) cover all areas that have been disturbed. With respect to areas that have been vegetated, vegetation must be at least 70% coverage of 100% of the vegetated areas on site. Vegetation must be evenly distributed.
    (b) Disturbed areas on agricultural land are considered to have achieved final stabilization when they are restored to their preconstruction agricultural use. If former agricultural land is changing to non-agricultural use, this is no longer considered agricultural land and shall follow condition (a).
    (c) If the intended function of a specific area of the site necessitates that it remain disturbed, final stabilization is considered achieved if all of the following are met:
        1) Only the minimum area needed remains disturbed (i.e., dirt access roads, motocross tracks, utility pole pads, areas being used for storage of vehicles, equipment, materials). Other areas must meet the criteria above.

2) Permanent structural BMPs (e.g., rock checks, berms, grading, etc.) or non-vegetative stabilization measures are implemented and designed to prevent sediment and other pollutants from entering waters of the state.
3) Inspection requirements in Part IV. SWPPP MANAGEMENT REQUIREMENT, Condition 11 are met and documented in the SWPPP.

(d) Winter weather and frozen conditions do not excuse any of the above final stabilization requirements. If vegetation is required for stabilization the permittee must maintain BMPs throughout winter weather and frozen conditions until thawing and vegetation meets final stabilization criteria above. Document stabilization attempts during frozen conditions in the SWPPP. Consider future freezing when removing vegetation and plan with temporary stabilization techniques before the ground becomes frozen.

VI. SITE FINALIZATION & PERMIT TERMINATION

1. Until a site is finalized, the permittee must comply with all conditions in the permit, including continuation of site inspections and reporting quarterly to the Department. To finalize the site and remove from this permit coverage, the site shall meet the following requirements:
   (a) For any areas that (1) were disturbed during construction, (2) are not covered over by permanent structures, and (3) over which the permittee had control during the construction activities, the requirements for final vegetative or non-vegetative stabilization in Part V. BMP REQUIREMENTS, Condition 13;
   (b) The permittee has removed and properly disposed of all construction materials, waste, and waste handling devices and has removed all equipment and vehicles that were used during construction, unless intended for long-term beyond construction phase;
   (c) The permittee has removed all temporary BMPs that were installed and maintained during construction, except those that are intended for long-term use or those that are biodegradable; and
   (d) The permittee has removed all potential pollutants and pollutant-generating activities associated with construction, unless needed for long-term use following the construction activities.

2. The permit may be terminated if;
   (a) There has been a transfer of control of all areas of the site for which the current permittee is responsible under this permit to another operator, and that operator has obtained coverage under this permit;
   (b) Active sites obtain coverage under an individual or alternative general NPDES permit, with land disturbance conditions; or
   (c) This permit may be terminated when all projects covered under this permit are finalized. In order to terminate the permit, the permittee shall notify the Department by submitting a Request for Termination along with the final quarterly report for the current calendar quarter.

VII. REPORTING AND SAMPLING REQUIREMENTS

1. The permittee is not required to sample stormwater under this permit. The Department may require sampling and reporting as a result of illegal discharges, compliance issues related to water quality concerns, or evidence of off-site impacts from activities at a site. If such an action is needed, the Department will specify in writing the sampling requirements, including such information as location and extent. If the permittee refuses to perform sampling when required, the Department may terminate the general permit and require the facility to obtain a site-specific permit with sampling requirements.

2. Electronic Discharge Monitoring Report (eDMR) Submission System. The NPDES Electronic Reporting Rule, 40 CFR Part 127, reporting of any report required by the permit shall be submitted via an electronic system to ensure timely, complete, accurate, and nationally consistent set of data for the NPDES program. The eDMR system is currently the only Department-approved reporting method for this permit unless specified elsewhere in this permit, or a waiver is granted by the Department. The facility must register in the Department's eDMR system through the Missouri Gateway for Environmental Management (MoGEM) before the first report is due.

3. Permittees shall prepare a quarterly report with a list of active land disturbance sites including any off-site borrow or depositional areas associated with the construction project and submit the following information electronically as an

attachment to the eDMR system until such a time when the current or a new system is available to allow direct input of the data:

(a) The name of the project;
(b) The location of the project (including the county);
(c) The name of the primary receiving water(s) for each project;
(d) A description of the project;
(e) The number of acres disturbed;
(f) The percent of completion of the project; and
(g) The projected date of completion.

The quarterly report(s) shall be maintained by the permittee and readily available for review by the Department at the address provided on the application as well as submitted quarterly via the Department's eDMR system. The permittee shall submit quarterly reports according to Table A.

Table A	**Schedule for Quarterly Reporting**
Activity for the months of:	Report is due:
January, February, March (1st Quarter)	April 28
April, May, June (2nd Quarter)	July 28
July, August, September (3rd Quarter)	October 28
October, November, December (4th Quarter)	January 28

VIII. STANDARD PERMIT CONDITIONS

1. Records: The permittee shall retain copies of this general permit, the SWPPP and all amendments for the site named in the State Operating Permit, results of any monitoring and analysis, and all site inspection records required by this general permit.
   (a) The records shall be accessible during normal business hours and retained for a period of at least three (3) years from the date of termination.
   (b) The permittee shall provide a copy (electronic or otherwise) of the SWPPP to the Department, USEPA, or any local agency or government representative if they request a copy in the performance of their official duties within 24 hours of the request (or next working day), unless given more time by the representative.
   (c) The permittee shall provide a copy of the SWPPP to those who are responsible for installation, operation, or maintenance of any BMP. The permittee, their representative, and/or the contractor(s) responsible for installation, operation and maintenance of the BMPs shall have a current copy of the SWPPP with them when on the project site.

2. Land Ownership and Change of Ownership: Federal and Missouri stormwater regulations [10 CSR 20-6.200(1) (B)] require a stormwater permit and erosion control measures for all land disturbances of one or more acres. These regulations also require a permit for less than one acre lots if the lot is part of a larger common plan of development or sale where that plan is at least one acre in size.
   (a) If the permittee sells any portion of a permitted site to a developer for commercial, industrial, or residential use, this land remains a part of the common sale and the new owner must obtain a permit prior to conducting any land disturbance activity. Therefore, the original permittee must amend the SWPPP to show that the property has been sold and, therefore, no longer under the original permit coverage.
   (b) Property of any size which is part of a larger common plan of development where the property has achieved final stabilization and the original permit terminated will require application of a new land disturbance permit for any future land disturbance activity unless the activity is by an individual residential building lot owner on a site less than one acre.
   (c) If a portion of a larger common plan of development is sold to an individual for the purpose of building his or her own private residence, a permit is required if the portion of land sold is equal to or greater than one acre. No permit is required, however, for less than one acre of land sold.

3. Permit Transfer: This permit may not be transferred to a new owner.

4. Termination: This permit may be terminated when the project has achieved final stabilization, defined in Part VI. SITE FINALIZATION & PERMIT TERMINATION.
   (a) In order to terminate the permit, the permittee shall notify the Department by submitting the form Request for Termination of Operating Permit Form MO 780-2814. The form should be submitted to the appropriate regional office or through an approved electronic system if it should become available.
   (b) The Cover Page (Certificate Page) of the Master General Permit for Land Disturbance specifies the "effective date" and the "expiration date" of the Master General Permit. The "issued date" along with the "expiration date" will appear on the State Operating Permit issued to the applicant. **This permit does not continue administratively beyond the expiration date.**

5. Duty to Reapply: If the project or development completion date will be after the expiration date of this general permit, then the permittee must reapply to the Department for a new permit. This permit may be applied for and issued electronically in accordance with Section 644.051.10, RSMo.
   (a) Due to the nature of the electronic permitting system, a period of time may be granted at the discretion of the Department in order to apply for a new permit after the new version is effective. Applicants must maintain appropriate best management practices and inspections during the discretionary period.

6. Duty to Comply: The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Missouri Clean Water Law and Federal Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

7. Modification, Revocation, and Reopening:
   (a) If at any time the Department determines that the quality of waters of the state may be better protected by reopening this permit, or revoking this permit and requiring the owner/operator of the permitted site to apply for a site-specific permit, the Department may revoke a general permit and require any person to obtain such an operating permit as authorized by 10 CSR20-6.010(13) and 10 CSR 20-6.200(1)(B).
   (b) If this permit is reopened, modified, or revoked pursuant to this Section, the permittee retains all rights under Chapter 536 and 644 Revised Statutes of Missouri upon the Department's reissuance of the permit as well as all other forms of administrative, judicial, and equitable relief available under law.

8. Other Information: Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.

9. Duty to Provide Information: The permittee shall furnish to the Department, within 24 hours unless explicitly granted more time in writing, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Department upon request, copies of records required to be kept by this permit.

10. Inspection and Entry: The permittee shall allow the Department, or an authorized representative (including an authorized contractor acting as a representative of the Department), upon presentation of credentials and other documents as may be required by law, to:
    (a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of the permit;
    (b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
    (c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
    (d) Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Federal Clean Water Act or Missouri Clean Water Law, any substances or parameters at any location.

11. Signatory Requirement:
    (a) All permit applications, reports required by the permit, or information requested by the Department shall be signed and certified. (See 40 CFR 122.22 and 10 CSR 20-6.010)
    (b) The Federal Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit (including monitoring reports or reports of compliance or non-compliance) shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six (6) months per violation, or by both.
    (c) The Missouri Clean Water Law provides that any person who knowingly makes any false statement, representation or certification in any application, record, report, plan, or other document filed or required to be maintained pursuant to sections 644.006 to 644.141 shall, upon conviction, be punished by a fine of not more than ten thousand dollars, or by imprisonment for not more than six months, or by both.

12. Property Rights: This permit does not convey any property rights of any sort or any exclusive privilege.

13. Notice of Right to Appeal: If you were adversely affected by this decision, you may be entitled to pursue an appeal before the administrative hearing commission (AHC) pursuant to Sections 621.250 and 644.051.6 RSMo. To appeal, you must file a petition with the AHC within thirty days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC. Any appeal should be directed to:

Administrative Hearing Commission
U.S. Post Office Building, Third Floor
131 West High Street, P.O. Box 1557
Jefferson City, MO 65102-1557
Phone: 573-751-2422
Fax: 573-751-5018
Website: https://ahc.mo.gov

MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

STORMWATER DISCHARGES FROM THIS LAND DISTURBANCE SITE ARE AUTHORIZED BY THE MISSOURI STATE OPERATING PERMIT NUMBER:

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ANYONE WITH QUESTIONS OR CONCERNS ABOUT STORMWATER DISCHARGES FROM THIS SITE, PLEASE CONTACT THE MISSOURI DEPARTMENT OF NATURAL RESOURCES AT

1-800-361-4827

MISSOURI DEPARTMENT OF NATURAL RESOURCES
FACT SHEET FOR MASTER GENERAL PERMIT
MO-R100XXX

The Federal Water Pollution Control Act [Clean Water Act (CWA)] Section 402 of Public Law 92-500 (as amended) established the National Pollution Discharge Elimination System (NPDES) permit program. This program regulates the discharge of pollutants from point sources into the waters of the United States and the release of stormwater from certain point sources. All such discharges are unlawful without a permit (Section 301 of the CWA). After a permit is obtained, a discharge not in compliance with all permit terms and conditions is unlawful. Missouri State Operating Permits (MSOPs) are issued by the Missouri Department of Natural Resources (Department) under an approved program operated in accordance with federal and state laws (Federal CWA and Missouri Clean Water Law Section 644 as amended). Permits are issued for a period of five (5) years unless otherwise specified.

Per 40 CFR 124.56, 40 CFR 124.8, and 10 CSR 20-6.020(1)(A)2, a Fact Sheet shall be prepared to give pertinent information regarding the applicable regulations, rationale for the development of effluent limitations and conditions, and the public participation process for the permit. A Fact Sheet is not an enforceable part of an MSOP.

DEFINITIONS FOR THE PURPOSES OF THIS PERMIT:

Common Promotional Plan: A plan undertaken by one (1) or more persons to offer lots for sale or lease; where land is offered for sale by a person or group of persons acting in concert, and the land is contiguous or is known, designated, or advertised as a common unit or by a common name or similar names, the land is presumed, without regard to the number of lots covered by each individual offering, as being offered for sale or lease as part of a common promotional plan.

Dewatering: The act of draining rainwater and/or groundwater from basins, building foundations, vaults, and trenches.

Effective Operating Condition: For the purposes of this permit, a stormwater control is kept in effective operating condition if it has been implemented and maintained in such a manner that it is working as designed to minimize pollutant discharges.

Emergency-Related Project: A project initiated in response to a public emergency (e.g. earthquakes, extreme flooding conditions, tornado, disruptions in essential public services, pandemic) for which the related work requires immediate authorization to avoid imminent endangerment to human health/safety or the environment or to reestablish essential public services.

Exposed Soils: For the purposes of this permit, soils that as a result of earth-disturbing activities are left open to the elements.

Immediately: For the purposes of this permit, immediately should be defined as within 24 hours.

Impervious Surface: For the purpose of this permit, any land surface with a low or no capacity for soil infiltration including, but not limited to, pavement, sidewalks, parking areas and driveways, packed gravel or soil, or rooftops.

Infeasible: Infeasible means not technologically possible or not economically practicable and achievable in light of best industry practices.

Install or Installation: When used in connection with stormwater controls, to connect or set in position stormwater controls to make them operational.

Land Disturbance Site or Site: The land or water area where land disturbance activities will occur and where stormwater controls will be installed and maintained. The land disturbance site includes construction support activities, which may be located at a different part of the property from where the primary land disturbance activity will take place or on a different piece of property altogether. Off-site borrow areas directly and exclusively related to the land disturbance activity are part of the site and must be permitted.

Larger Common Plan of Development or Sale: A continuous area where multiple separate and distinct construction activities are occurring under one plan, including any off-site borrow areas that are directly and exclusively related to the land disturbance activity. Off-site borrow areas utilized for multiple different land disturbance projects are considered their own entity and are not part of the larger common plan of development or sale. See definition of Common Promotional Plan to understand what a 'common plan' is.

Minimize: To reduce and/or eliminate to the extent achievable using stormwater controls that are technologically available and economically practicable and achievable in light of best industry practices.

Non-structural Best Management Practices (BMPs): Institutional, educational, or pollution prevention practices designed to limit the amount of stormwater runoff or pollutants that are generated in the landscape. Examples of non-structural BMPs include picking up trash and debris, sweeping up nearby sidewalks and streets, maintaining equipment, and training site staff on stormwater control practices.

Operational: for the purposes of this permit, stormwater controls are made "operational" when they have been installed and implemented, are functioning as designed, and are properly maintained.

Ordinary High Water Mark: The line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, and/or the presence of litter and debris.

Peripheral: For the purposes of this permit, peripheral should be defined as the outermost boundary of the area that will be disturbed.

Permanently: For the purposes of this permit, permanently is defined as any activity that has been ceased without any intentions of future disturbance.

Pollution Prevention Controls (or Measures): Stormwater controls designed to reduce or eliminate the addition of pollutants to construction site discharges through analysis of pollutant sources, implementation of proper handling/disposal practices, employee education, and other actions.

Qualified Person (inspections): A person knowledgeable in the principles and practice of erosion and sediment controls and pollution prevention who possesses the appropriate skills and training to assess conditions at the construction site that could impact stormwater quality and the appropriate skills and training to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of this permit.

Stormwater Control (also referred to as sediment/erosion controls): refers to any temporary or permanent BMP or other method used to prevent or reduce the discharge of pollutants to waters of the state.

Structural BMP: Physical sediment/erosion controls working individually or as a group (treatment train) appropriate to the source, location, and area climate for the pollutant to be controlled. Examples of structural BMPs include silt fences, sedimentation ponds, erosion control blankets, and seeding.

Temporary Stabilization: A condition where exposed soils or disturbed areas are provided temporary vegetation and/or non-vegetative protective cover to prevent erosion and sediment loss. Temporary stabilization may include temporary seeding, geotextiles, mulches, and other techniques to reduce or eliminate erosion until either final stabilization can be achieved or until further construction activities take place to re-disturb this area.

Treatment Train: A multi-BMP approach to managing the stormwater volume and velocity and often includes erosion prevention and sediment control practices often applied when the use of a single BMP is inadequate in preventing the erosion and transport of sediment. A good option to utilize as a corrective action.

Volunteer Vegetation: A volunteer plant is a plant that grows on its own, rather than being deliberately planted for stabilization purposes. Volunteers often grow from seeds that float in on the wind, are dropped by birds, or are inadvertently mixed into soils. Commonly, volunteer vegetation is referred to as 'weeds'. This does not meet the requirements for final stabilization.

Waters of the State: Section 644.016.1(27) RSMo. defines waters of the state as, "All waters within the jurisdiction of this state, including all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common."

PART I – BASIC PERMIT INFORMATION

Facility Type:	Industrial Stormwater; Land Disturbance
Facility SIC Code(s):	1629
Facility Description:	Construction or land disturbance activity (e.g., clearing, grubbing, excavating, grading, filling, and other activities that result in the destruction of the root zone and/or land disturbance activity that is reasonably certain to cause pollution to waters of the state).

This permit establishes a Stormwater Pollution Prevention Plan (SWPPP) requirement for pollutants of concern from this type of facility or for all facilities and sites covered under this permit. 10 CSR 20-6.200(7) specifies "general permits shall contain BMP requirements and/or monitoring and reporting requirements to keep the stormwater from becoming contaminated".

Land disturbance activities include clearing, grubbing, excavating, grading, filling and other activities that result in the destruction of the root zone and/or other activities that are reasonably certain to cause pollution to waters of the state. A Missouri State Operating Permit for land disturbance permit is required for construction disturbance activities of one or more acres or for construction activities that disturb less than one acre when they are part of a larger common plan of development or sale that will disturb a cumulative total of one or more acres over the life of the project.

The primary requirement of a land disturbance permit is the development of a SWPPP which incorporates site-specific BMPs to minimize soil exposure, soil erosion, and the discharge of pollutants. The SWPPP ensures the design, implementation, management, and maintenance of BMPs in order to prevent sediment and other pollutants from leaving the site.

When it precipitates, stormwater washes over the loose soil on a construction site and various other materials and products being stored outside. As stormwater flows over the site, it can pick up pollutants like sediment, debris, and chemicals from the loose soil and transport them to nearby storm sewer systems or directly into rivers, lakes, or coastal waters.

The Missouri Department of Natural Resources is responsible for ensuring that construction site operators have the proper stormwater controls in place so that construction can proceed in a way that protects your community's clean water and the surrounding environment. One way the department helps protect water quality is by issuing land disturbance permits.

Local conditions are not considered when developing conditions for a general permit. A facility may apply for a site-specific permit if they desire a review of site-specific conditions.

PART II – RECEIVING STREAM INFORMATION

APPLICABLE DESIGNATIONS OF WATERS OF THE STATE:
Per Missouri Effluent Regulations (10 CSR 20-7.015), the waters of the state are divided into seven (7) categories. This permit applies to facilities discharging to the following water body categories:

- ✓ Missouri or Mississippi River [10 CSR 20-7.015(2)]
- ✓ Lakes or Reservoirs [10 CSR 20-7.015(3)]
- ✓ Losing Streams [10 CSR 20-7.015(4)]
- ✓ Metropolitan No-Discharge Streams [10 CSR 20-7.015(5)]
- ✓ Special Streams [10 CSR 20-7.015(6)]
- ✓ Subsurface Waters [10 CSR 20-7.015(7)]
- ✓ All Other Waters [10 CSR 20-7.015(8)]

Missouri Water Quality Standards (10 CSR 20-7.031) defines the Clean Water Commission water quality objectives in terms of "water uses to be maintained and the criteria to protect those uses." The receiving stream and/or 1st classified receiving stream's designated water uses shall be maintained in accordance with 10 CSR 20-7.031(24). A general permit does not take into consideration site-specific conditions.

MIXING CONSIDERATIONS:
This permit applies to receiving streams of varying low flow conditions. Therefore, the effluent limitations must be based on the smallest low flow streams considered, which includes waters without designated uses. As such, no mixing is allowed [10 CSR 20-7.031(5)(A)4.B.(I)(a)]. No Zone of Initial Dilution is allowed. [10 CSR 20-7.031(5)(A)4.B.(I)(b)].

RECEIVING STREAM MONITORING REQUIREMENTS:
There are no receiving water monitoring requirements recommended at this time.

PART III – RATIONALE AND DERIVATION OF EFFLUENT LIMITATIONS & PERMIT CONDITIONS

305(B) REPORT, 303(d) LIST, & TOTAL MAXIMUM DAILY LOAD (TMDL):
Section 305(b) of the Federal CWA requires each state identify waters not meeting Water Quality Standards and for which adequate water pollution controls have not been required. Water Quality Standards protect such beneficial uses of water as whole body contact, maintaining fish and other aquatic life, and providing drinking water for people, livestock, and wildlife. The 303(d) list helps state and federal agencies keep track of waters which are impaired but not addressed by normal water pollution control programs.

A TMDL is a calculation of the maximum amount of a given pollutant a body of water can absorb before its water quality is affected. If a water body is determined to be impaired as listed on the 303(d) list, then a watershed management plan will be developed which shall include the TMDL calculation. For facilities with an existing general permit before a TMDL is written on their receiving stream, the Department will evaluate the permit and may require any facility authorized by this general permit to apply for and obtain a site-specific operating permit.

ANTI-BACKSLIDING:
A provision in the Federal Regulations [CWA Section 303(d)(4); CWA Section 402(c); 40 CFR Part 122.44(I)] requires a reissued permit to be as stringent as the previous permit with some exceptions.
✓ Not Applicable: All effluent limitations in this permit are at least as protective as those previously established.

ANTIDEGRADATION:
Antidegradation policies ensure protection of water quality for a particular water body on a pollutant by pollutant basis to ensure Water Quality Standards are maintained to support beneficial uses such as fish and wildlife propagation and recreation on and in the water. This also includes special protection of waters designated as an Outstanding National Resource Water or Outstanding State Resource Water [10 CSR 20-7.031(3)(C)]. Antidegradation policies are adopted to minimize adverse effects on water.

The Department has determined the best avenue forward for implementing the Antidegradation requirements into general stormwater permits is by requiring the appropriate development and maintenance of a SWPPP. The SWPPP must identify all reasonable and effective BMPs, taking into account environmental impacts and costs. This analysis must document why no discharge or no exposure options are not feasible at the facility. This selection and documentation of appropriate control measures will then serve as the analysis of alternatives and fulfill the requirements of the Antidegradation Rule and Implementation Procedure 10 CSR 20-7.031(3) and 10 CSR 20-7.015(9)(A)5.

Any facility seeking coverage under this permit which undergoes expansion or discharges a new pollutant of concern must update their SWPPP and select reasonable and cost effective new BMPs. New facilities seeking coverage under this permit are required to develop a SWPPP including this analysis and documentation of appropriate BMPs. Renewal of coverage for a facility requires a review of the SWPPP to ensure the selected BMPs continue to be appropriate.
✓ Applicable; the facility must review and maintain stormwater BMPs as appropriate.

BENCHMARKS:
When a permitted feature or outfall consists of only stormwater, a benchmark may be implemented at the discretion of the permit writer. Benchmarks require the facility to monitor and, if necessary, replace and update stormwater control measures. Benchmark concentrations are not effluent limitations. A benchmark exceedance, therefore, is not a permit violation; however, failure to take corrective action is a violation of the permit. Benchmark monitoring data is used to determine the overall effectiveness of control measures and to assist the permittee in knowing when additional corrective actions may be necessary to comply with the limitations of the permit.
✓ Not applicable; this permit does not contain numeric benchmarks.

BEST MANAGEMENT PRACTICES (BMPS):
Minimum site-wide BMPs are established in this permit to ensure all permittees are managing their sites equally to protect waters of the state from certain activities which could cause negative effects in receiving water bodies. While not all sites require a SWPPP because the SIC codes are specifically exempted in 40 CFR 122.26(b)(14), these BMPs are not specifically included for stormwater purposes. These practices are minimum requirements for all industrial sites to protect waters of the state. If the minimum BMPs are not followed, the facility may violate general criteria [10 CSR 20-7.031(4)]. Statutes are applicable to all permitted facilities in the state; therefore, pollutants cannot be released unless in accordance with RSMo 644.011 and 644.016 (17).

CHANGES IN DISCHARGES OF TOXIC POLLUTANT:
This special condition reiterates the federal rules found in 40 CFR 122.44(f) and 122.42(a)(1). In these rules, the facility is required to report changes in amounts of toxic substances discharged. Toxic substances are defined in 40 CFR 122.2 as "…any pollutant listed as toxic under section 307(a)(1) or, in the case of "sludge use or disposal practices," any pollutant identified in regulations implementing section 405(d) of the CWA." Section 307 of the CWA then refers to those parameters found in 40 CFR 401.15.

The permittee should also consider any other toxic pollutant in the discharge as reportable under this condition.

EFFLUENT LIMITATION GUIDELINE:
Effluent Limitation Guidelines, or ELGs, are found at 40 CFR 400-499. These are limitations established by the EPA based on the SIC code and the type of work a facility is conducting. Most ELGs are for process wastewater and some address stormwater. All are technology based limitations which must be met by the applicable facility at all times.

✓ The industries covered under this permit have an associated Effluent Limit Guideline (ELG) which is applicable to the stormwater discharges in this permit and is applied under 40 CFR 125.3(a).

ELECTRONIC DISCHARGE MONITORING REPORT (EDMR) SUBMISSION SYSTEM:
The U.S. Environmental Protection Agency (EPA) promulgated a final rule on October 22, 2015, to modernize CWA reporting for municipalities, industries, and other facilities by converting to an electronic data reporting system. The final rule requires regulated entities and state and federal regulators to use information technology to electronically report data required by the National Pollutant Discharge Elimination System (NPDES) permit program instead of filing paper reports. To comply with the federal rule, the Department is requiring all permittees to begin submitting discharge monitoring data and reports online.

✓ Applicable; this permit requires quarterly reports.

GENERAL CRITERIA CONSIDERATIONS:
In accordance with 40 CFR 122.44(d)(1), effluent limitations shall be placed into permits for pollutants determined to cause, have reasonable potential to cause, or to contribute to, an excursion above any water quality standard, including narrative water quality criteria. In order to comply with this regulation, the permit writer has completed a reasonable potential determination on whether discharges have reasonable potential to cause or contribute to an excursion of the general criteria listed in 10 CSR 20-7.031(4). In instances where reasonable potential exists, the permit includes limitations within the permit to address the reasonable potential. In discharges where reasonable potential does not exist, the permit may include monitoring to later determine the discharge's potential to impact the narrative criteria. Additionally, RSMo 644.076.1, as well as Standard Permit Conditions Part VIII of this permit state it shall be unlawful for any person to cause or allow any discharge of water contaminants from any water contaminant or point source located in Missouri in violation of sections 644.006 to 644.141 of the Missouri Clean Water Law or any standard, rule, or regulation promulgated by the commission.

LAND APPLICATION:
Land application, or surficial dispersion of wastewater and/or sludge, is performed by facilities to maintain a basin as no-discharge. Requirements for these types of operations are found in 10 CSR 20-6.015; authority to regulate these activities is from RSMo 644.026.

✓ Not applicable; this permit does not authorize operation of a surficial land application system to disperse wastewater or sludge.

LAND DISTURBANCE:
Land disturbance, sometimes called construction activities, are actions which cause disturbance of the root layer or soil; these include clearing, grading, and excavating of the land. 40 CFR 122.26(b)(14) and 10 CSR 20-6.200(3) requires permit coverage for these activities. Coverage is not required for facilities when only providing maintenance of original line and grade, hydraulic capacity, or to continue the original purpose of the facility.

✓ Applicable; this permit provides coverage for land disturbance activities. These activities have SWPPP requirements and may be combined with the standard site SWPPP. Land disturbance BMPs should be designed to control the expected peak discharges. The University of Missouri has design storm events for the 25 year 24 hour storm; these can be found at: http://ag3.agebb.missouri.edu/design_storm/comparison_reports/20191117_25yr_24hr_comparison_table.htm; to calculate peak discharges, the website https://www.lmnoeng.com/Hydrology/rational.php has the rational equation to calculate expected discharge volume from the peak storm events.

NUTRIENT MONITORING:
Nutrient monitoring is required for facilities characteristically or expected to discharge nutrients (nitrogenous compounds and/or phosphorus) when the design flow is equal to or greater than 0.1 MGD per 10 CSR 20-7.015(9)(D)8.

- ✓ This is a stormwater only permit; therefore, it is not subject to provisions found in 10 CSR 20-7.015 per 10 CSR 20-7.015(1)(C).

OIL/WATER SEPARATORS:
Oil water separator (OWS) tank systems are frequently found at industrial sites where process water and stormwater may contain oils and greases, oily wastewaters, or other immiscible liquids requiring separation. Food industry discharges typically require pretreatment prior to discharge to municipally owned treatment works. Per 10 CSR 26-2.010(2)(B), all oil water separator tanks must be operated according to manufacturer's specifications and authorized in NPDES permits per 10 CSR 26-2.010(2) or may be regulated as a petroleum tank.

- ✓ Not applicable; this permit does not authorize the operation of OWS. The facility must obtain a separate permit to cover operation of and discharge from these devices.

PERMIT SHIELD:
The permit shield provision of the CWA (Section 402(k)) and Missouri Clean Water Law (644.051.16 RSMo) provides that when a permit holder is in compliance with its NPDES permit or MSOP, they are effectively in compliance with certain sections of the CWA and equivalent sections of the Missouri Clean Water Law. In general, the permit shield is a legal defense against certain enforcement actions but is only available when the facility is in compliance with its permit and satisfies other specific conditions, including having completely disclosed all discharges and all facility processes and activities to the Department at time of application. It is the facility's responsibility to ensure that all potential pollutants, waste streams, discharges, and activities, as well as wastewater land application, storage, and treatment areas, are all fully disclosed to the Department at the time of application or during the draft permit review process. Subsequent requests for authorization to discharge additional pollutants or expanded or newly disclosed flows, or for authorization for previously unpermitted and undisclosed activities or discharges, will likely require permit modification or may require the facility be covered under a site specific permit.

