SOUTH DAKOTA DEPARTMENT OF
GAME, FISH AND PARKS
523 EAST CAPITOL AVENUE | PIERRE, SD 57501

ADDENDUM NO. 01
08/25/2026

Project Title: **Comfort Station-Expand @ #1**
Location: **West Bend Recreation Area**
Project No. **Wben25Pa**

Bid Opening Date: **August 27, 2026 3:00 PM CT**
Department of Game, Fish and Parks
GF&P Bidding Website (Remotely)

Owner: State of South Dakota
Department of Game, Fish and Parks

Scope of this Addendum:

- The following becomes a part of the original plans and specifications, taking precedence over the items that may conflict. The bidder shall note receipt and make acknowledgment of the addendum on his bid form, incorporating its provisions in his bid.

- **The Bid opening date will not be extended.**

ADDENDUM CONTENTS

SOUTH DAKOTA DEPARTMENT OF
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ARTICLE 1 – REVISIONS TO THE PLAN DRAWINGS

SOUTH DAKOTA DEPARTMENT OF
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Article 1

The following are written revisions to the Drawings and are binding without reissue of the affected sheets. Bidders shall mark their sets accordingly.

1.01 VOID DETAIL - SHAKE SIDING

The detail depicting shake siding is VOID and shall be disregarded in its entirety. The addition is concrete masonry unit construction throughout, with metal roof panels per Section 07 41 13. No wood siding, shake siding, or associated trim is required. (Pre-Bid Item F-3.)

1.02 DOOR SWING DIRECTION

Both family restroom doors shall swing to the north (outward, away from prevailing winds), reversing the swing shown on the Floor Plan. Door hardware handing in the Door Schedule shall be revised accordingly; hardware sets are otherwise unchanged.

Maneuvering clearances at each door shall comply with ICC A117.1 for the revised approach direction. Contractor shall verify clearances in the field prior to frame installation and notify the Engineer of any condition that cannot be met.

1.03 PROPANE SYSTEM RELOCATION

ADD to the Contract scope: relocation of the existing exterior liquid propane service line to the exterior of the new addition, and relocation of the propane tank and pad.

- Existing LP service line to be relocated to the exterior face of the new addition; new routing and connection points as required.
- Propane tank to be relocated within the same general area, set clear of the new addition with clearances per NFPA 58 and the LP supplier's requirements.
- New concrete pad to be provided for the relocated tank. Existing pad to be removed and disposed of.
- Coordination with the LP supplier and all disconnect/reconnect and purging is the Contractor's responsibility.

1.04 ISOLATION VALVES

Two isolation valve assemblies are required within the mechanical chase as described in Item 2.07.B. Where the plan shows a single valve, provide two as specified.

1.05 SPACE HEATERS

Provide one (1) electric space heater in each family restroom - two (2) total. No heater is required in the mechanical chase; the Park will furnish and install its own heat in the chase space. (Pre-Bid Item D-1.)

The Contractor shall provide a dedicated circuit, disconnect, and junction box in the chase for the Owner-furnished chase heater. Final connection of the Owner-furnished unit is not in the Contract scope.

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ARTICLE 2 – REVISIONS TO THE SPECIFICATIONS

Article 2

2.01 SECTION 04 22 00 - CONCRETE UNIT MASONRY

ADD the following to Paragraph 2.1:

Integral water repellent: Provide concrete masonry units and mortar manufactured with an integral polymeric water-repellent admixture (basis of design: W. R. Grace Dry-Block, ACM Chemistries RainBloc, or approved equal). Admixture shall be used in both units and mortar; use in units alone is not acceptable.

ADD the following to Paragraph 3.2:

Efflorescence: Protect masonry from moisture during construction. Cover walls at the end of each work day and during precipitation. Clean efflorescence prior to application of interior coatings specified in Section 09 90 00.

2.02 SECTION 07 41 13 - METAL ROOF PANELS

CLARIFICATION - Factory finish versus field painting (Pre-Bid Item E-3):

Roof panels shall receive the manufacturer's factory-applied finish, color selected to match the existing 1991 building roof. **Field painting of metal roof panels is NOT required and shall not be included in the bid.** Any drawing note or detail directing that roof panels be painted to match is hereby VOID.

ADD to Paragraph 1.3, Submittals: Submit color chip for Engineer approval against existing roof prior to fabrication.

2.03 SECTION 09 67 23 - RESINOUS FLOORING (NEW SECTION - ADD)

ADD new Section 09 67 23 to the Technical Specifications. This section resolves Pre-Bid Item I-1. The full section is attached to this Addendum.

Summary of requirements:

- Two-component epoxy resinous floor system, nominal 3/16-inch total thickness, applied to the finished concrete slab in both family restrooms and at the shower areas.
- Integral coved base, 4 inches high minimum, at all wall-to-floor junctions, including at the shower trench drain perimeter.
- Surface preparation: mechanical shot blast or diamond grind to CSP 3–4 per ICRI 310.2R. Acid etching is not permitted.
- Slip resistance: broadcast aggregate finish, minimum dynamic coefficient of friction 0.42 per ANSI A326.3, wet.
- Moisture testing per ASTM F2170 prior to application; relative humidity not to exceed system manufacturer's limit.
- Basis of design: Sherwin-Williams General Polymers, Tnemec, or approved equal.

This system replaces any reference to a concrete sealer or curing/sealing compound as the finished floor treatment in the restrooms. Curing compounds remain as specified for slab curing only, and shall be compatible with the resinous flooring system or removed prior to its application.

2.04 SECTION 06 64 00 - PLASTIC PANELING (NEW SECTION - ADD)

ADD new Section 06 64 00. Summary of requirements:

- Fiberglass reinforced plastic (FRP) liner panels at restroom ceilings and at wall surfaces where indicated.
- Panel: 0.090-inch nominal thickness, white, embossed finish, Class A flame spread per ASTM E84. Basis of design: Duramax, Crane Composites Glasbord, or approved equal.
- Trim: matching PVC or aluminum division bars, inside/outside corners, and cap trim at all panel edges and terminations.
- Fastening and adhesive per panel manufacturer's written instructions for high-humidity interiors; sealant at all trim joints per Section 07 92 00.
- Panels shall be installed over a continuous substrate. Coordinate substrate with the ceiling assembly.

2.05 SECTION 09 90 00 - PAINTING AND COATING

ADD the following interior CMU finish system (Pre-Bid Item F-2):

- Block filler: high-build cementitious or epoxy block filler, one coat, applied to all exposed interior CMU.
- Finish: two coats water-based catalyzed epoxy, semi-gloss, at all interior CMU surfaces in the family restrooms.
- Surfaces concealed by FRP liner panels under Section 06 64 00 require block filler only.

2.06 SECTION 10 28 00 - TOILET ACCESSORIES

A. DELETE Paragraph 2.1.C in its entirety.

Deleted text: ~~"Baby changing station: provide one per family restroom, surface-mounted, ADA-compliant deployed height."~~

Baby changing stations are not required. Bidders shall NOT carry these units. (Pre-Bid Item I-2.)

