December 9, 2025

Adams County Colorado
Attn: Community & Economic Development Department
4430 South Adams County Parkway
1st Floor, Suite W2000
Brighton, CO 80601

RE: United Power Stonehouse Substation Conditional Use Permit – RCU2025-00008 Submittal 2

Dear Adams County Community & Economic Development Department:

Ulteig on behalf of United Power, Inc. respectfully delivers this second submittal for Stonehouse substation Conditional Use Permit application RCU2025-00008.

Ulteig and United Power have reviewed and addressed the comments form Adams County, outside referral agencies and surrounding landowners regarding the first submittal – RCU2025-00008. Please see attached materials for reference.

United Power has retained Ulteig Operations LLC to assist with Land Use permitting. If you have any questions or require additional information, please contact Derek Holscher (720-973-5876 or derek.holscher@ulteig.com) or Will Halligan (720-873-5795 or will.halligan@ulteig.com).

Sincerely,

Derek Holscher

Derek Holscher – Project Manager, Ulteig

Community & Economic
Development Department
www.adcogov.org

ADAMS COUNTY
COLORADO

4430 South Adams County Parkway
1st Floor, Suite W2000
Brighton, CO 80601-8204
PHONE 720.523.6800
FAX 720.523.6998

Re-submittal Form

Case Name/ Number: Stonehouse / RCU2025-00008

Case Manager: Greg Barnes

Re-submitted Items:

- [X] Development Plan/ Site Plan
- [ ] Plat
- [X] Parking/ Landscape Plan
- [ ] Engineering Documents
- [ ] Subdivision Improvements Agreement (Microsoft Word version)
- [X] Other: Response to Comments, FAA Evaluation, Fence Details

* **All re-submittals must have this cover sheet and a cover letter addressing review comments.**

Please note the re-submittal review period is 21 days.

The cover letter must include the following information:

- Restate each comment that requires a response
- Provide a response below the comment with a description of the revisions
- Identify any additional changes made to the original document

For County Use Only:

Date Accepted:

Staff (accepting intake):

Resubmittal Active: Engineering; Planner; Right-of-Way; ~~Addressing; Building Safety;~~ ~~Neighborhood Services;~~ Environmental; ~~Parks; Attorney; Finance;~~ Plan Coordination

Adams County Comments and United Power/Ulteig Responses

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Commenting Division:
Name of Reviewer: Greg Barnes
Date:
Email: gjbarnes@adcogov.org
Planner Review
Resubmittal Required

PLN01: When a conditional use permit is approved, an operator has one year to be issued building permits. If a building permit is not issued, then the conditional use permit expires (Section 2-02-09-09, Development Standards & Regulations). An extension of this approval may be granted by the Planning Commission through separate proceedings (Section 2-02-09-10). Based on your written explanation, you are planning start construction in 2028. Please take note of these two sections of our regulations, and plan accordingly.

Response: Noted, and we will plan accordingly. Per meeting with Adams County, a building permit to construct fencing will establish use.

PLN02: The site is located with the Airport Height and Airport Noise Overlay Districts. Please submit the FAA Obstruction Evaluation prior to being scheduled for hearings for this conditional use permit. Please resubmit with documentation that this has been done.

Response: An FAA Obstruction Evaluation Notice was submitted on 9/11/2025. The FAA conducted an aeronautical study (2025-ANM-5975-OE) and issued a *Determination of No Hazard to Air Navigation* on 10/14/2025. FAA Determination attached hereto.

PLN03: A type-C landscape buffer is required around the facility (Section 4-08-02-07-04). This type of bufferyard requires a fifteen (15) foot minimum bufferyard width with two (2) trees per eighty (80) linear feet of lot line and six (6) foot high sight obscuring fence or wall located on the interior line of the bufferyard. Please resubmit with landscape plans and fence elevations. If you are asking for relief from landscaping standards then please provide alternatives and justify why you cannot conform to our regulations. Staff strongly encourages that you provide some sort of alternative, rather than asking for no landscaping at all.

Response: The subject parcel (parcel # 0156730300001) is not located within any water district and does not have a readily accessible source of water. Additionally, the electrical substation will be an unmanned facility and not require water service. Due to the insufficient water availability at the proposed project site, implementation and maintenance of the county's landscaping standard are deemed impractical.
The type-c landscape buffer yard details include a 15-foot minimum bufferyard width with 2 trees per 80 linear feet of the lot line and 6 foot high sight obscuring fence or wall located on the interior line of the bufferyard. Ulteig on behalf of United Power, consulted with a reclamation services company (H2 Enterprise) to see what trees would be able to survive after a year of trucking in a watering service. H2 Enterprises is a reputable and experienced

reclamation services company headquartered in Keenesburg, CO and have successfully reclaimed over 2 million acres across 45 states. H2 Enterprise recommended to not plant trees because trees would have a low chance of survival. From H2 Enterprise's experience, trucking in water to replenish trees would cause the roots of the trees to remain shallow and become dependent on a watering service. After a watering service concedes, any trees would likely die due to their reliance of shallow watering. As an alternative, United Power intends to restore all disturbed surface areas to their pre-construction condition utilizing native materials and reseeding. This will allow the landscape of the proposed project site to blend naturally with the physical conditions in the surrounding area, maintain the rural character and native vegetation. Also, the subject parcel is currently used for agriculture dry-crop farming. Restoring all disturbed surface areas to their pre-construction state will maximize the future dry-crop farming. The continuous use of dry-crop farming will ensure that the remainder of the property surrounding the substation will be maintained. In addition, United Power is proposing the installation of two fences around the entire substation yard; the inner fence will be an 8-foot chain link security fence with 1-foot of barbed wire on top and an outer 8-foot sight obscuring decorative wooden fence.

PLN04: Will the chain link fence have inserts? Please describe in further detail. Staff prefers a solid screen wooden fence.

Response: United Power plans to install two fences. The inner fence will be an 8-foot chain link security fence with 1-foot of barbed wire on top. The outer fence will be an 8-foot decorative wooden fence. A Variance application for fence height was submitted on 11/11/2025 (PRA2025-00009 & VSP2025-00054).

PLN05: Separate variance applications are needed for any structures that exceed the maximum height of the zone district (35 feet). Variance applications can be found at: https://epermits.adcogov.org/submittal-checklists. Variances must be processed with a hearing prior to the conditional use permit.

Response: Variance applications for structures exceeding 35 feet in height were submitted on 11/11/2025 (PRA2025-00009 & VSP2025-00056 & VSP2025-00057). There included the 9-foot chain link security fence and the substation static masts.

Commenting Division:
Name of Reviewer: Ian Cortez
Date:
Email:
ROW Review
Resubmittal Required

ROW1: Per the Master Transportation Plan, the classification of Gun Club Road is Rural Minor Arterial. The right of way width requirement is 120 feet, 60 feet on either side of

section line. The County will request an additional 30 feet of right-of-way conveyance along Gun Club Road.

Response: Noted. At this point, United Power will not dedicate additional right of way on the east side of Gun Club Road. An additional 30 foot right of way dedication would encroach on the proposed detention and drainage facilities/easement. Additionally, the proposed substation project will not cause additional traffic impacts that would warrant a road expansion or turn lane addition.

ROW2: The classification of E. 132nd Avenue is a Rural Residential Road. The right of way width requirement is 60 feet, 30 feet on either side of section line. The County requests of a 30 feet right-of-way conveyance for E. 132nd Avenue.

Response: The current right of way for E 132nd Avenue suggests that Adams County has sufficient right of way on the south side of the road based on comment ROW2. The current right of way width of E 132nd Avenue is 55 feet; 30 feet being south of E 132nd Avenue reserved per Land Survey Plat in Book 5788 Page 572. Please see attached site plan and ALTA/NSPS Land Title Survey for reference.

ROW3: The minimum setback from section line for all structures in an A-3 Zone District is 120 feet from section line.

Response: Noted. No structure will be located within the section line setback (120'). Please see attached site plan for reference.

ROW4: Pending engineering review, any storm water quality facilities or detention must be dedicated to the county by separate instrument.

Response: Noted.

ROW6: Revise the site plan to show the record boundary with dimensions, any existing easements, location of existing roads for access purposes, existing structures with tie dimensions to the record boundary.

Response: Noted. Record boundary with dimensions, existing easements, and roads shown on attached site plan.

Commenting Division:
Name of Reviewer: Steve Krawczyk
Date:
Email:
Development Engineering Review
Resubmittal Required

ENG1: The applicant has completed a Trip Generation Analysis (TGA), signed and stamped by a Professional Engineer (P.E.) licensed in the State of Colorado. Using the ITE Trip Generation Manual, it is estimated that the proposed development will have vehicle trips per day of less than twenty (20), and no adverse traffic impacts are anticipated.

Response: Noted. Complete.

ENG2: The applicant is required to obtain permits for the proposed signage. Please contact the Development Services Team at 720-523-6800 or email epermitcenter@adcogov.org for assistance prior to resubmittal to the different cases.

Response: All signage will be attached to fencing. No free-standing signage will be utilized. Per meeting with Adams County, permits will not be required for attached signage.

ENG4: Submit a preliminary drainage report. The applicant is proposing to install over 3,000 square feet of impervious area on the project site. A drainage report and drainage plan in accordance with Chapter 9 of the Adams County Development Review Manual are required to be completed by a registered professional engineer and submitted to Adams County for review and final approval. Full drainage engineering designs and reports are not required with the change of use.

Response: Noted. Preliminary drainage report and plan attached hereto.

EGR Comments (Future requirements)
ENG5: Where soil types allow, the County encourages the use of structural BMPs that match the runoff reduction and water quality recommendations of the Urban Drainage 4-step process outlined in UDFCD Volume 3, BMP Planning for New Development, beginning on page ND1. Step 1 BMPs reduce the required WQCV, and there are other BMPs that meet the water quality basin capture volume requirement in addition to the extended detention basin. Reduction in the total required stormwater detention volume is permitted for sites that confirm the criteria in Urban Drainage for minimizing directly connected impervious.

Response: Noted. Geotech/soil testing report and Preliminary drainage report/plans are attached hereto.

ENG6: If the applicant is proposing to install over 3,000 square feet of impervious area on the whole project site, a drainage report and drainage plans in accordance to Chapter 9 of the Adams County Development Review Manual, are required to be completed by a registered professional engineer and submitted to Adams County for review and final approval. Drainage design shall show no adverse off-site impacts on neighboring properties or the public ROW.

Response: Noted. Preliminary drainage report and plan attached hereto.

ENG7: Engineering Review (EGR): The applicant will need to be aware that access locations, that When a parking lot is adjacent to both an arterial road and a road of lower functional classification such as a local, access shall be from the lower classification road to avoid interfering with the primary function of the arterial road, which is to move traffic rather than to provide access. Per section 4-15-04-02, of the Adams County Development Standards and Regulations.

Response: Noted. There is no parking lot required for this site.

ENG8: The culvert is required for an access off 128th Avenue. Driveway throat width cannot exceed 30 feet or twenty feet (20 ft) each for two accesses without additional Adams County approval. The driveway must be paved with a Minimum of 6" of Class 6 aggregate within the County ROW.

Response: Noted. Please see attached preliminary drainage plan and site plan.

ENG9: If the applicant proposes to import soil to this site, additional permitting is required. Per section 4-05-02-07, of the Adams County Development Standards and Regulations, a Temporary or Conditional Use Permit is required to ensure that only clean, inert soil is imported into any site within unincorporated Adams County. This regulation applies to ANY amount of soil imported to a site.

Response: Noted. United Power is not proposing to import any fill to the site. Please see attached preliminary drainage report for reference.

ENG10: All interior circulation must be installed and approved by the Adams County Fire Protection District. The developer shall submit site construction plans to the Adams Local Fire District for review and approval before construction can begin.

Response: Noted. Ulteig on behalf of United Power, has been communicating with the Brighton Fire Rescue District (BFRD). Preliminary site plan options were sent to BFRD on 8/20/2024. BFRD responded providing their preference on site layout options and their current Planning & Development Requirements (2018 IFC Planning & Development Requirements). Additionally, Ulteig provided United Power's substation Emergency Response Plan to BFRD on 11/17/2025.

Commenting Division:
Name of Reviewer: Megan Grant
Date:
Email:
Environmental Analyst Review
Resubmittal Required
The following comments apply to the airport:

ENV1. The applicant has addressed the Airport Height Overlay and Airport Noise Overlay in their application. Review and approval from the FAA will need to be provided for Adams County review with this permit application.

Response: An FAA Obstruction Evaluation Notice was submitted on 9/11/2025. The FAA conducted an aeronautical study (2025-ANM-5975-OE) and issued a *Determination of No Hazard to Air Navigation* on 10/14/2025. FAA Determination attached hereto.

ENV2. Due to the proximity of the subject parcel to the airport, it is covered by the Airport Height Overlay (AHO), which restricts certain building height and development. More information can be found in Section 3-37 of the Adams County Development Standards and Regulations (ACDSR). a) Landowners may be required to install, operate, and maintain, at the owner's expense, such markers and lights which may be necessary to indicate to flyers the presence of a hazard which affects the aviation facility. This marking and lighting requirement may also extend to objects of natural growth (trees, primarily) on site.
b) An FAA aeronautical study may be required to determine if the proposed development could be a hazard to air navigation. The applicant shall communicate with the FAA regarding the proposed project and provide this information to Adams County for review at time of building permit application.

Response: An FAA Obstruction Evaluation Notice was submitted on 9/11/2025. The FAA conducted an aeronautical study (2025-ANM-5975-OE) and issued a *Determination of No Hazard to Air Navigation* on 10/14/2025. FAA Determination attached hereto.

ENV3. Due to the proximity of the subject parcel to Denver International Airport, it is covered by the Airport Noise Overlay (ANO). The portions of the commercial or industrial structures devoted to office uses, or occupied by members of the public, must incorporate noise level reduction measures sufficient to achieve an interior noise level of 45 dB on the A-weighted scale. Assurance that these measures have been incorporated into the structure is illustrated by submission of noise reduction plans certified by a registered professional engineer at the time of application for a building permit, and implemented prior to issuance of a Certificate of Occupancy. Refer to ACDSR Section 3-39.

Response: Noted. As part of this project, there are no commercial or industrial structures devoted to office uses, the site is unmanned. Noise produced by the transformers in the substation will not exceed the levels spelled out in Title 25 Article 12 (25-12-103) of Colorado Revised Statutes, Maximum Permissible Noise Levels. Please see attached Exhibit "A" for more information.

ENV4. In accordance with the ANO, a signed "Aircraft Activity Covenant with Disclosure" must be filed prior to issuance of a building permit.

Response: Noted. A signed Aircraft Activity Covenant with Disclosure will be filed prior to issuance of a building permit.

ENV5. The applicant has addressed the shut in well in the application. Applicant has indicated that well will be plugged in 2025. The well status will be confirmed prior to building permit application and this documentation provided for Adams County Review.

Response: Noted. The status of the well on the subject property will be confirmed prior to building permit application.

ENV6. There is one (1) shut in oil and gas well on the subject parcel, and one (1) plugged and abandoned oil and gas well on the adjacent parcel to the south. Prior to submittal of a site-specific development plan, all wells on the subject parcel shall be located and mapped.

Response: Noted. All wells on the subject and adjacent properties have been mapped (attached hereto) utilizing the Energy & Carbon Management Commission (ECMC) online mapping system.

ENV7. All wells within 200 feet of the subject parcel(s) must be located and mapped. These may be located off the subject parcel(s), but setback distances may impact the parcel(s). Refer to ACDSR Section 4-11-02-03-03-05-2b.

Response: Noted. All wells on the subject and adjacent properties have been mapped (attached hereto) utilizing the Energy & Carbon Management Commission (ECMC) online mapping system.

ENV8. Adams County has requirements for residential construction currently, and this may expand to all construction in the future. The applicant should be aware of the standards and regulations, and adherence is recommended for safety and environmental health. Please refer to ACDSR Section 4-11-02-03-03-05 Residential Construction Standards.

a) For active oil and gas wells (which includes producing and shut in), the setback is 250 feet from the well and no structures may be constructed in that buffer area. Access will be provided by a public street or recorded easement for private access. b) For plugged and abandoned wells, there shall be dedicated a well maintenance and workover setback depicted on the plat, the dimensions of which shall be not less than fifty feet in width and 100 feet in length. No permanent structures shall be located within this setback. The plugged and abandoned well shall be located in the center of the setback. There shall be public access for ingress and egress to the setback of a width of not less than twenty feet.

Response: Noted. No permanent structures will be located within an oil & gas well setback. Please see attached site plan for reference.

ENV9. All known oil and gas well flow lines and/or easements shall be graphically depicted on the final plat or site-specific development plan. Though some the wells may not be

active, that does not mean that the flowlines were removed. In the interest of public health and safety, Adams County recommends that the applicant verify the status and location of the flowlines.

Response: Noted. All known oil & gas well flow lines are graphically depicted on the attached site plan and are labeled UG (Underground Gas). The easements for pipelines on the subject property are blanket in nature and not plottable. Please see attached ALTA/NSPS Land Title Survey for reference.

ENV10. Well details and location, as well as historical aerials and records, are available through the Colorado Energy and Carbon Management Commission (ECMC), formerly the Colorado Oil & Gas Conservation Commission (COGCC), website and map features: https://ecmc.state.co.us/maps.html#/gisonline

Response: Noted. All wells on the subject and adjacent properties have been mapped (attached hereto) utilizing the Energy & Carbon Management Commission (ECMC) online mapping system.

ENV11. All plans shall be reviewed and approved by the applicable fire district.

Response: Noted. Ulteig on behalf of United Power, has been communicating with the Brighton Fire Rescue District (BFRD). Preliminary site plan options were sent to BFRD on 8/20/2024. BFRD responded providing their preference on site layout options and their current Planning & Development Requirements (2018 IFC Planning & Development Requirements). Additionally, Ulteig provided United Power's substation Emergency Response Plan to BFRD on 11/17/2025.

ENV12. Please provide the facility emergency response plan for Adams County review at time of building permit application.

Response: Noted. Attached hereto is United Power's substation Emergency Response Plan. The Emergency Response Plan will also be provided at the time of building permit application.

ENV13. All hydraulic fluids, oils, and other pollutant sources shall be stored within a covered area and in secondary containment.

Response: Noted. No hydraulic fluids, oils, or other pollutant sources will be stored on site. The Project transformers contain mineral oil, which is required for the operation of the equipment. The mineral oil is contained within the equipment and secondary containment is designed which will confine the entire volume of oil should a vessel failure occur. There are no poly-chlorinated biphenyls (PCBs) in the mineral oil or transformers. All equipment will be located within an enclosed, secured facility. Spill control and prevention measures

as well as procedures for contacting appropriate emergency offices and personnel are formulated and designed in accordance with federal, state, and local requirements.

ENV14. The applicant has addressed nuisance controls, including trash, noise, dust, and lighting, in the application. All nuisance control measures as outlined in the permit application may be included as conditions of approval.

Response: Noted. Complete.

ENV15. Exposure to air pollution is associated with numerous health problems including asthma, lung cancer, and heart disease. Construction and traffic in unpaved areas may contribute to increased fugitive dust emissions and offsite vehicle tracking. Applicant will be required to implement dust control measures to prevent off-site impacts if truck traffic into and within parcel occurs on non-paved surfaces during all phases of construction and operation.

Response: Noted. The section of Gun Club Road adjacent to the project is currently a non-paved surface. During construction, United Power and its contractors will implement dust control measures to prevent off-site impacts. During operation, traffic trips will consist of 1-2 trucks, 2-4 times a month; therefore, United Power and its contractors will not implement dust control measures.

ENV16. The operator will need to ensure that refuse (trash) is properly controlled and collected as often as necessary to prevent nuisance conditions.

Response: Noted. United Power and its contractors will ensure that refuse (trash) is properly controlled and collected as often as necessary to prevent nuisance conditions. Enclosed containment will be provided for all trash. All construction waste, including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials, will be removed from the site and transported to a disposal facility authorized to accept such materials.

ENV17. Regular exposure to elevated sound levels can have a negative impact on both physical and mental health by increasing the risk of stress, hearing impairment, hypertension, ischemic heart disease, and sleep disturbance. Noise attenuation shall comply with the Colorado Noise Statute (CRS 25-12-103) and applicable, local noise regulations. All necessary steps should be taken to mitigate off-site noise.

Response: Noted. Noise produced by the transformers in the substation will not exceed the levels spelled out in Title 25 Article 12 (25-12-103) of Colorado Revised Statutes, Maximum Permissible Noise Levels. Please see attached Exhibit “A” for more information.

ENV18. Lighting facilities shall be arranged and positioned so no direct light or reflection creates a nuisance or hazard on any adjacent property or right-of-way.

Response: Noted. All lighting facilities shall provide down cast lighting and be arranged/positioned so direct light or reflection does not create a nuisance or hazard on adjacent properties or right-of-way. Outdoor lighting fixtures at the substation would only be used during emergency situations by personnel, typically during outages.

ENV19. An inert fill permit must be obtained prior to importing any volume of fill material onto the parcel as part of site development. The permit type will depend on the duration and total volume of fill imported to the site. The fill must meet the definition of clean, inert material.

Response: Noted. United Power is not proposing to import any fill to the site. Please see attached preliminary drainage report for reference.

The following comments apply to outside referral agencies:

School District 27J: School District 27J does not have any comment on the proposed substation, but is supportive of the addition of infrastructure which will support growth within the School District boundaries.

Response: Noted.

CDPHE Local Referral: There are no comments from the Air Pollution Control Division. Please do not hesitate to contact me with any questions.

Response: Noted.

Comcast: Comcast has no facilities and no conflicts at this location.

Response: Noted.

Lumen: Please see attached picture as the location of Lumen facilities. Lumen also recommends that locates are done for all facilities for your project to ensure safety and protection of all facilities.

Response: The attached picture provided by Lumen appeared to be at the intersection of E 128th Avenue and Gun Club Road and did not include the project site. United Power and its contractors will have utility locates completed at the project site prior to commencement of construction.

United Power: Thank you for inviting us to review and comment on the Conditional Use Permit for Stonehouse Substation. We have no concerns or objections to the Conditional Use Permit. United Power look forward to safely and efficiently providing reliable electric power and outstanding service.

Response: Noted.

Xcel Energy: Public Service Company (PSCo) Right of Way and Permits Referral Desk has determined there are possible conflicts with the above caption project. Public Service Company has an existing electric transmission line and an existing high-pressure natural gas transmission pipeline with associated land rights along Gun Club Road. Any activity including annexation, zoning, grading, proposed landscaping, crossing, erosion control or similar activities, involving our existing right-of-way will require Public Service Company approval. Encroachments across Public Service Company's easements must be reviewed for safety standards, operational and maintenance clearances, liability issues, and acknowledged with a Public Service Company License Agreement to be executed with the property owner. PSCo is requesting that, prior to any final approval of the development plan, it is the responsibility of the property owner/developer/contractor to contact the following for development plan review and execution of License Agreements:

For Electric Transmission: email coloradorightofway@xcelenergy.com or website www.xcelenergy.com/rightofway
For High Pressure Natural Gas Transmission:
cloud.marketing.xcelenergy.com/encroachment

Also, please be aware PSCo owns and operates existing natural gas distribution facilities along Gun Club Road. As a safety precaution, PSCo would like to remind the developer to contact Colorado 811 for utility locates prior to construction.

Response: Noted. United Power and its contractors will coordinate with Xcel to obtain the necessary License Agreement(s) for encroachments and/or crossings of Xcel facilities and/or right-of-ways. Additionally, United Power and its contractors will have utility locates completed at the project site prior to commencement of construction.

Landowner Leovi Madera: I am opposed to the conditional use permit for the substation on 128th and Gun Club Rd. We already have a lot of unsafe and harmful things in our area such as the constant and near fracking to our house, the big powerlines, the Cherokee Pipeline, the shooting and noise from the FlatRock Training Center and not this. This will decrease our home value and impact the dirt road and traffic in our area and not to mention impact our health. But of course Adams County doesn't care about its citizens, just the money that come from these things.

Response: Noted. United Power mailed project info, maps and supporting materials to surrounding landowners within 1,000 feet of the project site on 2/12/2025. Comments from the surrounding landowners were received and reviewed by United Power. Additionally, United Power mailed project info, maps and additional info in response to landowners comments received; these additional items (attached hereto) were mailed to surrounding landowners within 1,000 feet of the project site and were mailed on 10/24/2025.

Landowner Willie Morgan: Willie Morgan of 13135 Gun Club Road called (Greg Barnes) to discuss the Stonehouse Substation request. Mr. Morgan does not support this request. He identified an oil and gas related project (Conner Wellpad) which was approved to the north of the site. That approved project in conjunction with he proposed substation give him concern over for the health of his family. He is particularly concerned about radioactivity since the proposed substation is across the street from his property. Additionally, Mr. Morgan has concerns regarding the overall visibility of the substation from his home and Gun Club Road. Mr. Morgan stated that he moved to a rural area to get away from development. Energy development in the area is making it difficult for him to enjoy his own property in the way he intended when he purchased the property.

Response: Noted. United Power mailed project info, maps and supporting materials to surrounding landowners within 1,000 feet of the project site on 2/12/2025. Comments from the surrounding landowners were received and reviewed by United Power. Additionally, United Power mailed project info, maps and additional info in response to landowners comments received; these additional items (attached hereto) were mailed to surrounding landowners within 1,000 feet of the project site and were mailed on 10/24/2025.

Exhibit A

Noise produced by the transformers in the substation will not exceed the levels spelled out in Title 25, Article 12 (25-12-103) of the Colorado Revised Statutes, Maximum Permissible Noise Levels. The statute identifies that sound levels of noise radiating from a property line at a distance of twenty-five feet or more does not exceed the db(A) levels assigned for each zone between the hours of 7am to 7pm and 7pm to 7am.

Residential: 7am-7pm - 55 dB(A), 7pm-7am – 50 db(A)

Commercial: 7am-7pm - 60 dB(A), 7pm-7am – 55 db(A)

Light Industrial: 7am-7pm - 70 dB(A), 7pm-7am – 65 db(A)

Industrial: 7am-7pm - 80 dB(A), 7pm-7am – 75 db(A)

With the zoning for site being Agricultural, a particular zone has not been established per the statute. The Residential zone threshold is the most stringent in any defined zone and it is anticipated that the noise emitted for the substation transformers at a distance of 25 feet beyond the property line will adhere to or be below these levels.

In a straight-line or line-of-sight calculation, the sound resulting from a point source will be attenuated by distance from the source. This attenuation follows the rule that the sound will decrease inversely with the square of the distance from the source. Performing this calculation shows that the sound from a point source is reduced by 6 decibels each time the distance to the source is doubled. This calculation does not consider wind, ambient temperature, reflections, or sound barriers. Assuming the transformers to be used simply meet industry standards, they would present a close-in sound level of 75 db(A). Then the sound due to the transformer at 6 feet would be 69 db(A). Extending this calculation to 472 feet (closest point on the property line toward the nearest residence) would result in an undetectable sound level due to the transformer. Extending this same calculation to 192 feet (closest point on the nearest property line) would result in a sound level due to the transformer of approximately 39 db(A). This information or results can be confirmed by field tests after the substation is operational.

Decibel Level Reference Chart

Decibel Level - dB(a) Examples	
120-130	Pneumatic Chipper
110-120	Loud audible horn (1 mile distance away)

Exhibit A

90-100	Inside subway (New York)
80-90	Inside motorbus
70-80	Average traffic on street corner
60-70	Conversational speech
50-60	Typical business office
40-60	Living room, suburban area
30-40	Library ambient noise
20-30	Bedroom at night
10-20	Broadcasting studio
0-10	Threshold of hearing

Courtesy: Electric Power Research Institute

Site Plan

Revisions Made to Plan:

1. Record boundary with dimensions, existing easements and roads added to site plan.
2. Proposed access roads and culverts added to site plan.
3. All oil C gas wells on the subject property are shown on the site plan.
4. All oil C gas wells located within 200 feet of the subject parcel (but not located on the subject parcel) are shown on attached map from Energy C Carbon Management Commission (ECMC).
5. All known oil C gas well flowlines are graphically depicted on the site plan and labeled as UG (Underground Gas). The easements for pipelines on the subject property are blanket in nature and not plottable. See attached ALTA/NSPS Land Title Survey for reference.

NW COR, SEC 30, T1S, R65W
FOUND 3 ¼" ALUM. CAP
STAMPED "PLS 6973 1999"

W ¼ COR, SEC 30, T1S, R65W
FOUND 2.5" ALUM. CAP, PARTIALLY ILLEGIBLE
STAMPED "LS 25951"

PROPERTY LINE

E. 132ND AVENUE

LAT: 39.9360
LONG: -104.7150

LAT: 39.9360
LONG: -104.7140

LAT: 39.9360
LONG: -104.7130

LAT: 39.9360
LONG: -104.7122

55' R.O.W.

FOUND 1.25 IN. RED
PLASTIC CAP MARKED
"ALPHA ENG PLS 12330"

NEW TRANSMISSION
LINE TAP POLES

FOUND ½" IRON PIPE

30' R.O.W. RESERVED PER
LAND SURVEY PLAT IN
BOOK 5788, PAGE 572

GUN CLUB ROAD

ACCESS ROAD

220'-0"

TRANSMISSION TAP DESIGN IS
PRELIMINARY, SUBJECT TO INPUT
FROM XCEL ENERGY AND ASSOCIATED
INTERCONNECT AGREEMENT

LAT: 39.9355
LONG: -104.7132

LAT: 39.9355
LONG: -104.7120

A

SB-01

SB-02

SB-03

SB-04

SB-05

FENCE

ELECTRICAL EQUIPMENT ENCLOSURE (EEE)

PROPERTY LINE

WEST ELEVATION VIEW POINT

230'-0"

50'-0"

14'-0"

14'-0"

50'-0"

342'-0"

ACCESS ROAD

20'-0"

92'-0"

EXISTING XCEL ENERGY TRANSMISSION LINE

LAT: 39.9346
LONG: -104.7132

LAT: 39.9346
LONG: -104.7120

400'-0"

318'-0"

SOUTH ELEVATION VIEW POINT

B

B

50'-0"

50'-0"

50' OIL & GAS SETBACK

WELL TO BE PLUGGED IN 2025,
WILL CONFIRM WELL STATUS
PRIOR TO SUBSTATION
CONSTRUCTION IN 2027.

60' R.O.W.

30' R.O.W. RESERVED PER
LAND SURVEY PLAT IN
BOOK 5788, PAGE 572

LEGEND:

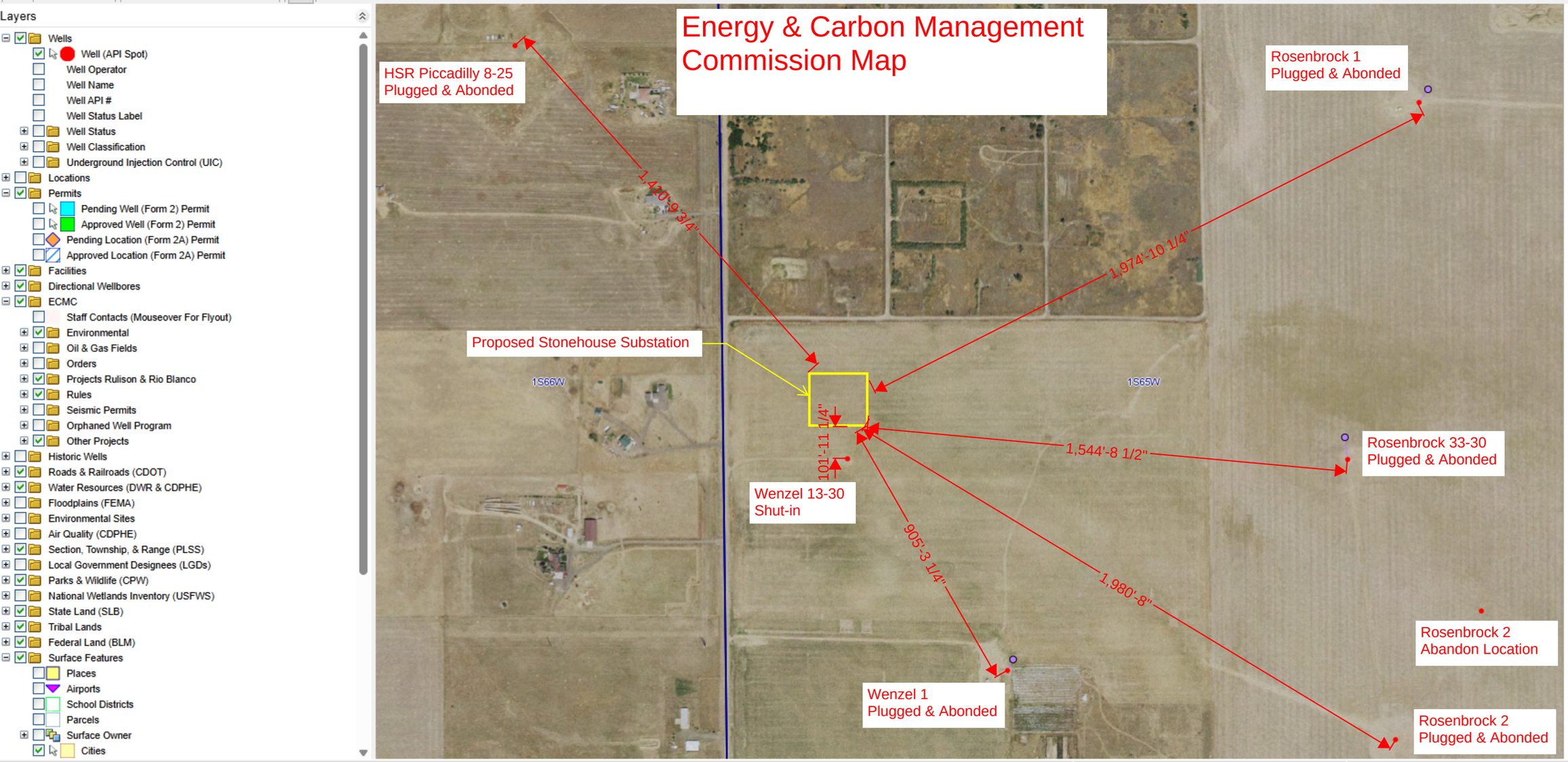
- SECTION LINE
- SECTION QUARTER LINE
- R.O.W. LINE
- PROPERTY LINE
- OE — EX. OVERHEAD ELECTRIC
- UG — EX. UNDERGROUND GAS
- EX. UNDERGROUND COMMUNICATION
- EX. GRAVEL EDGE
- CONTROL POINT
- SURVEY MONUMENT
- 5184 — EX. CONTOUR
- 5184 — PROPOSED CONTOUR
- PROPOSED SUBSTATION GRAVEL
- PROPOSED DRIVEWAY GRAVEL
- PROPOSED FENCE
- PROPOSED BIOROLL

PRELIMINARY
NOT FOR CONSTRUCTION

Ulteig
3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

PROJECT NUMBER: N/A
DESIGN BY: UEI
DRAWN BY: UEI
APPROVED BY: UEI
[DRAWING PREPARED 03-2025]

STONEHOUSE SUBSTATION
SITE PLAN



Layers

- Wells
  - Well (API Spot)
  - Well Operator
  - Well Name
  - Well API #
  - Well Status Label
  - Well Status
  - Well Classification
  - Underground Injection Control (UIC)
- Locations
- Permits
  - Pending Well (Form 2) Permit
  - Approved Well (Form 2) Permit
  - Pending Location (Form 2A) Permit
  - Approved Location (Form 2A) Permit
- Facilities
- Directional Wellbores
- ECMC
  - Staff Contacts (Mouseover For Flyout)
  - Environmental
  - Oil & Gas Fields
  - Orders
  - Projects Rulison & Rio Blanco
  - Rules
  - Seismic Permits
  - Orphaned Well Program
  - Other Projects
- Historic Wells
- Roads & Railroads (CDOT)
- Water Resources (DWR & CDPHE)
- Floodplains (FEMA)
- Environmental Sites
- Air Quality (CDPHE)
- Section, Township, & Range (PLSS)
- Local Government Designees (LGDs)
- Parks & Wildlife (CPW)
- National Wetlands Inventory (USFWS)
- State Land (SLB)
- Tribal Lands
- Federal Land (BLM)
- Surface Features
  - Places
  - Airports
  - School Districts
  - Parcels
  - Surface Owner
  - Cities

Measure Distance

Click a start and end point.

Measure units: Feet

Segment: 0.00 (Feet)

Total: 0.00 (Feet)

- To measure multiple distances, continue clicking new points.
- To finish, click "Stop".
- For reference, feet are always displayed above selected unit of measurement.
- You can pan or zoom and continue measuring by clicking "Resume".
- To start over, click "Clear".

Clear | Stop

Electronically Recorded RECEPTION#: 2023000025610,
5/8/2023 at 1:26 PM, 1 OF 2,
REC: $18.00
TD Pgs: 0 Josh Zygielbaum, Adams County, CO.