PRETREATMENT PROGRAM:
This permit does not regulate pretreatment requirements for facilities discharging to an accepting permitted wastewater treatment facility. If applicable, the receiving entity (the publicly owned treatment works - POTW) must ensure compliance with any effluent limitation guidelines for pretreatment listed in 40 CFR Subchapter N per 10 CSR 20-6.100. Pretreatment regulations per RSMo 644.016 are limitations on the introduction of pollutants or water contaminants into publicly owned treatment works or facilities.

- ✓ Not Applicable; the facilities covered under this permit are not required to meet pretreatment requirements under an ELG.

PUBLIC NOTICE OF COVERAGE FOR AN INDIVIDUAL FACILITY:
Public Notice of reissuance of coverage is not required unless the facility is a specific type of facility as defined in 10 CSR 20-6.200(1). The need for an individual public notification process shall be determined and identified in the permit [10 CSR 20-6.020(1)(C)5.].

- ✓ Not applicable; public notice is not required for coverage under this permit to individual facilities. The MGP is public noticed in lieu of individual permit PN requirements.

REASONABLE POTENTIAL ANALYSIS (RPA):
Federal regulation 40 CFR Part 122.44(d)(1)(i) requires effluent limitations for all pollutants which are or may be discharged at a level which will cause or have the reasonable potential to cause or contribute to an in-stream excursion above narrative or numeric water quality standard. In accordance with 40 CFR Part 122.44(d)(iii) if the permit writer determines any given pollutant has the reasonable potential to cause or contribute to an in-stream excursion above the water quality standard, the permit must contain effluent limits for the pollutant.

- ✓ The permit writer reviewed industry materials, available past inspections, and other documents and research to evaluate general and narrative water quality reasonable potential for this permit. Permit writers also use the Department's permit writer's manual, the EPA's permit writer's manual (https://www.epa.gov/npdes/npdes-permit-writers-manual), program policies, and best professional judgment. For each parameter in each permit, the permit writer carefully considers all applicable information regarding technology based effluent limitations, effluent limitation guidelines, and water quality standards. Best professional judgment is based on the experience of the permit writer, cohorts in the Department and resources at the EPA, research, and maintaining continuity of permits if necessary. For stormwater permits, the permit writer is required per 10 CSR 6.200(6)(B)2 to consider: A. application and other information supplied by the permittee; B. effluent guidelines; C. best professional judgment of the permit writer; D. water quality; and E. BMPs.

SCHEDULE OF COMPLIANCE (SOC):
Per § 644.051, RSMo, a permit may be issued with a Schedule of Compliance (SOC) to provide time for a facility to come into compliance with new state or federal effluent regulations, water quality standards, or other requirements. Such a schedule is not allowed if the facility is already in compliance with the new requirement or if prohibited by other statute or regulation. An SOC includes an enforceable sequence of interim requirements (e.g. actions, operations, or milestone events) leading to compliance with the Missouri Clean Water Law, its implementing regulations, and/or the terms and conditions of an operating permit. *See also* Section 502(17) of the CWA, and 40 CFR 122.2. For new effluent limitations, the permit may include interim monitoring for the specific parameter to demonstrate the facility is not already in compliance with the new requirement. Per 40 CFR 122.47(a)(1) and 10 CSR 20-7.031(11), compliance must occur as soon as possible. If the permit provides a schedule for meeting new water quality based effluent limits, an SOC must include an enforceable, final effluent limitation in the permit even if the SOC extends beyond the life of the permit.

- ✓ Not Applicable: This permit does not contain a SOC.

SETBACKS:
Setbacks, sometimes called separation distances, are common elements of permits and are established to provide a margin of safety in order to protect the receiving water and other features from accidents, spills, unusual events, etc. Specific separation distances are included in 10 CSR 20-8 for minimum design standards of wastewater structures. While wastewater is considered separately from stormwater under this permit, the guides and Chapter 8 distances may remain relevant to requirements under this permit if deemed appropriate by the permittee.

- ✓ Discharge to the watersheds of a Metropolitan No-Discharge Stream (10 CSR 20-7.031 Table F) is authorized by this permit if the discharges are in compliance with 10 CSR 20-7.015(5) and 10 CSR 20-7.031(7). Discharges to these watersheds are authorized for uncontaminated stormwater discharges only.
- ✓ This permit authorizes stormwater discharges which are located in a way to allow water to be released into sinkholes, caves, fissures, or other openings in the ground which could drain into aquifers (except losing streams) per 10 CSR 20-7.015(7). It is the best professional judgment of the permit writer to allow discharges to losing streams as the effluent is stormwater only.
- ✓ This permit authorizes stormwater discharge in the watersheds of Outstanding state Resource Waters (OSRW); Outstanding National Resources Waters (ONRW), which includes the Ozark National Riverways and the National Wild and Scenic Rivers System; and impaired waters as designated in the 305(b) Report provided no degradation of water quality occurs in the OSRW and ONRW due to discharges from the permitted facility per 10 CSR 20-7.015(6)(B) and 10 CSR 20-7.031(3)(C). Additionally, if the facility is found to be causing degradation or contributing to an impairment by discharging a pollutant of concern during an inspection or through complaint investigations, they will be required to become a no discharge facility or obtain a site specific permit with more stringent monitoring and SWPPP requirements. Missouri's impaired waters can be found at https://dnr.mo.gov/water/what-were-doing/water-planning/quality-standards-impaired-waters-total-maximum-daily-loads/impaired-waters. Sites within 1000 feet of a OSRW, ONRW, or water impaired for sediment must operate as a no-discharge facility. These additional protections are borrowed from the USEPA 2021 draft Construction General Permit.

SLUDGE – DOMESTIC BIOSOLIDS:
Biosolids are solid materials resulting from domestic wastewater treatment meeting federal and state criteria for beneficial use (i.e. fertilizer). Sewage sludge is solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works; including, but not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment process; and material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in a treatment works.

✓ This permit does not authorize discharge or land application of biosolids. Sludge/biosolids is not generated by this industry.

SLUDGE – INDUSTRIAL:
Industrial sludge is solid, semi-solid, or liquid residue generated during the treatment of industrial process wastewater in a treatment works; including, but not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment process; scum and solids filtered from water supplies and backwashed; and a material derived from industrial sludge.

✓ Not applicable; sludge is not generated by this industry.

SPILL REPORTING:
Any emergency involving a hazardous substance must be reported to the Department's 24 hour Environmental Emergency Response hotline at (573) 634-2436 at the earliest practicable moment after discovery. The Department may require the submittal of a written report detailing measures taken to clean up a spill. These reporting requirements apply when the spill results in chemicals or materials leaving the permitted property or reaching waters of the state. This requirement is in addition to the noncompliance reporting requirement found in Standard Conditions Part I. https://dnr.mo.gov/waste-recycling/investigations-cleanups/environmental-emergency-response.

Underground and above ground storage devices for petroleum products, vegetable oils, and animal fats may be subject to control under federal Spill Prevention, Control, and Countermeasure Regulation and are expected to be managed under those provisions, if applicable. Substances regulated by federal law under the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) which are transported, stored, or used for maintenance, cleaning or repair shall be managed according to the provisions of RCRA and CERCLA.

STORMWATER POLLUTION PREVENTION PLAN (SWPPP):
In accordance with 40 CFR 122.44(k), BMPs must be used to control or abate the discharge of pollutants when: 1) Authorized under section 304(e) of the CWA for the control of toxic pollutants and hazardous substances from ancillary industrial activities; 2) Authorized under section 402(p) of the CWA for the control of stormwater discharges; 3) Numeric effluent limitations are infeasible; or 4) the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA. In accordance with the EPA's *Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites,* (Document number EPA 833-R-06-004) published by the EPA in 2007 https://www.epa.gov/sites/production/files/2015-10/documents/sw_swppp_guide.pdf, BMPs are measures or practices used to reduce the amount of pollution entering waters of the state from a permitted facility. BMPs may take the form of a process, activity, or physical structure. Additionally, in accordance with the Stormwater Management, a SWPPP is a series of steps and activities to 1) identify sources of pollution or contamination, and 2) select and carry out actions which prevent or control the pollution of storm water discharges. Additional information can be found in *Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices* (EPA 832-R-92-006; September 1992).

A SWPPP must be prepared if the SIC code for the facility is found in 40 CFR 122.26(b)(14) and/or 10 CSR 20-6.200(2). A SWPPP may be required of other facilities where stormwater has been identified as necessitating better management.

The purpose of a SWPPP is to comply with all applicable stormwater regulations by creating an adaptive management plan to control and mitigate stream pollution from stormwater runoff. Developing a SWPPP provides opportunities to employ appropriate BMPs to minimize the risk of pollutants being discharged during storm events. The following paragraph outlines the general steps the permittee should take to determine which BMPs will work to achieve the benchmark values or limits in the permit. This section is not intended to be all encompassing or restrict the use of any physical BMP or operational and maintenance procedure assisting in pollution control. Additional steps or revisions to the SWPPP may be required to meet the requirements of the permit.

Areas which should be included in the SWPPP are identified in 40 CFR 122.26(b)(14). Once the potential sources of stormwater pollution have been identified, a plan should be formulated to best control the amount of pollutant being released and discharged by each activity or source. This should include, but is not limited to, minimizing exposure to stormwater, good housekeeping measures, proper facility and equipment maintenance, spill prevention and response, vehicle traffic control, and proper materials handling. Once a plan has been developed, the facility will employ the control measures determined to be adequate to prevent pollution from entering waters of the state. The facility will conduct inspections of the BMPs to ensure they are working properly and re-evaluate any BMP not achieving compliance with permitting requirements. For example if the BMP being employed is deficient in controlling stormwater pollution, corrective action should be taken to repair, improve, or replace the failing BMP. If failures do occur, continue this trial and error process until appropriate BMPs have been established.

The EPA has developed factsheets on the pollutants of concern for specific industries along with the BMPs to control and minimize stormwater (https://www.epa.gov/npdes/stormwater-discharges-industrial-activities). Along with EPA's factsheets, the International Stormwater BMP database (https://bmpdatabase.org/) may provide guidance on BMPs appropriate for specific industries.

For new, altered, or expanded stormwater discharges, the SWPPP shall identify reasonable and effective BMPs while accounting for environmental impacts of varying control methods. The antidegradation analysis must document why no discharge or no exposure options are not feasible. The selection and documentation of appropriate control measures shall serve as an alternative analysis of technology and fulfill the requirements of antidegradation [10 CSR 20-7.031(3)].

Alternative analysis evaluation of the BMPs is a structured evaluation of BMPs which are reasonable and cost effective. The alternative analysis evaluation should include practices designed to be: 1) non-degrading; 2) less degrading; or 3) degrading water quality. The glossary of the *Antidegradation Implementation Procedure* defines these three terms. The chosen BMP will be the most reasonable and effective management strategy while ensuring the highest statutory and regulatory requirements are achieved and the highest quality water attainable for the facility is discharged. The alternative analysis evaluation must demonstrate why "no discharge" or "no exposure" is not a feasible alternative at the facility. This structured analysis of BMPs serves as the antidegradation review, fulfilling the requirements of 10 CSR 20-7.031(3) Water Quality Standards and *Antidegradation Implementation Procedure*, Section II.B.

- ✓ Applicable: A SWPPP shall be developed and implemented for each site and shall incorporate required practices identified by the Department with jurisdiction, incorporate control practices specific to site conditions, and provide for maintenance and adherence to the plan.

UNDERGROUND INJECTION CONTROL (UIC):
The UIC program for all classes of wells in the State of Missouri is administered by the Missouri Department of Natural Resources and approved by EPA pursuant to section 1422 and 1425 of the Safe Drinking Water Act (SDWA) and 40 CFR 147 Subpart AA. Injection wells are classified based on the liquids which are being injected. Class I wells are hazardous waste wells which are banned by RSMo 577.155; Class II wells are established for oil and natural gas production; Class III wells are used to inject fluids to extract minerals; Class IV wells are also banned by Missouri in RSMo 577.155; Class V wells are shallow injection wells; some examples are heat pump wells and groundwater remediation wells. Domestic wastewater being disposed of sub-surface is also considered a Class V well.

In accordance with 40 CFR 144.82, construction, operation, maintenance, conversion, plugging, or closure of injection wells shall not cause movement of fluids containing any contaminant into Underground Sources of Drinking Water (USDW) if the presence of any contaminant may cause a violation of drinking water standards or groundwater standards under 10 CSR 20-7.031 or other health-based standards or may otherwise adversely affect human health. If the Department finds the injection activity may endanger USDWs, the Department may require closure of the injection wells or other actions listed in 40 CFR 144.12(c), (d), or (e). In accordance with 40 CFR 144.26, the permittee shall submit a Class V Well Inventory Form for each active or new underground injection well drilled, or when the status of a well changes, to the Missouri Department of Natural Resources, Geological Survey Program, P.O. Box 250, Rolla, Missouri 65402. Single family residential septic systems and non-residential septic systems used solely for sanitary waste and having the capacity to serve fewer than 20 persons a day are excluded from the UIC requirements (40 CFR 144.81(9)).

- ✓ Not applicable; this permit does not authorize subsurface wastewater systems or other underground injection. These activities must be assessed under an application for a site specific permit. Certain discharges of stormwater into sinkholes may qualify as UIC. It is important the permittee evaluate all stormwater basins, even those holding water; as sinkholes have varying seepage rates. This permit does not allow stormwater discharges into sinkholes. The facility must ensure sinkholes are avoided in the construction process. The State's online mapping resource https://modnr.maps.arcgis.com/apps/webappviewer/index.html?id=87ebef4af15d438ca658ce0b2bbc862e has a sinkhole layer.

VARIANCE:
Per the Missouri Clean Water Law Section 644.061.4, variances shall be granted for such period of time and under such terms and conditions as shall be specified by the commission in its order. The variance may be extended by affirmative action of the commission. In no event shall the variance be granted for a period of time greater than is reasonably necessary for complying with the Missouri Clean Water Law Section 644.006 to 644.141 or any standard, rule, or regulation promulgated pursuant to Missouri Clean Water Law Section 644.006 to 644.141.

- ✓ Not Applicable: This permit is not drafted under premises of a petition for variance.

WASTELOAD ALLOCATIONS (WLA) FOR LIMITATIONS:
Per 10 CSR 20-2.010(78), the amount of pollutant each discharger is allowed by the Department to release into a given stream after the Department has determined total amount of pollutant which may be discharged into the stream without endangering its water quality. Water quality based maximum daily and average monthly effluent limitations were calculated using methods and procedures outlined in USEPA's Technical Support Document For Water Quality-based Toxics Control (TSD) (EPA/505/2-90-001).

- ✓ Not applicable; water quality limitations were not applied in this permit.

WATER QUALITY STANDARDS:
Per 10 CSR 20-7.031(4), General Criteria shall be applicable to all waters of the state at all times, including mixing zones. Additionally, 40 CFR 122.44(d)(1) directs the Department to include in each NPDES permit conditions to achieve water quality established under Section 303 of the CWA, including state narrative criteria for water quality.

WHOLE EFFLUENT TOXICITY (WET) TEST:
Per 10 CSR 20-7.031(1)(FF), a toxicity test conducted under specified laboratory conditions on specific indicator organism; and per 40 CFR 122.2, the aggregate toxic effect of an effluent measured directly by a toxicity test. A WET test is a quantifiable method of determining if a discharge from a facility may be causing toxicity to aquatic life by itself, in combination with, or through synergistic responses when mixed with receiving water.

- ✓ Not applicable: At this time, permittees are not required to conduct a WET test. This permit is for stormwater only.

PART IV – EFFLUENT LIMITATIONS DETERMINATION

EPA Construction General Permit (CGP)
The CGP was used to research and support best professional judgment decisions made in establishing technology-based conditions for this general permit which are consistent with national standards. The permit writer determined the standards established by the CGP are achievable and consistent with federal regulations. Additionally, the conditions reflecting the best practicable technology currently available are utilized to implement the ELG.

In this general permit, technology-based effluent conditions are established through the SWPPP and BMP requirements. Effective BMPs should be designed on a site-specific basis. The implementation of inspections provides a tool for each facility to evaluate the effectiveness of BMPs to ensure protection of water quality. Any flow through an outfall is considered a discharge. Future permit action due to permit modification may contain new operating permit terms and conditions which supersede the terms and conditions, including effluent limitations, of this operating permit.

PART V–REPORTING REQUIREMENTS

SAMPLING:
The permittee is not required to sample stormwater under this permit. The Department may require sampling and reporting as a result of illegal discharges, compliance issues related to water quality concerns or BMP effectiveness, or evidence of off-site impacts from activities at the facility. If such an action is needed, the Department will specify in writing the sampling requirements, including such information as location and extent. If the permittee refuses to perform sampling when required, the Department may terminate the general permit and require the facility to obtain a site-specific permit with sampling requirements.

REPORTING:
There are quarterly reporting requirements for MO-R100xxx land disturbance permits. Project specific information is required to be report to the Department through the eDMR system.

PART VI – RAINFALL VALUES FOR MISSOURI & SURFACE WATER BUFFER ZONES

Knowledge of the 2-year, 24-hour storm event is used in this permit for two main reasons:
1) The design, installation, and maintenance of effective erosion and sediment controls to minimize the discharge of pollutants.
2) If the seven-day inspection frequency is utilized, an inspection must occur within 48 hours after any storm event equal to or greater than a 2-year, 24 hour storm has ceased.
For site-specific 2-year, 24-hour storm event information utilize the National Oceanic and Atmospheric Administration's National Weather Service Atlas 14 (NOAA Atlas 14) which is located at https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html. For more information visit; https://www.weather.gov/media/owp/oh/hdsc/docs/Atlas14_Volume8.pdf.

Surface Water Buffer Zones: In order to design controls that match the sediment removal efficiency of a 50-foot buffer, you first need to know what this efficiency is for your site. The sediment removal efficiencies of natural buffers vary according to a number of site-specific factors, including precipitation, soil type, land cover, slope length, width, steepness, and the types of erosion and sediment controls used to reduce the discharge of sediment prior to the buffer. For additional information; https://www.epa.gov/sites/default/files/2017-02/documents/2017_cgp_final_appendix_g_-_buffer_reqs_508.pdf

PART VII – ADMINISTRATIVE REQUIREMENTS

On the basis of preliminary staff review and applicable standards and regulations, the Department, as administrative agent for the Missouri Clean Water Commission, proposes to issue a permit(s) subject to certain effluent limitations, schedules, and special conditions contained herein and within the permit. The proposed determinations are tentative pending public comment.

PUBLIC MEETING:
The department hosted three public meetings for this permit. The meetings were held on January 27, February 17, and March 9, 2021.

PUBLIC NOTICE:
The Department shall give public notice when a draft permit has been prepared and its issuance is pending. Additionally, public notice will be issued if a public hearing is to be held because of a significant degree of interest or because of water quality concerns related to a draft permit. No public notice is required when a request for a permit modification or termination is denied; however, the requester and facility must be notified of the denial in writing.

The Department must give public notice of a pending permit or of a new or reissued Missouri State Operating Permit. The public comment period is a length of time not less than thirty (30) days following the date of the public notice, during which interested persons may submit written comments about the proposed permit.

For persons wanting to submit comments regarding this proposed permit, please refer to the Public Notice page located at the front of this draft permit. The Public Notice page gives direction on how and where to submit appropriate comments.

- ✓ The Public Notice period for this permit is started March 25, 2022 and ended April 25, 2022. Two comment letters were received.

DATE OF FACT SHEET: 03/2/2022

COMPLETED BY:
SARAH WRIGHT
MS4 & LAND DISTURBANCE PERMITTING COORDINATOR
MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
OPERATING PERMITS SECTION - STORMWATER AND CERTIFICATION UNIT
(573) 526-1139
Sarah.wright@dnr.mo.gov, dnr.generalpermits@dnr.mo.gov

Storm Water Pollution Prevention Plan (SWPPP)

for

X1423-01

Knob Noster Paved Bike/Pedestrian Trail

in

Knob Noster State Park, Johnson County, Missouri

Prepared by:
Bartlett & West
April 29, 2015

Table of Contents

I. Introduction

A. General

The State of Missouri is delegated by U.S. Environmental Protection Agency (EPA) to administer the National Pollutant Discharge Elimination System (NPDES) general permit for construction activities within the state that disturb more than one acre or more. A Missouri State Operating Permit for storm water discharges is required in accordance with Missouri Regulations 10 CSR 20-6.200. The Missouri Department of Natural Resources issued general operating permit number MO-R100038 on June 1, 2012 to the Missouri Office of Administration. This permit is applicable for and applies to all construction or land disturbance activity that is performed by or under contract to Missouri Office of Administration. All construction activities performed in relation to this project shall be done so in accordance with general operating permit number MO-R100038.

This document comprises the Storm Water Pollution Prevention Plan (SWPPP) required by the general operating permit number MO-R100038. This SWPPP establishes a plan to manage the quality of storm water runoff from construction activities associated with this construction project. The Contractor shall comply with all aspects of this document as well as all the conditions and requirements of general operating permit number MO-R100038.

B. Contact Information/Responsible Parties

Contractor:
Company Name:
Company Representative:
Address:

Telephone Number:
Fax Number:
E-mail:

Emergency 24-Hour Contact:
Name:
Telephone Number:
Company Name:

Subcontractor:
Company Name:
Company Representative:
Address:

Telephone Number:
Fax Number:
E-mail:

Subcontractor:
Company Name:
Company Representative:
Address:

Telephone Number:
Fax Number:
E-mail:

Person Responsible for BMP Maintenance
Name:
Phone:
e-mail:

Construction Foreman
Name:
Phone:
e-mail:

SWPPP Preparation
Todd Kempker, PE
Bartlett & West
573.659.6734
todd.kempker@bartwest.com

C. Notification to All Contractors

Each contractor or entity (including utility crews or their agents) who will be performing work at the site shall be notified of the existence of the SWPPP and what action(s) or precaution(s) shall be taken while on site to minimize the potential for erosion and the potential for damaging any BMP. Any additional land that is disturbed, beyond the limits of disturbance shown on the plans, or BMP damaged, shall be repaired.

D. Retention of Records

The contractor must maintain a copy of this SWPPP on the construction site and at their office from the date of the project initiation to the date of final stabilization.

II. Site and Project Information

A. Location

Location Description:

The project is located in Knob Noster State Park, in Johnson County, MO. The project is both north and south of State Highway DD through the state park.

Section Township and Range:

S29 T46N R24W
S30 T46N R24W
S31 T46N R24W
S36 T46N R25W

Latitude and Longitude

East terminus Lat 38 º 45' 16" N, Long 93 º 34’ 33" W
West terminus Lat 38 º 44' 32" N, Long 93 º 37' 42" W

B. Project Description

General

This project consists of the reconstruction of an existing equestrian trail to be shared use equestrian and bicycle/pedestrian through the southern portion of Knob Noster State Park, south of State Highway DD. There will also be new bicycle/pedestrian trail continuing to the northeast, crossing Highway DD and continuing to the Visitor Center. The project is approximately 18,000 feet long and includes sections of gravel, concrete and asphalt trail. There are also 3 stream crossings consisting of reinforced concrete box culverts and 1 crossing of a prefabricated pedestrian bridge over Clear Fork Creek.
The typical trail section is 10’ wide and varies between asphalt, gravel and concrete depending on the intended use. All equestrian portions of trail are gravel only. There will be two sections that will utilized controlled access park roads as trail surface, which will match existing width rather than limiting to 10’ wide. All earthwork will be graded to a maximum of 3:1 slope (3 horizontal to 1 vertical) in cut and fill areas. The existing terrain is hilly. Maximum earth fills and cuts will be approximately 15 feet.

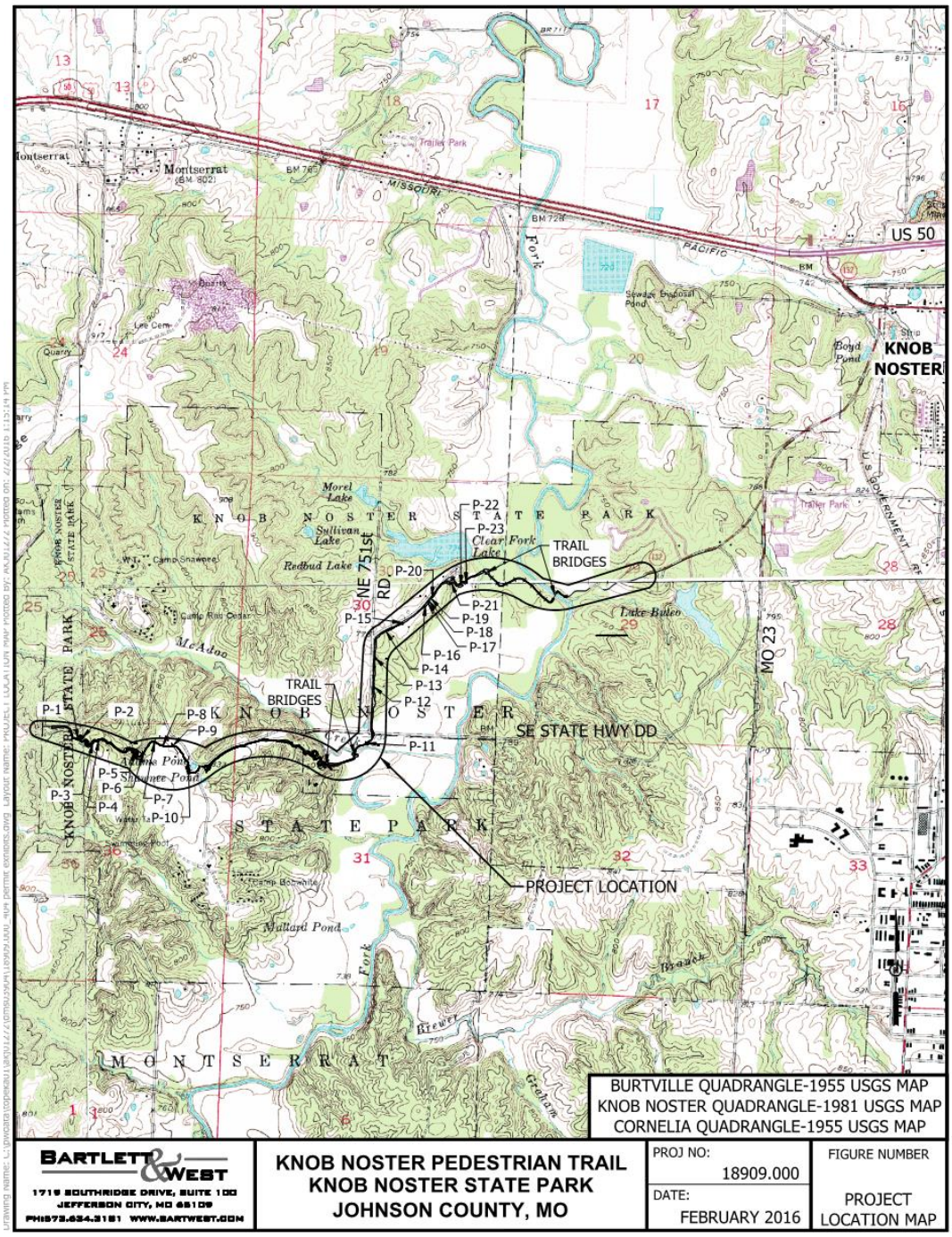
Amount of Disturbance

All of the area within grading limits will be disturbed. Some area beyond that may be disturbed by construction activities, but disturbance will not allow tree removal/damage beyond the defined grading limits. The disturbance limits for this project total approximately 10 acres.

Construction Support

The project will be staged on State Park property. All staging area to be coordinated with and approved by the State Park Staff.

C. Site Map



D. Receiving Waters

The receiving waterbody for this project is the Clear Fork Creek and its tributaries.

III. Sequence of Construction

Contractor to complete this section noting the sequencing and expected dates of beginning and completing the various tasks need to build the trail and submit this to the Engineer before Notice to Proceed. The first task should be to prepare the sediment control measures to meet the plans and specifications.

IV. Best Management Practices

A. General

To ensure that this project does not promote erosion, siltation, or drainage problems, erosion best management practices (BMPs) are to be implemented at this project site. Soil erosion and sediment controls are measures that are used to reduce the amount of soil particles that are carried off of a land area and deposited in receiving water. This section provides a general description of the most appropriate measures planned for this project. All applicable soil erosion and sediment control measures shall be implemented in accordance with the guidelines contained herein prior to commencement of field construction activities. Measures shall be maintained during and after the construction activity until final stabilization is accomplished. Upon successful re-vegetation of the disturbed area, all temporary soil erosion and sediment control measures shall be removed. Appropriate impediments for storm water discharge will be implemented, and benchmarks referenced for proper installation, operation and maintenance of drainage courses.

BMPs shall be provided around any stockpile areas.

BMPs should be field modified to accomplish the desired results.

B. Selection

The BMPs for this project are:

- Erosion Control Mats
- Permanent Turf Reinforcement Mats
- Silt Fence
- Rock Blanket at Storm Pipe/Culvert Outlets
- Prompt Fertilizing, Seeding, and Mulching
- Rock Ditch Check

A detailed description of each BMP is contained in Appendix A. The detailed description of each BMP includes the conditions required for its effective use, installation notes, and inspection and maintenance requirements as applicable.

Locations of all BMPs are shown on the Erosion Control Plans or elsewhere on the construction plans. Those not shown in the plans are included in the event they are required due to unanticipated conditions during construction.

C. Disturbed Areas

BMPs should be installed at disturbed locations at the end of each day where practical.

Where soil disturbing activities halt in an area for more than 14 days, the disturbed area shall be protected from erosion by stabilizing the area with mulch or other similarly effective BMP.