B. REVISE Paragraph 2.1.A.4 to read as follows:

Robe hooks: ASI 0751A, stainless steel. Provide four (4) per family restroom - two (2) at the vanity and two (2) at the shower. In each room, not fewer than one (1) hook shall be mounted within the accessible reach range, 48 inches maximum above finished floor; remaining hooks may be mounted at 60 inches maximum above finished floor. Hooks shall not protrude more than 4 inches into the circulation path between 27 and 80 inches above finished floor. (Pre-Bid Item I-3.)

C. ADD new Paragraph 2.1.D:

Shower curtain rod: ASI 1214, 1-inch diameter stainless steel, length as required, with concealed mounting flanges anchored to grouted CMU cells or solid blocking. Provide one (1) per family restroom.

Shower curtain: ASI 1200-V, vinyl, antibacterial, matching rod length, with corrosion-resistant hooks. Provide one (1) per family restroom.

The shower curtain and rod are included in the Contract scope and shall be furnished and installed by the Contractor.

D. ADD new Paragraph 2.1.E - Hand Dryers (Pre-Bid Item D-2):

Hand dryer: surface-mounted, ADA-compliant, high-speed, cast or stainless steel cover, 120V. Basis of design: Excel XLERATOR XL-SB with recessed mounting kit, World Dryer SLIMdri, or approved equal. Provide one (1) per family restroom.

Mounting: Where the unit projects more than 4 inches from the wall, install in a recess kit or mount with the leading edge at 27 inches maximum above finished floor so the unit is cane-detectable. Operable part shall be within reach range, 48 inches maximum above finished floor. Refer to Section 26 for circuiting.

2.07 SECTION 22 11 16 - DOMESTIC WATER PIPING

A. ADD to Paragraph 1.1, Summary:

Work includes replacement of the existing curb stop and curb box serving the facility, including excavation, new curb stop, new curb box and lid set to finished grade, backfill, compaction, and surface restoration. (Pre-Bid Item B-1.)

B. ADD to Paragraph 2.1, Valves (Pre-Bid Item B-2):

Provide two (2) full-port ball valve isolation assemblies within the mechanical chase, downstream of the point where the service enters the chase: one (1) serving the existing comfort station restrooms and existing water demand, and one (1) serving the two new family restrooms and the chase space. Valves shall be accessible without removal of finish materials and shall be tagged in accordance with Section 22 05 53.

C. ADD to Paragraph 2.1, Insulation (Pre-Bid Item B-4):

Insulate all new domestic water piping with 1-inch preformed fiberglass pipe insulation with all-service jacket, ASTM C547. In addition, remove and replace existing water supply piping insulation within the mechanical chase and the existing mechanical room to match. Insulation exposed in the chase shall meet flame spread 25 / smoke developed 450.

2.08 SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

A. REVISE floor drain material (Pre-Bid Item C-1):

Floor drains in the new family restrooms shall be PVC body with stainless steel strainer, in lieu of cast iron. All floor drains shall be trap-primed or provided with a trap seal protection device. Contractor shall verify acceptability of the specified drain assembly under ARSD 20:54 prior to submittal.

B. ADD to Paragraph 1.1, Summary (Pre-Bid Item G-2):

Work includes relocation of the existing wastewater cleanouts that conflict with the new construction, including new cleanout risers, covers set flush to finished grade, and reconnection to the existing service. Invert and rim elevations shall be field verified prior to construction.

2.09 SECTION 22 42 00 - COMMERCIAL PLUMBING FIXTURES

A. ADD new Paragraph 2.1.E - Shower valves and controls (Pre-Bid Item C-3):

Shower valve: pressure-balancing, thermostatic mixing type with high-limit stop set to 110 °F maximum, vandal-resistant metering or push-button control, ADA-compliant operating force not exceeding 5 pounds. Controls shall match those installed at the existing West Bend comfort station; Contractor shall field verify the existing installation prior to submittal.

Provide a stainless steel access cover on the mechanical chase side of the shower wall, sized to permit full valve service, secured with tamper-resistant fasteners.

Provide isolation valves within the chase permitting each shower and lavatory group to be shut off without interrupting service to the balance of the facility.

B. Countertops - NO CHANGE (Pre-Bid Item I-6).

Bidders are directed to Section 22 42 00, Paragraph 2.1.D: cultured marble by Dakota Marble, Inc., Yankton, South Dakota (GF&P library basis of design). No revision is made by this Addendum.

2.10 SECTION 01 10 00 - SUMMARY OF WORK

A. ADD - Campground closure and construction window (Pre-Bid Item H-1):

The campground will be closed for the duration of the construction period. Utility shutoffs and removal of the existing comfort station from service are permitted within the approved construction window and are not anticipated to conflict with public use. Contractor shall provide the Park Manager not less than 48 hours' written notice prior to any utility interruption.

B. ADD - Disposal of excavation spoils (Pre-Bid Item G-5):

Excess excavation spoils shall be placed at a location on Park property designated by Park staff at the time of construction. Haul distance for bidding purposes shall be assumed not to exceed one (1) mile within the Recreation Area. No off-site disposal is anticipated.

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ARTICLE 3 – REVISIONS TO THE ESTIMATE OF QUANTITIES / BID SCHEDULE

Article 3 - Estimate of Quantities

No.	Description	Units	Quantity
1	Mobilization	LS	1
2	Topsoil Strip, Salvage and Place	CY	7.5
3	Unclassified Excavation	CY	96.6
4	Concrete Sidewalks - 4”	CY	4
5	Sidewalk Compacted Base Course - 4”	TON	15
6	Foundation - 6" Concrete Slab + 18" Thickened Edge	CY	15
7	Foundation - 18" Crush Rock 1" +-	CY	20
8	F&I 1-1/4” HDPE Waterline	LF	40
9	F&I 1-1/4” Water Service Tie-In (Inside Chase)	LS	1
10	F&I 1-1/4” Stop and Waste	EA	2
11	Remove/Replace Existing 2" Curb Stop	EA	1
12	F&I Electrical Service Sub Panel	LS	1
13	F&I 4” Gravity Sewer Line	LF	20
14	Comfort Station Addition - Complete	LS	1
15	Traffic Control	LS	1

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ARTICLE 4 – BIDDER QUESTIONS AND RESPONSES

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Article 4

The following responses are issued in accordance with Instructions to Bidders, Paragraph 7.