UNOFFICIAL COPY

ALTA/NSPS LAND TITLE SURVEY - for - UNITED POWER, INC. - of -

A PORTION OF THE SOUTHWEST QUARTER
OF SECTION 30, TOWNSHIP 1 SOUTH,
RANGE 65 WEST OF THE 6TH P.M.
COUNTY OF ADAMS, STATE OF COLORADO

PROPERTY DESCRIPTION

(PER SCHEDULE A OF ALTA COMMITMENT FOR TITLE INSURANCE ISSUED BY OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY THROUGH LAND TITLE GUARANTEE COMPANY, ORDER NUMBER ABZ70791960 WITH A DATE OF NOVEMBER 16, 2022, AT 5:00 P.M.)

TRACT A, AS SHOWN ON THE LAND SURVEY PLAT RECORDED JUNE 14, 1999 IN BOOK 5788 AT PAGE 572, MORE PARTICULARLY DESCRIBED AS FOLLOWS:
THE PART OF THE SOUTHWEST 1/4 OF SECTION 30, TOWNSHIP 1 SOUTH, RANGE 65 WEST OF THE 6TH P.M., COUNTY OF ADAMS, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS:
BEGINNING AT THE SOUTHWEST CORNER OF SAID SECTION 30;
THENCE SOUTH 89°56'06" EAST ON AN ASSUMED BEARING ALONG THE SOUTHERLY LINE OF SAID SOUTHWEST 1/4 OF SECTION 30 A DISTANCE OF 1345.63 FEET;
THENCE NORTH 00°14'52" WEST PARALLEL WITH THE WESTERLY LINE OF SAID SOUTHWEST 1/4 OF SECTION 30 A DISTANCE OF 1133.00 FEET TO THE TRUE POINT OF BEGINNING;
THENCE CONTINUING NORTH 00°14'52" WEST PARALLEL WITH SAID WESTERLY LINE OF THE SOUTHWEST 1/4 OF SECTION 30 A DISTANCE OF 1414.67 FEET TO THE NORTHERLY LINE OF SAID SOUTHWEST 1/4 OF SECTION 30;
THENCE NORTH 90°00'00" WEST ALONG SAID NORTHERLY LINE OF THE SOUTHWEST 1/4 OF SECTION 30 A DISTANCE OF 1345.62 FEET TO THE WEST 1/4 CORNER OF SAID SECTION 30;
THENCE SOUTH 00°14'52" EAST ALONG SAID WESTERLY LINE OF THE SOUTHWEST 1/4 OF SECTION 30 A DISTANCE OF 1513.14 FEET TO A POINT 1133.00 FEET NORTHERLY OF SAID SOUTHWEST CORNER OF SECTION 30;
THENCE SOUTH 89°56'06" EAST PARALLEL WITH SAID SOUTHERLY LINE OF THE SOUTHWEST 1/4 OF SECTION 30 A DISTANCE OF 1345.63 FEET TO THE TRUE POINT OF BEGINNING;
EXCEPT THE WESTERLY 30 FEET THEREOF FOR GUN CLUB MILE ROAD RIGHT-OF-WAY, AND EXCEPT THE NORTHERLY 30 FEET THEREOF FOR POSSIBLE FUTURE EAST 132ND AVENUE RIGHT-OF-WAY; COUNTY OF ADAMS, STATE OF COLORADO.

SCHEDULE B, PART II EXCEPTIONS:

(PER ABOVE REFERENCED TITLE COMMITMENT)

ITEMS 1 AND 2 - *NOT SURVEY RELATED*

3. ANY ENCROACHMENT, ENCUMBRANCE, VIOLATION, VARIATION, OR ADVERSE CIRCUMSTANCE AFFECTING THE TITLE THAT WOULD BE DISCLOSED BY AN ACCURATE AND COMPLETE LAND SURVEY OF THE LAND AND NOT SHOWN BY THE PUBLIC RECORDS. *AS SHOWN HEREON, IF ANY.*

ITEMS 4 THROUGH 8 - *NOT SURVEY RELATED*

9. RIGHT OF PROPRIETOR OF A VEIN OR LODE TO EXTRACT AND REMOVE HIS ORE THEREFROM SHOULD THE SAME BE FOUND TO PENETRATE OR INTERSECT THE PREMISES AS RESERVED IN UNITED STATES PATENT RECORDED APRIL 12, 1894 IN BOOK A67 AT PAGE 73. *RIGHTS ARE NOT PLOTTABLE.*

10. RIGHT OF WAY GRANTED TO PANHANDLE EASTERN PIPE LINE COMPANY, FOR PIPELINES, AND INCIDENTAL PURPOSES, BY INSTRUMENT RECORDED AUGUST 27, 1975, IN BOOK 2014 AT PAGE 73. NOTICE OF GENERAL DESCRIPTION OF AREA SERVED RECORDED JUNE 25, 1986 IN BOOK 3162 AT PAGE 961. *EASEMENT IS BLANKET IN NATURE AND NOT PLOTTABLE.*

11. EASEMENT GRANTED TO KOCH HYDROCARBON COMPANY, FOR PIPELINES, AND INCIDENTAL PURPOSES, BY INSTRUMENT RECORDED SEPTEMBER 29, 1983, IN BOOK 2795 AT PAGE 583. *EASEMENT IS BLANKET IN NATURE AND NOT PLOTTABLE.*

12. TERMS, CONDITIONS, PROVISIONS, BURDENS, OBLIGATIONS AND EASEMENTS AS SET FORTH AND GRANTED IN MINERAL DEED RECORDED MARCH 13, 1986 IN BOOK 3119 AT PAGE 957. *EASEMENT IS BLANKET IN NATURE AND NOT PLOTTABLE.*

13. MINERALS AS DEFINED AND DESCRIBED IN MINERAL DEED RECORDED MARCH 13, 1986 IN BOOK 3119 AT PAGE 957. *EASEMENT IS BLANKET IN NATURE AND NOT PLOTTABLE.*

14. MINERALS AS DEFINED AND DESCRIBED IN DEED RECORDED NOVEMBER 1, 1994 IN BOOK 4416 AT PAGE 267. *DOES NOT AFFECT THE SURVEYED PROPERTY.*

15. MINERALS AS DEFINED AND DESCRIBED IN DEED RECORDED DECEMBER 22, 1994 UNDER RECEPTION NO. C0040938. *DOES NOT AFFECT THE SURVEYED PROPERTY.*

16. RIGHT OF WAY GRANTED TO UNITED POWER, INC., FOR ELECTRIC FACILITIES, AND INCIDENTAL PURPOSES, BY INSTRUMENT RECORDED DECEMBER 03, 1991, IN BOOK 3842 AT PAGE 88. *DOES NOT AFFECT THE SURVEYED PROPERTY.*

(17) 17. EASEMENTS, CONDITIONS, COVENANTS, RESTRICTIONS, RESERVATIONS AND NOTES ON THE LAND SURVEY PLAT RECORDED JUNE 14, 1999 IN BOOK 5788 AT PAGE 572. *AS SHOWN HEREON.*

ITEMS 18 THROUGH 20 - *NOT SURVEY RELATED*

21. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN RESOLUTION 2014-355 RECORDED DECEMBER 19, 2014 UNDER RECEPTION NO. 2014000089365. *DOES NOT AFFECT SURVEYED PROPERTY.*

22. TERMS, CONDITIONS, PROVISIONS, BURDENS, OBLIGATIONS AND EASEMENTS AS SET FORTH AND GRANTED IN RIGHT-OF-WAY GRANT RECORDED JANUARY 06, 2016 UNDER RECEPTION NO. 2016000001319. *EASEMENT IS BLANKET IN NATURE AND NOT PLOTTABLE.*

GENERAL SURVEY NOTES:

1. THIS SURVEY WAS MADE IN ACCORDANCE WITH LAWS AND/OR MINIMUM STANDARDS OF THE STATE OF COLORADO.
2. THE WORD "CERTIFY" OR "CERTIFICATION" AS SHOWN AND USED HEREON IS AN EXPRESSION OF PROFESSIONAL OPINION REGARDING THE FACTS OF THE SURVEY, AND DOE NOT CONSTITUTE A WARRANTY OR GUARANTY, EXPRESSED OR IMPLIED.
3. NOTICE: ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF THE CERTIFICATION SHOWN HEREON.
4. THE BASIS OF BEARINGS FOR THIS SURVEY IS THE WEST LINE OF THE SOUTHWEST ONE-QUARTER OF SECTION 30, TOWNSHIP 1 SOUTH, RANGE 65 WEST, OF THE 6TH P.M. AND BEARS SOUTH 00° 28' 58" EAST AND IS BASED ON THE COLORADO STATE PLANE COORDINATE SYSTEM OF 1983, NORTH ZONE (C.R.S. 38-52-105 & 106) AS SHOWN HEREON.
5. DISTANCES AS SHOWN HEREON ARE IN U.S. SURVEY FEET, GROUND. THE COMBINED FACTOR USED TO OBTAIN GROUND DISTANCES IS 1.00027313.
6. ADDRESS OF SUBJECT PROPERTY IS NOT APPLICABLE BASED ON ABOVE REFERENCED TITLE COMMITMENT.
7. PER FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP NO. 08001C0365H WITH AN EFFECTIVE DATE OF MARCH 6, 2007, FOR ADAMS COUNTY, COLORADO, SUBJECT PROPERTY IS LOCATED WITHIN "OTHER AREA ZONE X" - AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.
8. SUBJECT PROPERTY HAS A GROSS LAND AREA OF 2,037,123 SQUARE FEET OR 46.766 ACRES, MORE OR LESS.
9. NO PARTY WALLS WERE OBSERVED ON SUBJECT PROPERTY DURING THE COURSE OF THIS SURVEY.
10. VISIBLE ABOVE GROUND UTILITIES HAVE BEEN FIELD LOCATED AS SHOWN. UNDERGROUND UTILITIES SHOWN HEREON ARE REPRESENTED BASED ON FIELD MARKINGS ESTABLISHED BY A PRIVATE UTILITY LOCATE PERFORMED BY UNDERGROUND CONSULTING SOLUTIONS (UCS). THE UNDERGROUND UTILITIES HAVE NOT BEEN PHYSICALLY LOCATED AS A PART OF THIS SURVEY. PRIOR TO EXCAVATION OR DIGGING, CONTACT COLORADO 811 AT 811 OR 800-922-1987.
11. NAMES AND PARCEL IDENTIFICATION NUMBERS OF ADJOINING OWNERS ARE SHOWN ON SURVEY.
12. IMPROVEMENTS AS NOTED ARE BASED ON RECTIFIED ORTHOPHOTOGRAPHY FROM THE NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP), ADAMS COUNTY, COLORADO, COLLECTED IN 2019, WITH A RESOLUTION OF 0.6 METERS.
13. PLOTTABLE OFFSITE EASEMENTS DISCLOSED IN DOCUMENTS PROVIDED TO THE SURVEYOR ARE SHOWN HEREON.
14. THE FIELD WORK FOR THIS SURVEY WAS COMPLETED ON JANUARY 27, 2023. ALL VISIBLE IMPROVEMENTS WERE LOCATED, HOWEVER, DUE TO SNOW COVER SOME IMPROVEMENTS MAY NOT HAVE BEEN VISIBLE.

SURVEY OBSERVATIONS:

FOR THE BENEFIT OF THE PARTY REQUESTING THIS SURVEY (UNITED POWER, INC.), THE SURVEYOR NOTES THE FOLLOWING MATTER WHICH MAY AFFECT THE STATUS OF TITLE TO THE SUBJECT PROPERTY:

(1) **THERE EXISTS UTILITY LINES AND APPURTENANCES WITHIN THE SURVEYED PROPERTY THAT DO NOT APPEAR TO LIE WITHIN AN EASEMENT, AS SHOWN HEREON, AND THUS CREATES AN AREA OF CONCERN.**

SURVEYOR'S CERTIFICATE

COLORADO LICENSED
H. LAWRENCE SINCO
38229
05/05/2023
PROFESSIONAL LAND SURVEYOR

TO UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION, LAND TITLE GUARANTEE COMPANY; AND OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY:

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2021 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 1, 2, 3, 4, 8, 10, 11(B), 13, AND 18 OF TABLE A THEREOF. THE FIELDWORK WAS COMPLETED ON JANUARY 27, 2023.

DATE OF PLAT OR MAP: MAY 5, 2023

H. LAWRENCE SINCO

COLORADO LICENSE NUMBER 38229

Ulteig
Austin - Billings - Bismarck - Boise - Cedar Rapids - Denver
Detroit Lakes - Fargo - Sacramento - Sioux Falls - St. Paul - Williston
5575 DTC Parkway, Suite 200
Greenwood Village, Colorado 80111
Phone: 720.873.5700 Fax: 888.858.3440
Web: www.ulteig.com

ALTA/NSPS LAND TITLE SURVEY

A PORTION OF THE SOUTHWEST QUARTER,
SECTION 30, TOWNSHIP 1 SOUTH, RANGE 65 WEST, 6TH P.M.
COUNTY OF ADAMS, STATE OF COLORADO

UNITED POWER
Your Touchstone Energy® Cooperative

UNITED POWER, INC.
500 COOPERATIVE WAY
BRIGHTON, CO 80603

Project Number:	22.22407
Date:	05/05/2023
Drawn By:	NES
Reviewed By:	JPE
Approved By:	HLS
Sheets:	1 of 2

Electronically Recorded RECEPTION#: 2023000025610,
5/8/2023 at 1:26 PM, 2 OF 2,
TD Pgs: 0 Josh Zygielbaum, Adams County, CO.

WORKING COPY

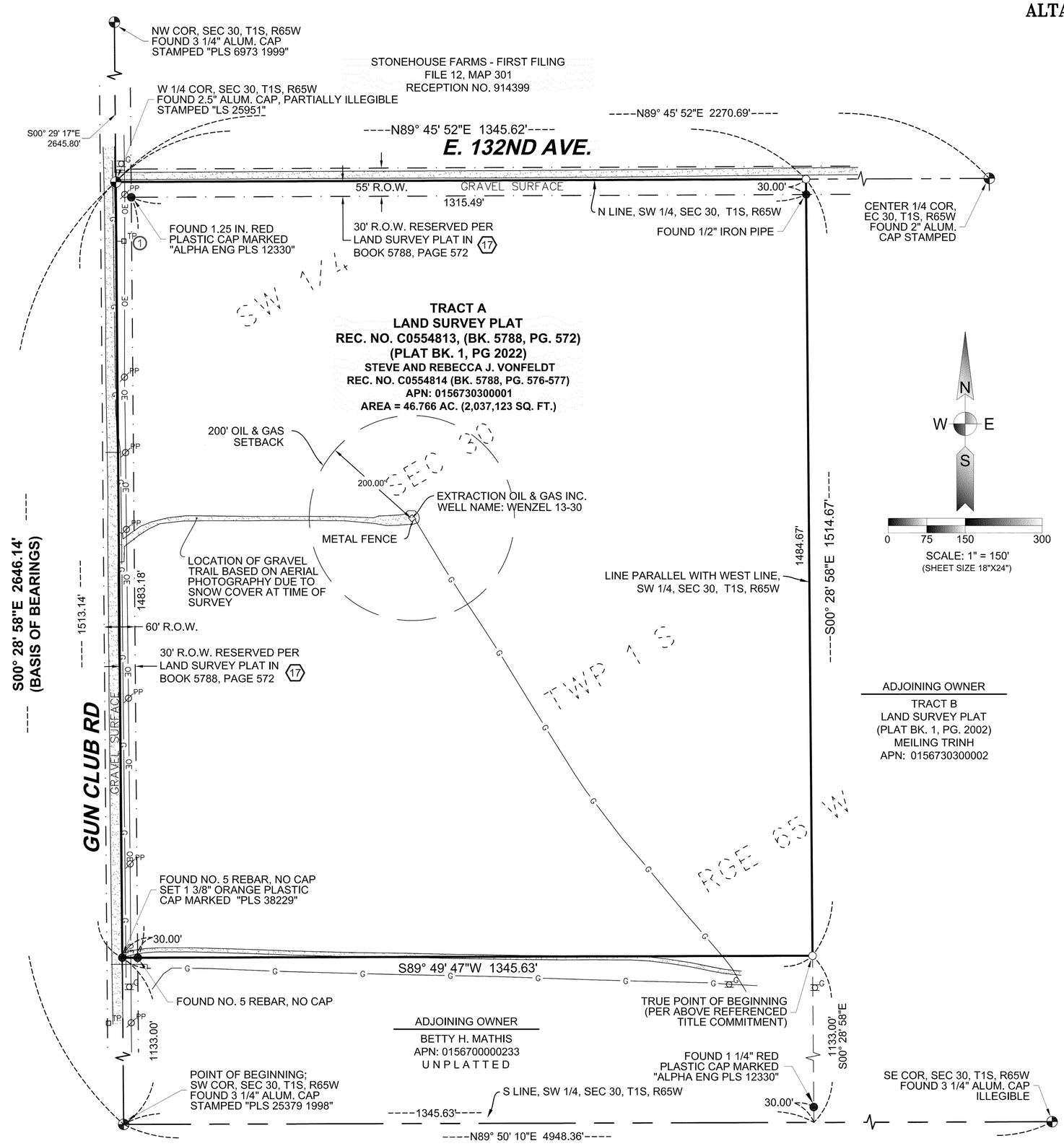
ALTA/NSPS LAND TITLE SURVEY

~ for ~

UNITED POWER, INC.

~ of ~

A PORTION OF THE SOUTHWEST QUARTER OF SECTION 30, TOWNSHIP 1 SOUTH, RANGE 65 WEST OF THE 6TH P.M. COUNTY OF ADAMS, STATE OF COLORADO

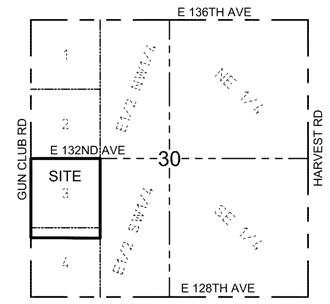


LEGEND OF SYMBOLS:

- FOUND SECTION CORNER MONUMENT (AS DESCRIBED)
- FOUND MONUMENT (AS DESCRIBED)
- SET 5/8" REBAR WITH 1-3/8" ORANGE PLASTIC CAP MARKED "PLS 38229"
- G GAS MARKER
- PP POWER POLE
- TP TELEPHONE PEDESTAL
- GRAVEL SURFACE
- OE OVERHEAD ELECTRIC
- G GAS PIPELINE
- UT UNDERGROUND TELEPHONE LINE
- CHAIN LINK FENCE
- SECTION LINE
- QUARTER LINE
- RIGHT-OF-WAY (R.O.W.) LINE

VICINITY MAP

NOT TO SCALE



SECTION 30
TOWNSHIP 1 S., RANGE 65 W., 6TH P.M.

Ulteig
Austin - Billings - Bismarck - Boise - Cedar Rapids - Denver
Detroit Lakes - Fargo - Sacramento - Sioux Falls - St. Paul - Williston
5575 DTC Parkway, Suite 200
Greenwood Village, Colorado 80111
Phone: 720.873.5700 Fax: 888.858.3440
Web: www.ulteig.com

ALTA/NSPS LAND TITLE SURVEY

A PORTION OF THE SOUTHWEST QUARTER,
SECTION 30, TOWNSHIP 1 SOUTH, RANGE 65 WEST, 6TH P.M.
COUNTY OF ADAMS, STATE OF COLORADO

UNITED POWER
Your Touchstone Energy® Cooperative

UNITED POWER, INC.
500 COOPERATIVE WAY
BRIGHTON, CO 80603

Project Number:	22.22407
Date:	05/05/2023
Drawn By:	NES
Reviewed By:	JPE
Approved By:	HLS
Sheets:	2 of 2

Parking/Landscape Explanation

Parking:

1. There is no parking lot required for this project site.

Landscape:

1. The subject parcel (parcel # 0156730300001) is not located within any water district and does not have a readily accessible source of water. Additionally, the electrical substation will be an unmanned facility and not require water service. Due to the insufficient water availability at the proposed project site, implementation and maintenance of the County's landscaping standard (type C landscape buffer section 4-08-02-07-04) are deemed impractical. As an alternative, United Power intends to restore all disturbed surface areas to their pre-construction condition utilizing native materials and reseeding. This will allow the landscape of the proposed project site to blend naturally with the physical conditions in the surrounding area, maintain the rural character and native vegetation. In addition, United Power is proposing the installation of two fences around the entire substation yard; the inner fence will be an 8-foot chain link security fence with 1-foot barbed wire on top and an outer 8-foot decorative wooden fence.

FAA Aeronautical Determination

(Remainder of Page Intentionally Left Blank)

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2025-ANM-5975-OE

Issued Date: 10/14/2025

UNITED POWER, INC.
MARISSA HILLJE
500 Cooperative Way
Brighton, CO 80603

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure: Transmission Line Tower Stonehouse Substation and Transmission
County, State: Adams, Colorado

Collected Point(s):

Label	Latitude	Longitude	SE	DET AGL	AMSL
Stonehouse Substation	39-56-09.07N	104-42-50.40W	5177 Ft	58 Ft	5235 Ft

In accordance with the provisions of 49 U.S.C., Section 44718 and as applicable Title 10 of the Code of Federal Regulations, part 183a, this aeronautical study was sent to the Military Aviation and Installation Assurance Clearinghouse established by the Secretary of Defense for review. The results of that review resulted in a finding of no risk to national security.

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M Change 1.

This determination expires on 04/14/2027 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

(c) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.This determination includes all previously filed frequencies and power for this structure.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

A copy of this determination will be forwarded to the Federal Communications Commission (FCC) because the structure is subject to their licensing authority.

If we can be of further assistance, please contact steven.l-ctr.landry@faa.gov, at 1-404-305-6249, or Steven.L-ctr.Landry@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2025-ANM-5975-OE.

Signature Control No: 677475877-681712980 (DNE)
Julie A. Morgan
Manager, Obstruction Evaluation Group

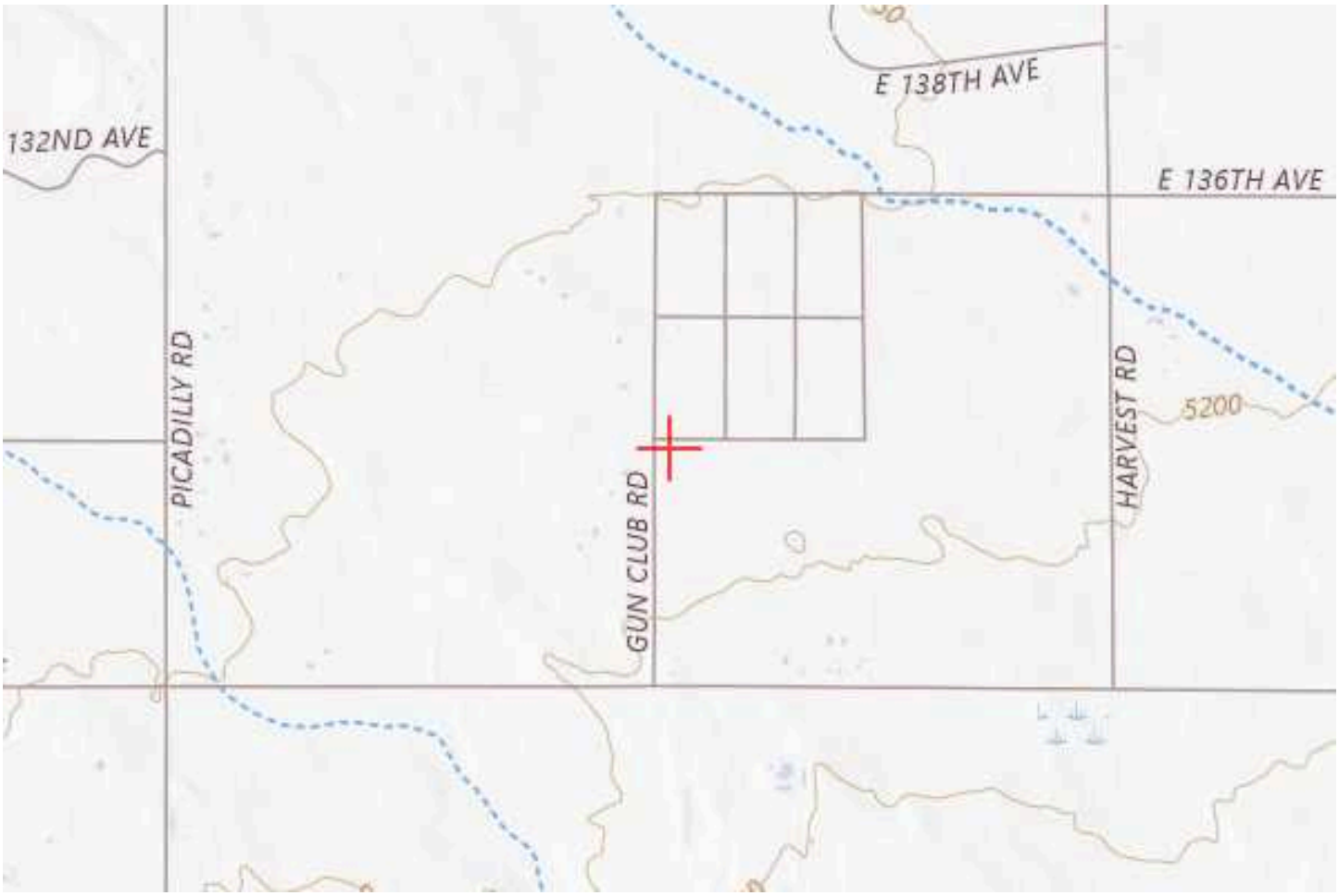
Attachment(s)
Frequency Data
Map(s)

cc: FCC

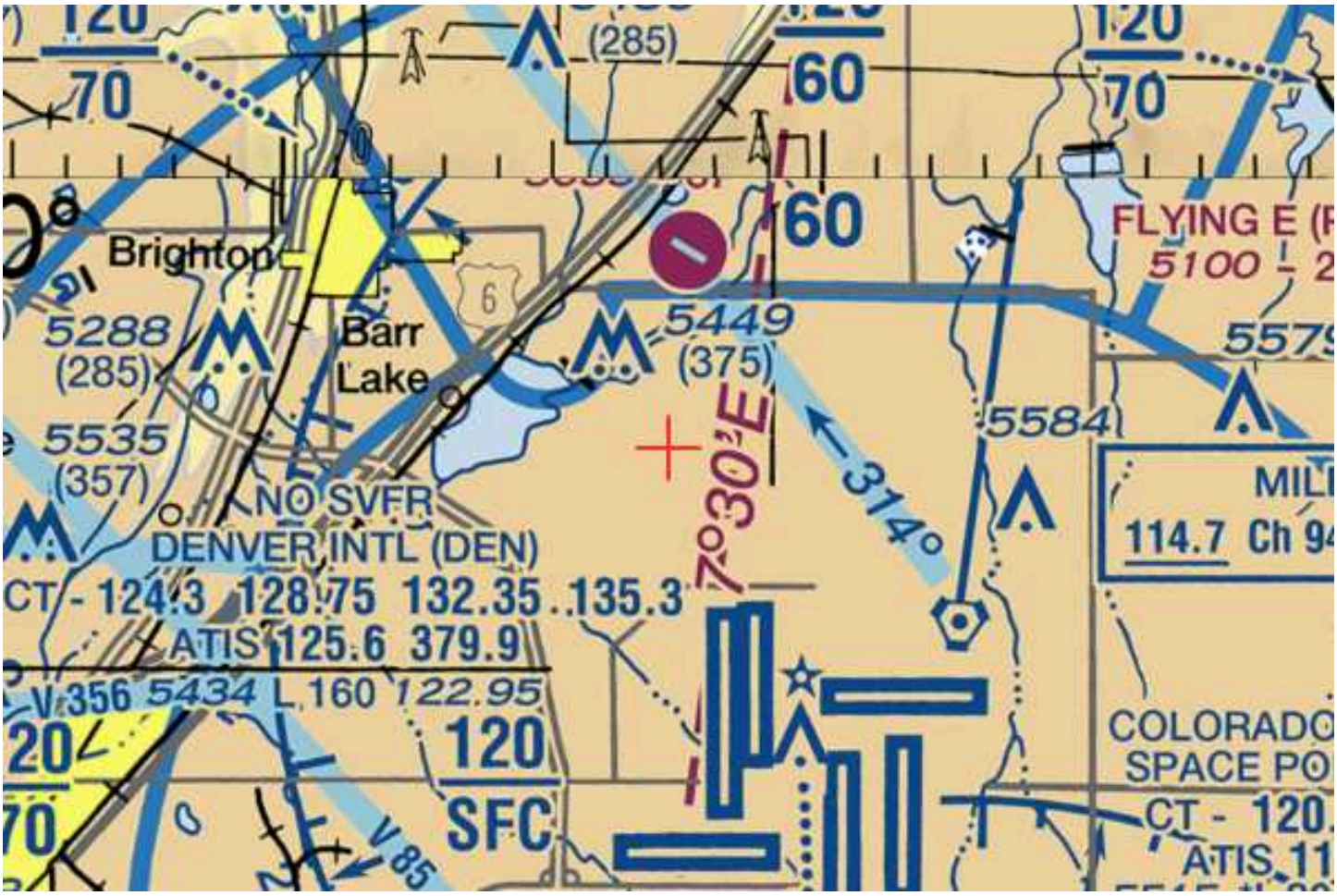
Frequency Data for ASN 2025-ANM-5975-OE

LOW FREQUENCY	HIGH FREQUENCY	FREQUENCY UNIT	ERP	ERP UNIT
6	7	GHz	42	dBW

TOPO Map for ASN 2025-ANM-5975-OE



Sectional Map for ASN 2025-ANM-5975-OE



Fencing Details

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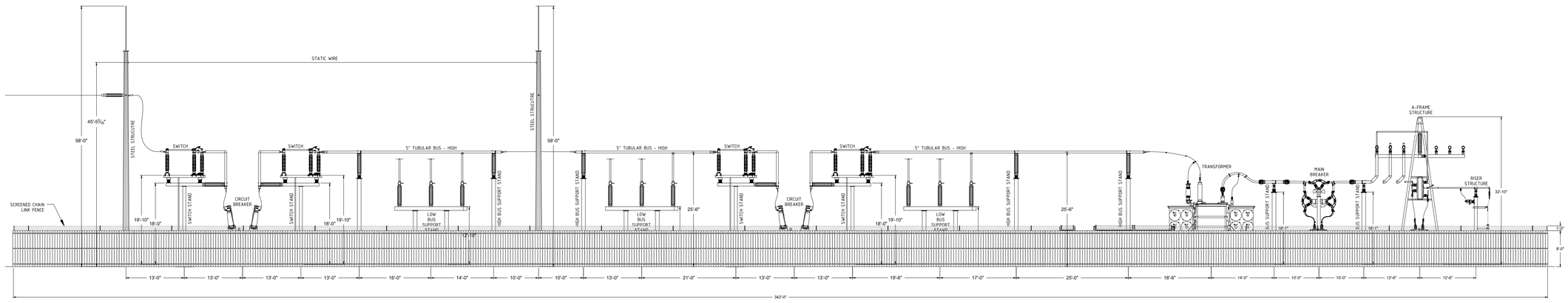
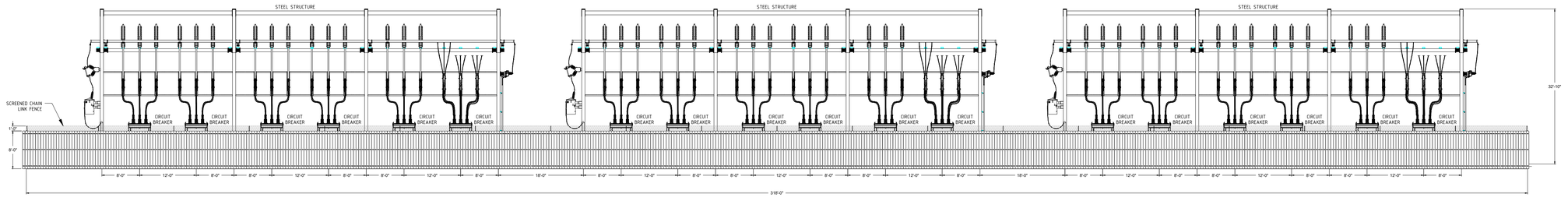


WEST ELEVATION
(LOOKING EAST TOWARDS
HARVEST ROAD)



SOUTH ELEVATION
(LOOKING NORTH TOWARDS
E. 132ND AVENUE)

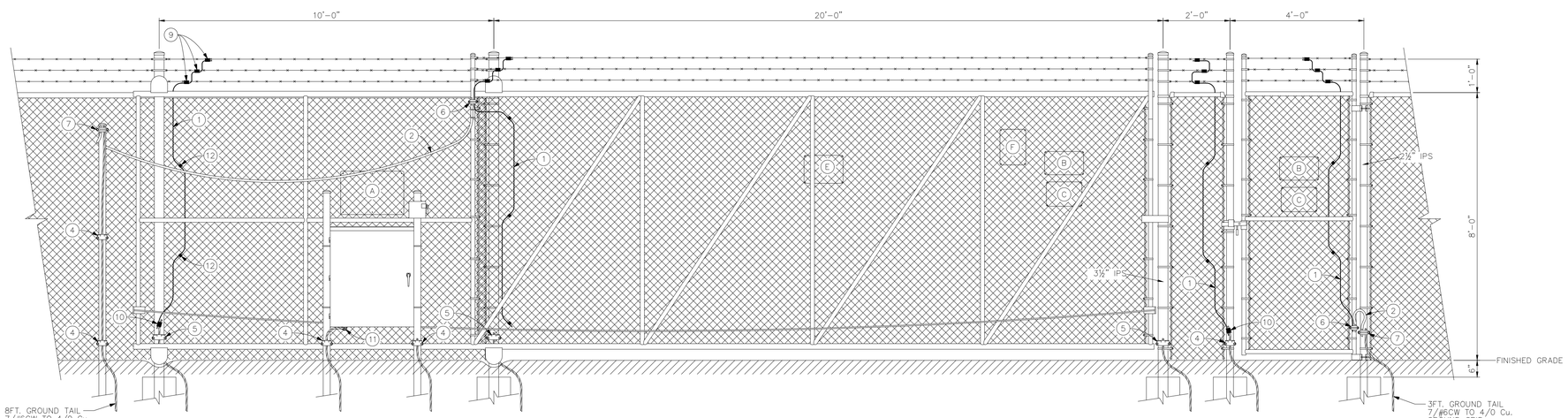
0 1 2
1"=150'-0"

3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

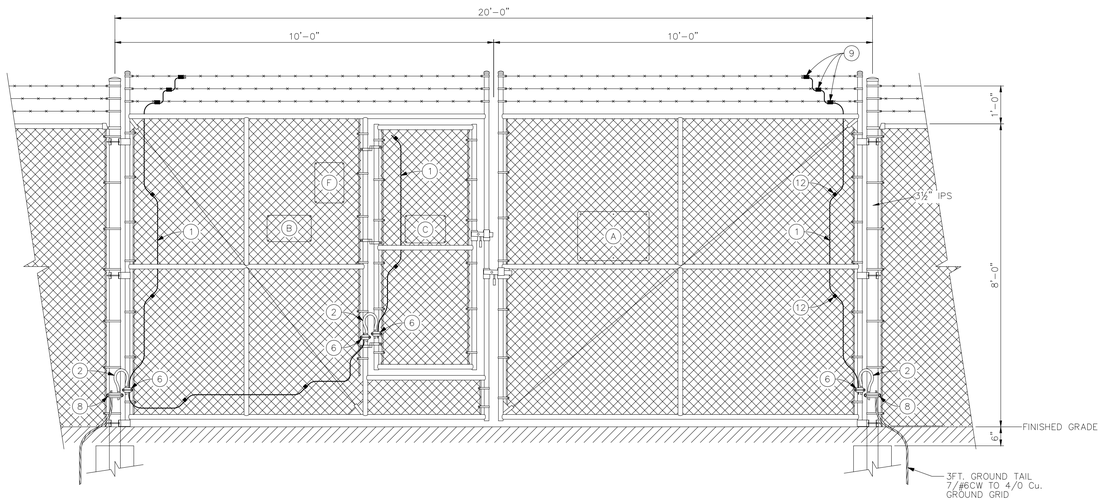
PROJECT NUMBER: N/A
DESIGN BY: UEI
DRAWN BY: UEI
APPROVED BY: UEI
{IF APPLICABLE IN STATE, ADD FIRM REG NO. HERE}

STONEHOUSE SUBSTATION FENCE ELEVATIONS

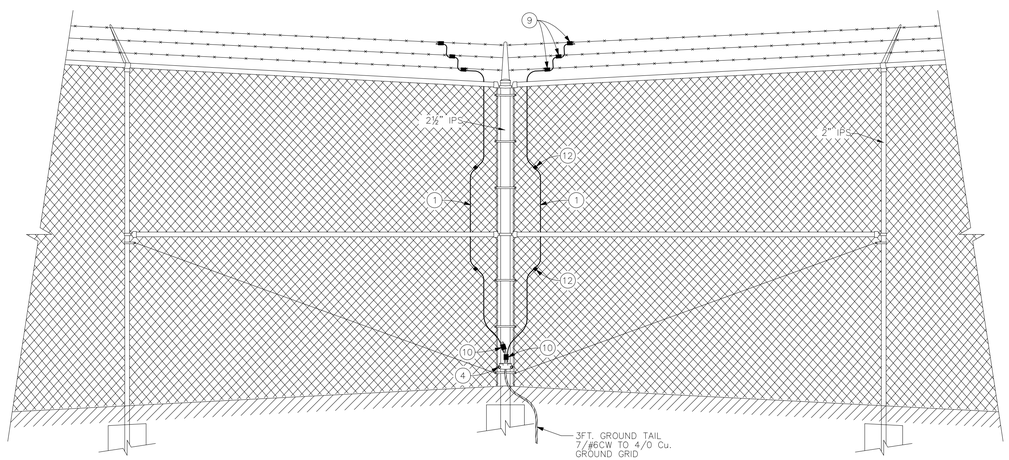
1/28/2025



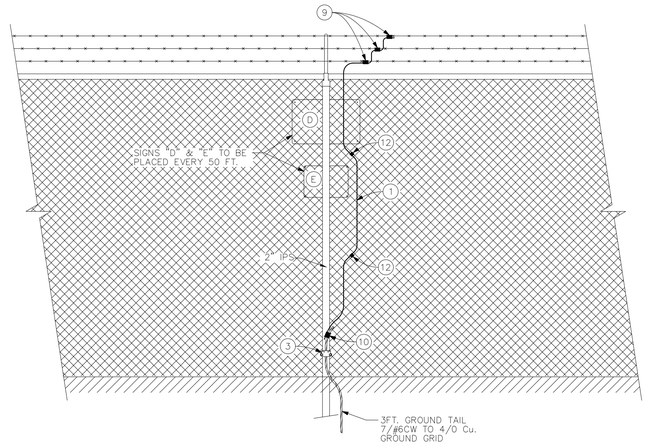
TYPICAL SLIDING GATE DETAIL



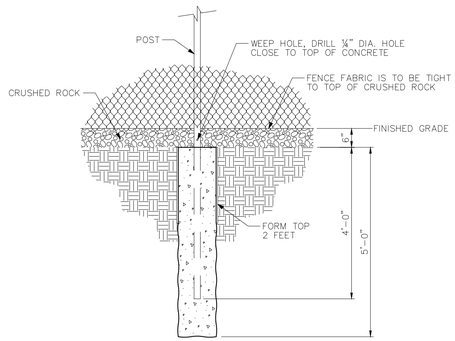
TYPICAL SWING GATE DETAIL



TYPICAL CORNER POST DETAIL



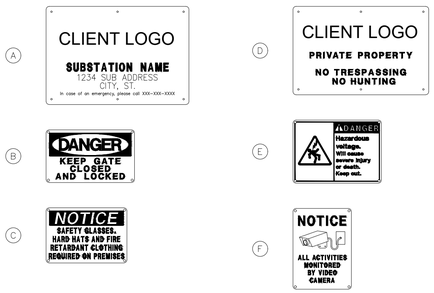
TYPICAL LINE POST DETAIL



TYPICAL FOUNDATION DETAIL

MATERIAL LIST		
DESCRIPTION	ITEM ID	QTY.
CONCRETE – 4000 PSI AT 28 DAYS	CONTRACTOR	0.15 CU.YD.
FORM, STOVE PIPE OR WAXED CARDBOARD TUBE, 12" DIA.	CONTRACTOR	2 FT.