If the slope of an area is greater than 3:1, or greater than 3% and greater than 150 feet in length; the disturbed area shall be protected from erosion by stabilizing the area with mulch, or another similarly effective BMP, if the activity ceases for more than 7 days. The requirement does not apply to sedimentary basins or areas that drain hereto.

The maximum time any area of the site will be left denuded is 6 months. Completed areas shall be seeded before grading begins for the next phase.

D. Perimeter BMP Installation

Perimeter or border BMPs shall be installed and marked for preservation prior to general site clearing. Storm water discharging from areas affected by construction shall pass through sediment control measures as shown on the plans.

E. Temporary and Permanent Non-Structural BMPs

Temporary and Permanent Non-Structural BMPs consist of protection of existing vegetation or trees, mulching, sodding, seeding, geotextiles, stabilization and stabilized site accesses. Permanent stabilization (groundcover) practices will be properly implemented within 30 days of final construction. Final seeding and mulching of disturbed areas shall in accordance with the “Seeding And Mulching” specification in the contract documents.

Temporary and Permanent Non-Structural BMPs shall be implemented as shown on the plans. Any existing vegetation shall be preserved where practical. Disturbed areas shall be without vegetative cover for the minimum duration as practical.

F. Temporary and Permanent Structural BMPs

Temporary and Permanent Structural BMPs consists of silt fences, check dams, diversion dikes, drainage swales, sediment traps, and sediment basins. Temporary and Permanent Structural BMPs shall be implemented as shown on the drawings.

G. Maintenance

All erosion and sediment control devices shall be properly maintained at all times. All temporary BMPs shall be left in place and be maintained until the site is permanently stabilized with vegetation (at least 70 percent cover). Following the completion of construction and planting activities, the construction inspector shall conduct periodic site reviews to ensure that vegetation establishment is satisfactory. If vegetation cover is not adequate, special steps to correct problems shall be implemented, such as re-seeding, mulching, sodding, or the use of erosion control blankets.

H. Dewatering

Dewatering methods shall include pumps. The water shall be discharged upstream of erosion control BMPs designed to treat water pumped from excavations prior to leaving the site. In no case shall this water be pumped off site without being treated by the specified BMPs. The Contractor is responsible for implementing these procedures. These measures shall be inspected during routine SWPPP inspections if applicable.

V. Site Inspection

A. General

All erosion and sediment control devices shall be properly maintained at all times and inspected: 1) every 7 days; and 2) within 48 hours after a storm event that causes stormwater runoff to occur on the site. A good faith effort will be made to inspect erosion and sediment control devices within 24 hours of a rainfall event that occurs Monday through Thursday.

Any deficiencies noted during an inspection shall be reported to the contractor within 24 hours of identification so that they may be repaired in an efficient manner, and shall be corrected within 7 calendar days of that inspection.

If inspection results indicate a need for revision to the SWPPP, the plan shall be revised and implemented as appropriate, within seven calendar days following the inspection.

B. Site Inspection Reports

Findings of these inspections shall be recorded on a BMP Inspection Report. The inspection reports shall identify any incidents of non-compliance. All inspection reports

shall be retained at the Office of Administration offices and shall be available for review during normal business hours. These reports shall be retained for a period of at least three years from the Letter of Termination date.

A copy of the BMP Inspection Report form to be used is attached and shall be reproduced and used as needed for individual inspections. All inspections shall be recorded and signed by the inspector.

BMP Inspection Report

Owner: _____ **Date:** _____

Project Name: _____ **Project No:** _____

Contractor: _____ **Job Superintendent:** _____

Observer's Name: _____

Today's Weather: _____ Temp _____ °F Other _____

Previous Precipitation: Rain _____ Snow_____ Sleet _____ Other_____

Describe Precipitation/Runoff: _____

_____

_____

Observations of BMP Effectiveness: _____

_____

_____

_____

Actions Taken to Correct Deficiencies: _____

_____

_____

_____

List Areas where Land Disturbance has Stopped: _____

_____

_____

Other Recommendations/Discussions with Contractor: _____

_____

_____

_____

Other Discharges (i.e.: Hazardous Substances, Oil, Etc.): _____

_____

_____

OBSERVER'S SIGNATURE: _____

VI. Amending/Updating the SWPPP

The SWPPP shall be amended and updated whenever:

- design, operation or maintenance of BMPs is changed,
- design of the construction project is changed that could significantly affect the quality of the storm water discharges,
- inspections indicate deficiencies in the SWPPP or any BMP,
- any notifications from MDNR of deficiencies in the SWPPP,
- SWPPP is determined to be ineffective in significantly minimizing or controlling erosion and sedimentation (e.g., there is visual evidence, such as excessive site erosion or excessive sediment deposits in streams or lakes),
- Total Settleable Solids from a storm water outfall exceeds 2.5 ml/L/hr,
- MDNR determines violations or Water Quality Standards may occur or have occurred.

VII. Pollution Prevention Controls

A. Solid Waste Disposal

The general contractor is responsible for disposing of all solid waste from the site in accordance with state law. Solid waste facilities shall be provided on the site. An adequate number of trash containers shall be located to provide access to all trades. The site shall remain in an orderly condition. All waste material shall be collected daily and stored in a secure container or removed from the project site. The waste container will be inspected regularly with contents disposed properly by the contractor. No waste oil or other petroleum-based products will be disposed of on site (e.g. buried, poured, etc.); but shall be taken off-site for proper disposal.

B. Sanitary Waste

All sanitary waste will be collected from portable units as required and properly disposed of off-site in compliance with local and state regulations.

C. Off-Site Vehicle Tracking

Public roads that provide access to the right-of-way will be monitored for any tracking of sediments (mud, etc.) from the site onto the road as follows:

1) Weekly during dry periods, and
2) Daily after rainfall events that leave the project area wet and construction activity is proceeding.

D. Concrete Waste

Concrete wash or rinse water from ready-mix trucks, concrete mixing equipment, tools, etc. may not be discharged into or be allowed to run directly into any existing waterbody or storm inlet. One or more locations for concrete washout shall be designated on site, such that discharges during concrete washout will be contained in a small area where waste concrete can solidify in place and excess water is evaporated or infiltrated into the ground.

E. Hazardous Waste

All fueling facilities present on all sites shall adhere to applicable federal and state regulations concerning underground storage, above ground storage, and dispensers, including spill prevention, control and counter measures.

Substances regulated by federal law under the Resource conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) which are transported, stored or used for maintenance, cleaning or repairs shall be managed according to the provisions of RCRA and CERCLA.

All paints, solvents, petroleum products and petroleum waste products (except fuels) and storage containers (such as drums, cans or cartons) shall be stored so that these materials are not exposed to storm water. Sufficient practices of spill prevention, control and/or management shall be provided to prevent any spills of these pollutants from entering a water of the state. Any containment system used to implement this requirement shall be constructed of materials compatible with the substances contained and shall also prevent the contamination of groundwater.

The applicant shall notify by telephone and in writing the Department of Natural Resources, water Pollution Control Program, Post Office Box 176, Jefferson City, MO 65102, 1-800-361-4827, of any oil spills or if hazardous substances are found during the prosecution of work under this permit.

F. Spill Prevention and Control Plan

The Spill Prevention and Control Plan (SPCP) describes measures to prevent, control, and minimize impacts from a spill of a hazardous, toxic, or petroleum substance during construction of the proposed project in the State of Missouri. This plan identifies the potentially hazardous materials to be used during this project; describes transport, storage, and disposal procedures for these substances; and outlines procedures to be followed in the event of a spill of a contaminating or toxic substance.

1. Material Management Practices

Properly managing these materials on the construction site will greatly reduce the potential for storm water pollution of these materials. Good housekeeping along with proper use and storage of these construction materials form the basis for proper management of potentially hazardous material.

The proper use of materials and equipment along with the use of general common sense greatly reduces the potential for contaminating storm water runoff. The following is a list of good housekeeping practices to be used during the construction project:

- Storage of hazardous materials: chemical fuels and oils, and fueling of construction equipment, shall not be performed within 100 feet of any stream bank, wetland, water supply well, spring, or other water body.
- Contractor and contractor's employees shall be properly trained in handling materials used and/or kept at the job site.
- Contractor and contractor's employees shall have proper access to all necessary safety items.
- Trash containers will be provided for waste disposal and regular site clean-up will be conducted.
- An effort will be made to store only enough product required to do the job.
- Materials stored on the site will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacture's label.
- Substances will not be mixed with one another unless recommended by manufacturer.
- Whenever possible, all of the product will be used before disposing of the container.
- Manufacturer's recommendations for proper use and disposal of a product will be followed.
- If surplus product must be disposed of, manufactures or local and state recommended methods for proper disposal will be followed.
- When possible, materials should be stored with secondary containment and in a covered structure such as a building or job trailer.

2. Product Specific Practices

Due to the chemical makeup of specific products, certain handling and storage procedures are required to promote the safety of handlers and prevent the possibility of pollution. Care shall be taken to follow all directions and warning for products used on the site. All pertinent information can be found on the Material Safety Data Sheets (MSDS) for each product. The MSDS sheets should be located with each product container they represent. Several product-specific practices are listed in the following sections.

a. Petroleum Products

All fueling facilities present on the job site shall adhere to applicable federal and state regulations concerning underground storage, above ground storage and dispensers, including spill prevention, control and counter measures.

On-site vehicles will be monitored for leaks and receive regular maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed clearly labeled containers. Preferably the containers will be stored in a covered truck or trailer that provides secondary containment for the products.

Bulk storage tanks having a capacity of greater than 55 gallons will be provided with secondary containment. Containment can be provided by a temporary earthen berm or other means. After each rainfall, the contents of the secondary containment area will be inspected by the contractor. If there is no visible sheen on the collected water, it will be pumped around in a manner that does not cause scouring. If a sheen is present, it must be cleaned up prior to discharging the water.

Bulk fuel or lubricating oil dispensers shall have a valve that must be held open to allow the flow of the fluid. During fueling operations, the contractor shall have personnel present to detect and contain spills.

b. Fertilizers

Fertilizers shall be applied to stimulate vegetation growth as recommended by the manufacturer and in accordance with the contract documents. Once applied, the fertilizer shall be worked into the soil to limit the exposure to storm water.

3. Spill Control and Cleanup

In addition to the best management procedures discussed previously, the following spill control and cleanup practices will be followed to prevent storm water pollution in the event of a spill:

- Spills will be contained and cleaned up immediately after discovery.
- Manufacturers' methods for spill cleanup of a material will be followed as described on the material's MSDS.
- Materials and equipment needed for cleanup procedures will be kept readily available on the site, either at an equipment storage area or on contractor's trucks. Equipment to be kept on the site will include but not be limited to brooms, dust pans, shovels, granular absorbents, sand, saw dust, absorbent pads and booms, plastic and metal trash containers, gloves and goggles.

- Personnel on site will be made aware of cleanup procedures and the location of spill cleanup equipment.
- Toxic, hazardous, or petroleum product spills required to be reported by regulation will be documented to the appropriate federal, state and local agencies.
- Spills will be documented and a record of the spills will be kept with this SWPPP.

If a spill occurs that is reportable to the federal, state or local agencies, the contractor is responsible for making the notifications.

The federal reportable spill quantity for petroleum products is defined in 40 CFR 11.0 as any oil spill that:

- Violates applicable water quality standards.
- Causes a film or sheen upon or discoloration of the water surface or adjoining shoreline.
- Causes a sludge or emulsion to be deposited beneath the surface of the water or adjoining shorelines.

A reportable spill for this project shall be defined as the discharge of 50 gallons or more of a petroleum product into the environment. It is the responsibility of the contractor to comply with the most current spill control and cleanup regulations.

The federal reportable spill quantities for hazardous materials are listed in 40 CFR, Part 302.4 in the table entitled: List of Hazardous Substances and Reportable Quantities." A procedure for determining a reportable spill is outlined below.

If a reportable spill occurs, a modification to the SWPPP must be made within 14 days. The modification shall include; a description of the release, the date of the release; an explanation of why the spill happened; a description of procedures to prevent future spills from happening; and a description or response procedures should a spill or release occur again and within 14 days of the release. A written description of the release must be submitted to the Engineer by the Contractor that includes; a description of the release, including the type of material and an estimated amount of spill; the date of the spill; an explanation of why the spill occurred; and a description of the steps taken to prevent and control future spills. These modifications to the SWPPP must be made by the Contractor and will be documented.

4. Procedures for Determining if a Hazardous Material Spill is a Reportable Quantity

1. First determine the type and quantity of material that has been spilled.

2. Obtain a material safety data sheet (MSDS) for the spilled material and determine whether any of the constituents are listed in Table 302.4 in 40 CFR 302 (Code of Federation Regulations).

3. If none of the constituents in the spilled material are listed in the table (excluding ethylene glycol), the spill is not reportable.

4. If the constituents in the spilled material are listed in the table, use the following equation to determine the pounds of material spilled:

   Pounds Spilled = (V)(Wt%)(Sg)(0.0834)

   Where:

   V = Volume of the material spilled, in gallons

   Wt% = The weight percent of the constituents in the spilled material (see the MSDS)

   Sg = Specific gravity of spilled material (see MSDS)

5. If based on the calculation, the pounds spilled are Greater than the Final RQ (reportable quantity) value listed in Table 302.4 in 40 CFR 302 or the State's reportable quantity minimum amount, the spill must be reported to the appropriate federal, state, and local agencies.

Spill Report Form

(1 of 2)

Project/Site: _____

Spill Reported By:_____ **Phone**_____

Date Reported: _____ **Time:** _____

Date of Spill: _____ **Time:** _____

Name of Facility:_____

Legal Description: 1/4 _____ 1/4_____ 1/4 SEC_____,TWP_____ ,Range_____

County _____

Describe Spill Location and Events Leading to Spill: _____

_____

_____

_____

Material Spilled: _____

Source of Spill: _____

Amount Spilled (Gallons or Pounds)**:** _____

Amount Spilled to Waterway (Gallons or Pounds)**:** _____

Nearest Municipality:_____

Containment or Cleanup Action: _____

_____

_____

List Environmental Damage (fish kill, etc)**:** _____

_____

_____

List Injuries or Personal Contamination:_____

_____

_____

Date and Time Cleanup Completed or Terminated _____

Spill Report Form

(2 of 2)

If Cleanup Delayed:

Nature and Duration of Delay: _____

Description of Materials Contaminated: _____

_____

_____

Approximate Depth of Soil Excavation: _____

Action to be taken to Prevent Future Spills: _____

_____

_____

_____

Agencies Notified:

Local: _____ **Date:** _____

State:_____ **Date:** _____

Federal: _____ **Date:** _____

Signed: _____

Contactor Superintendent or
Environmental Inspector

VIII. Permanent Storm Water Management

The permanent storm water management plan for this site includes the following:

- By establishing vegetative growth within the disturbed areas, the amount of silt laden runoff will be greatly reduced among the areas of low concentrated flows.

- All outfalls have an apron constructed of riprap, erosion control blanket, or turf reinforcement mat to prevent scour and minimize the potential for downstream erosion by reducing the velocity and energy of concentrated storm water flows.

- Ditches as noted in the plans will be lined with erosion control blanket or turf reinforcement mat where grades are steep enough to warrant.

Appendix A

Best Management Practices

Table of Contents

Land Grading

Description

Reshaping the ground surface to provide suitable topography for buildings, facilities and other land uses, to control surface runoff, and to minimize soil erosion and sedimentation both during and after construction.

Installation

When - Existing topography must be modified to prepare for another land use.

Where – Adapting proposed development to the existing landscape can reduce the erosion potential of the site and the cost of installing erosion and sedimentation control measures.

How -

- Determine exact location of underground utilities.
- Remove and stockpile topsoil if subsoils will not support plant growth.
- Clear and grub areas to be filled to remove trees, vegetation, roots and other debris.
- Check fill to make sure it does not contain brush, rubbish, oversized rocks or other objectionable material.
- Place fill in layers and compact as specified by the grading plan. Do not use material that is frozen, excessively soft or has high organic content.
- Do not place fill on frozen subgrade.
- Permanently stabilize graded areas immediately after final grading is completed. Use temporary stabilization measures on graded areas when work is to be interrupted or delayed for 30 working days or longer.
- Avoid disturbing natural drainageways, if possible. At each slope break, intercept runoff and channel to storm drains or stabilized watercourses. If runoff is laden with sediment, protect drain inlets with a filter.
- Graded areas should be stabilized with mulch, vegetation, crushed stone, riprap or other measures as soon as work is completed, or if work is interrupted for 30 or more working days.

- Slopes to be vegetated should be 2:1 or flatter; 3:1 or flatter where maintained by tractor or other equipment. Slopes should be roughened during grading operations to retain water, increase infiltration and promote vegetative growth. Slope should be protected from surface runoff while vegetation is being established.

- Borrow and disposal areas should be no closer than 50 feet to a streambank in the absence of a specification.

- Stable channels and waterways should be provided for runoff from the disturbed areas to retain sediment on site.

Operation and Maintenance

Periodically check all graded areas and the related erosion and sedimentation control practices, especially after heavy rainfalls. Clean sediment out of diversions and other structures as needed. If washouts or breaks occur, repair them immediately.

Mulching

Description

Mulching is a temporary soil stabilization or erosion control practice where materials such as grass, hay, woodchips, wood fibers, straw, or gravel are placed on the soil surface. In addition to stabilizing soils, mulching can reduce the speed of storm water runoff over an area. When used together with seeding or planting, mulching can aid in plant growth by holding the seeds, fertilizers, and topsoil in place, by helping to retain moisture, and by insulating against extreme temperatures.

Installation

When - Mulching is often used alone in areas where temporary seeding cannot be used because of the season or climate. Mulching can provide immediate, effective, and inexpensive erosion control. On steep slopes and critical areas such as waterways, mulch matting is used with netting or anchoring to hold it in place.

Where - Mulch seeded and planted areas where slopes are steeper than 2:1, where runoff is flowing across the area, or when seedlings need protection from bad weather.

How -

1. Spread straw or cereal grain mulch uniformly over the area with a power blower, hydroseeder or by hand. No more than 25% of the ground surface should be visible after spreading.

2. Apply at the rates shown in the table below. Use higher rates for steep slopes, channels and other erosive areas.

3. Anchor straw or wood cellulose mulch by one of the following methods:

    - Crimp with a weighted, straight, notched disc or a mulch anchoring tool to punch the straw into the soil.

    - Tack with a liquid tackifier designed to hold mulch in place.

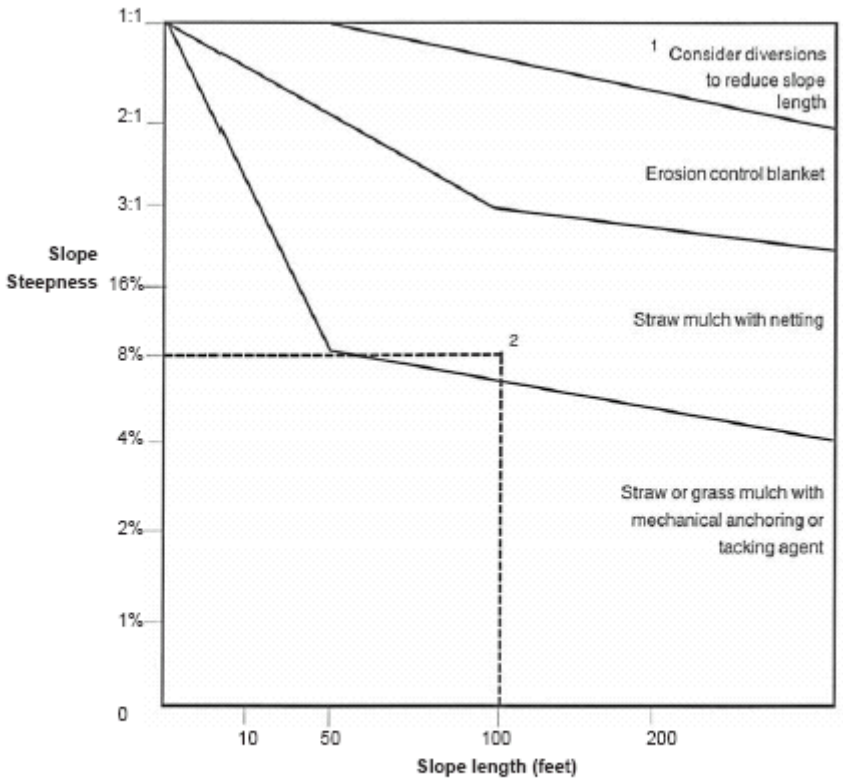
    - Use suitable spray equipment and follow manufacturer's recommendations.

    - Cover with netting, using a degradable natural or synthetic mesh to hold mulch materials in more erosive areas. The netting should be anchored according to manufacturer's specifications

Typical Mulching Material and Application Rates

	Material	Rate per Acre	Requirements	Installation/Uses
Organic Mulches:	Straw	1 1/2 - 2 1/2 tons	Dry, unchopped, unweathered; free of weed seeds and rot;	Spread by hand or machine 1.5 to 2.5 inches deep; must be tacked or tied down.
	Wood fiber, wood cellulose, recycled newsprint, bonded fiber matrix	1 - 2 tons	Double the application rate for erosion control on critical areas	Use with power mulcher or hydroseeder; may be used to tack straw on steep slopes. Do not use in hot, dry weather.
	Wood chips	10 - 20 tons	Air dry. Add Nitrogen fertilizer, 20 to 25 lbs of N/ton of mulch	Apply with blower, chip handler or by hand. Not for fine turf areas. Most effective around trees and shrubs. Not recommended for mowed areas.
	Bark	35 yd^3	Air dry, shredded or hammermilled or chips. Add Nitrogen fertilizer, 20 to 25 lbs of N/ton of mulch	Apply with mulch blower, chip handler or by hand. Do not use asphalt tack. Resistant to wind blowing. Most effective around trees and shrubs. Not recommended for mowed areas.
Nets, Mats and Roving:	Netting	Cover area	Uniform natural or synthetic netting. Used with or without organic mulch, depending on product.	Withstands water flow. Must be anchored.
	Erosion control mats/blankets	Cover area	Use without additional mulch.	Suitable for steep areas and areas with concentrated water flow. Must be anchored with good blanket-to-soil contact.
	Fiberglass roving	1/2 - 1 ton	Continuous fibers of drawn glass bound together with a nontoxic agent. Use with organic mulch.	Apply with compressed air ejector. Tack with emulsified asphalt at rate of 25 - 35 gal/1000 ft^2.
Tackifiers	Mulch Tackifiers: Many commercial products	Follow manufacturer's specifications	Biodegradable powders, water dispersable.	Use to hold mulch on steep or wet areas. Apply with suitable spray equipment at manufacturer's recommended rate.
Soil Binders:	Chemical Stabilizers: Many Trade Names	Follow manufacturer's specifications.	Use for temporary stabilization of soil.	Not beneficial to plant growth. Do not attempt to seed/mulch over the soil binder.

Source: adapted from North Carolina Field Manual, 1991



1 For slopes steeper than 1:1, consider building a diversion above slope to divert water.
2 Example: An 8% slope 100' long requires a straw mulch with netting.

General Mulch Recommendations to Protect from Splash and Sheet Flow

Source: Adapted from Minnesota
"Protecting Water Quality in Urban Areas," 1991

Operation and Maintenance

Inspect all mulched areas periodically and after rainstorms for erosion and damage to the mulch. Repair promptly and restore to original condition. Continue inspections until vegetation is well established. Keep mower height high if plastic netting is used to prevent netting from wrapping around mower blades or shaft.

Silt Fence

Description

A temporary measure for sedimentation control. It usually consists of posts with filter fabric stretched across the posts and sometimes with a wire support fence. The lower edge of the fence is vertically trenched and covered by backfill.

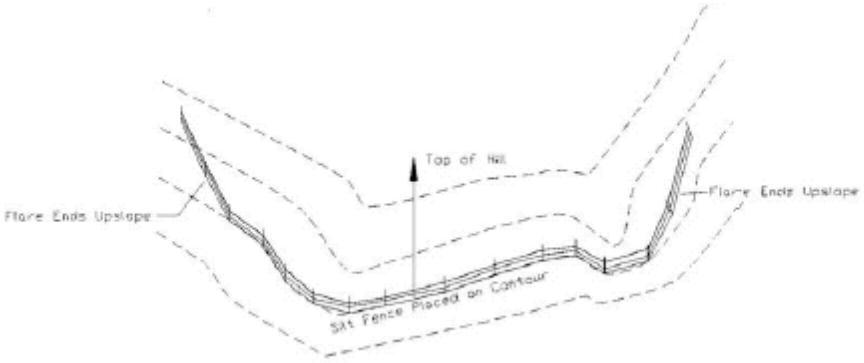
Installation

When - Should be installed prior to major soil disturbance in the drainage area. The drainage area should be limited to 1/4 acre per 100 feet of fence. Area is further restricted by slope steepness as shown in the following table.

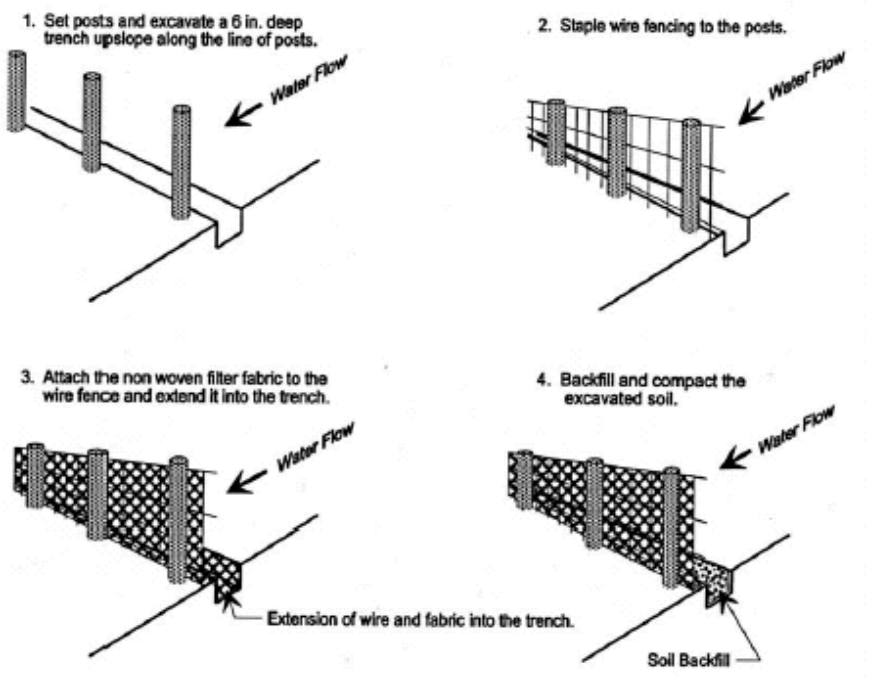
Typical Land Slope and Distance for Sediment Fence

Land Slope (%)	Maximum Slope Distance above Fence (feet)
Less than 2	100
2 to 5	75
5 to 10	50
Greater than 10	*

Where - Should be placed across the bottom of a slope along a line of uniform elevation (perpendicular to the direction of flow). It can be used at the outer boundary of the work area. However, the fence does not have to surround the work area completely. In addition, a silt fence is effective where sheet and rill erosion may be a problem. Silt fences should not be constructed in streams or swales.



Placement of Sediment Fence



Installation of Sediment Fence

How -

1. Dig a trench approximately 8 inches deep and 4 inches wide, or a V-trench along the fence alignment.

2. Drive posts at least 24 inches into the ground on the downslope side of the trench. Space posts a maximum of 8 feet if fence is supported by wire, or 6 feet if high strength fabric and no support fence is used.

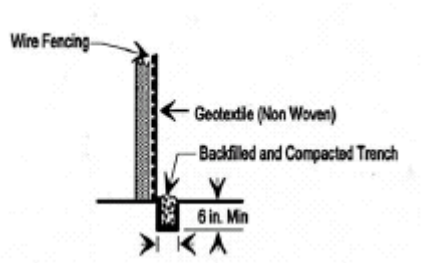
3. Fasten support wire fence to upslope side or posts, extending 6 inches into the trench as shown.

4. Attach continuous length of fabric to upslope side of fence posts. Try to minimize the number of joints. Avoid joints at low points in the fence line. Where joints are necessary, fasten fabric securely to support posts and overlap to the next post.

5. Place the bottom 1 foot of fabric in the 8 inch deep trench, lapping toward the upslope side. Backfill with compacted earth or gravel as shown.

6. To reduce maintenance, excavate a shallow sediment storage area in the upslope side of the fence. Provide good access in areas of heavy sedimentation for clean out and maintenance.

7. Allow for safe bypass of storm flow to prevent overtopping failure of fence.



Detail of Sediment Fence Installation

Operation and Maintenance

- Inspect sediment fences at least once a week and after each rainfall. Make any required repairs immediately.
- Should the fabric of a sediment fence collapse, tear, decompose or become ineffective, replace it promptly.
- Remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence. Take care to avoid damaging or undermining the fence during cleanout.
- Remove all fencing materials and unstable sediment deposits and bring the area to grade and stabilize it after the contributing drainage area has been properly stabilized.

Rock Outlets (Riprap)

Description

A structure constructed to control erosion at the outlet of a channel or conduit. A rock outlet is an apron constructed or rock riprap designed to prevent scour at storm water outlets, and to minimize the potential for downstream erosion by reducing the velocity of concentrated storm water flows.

Installation

When - This practice applies where the discharge velocity of a pipe, box culvert, diversion or other water conveyance structure exceeds the permissible velocity of the receiving area.

Where - Should be installed on steeply sloped swales, or in swales where adequate vegetation cannot be established.