Item	Question	Response
I-1	Is a concrete floor sealer or treatment part of the scope?	Yes. An epoxy resinous floor system with integral coved base is required. See Item 2.03 and new Section 09 67 23.
I-2	The specification requires baby changing stations, but none are shown. Should two be carried?	No. Baby changing stations are deleted. Do not carry these units. See Item 2.06.A.
I-3	Does the specification require four robe hooks per room?	Yes. Four per room - two at the vanity and two at the shower. At least one hook per room within accessible reach range. See Item 2.06.B.
I-4	Is there a specification for the ceiling liner?	Yes. FRP liner panel, Duramax or approved equal. See Item 2.04 and new Section 06 64 00.
I-5	Are the shower curtain and rod furnished by the Owner?	No. Curtain and rod are included in the Contract scope, furnished and installed by the Contractor. See Item 2.06.C.
I-6	Is there a specification for the countertop?	Yes - Section 22 42 00, Paragraph 2.1.D. Cultured marble by Dakota Marble, Inc., Yankton, SD. No change.
A-1	Will the exterior LP gas line be relocated to the new addition?	Yes. See Article 1.
A-2	Will the propane tank and concrete pad be moved?	Yes. Tank relocated in the same general area, clear of the addition; new pad provided; existing pad removed and disposed of. See Article 1.
B-1	Is the curb stop being replaced?	Yes. See Item 2.07.A.
B-3	Is heat trace required on the water supply?	No, Park intends to keep the mechanical chase heated.
B-4	Is insulation required on the water lines?	Yes, on new piping; existing insulation is also to be replaced. See Item 2.07.C.
C-1	Are floor drains intended to be cast iron?	No. PVC body with stainless strainer. See Item 2.08.A.
D-2	What hand dryers are required, at what height, and how do they meet ADA?	See Item 2.06.D.
E-1	Is the roof framed with engineered trusses or with rafters?	The roof will be framed with rafters and ledger board.
E-3	Metal roofing finish: factory finish or field paint?	Factory finish. Do not carry field painting of roof panels. See Item 2.02.
F-3	A detail shows shake siding on the comfort station.	The shake siding detail is not applicable and is VOID. The addition is CMU throughout. See Article 1.
F-4	Existing doors swing north; plans show south-swinging doors on the addition.	See Article 1.
G-5	Where are excavation spoils to be placed?	At a location designated by Park staff. See Item 2.10.B.

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ARTICLE 5 – GEOTECHNICAL REPORT & REPORT ADDENDA

GEOTEK ENGINEERING
& TESTING SERVICES, INC.
909 East 50th Street North
Sioux Falls, South Dakota 57104
Phone 605-335-5512 Fax 605-335-0773

March 5, 2026

South Dakota Department of Game, Fish & Parks
523 East Capitol Avenue
Pierre, South Dakota 57501

Attn: Sean Campbell

Subj: Geotechnical Exploration
Proposed Building Addition
West Bend Recreational Area
Westbend Road
Hughes County, South Dakota
GeoTek #26-0191

This correspondence presents our written report of the geotechnical exploration program for the referenced project. Our work was performed in accordance with your authorization. We are transmitting an electronic copy of our report for your use.

We thank you for the opportunity of providing our services on this project and look forward to continued participation during the design and construction phases. If you have any questions regarding this report, please contact our office at (605) 335-5512.

Respectfully Submitted,
GeoTek Engineering & Testing Services, Inc.

Cody Osthus

Cody Osthus, PE
Staff Engineer

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GEOTECHNICAL EXPLORATION
PROPOSED BUILDING ADDITION
WEST BEND RECREATIONAL AREA
WESTBEND ROAD
HUGHES COUNTY, SOUTH DAKOTA
GEOTEK #26-0191

INTRODUCTION

Project Information

This report presents the results of the recent geotechnical exploration program for the proposed building addition located at the West Bend Recreational Area in Hughes County, South Dakota.

Scope of Services

Our work was performed in accordance with the authorization of Sean Campbell with the South Dakota Department of Game, Fish & Parks. The scope of work as presented in this report is limited to the following:

1. To perform 1 standard penetration test (SPT) boring to gather data on the subsurface conditions at the site.

2. To perform laboratory tests that include moisture content, dry density and sieve analysis (#200 wash).

3. To prepare an engineering report that includes the results of the field and laboratory tests as well as our earthwork and foundation recommendations for design and construction.

The scope of our work was intended for geotechnical purposes only. This scope of work did not include determining the presence or extent of environmental contamination at the site or to characterize the site relative to wetlands status.

SITE & SUBSURFACE CONDITIONS

Site Location & Description

The site is located at the West Bend Recreational Area in Hughes County, South Dakota. A site location map (Figure 1) is attached showing the location of the site. The current site has an existing building, vegetation, existing roads and numerous trees. The building addition will be located on the west side of the existing comfort station building.

Ground Surface Elevation & Test Boring Location

The ground surface elevation at the test boring location was determined by using the finished floor of the existing comfort station building as a benchmark. An arbitrary elevation of 100.0 feet was used for the benchmark. Based on the benchmark datum, the ground surface elevation at the test boring location was 99.9 feet. A test boring location map (Figure 2) is attached at the conclusion of this report showing the relative location of the test boring.

Subsurface Conditions

One (1) test boring was performed at the site on February 12, 2026. The subsurface conditions encountered at the test boring location are illustrated by means of a boring log included in Appendix A.

The subsurface profile at the test boring location consisted of a layer of existing fill materials overlying coarse alluvium soils. The existing fill materials at the test boring location extended down to a depth of 4 ½ feet. The coarse alluvium soils extended to the termination depth of the test boring.

The consistency or relative density of the soils is indicated by the standard penetration resistance ("N") values as shown on the boring log. A description of the soil consistency or relative density based on the "N" values can be found on the attached Soil Boring Symbols and Descriptive Terminology data sheet.

We wish to point out that the subsurface conditions at other times and locations at the site may differ from those found at our test boring location. If different conditions are encountered during construction, then it is important that you contact us so that our recommendations can be reviewed.

Soil Types

Existing Fill Materials

The existing fill materials consisted of sandy lean clay (CL). The moisture condition of the existing fill materials was frozen and moist.

Coarse Alluvium Soils

Coarse alluvium soils are soils with less than 50 percent by weight passing the #200 sieve that have been deposited by moving water. The coarse alluvium soils consisted of clayey sand (SC). "N" values within the coarse alluvium soils ranged from 4 to 8 (relative density of very loose and loose). The moisture condition of the coarse alluvium soils was wet and waterbearing.

Water Level

A measurement to record the groundwater level was made at the test boring location. The time and level of the groundwater reading is recorded on the boring log. Groundwater was measured at a depth of 5 feet at the test boring location.

The water level indicated on the boring log may or may not be an accurate indication of the depth or lack of subsurface groundwater. The limited length of observation restricts the accuracy of the measurements. Long term groundwater monitoring was not included in our scope of work.

ENGINEERING REVIEW & RECOMMENDATIONS

Project Design Data

We understand that the project will consist of constructing a building addition to the existing comfort station building. The building addition will be located on the west side of the existing

comfort station building. The new building addition will be a 1-story slab-on-grade structure with a footprint of approximately 350 square feet. We assume that the finished floor elevation (FFE) of the building addition will match the FFE of the existing comfort station building (elevation 100.0 feet). Based on the FFE, minimal grade change is needed within the footprint of the building addition. We assume that foundation support for the building addition will be provided by perimeter footings resting below frost depth. Foundation loads were not provided at the time of this report; however, we anticipate that the foundation loads and floor loads will be light. It is our opinion that light foundation loads would consist of wall loads less than or equal to 3 kips per lineal foot (klf) and maximum column loads of less than or equal to 75 kips. Light floor loads would consist of less than or equal to 250 pounds per square foot (psf). We also understand that the building addition will not be heated during the winter months.