MATERIAL LISTED IS FOR ONE FOUNDATION



TYPICAL SECURITY FENCE SIGNAGE

MATERIAL LIST			
ITEM NO.	DESCRIPTION	ITEM ID	QTY.
1	WIRE, TIE, 1/C, #4, ALUMINUM, SOLID, SOFT DRAWN, EC GRADE, UTILITY GRADE, 25LB BOX, APPROX. 651FT; DIRECT 4ASB CT 25	TBD	TBD
2	CABLE, GROUNDING, 1/C, 2/0, 3276 STRAND COPPER, 21kA MAX FAULT CURRENT, BLACK COLORED JACKET; HUBBELL S3712	TBD	TBD
3	CLAMP, GROUNDING, 2" IPS, BRONZE, 1–WIRE, FOR 1/0–4/0 STR COPPER, □" HOLE; HUBBELL GC–111–7C	TBD	TBD
4	CLAMP, GROUNDING, 2–1/2" IPS TO 2/0–250KCMIL CU, PIPE TO CABLE, BRONZE TWO PIECE CLAMP, BOTH PARTS OF CLAMP ARE ATTACHED TO THE U–BOLT; HUBBELL GC–111–8C	TBD	TBD
5	CLAMP, GROUNDING, 3–1/2" IPS TO 2/0–250KCMIL CU, PIPE TO CABLE, BRONZE TWO PIECE CLAMP, BOTH PARTS OF CLAMP ARE ATTACHED TO THE U–BOLT; HUBBELL GC–111–10C	TBD	TBD
6	CONNECTOR, GROUND CABLE, #4 SOL – 2/0 STR, BRONZE, ONE, TWO OR THREE CABLES TO 2" O.D. – 1–1/2" IPS ROD OR TUBE; HUBBEL GC11061C	TBD	TBD
7	CONNECTOR, GROUND CABLE, 2/0 SOL – 250 MCM, BRONZE, ONE, TWO OR THREE CABLES TO 3" O.D. – 2–1/2" IPS ROD OR TUBE; HUBBEL GC110102C	TBD	TBD
8	CONNECTOR, GROUND CABLE, 2/0 SOL – 250 MCM, BRONZE, ONE, TWO OR THREE CABLES TO 4" O.D. – 3–1/2" IPS ROD OR TUBE; HUBBEL GC110142C	TBD	TBD
9	CONNECTOR, COMPRESSION, H–TAP, #2–#6 ACSR, MAIN/TAP, TYPE O DIES; BLACKBURN WR159	TBD	TBD
10	CONNECTOR, COMPRESSION, H–TAP, 4/0 STR/6–2 STR, DIE D; BLACKBURN WR379	TBD	TBD
11	CLAMP, GROUND CABLE, #4 SOL – 300 MCM, 2–PC BRONZE, SINGLE CABLE TO FLAT, ½" SS BOLT; HUBBELL POWER SYSTEMS GC–141–A02	TBD	TBD
12	CONNECTOR, SPLIT BOLT, #4 SOL – 1/0 STR, Cu TIN PLATED, 2–WIRE CONDUCTOR CONNECTION, □" BOLT SIZE; HUBBELL SBS10	TBD	TBD

NOTES:

1. ALL 7/#6CW GROUND TAILS TO BE 3FT. ABOVE FINISHED GRADE UNLESS OTHERWISE NOTED.
2. ALL GROUNDING WIRE AND CONNECTIONS SHALL BE INSTALLED ON THE INSIDE OF FENCE.

Preliminary
08/14/2025 12:03:46 PM

Ulteig
3350 38TH AVE S
FARGO, ND 58104
PHONE: (888) 858-3441
ULTEIG.COM

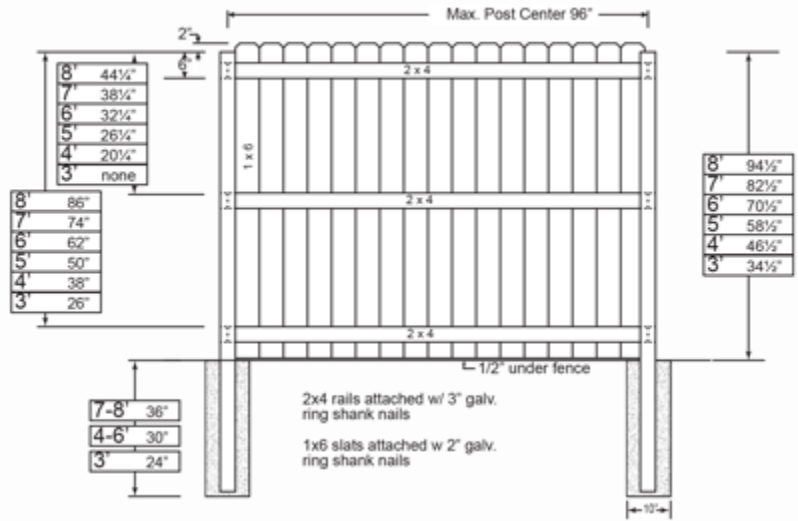
PROJECT NUMBER: N/A
DESIGN BY: N/A
DRAWN BY: N/A
APPROVED BY: N/A

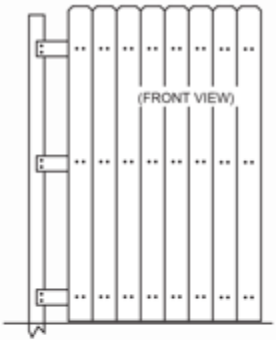
SECURITY FENCE DETAILS

DRAWING NUMBER: N/A
REVISION: N/A

2025-08-14

DOG EAR FENCE





OPTIONS:

STANDARD DOG EAR

(FACE NAIL)

ALTERNATING PANEL

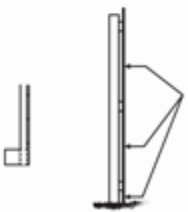
(TOE NAIL)

CORNER POSTS:

ALL OUTSIDE SLATS

INSIDE SLATS w/ OUTSIDE SLATS

END POSTS:



Public Outreach - 2

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United Power Stonehouse Substation
Public Outreach – 2

October 24, 2025

Arthur B Henry Trust
12835 Gun Club Rd.
Commerce City, CO 80022

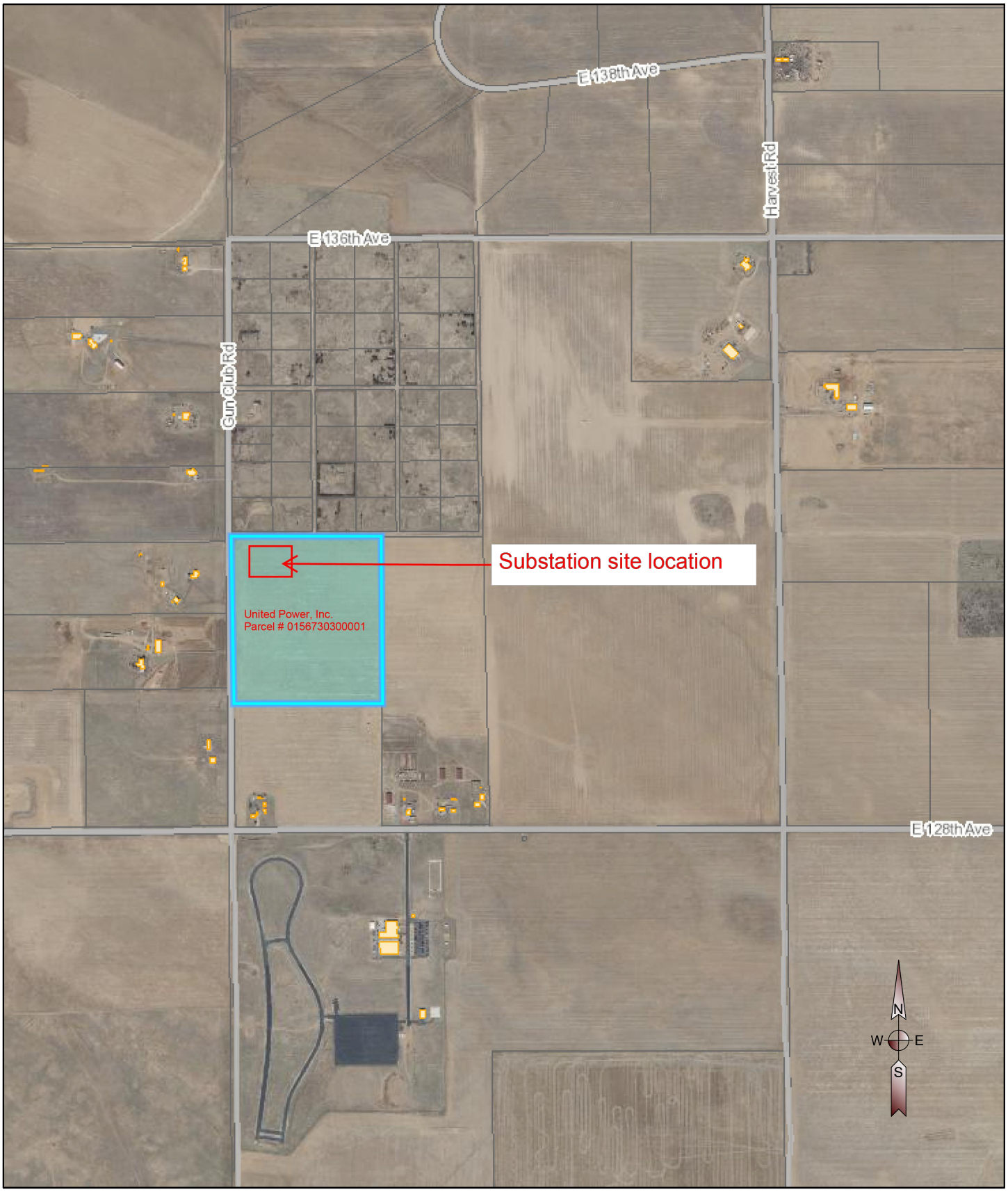
Dear Arthur B Henry Trust,

United Power, Inc. has received feedback from surrounding landowners regarding the previous notification about plans for a future electric substation located near the intersection of Gun Club Road and E 128th Avenue (see attached map for reference). United Power values your responses and this letter provides further information on specific items raised. Attached are the responses submitted by landowners along with additional details from United Power on each topic. We hope this information provides clarity and should you have any follow-up responses, please submit them by October 14th, 2025 to:

Ulteig Operations, LLC
Attn: Derek Holscher
5575 DTC Pkwy Suite 200
Greenwood Village, CO 80111
Or
derek.holscher@ulteig.com

Thank you for your participation in making this project successful.

Marissa Millje
Marissa Millje, RWA
Senior Right-of-Way Agent
Enclosure: Vicinity Map, Landowner Responses & Additional information



Ulteig

Austin - Billings - Bismarck - Boise - Cedar Rapids - Denver
Detroit Lakes - Fargo - Sacramento - Sioux Falls - St. Paul - Williston
5575 DTC Pkwy, Ste 200, Greenwood Village, CO 80111
Phone: 720.873.5700 Fax: 888.858.3440
Web: www.ulteig.com

STONEHOUSE SUBSTATION

SECTION 30, TOWNSHIP 1 SOUTH,
RANGE 65 WEST, 6TH P.M.
ADAMS COUNTY, CO

Project Number: WO202001013
Date: 11/18/2024
Sheet: 1 of 1

UNITED POWER
Your Touchstone Energy® Cooperative

Landowner Responses & Additional Information

1. Is the project planned to support any proposed growth or development in the immediate area?
    a. Currently, United Power is not aware of any proposed developments in the immediate area. The purpose of this project is to increase load serving capacity and provide additional reliability in this portion of United Power's service territory.
2. Will private property be impacted by any additional powerlines or easement related to the project?
    a. The purpose of this project is to construct a new electric substation on property owned by United Power. To bring power to the proposed substation, United Power anticipates tapping into the existing Xcel Transmission line that runs north/south on the west side of Gun Club Road. In the future, there will be smaller electric distribution lines that will exit the substation to serve existing and future load growth. Easements may be needed in the future for the smaller electric distribution projects.
3. Will there be any negative impact to property values in the surrounding area?
    a. The project should not have a negative impact on surrounding property values. There have been previous studies completed on impacts to property values in relation to electric substations, which have been supported by comparable market analysis examining appreciation rates, paired sales analysis, statistical descriptive measures and statistical regression. The results indicate there is no measurable market impact on property values. A study on impacts to property values is not a requirement for the Adams County Conditional Use permit process. Therefore, United Power did not perform an independent study for this project.
4. We are concerned on a multitude of areas. We already are exposed to the fracking in our area, to the big power lines that run through our area, and now additional substation. This impacts our health, the value of our home, our water, land, and any hazard runoff comes downstream to our home. I'm in disagreement one other problem being added to our neighborhood.
    a. United Power is not associated with fracking or the electric transmission lines in your area. The facilities for the project will be designed, constructed, operated and maintained in compliance with the National Electric Safety Code. There will be no hazardous materials stored on the project site. Certain pieces of equipment such as back-up battery and transformers that have operational fluids are contained within the equipment and will have secondary containment designed to capture and contain if an equipment failure occurs. Next, the water table/aquifer system will not be impacted. The runoff from the project site will be minimal and ground under the substation will be pervious for drainage into the ground. Additional engineering studies will be performed and reviewed by Adams County to evaluate any additional storm system facilities that are needed to capture storm water runoff and release runoff into the Adams County drainage system.

5. We are concerned about EMF emitted and health risks associated with exposure.
    a. There have been previous studies performed by government and scientific institutions that indicate exposure to EMF does not cause disease. Per the Public Utilities Commission Rule (3206(e), proposed magnetic field levels of 150mG (milliGauss) and below are deemed reasonable by rule and do not require mitigation to a lower level. The magnetic fields generated by the substation do not exceed 150mG at the substation fence, where the public has unrestricted access. The nearest residence to the proposed substation is approximately 700 feet from the proposed substation fence. An EMF study is not a requirement for the Adams County Conditional Use permit process; therefore, United Power did not perform an independent study for this project.
6. Why does it need to be so close to homes?
    a. There are many factors that are considered when siting a new substation. Included in those factors are a willing landowner to sell the property, proximity to homes, proximity to existing developments, areas of projected growth (load center), proximity to existing transmission lines, and environmental concerns. It is difficult to adhere to all of these considerations; however, in this case, United Power was able to find a landowner willing to sell their property, which is located adjacent to an existing transmission line (along the west side of Gun Club Road) and within the load center. There are homes in the area, so the substation was placed further east of Gun Club Road on the United Power property to provide more of a buffer.
7. We are concerned about increased traffic on the road and deterioration of the dirt road.
    a. Construction of the project is not expected to cause significant local transportation effects, and any impacts will be temporary in nature during the construction process. Work crews will mobilize each day from an on-site laydown yard. Traffic to the site will be limited to supervisory vehicles transporting work crews, required construction equipment, and equipment delivery vehicles. Construction equipment or labor transportation are not anticipated to have a significant impact on traffic volumes or flow on local roadways. To mitigate any potential impacts to County roads, Traffic Control Plans will be prepared and followed during construction. Once the substation is built and operational, traffic will consist of 1-2 trucks, 2-4 times a month. No impacts or improvements to county roads are expected. A traffic study is not a requirement for the Adams County Conditional Use permit process. Therefore, United Power did not perform an independent study for this project.

Emergency Action Plan

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November 17, 2025

Facility Emergency Action Plan

Stonehouse Substation
(303) 637-1300

November 17, 2025

1. **Name:** United Power, Inc. Stonehouse Substation
2. **Location**: Southeast corner of the intersection E 132nd Ave & Gun Club Rd,
   LAT: 39-56-09.07N LONG: 104-42-50-.40W
3. **Emergency Telephone Numbers:** | **24-Hour Phone #**

United Power Main Office:	303-659-0551 or 1-800-468-8809
Fire District	
Brighton Fire Rescue District	911
Ambulance Service Area	
American Medical Response (AMR)	911
Dispatch	
Adams County Regional Dispatch	911
Other	
Chemtrec (Chemical transportation Emergency Center)	800-424-9300

4. **Agency Notification Non-Emergency:** | **Phone#**

Fire Department/District (Brighton Fire Rescue District)	303-659-4101
Ambulance Service Area (American Medical Response Dispatch)	303-308-4000
County Law Enforcement Agency (Adams County Sheriff Office)	303-654-1850
State Law Enforcement Agency (Colorado State Patrol, Troop 1D)	303-239-4501
Communication Center (Adams County Regional Dispatch)	303-288-1535
Office of Emergency Management (Adams County OEM)	720-523-2792

5. **Surrounding Occupancies & Land Use**

   Surrounding land use is primarily agricultural and grazing land with single-family residences. Some light industrial facilities may also be present as well.

6. **Personal Protective Equipment Required:** Boots, gloves, hard hats, and eye protection.
7. **Emergency Equipment & Supplies:** | **Location and Phone#**

Spill Cleanup Kits	Brighton and Longmont Offices, 303-637-1300
Fire Extinguishers	Onsite Vehicles & Offices, 303-637-1300
Misc. Emergency Equipment	Onsite Vehicles & Offices, 303-637-1300
First-Aid Supplies	Onsite Vehicles & Offices, 303-637-1300

8. **Location & Types of Water Supplies:**

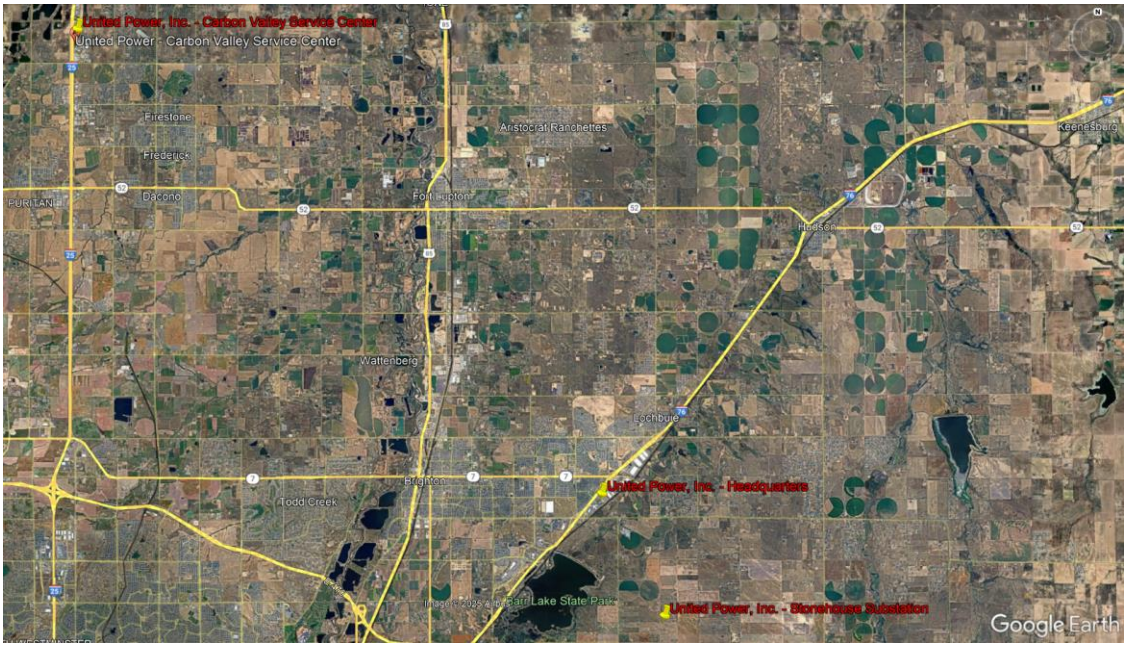
No permanent water supply is proposed. Bottled water would be provided during construction, and minimal quantities of water for construction and/or dust suppression would be brought in by a water truck if needed.

****Never attempt to fight a fire in any United Power, Inc. electrical facility with water without consent and instruction from United Power, Inc. Staff.****

9. **Transportation routes:**

The substation has yet to be fully designed. However, access to the substation will be via East 132nd Avenue and Gun Club Road. The route from United Power's Headquarters at 500 Cooperative Way, Brighton, CO 80603 will be: south 0.6 miles on E I-76 Frontage Road to E 152nd Avenue, then east 0.8 miles on E 152nd Avenue to Picadilly Road, then south 2.4 miles on Picadilly Road to E 128th Avenue, then 1.0 mile east on E 128th Avenue to Gun Club Road, then 0.5 miles north on Gun Club Road to the site entrance. The dedicated entrance(s) of the substation will likely be gated on the north and west sides of the substation accessed from the south side of East 132nd Avenue and from the east side of Gun Club Road. Do not try to access the substation without United Power, Inc. Staff approval or presence, as the site will be secured by chain link fence.

During construction, most materials will be delivered by United Power's selected contractors or in United Power, Inc. company vehicles. Following construction there will not be regular shipments of materials or chemicals to this facility as it is an unmanned electrical substation housing electrical equipment and batteries. Any deliveries will likely be electrical equipment including breakers, relays, transformers, batteries, etc. Chemicals of interest could be dielectric fluids such as mineral oil, SF6 gas for circuit breakers, and battery acid for battery banks as well as miscellaneous small quantities of chemicals necessary to perform work.



10. **Action Items and Response:**

****Never enter a substation in an unknown state of operation or energization****

If access to a facility is needed, United Power, Inc. staff must always be present and made aware of the request to ensure all parties safety and compliance to various standards. The dedicated entrance(s) of the substation will be a gate on the north and west sides of the substation accessed from the south side of East 132nd Avenue and east side of Gun Club Road. Do not try to access the substation without United Power, Inc., staff approval and presence.

Identified Emergency Response scenarios are as follows:

a. Electrical fire or dielectric fluid/gas release due to electrical equipment damage or malfunction. United Power's Substation Maintenance staff would respond to the emergency to de-energize the substation so that maintenance/fire/cleanup crews could make repairs, fight the fire, or clean up as necessary. **Never enter an energized facility or a facility in an unknown state of operation or energization**. United Power's Substation Maintenance Staff are available 24/7 to respond to emergencies upon request.

b. Battery bank failure causing a release of dilute sulfuric acid in the Power Control Assembly (PCA). United Power's Substation Maintenance Staff would respond to the emergency and provide cleanup services within their training. Outside cleanup contractors may also be utilized for larger releases.

c. Electrocution of personnel by energized equipment. United Power's staff would respond to the emergency by de-energizing equipment as necessary so that rescue crews could perform actions as necessary. Contractor or United Power personnel would call 911 for emergency medical and rescue services. United Power linemen and contractors are trained in rescue, first aid, and CPR.

d. Injury of personnel via impacts of falling or moving equipment, falls, slips, and trips. Contractor or United Power personnel would call 911 for emergency medical and rescue services, if necessary. United Power linemen and contractors are trained in rescue, first aid, and CPR.

11. **Wildland Fire Mitigation Measures for Construction and Maintenance**

a. United Power Inc. will require its employees and contractors to do everything reasonable and within their power or expertise, as allowed to protect human safety; to prevent and suppress fires resulting from construction or maintenance activities. Fires ignited by the contractor will be reported to the appropriate agency immediately.

b. Before each workday, a "tailgate" safety meeting will occur and include discussion of fire and other hazards.

c. All work areas will be mowed or plowed prior to construction to reduce the risk of grass fire ignition from vehicles.

d. Fuels and flammable materials may not be stored on the project site. They may be located in approved containers in a truck. For example, an approved diesel tank in the back of a truck, containing fuel for hand-held equipment. No fuel or flammable substance will be stored in any glass container.

e. Welding operations are subject to the following additional provisions:

1. There will be no welding when winds are over 15 miles per hour; and
2. Welding will occur only in areas cleared of all flammable vegetation and materials at a minimum radius of 35 feet from the welding operation.
3. Welding will not occur on days where a red flag warning has been issued for the location by the National weather service.

f. Exhaust systems of vehicles will have an acceptable muffler and will be in proper working condition. All motorized equipment and machinery will be equipped with spark arresters.

g. Type ABC rated fire extinguishers will be required and available during all operations.

12. **Coordination with First Responder Agencies:**

If requested, United Power's representative and first responders may meet to review this Emergency Action Plan and tour the site, since construction has not begun. The facility is not currently a Tier II facility, as it has not yet been constructed.

13. **Safety and Training Review:**

Job specific training will be performed on site prior to employees beginning work.

All United Power, Inc. electric facilities are designed, constructed, operated, and maintained to meet or exceed all applicable standards of design and performance set forth in the National Electrical Safety Code (NESC 2012).

Drainage Report Checklist

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Level 3 – Storm Drainage Plan(s)				
Item No.	Submitted[1]	County Use Only		
		Rejected	N/A	
				General Requirements for all Storm Drainage Study Plans and Details:
1.	☒	☐	☐	Sheet Size – 24" x 36" or 11" x 17"
2.	☒	☐	☐	Project Title Sheet
3.	☒	☐	☐	Project Site Plan
4.	☒	☐	☐	Title Block – include name and address of proposed project/development, submittal date, title of drawing, and sheet number.
5.	☒	☐	☐	Drawing Information • North arrow indicator • Section-Township-Range • Drawing Scale • Symbol Legend
6.	☒	☐	☐	Drawing Scale – 1" = 50' or 100'. Larger scales may be required where necessary to clearly present details.
				Site Plan:
7.	☒	☐	☐	Topography – include existing and final contour lines at a maximum of 2' intervals (with source to datum) for the site extended beyond project limits as appropriate to show downstream effects and adjacent property interaction (insufficient extension of contours will be cause for rejection). In addition, contour lines for adjacent rights-of-way must be included for the full width of right-of-way. Slopes steeper than 10% shall be identified by shading or cross-hatching.
8.	☒	☐	☐	Utilities – existing and proposed with easements identified.
9.	☒	☐	☐	Site Layout – including property boundaries (bearings, dimensions, and area), adjoining streets and centerlines (with names and ROW widths), access locations, and existing structures (curb, gutter, sidewalks, etc).
10.	☒	☐	☐	Storm Drainage Structures – including existing and proposed structures (curb, gutter, pipes, inlets, channels, culverts, irrigation ditches, detention/retention basins, etc.) clearly identifying invert, flowline elevations, limits of erosion protection, and direction of flow. Number, size and materials of construction for each structure shall be presented in tabulation form. In addition, notes shall be included referencing details, cross-sections, profiles, etc.
11.	☒	☐	☐	Natural Features – including drainage channels, wetlands, water bodies, areas of natural vegetation, and flood plains. For natural drainage features, show direction of flow and 100 year flood plain boundary (if applicable).
12.	☐	☐	☒	Demolition – including all items to be removed (culverts, storm sewer, trees, curb, gutter, sidewalk, etc.) shall be presented in tabulation form.

13.	☐	☐	☒	Proposed Structures - including new roads and road improvements, parking surfaces, building footprints, walkways, landscape areas, maintenance access, etc. Exact lines, grades and gradients of proposed public roadways shall be shown. If a cul-de-sac is proposed as part of the roadway system, show spot flowline elevations at 25' intervals along the perimeter of the cul-de-sac. Spot elevations at flowlines may also be necessary at intersections.
14.	☒	☐	☐	Fill Source and Quantity – including source and quantity of selected off-site material and locations and quantity of designated on-site borrow pits and pertinent information showing where each type of fill is to be placed. This information shall be referred to the County Environmental Analyst
				Profiles
15.	☒	☐	☐	Storm Drainage Structure Profiles - including pipe sizes, pipe types and materials, lengths of runs, gradients and exact locations of pipes or channels, structure identifier (e.g. catch basin/manhole number), type of structure (e.g. Type 16 CB), exact location of structures (e.g. station and offset, or dimensioning), invert elevations in/out of structures, outlet configuration, and top elevations of structures. In addition, hydraulic gradelines will be shown for all storm sewer collection systems.
16.	☒	☐	☐	Surface Grades – existing and finish surface grades.
17.	☒	☐	☐	Proposed utilities, showing exact line and grade of all proposed utilities at crossings with the proposed drainage system.
				Cross Sections:
18.	☐	☐	☒	Spacing – roadways, streets, channels and basins – 50' intervals (<1 mile) or 100' intervals (≥1 mile), changes in section or at critical areas.
19.	☐	☐	☒	Roadways – including new, existing, improved, and maintenance access roads.
20.	☒	☐	☐	Detention/Retention Basins – including slope, depth, and erosion protection techniques.
21.	☒	☐	☐	Modified/Newly Developed Channels – including proposed channels, ditches and swales.
				Details:
22.	☒	☐	☐	Details shall be provided for all proposed drainage structures for which there is insufficient information in the plan or profile views (i.e. outlet configurations, headwall/wingwall, etc.). Details are not required for structures included in the CDOT Standard Plans, provided that the specific CDOT Standard Plans are referenced in the construction notes.
				Additional Requirements:
23.	☐	☐	☒	Indicate any proposed phasing of construction.
24.	☒	☐	☐	Professional Engineer's Seal – including signature and date.

ATTACHMENT #6 CONTINUED

25.	☒	☐	☐	General Construction Notes – include notes for clarification (see Attachment ____ for County examples)
26.				Drainage maintenance plan
27.				All drainage easements and maintenance access points identified on plans. Submittal includes a copy of final plat to verify easements.
Developer's Comments (please reference the item number for each comment)				
County's Comments				

[1] To be checked by the Developer. If a "submitted" box is not checked, the Applicant must explain (in comment box above) or the application may be rejected for insufficient information.

Level 3 – Storm Drainage Study Report				
Item No.	Submitted[1]	County Use Only		
		Rejected	N/A	
1.	☒	☐	☐	Cover sheet – Including project name, proponent's name, address, and telephone number, Project Engineer, and date of submittal.
2.	☒	☐	☐	Table of contents - Show the page numbers for each section of the report, including appendices.
3.	☒	☐	☐	Project Description – • Describe the type of permit(s) for which the applicant is applying, the size and location of the project site, address or parcel number, and legal description of the property, property zoning, etc. • Describe other permits required. • Describe the project, including proposed land use, site improvements, construction of impervious surfaces, and landscaping.
4.	☒	☐	☐	Existing Conditions - include references to relevant reports such as basin plans, flood studies, groundwater studies, wetland designation, sensitive area designation, environmental impact statements, water quality report, etc.
5.	☒	☐	☐	Existing Conditions - where such reports impose additional conditions on the applicant, those conditions shall be included in the report. In addition, an existing drainage report or master plan (County approved source) may be used as a baseline and updated with the proposed information.
6.	☒	☐	☐	Developed site drainage conditions - describe the land cover resulting from the proposed project; describe the potential stormwater quantity and quality impacts resulting from the proposed project; describe the proposal for the collection and conveyance of site runoff from the project site, for the control of any increase in stormwater quantity resulting from the project , and for the control of stormwater quality.
7.	☒	☐	☐	Hydrological Analysis – including assumptions, computations, and results.
8.	☒	☐	☐	Describe the drainage basin(s) to which the project site contributes runoff, and identify the receiving waters for each of these drainage basins.
9.	☒	☐	☐	Soils hydrological group(s)
10.	☒	☐	☐	Description of upstream basins - identify any sources of runoff to the project site. This should be based on a field investigation. Any existing drainage or erosion problems upstream which may have an impact on the proposed development should be noted.
11.	☒	☐	☐	Downstream Drainage Analysis – the initial drainage report submittal shall include a Level 1 Downstream Drainage Analysis. Any further analysis of downstream conditions required beyond the Level 1 analysis shall be submitted as part of this Drainage Report.

ATTACHMENT #7 CONTINUED

12.	☒	☐	☐	Geotechnical Report - either supervised or prepared by a registered professional engineer (sealed, signed and dated).
13.	☒	☐	☐	Basin map(s) – showing boundaries of project, any offsite contributing drainage basins, onsite drainage basins, approximate locations of all major drainage structures within the basins, and depict the course of stormwater origination from the subject property and extending all the way to the closest receiving body of water. Reference the source of the topographic base map, the scale of the map, and include a north arrow.
14.	☒	☐	☐	Hydraulic design computations - supporting the design of proposed conveyance, quantity and quality control facilities, and verifying the capacity of existing drainage facilities. These computations may include capacity and backwater analysis required either as part of the proposed drainage design or as a part of the downstream drainage investigation, and flood routing computations required for the design of detention/retention storage facilities, for wetland impact analysis, or for flood plain analysis.
15.	☒	☐	☐	Erosion and Sedimentation Control - include a description of proposed erosion control objectives and strategies; a description of erosion control facilities and other temporary water quality facilities proposed; a description of the revegetation plan for the project site; identification of areas of concern regarding soil stability and/or water quality impacts; computations for the sizing of temporary stormwater conveyance and quantity control facilities; computations for the design and sizing of proposed sediment containment facilities, etc.
16.	☒	☐	☐	Appendices – include copies of any additional relevant reports, prepared by others, which support or corroborate the findings, conclusions, or assumptions contained in the Drainage Report; copies of any additional permits (or completed permit applications) required for the project.
				Vicinity Map
17.	☒	☐	☐	Sheet Size – 11" x 17" or 8½" x 11"
18.	☒	☐	☐	Project Title Sheet
19.	☒	☐	☐	Project Site Plan
20.	☒	☐	☐	Title Block – include name and address of proposed project/development, submittal date, title of drawing, and page number.
21.	☒	☐	☐	Drawing Information – • North arrow indicator • Section-Township-Range • Drawing Scale • Symbol Legend
22.	☒	☐	☐	Drawing Scale – as necessary to clearly present details.