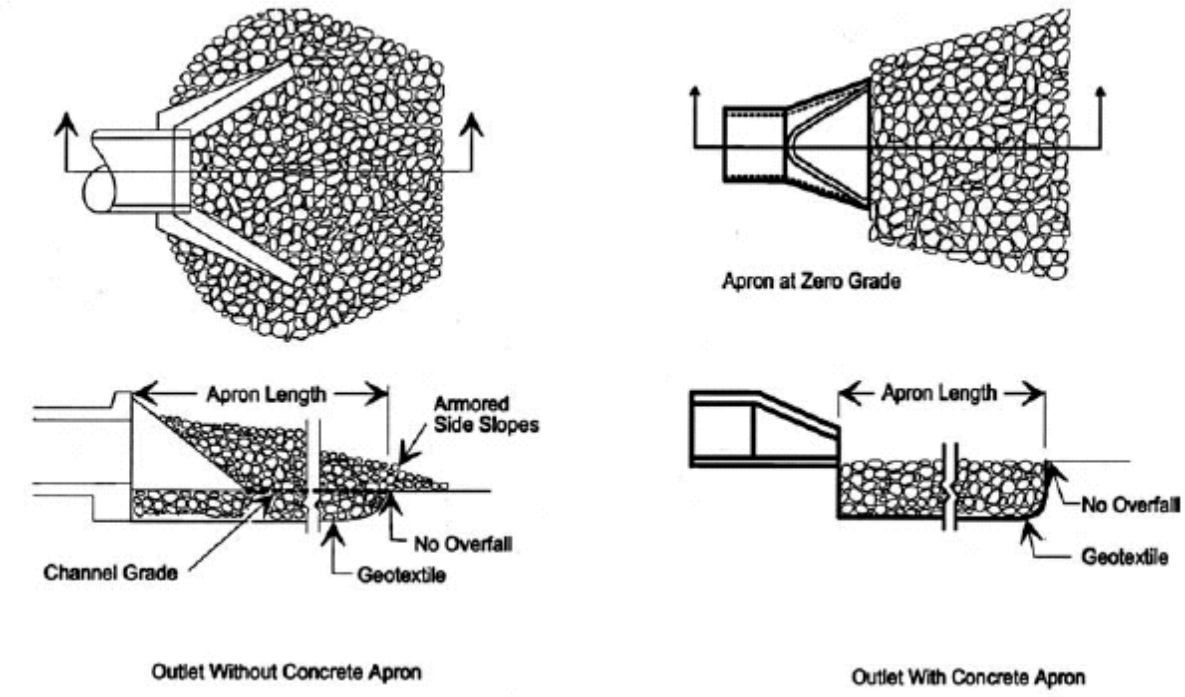
How -

- Clear the foundation area of trees, stumps, brush, sod and all other unsuitable material which would interfere with construction of the rock outlet.
- Excavate the apron area subgrade below design elevation to allow for thickness of the filter layer and the riprap.
- Compact any fill used in the subgrade to the specified maximum density as determined by testing, and smooth enough to protect fabric (if used) from tearing.
- Place the geotextile fabric on the compacted smooth foundation. If more than one fabric piece is needed, the upstream piece should overlap the downstream piece by at least 1.5 feet in all directions.
- If the geotextile fabric tears when placing the riprap, repair immediately by laying and stapling a piece of fabric over the damaged area, overlapping the undamaged areas by at least 1.5 feet in all directions.
- Material used should be a clean, free draining granular material with sufficient fine material to prevent subgrade from passing through the filter layer. Gradation should be specified in the design and verified by testing.
- Place gravel in a layer of uniform thickness and compact as specified in the design. Care should be taken to avoid segregation of particle sizes during placement.

- Install the riprap to the lines and elevations shown in the plans. If there is no defined channel, the final cross-section should be level or slightly depressed in the middle; if well defined, the filter and riprap should extend to the top of the bank.

- Make sure the top of the rock apron is level with or slightly below the receiving stream. (Riprap should not restrict the channel or produce an overfall.)

- Blend the riprap smoothly to the surrounding grade.



Typical Rock Outlet

Operation and Maintenance

- Inspect rock outlets after storm events for stone displacement and for erosion at the sides and ends of the apron.

- Make needed repairs immediately; use appropriate size stone, and do not place them above finished grade.

Erosion Control Blankets

Description

Erosion control blankets are a porous fabric called geotextiles used in the construction industry for a variety of uses including; separators, reinforcement, filtration and drainage, and erosion control.

Erosion control blankets can be made of straw, jute, wood or other plant fibers; plastic, nylon, paper or cotton. Some important factors in the choice of a blanket are: soil conditions, steepness of slope, length of slope, type and duration of protection required to establish desired vegetation, and probable shear stress.

Installation

When

Type of Erosion Control	Main Use	Comments
Netting	Synthetic or natural fiber mesh installed over disturbed area to hold organic mulch and/or seed in place.	Provides minimal structural erosion resistance. Mulch applied using standard procedures.
Biodegradable Erosion Control Blanket	Natural fiber blanket held together by netting to provide temporary erosion protection on slopes up to 1:1; and channels with permissable shear stress up to 4 lbs./ft.	Provides 1- to 5-year protection from erosion. Metal staples used as anchors.
Permanent Erosion Control Blanket	Synthetic blanket material which provides permanent erosion control on slopes up to 1:1; channels with increased water flow velocities and increased shear stress.	Provides minimal protection from wave action around ponds and lakes. Permanent erosion control blankets extend the limits of vegetation. Metal staples used as anchors.
Turf Reinforcement Mat	3-dimensional permanent synthetic mat that provides a matrix to greatly reinforce the root system of the desired vegetation for permanent erosion protection in high flow channels and on critical slopes.	Provides a substantial increase in erosion resistance. May provide erosion protection equivalent to stone or concrete liners.

-

Types of Erosion Control Blankets

Source: Adapted from North Carolina Field Manual, 1991

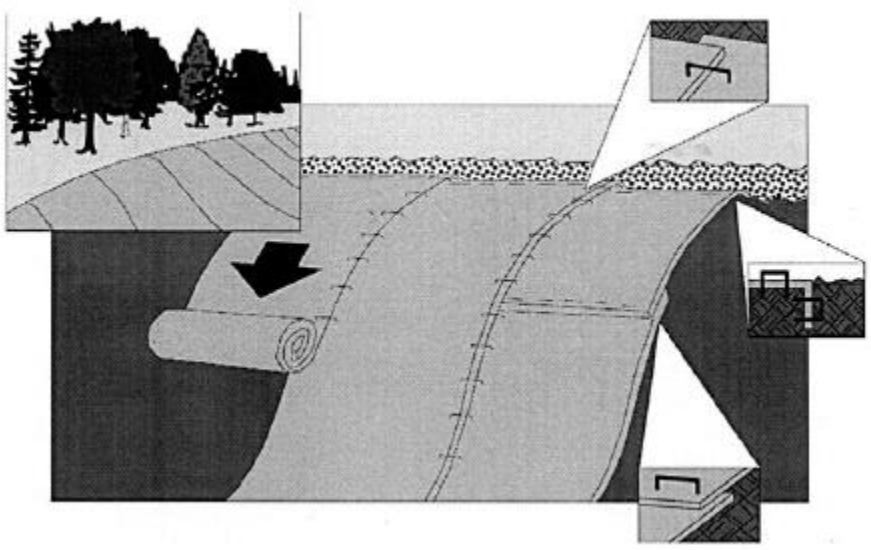
- Two important factors in the choice of a mat are steepness of slope (up to 1:1) and channel velocity (up to 12 fps).

Where - This practice is best utilized on slopes and channels where the erosion hazard is high, and plant growth is likely to be too slow to provide adequate protective cover. Erosion control blankets are typically used as an alternative to mulching but can also be used to provide structural erosion protection.

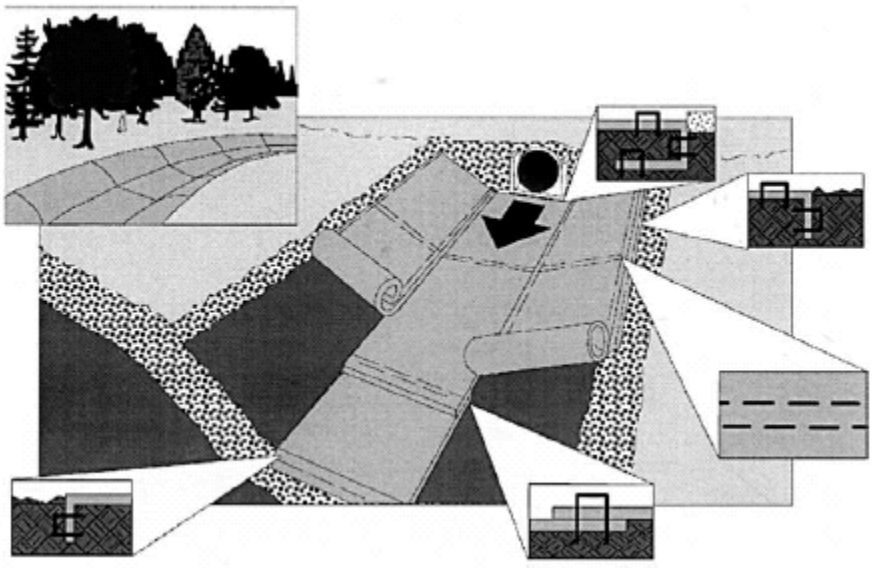
How -

- Erosion control products should be installed in accordance with the manufacturers' recommendations and specifications, including check slots and stapling materials.

- Anchor product so that a continuous, firm contact (no tenting) with the soil surface/seed bed is maintained. Failure to do this could result in soil erosion which would require regrading and reseeding.



Typical Installation of Erosion Control Blankets on a Slope



Typical Installation of Erosion Control Blankets on a Channel

Operation and Maintenance

- Inspect after storm events, until vegetation is established, for erosion or undermining beneath the blankets. If any area shows erosion, pull back that portion of the blanket, add tamped soil and reseed; then resecure the blankets.

- If blankets should become dislocated or damaged, repair or replace and resecure immediately.

Rock Ditch Check

Description

Rock ditch checks operate by intercepting and ponding sediment-laden runoff. Ponding the water dissipates the energy of any incoming flow and allows a large portion of the suspended sediment to settle. Water exits the ditch check by flowing over its crest.

Installation

When – Whenever conditions warrant intercepting runoff.

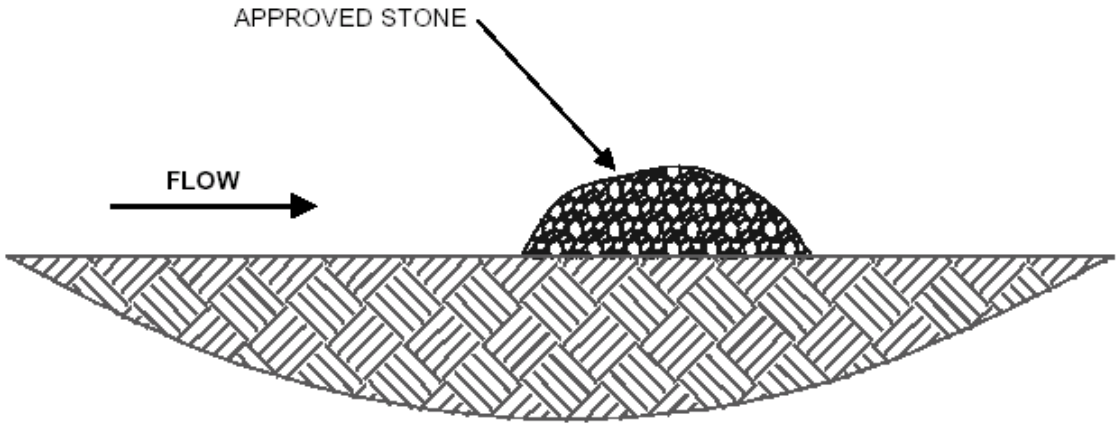
Where – Rock ditch checks are used in ditches.

How –

- Rock ditch checks should be perpendicular to the flowline of the ditch.
- Rock ditches must be designed so that water can flow over them, not around the sides.
- The ditch check should extend far enough so that the ground level at the ends of the check is higher than the low point on the crest of the check.
- The ditch check should be 18 to 24 inches high and have side slopes no steeper than 1:1.

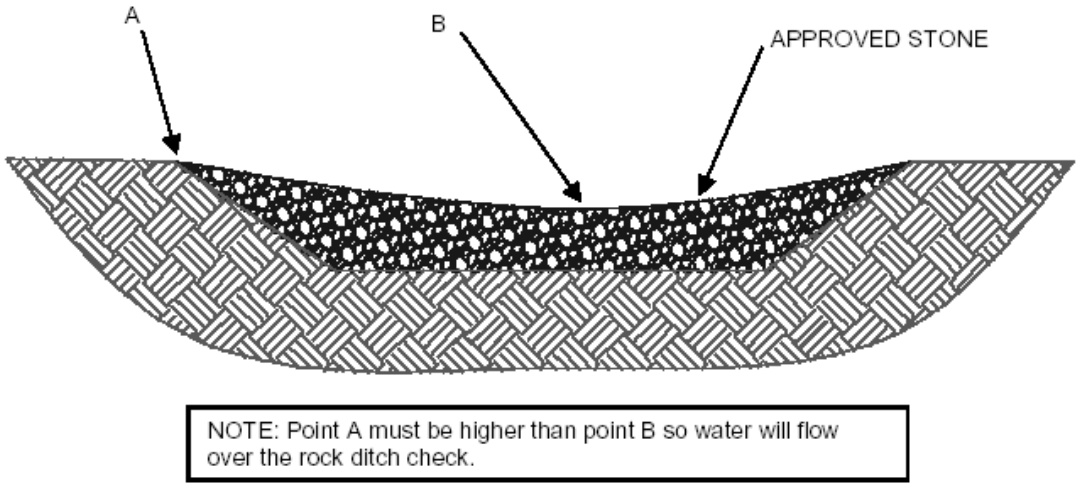
Ditch-Check Spacing		
Ditch Slope (percent)	Check Spacing for 9” Eff. Height (feet)	Check Spacing for 18” Eff. Height (feet)
0.5	150	300
1.0	75	150
1.5	50	100
2.0	37	750
2.5	30	60
3.0	25	50
3.5	21	43
4.0	19	38
4.5	16	33
5.0	15	30
5.5	13	27
6.0	12	25
6.5	11	23
7.0	10	21
7.5	10	20
8.0	9	19
8.5	9	18
9.0	8	17
9.5	8	16
10.0	7	15

Source: MoDOT Standard Plans



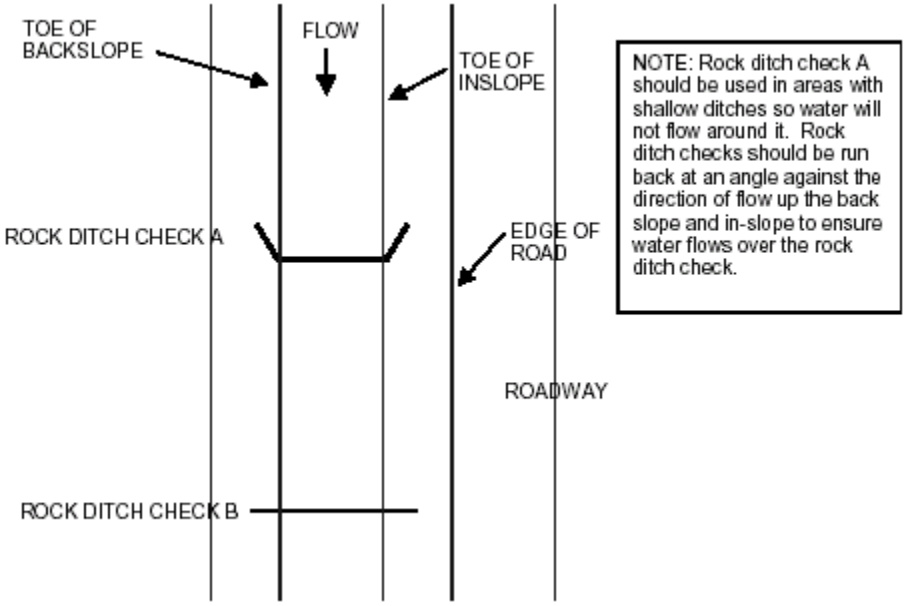
Rock Ditch Installation – Side View

Source: NDDoH BMP Guidance Manual



Rock Ditch Installation – Elevation View

Source: NDDoH BMP Guidance Manual



Placement of Rock Ditch Check

Source: NDDoH BMP Guidance Manual

Operation and Maintenance

- Rock ditch checks should be inspected every seven days and within 24 hours of a rainfall of 0.5 inches or more.
- Water flowing around the ditch check usually is cause by insufficient dike check length. Extend check a sufficient length so that the ground level at the ends are higher than the low point on the crest of the check.
- After a heavy rainstorm, inspect the rock ditch check for any displaced stones. Fill void areas immediately.
- Any accumulated sediment behind the ditch check should be removed when it reaches one-half of the original exposed height of the rock ditch check.

Geotechnical Engineering Report

Paved Bike/Pedestrian Trail
Knob Noster State Park
Knob Noster, Missouri

January 6, 2016
Terracon Project No. 02155085

Prepared for:
Bartlett & West
Jefferson City, Missouri

Prepared by:
Terracon Consultants, Inc.
Lenexa, Kansas

January 6, 2016

Bartlett & West
1719 Southridge Drive, Suite 100
Jefferson City, Missouri 65109

Attn: Mr. Todd Kempker, P.E.
P: [573] 659-6734
E: todd.kempker@bartwest.com

Re: Geotechnical Engineering Report
Paved Bike/Pedestrian Trail
Knob Noster State Park
Knob Noster, Missouri
Terracon Project Number: 02155202

Dear Mr. Kempker:

Terracon Consultants, Inc. (Terracon) has performed a geotechnical subsurface exploration for the referenced project as described in our Task Order executed November 2, 2015. This report presents the findings of the subsurface exploration and provides geotechnical recommendations regarding earthwork, subgrade preparation, and the design and construction of foundations for the pedestrian bridge. We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Daniel A. Barnett, P.G.
Project Geologist
Missouri: 2007035892

Craig K. Denny, Ph.D., P.E.
Senior Consultant
Missouri: E-19171

Report distribution: Addressee

1/8/16

STATE OF MISSOURI
CRAIG K. DENNY
NUMBER E-19171
REGISTERED PROFESSIONAL ENGINEER

TABLE OF CONTENTS

EXECUTIVE SUMMARY

A geotechnical exploration has been performed for the planned paved bike/pedestrian trail planned at Knob Noster State Park in Knob Noster, Missouri. Fourteen borings were performed at the site and samples recovered from the borings have been tested. Findings, professional opinions, and recommendations presented in this report are summarized below.

- The proposed pedestrian bridge abutments can be supported by steel pipe piles bearing in native clay soils.

- The lean clay soils encountered at the site are susceptible to disturbance from construction activity, particularly when the soils exhibit high moisture contents or are wetted by surface water and/or seepage. Provided subgrades are prepared as described in this report, these soils should provide adequate support for the planned pedestrian and bike trail.

The professional opinions and recommendations presented in this report are based on evaluation of data developed by testing discrete samples obtained from 14 borings. Site subsurface conditions have been inferred from available data, but actual subsurface conditions will only be revealed by excavation. We recommend Terracon be retained to observe excavation and perform tests during earthwork.

This executive summary should not be separated from or used apart from this report. This report presents recommendations and opinions based on our understanding of the project at the time the report was prepared. The report limitations are described in section **5.0 GENERAL COMMENTS**.

GEOTECHNICAL ENGINEERING REPORT
PAVED BIKE/PEDESTRIAN TRAIL
KNOB NOSTER STATE PARK
KNOB NOSTER, MISSOURI

Terracon Project No. 02155202
January 6, 2016

1.0 INTRODUCTION

Terracon Consultants, Inc. (Terracon) has performed a subsurface exploration for the paved bike/pedestrian trail planned at Knob Noster State Park in Knob Noster, Missouri. Fourteen borings were performed to depths ranging from approximately 2 to 30 feet below the existing ground surface. An exploration plan and logs of borings are included in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations and/or professional opinions relative to:

- subsurface soil conditions
- groundwater conditions
- RCB and HDPE culverts
- bridge foundation design and construction
- trail subgrade preparation

2.0 PROJECT INFORMATION

Our understanding of the proposed project is presented in this section. If we have misunderstood any aspect of the project, as we have described, please contact us.

2.1 Project Description

Item	Description
Pedestrian bridge	We understand the proposed pedestrian bridge will be a single-span prefabricated steel truss bridge with a length of 150 feet. The bridge will be supported on cast-in-place concrete abutments. Less than 5 feet of fill will be required to develop design grades at the bridge abutments.
Trail improvements	We understand the existing trail will be improved and connected to the existing “Spirit Trail”. Maximum cuts of 8 feet, and maximum fills of 15 feet will be performed east of the Spirit Trail connection. New concrete box and HDPE pipe culverts will be placed in some areas along the trail.

Item	Description
Maximum pedestrian bridge loads (estimated by Terracon)	Actual design loads for the bridge were not provided. This report considers the maximum bridge load would be 300 pounds/lineal foot.

2.2 Site Location and Description

Item	Description
Location	Knob Noster State Park is located northwest of SE Highway DD and Highway 23 in Knob Noster, Missouri.
Existing conditions	The proposed bike/pedestrian bridge will span Clear Fork Blackwater River and connect an existing paved trail with a new paved trail. The project site is heavily wooded.
Stream bank stability	We observed several failures of the existing stream bank in the vicinity of the proposed pedestrian bridge. Evaluation of stream bank stability is not included in our current scope of services. We recommend stream bank stability be considered as construction plans and specifications are developed.

Figure 1. Site location

Figure 2. Aerial photograph

3.0 SUBSURFACE CONDITIONS

3.1 Subsurface Profiles

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil and rock types; in situ, the transition between materials may be gradual. Conditions encountered at borings are summarized in the table below.

Boring	Feature	Comments
B-1 to B-6, B-8, B-10 & B-11	Trail	Clay soils at surface; bedrock as shallow as 1 foot below surface
B-7	Trail & 10' by 6' RCB	13.5 feet of clay soil, then shale bedrock
B-9	Trail & Double 14' by 10' RCB	Clay soil to bottom of 10-foot deep boring
B-12	Trail & 8' by 8' RCB	Clay soil to bottom of 10-foot deep boring
B-13 & B-14	Bridge	Clay soil to bottom of borings (10' & 30')

3.2 Water Level Observations

The borings were observed while drilling and immediately after completion for the presence and level of groundwater. Groundwater was observed in Boring B-14 at a depth of approximately 17 feet while drilling. Groundwater was not observed in other borings, which terminated at shallower depths. B-14 was located close to Clear Fork Blackwater River. Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, river level and other factors not evident at the time the borings were performed. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Based on the subsurface conditions encountered at Borings B-13 and B-14, in our opinion, the proposed pedestrian bridge abutments should be supported by piles that derive their support within materials below the bottom of Clear Fork Blackwater River. The native clay soils generally exhibit soft to medium stiff consistency and are susceptible to erosion and sloughing during high water events. We noted areas of bank instability along the river. Foundation recommendations are provided in section **4.3**.

Based on conditions encountered at Borings B-7, B-9 and B-12, we expect excavations for box culverts will extend through native clay soils. In our opinion, box culverts can be supported on a

native clay soil subgrade that is prepared as recommended in section **4.2**. Clay soils are easily disturbed by excavation and construction activity. In addition, culverts are often placed in existing drainage ways, so surface and groundwater conditions could disturb bearing soils. It may be appropriate to extend culvert excavations below the base of the culvert to enable placement of a compacted crushed aggregate "working surface" below the box culverts.

Conditions at each boring location that, in our opinion, may influence design or construction of the trail and associated improvements are presented in the table below.

Boring	Feature	Condition	Comments
B-1	Trail	Cut 7'	Apparent limestone at 4'; rock excavation
B-2	Trail	Fill 4'	Apparent limestone at 2'
B-3	Trail	Cut 6'	Shale at 3'; rock excavation
B-4	Trail	Cut 5'	Shale at 1.5 feet; rock excavation
B-5	Trail	Cut 5'	Shale at 1 foot; rock excavation
B-6	Trail	Minor cut/fill	Shale at 1 foot
B-7	Trail & RCB	Fill 13 [1]'	Shale at 13.5 feet; rock excavation may be needed for RCB
B-8	Trail	Fill 11'	Shale at 7'
B-9	Trail & RCB	Fill 2' [1]	Clay to bottom of 10' boring
B-10	Trail	Minor cut/fill	Shale at 2', limestone at 6', refusal at 6.5'
B-11	Trail	Cut 3'	Clay to bottom of 10' boring
B-12	Trail & RCB	Fill 2' [1]	Clay to bottom of 10' boring
B-13	Bridge	Fill 5' [2]	Clay to bottom of 10' boring
B-14	Bridge	Fill 3' [2]	Clay to bottom of 30' boring

1. Fill thickness above top of RCB culverts
2. Fill thickness at bridge abutments

The lean clay soils encountered at the site are highly susceptible to disturbance from construction activity, particularly when the soils exhibit high moisture contents or are wetted by surface water and/or seepage. Construction activities on these soils during wet weather will likely require special site preparation procedures to facilitate construction. Care should be taken during the construction activities to minimize disturbance of the bearing soils. Heavy equipment traffic on wet lean clay soils should be avoided where possible. Water that accumulates on a lean clay soil surface will infiltrate rapidly into the subgrade, potentially causing subgrade instability.

We observed several failures of the existing stream bank in the vicinity of the proposed pedestrian bridge. Evaluation of stream bank stability is not included in our current scope of services. We recommend stream bank stability be considered as construction plans and specifications are developed. Based on our observations, stabilization methods will be required to protect proposed bridge abutments from scour and potential stream bank failure.

4.2 Earthwork

We recommend earthwork on this project be observed and tested by Terracon. Recommendations for site preparation, excavation, culvert and pavement subgrade preparation, and placement of engineered fill for the project are provided in the following sections.

4.2.1 Trail Subgrade Preparation

Vegetation, topsoil, and loose, soft, or otherwise unsuitable material should be removed along the trail alignment. The width of removal should extend several feet beyond the finished pavement edge. The soils exposed following stripping and undercutting should be observed by a Terracon representative. Unsuitable soils should be improved by scarification/compaction or by removal and replacement with engineered fill.

4.2.2 Engineered Fill Material Requirements

All materials incorporated in engineered fill sections should be free of organic matter and debris. Fill materials should not be frozen and should not be placed on a frozen subgrade. A sample of each material type should be tested prior to being used on the site. Soil is commonly used as fill in this locale, but not all soils are suitable. Our professional opinions concerning suitability of fill materials are presented in the table below.

Suitability as Fill	Description	Unified Soil Classification	
		Group Symbol	Group Name
Suitable	Clean Gravel	GW	Well-graded gravel
		GP	Poorly graded gravel
	Gravels with fines	GM	Silty gravel
		GC	Clayey gravel
	Clean sand	SW	Well-graded sand
		SP	Poorly-graded sand
	Sand with fines	SM	Silty sand
		SC	Clayey sand
	Description	**Group Symbol**	**Group Name**
Marginally Suitable [1]	Silt	ML	Silt [2]
	Clay	CL	Lean clay [3]
	Clay	CH	Fat clay [4]
Unsuitable	Highly organic soils	MH	Elastic silt
		OL & OH	Organic clay & organic silt
		PT	Peat

3. Depends on location and intended use. Can be used if approved by geotechnical engineer.
4. Highly susceptible to frost action; unstable when wet. Should not be used directly below pavements and exterior slabs without prior approval of geotechnical engineer.
5. Can be expansive if dry or if liquid limit is 45 or greater. Requires approval of geotechnical engineer.
6. Expansive. Not recommended immediately below movement-sensitive features. Must be placed with strict moisture and density control to reduce swell potential.

4.2.3 Fill Placement and Compaction Recommendations

Item		Description
Lift Thickness (maximum)		9 inches in loose thickness when large, self-propelled compaction equipment is used 4 inches when small, hand-guided equipment (vibratory plate compactor or "jumping jack" compactor) is used
Minimum compaction [1]		95% of the material's maximum dry density [2]
Moisture Content of Clay Soil	LL<45	-2% to +2% of optimum moisture content value [2]
	LL>45	0 to 4% above the optimum moisture content value [2]
Moisture Content of Granular Material		Sufficient to achieve compaction without pumping when proofrolled

1. We recommend that engineered fill be tested for moisture content and compaction during placement. If the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
2. As determined by ASTM D698

4.2.4 Grading and Drainage

Ideally, the bike/pedestrian trail should have a slight crown or slope to direct surface water flow off the trail. During construction, exposed subgrades should be similarly crowned or sloped to provide positive drainage so water does not stand on soil subgrades. Surface water that accumulates on subgrades should be promptly removed.

4.2.5 Rock Excavation

Limestone and shale bedrock strata were encountered at relatively shallow depths at Borings B-1, B-2, B-3, B-4, B-5, B-6, B-8, and B-10 Maximum cuts of approximately 8 feet will be required in these areas and bedrock excavation will likely be required during site grading activities. In our experience, excavation of shale and limestone bedrock will be difficult and will likely require the use of large pneumatic breakers, or other rock excavating techniques to complete the excavations. Excavation of rock formations in confined excavations is more difficult.

4.2.6 Earthwork and Culvert Construction Considerations

Care should be taken to avoid disturbance of prepared subgrades. Unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or

subjected to repetitive construction traffic. New fill compacted above optimum moisture content or that accumulates water during construction can also become disturbed under construction equipment. Construction traffic over the completed subgrade should be avoided to the extent practical. If the subgrade becomes saturated, desiccated, or disturbed, the affected materials should either be scarified and compacted or be removed and replaced.

The use of temporary sheeting/shoring or trench boxes may be needed where space or cost limitations will not permit safe slopes for an open cut excavation. Careful planning and execution of the trench excavations, dewatering, and any sheeting/shoring installation will be important to reduce the potential for subgrade instability and ground loss due to the granular soils flowing into the excavations.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, state, and federal safety regulations. The contractor should be aware that slope height, slope inclination, and excavation depth should in no instance exceed those specified by these safety regulations. Flatter slopes than those dictated by these regulations may be required depending upon the soil conditions encountered and other external factors. These regulations are strictly enforced and if they are not followed, the owner, contractor, and/or earthwork and utility subcontractor could be liable and subject to substantial penalties. Under no circumstances should the information provided in this report be interpreted to mean that Terracon is responsible for construction site safety or the contractor's activities. Construction site safety is the sole responsibility of the contractor who shall also be solely responsible for the means, methods, and sequencing of the construction operations.