The information/assumptions detailed in the project design data section are important factors in our review and recommendations. If there are any corrections or additions to the information detailed in this section, then it is important that you contact us so that we can review our recommendations with regards to the revised plans.

Discussion

It is our opinion that a spread footing foundation system can be used for support of the proposed building addition after the recommended site preparation has been performed.

The test boring encountered 4 ½ feet of existing fill materials overlying coarse alluvium soils. In our opinion, the existing fill materials are not suitable for support of the footings of the building addition. In regards to the coarse alluvium soils, it is our opinion that these soils have low strength levels and limited bearing capacity. Our opinion is based on the measured "N" values within these soils. With that said, it is our opinion that an overexcavation beneath the footings of the building (backfill with crushed drainage rock) will be needed in order to provide uniform support over the low strength coarse alluvium soils and a stable working surface. Also, due to the shallow groundwater, the crushed drainage rock will help facilitate drainage during construction. We expect that some dewatering will be needed during construction of the building addition. The dewatering could be extensive due to the wet and waterbearing sand soils.

In regards to the floor slab of the building addition, we recommend providing a layer (up to 4 feet) of granular material beneath the floor slab to provide adequate frost protection.

Site Preparation – Footing Areas

The site preparation in the footing areas of the building addition should consist of removing the existing fill materials in order to expose the coarse alluvium soils. Following the removals, we recommend performing an overexcavation to a minimum depth of 18 inches below the bottom-of-footing elevation. The overexcavated areas should be backfilled with a minimum of 18 inches of crushed drainage rock. The thickness of the crushed drainage rock will exceed the minimum overexcavation depth in areas where the coarse alluvium soils are encountered at a depth greater than the overexcavation depth of 18 inches below the bottom-of-footing elevation. We also recommend that observations (hand auger borings) be performed at the bottom of the excavations prior to the placement of crushed drainage rock. Additional removals would be needed if areas of unsuitable materials are encountered at the bottom of the excavations. Also, if any existing utilities are within the footprint of the building addition, then the existing utilities should be removed and rerouted.

Site Preparation – Floor Slab Areas

As previously stated, frost protection should be considered for the floor slab of the building addition. If movement of the floor slab cannot be tolerated, then we recommend placing 4 feet of granular structural fill beneath the floor slab. If it is desired to reduce (but not eliminate) the amount of potential frost heave of the floor slab, then we recommend consideration be given to placing at least 2 feet of granular structural fill beneath the floor slab of the building addition. Also, if the thickness of 4 feet of granular structural fill is chosen, then a layer of crushed drainage may be needed at the bottom of the excavation due to shallow groundwater.

Foundation Loads & Settlement

If our recommendations are followed during site preparation for the footings, then it is our opinion that the footings of the building addition can be sized for a net allowable soil bearing pressure of up to 2,000 psf. With the net allowable soil bearing pressure and our site preparation

recommendations, we recommend limiting the wall loads to 3 klf and the column loads to 75 kips. If a higher net allowable soil bearing pressure is desired or the load limits are exceeded, then we recommend that we be contacted to provide additional recommendations.

With the recommended site preparation, load limits and net allowable soil bearing pressure, total settlement of the footings should be less than 1 inch and differential settlement should be less than ½ inch over 50 feet. Unknown soil conditions at the site that are different from those depicted at the test boring location could increase the amount of expected settlement. At least a portion of the anticipated total settlement may appear as differential with respect to the existing building. Suitable expansion or control joints should be provided between the existing building and the building addition to allow for the expected movement.

Excavation & Temporary Shoring

All excavations within the footprint of the building addition should be performed with a track backhoe with a smooth edge bucket. The subgrade within the footprint of the building addition should not be exposed to heavy construction traffic from rubber tire vehicles.

We recommend extreme caution be exercised while excavating adjacent to any existing structure to prevent undermining of the existing foundations. The excavations adjacent to any existing structure should be performed in small sections such that only a limited area of the foundation soils supporting the existing structure is exposed for a short period of time.

If an excavation adjacent to the existing structure is to extend below the existing foundations, then we recommend that the excavation extend 1 foot to 2 feet outside the bottom of the existing foundation and then extend downward and outward at a slope no steeper than 1:1 (horizontal to vertical). This may not apply if caving soils are encountered beneath the existing foundations. In this case, temporary shoring or underpinning may be needed.

Floor Slab & Soil Modulus of Subgrade Reactions

If 5 feet of granular material is provided beneath the floor slab, then a soil modulus of subgrade reaction (k value) of 150 psi/inch could be used for the design of the floor slab of the building addition. If only 2 feet of granular material is provided beneath the floor slab of the building

addition, then a k value of 100 psi/inch could be used for the design of the floor slab of the building addition.

Water & Saturated Soils

If water or saturated soils are encountered at the bottom of the excavation, then we recommend placing a layer of drainage rock at the bottom of the excavation prior to the placement of the granular structural fill or the footings. Crushed drainage rock is recommended in several of the areas. We expect that water and saturated soils will be encountered at the bottom of the majority of the excavations.

Laterally Oversized Excavations – Granular Structural Fill & Drainage Rock

Where granular structural fill or drainage rock is needed below the footings, the bottom of the excavation should be laterally oversized 1 foot beyond the edges of the footings for each vertical foot of granular structural fill or drainage rock required below the footings (1 horizontal : 1 vertical).

Coefficient of Friction

It is our opinion that a friction factor of 0.45 can be used between the granular structural fill or drainage rock and the bottom of the concrete. The friction value is considered an ultimate value. We recommend applying a theoretical safety factor of at least 2.0.

Retaining Walls

We recommend backfilling any retaining walls with free-draining sand. The active lateral earth pressures may be employed only if movement of the walls can be tolerated to reach the active state. A horizontal movement of approximately 1/500 of the height of the wall would be required to develop the active state for granular soils. If the above movement cannot be tolerated, then we recommend using the at-rest lateral earth pressures to design the walls. The zone of the sand backfill should extend a minimum of 2 feet outside the bottom of the foundation and then extend upward and outward at a slope no steeper than 1:1 (horizontal to vertical). Also, we recommend capping the sand backfill section with 1 foot to 2 feet of clayey soil in areas that will not have

asphalt or concrete surfacing to minimize infiltration of surface waters. Table 1, shows the equivalent fluid unit weight values for the various soil types anticipated for this project.

Table 1. Equivalent Fluid Unit Weight Values

Soil Type	At-Rest, pcf		Active, pcf		Passive, pcf	
	Drained	Submerged	Drained	Submerged	Drained	Submerged
Clay	-	-	-	-	220*	115*
Free-Draining Sand (SP)	50	90	35	80	460*	230*

*Value below frost depth – 0 pcf above frost depth.

The passive resistance in front of a retaining wall should not be used in an analysis unless the wall extends well below the depth of frost penetration due to loss of strength upon thawing. In addition, development of passive lateral earth pressure in the soil in front of a wall requires a relatively large rotation or outward displacement of the wall. Therefore, we do not recommend using passive resistance in front of the wall for the analysis.