ATTACHMENT #7 CONTINUED

23.	☒	☐	☐	Project site topography, land cover and land use; abutting property land cover and land use.
24.	☒	☐	☐	Offsite drainage to the property; creeks, lakes, ponds, wetlands, ravines, gullies, steep slopes, springs, and other environmentally sensitive areas on or adjacent to the project site.
25.	☒	☐	☐	General soils conditions present within the project site.
26.	☐	☐	☒	Existing natural and manmade drainage facilities within and immediately adjacent to the project site.
27.	☒	☐	☐	Points of discharge for drainage from the project site.
28.	☒	☐	☐	Impact on adjacent properties. Location(s) of downstream outfall points.
29.	☒	☐	☐	Signed statement from engineer, developer

Developer's Comments (please reference the item number for each comment)

County's Comments

[1] To be checked by the Developer. If a "submitted" box is not checked, the Applicant must explain (in comment box above) or the application may be rejected for insufficient information.

Drainage Report

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We listen. We solve.®

Stonehouse Substation Build Drainage Report

PROJECT NAME
Stonehouse Substation Build

ULTEIG PROJECT NUMBER
24.00441

DEPARTMENT
Energy Solutions-Substation

PREPARED FOR
United Power

PREPARED BY
Marisol Velilla PE, Ulteig Engineers Inc.

ENGINEER OF RECORD
Marisol Velilla PE, Ulteig Engineers Inc.

REVISION HISTORY

Revision	Date	Description
A	10/10/25	Issue for Review

We listen. We solve.®

DRAINAGE CERTIFICATION:

Engineer's Statement

I Hereby attest that this report for the final drainage design of Stonehouse Substation was prepared by me, or under my direct supervision, in accordance with the provisions of the County Storm Drainage Design Criteria for their responsible parties thereof. I understand that the County does not assume liability for drainage facilities designed by others.

Registered Engineer

Marisol E Velilla

Marisol E Velilla
2025.10.10
10:49:06-05'00'

Name

Seal

Table of Contents

Limitations:
This report is for United Power use only and is not to be distributed or used by third parties outside of United Power without express permission of United Power. The scope of services performed during the preparation of this document may not be appropriate to satisfy the needs of other users, and any use or re-use of this document or of the findings, conclusions, or recommendations presented herein is at the sole risk of said user.

1. General Location and Description

1.1 Project Description:

The subject parcel for the Project (parcel # 0156730300001) does not currently have an address associated with it but is located at the southeast corner of 132nd Avenue and Gun Club Road. The subject parcel is a portion of SW1/4 of Section 30, Township 1 South, Range 65 West of the 6th Principal Meridian in unincorporated Adams County. The parcel has been used for agricultural purposes in the distant past but is currently vacant with no permanent or temporary structures. The Project will be constructed on a 46.766-acre parcel, zoned Agricultural 3 (A-3), and is owned by United Power. The footprint for the substation itself will be approximately 2.5 acres and utilize access to the site off of both Gun Club Road and 132nd Avenue; the remainder of the parcel will be left in its current condition. In order to provide power for the substation, a transmission line tap will be required, which will involve tapping the existing Public Service Company of Colorado (PSCo) Reunion-Barr Lake 230kV overhead transmission line. The PSCo transmission line is adjacent to the subject parcel and runs north-south along the west side of Gun Club Road. The Project site will be unmanned and will not require water/sewer services.
The project includes two driveways, swales, a new detention basin to the west of the substation with an outlet structure and culverts. The site drains northwest, eventually leading to Mile High Lakes-Beebe Seep Canal.

1.2 Constraints

- Extensive substation pad (3 acres of gravel with no more than 1 percent slope)
- Diversion of run-on from adjacent properties
- Extended Detention Basin to comply with local requirements.
- Provide two access to the site from the existing county roads.

To fulfill the constrains above, we used diversion berms and swales around the Substation pad to intercept sheet flow, prevent shallow concentrated flows and promote infiltration.

The conveyance swales and berms were designed to capture or block any run-off from outside the substation site and redirect it around the perimeter. All swales are trapezoidal with a 4:1 side slope and minimum 4-foot bottom.

The access roads were designed to meet requirements for grade and alignment due to the heavy equipment it must accommodate. They will be surfaced with 12 inches of base material.

1.3 Permits

A Conditional Use Permit, which is case number RCU2025-00008.was submitted to the County on April 15th. See letter on Appendix E .

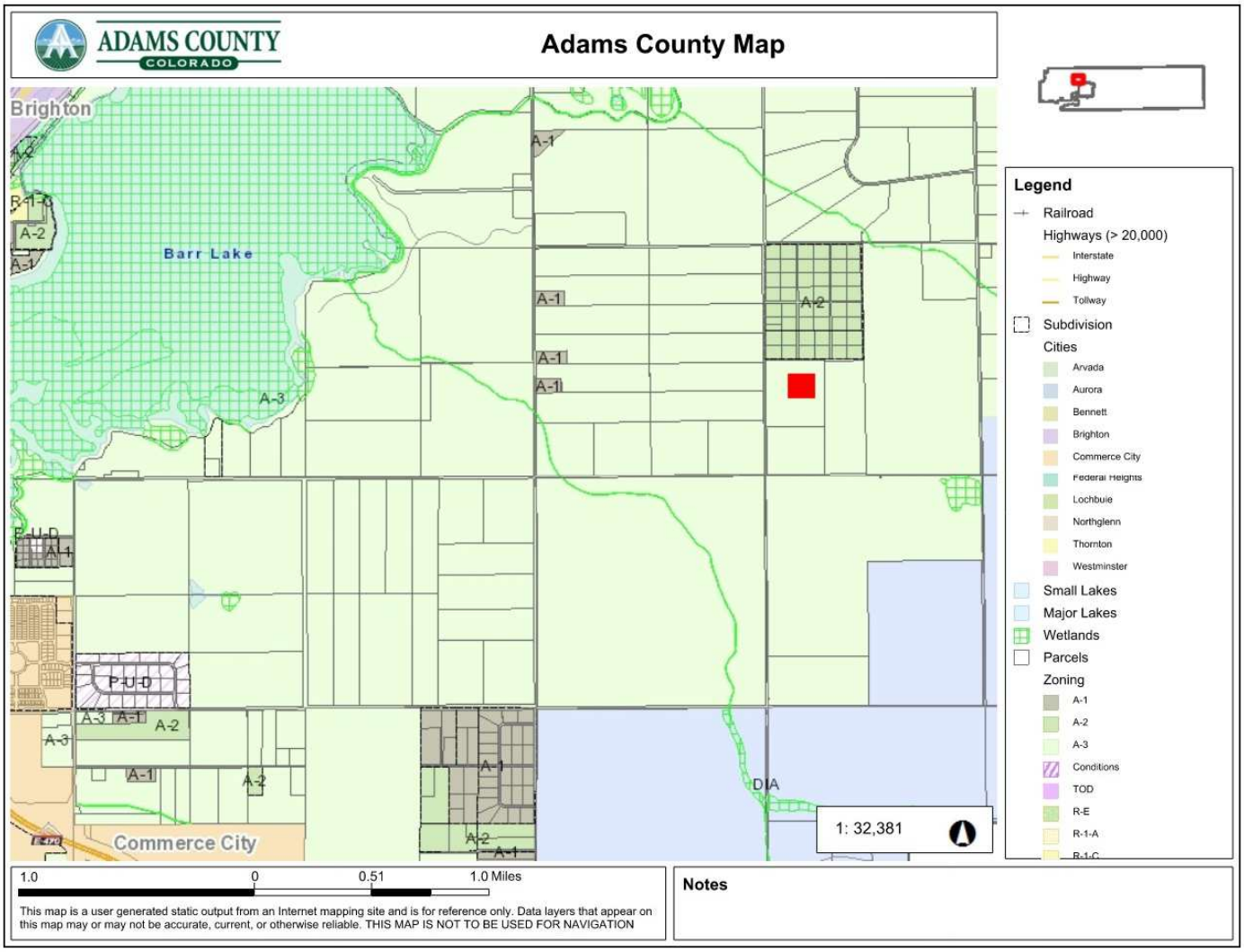


Figure 1: Site Location

1.4 Project Mapping

Ulteig Engineers provide an ALTA/NSPS Land title survey on May 5th of 2023. Topography was collected to 1' interval accuracy. All data was surveyed using the NAD83 Colorado State Planes, North Zone, US Foot horizontal datum.

1.5 Soil Types, Geological Features

Soil data was obtained from the National Resources Conversation Services (NRCS) Soil Survey Geographic database (SSURGO). The site is composed of soils with a hydrologic soil group rating of B. Specifically, the project site contains Type B Ascalon-Vona sandy loams. The soil resource report including the hydrplogic soil group map and from the USDA Natural Resources Conservation Service Soil Mapper in Appendix A.

Additionally, five soil borings were taken on 09-05-25 to further investigate on site conditions. These borings indicated Clayey San on boring 1 on the first 19 feet, confirming the B soil from the NRCS.

In the detention basin design, we assumed the site to be 100% type B soils.

See geotechnical report by Terracon in Appendix A.

1.6 Flood History

The Project site is located on Panel 08001C0365H of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), The site is in FEMA Zone X. Zone X is defined as an area of minimal flood hazard. The FIRMette map is in Appendix B.

There is no known history of the project area experiencing flood related problems.

1.7 Groundwater Investigation:

"The boreholes were observed while drilling and shortly after completion of drilling for the presence

and level of groundwater. Groundwater was not observed in the boreholes to the maximum depth explored of about 40.

From page 4 of geotechnical report by Terracon N0 25255177

See geotechnical report by Terracon in Appendix A.

2. Drainage Area and Sub-Basins

The site is in South Platte River Basin
Watershed: Mile High Lakes-Beebe Seep Canal (101900030502) see Appendix C
The runoff from this parcel historically flows northwest with an average slope of 2 percent.

We use "E" to describe existing Conditions drainage areas or basins and "P" for Proposed.

2.1 Existing Conditions

This parcel has 2 sub basins that drain to 2 design points in the property. Design points A and B

The area draining to Design point B will not be changed in this project. See figure 2, section 8.

Basin E 1- Draining to Design Point A

Basin E1 consists of 37 acres of farmland inside the property, located in the northeast section of the site and flows traverse to the northwest area of the property. This basin receives run-on from more than 200 Acres of the adjacent southeast property. The offsite runoff was calculated with GeoHECHMS and is in the Appendix D. Only areas inside the property were used to compare existing and proposed runoff values as off-site upstream areas will not be impacted.

E1= 37Acres

5% impervious $C_5 = 0.03$, $C_{100} = 0.45$

T_c = 56.08 min

Q_5 = 1.83 cfs, Q_{100} = 47.64 cfs.

Basin E2- Draining to Design point B

Basin 2 consists of 9.7 acres of farmland. This Basin will not be developed as part of this project.

E2 = 9.7 Acres.

5% impervious C_5 = 0.03, C_{100} = 0.45

T_c = 31.28 min

Q_5 = 0.69 cfs, Q_{100} = 18.08 cfs.

2.2 Proposed Conditions

The proposed grading design will include multiple aspects of construction such as grading earth work cut and fill, two entrance roads connecting the substation to E 132nd Ave and to Gun Club Rd, security fence installation, and multiple drainage structures such as swales, culverts and a detention and WQCV basin to capture the runoff from the substation pad. In addition to the hydraulic grading construction there will be multiple concrete and steel electrical structures on the grading pad.

The proposed grading design will reduce the existing historical peak flows and improve the water quality.

See figure 3, Section 8.

The areas that drain to Desing point A are:

P1

This basin has a surface area of 1.24 acres. The proposed conditions will include the southern side of the substation pad that runs south-west to a grass swale and a culvert under the driveway connected to the proposed trickle channel of the detention and WQCV basin.

The proposed substation pad soil structure will have 2 layers starting with a top surface of 6 inches of loose aggregate surface, then 6 inches Class 5 CDOT road base.

Area= 1.24 acres

60% impervious C_5 = 0.49, C_{100} = 0.71

T_c = 17.37 min

Q_5 = 1.76 cfs, Q_{100} = 4.81 cfs.

P2

This 1.21-acre basin will be mostly unchanged, and grading slope of 8:1 with 4 foot wide swales to convey the runoff under the driveway to the EDB (Extended Detention Basin)

Area= 1.21 acres

20% impervious C_5 = 015, C_{100} = 0.52

T_c = 14.10 min

Q_5 = 0.60 cfs, Q_{100} = 3.96 cfs.

P3

This basin has a surface area of 1.4 acres. The proposed conditions will include the northern side of the substation pad that runs north-west to a grass swale and a culvert under the driveway connected to the trickly channel of the detention and WQCV basin

The proposed substation pad soil structure will have 2 layers starting with a top surface of 6 inches of loose aggregate surface, then 6 inches Class 5 CDOT road base.

Area= 1.4 acres

60% impervious C_5 = 0.49, C_{100} = 0.71

T_c = 17.98 min

Q_5 = 2.16 cfs, Q_{100} = 5.90 cfs.

P4

This basin has a surface area of 0.11 acres. This basin is grass swale at the northeast side of the pad conveying the runoff through a culvert under the driveway connected to the trickly channel of the detention and WQCV.

Area= 0.11 acres

20% impervious C_5 = 0.15, C_{100} = 0.52

T_c = 10 min

Q_5 = 0.06 cfs, Q_{100} = 0.42 cfs.

P5

This basin has a surface area of 0.11 acres. This basin is part of the south driveway conveying the runoff through a grass swale to the trickly channel of the detention and WQCV

Area= 0.10 acres

60% impervious C_5 = 0.49, C_{100} = 0.71

T_c = 9.2 min

Q_5 = 0.15 cfs, Q_{100} = 0.45 cfs.

P6

Area P6 will receive the runoff from Areas P1-P5 through the culverts and swale.

This area has a surface area of 1.95 acres. The detention and WQCV basin were designed as an extended detention basin with full spectrum detention. See calculations Appendix D.

The outflow is located at the north-west side of the parcel (Design point A). The outlet pipe has a riprap basin designed with MHFD criteria.

Area= 1.95 Acres

25% impervious C_5 = 0.19, C_{100} = 0.54

T_c = 15.53 min

Q_5 = 1.17 cfs, Q_{100} = 6.40 cfs.

P7

This basin receives runoff from 30.99 Acres from the property and more than 200 Acres from outside the property.

The offsite runoff will be diverted by a wide swale at the east side of the Substation pad through 4X 18x11 Arch culverts to keep similar existing drainage patterns.

A drainage analysis was conducted to size the culverts, and the diversion swale see attached calculations on Appendix D.

For comparison purposes we used the area inside the property.

Area= 30.99 Acres

5% impervious C_5 = 0.03, C_{100} = 0.45

T_c = 47.49 min

Q_5 = 1.71 cfs, Q_{100} = 44.51.

2.3 Summary

The Stonehouse electrical substation project site design complies with Adams County Design.

The proposed design maintains the historical runoff direction while improving the water quality. The 5- & 100-year large storm events will be adequately captured by the proposed swales, drain tiles and detention pond.

Runoff peaks for the existing and developed conditions from the basins are summarized in Table 1 and 2 below.

Design point	Basin ID	Contributing Area (acres)	Basin % Imp.	T_c (min)	C_5	C_{100}	Runoff 5 Yrs. (cfs)	Runoff 100 Yrs. (cfs)
A	E1	37	5	56.08	0.03	0.45	0.83	47.64
B	E2	9.7	5	31.28	0.03	0.45	0.69	18.08

Table 1: Existing Conditions Basin Summary

Design point	Basin ID	Area (acres)	Basin % Imp.	T_c (min)	C_5	C_{100}	Runoff 5 Yrs. (cfs)	Release rate EURV. (cfs) with detention	Runoff 100 Yrs. (cfs)	Release rate 100 Yrs. (cfs) with detention
A	P1	1.24	60	17.37			1.76		4.81	
A	P2	1.21	20	14.10			0.6		3.96	
A	P3	1.4	60	17.98			2.16		5.9	
A	P4	0.11	20	3.22			0.06		0.42	
A	P5	0.1	60	4.16			0.19		0.53	
A	P6	1.95	25	15.26			1.17	**0.1**	6.40	**1**
A	P7	30.99	5	38.55			1.77	1.71	44.51	44.51
	Total	37						1.81		45.51
B		9.7	5	31.28	0.03	0.45	0.69		18.08	No change

Table 2: Proposed Conditions Basin Summary

See Table 5 for Design Point Summary.

3. Drainage Design Criteria

3.1 Regulations

The design criteria used for this study include the Mile High Flood District Drainage Criteria Manual. Various spreadsheets and design programs that were developed by MHFD were also used to aid in the design of the site drainage system.

3.2 Hydrology

3.2.1 Runoff calculations methods

We performed the Hydrologic analysis using the Rational Method. We use this method to compute flow rates at basin outlets and design points for small watersheds (less than 90 acres) and is based on the equation below. All tables, equations and recommended values are from MHFD Manual Volume 1 Chapter 6 unless noted.

$Q = CiA$

Where:

Q = peak discharge in cubic feet per second

C = runoff coefficient

i = rainfall intensity in inches per hour

A = basin area in acres

Time of concentration (T_c) is the approximate travel time for a droplet of water to travel to the basin outlet from the most hydraulically distant point in the basin and is used to determine rainfall intensity. Reference 2 lists the method for calculating T_c. The calculated T_c were bigger in most cases than the empirical T_C used for the Denver region. We adopted the smaller as recommended.

We used NOAA Atlas 14 for the Rainfall intensity. The runoff coefficient, C, represents the integrated effects of infiltration, evaporation, retention, and interception, all of which affect the volume of runoff.

We calculated imperviousness based on the recommended values from Table 6-3 of Chp.6. of Volume 1

3.2.2 Design storm recurrence intervals

Design storm recurrence intervals used were 5-yr and 100-yr.

3.2.3 Design rainfall

We used the design rainfalls from NOAA Atlas 14

One hour point rainfall values for 5-yr. = 1.42 inches and for 100-yr. = 2.71 inches.

3.2.4 Detention Storage and release rate calculations methods

We used MHFD-Detention_v4.07 spread sheet to calculate the detentions and the release rate see section below.

3.3 Hydraulics

We performed hydraulic analysis of the site drainage features based on standards set in References 1 and 2. spread sheet was used for the pond routing.

The site will have an extended detention basin combined with full spectrum detention as the recommended approach. Full spectrum detention will reduce the flooding and stream degradation impacts associated with urban development by controlling peak flows in the stream for a range of events.

Water Quality Capture Volume (WQCV)

Excess Urban Runoff Volume (EURV)

The WQCV is a function of imperviousness and BMP drain time.

$WQCV = a\ (0.91I^3 - 1.191I^3 + 0.78I)$

$EURV = 1.2i^{1.08}$

`

Table 3: Detention and WQCV Basin Storage Volume

Zone	Volume	Volume required	Volume Provided
1	WQCV	0.09 ac-ft.	0.091 ac-ft.
2	EURV	0.253 ac-ft.	0.256 ac-ft.
3	100-yr -zone 1&2	1.015 ac-ft.	1.015 ac-ft.

Table 4: Detention and WQCV Basin Outlet Summary

Tributary area 13.63 ac.	Peak inflow cfs.	Peak outflow cfs.	Peak depth ft.	Peak elevation ft.
5-year	3.9	0.1	2.46	5180.96
100-year	12.2	1	3.2	5181.70

4. Stormwater Conveyance

The site - as described in previous sections - drains to two points. They are labeled as design points A, and B, in the drawings and calculations.
We compared the existing and proposed runoff condition for each design point and for the summation of all points. The overall site, as indicated by the summation of design points, meets the release criteria.
We evaluated each Point to confirm runoff will not affect existing structures and that discharge locations are protected from erosion.

5. Drainage Facility Design

The drainage facilities design will:

- Accommodate the runoff from the proposed substation yards.
- Route the flows to the Detention Pond through swales and culverts to a detention and WQCV basin where the water will be released in a controlled manner.
- Grass swales, and buried riprap were used to convey surface water as described below.

5.1 Swales

5.1. Grass Swales

We designed grass lined swales to divert water and the driveway ditches. The typical dimensions of the swales include 4:1 side and a 4 feet wide bottom. See Appendix D for East diversion swale calculations.

5.2 Buried Riprap

We designed buried riprap on the emergency spillway.

5.3 Summary

Flow rates under the existing and proposed conditions for the 5- and 100-year peak outflows at the design points for the project area shown in Table 5. The design points shown in Table 5 are at location where runoff is leaving the site.

Design Point	Basin		Peak outflows			
			Existing		Proposed	
	Existing	Proposed	Q_5 (cfs)	Q_{100} (cfs)	Q_5 (cfs)	Q_{100} (cfs)
A	E1	P1 to P7	1.83	47.64	1.81	45.51

Table 5: Design Point Summary

6. Water Quality Enhancement BMPs

6.1 Detention and WQCV Basin

As previously stated, we designed the detention basin to a full spectrum.

We designed the detention basin with more than 1 foot of freeboard and side slopes of 3:1 and the pond with an access road for regular maintenance as well as an emergency spillway lined with buried riprap to prevent overtopping of the berms. The storage volumes provided meet the required volume for an extended detention basin combined with full spectrum detention, as shown in Table 3, page 17. See Appendix D for Detention Basin Design Workbook.

6.2.1 Detention and WQCV Basin Outlet Structure

We designed the detention pond outlet to release the WQCV and EURV volumes in a controlled manner, while allowing the larger recurrence events to pass safely. The WQCV and EURV release rates are controlled through an orifice plate. The orifice diameters were calculated with the MHFD UD-Detention spreadsheet. The micro-pool is integral to the outlet structure and is larger than the 0.5% of the WQCV requirement.

6.2.2 Riprap Basin at the Outlet Structure

We designed this basin to protect from scour at the outlet of the 4 X 18-inch ARCH RCP.Riprap sizing and basin size was based on the MHFD Criteria Manual Volume 2 Section 3.2. See Appendix D.

6.2.3 Emergency Overflow Spillway

We designed the emergency overflow spillway to pass the 500-yr developed flow from the upstream watershed. The spillway contains a 4 feet wide buried riprap lining to prevent fill slope erosion in an overflow event. Soil riprap will be installed to a depth of 2 feet and will eventually re-vegetate to match the surrounding fill slopes.

7. Conclusion and Level 1 Downstream Analysis

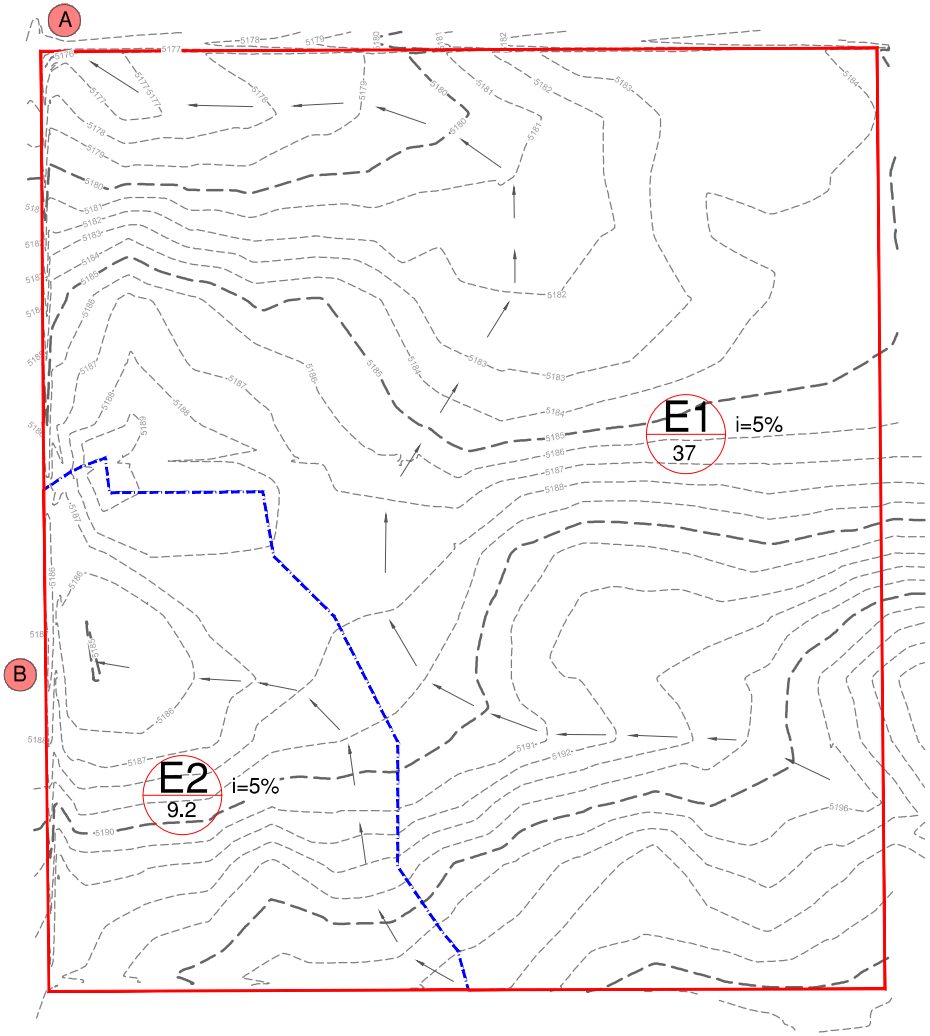
The Stonehouse substation drainage plan has been designed in accordance with the MHFD Design Criteria Manual Volume 1, 2 and 3

Design criteria dictated the drainage system address the 5 and 100-year runoff peaks and comply with the detention and WQCV requirements using an extended detention basin.

The overall runoff will be less, with better water quality than existing conditions consisting of farm runoff with no attenuation or treatment. No adverse impact is anticipated upstream or downstream of the proposed project.

8. Figures

Figure 2 – Existing Conditions



0 200 400

1"=200'-0"

LEGEND

- 1 / 1.92 — BASIN NUMBER; i=2% — % OF IMPERVIOUSNESS; 1.92 — AREA IN ACRES
- B — DESIGN POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- PROPERTY LINE

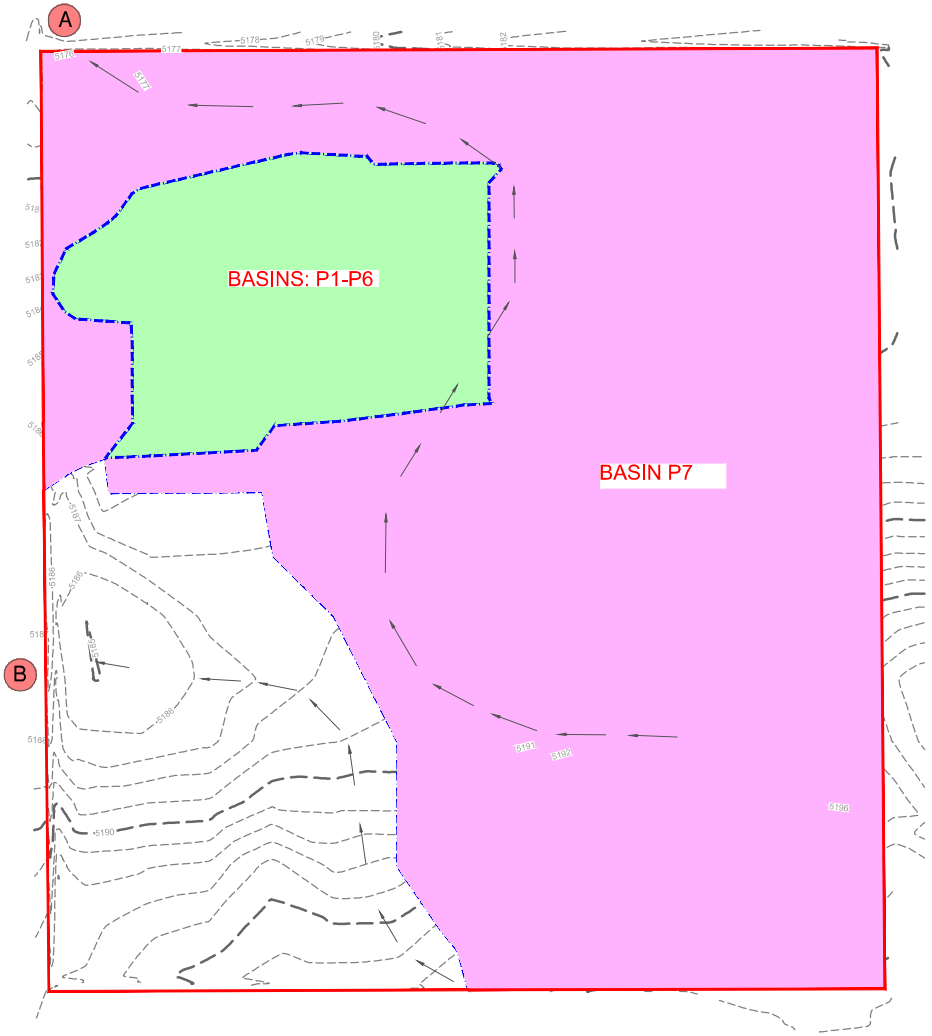
NOTE:
SEE STONEHOUSE DRAINAGE ANALYSIS FOR OFF PROPERTY RUNOFF

3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

PROJECT NUMBER: 24.00441
DESIGN BY: UEI-MEV
DRAWN BY: UEI-CJK
APPROVED BY: UEI-MEV
(DRAWING PREPARED 10-06-2025)

STONEHOUSE SUBSTATION
EXISTING DRAINAGE EXHIBIT

Figure 3 – Proposed Conditions



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1"=200'-0"

LEGEND

- B — DESIGN POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- PROPERTY LINE
- BASINS 1-6
- BASIN 7

NOTE:
SEE STONEHOUSE DRAINAGE ANALYSIS FOR OFF PROPERTY RUNOFF

3350 38TH AVE S
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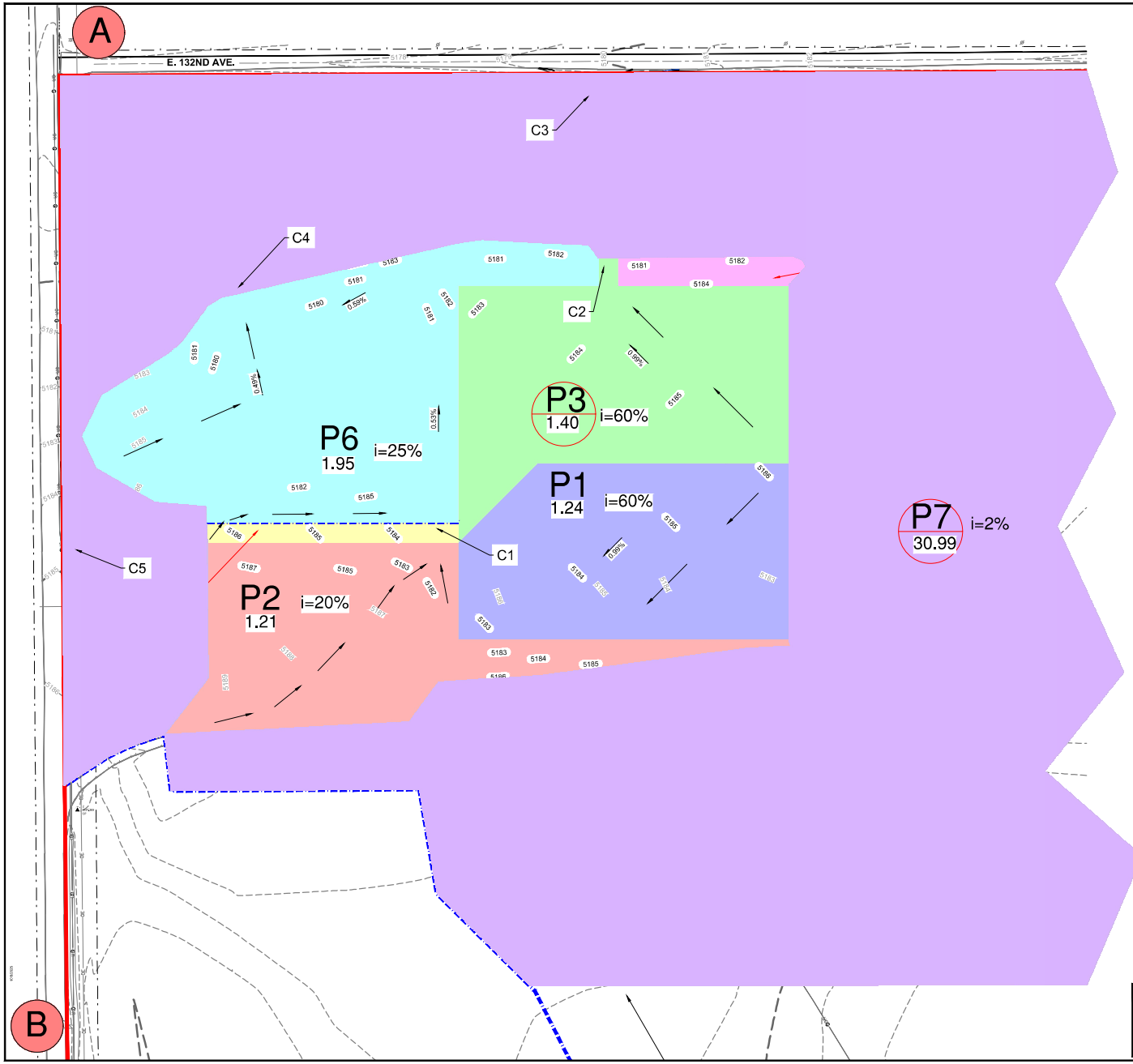
APPROVED BY: UEI-MEV
(DRAWING PREPARED 10-06-2025)

STONEHOUSE SUBSTATION
PROPOSED DRAINAGE EXHIBIT



0 100 200

1"=100'-0"

LEGEND

- 1 / 1.92 — BASIN NUMBER; i=2% — % OF IMPERVIOUSNESS; AREA IN ACRES
- B — DESIGN POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- PROPERTY LINE
- BASIN 1
- BASIN 2
- BASIN 3
- BASIN 4
- BASIN 5
- BASIN 6P
- BASIN 7
- C1 — CULVERT NUMBER 1

BASIN 7:

THIS BASIN IS RECEIVING WATER FROM 30.99 ACRES FROM THE PROPERTY AND 200+ OFF PROPERTY. THE RUNOFF WILL BE DIVERTED BY A WIDE SWALE AT THE EAST SIDE OF THE SUBSTATION PAD THROUGH (4) 14X23 RCP ARCH CULVERTS. A DRAINAGE ANALYSIS WAS CONDUCTED TO SIZE THE CULVERTS, SEE ATTACHED CALCULATIONS ON APPENDIX D. FOR COMPARISON PURPOSES WE USED THE AREA INSIDE THE PROPERTY
5% IMPERVIOUS, C5=0.03, C100=045
TC=47.49 MIN
Q5=1.71 CFS, Q100=44.51 CFS.