4.3 Pile Foundations

In our opinion, the pedestrian bridge abutments should be supported on pile foundations. We performed axial static analyses on 10-inch, 12-inch, 14-inch and 16-inch diameter closed-end steel pipe piles that terminated in soft soil at depths of 30 feet below existing grade using data obtained at Boring B-14. Our calculated factored pile capacities in the following table consider that similar soils continue below the pile tip for a distance equal to at least 2 times the pile diameter The factored axial capacities incorporate a resistance factor of 0.5. Boring B-14 terminated at a depth of 30 feet, so the depth to bedrock strata is unknown. Piles driven to refusal in bedrock would have higher capacities.

Minimum Pile Depth Below Existing Grade	Pile Diameter	Factored Axial Capacity
30 feet	10 inches	16 tons
	12 inches	20 tons
	14 inches	22 tons
	18 inches	25 tons

Piles that derive their capacity from skin friction should be spaced at least 3 pile diameters apart (center-to-center). Closer spacing may result in total axial load capacity of the pile group being less than the sum of the individual pile capacities due to group effect. Terracon should evaluate group effect if closer pile spacing is required.

Individual piles that are designed and constructed as recommended in this report are expected to experience settlements on the order of 1 inch or less. As noted above, once the preliminary pile layout/spacing has been determined, the group effect of closely spaced piles should be evaluated to determine capacity and settlement of the pile group.

Uplift loads can be resisted by the weight of the pile and by side friction between the pile perimeter and the surrounding soils. Uplift resistance of a single pile can be taken as 2/3 of the factored axial capacity values provided in the above table, provided pile spacing is at least 3 pile diameters (center-to-center). If piles are more closely spaced, the allowable uplift resistance will be reduced by group effect.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction, and other earth-related construction phases of the project.

The analysis, recommendations, and professional opinions presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of geotechnical services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in

the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A
FIELD EXPLORATION

Field Exploration Description

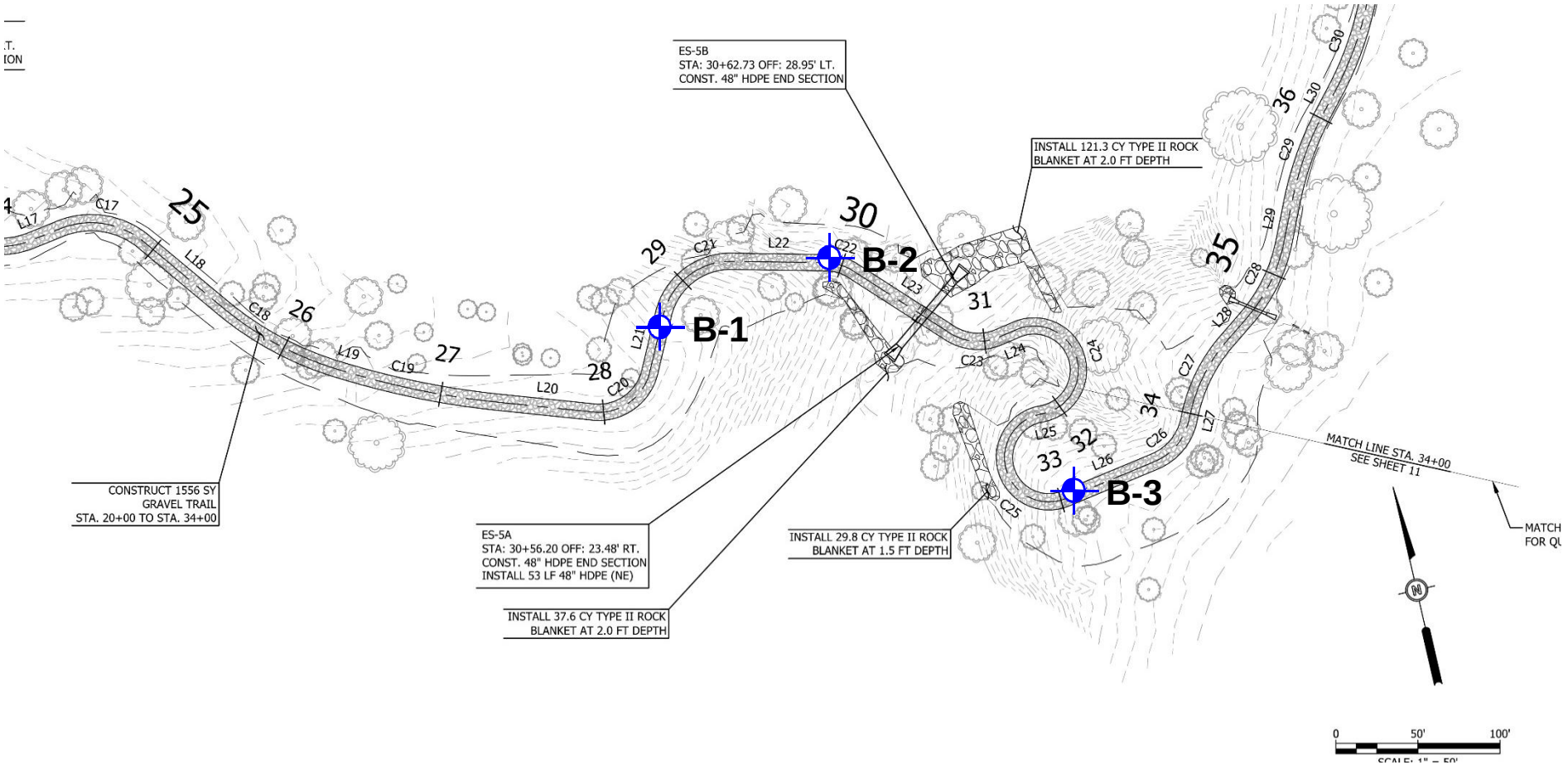
Terracon personnel located the borings at the site using provided coordinates and a hand-help GPS unit. The approximate ground surface elevations indicated on the boring logs (rounded to the nearest 1 foot) were obtained by plotting the boring locations on provided plan and profile plans. We estimated elevations by interpolating between elevation contours and centerline profile elevations. The locations and elevations of the borings should be considered accurate only to the degree implied by the means and methods used to define them. To determine more precise elevations and locations, we recommend boring locations be surveyed by a licensed land surveyor.

Where accessible, borings were drilled with a rotary drill rig using continuous flight augers to advance the boreholes. Samples of the soils encountered at the borings were obtained using thin-walled tube sampling procedures. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is pushed hydraulically into the soil to obtain a relatively undisturbed sample. The samples were sealed and transported to the laboratory for testing and classification.

Borings B-1, B-2, B-3, B-9, B-11, B-12 & B-13 were inaccessible to our mechanized drill rig. These borings were advanced using hand methods. At most of these borings, grab samples were obtained for visual classification and comparison with samples recovered at other borings.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. The drill crew backfilled the borings with auger cuttings.

The drill crew prepared a field log of each boring. These logs included visual classifications of the materials encountered during drilling and the driller's interpretation of the subsurface conditions between samples. The boring logs included with this report represent an interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.



Boring Location

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: DAB	Project No. 02155202
Drawn by: DAB	Scale: As shown
Checked by: CKD	File Name:
Approved by: DAB	Date: 01/06/2016

Terracon
Consulting Engineers & Scientists
13910 West 96th Terrace Lenexa, KS 66215
PH. (913) 492-7777 FAX. (913) 492-7443

EXPLORATION PLAN

Paved Bike/Pedestrian Trail, Trail Network
Knob Noster State Park
Knob Noster, Missouri

Exhibit
A-2

Boring Location

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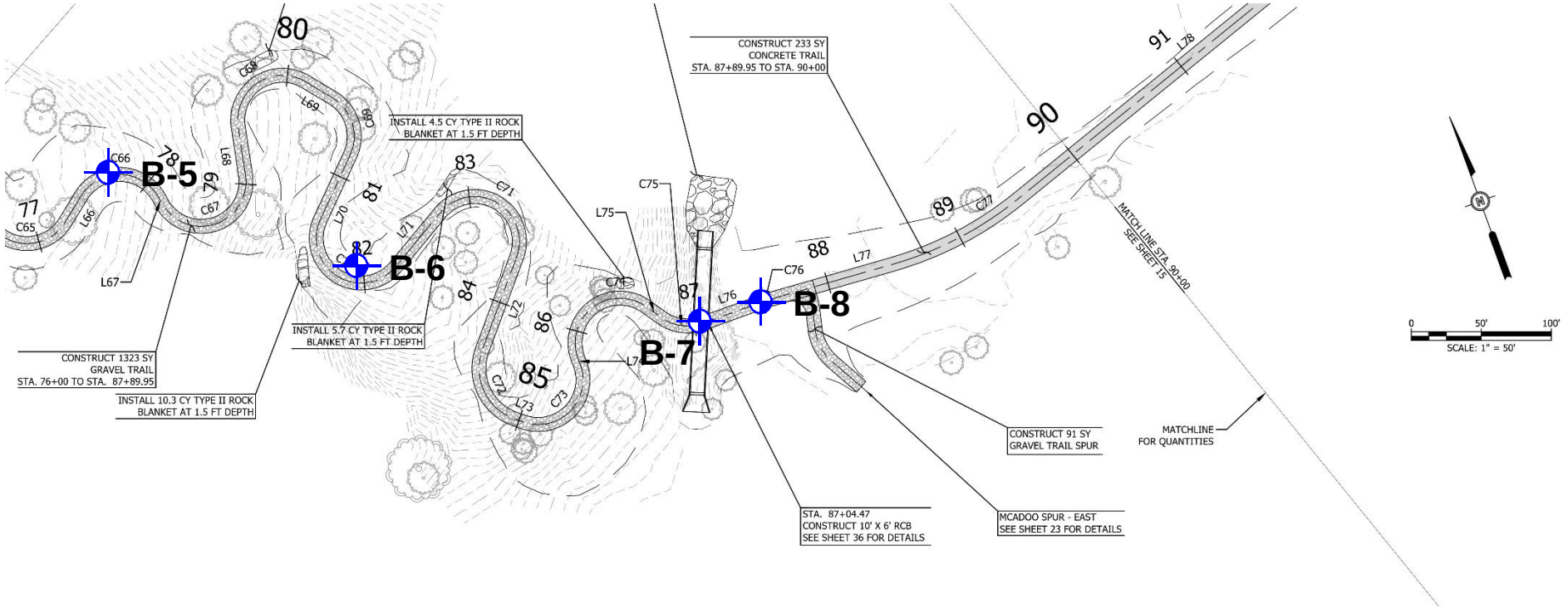
Knob Noster, Missouri

Exhibit
A-3



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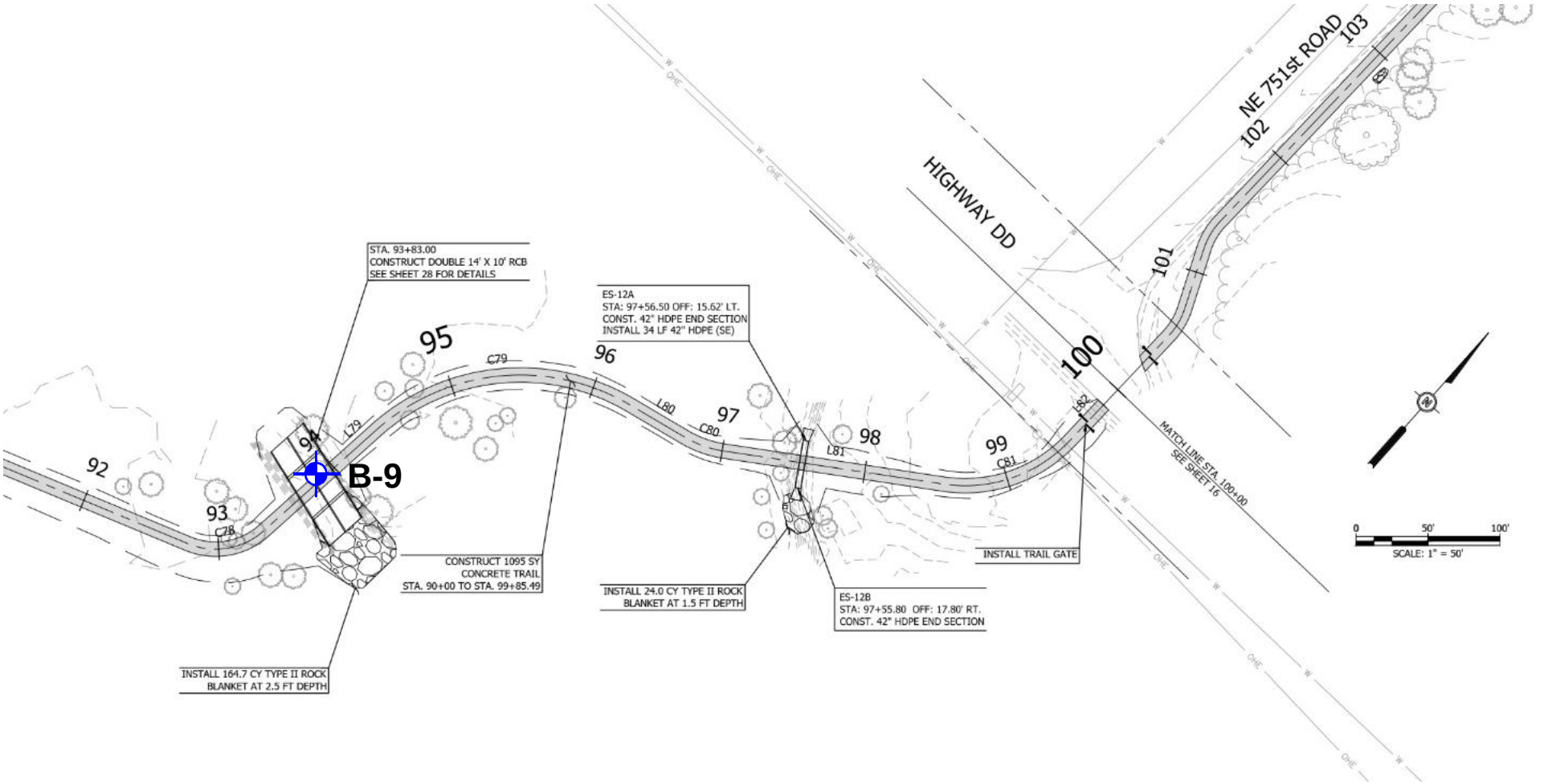
Knob Noster, Missouri

Exhibit
A-4



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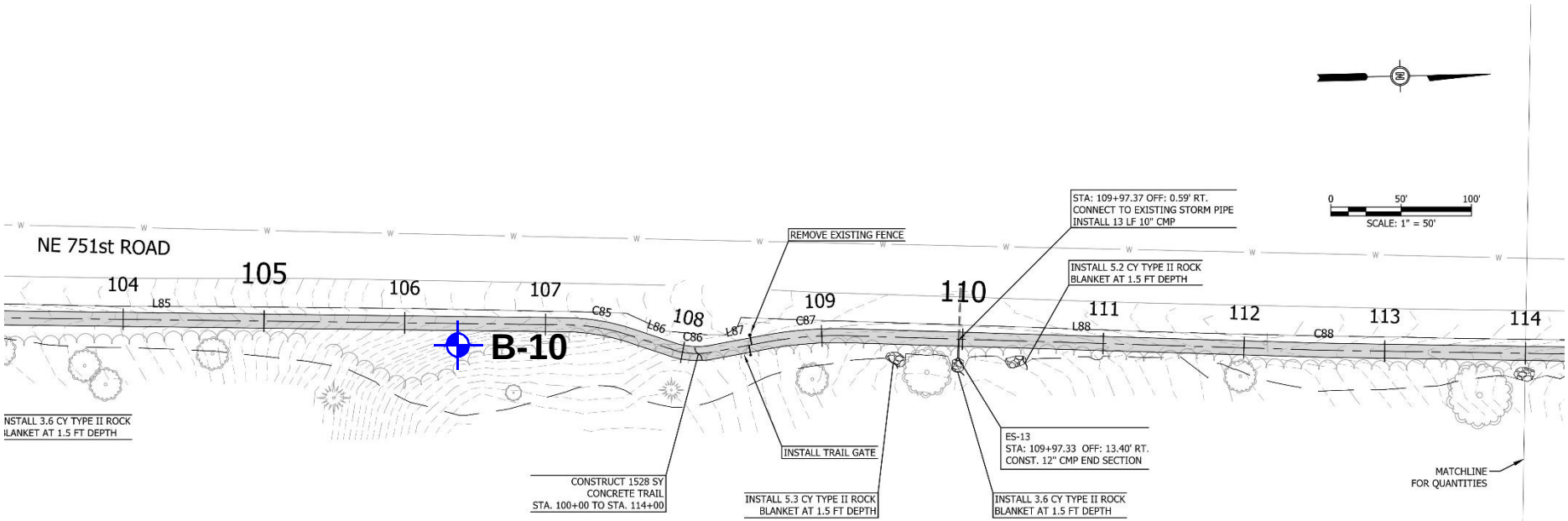
EXPLORATION PLAN

Paved Bike/Pedestrian Trail, Trail Network
Knob Noster State Park
Knob Noster, Missouri

Exhibit
A-5



Boring Location

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Checked by: CKD	File Name:
Approved by: DAB	Date: 01/06/2016

Terracon
Consulting Engineers & Scientists
13910 West 96th Terrace Lenexa, KS 66215
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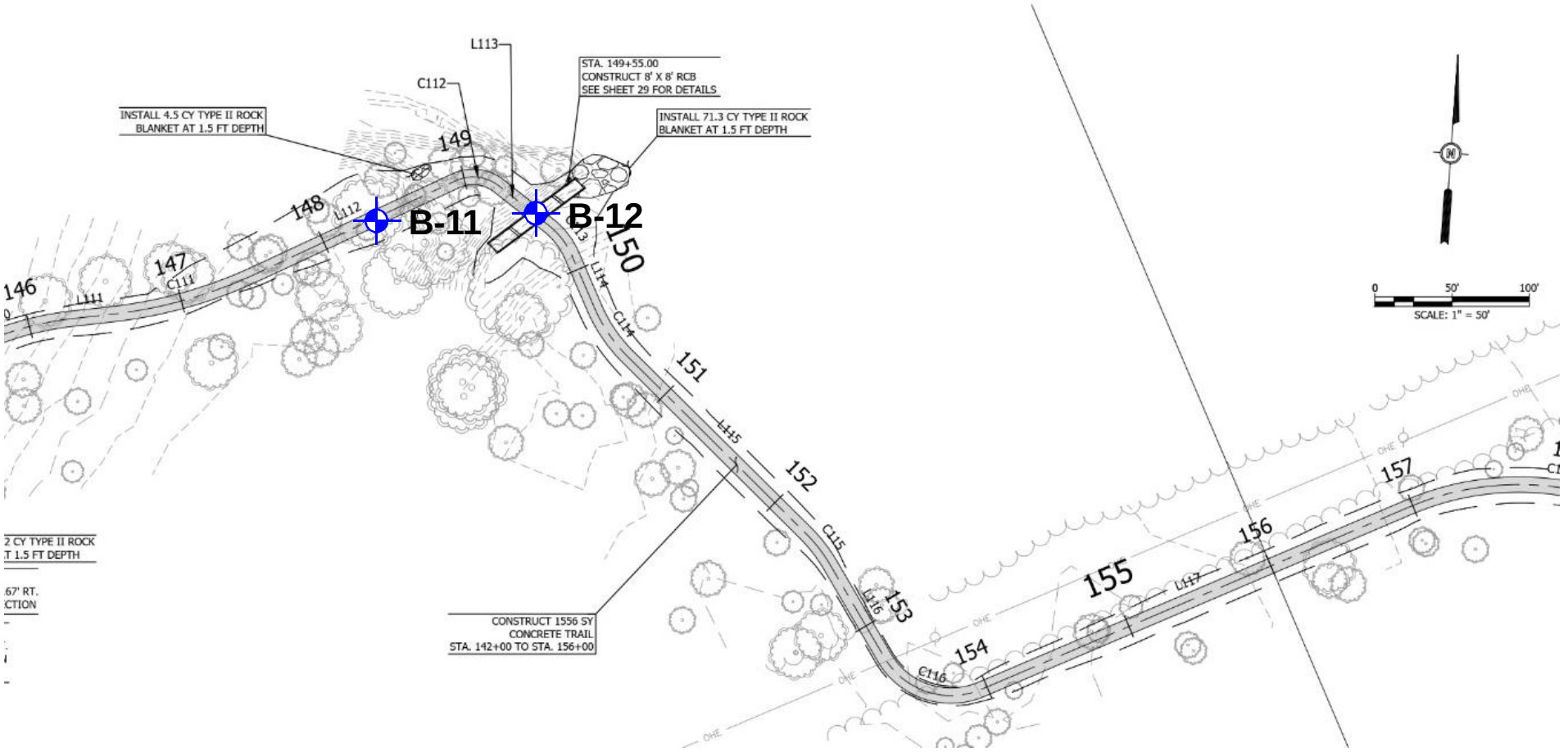
EXPLORATION PLAN

Paved Bike/Pedestrian Trail, Trail Network
Knob Noster State Park
Knob Noster, Missouri

Exhibit

A-6



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Approved by: DAB	Date: 01/06/2016

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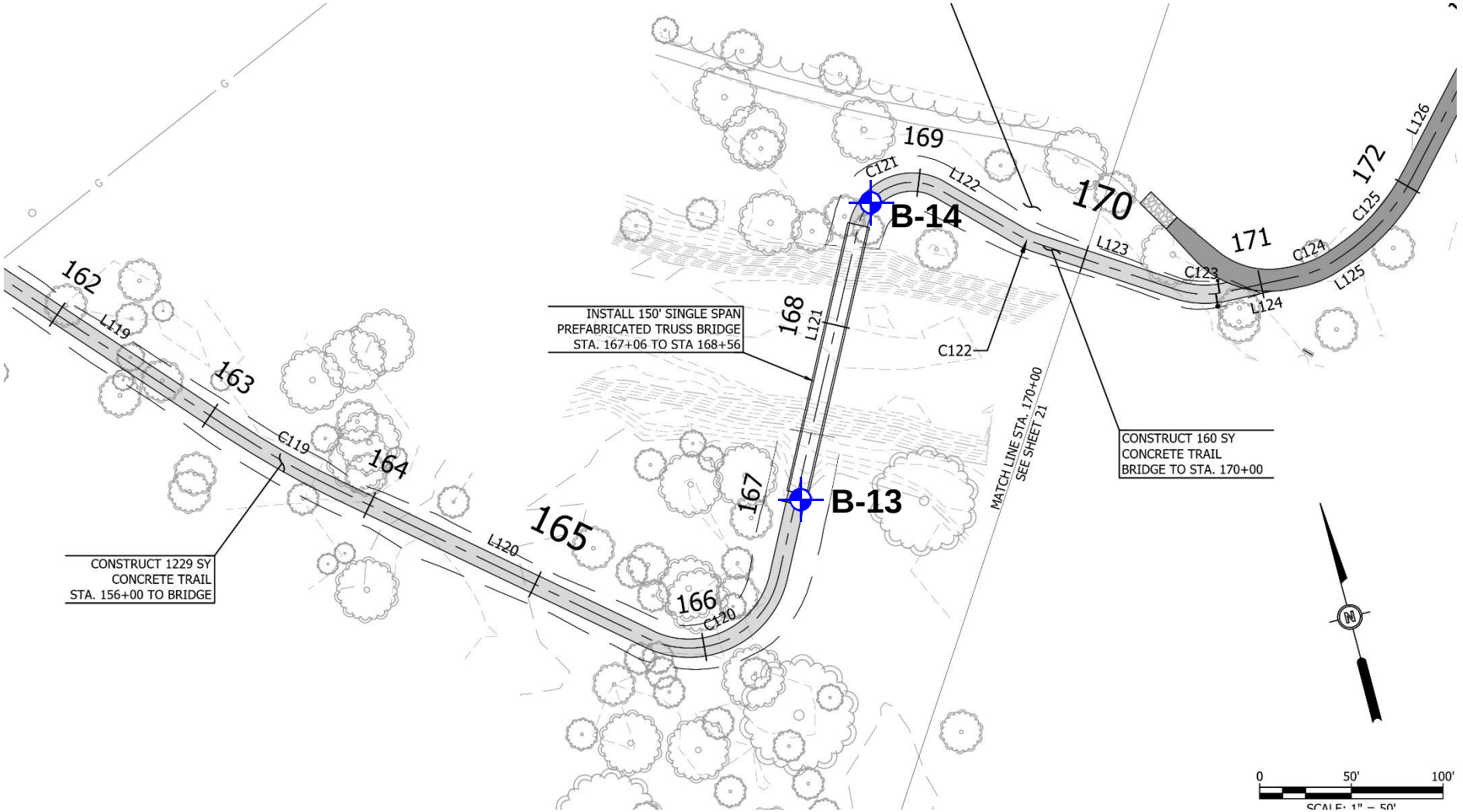
EXPLORATION PLAN

Paved Bike/Pedestrian Trail, Trail Network
Knob Noster State Park
Knob Noster, Missouri

Exhibit

A-7



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Approved by: DAB	Date: 01/06/2016

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Consulting Engineers & Scientists
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PH. (913) 492-7777 FAX. (913) 492-7443

EXPLORATION PLAN

Paved Bike/Pedestrian Trail, Trail Network
Knob Noster State Park
Knob Noster, Missouri

Exhibit
A-8

BORING LOG NO. B-1

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

LOCATION See Exhibit A-2

Approximate Surface Elev: 832 (Ft.) +/-

GRAPHIC LOG	DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)		SAMPLE TYPE	WATER CONTENT (%)
		FAT CLAY (CH), trace wood and organics, brown					
							22
	4.0	...apparent limestone bedrock at 4 feet	828+/-				
		Hand auger refusal at 4 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 11/30/2015	Boring Completed: 11/30/2015
Drill Rig: HA	Driller: KP
Project No.: 02155202	Exhibit: A-9

BORING LOG NO. B-2

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

GRAPHIC LOG	LOCATION See Exhibit A-2 DEPTH	Approximate Surface Elev: 815 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)		SAMPLE TYPE	WATER CONTENT (%)
	FAT CLAY (CH), trace gravel, brown					
	2.0 ...apparent limestone bedrock at 2 feet	813+/-				25
	Hand auger refusal at 2 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 11/30/2015	Boring Completed: 11/30/2015
Drill Rig: HA	Driller: KP
Project No.: 02155202	Exhibit: A-10

BORING LOG NO. B-3

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

GRAPHIC LOG	LOCATION See Exhibit A-2 Approximate Surface Elev: 834 (Ft.) +/- DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)		SAMPLE TYPE	HAND PENETROMETER (psf)	WATER CONTENT (%)
	LEAN CLAY (CL), light brown, stiff					
					2000	22 31
	3.0 / 831+/-					
	3.5 / 830.5+/- **SHALE**, gray, highly weathered ...apparent limestone bedrock at 3.5 feet					
	Hand auger refusal at 3.5 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 11/30/2015	Boring Completed: 11/30/2015
Drill Rig: HA	Driller: KP
Project No.: 02155202	Exhibit: A-11

BORING LOG NO. B-4

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

LOCATION See Exhibit A-3

Approximate Surface Elev: 826 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
	LEAN CLAY (CL), brown				
1.5	824.5+/-				
	SHALE, with limestone seams, light brown and gray, moderately to slightly weathered				
				6-12-16 N=28	22
				9-10-11 N=21	19
		5			
				12-13-26 N=39	9
				19-35-39 N=74	11
		10			
14.3	811.5+/-			30-50/3"	11
	Boring Terminated at 14.3 Feet				

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

Advancement Method:
Continuous flight solid-stem augers

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 12/1/2015 | Boring Completed: 12/1/2015

Drill Rig: CME-55 | Driller: KP

Project No.: 02155202 | Exhibit: A-12

BORING LOG NO. B-5

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

LOCATION See Exhibit A-4

Approximate Surface Elev: 804 (Ft.) +/-

DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
1.0	**LEAN CLAY (CL)**, brown	803+/-				
	SHALE, light brown to gray, moderately to slightly weathered			X	4-11-14 N=25	14
			5	X	11-21-19 N=40	9
				X	14-14-16 N=30	13
			10	X	9-14-16 N=30	9
14.3		789.5+/-		X	17-50/3"	14
	Boring Terminated at 14.3 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

Advancement Method:
Continuous flight solid-stem augers

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 12/1/2015 | Boring Completed: 12/1/2015

Drill Rig: CME-55 | Driller: KP

Project No.: 02155202 | Exhibit: A-13

BORING LOG NO. B-6

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

LOCATION See Exhibit A-4

Approximate Surface Elev: 775 (Ft.) +/-

GRAPHIC LOG	DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
	1.0	**LEAN CLAY (CL)**, brown	774+/-				
		SHALE, light brown to gray, moderately to slightly weathered				3-6-11 N=17	14
				5		11-15-26 N=41	9
						11-20-21 N=41	10
				10		12-14-25 N=39	16
	14.3		760.5+/-			9-50/4"	26
		Boring Terminated at 14.3 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

Advancement Method:
Continuous flight solid-stem augers

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 12/1/2015	Boring Completed: 12/1/2015
Drill Rig: CME-55	Driller: KP
Project No.: 02155202	Exhibit: A-14