We recommend that backfill drainage systems be provided for the retaining walls to collect and remove water and to prevent hydrostatic pressure on the walls. The drainage systems should consist of slotted or perforated drainage pipes located at the bottom of the backfill trench. The drainage systems should be connected to a suitable means of discharge.

During backfill operations, bracing and/or shoring of the walls may be needed. Only hand-operated compaction equipment should be used directly adjacent to the walls.

Dewatering

Dewatering should be expected during construction. In areas of predominant clay soils, it is our opinion that a layer of crushed rock with a system of sump pumps would be adequate to counter groundwater. If waterbearing sand soils are encountered, then an extensive dewatering system will likely be needed.

It should be noted that the water level is expected to fluctuate during wet or dry periods of the year. Any water that accumulates at the bottom of the excavations should be immediately

removed and surface drainage away from the excavations should be provided during construction.

Drain Tile Recommendations

Since the building addition will be slab-on-grade, it is our opinion that drain tile is not needed along the perimeter of the building addition. However, if there are portions of the structure that will extend below grade, then drain tile should be installed.

Seismic Site Classification

Based on the 2021 International Building Code (IBC), it is our opinion that the site, as a whole, corresponds to a Site Class D (stiff soil). Also, the ground acceleration values are as follows: S_S = 0.135 g, S_1 = 0.034 g, S_{MS} = 0.216 g, S_{M1} = 0.082 g, S_{DS} = 0.144 g, S_{D1} = 0.055 g. Therefore, the seismic design category is "A". The ground acceleration values are based on the ASCE 7-16 (referenced standard for 2021 IBC) with Risk Category II/III. If needed, we can provide ground acceleration values for a different design code.

Frost Protection

Footings

We recommend all footings be placed at a sufficient depth for frost protection. The perimeter footings for heated buildings should be placed such that the bottom of the footing is a minimum of 4 feet below finished exterior grade. Interior footings in heated buildings can be placed beneath the floor slab. Footings for unheated areas and canopies, or footings that are not protected from frost during freezing temperatures, should be placed at a minimum depth of 5 feet below the lowest adjacent grade.

Surface Improvements

It is our opinion that the on-site clay soils have a moderate to high frost susceptibility. Surface improvements, such as pavements and sidewalks, constructed on clay soils are potentially subject to both cosmetic and structural damage caused by frost heaving. The surface improvements should be designed to accommodate the potential frost movements, or non-frost susceptible

drainage fill should be placed beneath the surface improvements. If movement cannot be tolerated, then we recommend placing non-frost susceptible drainage fill beneath the surface improvements. The non-frost susceptible drainage fill should extend to a depth of 4 feet below the finished exterior grade. If it is desired to reduce (but not eliminate) the amount of potential frost heave, then we recommend consideration be given to placing 2 feet of non-frost susceptible drainage fill beneath the surface improvements. Frost protection should be considered for the entrance to the building addition.

Material Types & Compaction Levels

Granular Structural Fill – The granular structural fill should consist of a pit-run or processed sand or gravel having a maximum particle size of 3 inches with less than 15 percent by weight passing the #200 sieve. The granular structural fill should be placed in lifts of up to 1 foot in thickness.

Drainage Rock – The drainage rock should be crushed, washed and meet the gradation specifications shown in Table 2.

Table 2. Drainage Rock Gradation Specifications

Sieve Size	Percent Passing
1 1/2-inch	100
1-inch	70 – 90
3/4-inch	25 – 50
3/8-inch	0 – 5

Select Granular Fill – The select granular fill should consist of a medium to coarse grained, free-draining sand or rock having a maximum particle size of 1 inch with less than 5 percent by weight passing the #200 sieve. The select granular fill should be placed in lifts of up to 1 foot in thickness.

Free-Draining Sand – The free-draining sand should have a maximum particle size of 1 inch with less than 5 percent by weight passing the #200 sieve. The free-draining sand should be placed in lifts of up to 1 foot in thickness.

Non-Frost Susceptible Drainage Fill – The non-frost susceptible drainage fill should have less than 40 percent by weight passing the #40 sieve and less than 5 percent by weight passing the #200 sieve.

Exterior Backfill / Slab-on-Grade Backfill – We recommend either clay or granular soils be used. Debris, organic material, or over-sized material should not be used as backfill. If granular soils are used in areas that will not have asphalt or concrete surfacing, we recommend capping the granular soils with at least 1 foot to 2 feet of clay soils to minimize infiltration of surface water. The exterior backfill should be placed in lifts of up to 1 foot in thickness.

Interior Foundation Wall Backfill – We recommend that granular structural fill be used to backfill the interior side of the foundation walls. It should be placed in lifts up to 1 foot in thickness.

Recommended Compaction Levels – The recommended compaction levels listed in Table 3 are based on a material's maximum dry density value, as determined by a standard Proctor (ASTM: D698) test.

Table 3. Recommended Compaction Levels

Placement Location	Compaction Specifications
Below Footings	95%
Below Floor Slabs	95%
Exterior Wall Backfill (Slab-on-Grade)	95%
Behind Retaining Walls	95% - 98%
Utility Trench Backfill in Structural Areas	95%
Non-Structural Areas	90%
Note: Compaction specifications are not applicable with the crushed drainage rock.	

Recommended Moisture Levels – The moisture content of the clay backfill materials, when used as backfill around the exterior of a foundation should be maintained within a range of plus or minus 2 percent of the materials' optimum moisture content. The optimum moisture content should be determined using a standard Proctor (ASTM: D698) test. The moisture content of the

granular backfill materials should be maintained at a level that will be conducive for vibratory compaction.

Drainage

Proper drainage should be maintained during and after construction. The general site grading should direct surface run-off waters away from the excavation. Water which accumulates in the excavation should be removed in a timely manner.

CONSTRUCTION CONSIDERATIONS

Groundwater & Surface Water

Water may enter the excavation due to subsurface water, precipitation or surface run off. Any water that accumulates in the bottom of the excavation should be immediately removed and surface drainage away from the excavation should be provided during construction.

Disturbance of Soils

The soils encountered at the test boring location are susceptible to disturbance and can experience strength loss caused by construction traffic and/or additional moisture. Precautions will be required during earthwork activities in order to reduce the risk of soil disturbance.

Cold Weather Precautions

If site preparation and construction is anticipated during cold weather, then we recommend all foundations, slabs and other improvements that may be affected by frost movements be insulated from frost penetration during freezing temperatures. If filling is performed during freezing temperatures, then all frozen soils, snow and ice should be removed from the areas to be filled prior to placing the new fill. The new fill should not be allowed to freeze during transit, placement and compaction. Concrete should not be placed on frozen subgrades. Frost should not be allowed to penetrate below the footings. The subgrade soils will likely require reworking and recompacting due to the loss of density caused by the freeze/thaw process.

Excavation Sideslopes

The excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, "Excavations and Trenches". This document states that the excavation safety is the responsibility of the contractor. Reference to this OSHA requirement should be included in the project specifications.