NOTE:
SEE STONEHOUSE DRAINAGE ANALYSIS FOR OFF PROPERTY RUNOFF

Ulteig
3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

PROJECT NUMBER: 24.00441
DESIGN BY: UEI-MEV
DRAWN BY: UEI-CJK
APPROVED BY: UEI-MEV
(DRAWING PREPARED 10-08-2025)

STONEHOUSE SUBSTATION PROPOSED DRAINAGE EXHIBIT

9. Appendices

APPENDIX A – USDA soils data and Geotechnical Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Adams County Area, Parts of Adams and Denver Counties, Colorado

Stonehouse

June 30, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,670 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Adams County Area, Parts of Adams and Denver Counties, Colorado
Survey Area Data: Version 21, Aug 29, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AvC	Ascalon-Vona sandy loams, 1 to 5 percent slopes	10.0	100.0%
Totals for Area of Interest		**10.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Adams County Area, Parts of Adams and Denver Counties, Colorado

AvC—Ascalon-Vona sandy loams, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2xst1
Elevation: 4,750 to 5,560 feet
Mean annual precipitation: 13 to 17 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 135 to 160 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Ascalon and similar soils: 45 percent
Vona and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind-reworked alluvium and/or calcareous sandy eolian deposits

Typical profile

Ap - 0 to 10 inches: sandy loam
Bt - 10 to 15 inches: sandy clay loam
Btk - 15 to 21 inches: sandy loam
Bk1 - 21 to 35 inches: sandy loam
Bk2 - 35 to 80 inches: sandy loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R067BY024CO - Sandy Plains

Hydric soil rating: No

Description of Vona

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sands

Typical profile

Ap - 0 to 9 inches: sandy loam
Bt - 9 to 22 inches: sandy loam
Bk1 - 22 to 27 inches: sandy loam
Bk2 - 27 to 39 inches: sandy loam
Bk3 - 39 to 80 inches: loamy sand

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 3.0
Available water supply, 0 to 60 inches: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Vona, loamy sand surface

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Ascalon, loamy sand surface

Percent of map unit: 10 percent
Landform: Interfluves

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group (Stonehouse)

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

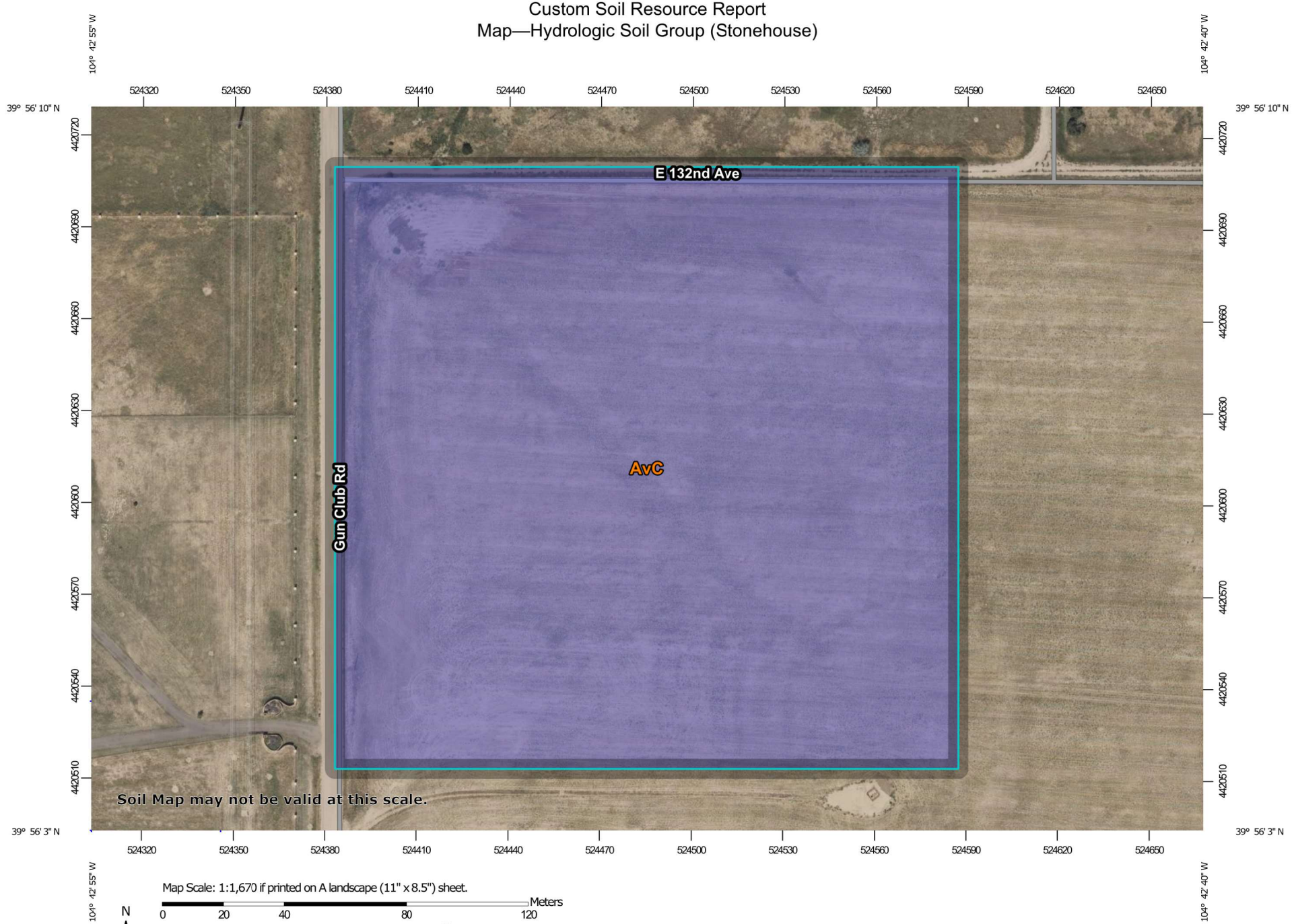
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group (Stonehouse)



Map Scale: 1:1,670 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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Survey Area Data: Version 21, Aug 29, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

Table—Hydrologic Soil Group (Stonehouse)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AvC	Ascalon-Vona sandy loams, 1 to 5 percent slopes	B	10.0	100.0%
Totals for Area of Interest			**10.0**	**100.0%**

Rating Options—Hydrologic Soil Group (Stonehouse)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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Site Location

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

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan with Aerial Image

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

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan with Project Overlay

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

MAP PROVIDED BY MICROSOFT BING MAPS

Stonehouse Substation
Southeast of E 132nd Avenue and Gun Club Road, Commerce City, CO,USA
Terracon Project No. 25255177

Latitude: 39.9353° Longitude: -104.7138°

Boring No. SB-01

Terracon
10625 W I70 Frontage Rd N, Ste. 3
Wheat Ridge, CO 80033-1729

Surface Elevation:
5181(Ft) +/-

Graphic Log	Lithology Depth (Ft.)	Material Description	Depth (Ft.)	Elevation (Ft.)	Sample Type	Recovery (In.)	Field Test Results
	0.58	**TOPSOIL** ,about 7 inches		5180.4			
		CLAYEY SAND (SC) , fine to coarse grained, brown, very loose to medium dense					2-3
			5				4-6
			10				8-7
			15				7-12
	19			5162.0			
		SANDY LEAN CLAY (CL) , brown, very stiff to hard	20				11-17
			25				12-25
			30				10-13
	34			5147.0			
		SANDSTONE , brown, fine to coarse, hard, weak cementation	35				50/7''
							50/8''
		Boring Terminated at 40 Ft					

DRAFT

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes
Elevation Reference: Approximate ground surface elevation obtained using Mapbox.
Location Reference:

Water Level Observations
Groundwater not encountered while drilling

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Drill Rig
422/Mobile B-57

Hammer Type
Automatic

Driller
Terracon

Logged By
KT

Boring Started
09/05/2025

Boring Completed
09/05/2025

Stonehouse Substation
Southeast of E 132nd Avenue and Gun Club Road, Commerce City, CO,USA
Terracon Project No. 25255177

Latitude: 39.9354° Longitude: -104.7130°

Boring No. SB-02

Terracon
10625 W I70 Frontage Rd N, Ste. 3
Wheat Ridge, CO 80033-1729

Surface Elevation:
5180.4(Ft) +/-

Graphic Log	Lithology Depth (Ft.)	Material Description	Depth (Ft.)	Elevation (Ft.)	Sample Type	Recovery (In.)	Field Test Results
		TOPSOIL ,about 30 inches					
	2.5			5177.9			4-6
		CLAYEY SAND (SC) , fine to coarse grained, brown, loose to medium dense					3-12
			5				
			10				7-11
	14			5166.4			
		SANDY LEAN CLAY (CL) , brown, very stiff	15				11-12
			20				11-14
			25				11-14
			30				8-13
			35				6-10
	39			5141.4			
		SANDSTONE , brown, fine to coarse, hard, weak cementation					50/9''
		Boring Terminated at 40 Ft					

DRAFT

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes
Elevation Reference: Approximate ground surface elevation obtained using Mapbox.
Location Reference:

Water Level Observations
Groundwater not encountered while drilling

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Drill Rig
422/Mobile B-57

Hammer Type
Automatic

Driller
Terracon

Logged By
KT

Boring Started
09/05/2025

Boring Completed
09/05/2025

Stonehouse Substation
Southeast of E 132nd Avenue and Gun Club Road, Commerce City, CO,USA
Terracon Project No. 25255177

Latitude: 39.9354° Longitude: -104.7122°

Boring No. SB-03

Terracon
10625 W I70 Frontage Rd N, Ste. 3
Wheat Ridge, CO 80033-1729

Surface Elevation:
5181.3(Ft) +/-

Graphic Log	Lithology Depth (Ft.)	Material Description	Depth (Ft.)	Elevation (Ft.)	Sample Type	Recovery (In.)	Field Test Results
		TOPSOIL ,about 32 inches					
	2.66	**SANDY LEAN CLAY (CL)** , brown, loose to medium dense		5178.6			6-7
							8-9
			5				
							8-10
			10				
			15				8-13
							7-15
			20				
			25				10-17
			30				10-17
	34.5			5146.8			11-26
		CLAYSTONE, gray to brown, medium hard	35				
							50/10''
		Boring Terminated at 40 Ft					

DRAFT

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes
Elevation Reference: Approximate ground surface elevation obtained using Mapbox.
Location Reference:

Water Level Observations
Groundwater not encountered while drilling

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Drill Rig
422/Mobile B-57

Hammer Type
Automatic

Driller
Terracon

Logged By
KT

Boring Started
09/05/2025

Boring Completed
09/05/2025

Stonehouse Substation

Southeast of E 132nd Avenue and Gun Club Road, Commerce City, CO,USA

Terracon Project No. 25255177

Latitude: 39.9350° Longitude: -104.7126°

Boring No. SB-04

Terracon

10625 W I70 Frontage Rd N, Ste. 3

Wheat Ridge, CO 80033-1729

Surface Elevation:

5183.3(Ft) +/-

Graphic Log	Lithology Depth (Ft.)	Material Description	Depth (Ft.)	Elevation (Ft.)	Sample Type	Recovery (In.)	Field Test Results
	0.5	**TOPSOIL**, about 6 inches		5182.8			
		SANDY LEAN CLAY (CL), brown, stiff					5-7
	4			5179.3			
		CLAYEY SAND (SC), fine to coarse grained, brown, medium dense	5				7-8
	9			5174.3			
		SANDY LEAN CLAY (CL), brown, very stiff	10				8-12
			15				10-18
			20				12-14
			25				9-17
			30				10-14
	34			5149.3			
		CLAYSTONE, gray, firm to medium hard	35				12-20
							16-23
		Boring Terminated at 40 Ft					

DRAFT

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Elevation Reference: Approximate ground surface elevation obtained using Mapbox.
Location Reference:

Water Level Observations

Groundwater not encountered while drilling

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Drill Rig
1047/CME-55

Hammer Type
Automatic

Driller
Terracon

Logged By
KT

Boring Started
09/05/2025

Boring Completed
09/05/2025

Stonehouse Substation

Southeast of E 132nd Avenue and Gun Club Road, Commerce City, CO,USA

Terracon Project No. 25255177

Latitude: 39.9347° Longitude: -104.7129°

Boring No. SB-05

Terracon

10625 W I70 Frontage Rd N, Ste. 3

Wheat Ridge, CO 80033-1729

Surface Elevation:

5185.7(Ft) +/-

Graphic Log	Lithology Depth (Ft.)	Material Description	Depth (Ft.)	Elevation (Ft.)	Sample Type	Recovery (In.)	Field Test Results
	0.5	**TOPSOIL** ,about 6 inches		5185.2			
		CLAYEY SAND (SC) , fine to coarse grained, brown, loose					5-8
	4			5181.7			
		SILT (ML) , trace sand, with clay, brown, stiff	5				5-7
			10				5-7
	14			5171.7			
		SANDY LEAN CLAY (CL) , brown, very stiff	15				8-12
			20				11-18
			25				10-19
			30				10-13
	34			5151.7			
		CLAYSTONE, gray, firm to medium hard	35				10-16
							15-28
		Boring Terminated at 40 Ft					

DRAFT

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Elevation Reference: Approximate ground surface elevation obtained using Mapbox.
Location Reference:

Water Level Observations

Groundwater not encountered while drilling

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Drill Rig
1047/CME-55

Hammer Type
Automatic

Driller
Terracon

Logged By
PA

Boring Started
09/05/2025

Boring Completed
09/05/2025

Stonehouse Substation

Southeast of E 132nd Avenue and Gun Club Road, Commerce City, CO,USA

Terracon Project No. 25255177

Latitude: 39.9346° Longitude: -104.7122°

Boring No. SB-06

Terracon

10625 W I70 Frontage Rd N, Ste. 3
Wheat Ridge, CO 80033-1729

Surface Elevation:
5183.7(Ft) +/-

Graphic Log	Lithology Depth (Ft.)	Material Description	Depth (Ft.)	Elevation (Ft.)	Sample Type	Recovery (In.)	Field Test Results
	0.5	**TOPSOIL** ,about 6 inches		5183.2			
		CLAYEY SAND (SC) , fine to coarse grained, brown, very loose to loose					4-4
							2-2
			5				
	9			5174.7			
		SANDY LEAN CLAY (CL) , brown, stiff to very stiff	10				10-11
			15				8-10
			20				12-15
	24			5159.7			
		CLAYEY SAND (SC) , fine to coarse grained, brown, medium dense	25				8-12
	29			5154.7			
		CLAYSTONE, gray, medium hard	30				15-24
			35				16-30
							12-26
		Boring Terminated at 40 Ft					

DRAFT

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Elevation Reference: Approximate ground surface elevation obtained using Mapbox.
Location Reference:

Water Level Observations

Groundwater not encountered while drilling

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Drill Rig
1047/CME-55

Hammer Type
Automatic

Driller
Terracon

Logged By
Tiffani Robinson

Boring Started
09/05/2025

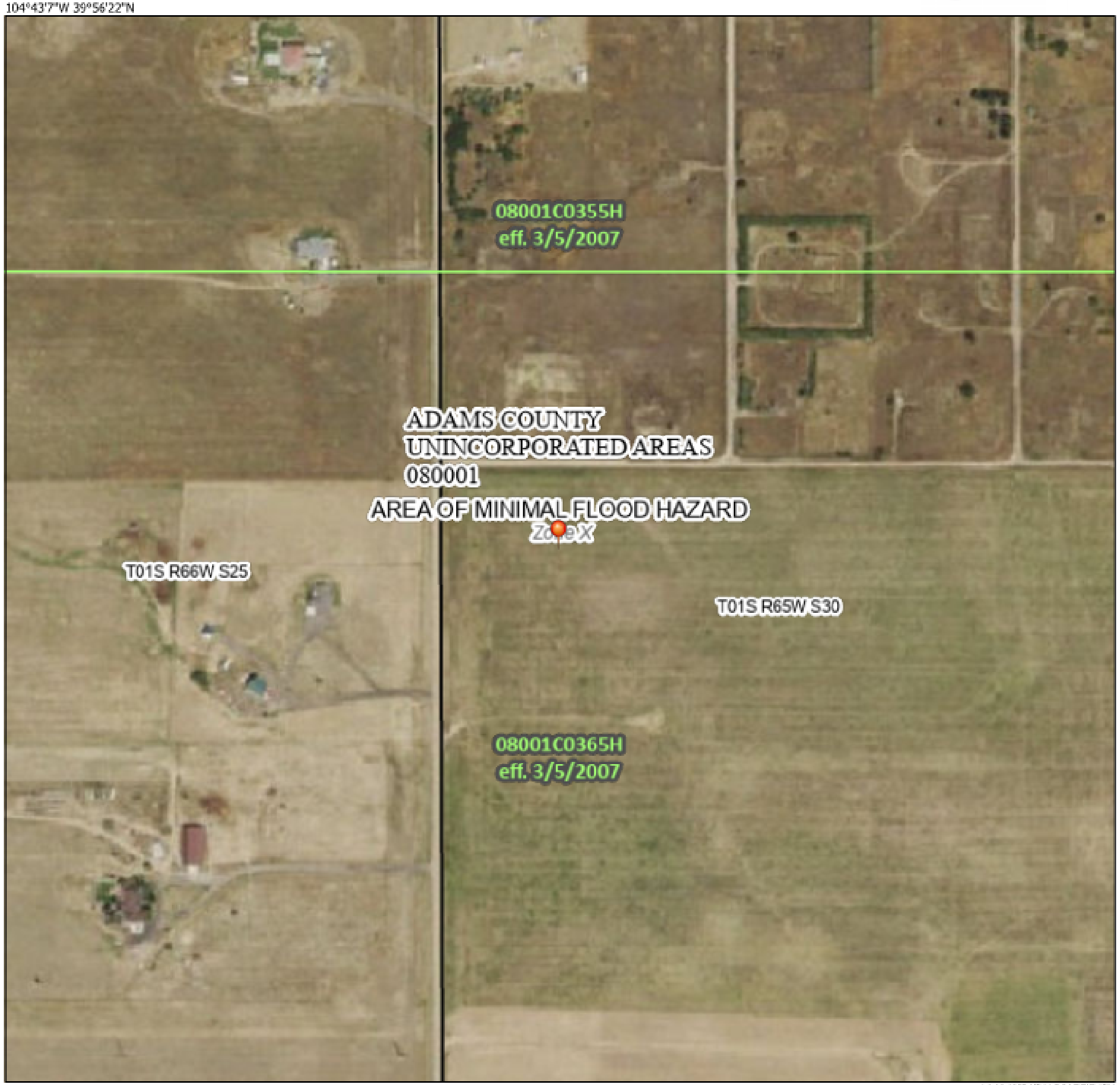
Boring Completed
09/05/2025

APPENDIX B – FIRMette and Wetlands

National Flood Hazard Layer FIRMette

FEMA

104°43'7"W 39°56'22"N



104°42'30"W 39°55'54"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/30/2025 at 8:13 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

U.S. Fish and Wildlife Service
National Wetlands Inventory

Stonehouse

June 30, 2025

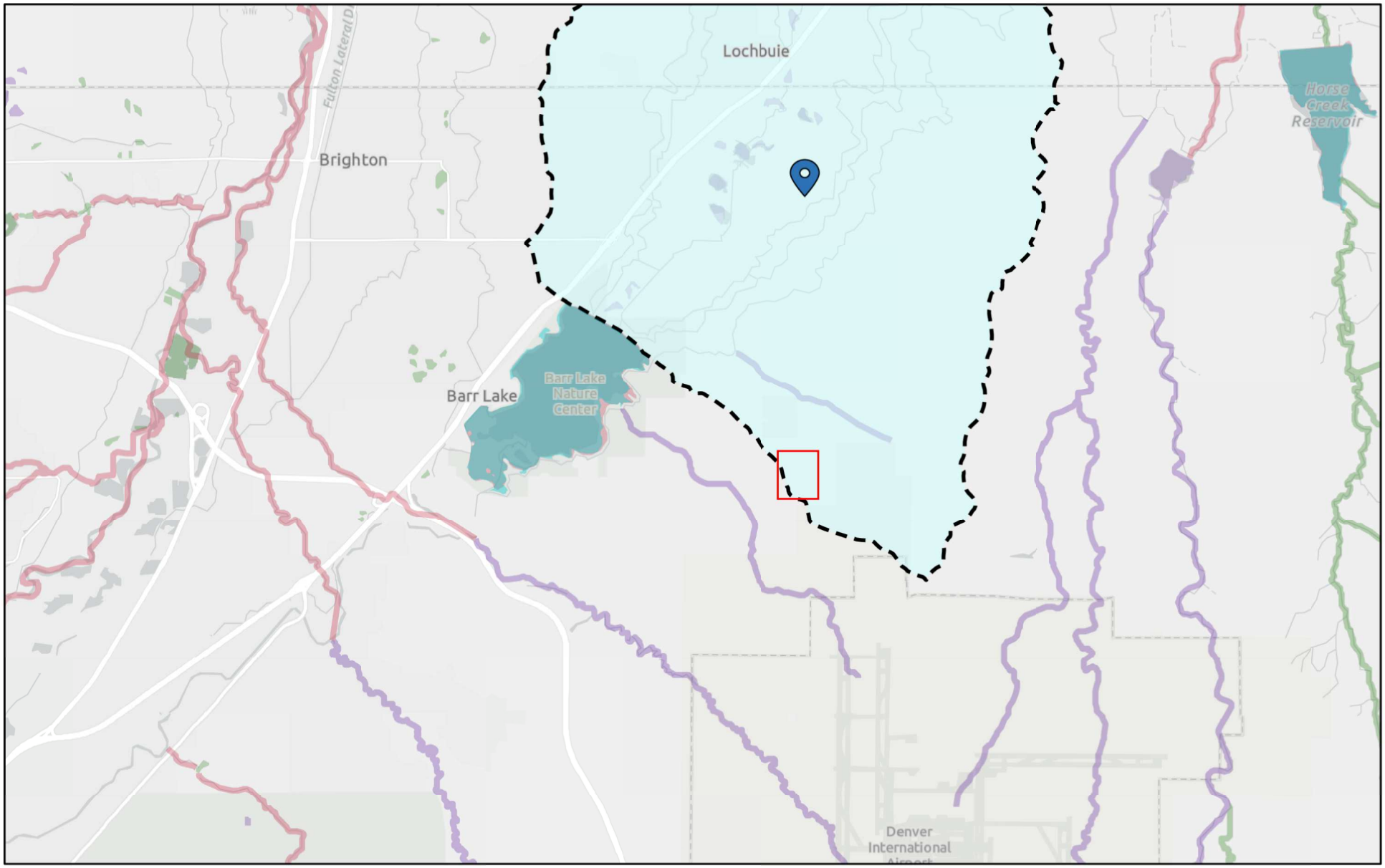
Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

APPENDIX C – Watershed

Stone House Watershed



9/19/2025

1:144,448

0 0.75 1.5 3 mi

0 1.5 3 6 km

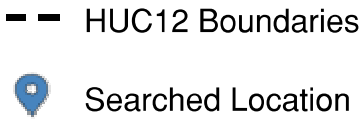
Waterbody: Good

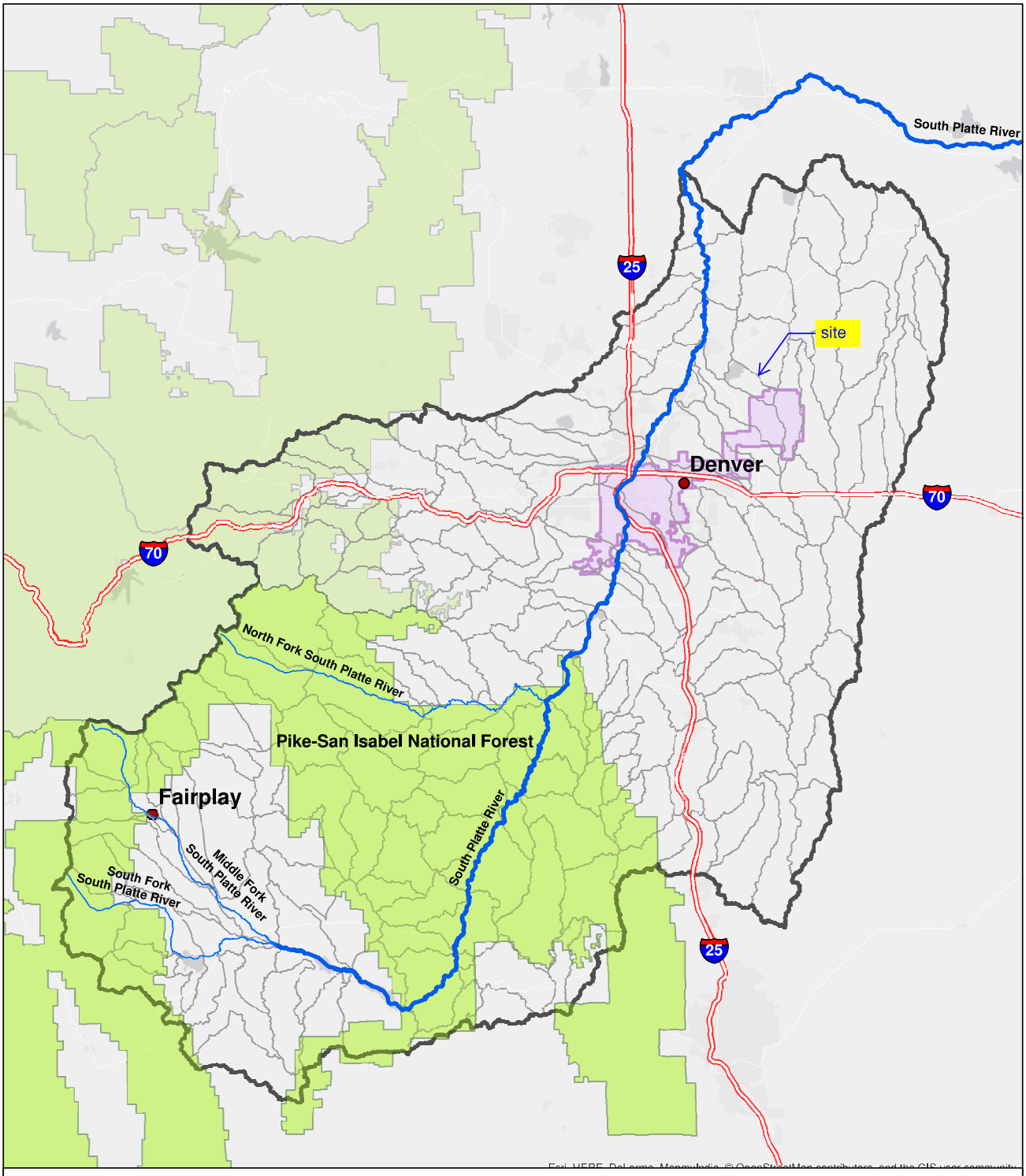
Waterbody: Impaired

Waterbody: Condition Unknown

Potential Harmful Algal Blooms (HABs)

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin,


HUC12 Boundaries
Searched Location



South Platte River Urban Waters Partnership

- Cities
- Rivers / Streams
- South Platte River
- Interstates
- USFS land
- Pike - San Isabel National Forest
- Watershed Boundaries (HUC12)
- SPRUWP Boundary
- City Boundary

0 10 20 Miles

0 10 20 Kilometers

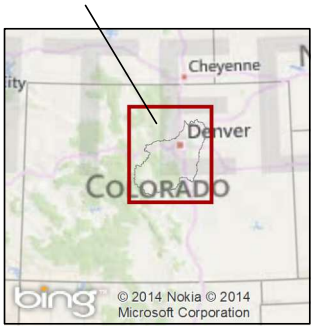
Date: September 8, 2014

Map Projection: Albers Projection, Meters, NAD83

Data Sources:

Cities and City Boundaries - Navteq (2013)
Rivers / Streams - NHD Plus (2012)
Interstates - Navteq (2011)
USFS lands - U.S. Forest Service (2012)
South Platte River Urban Waters Partnership (SPRUWP) Boundary - SPRUWP 2014;
HUC12 Watershed Boundary - National Resources Conservation Service (2010);
Imagery - ESRI Web Service (2014).

Area Enlarged



APPENDIX D – Calculations

1. Existing Conditions Rational Method
2. Proposed Conditions Rational Method
3. Hydraulic Analysis for Driveway culverts and diversion swale design.
4. Culvert Analysis and outlet protection determination
5. Trickle channel check
6. Detention basin design.

EXISTING CONDITIONS

Calculation of Peak Runoff using Rational Method

Calculation of Peak Runoff using Rational Method

Designer: M Velilla
Company: Ulteig
Date: 9/29/2025
Project: Stonehouse EC
Location: Adams County Co

MHFD-Rational, Version 3.00 (August 2025)

Cells of this color are for required user-input
Cells of this color are for optional override values

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

Computed $t_c = t_i + t_t$

Regional $t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$

$t_{c\ minimum} = 5$ (urban)
$t_{c\ minimum} = 10$ (non-urban)

Selected $t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$

Provide input for area, soil type, and imperviousness on the Runoff Coeffs worksheet.

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group(s)	Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time						
				WQE & 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)
E1	37.00	B	5.0%	0.03	0.03	0.10	0.28	0.36	0.45	0.55	500.00			0.011	41.75	1800.00			0.010	5	0.50	60.00
E2	9.70	B	5.0%	0.03	0.03	0.10	0.28	0.36	0.45	0.55	500.00			0.014	38.55	422.00			0.014	5	0.59	11.89

Calculation of Peak Runoff using Rational Method

Designer:
Company:
Date:
Project:
Location:

Select MHFD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	WQE	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	0.60	1.00	1.42	1.68	1.69	2.35	2.71	3.14

	a	b	c
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

Subcatchment Name	Time of Concentration: Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	(Optional) Override t_c (min)	Rainfall Intensity, I (in/hr): WQE	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Peak Flow, Q (cfs): WQE	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
E1	101.75	56.08	56.08		0.63	1.06	1.50	1.78	1.79	2.49	2.87	3.32	0.59	0.98	1.83	6.40	18.54	32.72	47.64	68.10
E2	50.44	31.28	31.28		0.92	1.53	2.17	2.57	2.59	3.60	4.15	4.81	0.22	0.37	0.69	2.43	7.04	12.42	18.08	25.84

Calculation of Peak Runoff using Rational Method

Calculation of Peak Runoff using Rational Method

Designer: M Velilla
Company: Ulteig
Date: 9/26/2025
Project: Stonehouse
Location: Adams County

MHFD-Rational, Version 3.00 (August 2025)

Cells of this color are for required user-input
Cells of this color are for optional override values

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

Computed $t_c = t_i + t_t$

$t_{c\,minimum} = 5$ (urban)
$t_{c\,minimum} = 10$ (non-urban)

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

$$\text{Selected } t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

Provide input for area, soil type, and imperviousness on the Runoff Coeffs worksheet.

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group(s)	Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time							
				WQE & 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)
P 1	1.24	B	60.0%	0.46	0.49	0.54	0.63	0.66	0.71	0.76	250.00			0.010	17.37	244.00			0.006	7	0.54	7.50
P 2	1.21	B	20.0%	0.13	0.15	0.22	0.37	0.44	0.52	0.61	154.00			0.035	14.10	20.00			0.020	20	2.83	0.12
P 3	1.40	B	60.0%	0.46	0.49	0.54	0.63	0.66	0.71	0.76	268.00			0.010	17.98	20.00			0.020	20	2.83	0.12
P 4	0.11	B	20.0%	0.13	0.15	0.22	0.37	0.44	0.52	0.61	15.00			0.090	3.22	16.00			0.050	7	1.57	0.17
P5	0.10	B	60.0%	0.46	0.49	0.54	0.63	0.66	0.71	0.76	25.50			0.024	4.16	212.00			0.010	7	0.70	5.05
P6	1.95	B	25.0%	0.17	0.19	0.26	0.41	0.47	0.54	0.63	178.00			0.030	15.26	80.00			0.060	20	4.90	0.27
P7	30.99	B	5.0%	0.03	0.03	0.10	0.28	0.36	0.45	0.55	500.00			0.010	43.08	1300.00			0.010	5	0.50	43.33

Calculation of Peak Runoff using Rational Method

Designer:
Company:
Date:
Project:
Location:

Select MHFD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	WQE	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	0.60	1.00	1.42	1.68		2.35	2.71	

	a	b	c
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

Subcatchment Name	Time of Concentration				Rainfall Intensity, I (in/hr)								Peak Flow, Q (cfs)							
	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	**(Optional)** Override t_c (min)	WQE	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	WQE	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
P1	24.87	18.82	18.82		1.22	2.03	2.88	3.41		4.77	5.50		0.69	1.16	1.76	2.29		3.92	4.81	
P2	14.21	22.80	14.21		1.40	2.33	3.31	3.91		5.47	6.31		0.22	0.36	0.60	1.03		2.91	3.96	
P3	18.10	15.94	15.94		1.32	2.21	3.13	3.71		5.18	5.98		0.85	1.42	2.16	2.81		4.81	5.90	
P4	3.39	22.70	10.00		1.62	2.71	3.84	4.55		6.36	7.33		0.02	0.04	0.06	0.11		0.31	0.42	
P5	9.20	17.83	9.20		1.68	2.79	3.97	4.69		6.56	7.57		0.08	0.13	0.19	0.25		0.44	0.53	
P6	15.53	22.19	15.53		1.34	2.23	3.17	3.75		5.25	6.05		0.43	0.72	1.17	1.89		4.78	6.40	
P7	86.41	47.49	47.49		0.71	1.18	1.68	1.98		2.77	3.20		0.55	0.92	1.71	5.98		30.58	44.51	

Hydraulic Analysis Report

Channel Analysis: Channel Analysis South to North

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 4.0000 ft/ft

Channel Width 25.00 ft

Longitudinal Slope: 0.0074 ft/ft

Manning's n: 0.0449

Flow 60.9700 cfs

Result Parameters

Depth 0.8842 ft

Area of Flow 25.2324 ft^2

Wetted Perimeter 32.2913 ft

Hydraulic Radius 0.7814 ft

Average Velocity 2.4163 ft/s

Top Width 32.0736 ft

Froude Number: 0.4801

Critical Depth 0.5524 ft

Critical Velocity 4.0560 ft/s

Critical Slope: 0.0370 ft/ft

Critical Top Width 29.42 ft

Calculated Max Shear Stress 0.4083 lb/ft^2

Calculated Avg Shear Stress 0.3608 lb/ft^2

Channel Lining Analysis: Channel Lining Design AnalysisSouthtoNorth

Notes:

Lining Input Parameters

Channel Lining Type: Vegetation

Specific Weight of Water: 62.4 lb/ft^3

Height of Vegetation: 0.333 ft

Vegetation Condition is good

Growth Form of Vegetation is mixed

Cf: 0.75

See HEC-15, Table 4.5 (default: 0.75 for Good cover factor and Mixed growth form)

soil is noncohesive

D75: 2.54 mm

Safety Factor: 1

Lining Results

Cn: 0.165205

Permissible Soil Shear Stress: 0.04 lb/ft^2

Mean Boundary Shear Stress: 0.118233 lb/ft^2

Maximum Shear Stress on the Channel Bottom: 0.313031 lb/ft^2

Manning's n: 0.0826623

Soil Grain Roughness: 0.0177136

Effective Shear Stress: 0.00293192 lb/ft^2

Permissible Shear Stress on Vegetation: 3.48435 lb/ft^2

This value is compared with the maximum shear stress times the safety factor to determine lining stability

This value is compared with the maximum shear stress times the safety factor to determine lining stability

Channel bottom is stable

Channel Lining Stability Results 2

The channel is stable

Channel Summary

Channel Analysis: Channel AnalysisWestoEast

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 4.0000 ft/ft

Channel Width 10.00 ft

Longitudinal Slope: 0.0094 ft/ft

Manning's n: 0.0531

Flow 25.9400 cfs

Result Parameters

Depth 0.8940 ft

Area of Flow 12.1364 ft^2

Wetted Perimeter 17.3719 ft

Hydraulic Radius 0.6986 ft

Average Velocity 2.1374 ft/s

Top Width 17.1517 ft

Froude Number: 0.4478

Critical Depth 0.5493 ft

Critical Velocity 3.8714 ft/s

Critical Slope: 0.0537 ft/ft

Critical Top Width 14.39 ft

Calculated Max Shear Stress 0.5244 lb/ft^2

Calculated Avg Shear Stress 0.4098 lb/ft^2

Channel Lining Analysis: Channel Lining Design AnalysisWesttoEast

Notes:

Lining Input Parameters

Channel Lining Type: Vegetation

Specific Weight of Water: 62.4 lb/ft^3

Height of Vegetation: 0.333 ft

Vegetation Condition is good

Growth Form of Vegetation is mixed

Cf: 0.75

See HEC-15, Table 4.5 (default: 0.75 for Good cover factor and Mixed growth form)

soil is noncohesive

D75: 2.54 mm

Safety Factor: 1

Lining Results

Cn: 0.165205

Permissible Soil Shear Stress: 0.04 lb/ft^2

Mean Boundary Shear Stress: 0.0463943 lb/ft^2

Maximum Shear Stress on the Channel Bottom: 0.220512 lb/ft^2

Manning's n: 0.120176

Soil Grain Roughness: 0.0177136

Effective Shear Stress: 0.000977188 lb/ft^2

Permissible Shear Stress on Vegetation: 7.36446 lb/ft^2

This value is compared with the maximum shear stress times the safety factor to determine lining stability

This value is compared with the maximum shear stress times the safety factor to determine lining stability

Channel bottom is stable

Channel Lining Stability Results 2

The channel is stable

Stone House Drainage Analysis Using GeoHECHMS

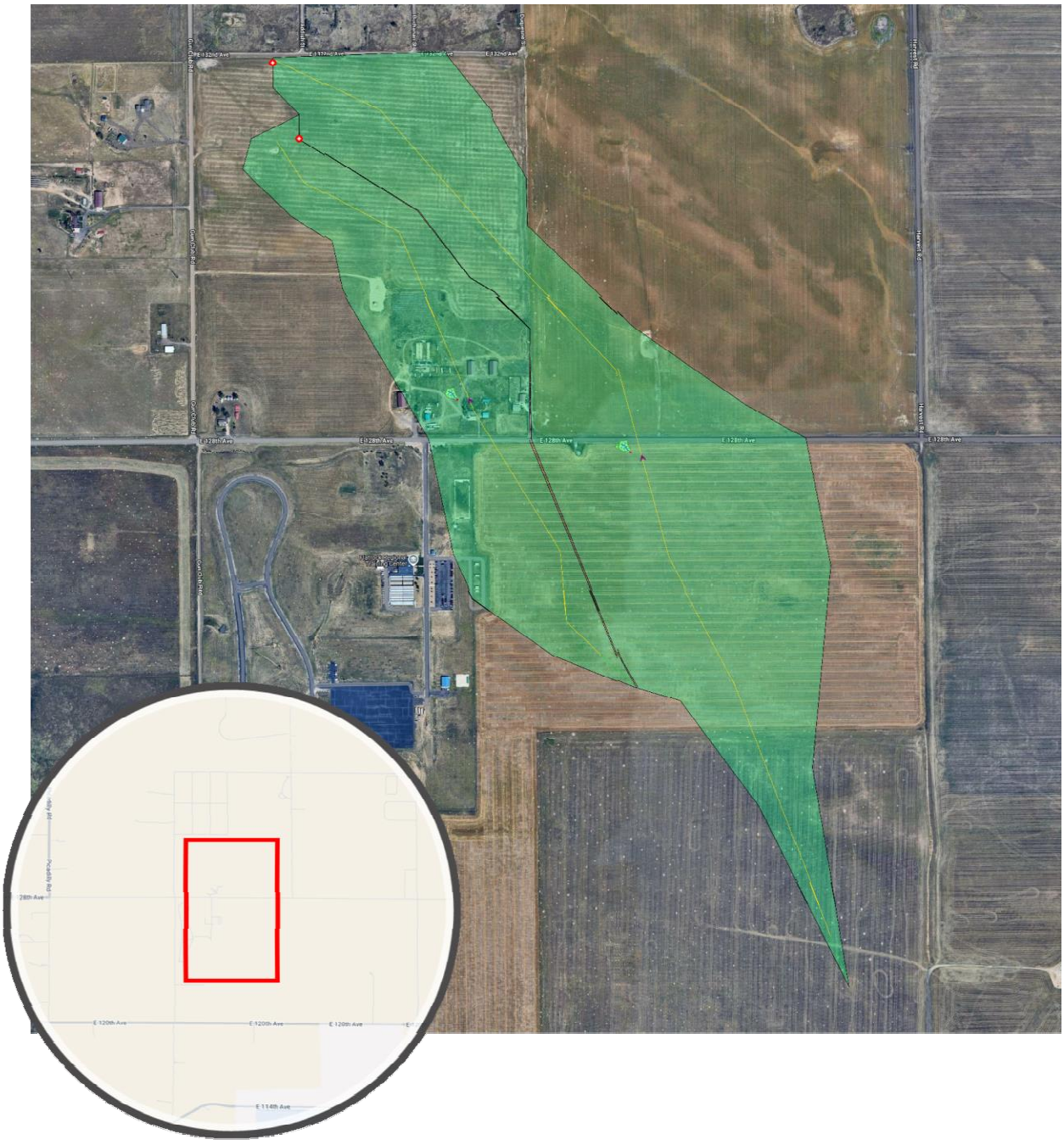
Prepared by:
Ulteig Engineers, Inc.