BORING LOG NO. B-7

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

LOCATION See Exhibit A-4

Approximate Surface Elev: 740 (Ft.) +/-

GRAPHIC LOG	DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
		LEAN CLAY (CL), brown and gray brown, medium stiff to stiff					
						3-4-4 N=8	19
				5		4-4-11 N=15	22
						4-6-6 N=12	19
						4-2-5 N=7	22
				10			
	13.5		726.5+/-				
	14.4	**SHALE**, gray, slightly weathered	725.5+/-			21-50/5"	11
		Boring Terminated at 14.4 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

Advancement Method:
Continuous flight solid-stem augers

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 12/1/2015	Boring Completed: 12/1/2015
Drill Rig: CME-55	Driller: KP
Project No.: 02155202	Exhibit: A-15

BORING LOG NO. B-8

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

LOCATION See Exhibit A-4

Approximate Surface Elev: 737 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
	FAT CLAY (CH), brown, stiff					
				X	3-5-6 N=11	19
				X	4-5-4 N=9	19
			5			
	7.0	730+/-		X	8-13-12 N=25	14
	SHALE, light brown to gray, moderately to slightly weathered			X	8-32-50/4"	10
			10			
	14.2	723+/-		X	37-50/2"	8
	Boring Terminated at 14.2 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

Advancement Method:
Continuous flight solid-stem augers

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 12/1/2015	Boring Completed: 12/1/2015
Drill Rig: CME-55	Driller: KP
Project No.: 02155202	Exhibit: A-16

BORING LOG NO. B-9

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

LOCATION See Exhibit A-5

Approximate Surface Elev: 728 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	HAND PENETROMETER (psf)	VISUAL CLASSIFICATION	WATER CONTENT (%)
	FAT CLAY (CH), brown, medium stiff						
						X	
					1500 1000	X	29
			5				
						X	
						X	
	10.0	718+/-	10			X	
	Boring Terminated at 10 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 12/7/2015 | Boring Completed: 12/7/2015

Drill Rig: HA | Driller: JK

Project No.: 02155202 | Exhibit: A-17

BORING LOG NO. B-10

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

LOCATION See Exhibit A-6

Approximate Surface Elev: 765 (Ft.) +/-

DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
1.0	**12" ROOT ZONE**	764+/-				
2.0	**LEAN CLAY (CL)**, gray	763+/-			4-9-19 N=28	22 38
	SHALE, light brown to gray, highly weathered		5		5-3-3 N=6	20
6.0		759+/-				
6.5	**LIMESTONE**, moderately weathered	758.5+/-			50/0"	
	Auger Refusal at 6.5 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

Advancement Method:
Continuous flight solid-stem augers

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 11/30/2015 | Boring Completed: 11/30/2015
Drill Rig: CME-55 | Driller: KP
Project No.: 02155202 | Exhibit: A-18

BORING LOG NO. B-11

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

LOCATION See Exhibit A-7

Approximate Surface Elev: 733 (Ft.) +/-

GRAPHIC LOG	DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	VISUAL CLASSIFICATION
		LEAN CLAY (CL), brown				
						X
						X
				5		
						X
						X
	10.0		723+/-	10		X
		Boring Terminated at 10 Feet				

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 12/7/2015	Boring Completed: 12/7/2015
Drill Rig: HA	Driller: JK
Project No.: 02155202	Exhibit: A-19

BORING LOG NO. B-12

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

LOCATION See Exhibit A-7

Approximate Surface Elev: 717 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	HAND PENETROMETER (psf)	VISUAL CLASSIFICATION
	LEAN CLAY (CL), brown, medium stiff to stiff					
						X
					2500 1500	X
			5			X
						X
	10.0	707+/-	10			X
	Boring Terminated at 10 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 12/7/2015	Boring Completed: 12/7/2015
Drill Rig: HA	Driller: JK
Project No.: 02155202	Exhibit: A-20

BORING LOG NO. B-13

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

LOCATION See Exhibit A-8

Approximate Surface Elev: 725 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	SAMPLE TYPE	HAND PENETROMETER (psf)	VISUAL CLASSIFICATION	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	LEAN CLAY (CL), brown, stiff						
				X			
3.0	722+/-		2000	X	28	91	
	LEAN CLAY (CL), with sand, brown		3000	X			
5							
				X	30		36-17-19
10.0	715+/-			X			
10	***Boring Terminated at 10 Feet***						

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 12/7/2015 | Boring Completed: 12/7/2015

Drill Rig: HA | Driller: JK

Project No.: 02155202 | Exhibit: A-21

BORING LOG NO. B-14

PROJECT: Paved Bike/Pedestrian Trail

CLIENT: Bartlett & West
Jefferson City, Missouri

SITE: Knob Noster State Park
Knob Noster, Missouri

LOCATION See Exhibit A-8

Approximate Surface Elev: 726 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	LITHOLOGY	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	HAND PENETROMETER (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
0.8	725+/-	**8" ROOT ZONE**								
		LEAN CLAY (CL), brown and gray, soft to medium stiff								
						+9000		17	98	
						1500		20	106	
			5							
						2000	1680	23	103	
						1000	640	27	100	30-17-13
			10							
						500	860	29	99	
			15							
				▽						
						500	870	29	99	
			20							
						1000		29	99	37-21-16
			25							
		...wood at 28 feet				2000		50	70	
30.0	696+/-		30							
		Boring Terminated at 30 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Continuous flight solid-stem augers

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Elevations were interpolated from centerline profile

Notes:

WATER LEVEL OBSERVATIONS

▽ *17 feet while drilling*

Terracon
13910 West 96th Terrace
Lenexa, Kansas

Boring Started: 11/13/2015 | Boring Completed: 11/13/2015

Drill Rig: CME-55 | Driller: JJ

Project No.: 02155202 | Exhibit: A-22

APPENDIX B
LABORATORY TESTS

Laboratory Tests

Representative samples obtained from the borings were tested in the laboratory to measure their natural water contents and dry unit weight, as applicable. A hand penetrometer was used to estimate the approximate unconfined compressive strength of selected samples. Unconfined compressive strength and Atterberg limit tests were also performed on selected samples. The test results are provided on the boring logs in Appendix A.

The soil samples were classified in the laboratory based on visual observation, texture, plasticity, and the limited laboratory testing described above. The soil descriptions presented on the boring logs for native soils are in accordance with the enclosed General Notes and Unified Soil Classification System (USCS). The estimated USCS group symbols for native soils are shown on the boring logs, and a brief description of the USCS is included in this report.

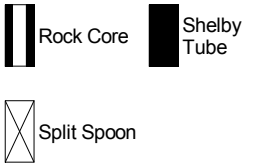
Samples of bedrock were classified based on examination of disturbed samples. Core samples and petrographic analyses may reveal other rock types. Descriptions on the logs are in accordance with Exhibit C-3.

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING



WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

N	**Standard Penetration Test Resistance (Blows/Ft.)**
(HP)	**Hand Penetrometer**
(T)	**Torvane**
(DCP)	**Dynamic Cone Penetrometer**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (psf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 500	0 - 1
Loose	4 - 9	Soft	500 to 1,000	2 - 4
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8
Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30
		Hard	> 8,000	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Terracon

Exhibit: C-1

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

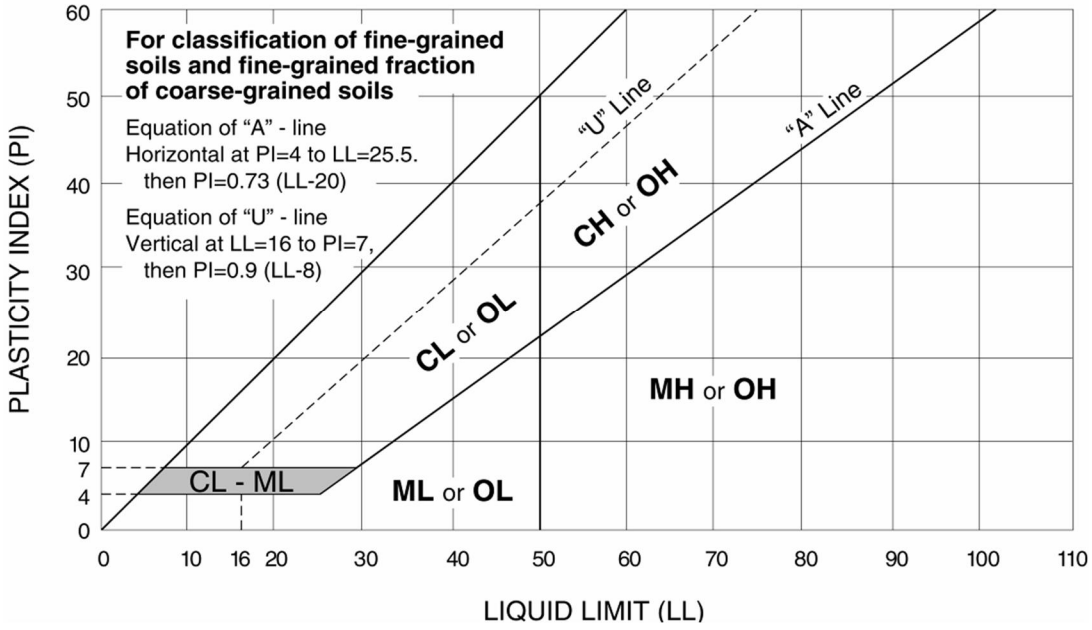
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



Terracon

Exhibit C-2

DESCRIPTION OF ROCK PROPERTIES

WEATHERING	
Term	**Description**
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	**Field Identification**	**Uniaxial Compressive Strength, PSI (MPa)**
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		**Bedding Spacing (May Include Foliation or Banding)**	
Description	**Spacing**	**Description**	**Spacing**
Extremely close	< ¾ in (<19 mm)	**Laminated**	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	**Very thin**	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	**Thin**	2 in – 1 ft (50 – 300 mm)
Moderate	8 in – 2 ft (200 – 600 mm)	**Medium**	1 ft – 3 ft (300 – 900 mm)
Wide	2 ft – 6 ft (600 mm – 2.0 m)	**Thick**	3 ft – 10 ft (900 mm – 3 m)
Very Wide	6 ft – 20 ft (2.0 – 6 m)	**Massive**	> 10 ft (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0 degree angle.

ROCK QUALITY DESIGNATION (RQD*)	
Description	**RQD Value (%)**
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

*The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009 Technical Manual for Design and Construction of Road Tunnels – Civil Elements

SECTION 013300 – SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division 1 Specification Sections apply to this Section.

B. Division 1, Section 013115 “Project Management Communications” for administrative requirements for communications.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work including the following:

1. Shop Drawings
2. Product Data
3. Samples
4. Quality Assurance Submittals
5. Construction Photographs
6. Operating and Maintenance Manuals
7. Warranties

B. Administrative Submittals: Refer to General and Supplementary Conditions other applicable Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Construction Progress Schedule including Schedule of Values
2. Performance and Payment Bonds
3. Insurance Certificates
4. Applications for Payment
5. Certified Payroll Reports
6. Partial and Final Receipt of Payment and Release Forms
7. Affidavit – Compliance with Prevailing Wage Law
8. Record Drawings
9. Notifications, Permits, etc.

C. The Contractor is obliged and responsible to check all shop drawings and schedules to assure compliance with contract plans and specifications. The Contractor is responsible for the content of the shop drawings and coordination with other contract work. Shop drawings and schedules shall indicate, in detail, all parts of an Item or Work including erection and setting instructions and integration with the Work of other trades.

D. The Contractor shall at all times make a copy, of all approved submittals, available on site to the Construction Representative.

1.3 SUBMITTAL PROCEDURES

A. The Contractor shall comply with the General and Supplementary Conditions and other applicable sections of the Contract Documents. The Contractor shall submit, with such promptness as to cause no delay in his work or in that of any other contractors, all required submittals indicated in Part 3.1 of this section and elsewhere in the Contract Documents. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

    a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

B. Each drawing and/or series of drawings submitted must be accompanied by a letter of transmittal giving a list of the titles and numbers of the drawings. Each series shall be numbered consecutively for ready reference and each drawing shall be marked with the following information:

1. Date of Submission

2. Name of Project

3. Location

4. Section Number of Specification

5. State Project Number

6. Name of Submitting Contractor

7. Name of Subcontractor

8. Indicate if Item is submitted as specified or as a substitution

1.4 SHOP DRAWINGS

A. Comply with the General Conditions, Article 3.2.

B. The Contractor shall submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

C. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings including the following information:

1. Dimensions

2. Identification of products and materials included by sheet and detail number

3. Compliance with specified standards

4. Notation of coordination requirements

5. Notation of dimensions established by field measurement

6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8½"x11" but no larger than 36"x48".

1.5 PRODUCT DATA

A. The Contractor shall comply with the General Conditions, Article 3.2.

B. The Contractor shall collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information including the following information:

   a. Manufacturer's printed recommendations

   b. Compliance with Trade Association standards

   c. Compliance with recognized Testing Agency standards

   d. Application of Testing Agency labels and seals

   e. Notation of dimensions verified by field measurement

   f. Notation of coordination requirements

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

1.6 SAMPLES

A. The Contractor shall comply with the General Conditions, Article 3.2.

B. The Contractor shall submit full-size, fully fabricated samples, cured and finished as specified, and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

1. The Contractor shall mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the Designer's sample including the following:

   a. Specification Section number and reference

   b. Generic description of the Sample

   c. Sample source

   d. Product name or name of the Manufacturer

   e. Compliance with recognized standards

   f. Availability and delivery time

2. The Contractor shall submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show approximate limits of the variations.

b. Refer to other Specification Sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

c. Refer to other Sections for samples to be returned to the Contractor for incorporation in the Work. Such samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of sample submittals.

d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.

3. Field samples are full-size examples erected onsite to illustrate finishes, coatings, or finish materials and to establish the Project standard.

a. The Contractor shall comply with submittal requirements to the fullest extent possible. The Contractor shall process transmittal forms to provide a record of activity.

1.7 QUALITY ASSURANCE DOCUMENTS

A. The Contractor shall comply with the General Conditions, Article 3.2

B. The Contractor shall submit quality control submittals including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

C. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the Manufacturer certifying compliance with specified requirements.

1. Signature: Certification shall be signed by an officer of the Manufacturer or other individual authorized to contractually bind the Company.

D. Inspection and Test Reports: The Contractor shall submit the required inspection and test reports from independent testing agencies as specified in this Section and in other Sections of the Contract Documents.

E. Construction Photographs: The Contractor shall submit record construction photographs as specified in this Section and in other Sections of the Contract Documents.

1. The Contractor shall submit digital photographs. The Construction Administrator shall determine the quantity and naming convention at the preconstruction meeting.

2. The Contractor shall identify each photograph with project name, location, number, date, time, and orientation.

3. The Contractor shall submit progress photographs monthly unless specified otherwise. Photographs shall be taken one (1) week prior to submitting.

4. The Contractor shall take four (4) site photographs from differing directions and a minimum of five (5) interior photographs indicating the relative progress of the Work.

1.8 OPERATING AND MAINTENANCE MANUALS AND WARRANTIES

A. The Contractor shall submit all required manufacturer's operating instructions, maintenance/service manuals, and warranties in accordance with the General Conditions, Article 3.5, and Supplementary Conditions along with this and other Sections of the Contract Documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REQUIRED SUBMITTALS

A. Contractor shall submit the following information for materials and equipment to be provided under this contract.

SPEC SECTION	TITLE	CATEGORY
01 3115	Schedules of Values	Construction Schedule
01 3115	Contractor's Construction Schedule	Construction Schedule
01 5526	Traffic Management Schedule	Shop Drawings
01 5713	Silt Fence	Certification
01 5713	Rock Ditch Check	Product Data
01 5723	Storm water runoff control program SWPPP	Shop Drawings
01 5723	Erosion Control Schedule	Construction Schedule
03 2100	Shop Drawings of Reinforcement Steel	Shop Drawings
03 2100	Epoxy Coating Applicator's Certification of Reinforc-ing Steel	Certification
03 2100	Steel Manufacturer's Certified Mill Test Report (Coated and Uncoated)	Test Report
03 2100	Epoxy Resin Material (in accordance with Sec 1039)	Certification
03 2100	Documentation of Mechanical Bar Splice Systems and Components	Product Data
03 3000	Cast-In-Place Concrete Mix Design	Certification
03 3000	Cast-In-Place Concrete Mix Fresh and Hardened Properties	Test Report
03 3000	Daily Quality Control Tests	Test Report
03 3000	Cast-In-Place Concrete Mix Cement, Aggregates, Admixtures Materials Certifications	Certification
03 3000	Hot Weather Concreting Procedures	Construction Schedule
03 3000	Cold Weather Concreting Procedures	Construction Schedule
03 3000	Case-In-Place Concrete Method of Cure	Product Data
03 3000	Daily Cast-In-Place Concrete Quality Control Tests	Test Report
05 5200	Railing Components	Shop Drawings
05 5200	Railing Components	Product Data
10 1453	Sign Components	Certification
31 2300	Geotextile for Subsurface Drainage	Product Data
31 2300	Preconstruction Pictures and Videos	Product Data
31 2300	Proof Rolling Field Results	Test Report

SPEC SECTION	TITLE	CATEGORY
31 2500	Erosion control blanket and/or turf reinforcement mat	Certification
31 3716.13	Permanent Erosion Control Geotextile	Certification
31 3716.13	Type II Rock Blanket	Certification
31 1123	Aggregate for Base Course Gradation, Deleterious and PI	Test Report
31 1123	Aggregate for Base Courses Field Quality Control Test Reports	Test Report
32 1216	Asphalt Mix Designs and Mix Design Properties Certification	Certification
32 1216	Asphalt Mix Placement Field Quality Control Requirements	Certification
32 1216	Asphalt QA Test Results	Test Report
32 1313	ADA Warning Panels	Product Data
32 1313	Epoxy-Coated Steel	Certification
32 1313	Uncoated Steel	Certification
32 1313	Coating application for Epoxy-Coated Steel	Certification
32 1313	Uncoated steel for Box Culverts	Shop Drawing
32 1313	Curing Compounds	Certification
32 1313	Joint filler	Product Data
32 1313	Daily Concrete Paving Quality Control Test Reports	Test Report
32 1313	Concrete Paving Mix Design	Certification
32 1313	Concrete Paving Mix Fresh and Hardened Properties	Test Report
32 1313	Concrete Paving Mix Cement, Aggregates, Admixtures Materials Certifications	Certification
32 1313	Concrete Paving Concrete Method of Cure	Product Data
32 1313	Daily Concrete Paving Concrete Quality Control Tests	Test Report
32 1373	Concrete Paving Joint Sealant Components	Product Data
32 1540	Crushed Stone Surfacing Aggregate Gradation	Test Report
32 3119	Decorative Fence	Product Data
32 3119	Decorative Fence	Shop Drawings
32 3129	Timber Materials	Product Data
32 3129	Hinge components and miscellaneous hardware	Product Data
32 3413	Fabricated Pedestrian Bridge Shop Drawings	Shop Drawings
32 3413	Fabricated Pedestrian Bridge Design Calculations	Product Data
32 3413	Fabricated Pedestrian Bridge Materials and Components	Test Report
32 3413	Fabricated Pedestrian Bridge Materials and Components	Product Data
32 3413	Substructure	Shop Drawings
32 3413	Superstructure	Shop Drawings
32 3219	Seed	Certification

SPEC SECTION	TITLE	CATEGORY
32 9219	Soil amendments and fertilizers	Certification
33 4213	HDPE Pipe Culverts	Certification
33 4213	RCP Pipe Culverts	Certification
33 4213	CMP Pipe Culverts	Certification
33 4213	Pipe anchors if HDPE is used	Shop Drawings
33 4900	Storm Drainage Structures	Test Report
33 4900	Storm Drainage Structures	Certification
33 4900	Inlet Grate	Product Data
33 4900	Inlet Frame	Product Data
34 4113	Traffic Signals	Product Data

END OF SECTION 013300

SECTION 03 3000- CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. All structural concrete required for project with the exception of any precast concrete elements.

B. Related Sections:

1. Division 03: Section 03 2100 Reinforcement Bars.

2. Division 32: Section 32 3413 Fabricated Pedestrian Bridges.

3. Division 33: Section 33 4900 Storm Drainage Structures.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
C33	Standard Specification for Concrete Aggregates
C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C40	Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
C42	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C94	Standard Specification for Ready-Mixed Concrete
C127	Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
C128	Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate

C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
C143	Standard Test Method for Slump of Hydraulic Cement Concrete
C150	Standard Specification for Portland Cement
C171	Standard Specification for Sheet Materials for Curing Concrete
C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
C192	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
C260	Standard Specification for Air-Entraining Admixtures for Concrete
C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
C494	Standard Specification for Chemical Admixtures for Concrete
C1064	Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete

B. American Concrete Institute (ACI)

211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
224R	Control of Cracking in Concrete Structures
301	Specifications for Structural Concrete for Buildings
304R	Guide for Measuring, Mixing, Transporting and Placing Concrete
305R	Hot Weather Concreting
306R	Cold Weather Concreting
309R	Guide for Consolidation of Concrete
318/318R	Building Code Requirements for Structural Concrete and Commentary
347	Guide to Formwork for Concrete

C. American Association of State Highway and Transportation Officials (AASHTO)

M182	Burlap Cloth Made From Jute or Kenaf

1.4 SUBMITTALS

A. Reports covering the source, quality, and proportions of the concrete materials used in the design mix should include the following information:

1. Compressive strength (f'_c) based on 7-day and 28-day compression tests in accordance with ASTM C39

2. Slump determined in accordance with ASTM C143
3. Air content, determined in accordance with ASTM C138, C173 or C231
4. Unit weight and yield determined in accordance with ASTM C138
5. Water-Cementitious materials ratio
6. Weight and volume of each aggregate
7. Weight and volume of portland cement
8. Weight and volume of added water. Water added at the plant shall account for the net moisture in both the coarse and fine aggregate.
9. Type and quantity of each admixture
10. Specific gravity, absorption and gradation of each aggregate in accordance with ASTM C127, ASTM C128 and ASTM C33.
11. Daily concrete quality control tests must be accomplished by an individual certified as ACI Concrete Field Testing Technician, Grade 1, or equivalent program and daily results must be provided to the Engineer.
12. Field quality-control reports.
13. Concrete 28-day compressive strength tests to be completed by the Contractor and results submitted to the Engineer.

B. Certifications:

1. Provide certification that portland cement used complies with ASTM C150. Provide brand, type and composition of cement used.
2. Provide certification that aggregates comply with ASTM C33. State amount of deleterious substances. Identify certifications for and tests of actual materials to be used in the work. State basis of determining that alkali reactivity potential is negligible.
3. Provide certificate of compliance with these specifications from the manufacturer of the concrete admixtures.
4. Provide delivery tickets for ready-mix concrete or weighmasters certificate per ASTM C94, including weights of cement and each size aggregate and amount of water added at the plant. Record the amount of water added on the job on the delivery ticket.

1.5 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

C. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

D. ACI Publications: Comply with ACI 301 unless otherwise indicated.

PART 2 - PRODUCTS

A. General

Proportioning of the individual components of batched concrete shall be within the following tolerances of the submitted concrete mix design weights.

Item	Tolerance (%)
Cement	0 to +4
Fine Aggregate	±2
Coarse Aggregate	±2
Water	±1
Admixtures	±3

The Contractor shall use whatever means necessary to ensure concrete delivered to the project is properly batched with approved kinds and quantities of materials.

B. Cement

Cement shall conform to ASTM C150, Type I or Type II. The minimum quantity of portland cement in the concrete shall be as indicated in the following table:

Maximum Nominal Coarse Aggregate Size (inch)	Minimum Cement Content (pounds/cu. yd.)
3/8	635
1/2	611
3/4	588
1	564

C. Aggregates

1. General

Aggregates and final gradation shall comply with ASTM C33. The ratio of fine to total aggregates, based on solid volumes (not weights), shall be as follows:

Coarse Aggregate Size	Minimum Ratio	Maximum Ratio
3/8 inch	0.45	0.60
1/2 inch	0.40	0.55
3/4 inch	0.35	0.50
1 inch	0.30	0.46

2. Fine Aggregate

Fine aggregate shall be a fine granular material naturally produced by the disintegration of rock of a siliceous nature or manufactured from an approved limestone or dolomite source, and shall conform to the following sieve analysis:

Sieve Size	Percent Passing
3/8 inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 20	40-75
No. 30	25-60
No. 50	5-30
No. 100	0-10

The sand shall not have more than 45% retained between any two consecutive sieve sizes. Fineness modulus shall not be less than 2.3 nor more than 3.1.

The amount of deleterious substances in fine aggregate shall not exceed the following limits:

Item	Maximum Percent by Weight of Total Sample
Clay Lumps and Shale	0.25
Material Finer than No. 200 Sieve	2.00
Coal and Lignite	0.25
Other Deleterious Material	0.10

Fine aggregate shall be free of injurious amounts of organic impurities. Fine aggregates subjected to ASTM C40 for organic impurities and producing a color darker than the standard shall be rejected.

Fine aggregate shall be free of material that could react harmfully with alkalis in the cement. If such materials are present in injurious amounts, the fine aggregate shall be rejected, or shall be used with the addition of a material that has been shown to inhibit undue expansion due to the alkali-aggregate reaction.

Fine aggregate subjected to five cycles of the soundness test (ASTM C88) shall show a loss of not greater than 8% when sodium sulfate is used or 10% when magnesium sulfate is used.

3. Coarse Aggregate

Coarse aggregate shall be washed gravel or crushed stone produced from rock of uniform quality, and shall be approved by the Engineer. Coarse aggregate shall conform to the following sieve analysis unless otherwise approved:

Sieve Size	Percent Passing
1 inch	100
3/4 inch	90-100

3/8 inch	25-55
No. 4	0-10
No. 8	0-5
No. 200	0-2

The amount of deleterious substances in coarse aggregate shall not exceed the following limits:

Item	Maximum Percent by Weight of Total Sample
Shale	1.00
Chert in Limestone	4.00
Other Deleterious Material	1.00

Coarse aggregate subjected to five cycles of the soundness test (ASTM C88) shall show a loss of not greater than 8% when sodium sulfate is used or 10% when magnesium sulfate is used.

D. Water

1. Use water and ice in concrete that is clean and free from injurious quantities of organic matter, alkali, salts, and other impurities, which might reduce the strength, durability, or otherwise adversely affect the quality of the concrete.
2. Water approved by the Missouri Department of Natural Resources for drinking purposes may be considered satisfactory for the purpose. If in the judgment of the Engineer the water for mixing or curing is not clean or otherwise free from injurious quantities or impurities, testing may be required.

E. Concrete Mixtures

1. Proportion mixtures to provide normal-weight concrete with the following properties:
   a. Compressive Strength (28 Days): 4000 psi.
   b. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45
   c. Slump Limit: 4 inches, plus or minus 1 inch.

F. Concrete Admixtures

1. General

   All concrete admixtures shall be from one manufacturer and shall be compatible. The admixture dosage rate, batching method, and time of introduction to the mix shall comply with these specifications and with the manufacturer's recommendations. Neither calcium chloride nor an admixture containing chloride from sources other than impurities in admixture ingredients will be acceptable.

2. Air-Entraining Admixture

The air-entraining admixture shall conform to ASTM C260, shall contain no chlorides and shall be subject to the Engineer's approval.

3. Water-Reducing Admixture

   The water-reducing admixture shall conform to ASTM C494, Type A, shall contain no chlorides and shall be subject to the Engineer's approval.

4. Superplasticizer Admixture

   A superplasticizer may be used at the option of the Contractor. The superplasticizer admixture shall comply with ASTM C494, Type F or G, shall contain no chlorides and shall be subject to the Engineer's approval. Superplasticizer may be added to the concrete at the plant or on the job site and shall be mixed in accordance with the admixture manufacturer's recommendations. The superplasticizer dose shall be accurately proportioned and shall be easily verifiable for each concrete load. When permitted by the Engineer, redosing of concrete with superplasticizer shall be done only once. Redosing procedures shall be as recommended by the admixture manufacturer.

   Slump shall not exceed 4 inches before superplasticizer is added. Slump shall not exceed 7 inches after the superplasticizer has been added.

PART 3 - EXECUTION

A. General

1. All ready-mixed concrete shall conform to ASTM C94 and be furnished by a reputable permanent concrete plant. The supplier shall have an adequate number of modern transit mix trucks to ensure delivery of concrete as required for the schedule of placement. The plant shall be located within a reasonable distance from the project so travel time is 30 minutes or less. Concrete shall be handled and preserved in its "batched" proportion during transportation. Mixing time shall not exceed 45 minutes and water shall not be added during transportation. Concrete improperly cared for or mixed in the truck longer than 45 minutes shall be disposed of away from the project. With the Engineer's approval and in accordance with ASTM C94, water can be added on-site within the limits of these specifications to obtain the specified slump.

2. Proportion mixtures to provide normal-weight concrete with the following properties:

   a. Compressive Strength (28 Days): 4000 psi.

   b. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45

   c. Slump Limit: 4 inches, plus or minus 1 inch.

3. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

   a. Air Content: 6 percent plus or minus 1 percent.

B. PREPARATION

1. Notify the Engineer of readiness to place concrete in any portion of the work. This notification shall be such time in advance of the operation as the Engineer deems necessary to allow observation of the work at the location of the proposed concrete placing. Failure to provide sufficient advance notification will be cause for delay in placing until observation can be completed. Forms, reinforcement, screeds, ties, anchors, inserts, and other embedded items shall be secured, inspected and approved before the Contractor may proceed with concrete placement.

2. All concrete shall be placed in a manner and with adequate equipment which shall be subject to the Engineer's approval. Equipment for placing concrete may include flumes, tremies, cranes or concrete pumps for placing concrete; vibrators, hand tool and finishing equipment for manipulation as needed.

3. Coordinate in advance of concrete placement the sequence of placement and availability of concrete, to assure that construction joints will occur only as designed or specified. Provide the Engineer with a copy of the sequence of placement for approval in advance of placement.

4. Schedule sufficient equipment for continuous concrete placement within the predetermined sequence limits. Provide for backup equipment and procedures to be taken in case of an interruption in placement. Provide backup concrete vibrators at the project site and test concrete vibrators the day before placing concrete.