Observations & Testing

This report was prepared using a limited amount of information for the project and a number of assumptions were necessary to help us develop our conclusions and recommendations. It is recommended that our firm be retained to review the geotechnical aspects of the final design plans and specifications to check that our recommendations have been properly incorporated into the design documents.

The recommendations submitted in this report have been made based on the subsurface conditions encountered at the test boring location. It is possible that there are subsurface conditions at the site that are different from those represented by the test boring. As a result, on-site observation during construction is considered integral to the successful implementation of the recommendations. We believe that qualified field personnel need to be on-site at the following times to observe the site conditions and effectiveness of the construction.

Excavation

We recommend that a geotechnical engineer or geotechnical engineering technician working under the direct supervision of a geotechnical engineer observe all excavations for foundations, slabs and pavements. These observations are recommended to determine if the exposed soils are similar to those encountered at the test boring location, if unsuitable soils have been adequately removed and if the exposed soils are suitable for support of the proposed construction. These observations should be performed prior to placement of fill or foundations.

Testing

After the subgrade is observed by a geotechnical engineer/technician and approved, we recommend a representative number of compaction tests be taken during the placement of the structural fill and backfill placed below foundations, slabs and pavements, beside foundation walls and behind retaining walls. The tests should be performed to determine if the required compaction has been achieved. As a general guideline, we recommend at least 1 test be taken for every 2,000 square feet of structural fill placed in building and pavement areas, at least 1 test for every 75 feet to 100 feet in trench fill, and for every 2-foot thickness of fill or backfill placed. The actual number of tests should be left to the discretion of the geotechnical engineer. Samples of proposed fill and backfill materials should be submitted to our laboratory for testing to determine their compliance with our recommendations and project specifications.

SUBSURFACE EXPLORATION PROCEDURES

Test Borings

We performed 1 SPT boring with a truck rig equipped with hollow-stem auger. Soil sampling was performed in accordance with the procedures described in ASTM:D1586. Using this procedure, a 2-inch O.D. split barrel sampler is driven into the soil by a 140-pound weight falling 30 inches. After an initial set of 6 inches, the number of blows required to drive the sampler an additional 12 inches is known as the penetration resistance, or “N” value. The “N” value is an index of the relative density of cohesionless soils and the consistency of cohesive soils. In addition, thin walled tube samples were obtained according to ASTM:D1587, where indicated by the appropriate symbol on the boring logs.

The test boring was backfilled with on-site materials and some settlement of these materials can be expected to occur. Final closure of the holes is the responsibility of the client or property owner.

The soil samples collected from the test boring location will be retained in our office for a period of 1 month after the date of this report and will then be discarded unless we are notified otherwise.

Soil Classification

As the samples were obtained in the field, they were visually and manually classified by the crew chief according to ASTM:D2488. Representative portions of all samples were then sealed and returned to the laboratory for further examination and for verification of the field classification. In addition, select samples were then submitted to a program of laboratory tests. Where laboratory classification tests (sieve analysis and Atterberg limits) have been performed, classifications according to ASTM:D2487 are possible. A log of the test boring indicating the depth and identification of the various strata, the "N" value, the laboratory test data, water level information and pertinent information regarding the method of maintaining and advancing the drill hole are also attached in Appendix A. Charts illustrating the soil classification procedures, the descriptive terminology and the symbols used on the boring log are also attached in Appendix A.

Water Level Measurement

The subsurface groundwater level should be expected to fluctuate seasonally and yearly from the groundwater reading recorded at the test boring location. Fluctuations occur due to varying seasonal and yearly rainfall amounts and snowmelt, as well as other factors. It is possible that the subsurface groundwater level during or after construction could be significantly different than the time the test boring was performed.

The water level may or may not be an accurate indication of the depth or lack of subsurface groundwater. The limited length of observation restricts the accuracy of the measurements. Long term groundwater monitoring was not included in our scope of work.

Laboratory Tests

Laboratory tests were performed on select samples to aid in determining the index and strength properties of the soils. The index tests consisted of moisture content, dry density, pH, sulfate content, chloride content, resistivity, redox potential and sulfide content. The strength tests consisted of unconfined compressive strength. The laboratory tests were performed in accordance with the appropriate ASTM procedures. The results of the laboratory tests are shown

on the boring log opposite the samples upon which the tests were performed or on the data sheets included in the Appendix.

LIMITATIONS

The recommendations and professional opinions submitted in this report were based upon the data obtained through the sampling and testing program at the test boring location. We wish to point out that because no exploration program can totally reveal the exact subsurface conditions for the entire site, conditions between test boring and between samples and at other times may differ from those described in our report. Our exploration program identified subsurface conditions only at those points where samples were retrieved or where water was observed. It is not standard engineering practice to continuously retrieve samples for the full depth of the boring. Therefore, strata boundaries and thicknesses must be inferred to some extent. Additionally, some soils layers present in the ground may not be observed between sampling intervals. If the subsurface conditions encountered at the time of construction differ from those represented by our test boring, it is necessary to contact us so that our recommendations can be reviewed. The variations may result in altering our conclusions or recommendations regarding site preparation or construction procedures, thus, potentially affecting construction costs.

This report is for the exclusive use of the addressee and its representatives for use in design of the proposed project described herein and preparation of construction documents. Without written approval, we assume no responsibility to other parties regarding this report. Our conclusions, opinions and recommendations may not be appropriate for other parties or projects.

STANDARD OF CARE

The recommendations submitted in this report represent our professional opinions. Our services for your project were performed in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering profession currently practicing at this time and area.

This report was prepared by:
GeoTek Engineering & Testing Services, Inc.