July 29, 2025

Contents

Project Description

The project is located in Adams County, Colorado



Purpose

The purpose of this hydrology study is to determine the peak runoff rates.

Methodology Used

The HEC-HMS version 4.5 computer software was used in this hydrology study. The **SCS Curve Number** infiltration (loss) method and **SCS Unit Hydrograph** runoff (transform) method was used for determining the stormwater runoff**.** Multiple routing method were used for routing the stormwater**.**

The following scenarios were analyzed in this hydrology study:

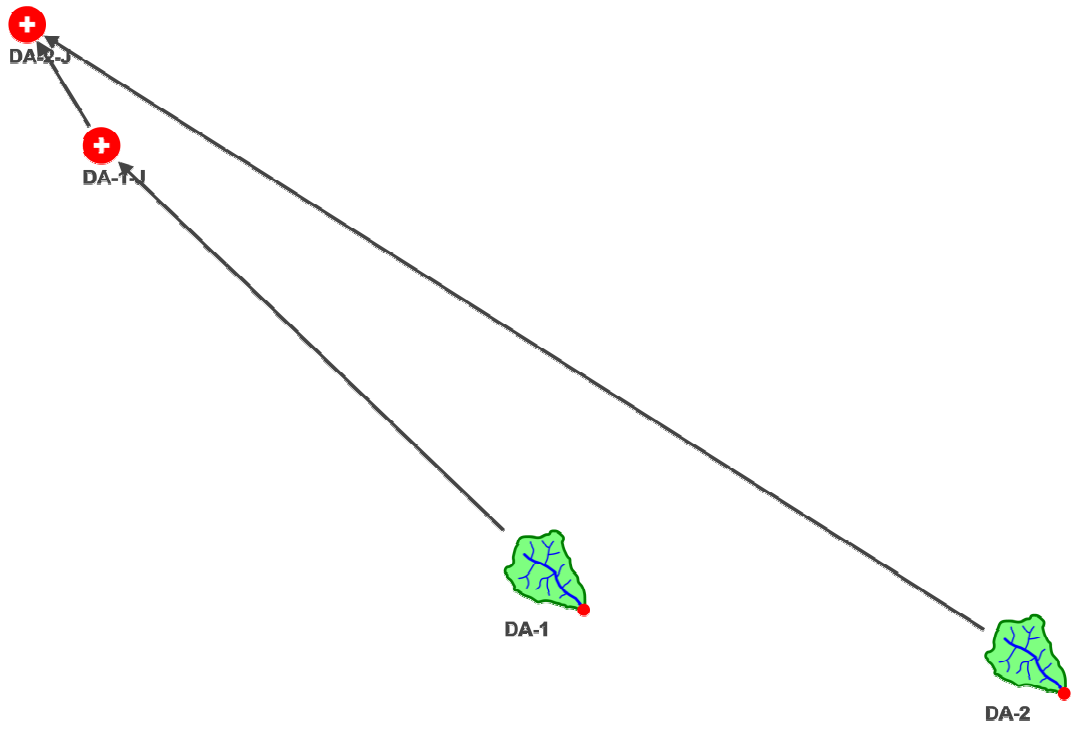
5yr

This scenario contains:

- 2 delineated subbasin areas and corresponding lag time flow paths.
- 2 connecting junctions.

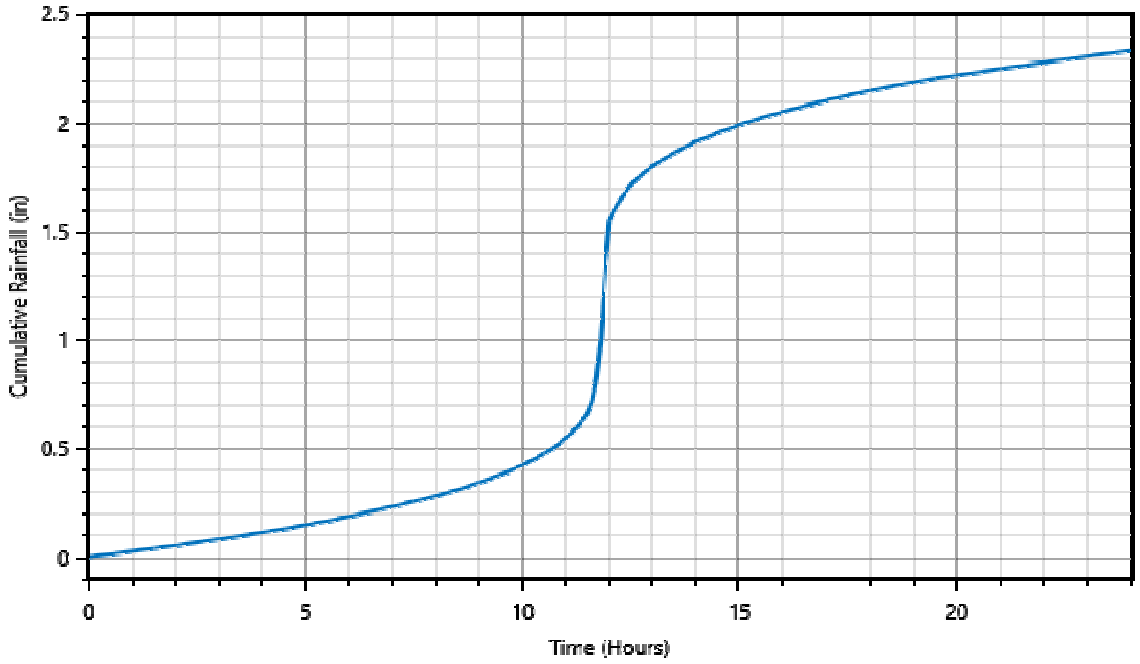
5yr

Watershed Routing Diagram



Design Storm

Precipitation type: SCS Storm
SCS storm distribution: Type II
Rainfall depth: 2.33 in



Watershed Summary

Subbasin ID	Drainage Area (acres)	Initial Abstraction (in)	Curve Number	Impervious Surface (%)	Lag Time (minutes)	Peak Discharge (cfs)
DA-1	67.740	N/A	81.10	25.00	67.97	25.94
DA-2	148.301	N/A	79.60	25.00	103.56	39.24

Subbasins

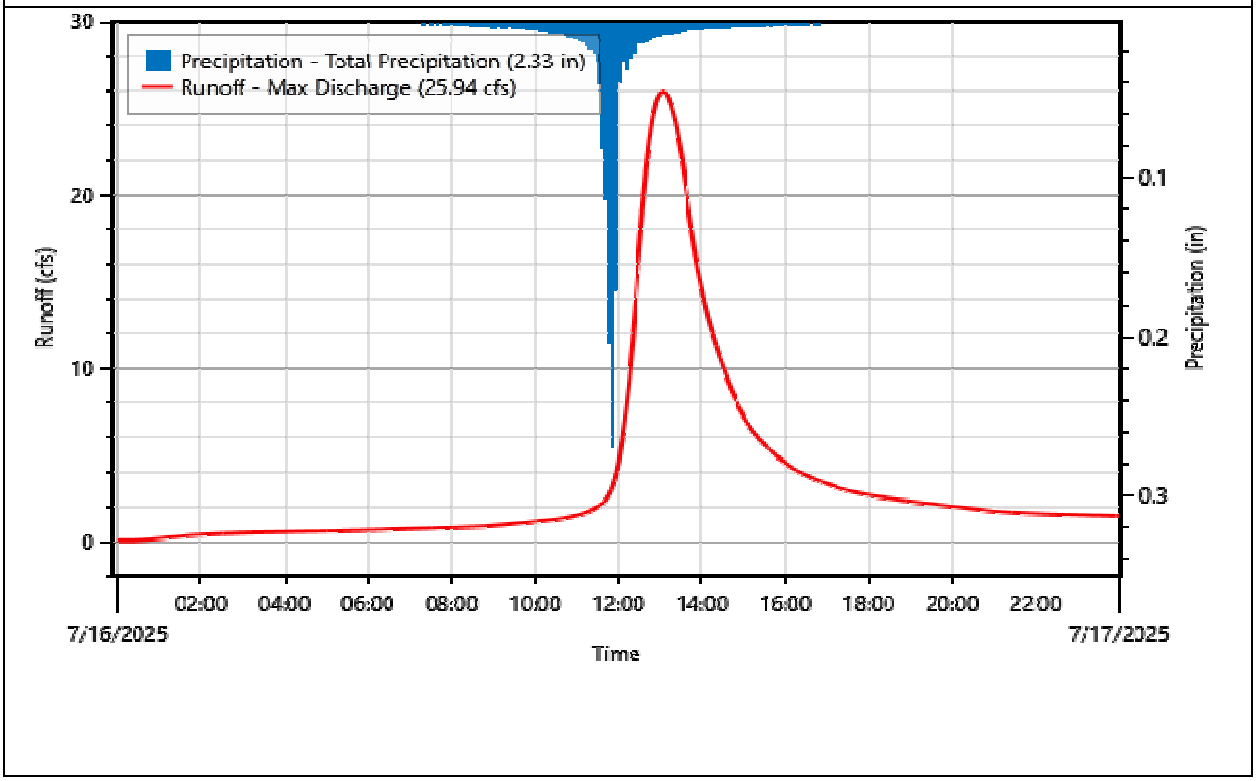
Subbasin ID:	**DA-1**			
Scenario:	**5yr**		**Depth**	**Volume**
Peak discharge:	25.94 cfs	**Time of peak:**	16 Jul 2025, 01:05	
Drainage area:	67.740 acres	**Total rainfall:**	2.33 in	13.153 ac-ft
Initial abstraction:	N/A	**Losses:**	1.13 in	6.358 ac-ft
Curve Number:	81.10	**Precip excess:**	1.20 in	6.795 ac-ft
Impervious surface:	25.00%	**Direct runoff:**	1.17 in	6.625 ac-ft
Peaking factor:	484	**Baseflow:**	0.00 in	0.000 ac-ft
Lag time:	67.97 minutes	**Total runoff:**	1.17 in	6.625 ac-ft

Weighted Curve Number Calculations

Soil Group	Land Use Description	Area (acres)	Area (%)	Composite CN
C	Developed, Low Density	0.266	0.39	83.00
C	Agricultural, Pasture/Hay	7.301	10.78	74.00
C	Developed, Medium Density	0.409	0.60	90.00
C	Agricultural, Cultivated Crops	45.376	66.99	85.00
C	Developed, Open Space	2.025	2.99	79.00
C	Undeveloped, Grassland	12.364	18.25	71.00
Weighted Average		**67.740**	**100.00**	**81.10**

Time of Concentration (TOC) / Lag time Calculations

TOC (min)	Length (ft)	Slope (ft/ft)	Velocity (ft/s)	Description
52.55	300.00	0.03838	0.0952	Sheet Flow
60.73	4,318.49	0.01734	1.1851	Shallow Concentrated Flow
113.28	**4,618.49**	**Total**	**Lag Time = 67.97 minutes**	



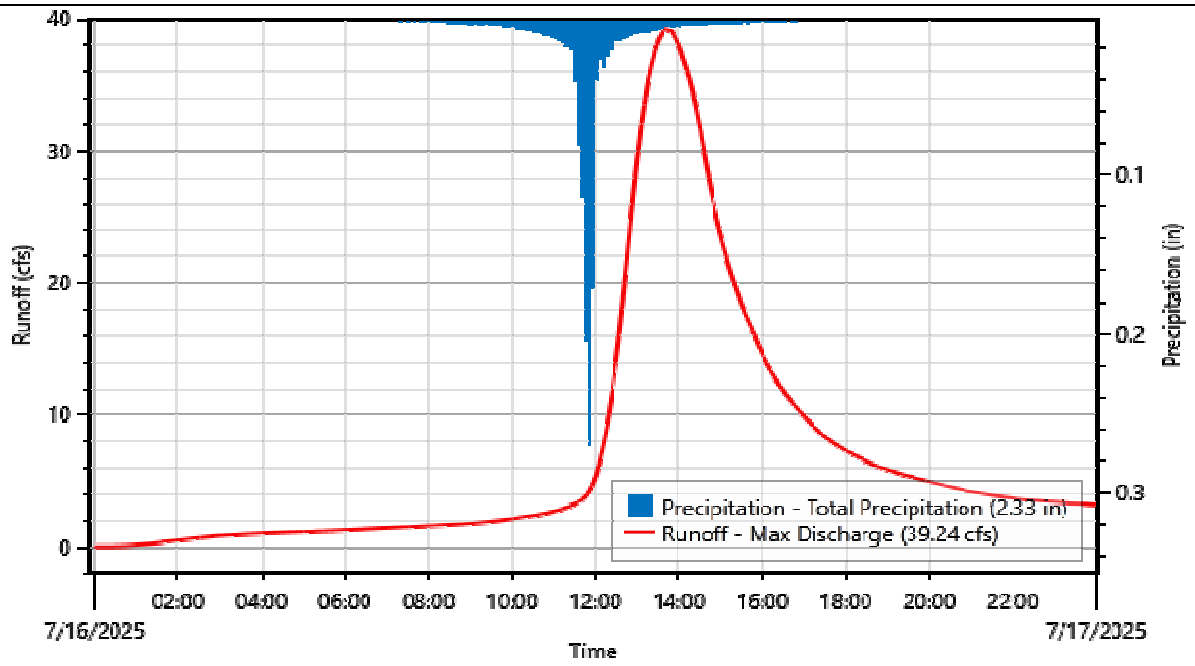
Subbasin ID:	**DA-2**			
Scenario:	**5yr**		**Depth**	**Volume**
Peak discharge:	39.24 cfs	**Time of peak:**	16 Jul 2025, 01:45	
Drainage area:	148.301 acres	**Total rainfall:**	2.33 in	28.795 ac-ft
Initial abstraction:	N/A	**Losses:**	1.18 in	14.607 ac-ft
Curve Number:	79.60	**Precip excess:**	1.15 in	14.188 ac-ft
Impervious surface:	25.00%	**Direct runoff:**	1.10 in	13.627 ac-ft
Peaking factor:	484	**Baseflow:**	0.00 in	0.000 ac-ft
Lag time:	103.56 minutes	**Total runoff:**	1.10 in	13.627 ac-ft

Weighted Curve Number Calculations

Soil Group	Land Use Description	Area (acres)	Area (%)	Composite CN
C	Agricultural, Pasture/Hay	31.579	21.29	74.00
C	Agricultural, Cultivated Crops	80.764	54.46	85.00
C	Developed, Open Space	6.318	4.26	79.00
C	Undeveloped, Grassland	29.640	19.99	71.00
Weighted Average		**148.301**	**100.00**	**79.60**

Time of Concentration (TOC) / Lag time Calculations

TOC (min)	Length (ft)	Slope (ft/ft)	Velocity (ft/s)	Description
67.98	300.00	0.02016	0.0735	Sheet Flow
104.62	7,339.78	0.01688	1.1693	Shallow Concentrated Flow
172.60	**7,639.78**	**Total**	**Lag Time = 103.56 minutes**	



Nodes

Element ID	Element Type	Peak Inflow (cfs)	Peak Outflow (cfs)	Peak Diverted Flow (cfs)
DA-1-J	Junction	25.94	25.94	
DA-2-J	Junction	60.97	60.97	

Results Summary

Hydrologic Element	Drainage Area (acres)	Maximum Outflow (cfs)	Time of Peak	Volume (ac-ft)
DA-1	67.740	25.94	16Jul2025, 13:05	6.625
DA-1-J	67.740	25.94	16Jul2025, 13:05	6.625
DA-2	148.301	39.24	16Jul2025, 13:45	13.627
DA-2-J	216.041	60.97	16Jul2025, 13:25	20.252

NATURAL RESOURCES CONSERVATION SERVICE

WEST VIRGINIA DESIGN NOTE

RIPRAP-LINED OUTLET PROTECTION

INTRODUCTION

Outlet protection as presented here is a level apron of sufficient length and flare such that the expanding flow from a pipe or culvert loses sufficient velocity and energy and will not erode downstream of the discharge pipe. The design curves shown in Figures[A] 1a and 1b are for circular conduits flowing full. The curves provide the recommended apron dimension and median riprap diameter, D_{50}. Figure 1a presents curves for minimum tailwater condition and Figure 1b presents curves for maximum tailwater condition. This design procedure is applicable to all pipe, culverts, and storm sewer outlets greater than or equal to 4 inches in diameter and less than or equal to 42 inches in diameter and to detention structure pipe outlets less than or equal to 24 inches in diameter.

This design note is not intended for use with: 1) detention structures having outlet pipes greater than 24 inches in diameter or 2) general outlet pipes or culverts greater than 48 inches in diameter. Design Note 6 - Riprap Lined Plunge Pool for Cantilever Outlet, Technical Release (TR) 54 - Structural Design of SAF Stilling Basins, National Engineering Handbook Section 14 - Chute Spillways or TR 50 - Design of Rectangular Structural Channels may be used to design energy-dissipating outlet structures for these situations as appropriate.

DESIGN PROCEDURE STEPS

Document the pipe diameter (inches) and discharge (cfs) of the pipe when in full flow condition.

1. Based on the tailwater depth immediately below the pipe outlet classify the tailwater condition as either
    a. Minimum Tailwater Condition (Figure 1a) where the tailwater depth is less than half the diameter of the pipe at the discharge point.
    b. Maximum Tailwater Condition (Figure 1b) where the tailwater depth is equal or greater than half the diameter of the pipe at the discharge point.
2. Select Figure 1a or Figure 1b for the appropriate tailwater condition. Determine the
    a. Median Riprap Diameter, D_{50} (Ft)
        i. Go to the selected figure and select the full pipe discharge (cfs) on the x-axis, extend a vertical line to the pipe diameter in the lower set of curves. Then read horizontally to the y-axis on the right and determine the Median Riprap Diameter, D_{50}.
    b. Minimum Apron Length, La (Ft)
        i. Extend the vertical line (discussed in 2ai) to the pipe diameter in the upper set of curves in the figure until it intersects the pipe diameter. Then read horizontally to the y-axis on the left and determine the Minimum Apron Length, La.

Note: [A] The figures provided are generated from equations found in the U.S. Army Corps of Engineers *Erosion and Riprap Requirements at Culvert and Storm-Drain Outlets*, Bohan, J. P. Research Report H-70-2, 1970.

3. Calculate the Apron Width, W (Ft)
    a. Calculate the apron width by adding three times the pipe diameter (Do) to the apron length, La. W = (3 x Do(ft)) + La(ft) when minimum tailwater conditions prevail and the outlet is
        i. discharging into a flat channel or area or
        ii. discharging into a defined channel wider than the apron width (W).
    b. Calculate the apron width by adding three times the pipe diameter (Do) to 0.4 times the apron length, La. W = (3 x Do(ft)) + (La(ft) x 0.4) when maximum tailwater conditions are met and the pipe outlet is discharging into an area wider than the apron width.
    c. If the above conditions cannot be met and the outlet discharges into a channel narrower than the required apron width, then at a minimum, continuously line the channel one foot (1.0') above the design flow elevation or to the top of bank, whichever is less, and downstream to length of 1.2 x (La).

BOTTOM GRADE

The apron shall be constructed with no slope along its entire length (0.0% grade). The invert elevation of the downstream end of the apron shall be equal to the elevation of the invert of the receiving channel or flat area. There shall be no overfall at the end of the apron.

ALIGNMENT

The apron shall be straight and symmetrical for its entire length. The centerline of the discharging pipe shall be coincident with the centerline of the apron.

RIPRAP SIZE

The median D_{50} size of the riprap shall be taken from Figure 1 for the appropriate tailwater condition. The riprap shall be reasonably well graded between the limits of 3 inches and 1.5 times D_{50}.

EXAMPLE:

A hooded 2.0' diameter circular pipe flowing full is discharging into a channel with the following characteristics. Pipe flow Q=50.6 cfs; Inlet Invert Elev. = 96.0; Outlet Invert Elev. = 88.0, Tailwater = 89.2, channel bottom width 30'.

Maximum Tailwater Condition (Tw>=0.5 Dia.)

From Figure 1b- Median Riprap Diameter, D_{50} = 0.8 ft. (well-graded between limits of 3-29 inches)
Minimum Apron Length = 52.5 ', Minimum Apron Width = 3 x 2' + 0.4 * 52.5' = 27'

Figure 1a: Minimum Tailwater Condition

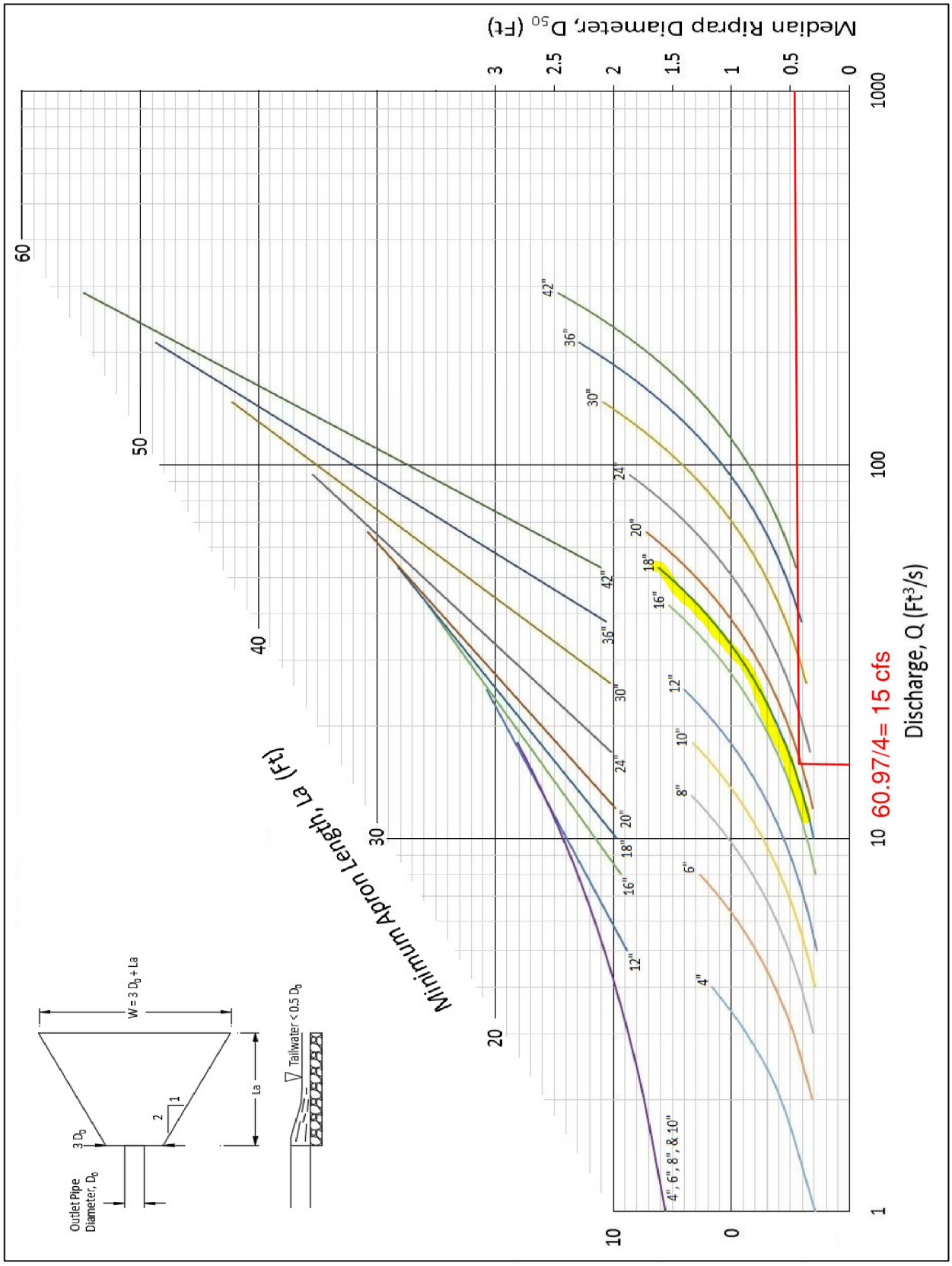
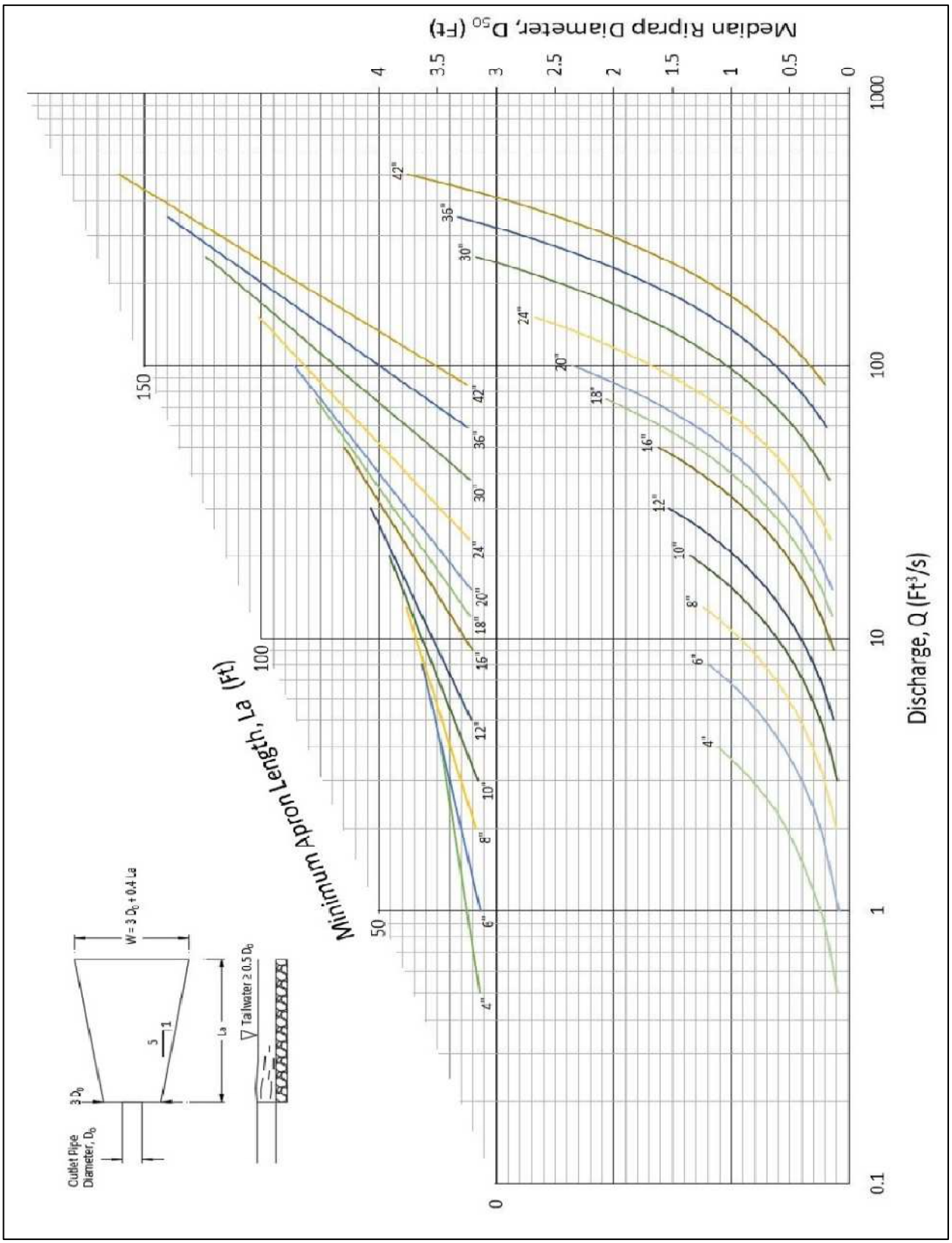


Figure 1b: Maximum Tailwater Condition

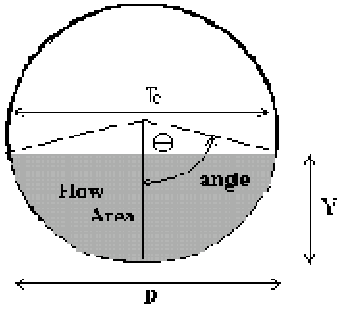


CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.01 (April 2025)

Project: Stonehouse Substations

Pipe ID: C2 18 " RCP



Design Information (Input)			
Pipe Invert Slope	So =	0.5000	ft/ft
Pipe Manning's n-value	n =	0.0120	
Pipe Diameter	D =	18.00	inches
Design discharge	Q =	3.20	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	80.68	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	0.76	radians
Flow area	An =	0.14	sq ft
Top width	Tn =	1.03	ft
Wetted perimeter	Pn =	1.13	ft
Flow depth	Yn =	0.20	ft
Flow velocity	Vn =	22.21	fps
Discharge	Qn =	3.20	cfs
Percent of Full Flow	Flow =	4.0%	of full flow
Normal Depth Froude Number	Fr_n =	10.45	supercritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.48	radians
Critical flow area	Ac =	0.78	sq ft
Critical top width	Tc =	1.49	ft
Critical flow depth	Yc =	0.68	ft
Critical flow velocity	Vc =	4.10	fps
Critical Depth Froude Number	Fr_c =	1.00	

Culverts C 3

HY-8 Culvert Analysis Report

Table 1 - Project Headwater Table

Crossing Name	Culvert Name	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Outlet Velocity (ft/s)
Crossing 1 Arch	Culvert 1 Arch	60.97	60.97	5180.51	2.23	2.505	1.67	1.09	1.12	1.50	5.47

Crossing Input: Crossing 1 Arch

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	0.000	cfs
Design Flow	60.970	cfs
Maximum Flow	60.970	cfs
TAILWATER DATA		
Channel Type	Rectangular Channel	
Bottom Width	10.000	ft
Channel Slope	0.0050	ft/ft
Manning's n (channel)	0.040	
Channel Invert Elevation	5177.500	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	ft
Crest Length	100.000	ft
Crest Elevation	5182.000	ft
Roadway Surface	Paved	
Top Width	39.000	ft

Culvert Input: Crossing 1 Arch

Parameter	Value	Units
CULVERT DATA		
Name	Culvert 1 Arch	
Shape	Pipe Arch	
Material	Concrete	
Size	Define...	
Span	28.500	in
Rise	18.000	in
Embedment Depth	0.000	in
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Square Edge with Headwall (Ke=0.5)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	5178.000	ft
Outlet Station	75.150	ft

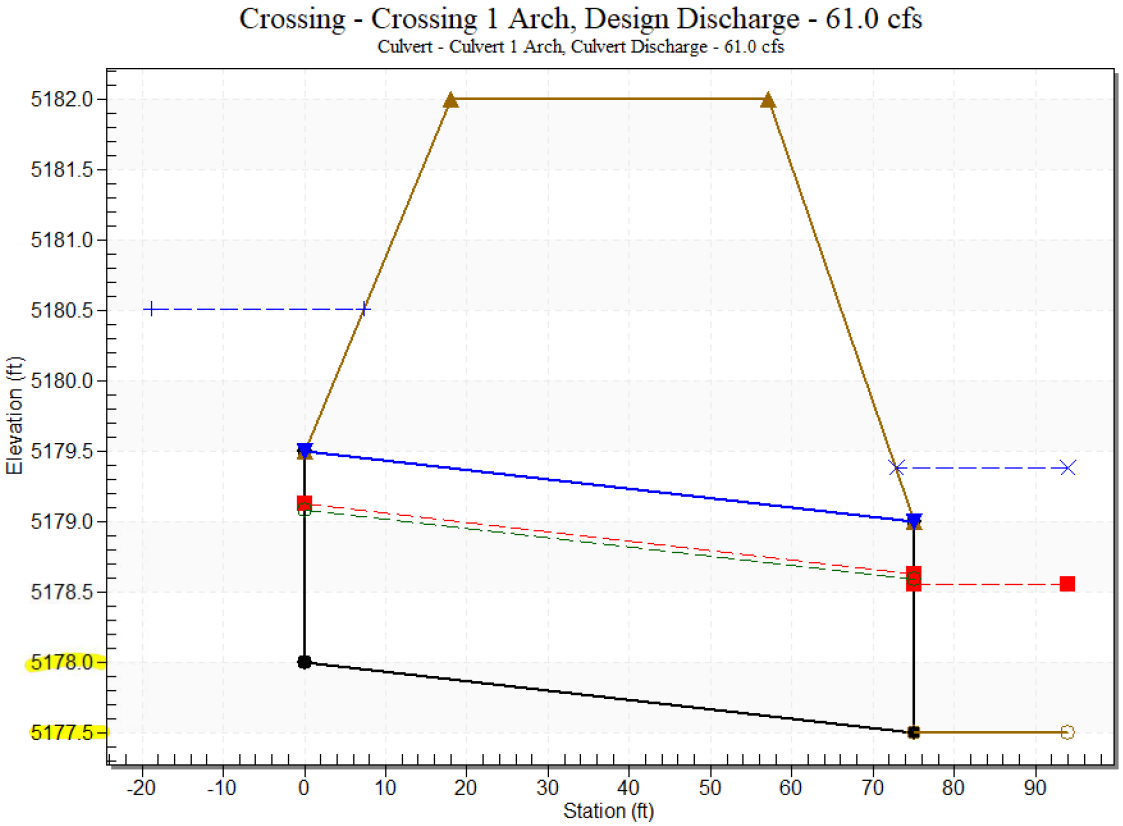
Outlet Elevation	5177.500	ft
Number of Barrels	4	
Computed Culvert Slope	0.006653	ft/ft

Table 2 - Culvert Summary Table: Culvert 1 Arch

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	5178.00	0.00	0.000	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
6.10	6.10	5178.43	0.43	0.0*	0.29	1-JS1t	0.27	0.31	0.43	0.43	1.85	1.42
12.19	12.19	5178.64	0.64	0.208	0.43	1-JS1t	0.38	0.45	0.66	0.66	2.22	1.84
18.29	18.29	5178.82	0.82	0.458	0.54	1-JS1t	0.48	0.57	0.86	0.86	2.53	2.13
24.39	24.39	5179.00	1.00	0.710	0.67	1-JS1t	0.56	0.67	1.03	1.03	2.82	2.37
30.48	30.48	5179.18	1.18	0.972	0.79	1-JS1t	0.65	0.76	1.19	1.19	3.12	2.56
36.58	36.58	5179.37	1.37	1.245	0.91	1-JS1t	0.73	0.84	1.34	1.34	3.44	2.73
42.68	42.68	5179.60	1.57	1.600	1.07	1-S1t	0.81	0.92	1.50	1.48	3.83	2.87
48.78	48.78	5179.84	1.77	1.840	1.23	1-S1f	0.89	0.99	1.50	1.62	4.38	3.01
54.87	54.87	5180.16	1.99	2.164	1.44	4-FFf	0.98	1.06	1.50	1.75	4.92	3.13
60.97	60.97	5180.51	2.23	2.505	1.67	4-FFf	1.09	1.12	1.50	1.88	5.47	3.24
94.23	82.99	5182.11	3.23	4.114	2.74	4-FFf	1.50	1.30	1.50	2.54	7.45	3.72

* Full Flow Headwater elevation is below inlet invert.