C. FORMWORK

1. General

   Forms shall be designed, constructed and maintained so as to ensure that after removal of the forms, the finished concrete members shall have true surfaces free of waviness or bulges, conforming accurately to the shapes, dimensions, lines, elevations and positions called for on the drawings. The design and construction of the form work shall be the responsibility of the Contractor. Forms shall be thoroughly cleaned before each use and of a material that is non-reactive with the concrete. Joints and forms shall be sufficiently tight to prevent leakage of mortar during placing of concrete. Forms shall also provide for all openings as shown on the drawings. Triangular moulding, smooth on three sides and having ¾ inch width on each of the two form sides, shall be used to bevel all exposed edges of the structure, except where special bevels are shown on the drawings.

2. Surface Preparation

   Plywood and other wood surfaces not subject to shrinkage shall be sealed against absorption of moisture from the concrete by either a field applied approved form oil or sealer or a factory applied non-absorptive liner non-reactive with the concrete. When forms are coated to prevent bond with concrete, it shall be done prior to placing of the reinforcing steel. Excess coating material shall not be allowed to stand in puddles in the forms nor allowed to come in contact with concrete against which fresh concrete will be placed. Where cast finishes are required, materials which will impart a stain to the concrete shall not be applied to the form surfaces. Do not apply form release agent where concrete surfaces receive special

finishes or applied coatings which may be affected by the agent. Tolerances for formed surfaces shall be as specified in ACI 301 and 347.

3. Alternative Formwork

Trenches in earth may be used as forms upon approval by the Engineer. Under no circumstance shall they be used when side walls crumble or if footing cannot be poured on level ground. If the earth walls will not allow proper pouring conditions, conventional forms will be required. Subgrade shall be fine graded and moistened if necessary prior to placing concrete.

4. Form Ties

Ties and spreaders and all metal appliances used inside of forms to hold them to correct alignment and location shall be so constructed that after removal of forms, the metal may be removed to a depth of at least one inch from the surface of the concrete. Metal tie rods used inside the forms where concrete will have an exposed surface shall be a type which will not produce a cavity at the surface of the concrete greater than 1½ inches in diameter. Bolts and rods used as ties shall not be removed by pulling them through the concrete. Wire ties and pipe spreaders will not be permitted, and metal or wood spreaders which are separate from form ties shall be removed as concrete is being placed.

D. PLACEMENT PROCEDURES

1. General

Concrete placement shall conform to ACI 304R and 224R as modified by these specifications. Concrete shall be of such consistency and composition that it can be worked readily into the forms and around the reinforcement without excessive vibrating and without permitting the materials to segregate or free water to collect on the surface. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited. Concrete shall be placed in a logical sequence that will permit efficient operation, and shall provide structural continuity and strength required. Concrete shall be deposited continuously with no interruption in excess of 45 minutes between the placement of contiguous portions of concrete, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, construction joints shall be located at points as provided for in the drawings or as approved by the Engineer. For proper compaction, concrete shall be placed in approximately horizontal layers not to exceed 2'-0".

Do not place concrete until all free water has been removed from out of the forms and clear of the work. Do not place concrete during rainstorms. In case of pending inclement weather, prepare temporary covers to protect freshly placed and finished surfaces from surface damage. Keep sufficient protective covering ready at all times for this purpose. Do not permit free or storm water to flow over surfaces of concrete to injure the quality or surface finish.

Deposit concrete at or near its final position to avoid segregation caused by rehandling or flowing. Do not deposit concrete in large quantities in one place to be worked along the

forms with a vibrator. Concrete shall not be moved laterally more than 5 feet after placement in the forms.

Do not drop concrete freely into place from a height greater than 5 feet. Use an approved system of tremies or pumps where the drop exceeds these limits.

Embedded screeds may be used unless otherwise called for. Screeds shall be accurately set and held in place with approved materials and with approved methods. Screeds must be removed and voids filled while concrete is plastic.

2. Vibration

All concrete shall be consolidated by vibration in accordance with ACI 309R so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air and water pockets which may cause honeycombing, pitting, or planes of weakness.

Vibrators shall be of the high-frequency internal type, and the number in use shall be ample to consolidate the incoming concrete to a proper degree within 15 minutes after it is deposited in the forms. Mechanical vibrators shall have a minimum frequency of 4500 revolutions per minute and shall be operated by competent workmen. A spare vibrator shall be kept on the job site during all concrete placing operations.

Over-vibrating or the use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at many points, generally from 18 to 30 inches apart. At each insertion, the duration shall be sufficient to consolidate the concrete but not over-vibrated to cause segregation, generally from 5 to 15 seconds duration. Under no circumstances shall vibrators penetrate or disturb previously placed concrete that has taken initial set. For slabs or footings on grade, the vibrator should not make contact with the subgrade.

3. Finishing Concrete

All voids in horizontal surfaces are to be filled during finishing operation of plastic concrete. Finish shall be of specified texture and uniform in color and appearance as approved by the Engineer. Avoid over-finishing, late finishing, re-watering and other techniques that may cause "crazing". Initiate the curing process as soon as surface strength will permit.

Surface finish shall begin immediately following removal of the forms. Form tie cavities, holes, honeycomb spots and other defects shall have all loose material removed, be thoroughly cleaned, saturated with water, carefully patched with an approved mortar or grout and satisfactorily cured. Break off all "fins" and irregular projections and grind as required for uniform appearance. Grind all form "off-set" where concrete will be visible after construction is complete.

4. Curing

Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures, and shall be maintained with minimum moisture loss at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete.

Initial curing shall immediately follow the finishing operation. One of the following materials or methods shall be used and as approved by the Engineer:

a. Ponding or continuous sprinkling using a regulated water application rate providing complete surface coverage with a minimum of runoff

b. Moisture-retaining fabric coverings such as burlap, cotton mats or rugs kept continuously wet

c. Sand or other approved covering kept continuously wet

d. Impervious paper or plastic sheeting material, such as polyethylene film, conforming to ASTM C171

e. Continuous steam not exceeding 150° F or vapor mist bath

f. Chlorinated rubber type membrane curing compound conforming to ASTM C309 may be used in lieu of water on concrete which will not be covered later with mortar or additional concrete. Membrane curing compound shall be spray applied at coverage of not more than 150 square feet per gallon. Unformed surfaces shall be covered with curing compound within 30 minutes after final finishing. If forms are removed before the end of the specified curing period, curing compound shall be immediately applied to the formed surfaces before they dry out. Curing compound shall be suitably protected against abrasion during the curing period.

Final curing methods shall be approved by the Engineer and may be the same as the initial process. The final curing shall continue for not less than 5 days unless the concrete compressive strength shown on the drawings has been reached and verified through additional test cylinders.

5. Construction Joints

All keyed and other construction joints shall be constructed as shown on the drawings. Joints not indicated on the drawings shall be so made and located as to least impair the strength of the structure and shall be approved by the Engineer. Where a joint is to be made, the surface of the concrete shall be thoroughly cleaned and all laitance removed; hand wire brushing is required as a minimum to remove laitance.

E. SPECIAL PLACEMENT PROCEDURES

1. Hot Weather Concreting

Details of concrete placement, curing and protection shall be submitted for review and approval when the weather forecast predicts temperatures of above 90º F. Ingredients, production methods, handling, placing, protection, and curing shall be in accordance with ACI 305R in order to prevent excessive concrete temperatures or water evaporation. Concrete shall not be placed when the evaporation rate is expected to be greater than 0.2 pounds per square foot per hour as determined by Figure 2.1.5 in ACI 305R. The mixed concrete when placed in the forms shall have a temperature no higher than 90º F. The concrete shall be protected with wet burlap mats or other approved materials as soon as it has hardened sufficiently to allow their placement. There will be no additional reimbursement to the Contractor for costs incurred for placing concrete in hot weather.

Suggested precautions to take during hot weather include but are not limited to:

1. Schedule placing and finishing of concrete during hours in which the ambient temperature will be lower than 90º F
2. Forms and reinforcing kept cool with acceptable methods such as covering with wet burlap for at least 12 hours prior to placing of concrete
3. Use ice as a water source during mixing or added at site
4. Use Type II Portland cement which has a lower heat of hydration

2. Cold Weather Concreting

Details of concrete placement, curing and protection shall be submitted for review and approval when the weather forecast predicts temperatures of below 50º F. Ingredients, production methods, handling, placing, protection, and curing shall be in accordance with ACI 306R. Concrete shall not be placed when the temperature is below 35º F. Concrete shall not be placed on frozen ground or against surfaces with temperatures lower than 35º F. The temperature of concrete as mixed and delivered shall be at least 55º F. The temperature of concrete as placed shall be at least 50º F. The temperature of concrete shall be maintained at 50º F for at least 3 days and the formwork not removed for at least 6 days or unless the concrete compressive strength shown on the drawings has been reached and verified through additional test cylinders. There will be no additional reimbursement made to the Contractor for costs incurred for placing concrete during cold weather.

Suggested precautions to take during cold weather include but are not limited to:

1. Heat aggregate or water or both. Aggregates shall not be heated higher than 150º F. The temperature of the aggregates and water combined shall not be higher than 100º F when the cement is added. The apparatus used shall heat the mass uniformly and avoid hot spots that will burn the material.
2. Curing within a weatherproof enclosure. When dry heat is used, at least 40% humidity shall be maintained. The exposed surfaces of the concrete shall be kept moist either by the application of steam or wet burlap mats. When the curing is complete, the temperature within the enclosure shall be lowered gradually at a rate not to exceed 3º F per hour, until the outside temperature is reached.
3. Insulated forms may be used at approved locations in lieu of enclosures. The Contractor shall secure written approval of the type of insulation, method of installation and the locations at which it is proposed for use.

F. CONSTRUCTION PROGRESSION

Do not place backfill until the concrete has obtained a compressive strength equal to the compressive strength specified on the drawings. Place the backfill uniformly on both sides where backfill is to be placed on both sides of the concrete.

Falsework and form removal from any structural concrete unit shall not be started until the concrete has attained at least 75 percent of the 28-day compressive strength as determined by cylinders made and cured in the field.

G. SPECIFIC TOLERANCES

The top of concrete for all piers shall be level and shall be the same elevation with a maximum differential of ¼ inch from the highest to the lowest. Anchor bolts when required shall be placed in accordance with the manufacturer's recommendations.

H. DEFECTIVE WORK

Damaged or defective concrete shall be repaired or removed and replaced immediately as directed by the Engineer. Examples of defective work include but are not limited to:

1. Work built outside tolerances
2. Concrete of inadequate strength
3. Concrete having surface conditions indicating poor durability such as crazing, crumbling, or "map cracking"
4. Minor faults such as small "honeycomb" areas and voids

The Engineer shall be notified immediately when such conditions become apparent. Repairs shall be as directed by the Engineer.

I. FIELD QUALITY CONTROL

1. Testing Agency: Contractor shall engage a qualified testing agency to perform tests and inspections.

2. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

   A. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

   B. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

   C. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

   D. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

   E. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.

   F. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

G. Compressive-Strength Tests: ASTM C 39; test one specimen at seven days and two specimens at 28 days.

H. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

3. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

4. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

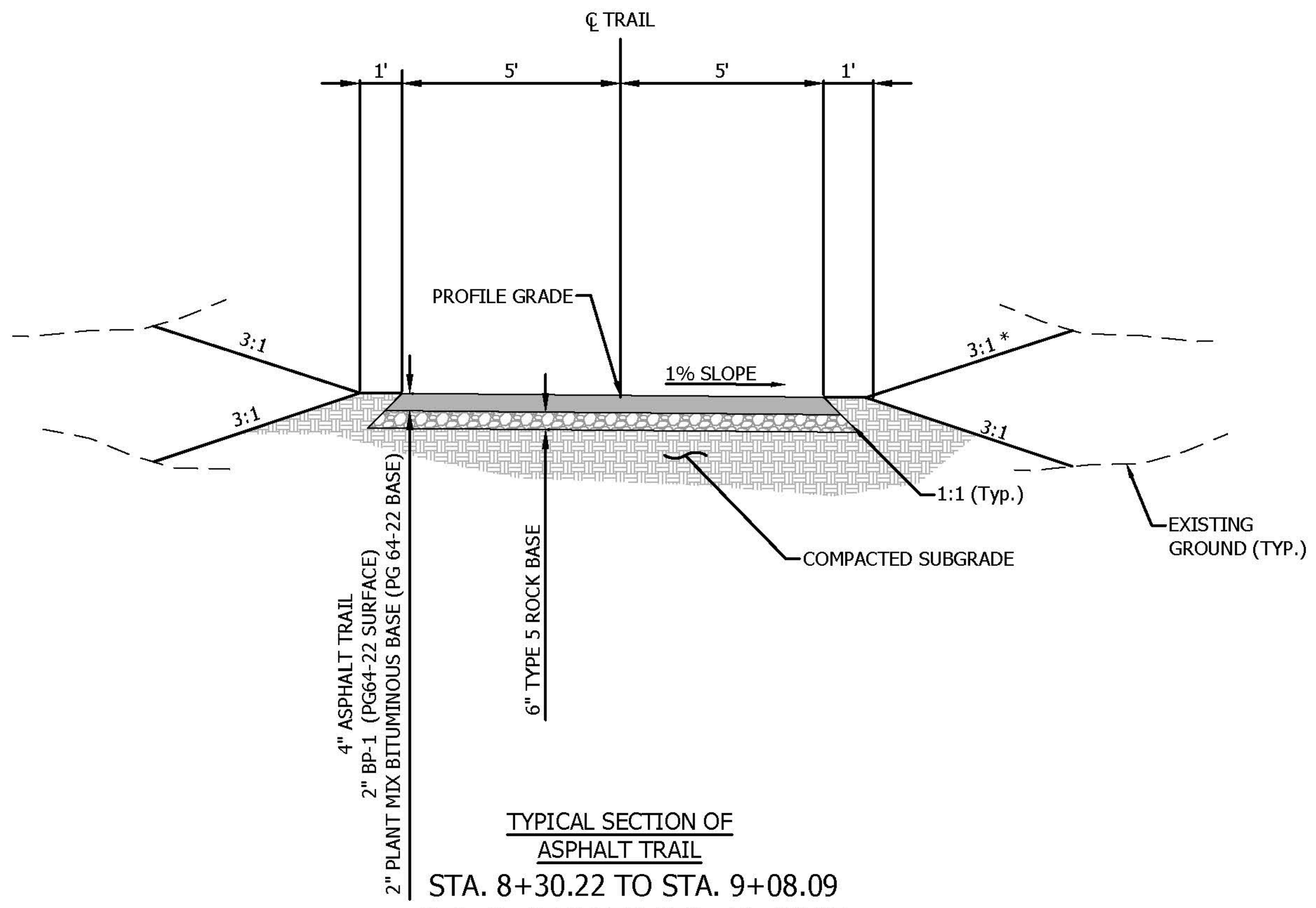
5. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.

6. Concrete paving will be considered defective if it does not pass tests and inspections.

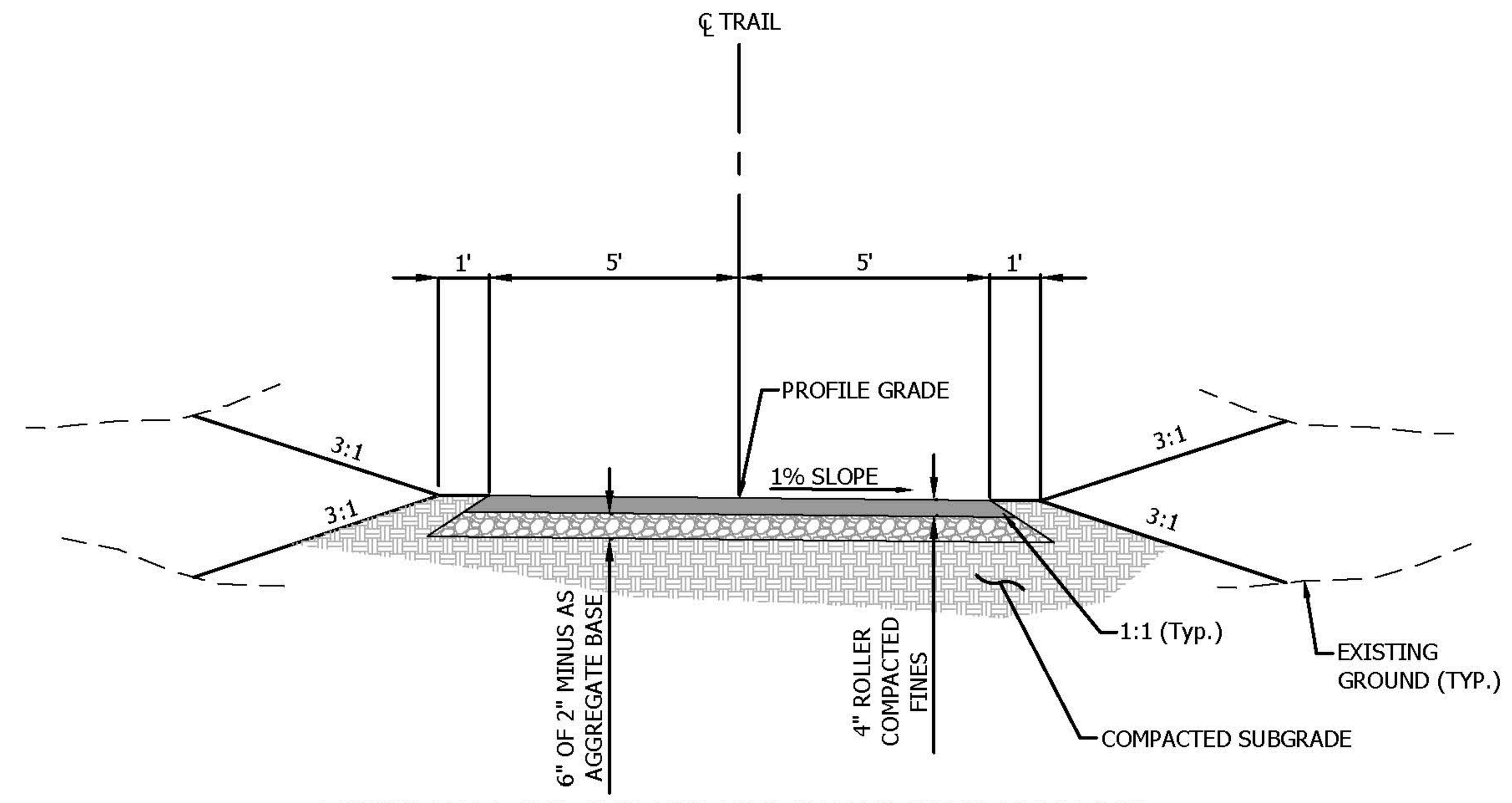
7. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

8. Prepare test and inspection reports.

END OF SECTION 03 3000



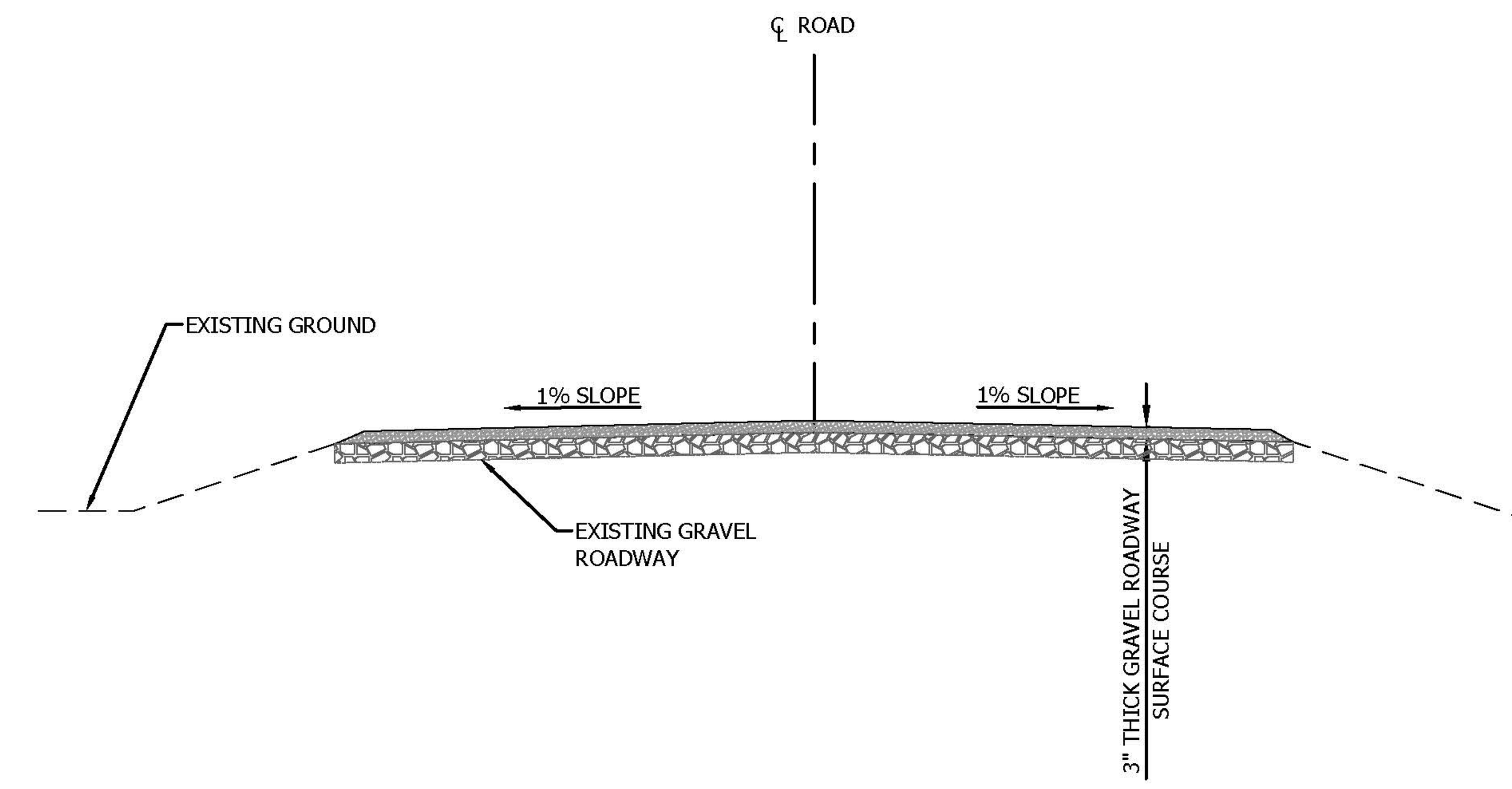
TYPICAL SECTION OF
ASPHALT TRAIL
STA. 8+30.22 TO STA. 9+08.09
STA. 9+37.64 TO STA. 16+92.27
*FROM STA. 11+75 TO STA. 13+25
CONTRACTOR TO USE 1.5:1 CUT SLOPES ON
THE RIGHT



TYPICAL TRAIL SECTION THRU AREA OF EXISTING McADOO TRAIL
STA. 16+92.27 TO STA. 57+56.15
STA. 68+37.12 TO STA. 78+00.00
STA. 79+00.00 TO STA. 81+75.00
STA. 86+25.00 TO STA 87+89.85

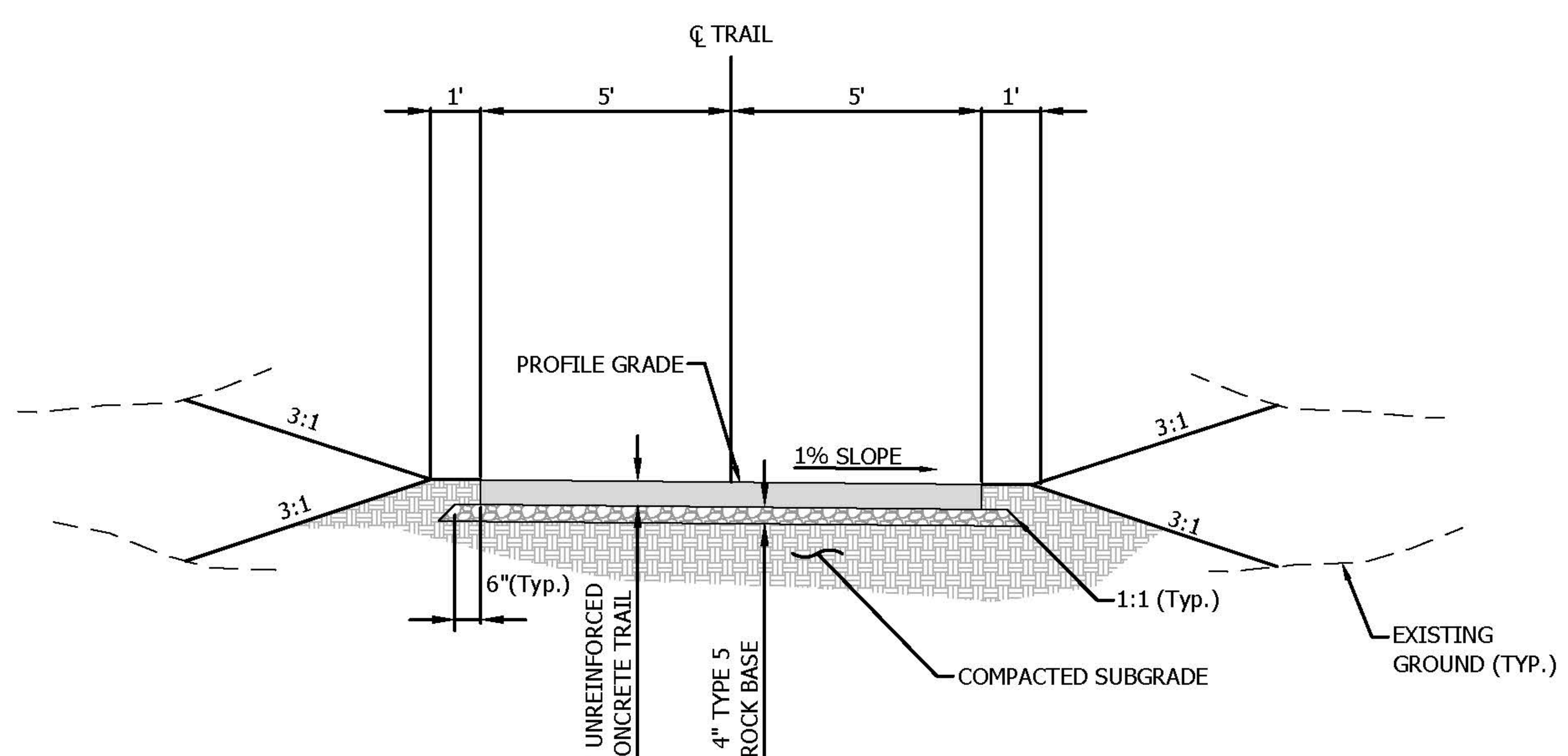
TYPICAL TRAIL SECTION OF McADOO TRAIL SPUR-WEST
STA. 0+10.00 TO STA. 0+50.47

TYPICAL TRAIL SECTION OF McADOO TRAIL SPUR-EAST
STA. 0+05.00 TO STA. 1+15.00



TYPICAL SECTION GRAVEL OVERLAY
STA. 57+56.15 TO STA. 68+37.12

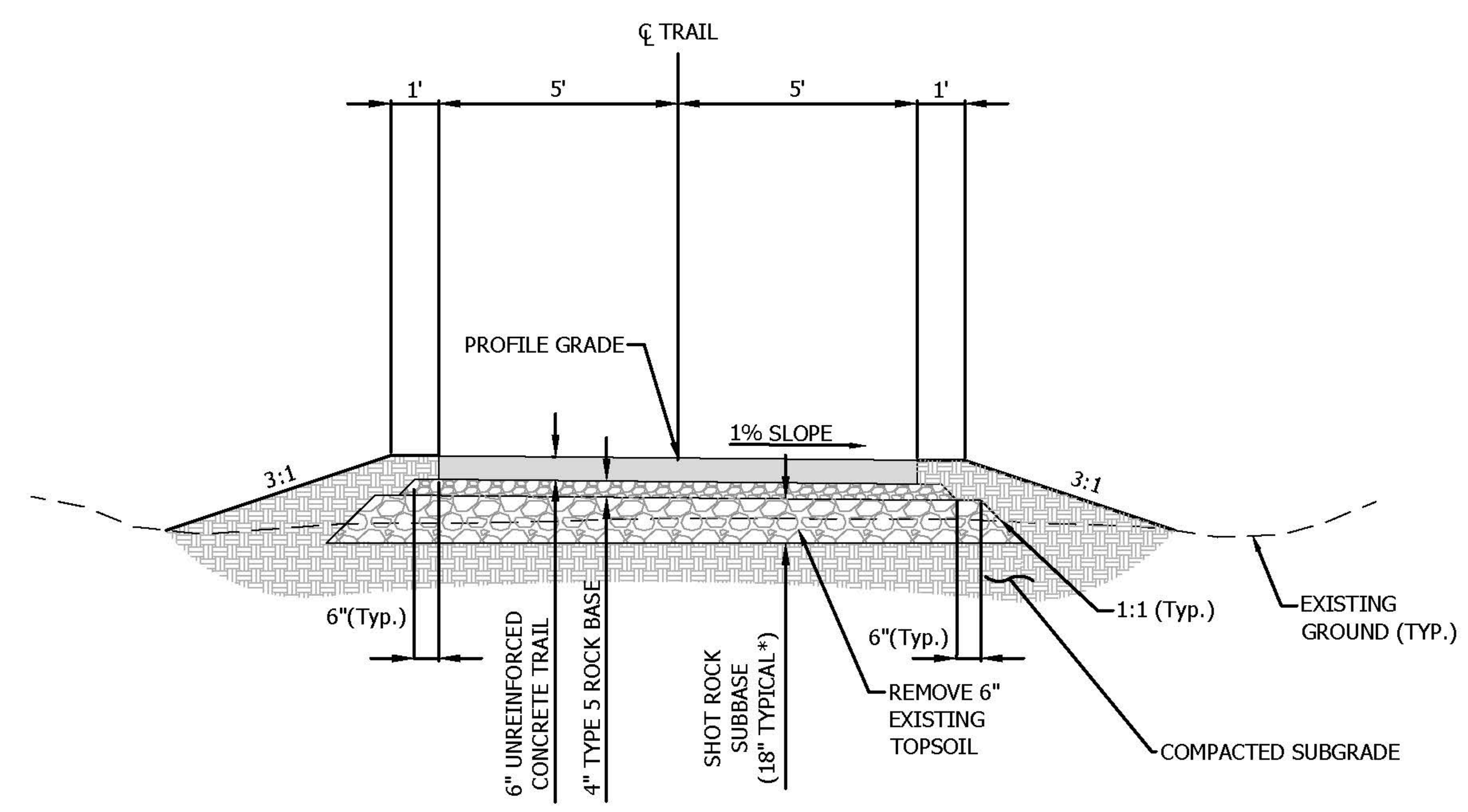
TYPICAL TRAIL SECTION OF BRIDGE SPUR
STA. 0+50.71 TO STA. 0+70.42



TYPICAL SECTION OF CONCRETE TRAIL
STA. 87+89.95 TO STA. 90+25.00 &
STA. 138+00.00 TO STA. 150+00.00 &
STA. 168+56.00 TO STA. 169+20.50