Cody Osthus, PE
Staff Engineer

FIGURE 1
SITE LOCATION MAP
PROPOSED BUILDING ADDITION
WESTBEND ROAD
HUGHES COUNTY, SD

ACAD/GEOTEK/CODY/26-0191

PROJECT#: 26-0191

DRAWN BY: MW

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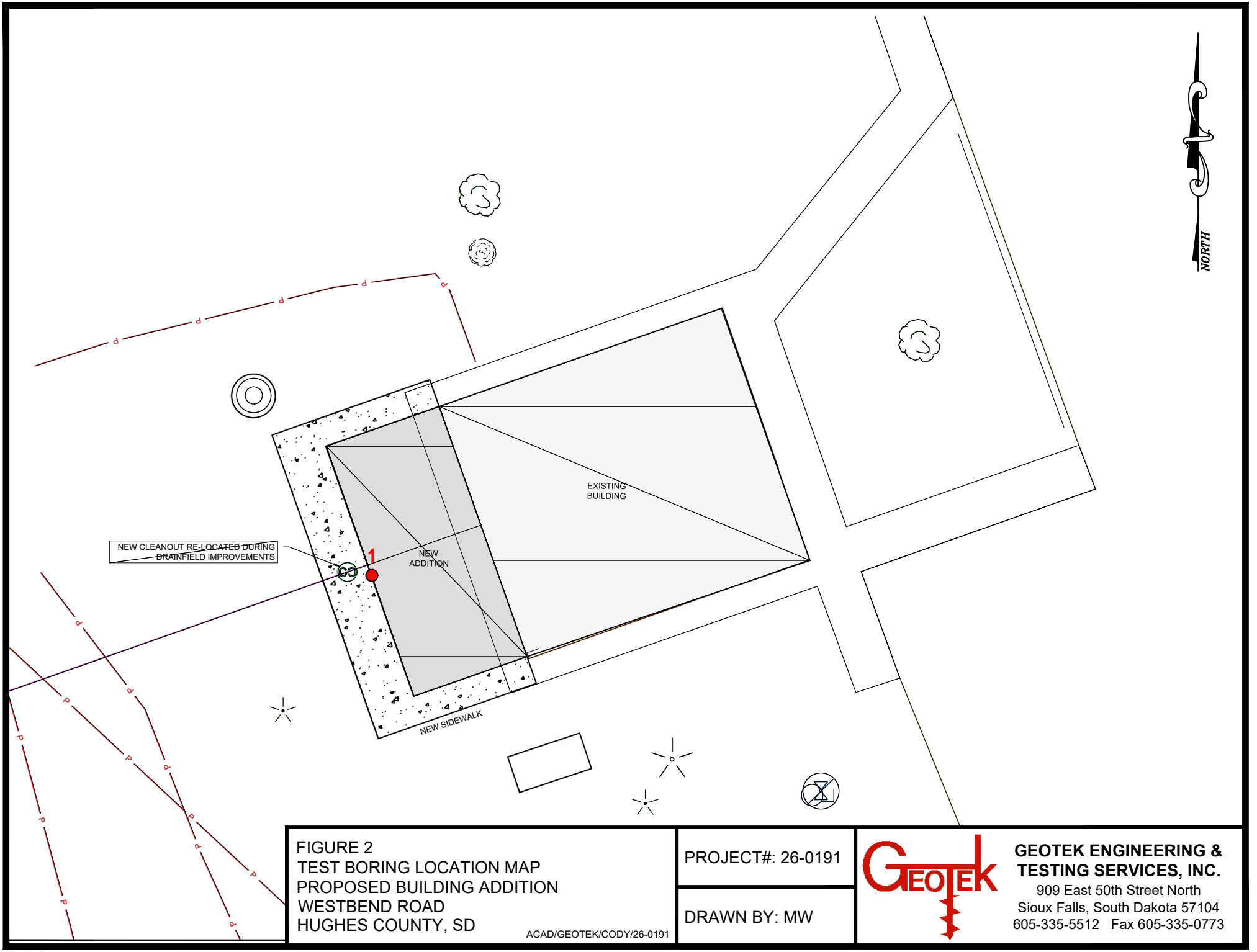

FIGURE 2
TEST BORING LOCATION MAP
PROPOSED BUILDING ADDITION
WESTBEND ROAD
HUGHES COUNTY, SD

ACAD/GEOTEK/CODY/26-0191

PROJECT#: 26-0191

DRAWN BY: MW

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GEOTECHNICAL TEST BORING LOG

BORING NO. 1

GEOTEK # **26-0191**

PROJECT: **Proposed Building Addition - West Bend Recreational Area - Westbend Road - Hughes County, South Dakota**

WL	Elevation / Depth (feet)	DESCRIPTION OF MATERIAL 99.9 ft = SURFACE ELEVATION	GEOLOGIC ORIGIN	N	SAMPLE TYPE NO.	MC	D	LL / PL	QU	- #200
		FILL, MOSTLY SANDY LEAN CLAY: a trace of gravel, dark brown, moist, Frozen to 1 foot then moist	FILL		HSA 1	20				
				2	SPT 2	21	105			
	95.4 / 4.5	CLAYEY SAND: fine to medium grained, brown, wet to waterbearing, very loose to loose, Lenses and Lamination of clay (SC)	COARSE ALLUVIUM	4	SPT 3	16				30
▼				4	SPT 4	34				42
					SH 5					
				6	SPT 6					
				4	SPT 7					
				8	SPT 8					
	83.9 / 16.0	Bottom of borehole at 16.0 Feet.								

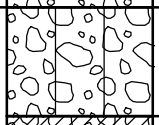
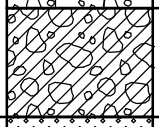
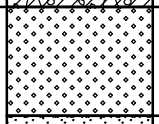
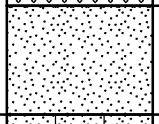
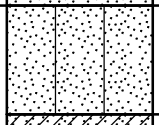
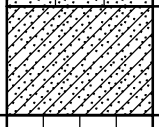
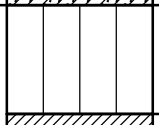
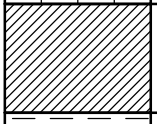
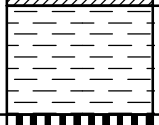
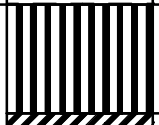
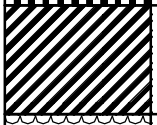
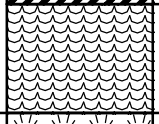
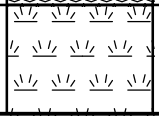
Water Level Measurements

DATE	TIME	SAMPLE DEPTH (ft)	CAVE-IN DEPTH (ft)	WATER LEVEL (ft)
02/12/2026	09:34 AM	16.0	6.0	5.0

Additional Boring Information

START:	02-12-2026	COMPLETE:	02-12-2026, 08:56 AM
METHOD:	3.25" ID Hollow Stem Auger		
LATITUDE:		*(Latitude / Longitude) (Approximate Values)*	
LONGITUDE:			
DRILL RIG:	B-57 Blue		
CREW CHIEF:	Marcus Shields		

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BORING LOG SYMBOLS AND DESCRIPTIVE TERMINOLOGY

SYMBOLS FOR DRILLING AND SAMPLING

Symbol	Definition
Bag	Bag sample
CS	Continuous split-spoon sampling
DM	Drilling mud
FA	Flight auger; number indicates outside diameter in inches
HA	Hand auger; number indicates outside diameter in inches
HSA	Hollow stem auger; number indicates inside diameter in inches
LS	Liner sample; number indicates outside diameter of liner sample
N	Standard penetration resistance (N-value) in blows per foot
NMR	No water level measurement recorded, primarily due to presence of drilling fluid
NSR	No sample retrieved; classification is based on action of drilling equipment and/or material noted in drilling fluid or on sampling bit
SH	Shelby tube sample; 3-inch outside diameter
SPT	Standard penetration test (N-value) using standard split-spoon sampler
SS	Split-spoon sample; 2-inch outside diameter unless otherwise noted
WL	Water level directly measured in boring
▼	Water level symbol

SYMBOLS FOR LABORATORY TESTS

Symbol	Definition
WC	Water content, percent of dry weight; ASTM:D2216
D	Dry density, pounds per cubic foot
LL	Liquid limit; ASTM:D4318
PL	Plastic limit; ASTM:D4318
QU	Unconfined compressive strength, pounds per square foot; ASTM:D2166