Water Surface Profile Plot for Culvert: Culvert 1 Arch

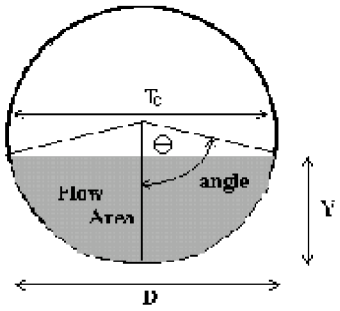


CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.01 (April 2025)

Project: Stonehouse Substations

Pipe ID: C1 12 " RCP



100 year

Design Information (Input)			
Pipe Invert Slope	So =	0.4500	ft/ft
Pipe Manning's n-value	n =	0.0120	
Pipe Diameter	D =	12.00	inches
Design discharge	Q =	8.70	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	0.79	sq ft
Full-flow wetted perimeter	Pf =	3.14	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	25.96	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.37	radians
Flow area	An =	0.29	sq ft
Top width	Tn =	0.98	ft
Wetted perimeter	Pn =	1.37	ft
Flow depth	Yn =	0.40	ft
Flow velocity	Vn =	29.78	fps
Discharge	Qn =	8.70	cfs
Percent of Full Flow	Flow =	33.5%	of full flow
Normal Depth Froude Number	Fr_n =	9.61	supercritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.94	radians
Critical flow area	Ac =	0.78	sq ft
Critical top width	Tc =	0.20	ft
Critical flow depth	Yc =	0.99	ft
Critical flow velocity	Vc =	11.10	fps
Critical Depth Froude Number	Fr_c =	1.00	

Trickle Channel Check

Mannings Formula					
$Q = a \times 1.486/n \times R^{2/3} \times S^{1/2}$					
Input Data:			**Results:**		
Area =	2	ft^2	Hydraulic Radius =	0.4	ft
Mannings 'n' =	0.013		Flow Rate =	9.61	cfs
Wetted Perimeter =	5	ft	Velocity =	4.81	ft/s
Slope =	0.006	ft/ft			

At culverts exit for 100 year

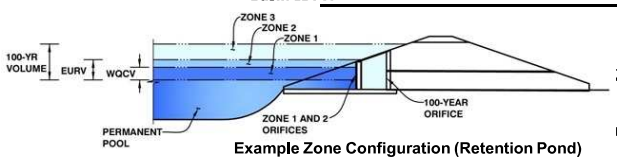
C1 Q = 8.7 CFS
C2 Q = 3.2 CFS

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: Stonehouse Adams County Co

Basin ID: A



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.87	0.090	Orifice Plate
Zone 2 (EURV)	2.36	0.163	Orifice Plate
ne 3 (100-year)	2.76	0.265	Weir&Pipe (Restrict)
Total (all zones)		0.518	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration SCM)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation SCM)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	2.36	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.81	1.42					
Orifice Area (sq. inches)	0.12	0.26	2.70					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.25	N/A	feet
Overflow Weir Front Edge Length =	5.00	N/A	feet	Overflow Weir Slope Length =	5.15	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	20.59	N/A	
Horiz. Length of Weir Sides =	5.00	N/A	feet	Overflow Grate Open Area w/o Debris =	17.94	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	17.94	N/A	ft^2
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.87	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.43	N/A	feet
Restrictor Plate Height Above Pipe Invert =	8.90		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.56	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.20	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.70	feet
Spillway Crest Length =	4.00	feet	Stage at Top of Freeboard =	4.90	feet
Spillway End Slopes =	5.00	H:V	Basin Area at Top of Freeboard =	1.64	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.35	acre-ft

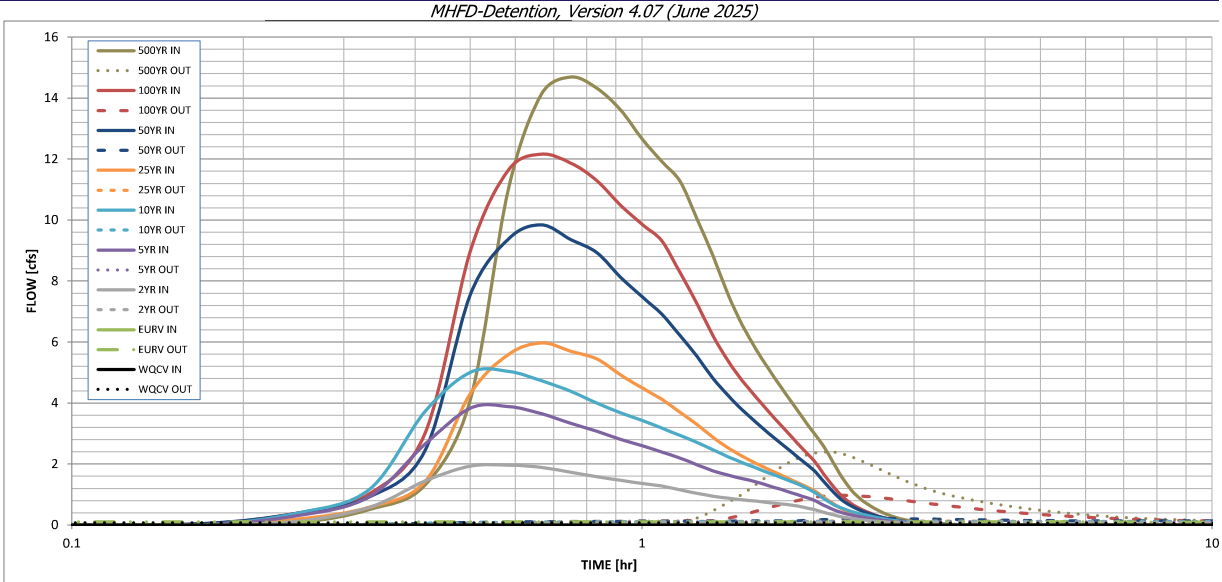
Calculated Parameters for Spillway

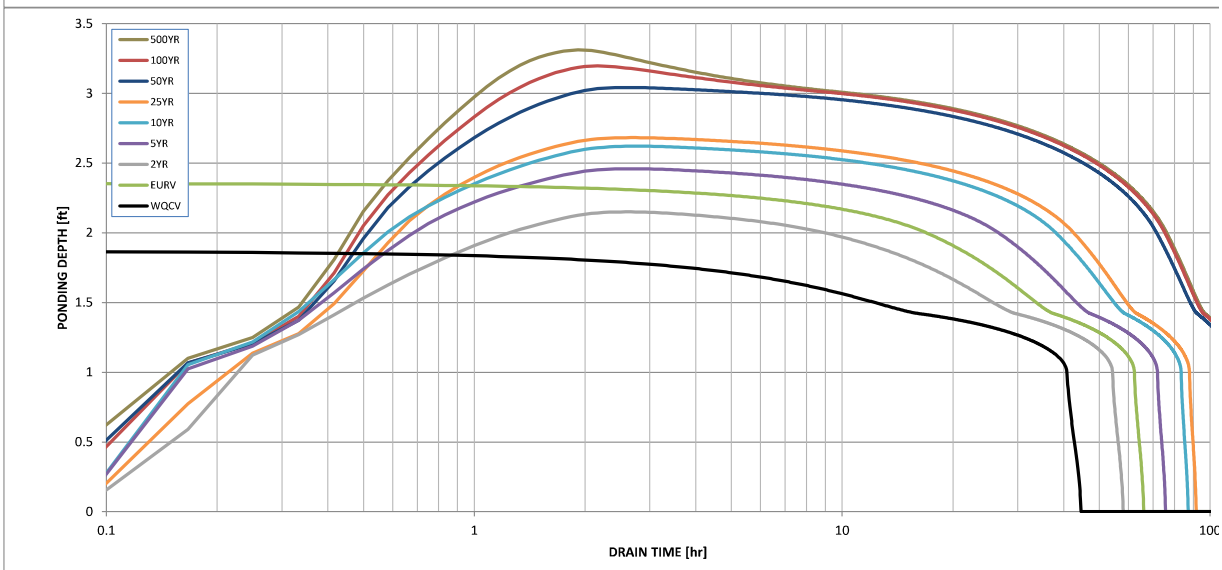
Routed Hydrograph Results *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

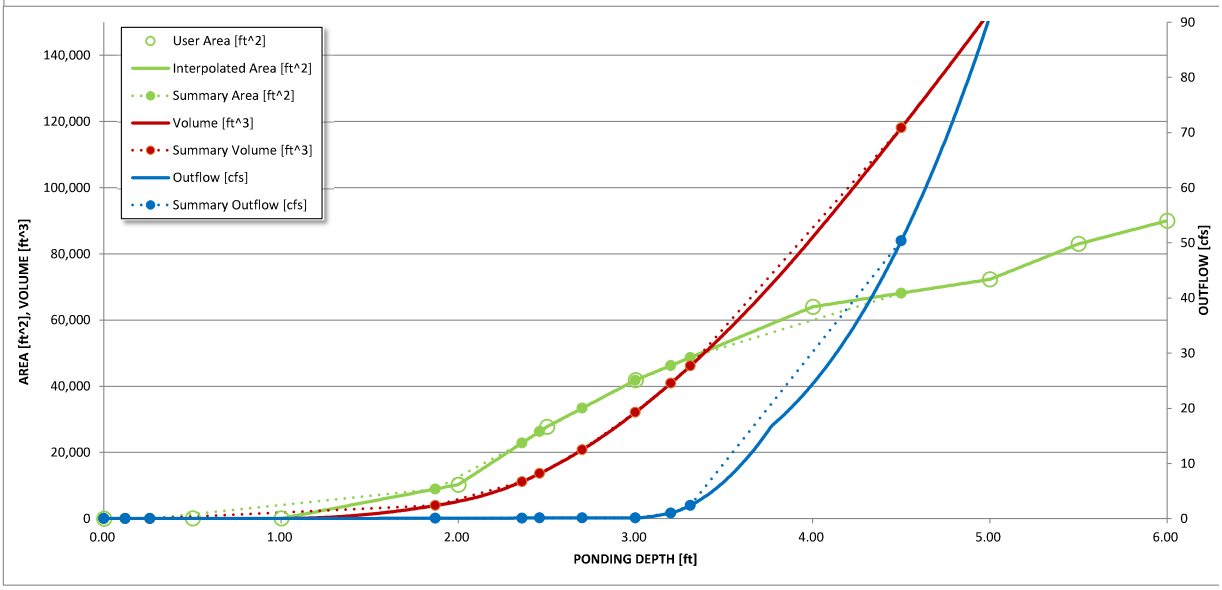
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.00	1.42	1.68	1.69	2.35	2.71	3.14
CUHP Runoff Volume (acre-ft) =	0.090	0.253	0.181	0.334	0.443	0.487	0.808	1.015	1.236
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.181	0.334	0.443	0.487	0.808	1.015	1.236
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	1.2	2.0	2.8	5.4	7.1	8.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.03	0.21	0.33	0.46	0.90	1.18	1.47
Peak Inflow Q (cfs) =	N/A	N/A	2.0	3.9	5.0	6.0	9.8	12.2	14.7
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	0.1	0.1	0.2	1.0	2.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.1	0.0	0.0	0.1	0.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	0.0	0.0	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	54	48	61	68	71	91	92	91
Time to Drain 99% of Inflow Volume (hours) =	**41**	60	53	69	79	83	108	109	108
Maximum Ponding Depth (ft) =	1.87	2.36	2.15	2.46	2.62	2.68	3.04	3.20	3.31
Area at Maximum Ponding Depth (acres) =	0.21	0.52	0.35	0.60	0.71	0.75	0.98	1.06	1.11
Maximum Volume Stored (acre-ft) =	0.091	0.256	0.160	0.307	0.419	0.463	0.776	0.929	1.048

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

ime Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.04	0.03	0.08
	0:15:00	0	0.00	0.13	0.31	0.40	0.19	0.39	0.40	0.51
	0:20:00	0	0.00	0.59	0.94	1.18	0.59	0.93	1.03	1.31
	0:25:00	0	0.00	1.44	2.65	3.73	1.42	2.45	3.01	4.09
	0:30:00	0	0.00	1.93	3.83	5.01	4.30	7.54	8.97	11.04
	0:35:00	0	0.00	1.97	3.89	5.04	5.59	9.38	11.65	14.13
	0:40:00	0	0.00	1.89	3.65	4.73	5.97	9.84	12.16	14.68
	0:45:00	0	0.00	1.73	3.34	4.39	5.70	9.36	11.87	14.32
	0:50:00	0	0.00	1.58	3.07	3.99	5.45	8.93	11.29	13.62
	0:55:00	0	0.00	1.46	2.81	3.68	4.93	8.13	10.49	12.67
	1:00:00	0	0.00	1.37	2.60	3.42	4.49	7.49	9.86	11.92
	1:05:00	0	0.00	1.27	2.39	3.18	4.12	6.92	9.32	11.27
	1:10:00	0	0.00	1.15	2.20	2.93	3.70	6.21	8.27	10.03
	1:15:00	0	0.00	1.04	1.98	2.71	3.29	5.53	7.25	8.82
)	1:20:00	0	0.00	0.94	1.78	2.46	2.87	4.80	6.20	7.55
	1:25:00	0	0.00	0.88	1.63	2.24	2.53	4.25	5.38	6.56
	1:30:00	0	0.00	0.83	1.52	2.05	2.25	3.77	4.74	5.78
	1:35:00	0	0.00	0.78	1.42	1.87	2.03	3.37	4.20	5.13
	1:40:00	0	0.00	0.74	1.29	1.71	1.83	3.01	3.72	4.54
	1:45:00	0	0.00	0.70	1.17	1.56	1.64	2.69	3.29	4.01
	1:50:00	0	0.00	0.65	1.05	1.42	1.47	2.38	2.88	3.50
	1:55:00	0	0.00	0.58	0.94	1.26	1.30	2.09	2.49	3.03
	2:00:00	0	0.00	0.51	0.82	1.09	1.14	1.80	2.12	2.59
	2:05:00	0	0.00	0.42	0.65	0.87	0.92	1.43	1.68	2.04
	2:10:00	0	0.00	0.33	0.51	0.67	0.70	1.08	1.26	1.53
	2:15:00	0	0.00	0.26	0.40	0.54	0.52	0.80	0.92	1.13
	2:20:00	0	0.00	0.22	0.33	0.44	0.39	0.61	0.70	0.86
	2:25:00	0	0.00	0.18	0.27	0.36	0.31	0.48	0.53	0.66
	2:30:00	0	0.00	0.15	0.22	0.30	0.24	0.38	0.40	0.50
	2:35:00	0	0.00	0.12	0.18	0.24	0.19	0.30	0.31	0.38
	2:40:00	0	0.00	0.10	0.15	0.20	0.15	0.23	0.23	0.28
	2:45:00	0	0.00	0.08	0.12	0.15	0.12	0.18	0.17	0.21
	2:50:00	0	0.00	0.07	0.09	0.12	0.09	0.14	0.13	0.16
	2:55:00	0	0.00	0.05	0.07	0.10	0.08	0.11	0.10	0.13
	3:00:00	0	0.00	0.04	0.06	0.08	0.06	0.09	0.08	0.10
	3:05:00	0	0.00	0.03	0.05	0.06	0.05	0.07	0.06	0.08
	3:10:00	0	0.00	0.03	0.03	0.05	0.04	0.05	0.05	0.06
	3:15:00	0	0.00	0.02	0.03	0.03	0.03	0.04	0.04	0.05
)	3:20:00	0	0.00	0.01	0.02	0.02	0.02	0.03	0.03	0.03
	3:25:00	0	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02
	3:30:00	0	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	3:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Elevation [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
Micropool 5178.5	0.00		0	0.000	0	0.000	0.00
Orifice 1- 5178.62	0.12		13	0.000	1	0.000	0.00
Orifice 2- 5178.76	0.26		29	0.001	4	0.000	0.00
WQV 5180.5	1.87		8942	0.205	3955	0.091	0.07
EURV 5180.37	2.36		22856	0.525	11166	0.256	0.10
5 Year 5180.98	2.46		26352	0.605	13626	0.313	0.11
Orifice 3 5181.2	2.70		33387	0.766	20822	0.478	0.12
Spillway 5181.5	3.00		41842	0.961	32106	0.737	0.13
100 year 5181.7	3.20		46274	1.062	40918	0.939	1.00
500 year 5181.81	3.31		48711	1.118	46142	1.059	2.40
Top of berm 8183	4.50		68150	1.565	118065	2.710	50.36

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

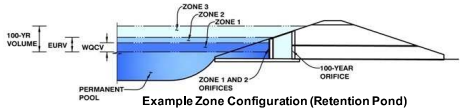
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: Stonehouse Adams County Co

Basin ID: A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	EDB	
Watershed Area =	6.02	acres
Watershed Length =	750	ft
Watershed Length to Centroid =	410	ft
Watershed Slope =	0.007	ft/ft
Watershed Imperviousness =	40.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

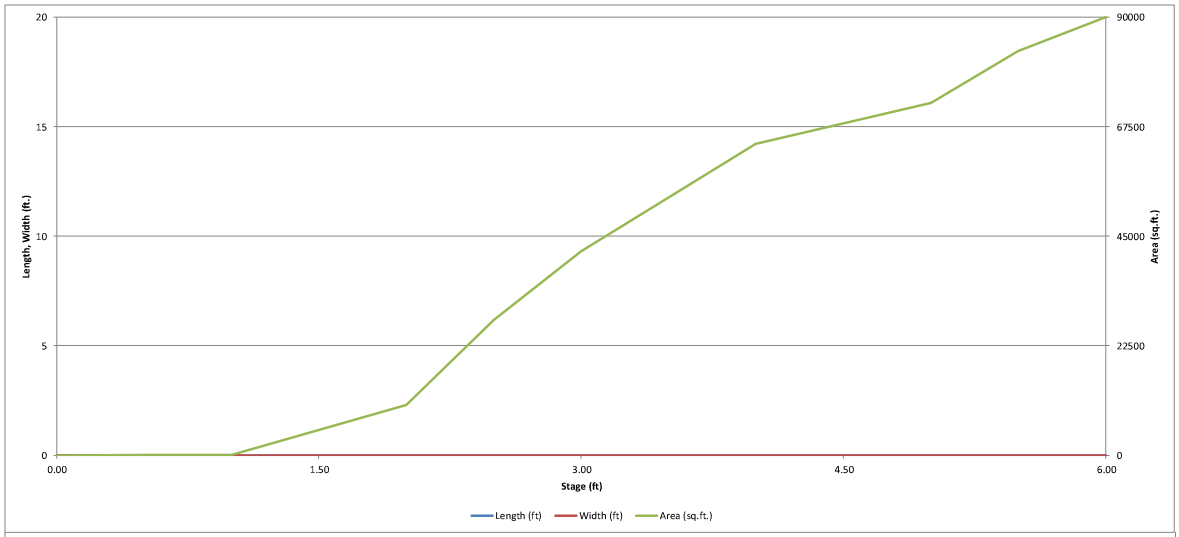
			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.090	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.253	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1 in.) =	0.181	acre-feet	1.00 inches
5-yr Runoff Volume (P1 = 1.42 in.) =	0.334	acre-feet	1.42 inches
10-yr Runoff Volume (P1 = 1.68 in.) =	0.443	acre-feet	1.68 inches
25-yr Runoff Volume (P1 = 1.69 in.) =	0.487	acre-feet	1.69 inches
50-yr Runoff Volume (P1 = 2.35 in.) =	0.808	acre-feet	2.35 inches
100-yr Runoff Volume (P1 = 2.71 in.) =	1.015	acre-feet	2.71 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	1.236	acre-feet	3.14 inches
Approximate 2-yr Detention Volume =	0.157	acre-feet	
Approximate 5-yr Detention Volume =	0.246	acre-feet	
Approximate 10-yr Detention Volume =	0.344	acre-feet	
Approximate 25-yr Detention Volume =	0.339	acre-feet	
Approximate 50-yr Detention Volume =	0.439	acre-feet	
Approximate 100-yr Detention Volume =	0.518	acre-feet	

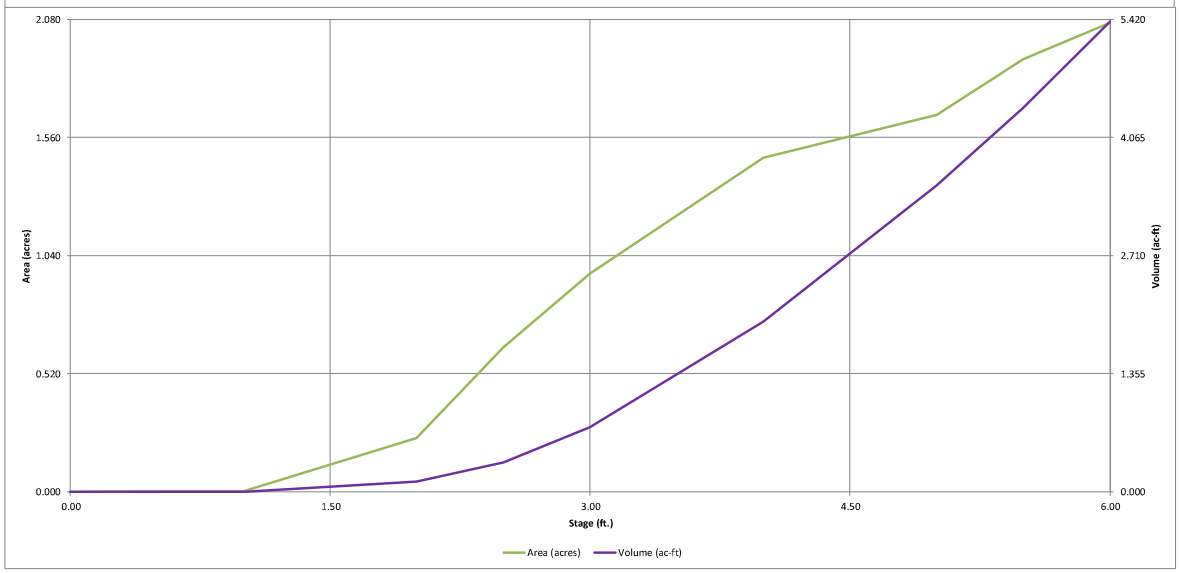
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.090	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.163	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.265	acre-feet
Total Detention Basin Volume =	0.518	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
79	--	0.50	--	--	--	55	0.001	14	0.000
79.5	--	1.00	--	--	--	55	0.001	41	0.001
80	--	2.00	--	--	--	10,270	0.236	5,204	0.119
80.5	--	2.50	--	--	--	27,750	0.637	14,708	0.338
81	--	3.00	--	--	--	41,842	0.961	32,106	0.737
82	--	4.00	--	--	--	64,000	1.469	85,027	1.952
83	--	5.00	--	--	--	72,300	1.660	153,177	3.516
83.5	--	5.50	--	--	--	83,000	1.905	192,002	4.408
84	--	6.00	--	--	--	90,000	2.066	235,252	5.401


20
15
10
5
0
90000
67500
45000
22500
0
0.00
1.50
3.00
4.50
6.00
Length, Width (ft.)
Area (sq.ft.)
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

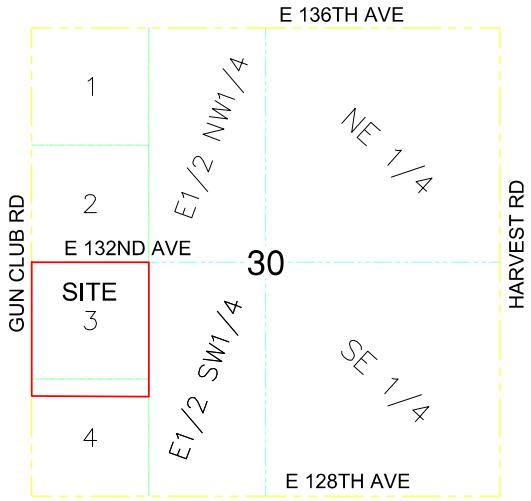

2.080
1.560
1.040
0.520
0.000
5.420
4.065
2.710
1.355
0.000
0.00
1.50
3.00
4.50
6.00
Area (acres)
Volume (ac-ft)
Stage (ft.)
Area (acres)
Volume (ac-ft)

APPENDIX E– Plans

CIVIL DESIGN PACKAGE

GRADING PLAN FOR
STONE HOUSE SUBSTATION
ADAMS COUNTY, STATE OF COLORADO

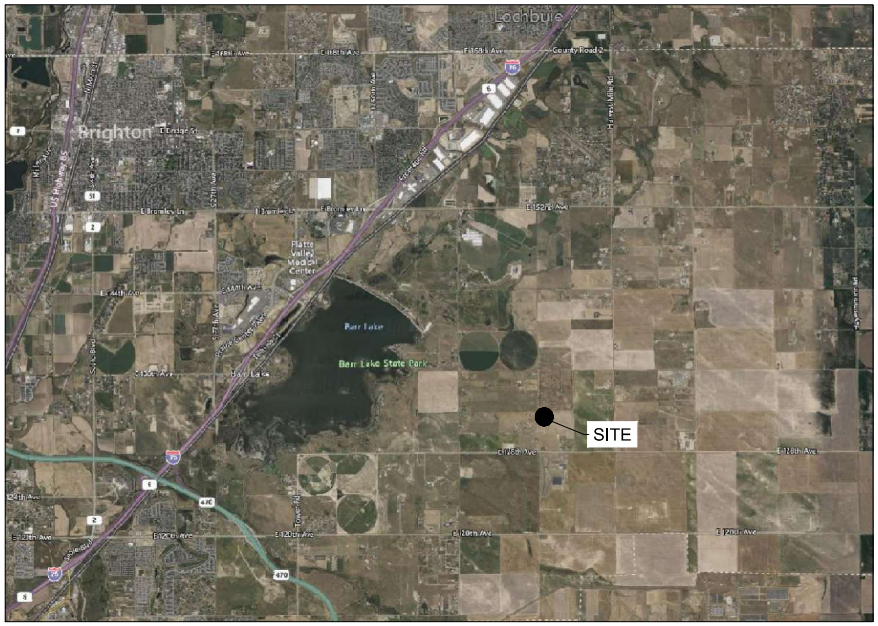
DRAWING INDEX	
REV	TITLE
0	GRADING DESIGN TITLE SHEET
0	SITE PLAN
0	GRADING AND EROSION CONTROL PLAN
0	GRADING SECTIONS
0	GRADING DETAILS 1
0	GRADING DETAILS 2



SECTION 30
TOWNSHIP 1 S., RANGE 65 W., 6TH P.M.

LOCATION

(NOT TO SCALE)



VICINITY MAP

(NOT TO SCALE)

THE SITE IS IN SOUTH PLATTE RIVER BASIN.
WATERSHED: MILE HIGH LAKES-BEEBE SEEP CANAL

ANTICIPATED START DATE	TBD
ANTICIPATED COMPLETION DATE	TBD
ANTICIPATED FINAL STABILIZATION DATE	TBD

ENGINEER'S STATEMENT
THIS GRADING PLAN WAS PREPARED UNDER MY DIRECTION AND SUPERVISION AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. IF SUCH WORK IS PERFORMED IN ACCORDANCE WITH THE GRADING PLAN, THE WORK WILL NOT BECOME A HAZARD TO LIFE AND LIMB, ENDANGER PROPERTY, OR ADVERSELY AFFECT THE SAFETY, USE, OR STABILITY OF A PUBLIC WAY, DRAINAGE CHANNEL, OR OTHER PROPERTY.

NAME: MARISOL E. VELILLA, CO. PE-C NO. 44702 3-25-2024
PHONE:651-415-6628
SEAL

ADAMS COUNTY APPROVAL BLOCK
REVIEW IS FOR GENERAL COMPLIANCE WITH COUNTY STANDARDS AND REGULATIONS. CONSTRUCTION MUST BE IN ACCORDANCE WITH APPLICABLE COUNTY STANDARDS. THE COUNTY'S ACCEPTANCE SHALL NOT RELIEVE THE DESIGN ENGINEER'S RESPONSIBILITY FOR ERRORS, OMISSIONS, OR DESIGN DEFICIENCIES FOR WHICH THE COUNTY IS HELD HARMLESS

COUNTY ENGINEER:_____

DATE:_____

PRELIMINARY
NOT FOR CONSTRUCTION

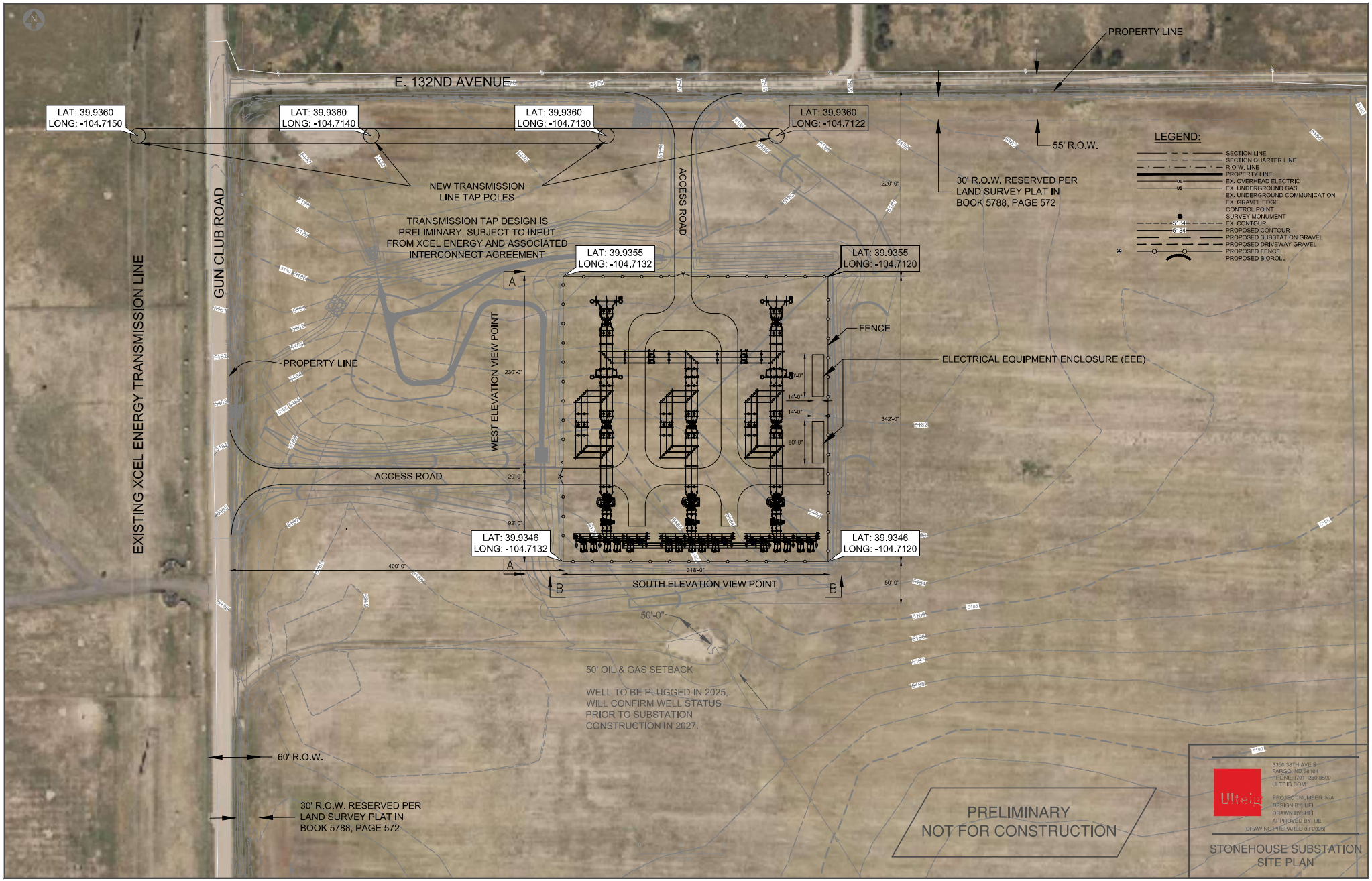
ULTEIG ENGINEERS

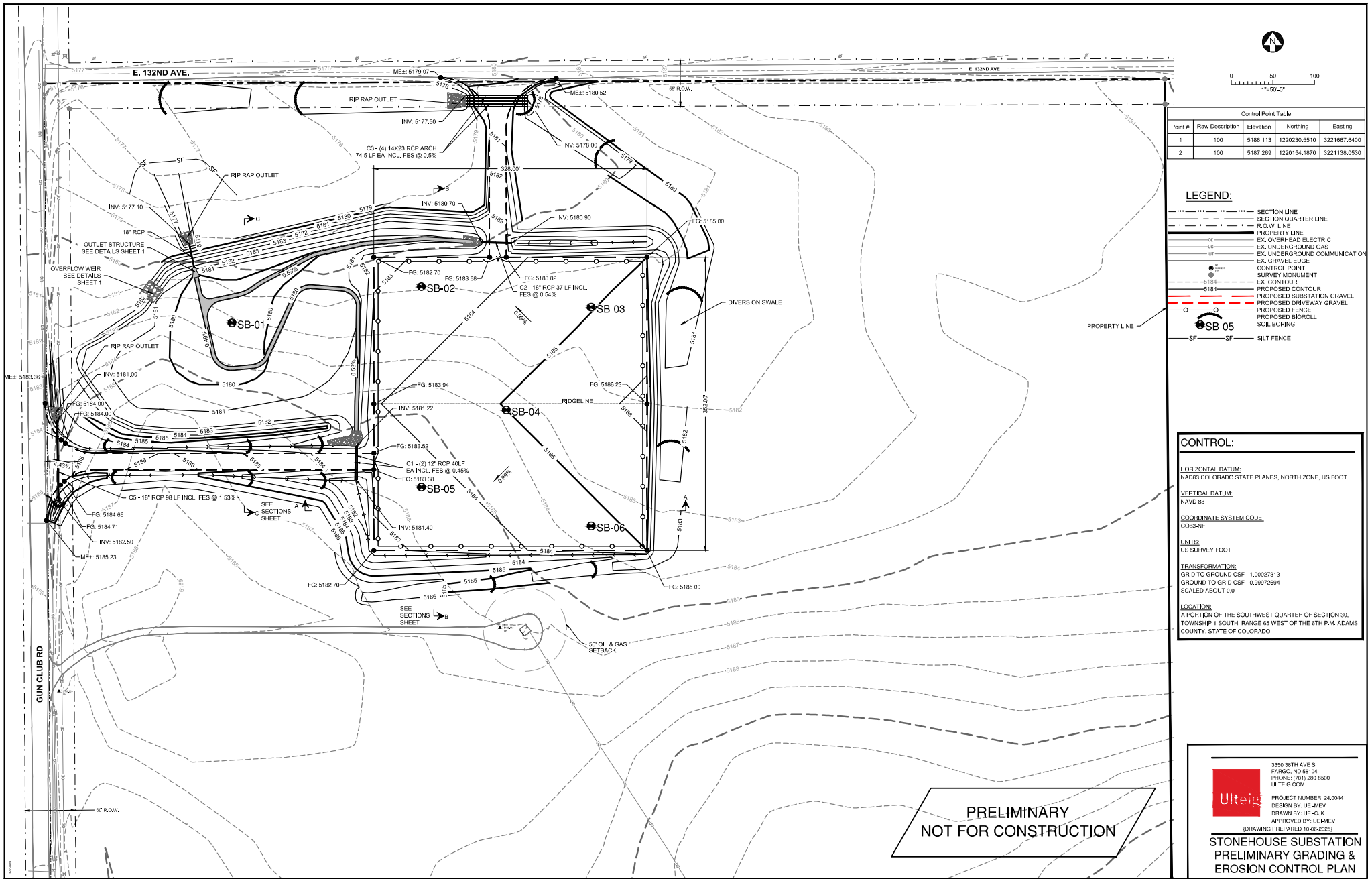
5575 DTC PARKWAY, STE. 200
GREENWOOD VILLAGE, CO. 80111
PROJECT MANAGER:
DEREK HOLSCHER

3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

PROJECT NUMBER: 24.00441
DESIGN BY: UEI-MEV
DRAWN BY: UEI-CJK
APPROVED BY: UEI-MEV
(DRAWING PREPARED 10-09-2025)

STONEHOUSE SUBSTATION
GRADING DESIGN
TITLE SHEET


PROPERTY LINE
E. 132ND AVENUE
LAT: 39.9360
LONG: -104.7150
LAT: 39.9360
LONG: -104.7140
LAT: 39.9360
LONG: -104.7130
LAT: 39.9360
LONG: -104.7122
NEW TRANSMISSION
LINE TAP POLES
55' R.O.W.
30' R.O.W. RESERVED PER
LAND SURVEY PLAT IN
BOOK 5788, PAGE 572
LEGEND:
SECTION LINE
SECTION QUARTER LINE
R.O.W. LINE
PROPERTY LINE
EX. OVERHEAD ELECTRIC
EX. UNDERGROUND GAS
EX. UNDERGROUND COMMUNICATION
EX. GRAVEL EDGE
CONTROL POINT
SURVEY MONUMENT
EX. CONTOUR
PROPOSED CONTOUR
PROPOSED SUBSTATION GRAVEL
PROPOSED DRIVEWAY GRAVEL
PROPOSED FENCE
PROPOSED BIOROLL
GUN CLUB ROAD
EXISTING XCEL ENERGY TRANSMISSION LINE
ACCESS ROAD
TRANSMISSION TAP DESIGN IS
PRELIMINARY, SUBJECT TO INPUT
FROM XCEL ENERGY AND ASSOCIATED
INTERCONNECT AGREEMENT
LAT: 39.9355
LONG: -104.7132
LAT: 39.9355
LONG: -104.7120
FENCE
ELECTRICAL EQUIPMENT ENCLOSURE (EEE)
WEST ELEVATION VIEW POINT
PROPERTY LINE
ACCESS ROAD
LAT: 39.9346
LONG: -104.7132
LAT: 39.9346
LONG: -104.7120
SOUTH ELEVATION VIEW POINT
50'-0"
50' OIL & GAS SETBACK
WELL TO BE PLUGGED IN 2025,
WILL CONFIRM WELL STATUS
PRIOR TO SUBSTATION
CONSTRUCTION IN 2027.
60' R.O.W.
30' R.O.W. RESERVED PER
LAND SURVEY PLAT IN
BOOK 5788, PAGE 572
PRELIMINARY
NOT FOR CONSTRUCTION
3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM
PROJECT NUMBER: N/A
DESIGN BY: UEI
DRAWN BY: UEI
APPROVED BY: UEI
[DRAWING PREPARED 03-2025]
STONEHOUSE SUBSTATION
SITE PLAN