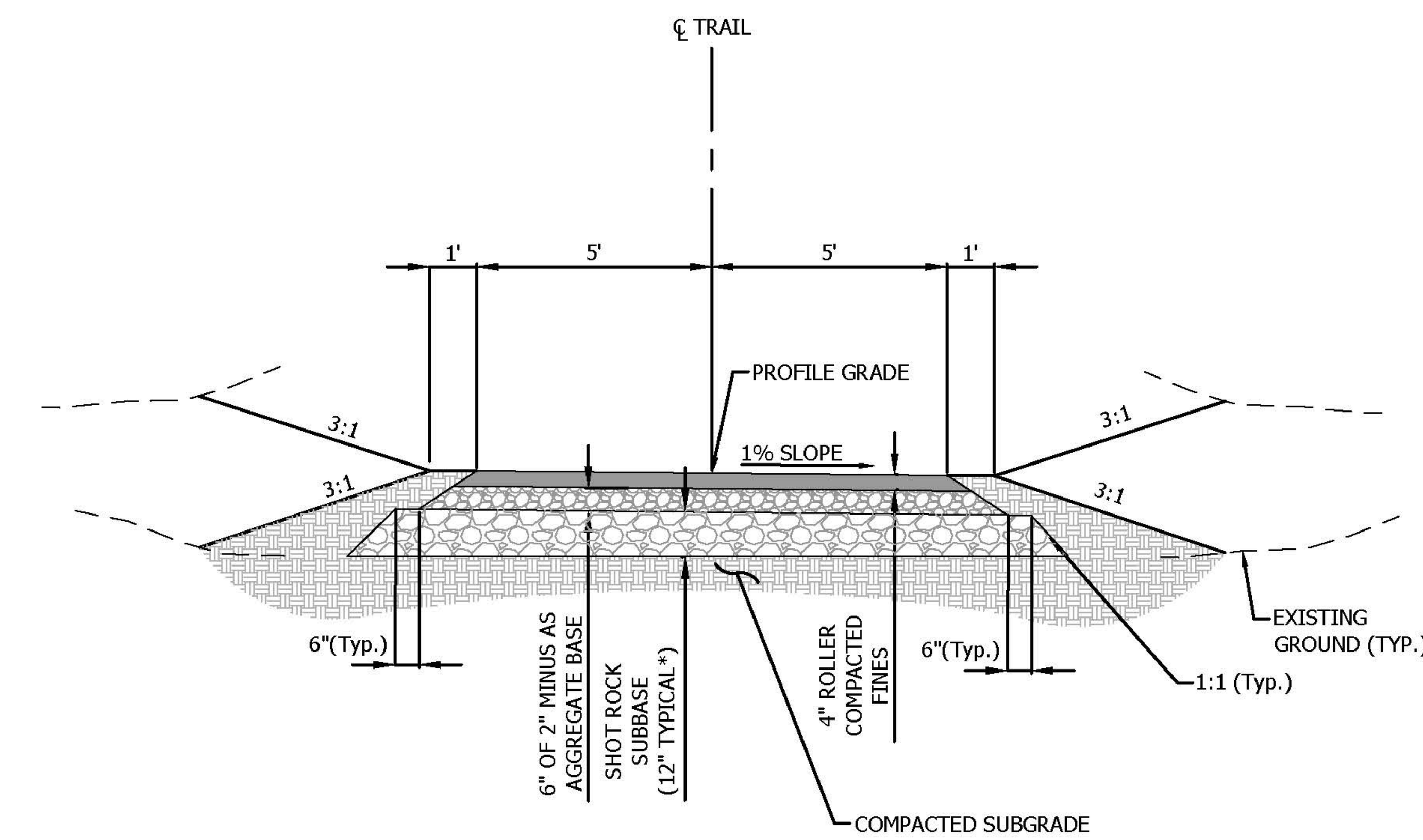
TYPICAL SECTION OF CONCRETE TRAIL - PARKING LOT SPUR*
STA. 0+05.00 TO STA. 1+39.41

*6' WIDE

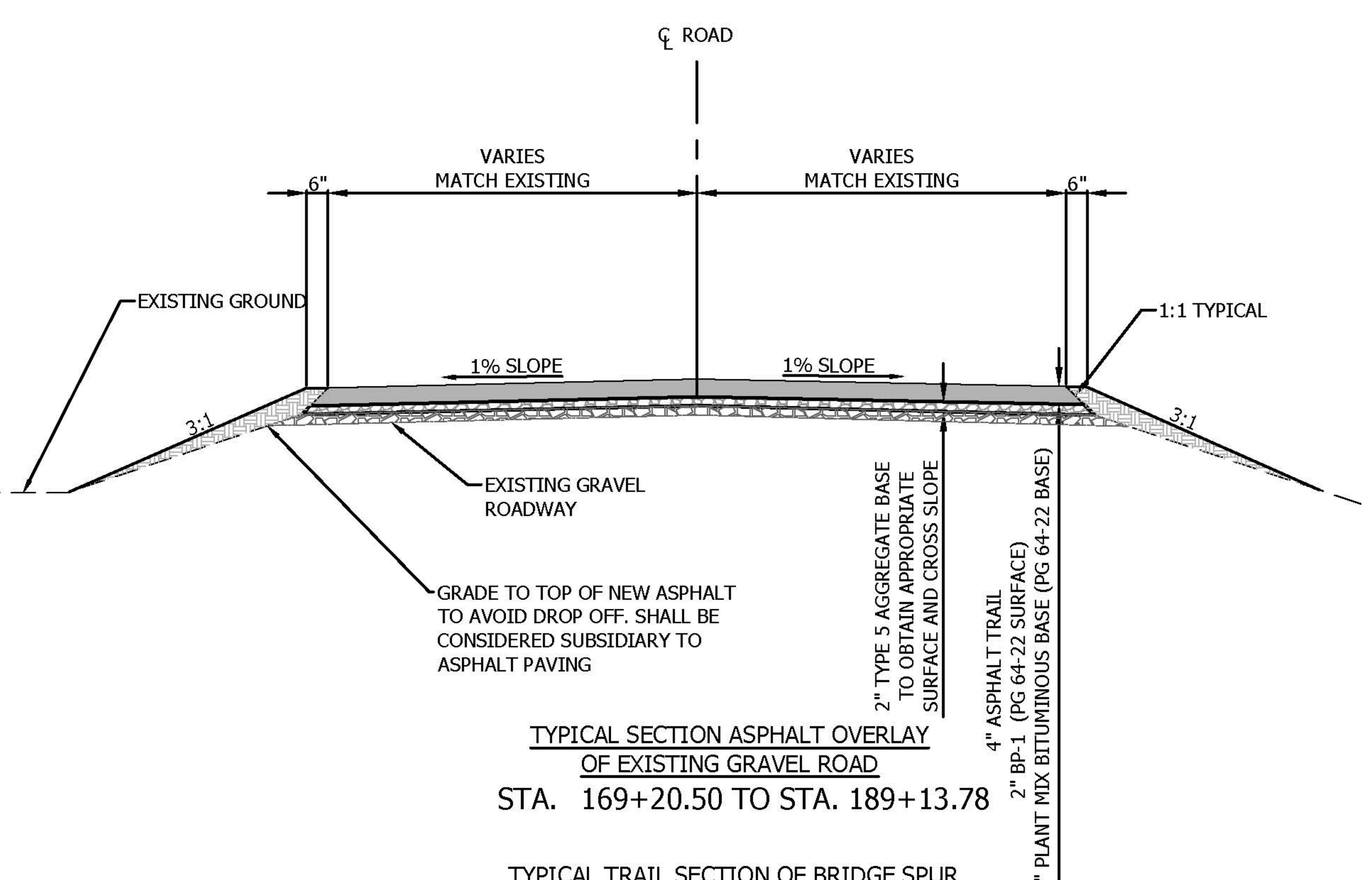


TYPICAL SECTION OF CONCRETE TRAIL REQUIRING
SUBGRADE STABILIZATION
STA. 90+25.00 TO STA. 99+85.93
&
STA. 150+00.00 TO STA. 167+06.00

*THICKNESS OF SHOT ROCK SUBBASE VARIES AS NEEDED TO FILL FROM APPROXIMATELY 6" BELOW EXISTING GROUND TO THE BOTTOM OF THE 4" TYPE 5 ROCK BASE.



TYPICAL SECTION OF AGGREGATE SURFACE WITH
SHOT ROCK STABILIZATION
STA. 78+00.00 TO STA. 79+00.00
&
STA. 81+75.00 TO STA. 86+25.00



TYPICAL SECTION ASPHALT OVERLAY
OF EXISTING GRAVEL ROAD
STA. 169+20.50 TO STA. 189+13.78

TYPICAL TRAIL SECTION OF BRIDGE SPUR
STA. 0+70.42 TO STA. 1+25.00

NOTES: NO TRAIL CROSS SLOPE SHALL EXCEED 2.00%.

DITCH SECTIONS FOR TYPICAL TRAIL NOT SHOWN. SEE SHEET C503 FOR DETAILS.

STATE OF MISSOURI
MICHAEL L. PARSON
GOVERNOR

STATE OF MISSOURI
AUSTIN K. JOHNSON
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DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION

DEPARTMENT OF NATURAL RESOURCES
MISSOURI STATE PARKS

PAVED BIKE/ PEDESTRIAN TRAIL, TRAIL NETWORK

KNOB NOSTER STATE PARK
PROJECT # X2226-01
SITE # 5305
ASSET # 7815305083

REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
ISSUE DATE:

CAD DWG FILE: C-001.dwg
DESIGNED BY: AKJ
DRAWN BY: TAA
APPROVED BY: AKJ

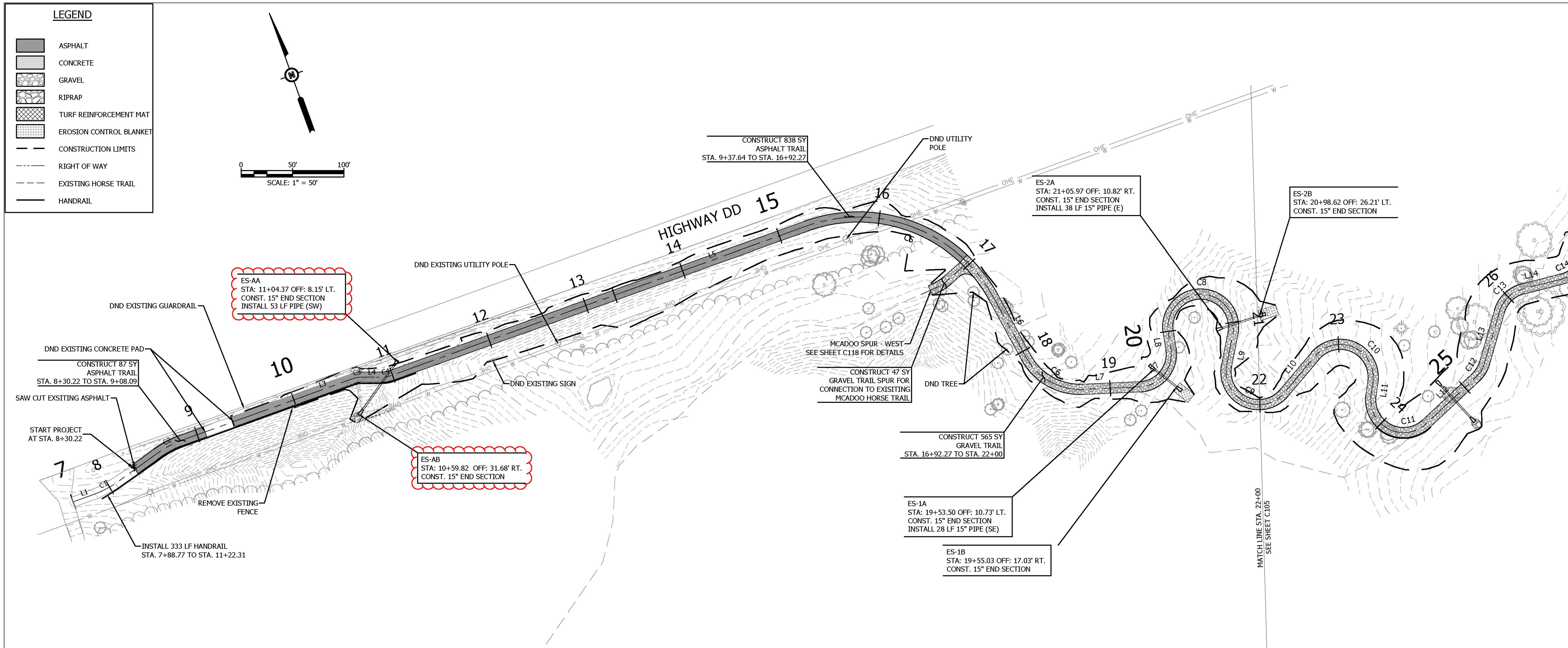
SHEET TITLE:

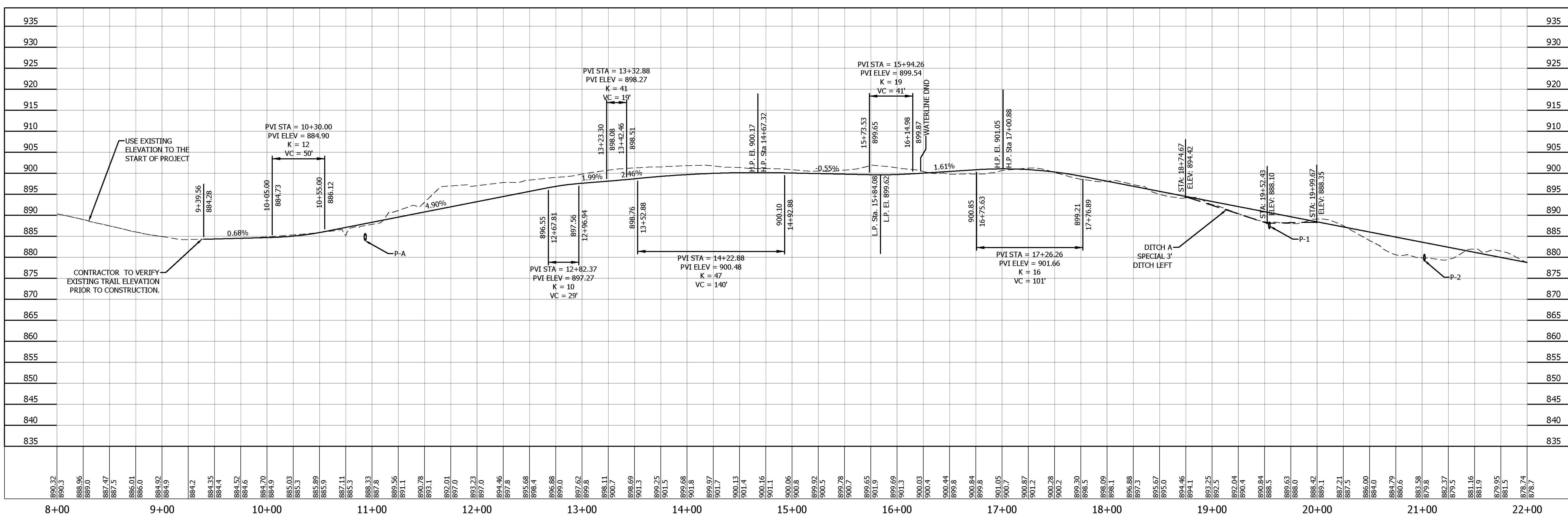
TYPICAL SECTIONS

SHEET NUMBER:

C001

3 of 95 SHEETS





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REVISION:
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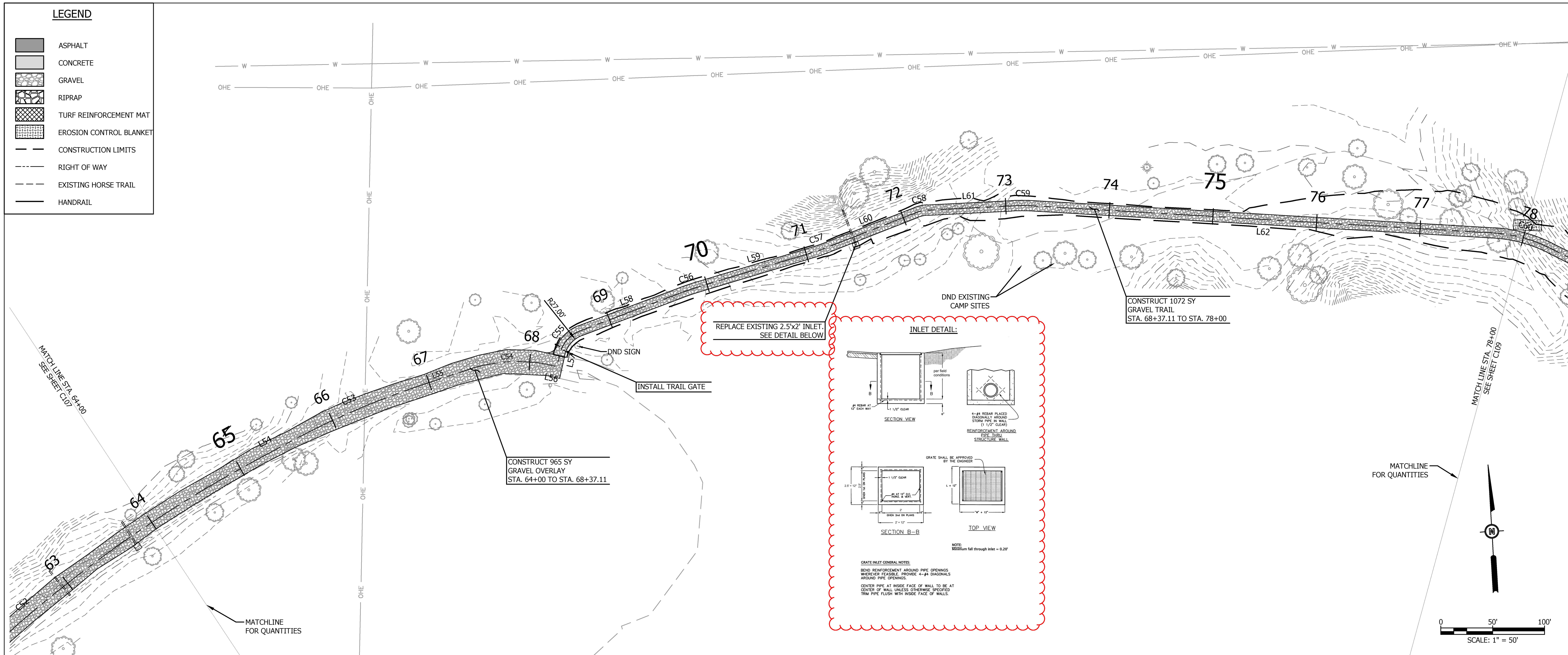
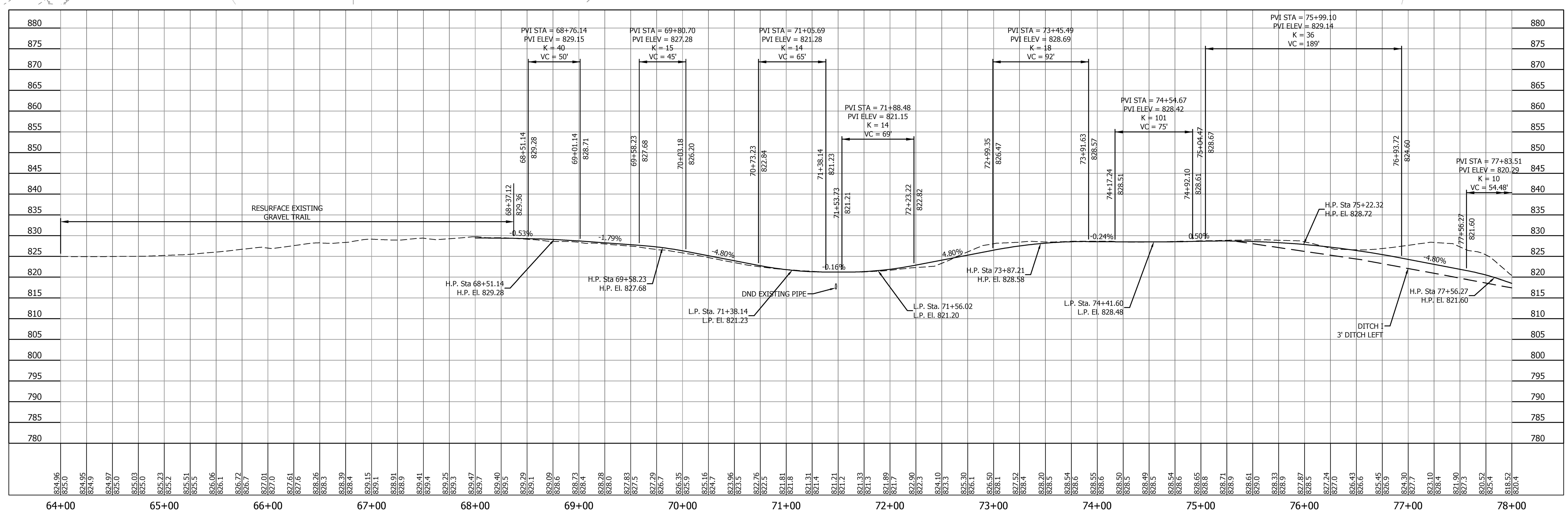
ISSUE DATE:

CAD DWG FILE: C-104.dwg
DESIGNED BY: AKJ
DRAWN BY: KME
APPROVED BY: AKJ

SHEET TITLE:
PLAN PROFILE
MAIN TRAIL

SHEET NUMBER:
C104


LEGEND
ASPHALT
CONCRETE
GRAVEL
RIPRAP
TURF REINFORCEMENT MAT
EROSION CONTROL BLANKET
CONSTRUCTION LIMITS
RIGHT OF WAY
EXISTING HORSE TRAIL
HANDRAIL
MATCH LINE STA. 64+00
SEE SHEET C107
MATCHLINE
FOR QUANTITIES
CONSTRUCT 965 SY
GRAVEL OVERLAY
STA. 64+00 TO STA. 68+37.11
DND SIGN
INSTALL TRAIL GATE
REPLACE EXISTING 2.5'x2' INLET.
SEE DETAIL BELOW
INLET DETAIL:
SECTION VIEW
SECTION B–B
TOP VIEW
DND EXISTING
CAMP SITES
CONSTRUCT 1072 SY
GRAVEL TRAIL
STA. 68+37.11 TO STA. 78+00
MATCH LINE STA. 78+00
SEE SHEET C109
MATCHLINE
FOR QUANTITIES
SCALE: 1" = 50'


RESURFACE EXISTING
GRAVEL TRAIL
PVI STA = 68+76.14
PVI ELEV = 829.15
K = 40
VC = 50'
PVI STA = 69+80.70
PVI ELEV = 827.28
K = 15
VC = 45'
PVI STA = 71+05.69
PVI ELEV = 821.28
K = 14
VC = 65'
PVI STA = 71+88.48
PVI ELEV = 821.15
K = 14
VC = 69'
PVI STA = 73+45.49
PVI ELEV = 828.69
K = 18
VC = 92'
PVI STA = 74+54.67
PVI ELEV = 828.42
K = 101
VC = 75'
PVI STA = 75+99.10
PVI ELEV = 829.14
K = 36
VC = 189'
PVI STA = 77+83.51
PVI ELEV = 820.29
K = 10
VC = 54.48'
H.P. Sta 68+51.14
H.P. El. 829.28
H.P. Sta 69+58.23
H.P. El. 827.68
DND EXISTING PIPE
L.P. Sta. 71+38.14
L.P. El. 821.23
L.P. Sta. 71+56.02
L.P. El. 821.20
H.P. Sta 73+87.21
H.P. El. 828.58
L.P. Sta. 74+41.60
L.P. El. 828.48
H.P. Sta 75+22.32
H.P. El. 828.72
H.P. Sta 77+56.27
H.P. El. 821.60
DITCH
3' DITCH LEFT
64+00
65+00
66+00
67+00
68+00
69+00
70+00
71+00
72+00
73+00
74+00
75+00
76+00
77+00
78+00

Drawing Name: C:\pwdata\topeka01\kme01739\bartwest.com\d0106032\C-104.dwg Layout Name: 64+00 to 78+00 Plotted By: KME01739 Plotted on: 9/25/2023 11:31:57 AM

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KNOB NOSTER STATE PARK

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ASSET # 7815305083

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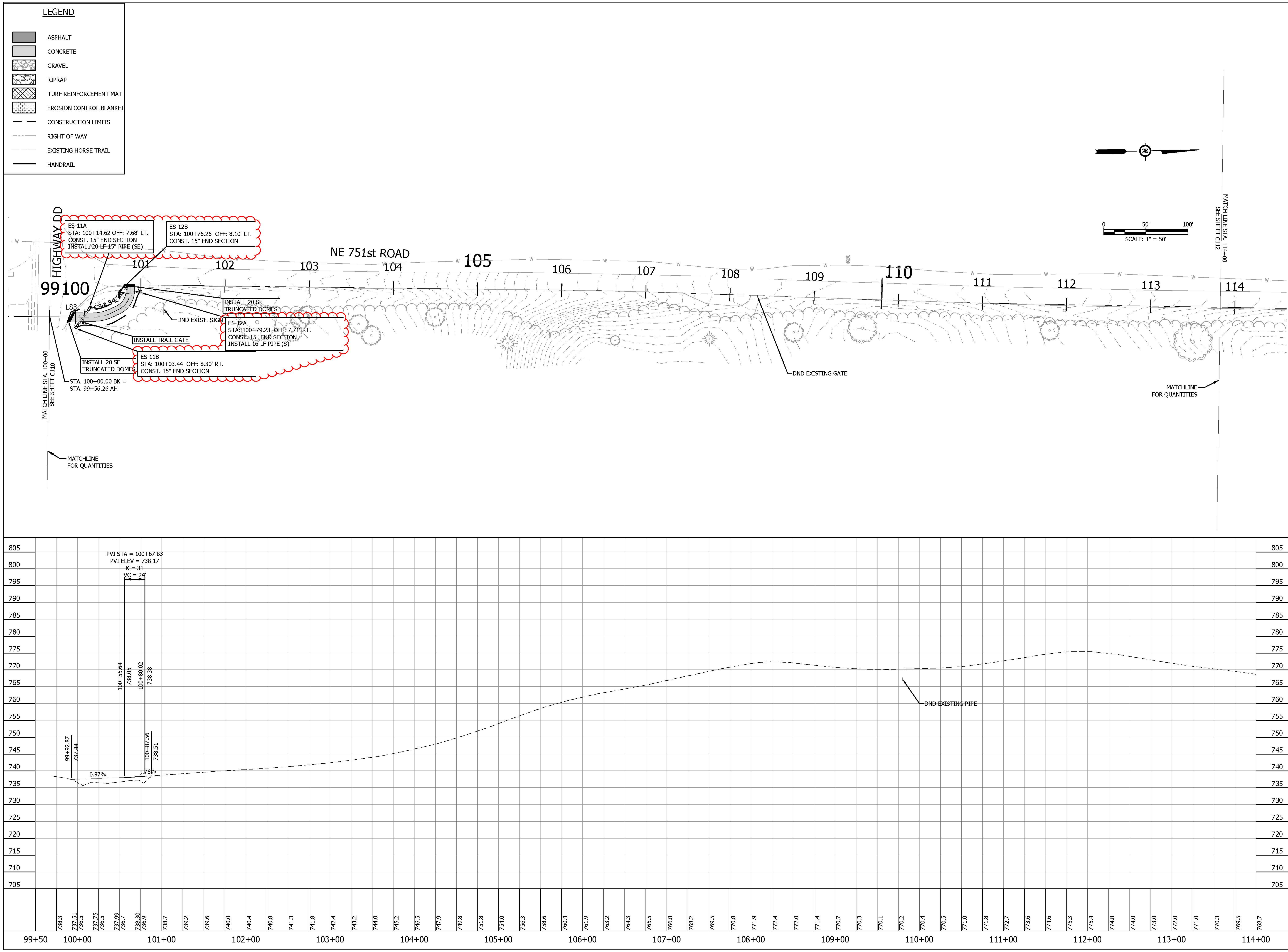
CAD DWG FILE: C-104.dwg
DESIGNED BY: DESIGNED
DRAWN BY: DRAWN
APPROVED BY: AKJ

SHEET TITLE:
PLAN PROFILE
MAIN TRAIL

SHEET NUMBER:
C108
17 of 95 SHEETS



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20 of 95 SHEETS