DENSITY/CONSISTENCY TERMINOLOGY

Density		Consistency
Term	N-Value	Term
Very Loose	0-4	Soft
Loose	5-8	Firm
Medium Dense	9-15	Stiff
Dense	16-30	Very Stiff
Very Dense	Over 30	Hard

PARTICLE SIZES

Term	Particle Size
Boulder	Over 12”
Cobble	3” – 12”
Gravel	#4 – 3”
Coarse Sand	#10 – #4
Medium Sand	#40 – #10
Fine Sand	#200 – #40
Silt and Clay	passes #200 sieve

DESCRIPTIVE TERMINOLOGY

Term	Definition
Dry	Absence of moisture, powdery
Frozen	Frozen soil
Moist	Damp, below saturation
Waterbearing	Pervious soil below water
Wet	Saturated, above liquid limit
Lamination	Up to ½” thick stratum
Layer	½” to 6” thick stratum
Lens	½” to 6” discontinuous stratum

GRAVEL PERCENTAGES

Term	Range
A trace of gravel	2-4%
A little gravel	5-15%
With gravel	16-50%

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April 16, 2026

South Dakota Department of Game, Fish & Parks
523 East Capitol Avenue
Pierre, South Dakota 57501

Attn: Sean Campbell

Subj: Addendum to Geotechnical Report
Proposed Building Addition
West Bend Recreational Area
Westbend Road
Hughes County, South Dakota
GeoTek #26-0191

Introduction

This correspondence is an addendum to our original report for the referenced project that was dated March 5, 2026 (GeoTek #26-0191). It has come to our attention that the design of the building addition has changed. We understand that a thickened edge foundation system will be utilized to support the new building addition.

Discussion

It is our opinion that a thickened edge foundation system can be used for support of the proposed building addition after the recommended site preparation has been performed.

The test boring encountered 4 ½ feet of existing fill materials overlying coarse alluvium soils. In our opinion, the existing fill materials are not suitable for support of the foundation of the building addition. In regards to the coarse alluvium soils, it is our opinion that these soils have low strength levels and limited bearing capacity. Our opinion is based on the measured "N" values within these soils. With that said, it is our opinion that an overexcavation beneath the foundation of the building addition (backfill with granular materials) will be needed in order to provide uniform support over the low strength coarse alluvium soils. Also, due to the shallow groundwater, it is our opinion that a layer of crushed drainage rock should be placed at the bottom of the excavation. The crushed drainage rock will help facilitated drainage during construction.

Site Preparation – Footprint of Building Addition

The site preparation in the footprint of the building addition should consist of removing the existing fill materials in order to expose the coarse alluvium soils. Following the removals, we recommend performing an overexcavation to a minimum depth of 18 inches below the bottom-of-foundation elevation. The overexcavated areas should be backfilled with a minimum of 1 foot of crushed drainage rock. The balance of the overexcavation could be backfilled with crushed drainage rock or granular structural fill. The thickness of the granular materials will exceed the minimum overexcavation depth in areas where the coarse alluvium soils are encountered at a depth greater than the overexcavation depth of 18 inches below the bottom-of-foundation elevation. Based on the ground surface elevation at the test boring and the thickness of the existing fill materials, we expect that 3 feet to 4 feet of granular materials will be needed beneath the building addition foundation. We also recommend that observations (hand auger borings) be performed at the bottom of the excavations prior to the placement of granular materials. Additional removals would be needed if areas of unsuitable materials are encountered at the bottom of the excavations. Also, if any existing utilities are within the footprint of the building addition, then the existing utilities should be removed and rerouted.

Foundation Loads & Settlement

If our recommendations are followed during site preparation for the foundations, then it is our opinion that the foundation of the building addition can be sized for a net allowable soil bearing pressure of up to 2,000 psf. With the net allowable soil bearing pressure and our site preparation recommendations, we recommend limiting the wall loads to 3 klf and the column loads to 75 kips. If a higher net allowable soil bearing pressure is desired or the load limits are exceeded, then we recommend that we be contacted to provide additional recommendations.

With the recommended site preparation, load limits and net allowable soil bearing pressure, total settlement of the foundation should be less than 1 inch and differential settlement should be less than ½ inch over 50 feet. Unknown soil conditions at the site that are different from those depicted at the test boring location could increase the amount of expected settlement. At least a portion of the anticipated total settlement may appear as differential with respect to the existing building. Suitable expansion or control joints should be provided between the existing building and the building addition to allow for the expected movement.

Excavation & Temporary Shoring

All excavations within the footprint of the building addition should be performed with a track backhoe with a smooth edge bucket. The subgrade within the footprint of the building addition should not be exposed to heavy construction traffic from rubber tire vehicles.

We recommend extreme caution be exercised while excavating adjacent to any existing structure to prevent undermining of the existing foundations. The excavations adjacent to any existing structure should be performed in small sections such that only a limited area of the foundation soils supporting the existing structure is exposed for a short period of time.

If an excavation adjacent to the existing structure is to extend below the existing foundations, then we recommend that the excavation extend 1 foot to 2 feet outside the bottom of the existing foundation and then extend downward and outward at a slope no steeper than 1:1 (horizontal to vertical). This may not apply if caving soils are encountered beneath the existing foundations. In this case, temporary shoring or underpinning may be needed.

Floor Slab & Soil Modulus of Subgrade Reaction

If our recommendations are followed, then it is our opinion that the floor slab of the building addition can be designed using a soil modulus of subgrade reaction (k value) of 150 psi/inch.

Water & Saturated Soils

If water or saturated soils are encountered at the bottom of the excavation, then we recommend placing a layer of drainage rock at the bottom of the excavation prior to the placement of the granular structural fill or the footings. Crushed drainage rock is recommended in several of the areas. We expect that water and saturated soils will be encountered at the bottom of the majority of the excavations.

Laterally Oversized Excavations – Granular Structural Fill & Drainage Rock

Where granular structural fill or drainage rock is needed below the foundation, the bottom of the excavation should be laterally oversized 1 foot beyond the edges of the foundation for each vertical foot of granular structural fill or drainage rock required below the foundation (1 horizontal : 1 vertical).

Coefficient of Friction

It is our opinion that a friction factor of 0.45 can be used between the granular structural fill or drainage rock and the bottom of the concrete. The friction value is considered an ultimate value. We recommend applying a theoretical safety factor of at least 2.0.

Material Types & Compaction Levels

Our recommendations from our previous report should be followed.

Frost Protection

Our recommendations from our previous report should be followed.

Standard of Care

The recommendations submitted in this report represent our professional opinions. Our services for your project were performed in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering profession currently practicing at this time and area.

Remarks

We thank you for the opportunity of providing our services on this project and look forward to continued participation during the design and construction phases. If you have any questions regarding this report, please contact our office at (605) 335-5512.

Respectfully Submitted,

GeoTek Engineering & Testing Services, Inc.

Cody Osthus, PE
Staff Engineer

SOUTH DAKOTA DEPARTMENT OF
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END OF ADDENDUM NO. 01