0 50 100
1"=50'-0"

Control Point Table				
Point #	Raw Description	Elevation	Northing	Easting
1	100	5186.113	1220230.5510	3221667.8400
2	100	5187.269	1220154.1870	3221138.0530

LEGEND:

- SECTION LINE
- SECTION QUARTER LINE
- R.O.W. LINE
- PROPERTY LINE
- OE — EX. OVERHEAD ELECTRIC
- UG — EX. UNDERGROUND GAS
- UT — EX. UNDERGROUND COMMUNICATION
- EX. GRAVEL EDGE
- CONTROL POINT
- SURVEY MONUMENT
- 5184 — EX. CONTOUR
- 5184 — PROPOSED CONTOUR
- PROPOSED SUBSTATION GRAVEL
- PROPOSED DRIVEWAY GRAVEL
- PROPOSED FENCE
- PROPOSED BIOROLL
- SB-05 — SOIL BORING
- SF SF — SILT FENCE

CONTROL:

HORIZONTAL DATUM:
NAD83 COLORADO STATE PLANES, NORTH ZONE, US FOOT

VERTICAL DATUM:
NAVD 88

COORDINATE SYSTEM CODE:
CO83-NF

UNITS:
US SURVEY FOOT

TRANSFORMATION:
GRID TO GROUND CSF - 1.00027313
GROUND TO GRID CSF - 0.99972694
SCALED ABOUT 0,0

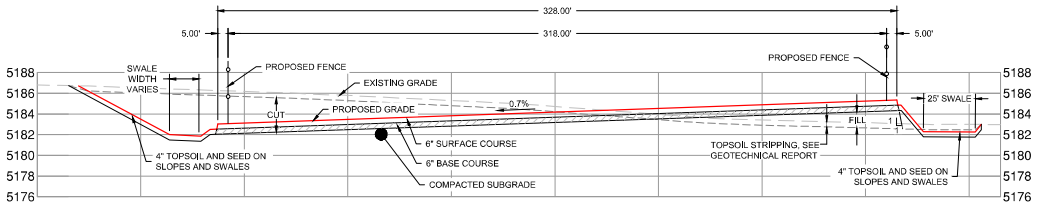
LOCATION:
A PORTION OF THE SOUTHWEST QUARTER OF SECTION 30, TOWNSHIP 1 SOUTH, RANGE 65 WEST OF THE 6TH P.M. ADAMS COUNTY, STATE OF COLORADO

PRELIMINARY
NOT FOR CONSTRUCTION

Ulteig
3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

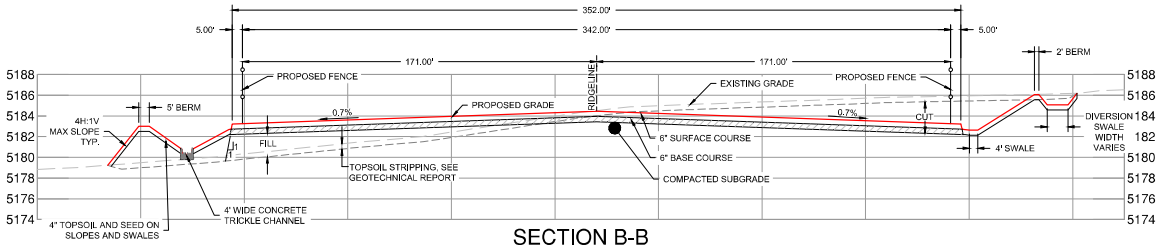
PROJECT NUMBER: 24.00441
DESIGN BY: UEI-MEV
DRAWN BY: UEI-CJK
APPROVED BY: UEI-MEV
(DRAWING PREPARED 10-06-2025)

STONEHOUSE SUBSTATION PRELIMINARY GRADING & EROSION CONTROL PLAN



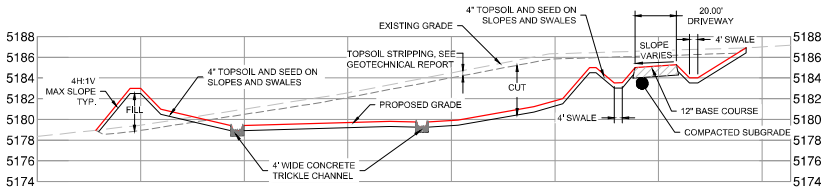
SECTION A-A

HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=6'



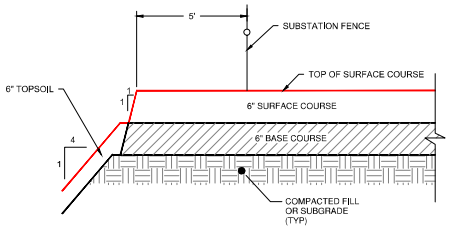
SECTION B-B

HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=3'

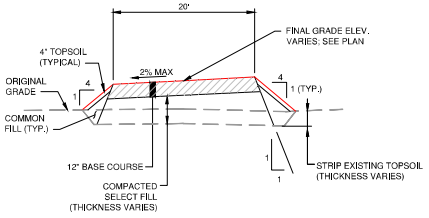


SECTION C-C

HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=3'



1 / ####
SUBSTATION EDGE SECTION
SCALE = NONE



2 / ####
TYPICAL DRIVEWAY SECTION
SCALE = NONE

CONSTRUCTION NOTES

1. FILLS AND EMBANKMENTS SHALL BE CONSTRUCTED IN UNIFORM LIFTS OR LAYERS NOT EXCEEDING 9 INCHES OF LOOSE FILL AND LAID PARALLEL TO THE FINISHED SURFACE .
2. COMPACT FILL MATERIAL IN LIFTS NOT EXCEEDING 9 INCHES UNCOMPACTED THICKNESS TO 95% OF STANDARD PROCTOR DENSITY (ASTM D698). MAINTAIN MOISTURE CONTENT WITHIN PLUS OR MINUS 2% OF THE OPTIMUM DETERMINED FOR MAXIMUM DENSITY OR AS RECOMMENDED BY GEOTECHNICAL ENGINEERING REPORT. DO NOT PLACE, SPREAD, OR COMPACT FILL MATERIAL DURING WET OR UNFAVORABLE WEATHER CONDITIONS. WET GRANULAR MATERIALS THOROUGHLY DURING OR IMMEDIATELY PRIOR TO COMPACTION.
3. FINISH ALL DISTURBED AREAS TO A NEAT APPEARANCE AND PROVIDE UNIFORM GRADE AND POSITIVE DRAINAGE AS OBTAINABLE WITH A BLADE GRADER.
4. SEE GEOTECHNICAL ENGINEERING REPORT, NAME, ADAMS COUNTY, COLORADO, DATED MONTH ##, 2025, BY GEOTECH NAME, PROJECT NO. ######### FOR SITE PREPARATION RECOMMENDATIONS.

BASE COURSE

1. SUBSTATION AGGREGATE SHALL CONFORM WITH SPECIFICATIONS SECTION #####

SURFACE COURSE

1. SUBSTATION AGGREGATE SHALL CONFORM WITH SPECIFICATIONS SECTION #####

COMMON FILL

1. ALL FILL MATERIALS AND ACTIVITIES SHALL FOLLOW ALL RECOMMENDATIONS PROVIDED IN THE LATEST GEOTECHNICAL REPORT AS REFERENCED ON THIS SHEET OR ONCOR SPECIFICATIONS WHICHEVER IS MORE STRINGENT.
2. COMMON FILL SHALL CONSIST OF LOW-PLASTICITY COHESIVE MATERIAL OR GRANULAR MATERIAL. LOW-PLASTICITY COHESIVE FILL SHALL HAVE A LIQUID LIMIT LESS THAN 30% AND A PLASTICITY INDEX BETWEEN 4%-15%.
3. COMMON FILL SHALL NOT CONTAIN FROZEN MATERIAL OR PARTICLES WITH MAXIMUM LENGTHS GREATER THAN 4".
4. COMMON FILL MATERIAL SHALL CONFORM TO RECOMMENDATIONS PRESENTED IN THE SOILS REPORT FOR THE PROJECT. THE ENGINEER MAY APPROVE VARIATIONS FROM THE PREVIOUS CONDITIONS IF REQUESTED IN WRITING.

GENERAL NOTES

1. STRIPPING MATERIAL TO BE USED FOR DRESSING OF SIDE SLOPES.
2. LOCATION AND STAKING OF THE SITE WITHIN THE PROPERTY LINES WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.
3. ALL SLOPES 3:1 MAXIMUM UNLESS NOTED.
4. BASE ROCK AREA TO HAVE SOIL STERILANT APPLIED PRIOR TO PLACEMENT OF SURFACE COURSE .(NOT IN THIS CONTRACT)
5. EXCESS MATERIAL SHALL BE HAULED OFF AND DISPOSED OF OFF SITE OR SPREAD EVENLY IN AREAS AS AGREED BETWEEN CONTRACTOR AND OWNER.
6. ELEVATIONS INDICATED IN SWITCHYARD GRADED AREA ARE TOP OF SURFACE COURSE.
7. NO EQUIPMENT WILL BE ALLOWED TO CROSS RIVERS OR STREAM BEDS.

APPROXIMATE QUANTITIES

ASSUMED 12" OF TOP SOIL

CUT 12,000 CY (EV)

FILL 10,000 CY (CV)

EV = EXCAVATED VOLUME

CV = COMPACTED VOLUME

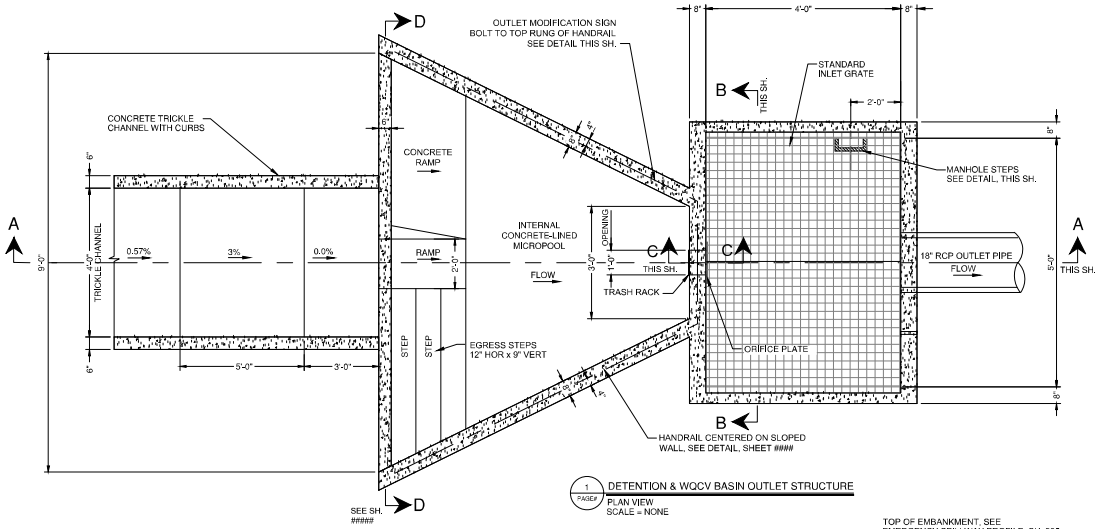
PRELIMINARY
NOT FOR CONSTRUCTION

Ulteig

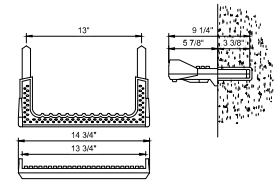
3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

PROJECT NUMBER: 24.00441
DESIGN BY: UEI-MEV
DRAWN BY: UEI-CJK
APPROVED BY: UEI-MEV
(DRAWING PREPARED 10-06-2025)

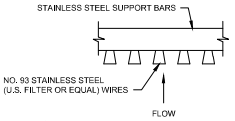
STONEHOUSE SUBSTATION
PRELIMINARY SECTIONS



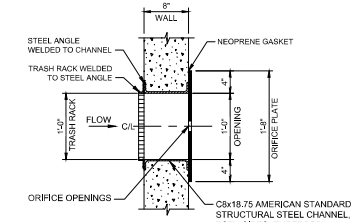
1 PAGE# DETENTION & WQCV BASIN OUTLET STRUCTURE
PLAN VIEW
SCALE = NONE



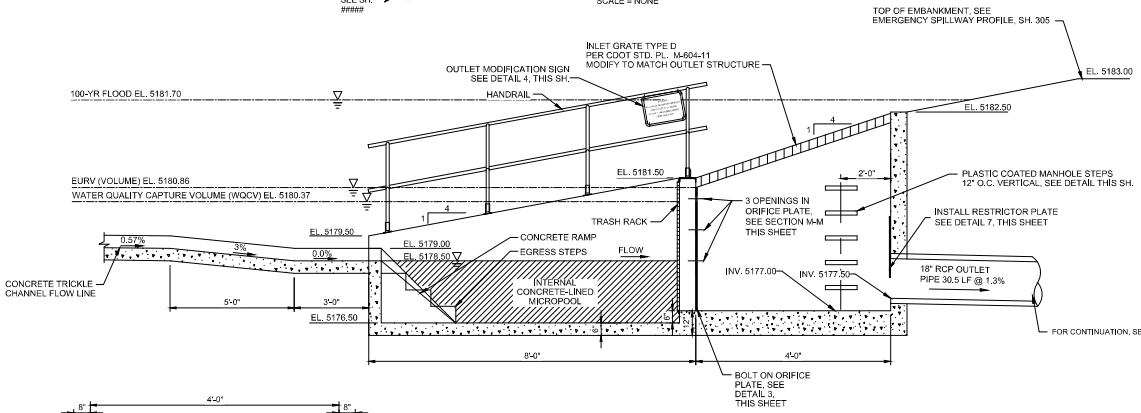
5 PAGE# MANHOLE STEPS
SCALE = NONE



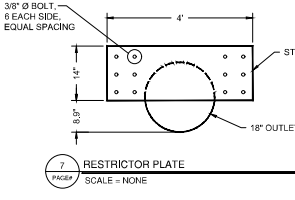
6 PAGE# TRASH RACK SCREEN
SCALE = NONE



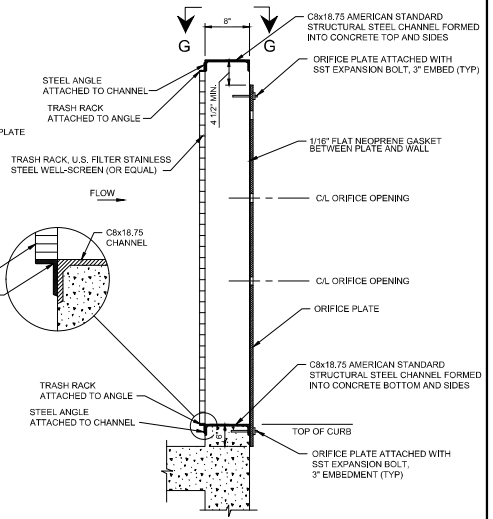
8 PAGE# ORIFICE PLATE - PLAN VIEW
SECTION G-G - THIS SH.
SCALE = NONE



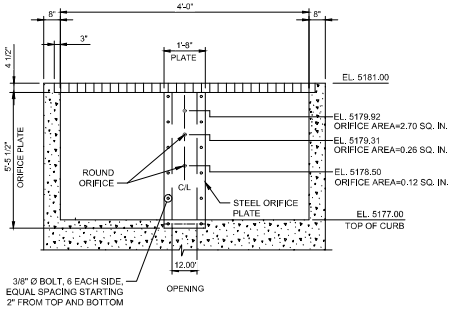
2 PAGE# DETENTION & WQCV BASIN OUTLET STRUCTURE
SECTION VIEW A-A
SCALE = NONE



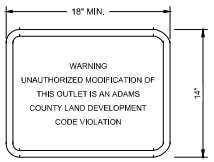
7 PAGE# RESTRICTOR PLATE
SCALE = NONE



9 PAGE# BASIN OUTLET STRUCTURE OPENING
SECTION C-C
SCALE = NONE

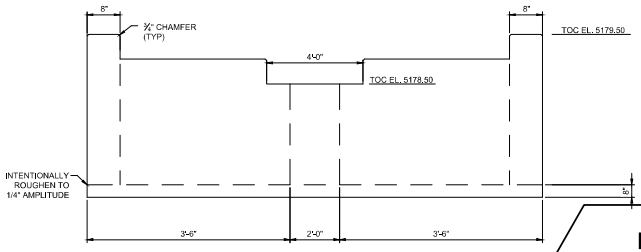


3 PAGE# OUTLET STRUCTURE ORIFICE PLATE
SECTION B-B
SCALE = NONE



1. WARNING SIGN TO BE BOLTED TO OUTLET STRUCTURE HANDRAIL.
2. SIGN WITH A MINIMUM AREA OF 1.75-SQUARE FEET, SHALL HAVE RED LETTERS ON A WHITE BACKGROUND.

4 PAGE# OUTLET MODIFICATION SIGN
SCALE = NONE



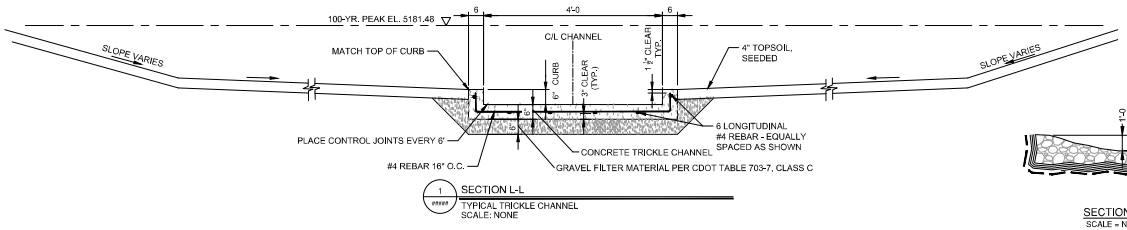
D PAGE# DETENTION & WQCV BASIN OUTLET STRUCTURE
SECTION D-D - SH. 304
SCALE = NONE

PRELIMINARY
NOT FOR CONSTRUCTION

Ulteig
3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

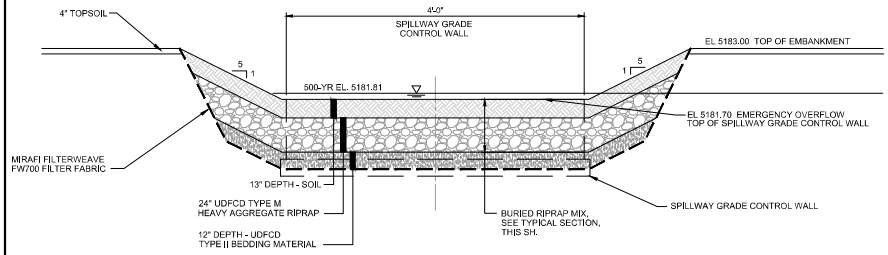
PROJECT NUMBER: 24.00441
DESIGN BY: UEI-MEV
DRAWN BY: UEI-CJK
APPROVED BY: UEI-MEV
(DRAWING PREPARED 10-09-2025)

STONEHOUSE SUBSTATION
PRELIMINARY DETAILS 1

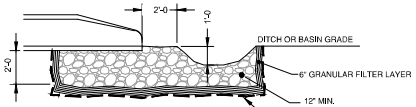


1 SECTION L-L
TYPICAL TRICKLE CHANNEL
SCALE: NONE

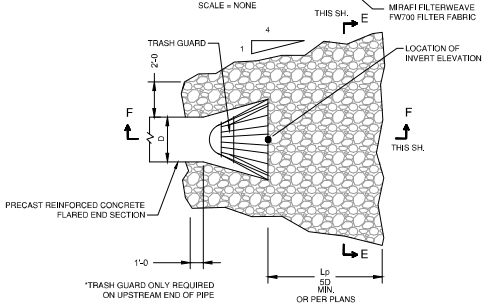
SECTION E-E
SCALE = NONE



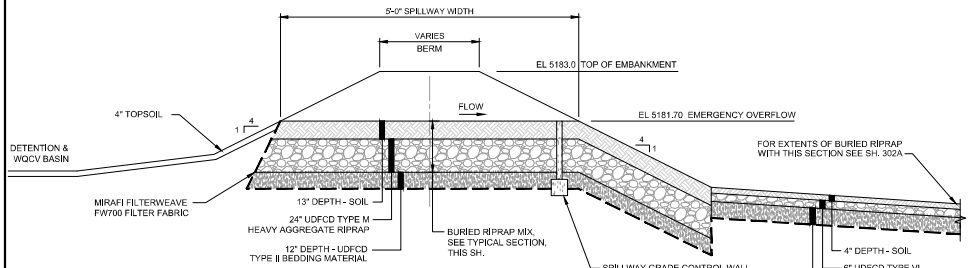
2 EMERGENCY SPILLWAY SECTION
SCALE: NONE



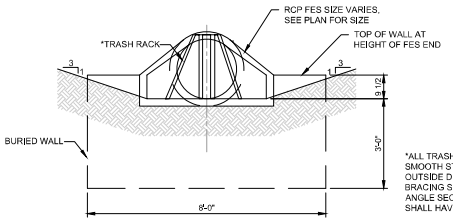
SECTION F-F
SCALE = NONE



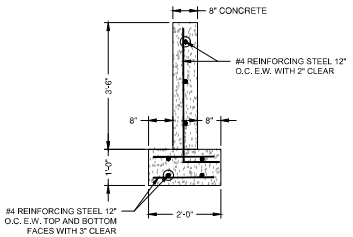
5 RIP RAP OUTLET DETAIL
SCALE: NONE



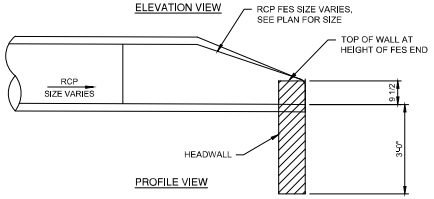
3 EMERGENCY SPILLWAY PROFILE
SCALE: NONE



*ALL TRASH RACKS SHALL BE CONSTRUCTED WITH SMOOTH STEEL PIPE WITH A MINIMUM 1.25 INCHES OUTSIDE DIAMETER. THE TRASH RACK ENDS AND BRACING SHOULD BE CONSTRUCTED WITH STEEL ANGLE SECTIONS. ALL TRASH RACK COMPONENTS SHALL HAVE A CORROSION PROTECTIVE FINISH.



4 SPILLWAY GRADE CONTROL WALL
SCALE: NONE



6 FLARED END SECTION HEADWALL
SCALE: NONE

PRELIMINARY
NOT FOR CONSTRUCTION

3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

PROJECT NUMBER: 24.00441
DESIGN BY: UEI-MEV
DRAWN BY: UEI-CJK
APPROVED BY: UEI-MEV
(DRAWING PREPARED 10-09-2025)

STONEHOUSE SUBSTATION
PRELIMINARY DETAILS 2

APPENDIX F – Permits

Geotechnical Engineering Report

(Remainder of Page Intentionally Left Blank)

United Power Stonehouse Substation

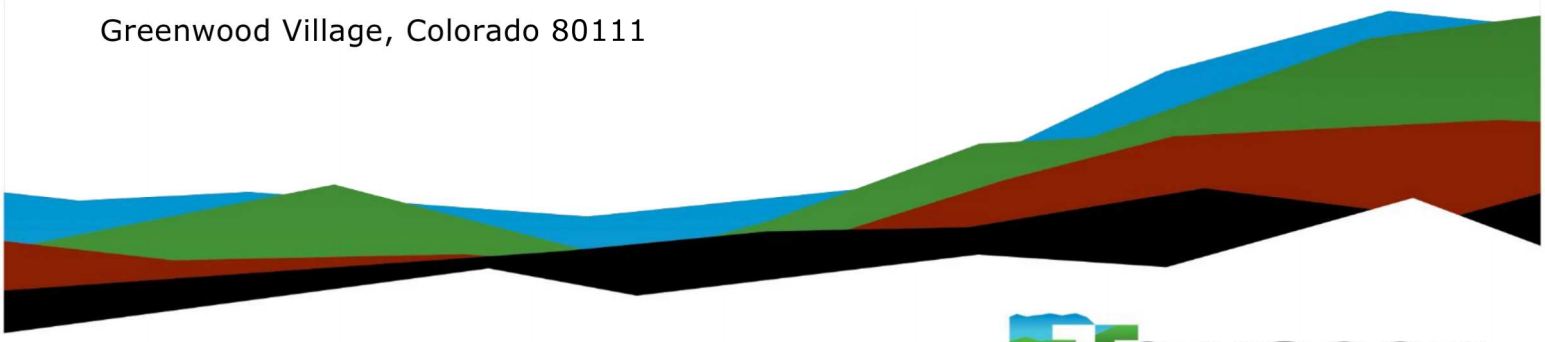
Geotechnical Engineering Report

Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado

October 7, 2025 | Terracon Project No. 25255177

Prepared for:

Ulteig Engineers, Inc.
5575 DTC Parkway, Suite 200
Greenwood Village, Colorado 80111



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10625 W. I-70 Frontage Rd N., Ste. 3
Wheat Ridge, Colorado 80033
P 303-423-3300
Terracon.com

October 7, 2025

Ulteig Engineers, Inc.
5575 DTC Parkway, Suite 200
Greenwood Village, Colorado 80111

Attn: Derek Holscher
P: (720) 837-4742
E: derek.holscher@ulteig.com

Re: Geotechnical Engineering Report
United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue
Adams County, Colorado
Terracon Project No. 25255177

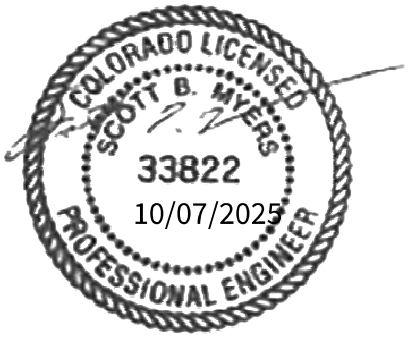
Mr. Holscher:

We have completed the scope of Geotechnical Engineering services for the project referenced above in general accordance with Work Order No. 1 for Ulteig Project No. 24.00441. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations for the proposed project.

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



Trevor Meinholz, E.I.T.
Staff Engineer

Scott B. Myers, P.E.
Regional Senior Consultant

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Report Summary

Topic [1]	Overview Statement [2]
Project Description	We understand the proposed project consists of the design and construction of a new substation southeast of Gun Club Road and East 132nd Avenue in Adams County. Based on email and phone conversations with Ulteig, we understand the substation equipment and structures will include the following: ■ 230 kV and 12.47 kV Transformers ■ 230 kV Circuit Breakers ■ 230 kV Dead end Tapered Tubular Structures ■ 230 kV and 12.47 kV Standard Steel Support Structures (bus supports, switches, etc.) We understand the substation development will include a detention pond to be located west of the proposed substation.
Geotechnical Characterization	Subsurface conditions encountered in the borings generally consisted of 6 to 32 inches of topsoil underlain by native sand with varying amounts of silt and clay and native lean clay with varying amounts of sand to depths of about 29 to 39 feet below the ground surface (bgs). Claystone and sandstone bedrock was encountered below the native soils to the maximum depths explored of about 40 feet bgs. Groundwater was not encountered in any of the borings at the time of our exploration to the maximum depths explored of about 40 feet.
Earthwork	The on-site native sand and clay soils can be reused as engineered fill for this project provided any deleterious materials are removed. It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.
Foundation Recommendations	The proposed breakers and transformers may be constructed on shallow mat foundations on properly prepared native soils or engineered fill. The proposed tapered tubular and steel support structures may be constructed on drilled pier foundations bottomed in native soils or claystone and sandstone bedrock.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

Topic [1]	Overview Statement [2]

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed United Power Stonehouse Substation to be located southeast of Gun Club Road and East 132nd Avenue in Adams County, Colorado. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Seismic site classification per IBC
- Site preparation and earthwork
- Foundation design and construction

The geotechnical engineering Scope of Services for this project included the advancement of six (6) soil borings (designated as Boring Nos. SB-01 to SB-06) to depths of approximately 40 feet below existing site grades. In addition, field electrical resistivity testing was performed at the southwest portion of the project site.

Plans showing the site and boring locations are shown on the **Site Location** and **Exploration Plan**, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	Our understanding of the project is based on the emails and documents provided by Ulteig Engineers, Inc., including the following file: ■ Stone House - Soil Boring Sketch.pdf

Item	Description
Project Description	We understand the proposed project consists of the design and construction of a new substation southeast of Gun Club Road and East 132nd Avenue in Adams County. Based on email and phone conversations with Ulteig, we understand the substation equipment and structures will include the following: ■ 230 kV and 12.47 kV Transformers ■ 230 kV Circuit Breakers ■ 230 kV Tapered Tubular Structures ■ 230 kV and 12.47 kV Standard Steel Support Structures (bus supports, switches, etc.) We understand the transformers and breakers will be constructed on mat foundations, and the steel support and tapered tubular structures will be constructed on drilled pier foundations. We understand there will be no below grade areas constructed as a part of this development. We understand the substation development will include a detention pond to be located west of the proposed substation.
Maximum Loads (From Project Team)	**Transformers** ■ Bearing Pressure: 1.3 ksf **Circuit Breakers** ■ Bearing pressure: 0.8 psf **Tapered Tubular Structures** ■ Moment: 550 kip-ft ■ Shear: 13 kips ■ Axial: 17 kip **Standard Steel Support Structures** ■ Moment: 80 kip-ft ■ Shear: 4 kips ■ Axial: 2.5 kip
Grading/Slopes	Cut and fill, 3 feet (+/-) max
Excavation Depth	3 feet for frost-depth foundations
Below Grade Construction	Not anticipated
Pavement	Not anticipated

Terracon should be notified if any of the above information is inconsistent with the planned construction as revised and/or additional geotechnical recommendations may be required.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration.

Item	Description
Parcel Information	This project is located southeast of Gun Club Road and East 132nd Avenue in Adams County, Colorado. Approximate latitude/longitude: 39.9356° N, 104.7132° W See **Site Location**.
Existing Improvements	The site is currently undeveloped and is used as agricultural land.
Current Ground Cover	Ground cover on the subject site consists of the remnants of previously harvested crops.
Existing Topography	The site slopes down from south to north with an elevation difference of about 5 feet.

Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** and the GeoModel can be found in the **Figures** attachment of this report. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Subsurface Profile

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	Topsoil	Topsoil; about 6 inches
2	Native Sand	Native sand with varying amounts of silt and clay; very loose to medium dense
3	Native Clay	Native lean clay with varying amounts of sand; stiff to hard
4	Bedrock	Bedrock consisting of claystone and sandstone; firm to hard

Stratification boundaries on the boring logs represent the approximate location of changes in soil and material types; in situ, the transition between materials may be gradual. Further details of the borings can be found on the boring logs in the **Exploration Results**.

Based on the results of the laboratory testing and our experience in the area, the native sand and clay soils have nil to low expansive potential. Based on our experience in the area, the claystone bedrock has low to moderate expansive potential and the sandstone bedrock has nil to low expansive potential. A summary of laboratory test results is included in the **Exploration Results**.

Groundwater Conditions

The borings were observed while drilling and upon completion of drilling for the presence and level of groundwater. The water levels encountered in the boreholes can be found on the boring logs in **Exploration Results** and are summarized below.

Boring No.	Shallowest depth to groundwater encountered while or upon completion of drilling [1]
SB-01	Not encountered to the maximum depth explored of about 40 feet
SB-02	Not encountered to the maximum depth explored of about 40 feet
SB-03	Not encountered to the maximum depth explored of about 40 feet
SB-04	Not encountered to the maximum depth explored of about 40 feet
SB-05	Not encountered to the maximum depth explored of about 40 feet
SB-06	Not encountered to the maximum depth explored of about 40 feet

1. Borings were backfilled immediately after completion. Therefore, subsequent groundwater measurements were not obtained.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings were performed.

Groundwater levels during construction or at other times in the life of the structures may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

Field Electrical Resistivity Test Results

Field measurements of soil electrical resistivity were performed by Terracon on September 4, 2025. The Wenner arrangement (equal electrode spacing) was used with "a" spacings of 0.5, 1, 1.5, 2, 3, 5, 7, 10, 15, 20, 30, 45, 70, 100, 150, 200, 300, 400, and 500 feet at the test location (designated FER-1) at the southwest corner of the project site. The "a" spacing is generally considered to be the depth of influence of the test. The testing was performed in both a northwest-southeast and a northeast-southwest orientation. The approximate location of the center of the in-situ electrical resistivity lines are shown in the **Site Location and Exploration Plans**. Results of the soil electrical resistivity measurements are presented in the **Field Electrical Resistivity Test Results**.

It should be noted that the resistivity values measured in the field may vary by material type, moisture content, surface temperature, groundwater depth, and other climatic conditions. During testing, our field representative indicated the ground surface was dry. The weather conditions during the site visit are indicated on the field data sheets.

Corrosivity

The table below lists the results of laboratory soluble sulfate, chlorides, electrical resistivity, pH, Red-Ox, total salts, and sulfides. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary

Boring	Sample Depth (feet)	Soluble Sulfate (%)	Soluble Chloride (mg/kg)	Electrical Resistivity (Ω-cm)	pH	Red-Ox (mV)	Total Salts (mg/kg)	Sulfides
SB-04	0 – 5	<0.10	1	2,600	7.35	+372	513	Negative
SB-05	0 – 5	<0.10	2	2,800	7.33	+345	500	Negative

Results of water-soluble sulfate testing indicate that samples of the on-site soils have an exposure class of S0 when classified in accordance with the American Concrete Institute (ACI) Design Manual. The results of the testing indicate ASTM Type I portland cement is

suitable for project concrete in contact with on-site soils. However, if there is no (or minimal) cost differential, use of ASTM Type II portland cement is recommended for additional sulfate resistance of construction concrete. Concrete should be designed in accordance with the provisions of the ACI Design Manual.

Imported fill materials may have significantly different properties than the site materials noted above and should be evaluated if expected to be in contact with materials used for construction.

Geotechnical Overview

Based on subsurface conditions encountered in the borings, the site appears suitable for the proposed construction from a geotechnical point of view provided certain precautions and design and construction recommendations outlined in this report are followed. We have identified geotechnical conditions that could impact design and construction of the proposed substation.

Loose Soils

Test boring data indicate that loose soils may be locally present. Consequently, loose soils could be encountered below foundations or other improvements and these conditions will likely require some corrective work. Corrective work could involve removal and re-compaction or replacement, in-place soil densification, or deepening footings excavations to suitable bearing materials. In any event, Terracon should be contacted to observe foundation excavations to evaluate bearing conditions and to provide guidance concerning corrective work (if needed).

Earthwork

The following sections present recommendations for site preparation, excavation, subgrade preparation, and placement of engineered fills on the project. All earthwork on the project should be observed and evaluated by Terracon.

Site Preparation

Strip and remove existing vegetation, organics, and other deleterious materials from the proposed construction areas. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

Stripped materials consisting of vegetation, unsuitable fills, and organic materials should be wasted from the site or used to revegetate landscaped areas or exposed slopes after completion of grading operations.

Where possible, the site should be initially graded to create a relatively level surface to receive fill and to provide for a relatively uniform thickness of fill beneath the proposed improvement areas. All exposed areas that will receive fill, once properly cleared, should be scarified to a minimum depth of 12 inches, conditioned to near optimum moisture content, and compacted. It is imperative the moisture content of prepared materials be protected from moisture loss.

Although evidence of underground facilities such as utility vaults was not observed during our exploration, such features could be encountered during construction. If unexpected fills or underground facilities are encountered, such features should be removed, and the excavation thoroughly cleaned prior to backfill placement and/or construction.

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

Depending upon seasonal conditions, surface water may infiltrate into the excavations on the site. Water seeping into excavations at this site could most likely be controlled by shallow trenches leading to a sump pit where the water could be removed by pumping.

The stability of subgrade soils may be affected by precipitation, repetitive construction traffic, or other factors. If unstable conditions are encountered or develop during construction, workability may be improved by overexcavation of wet zones and mixing these soils with crushed gravel. Use of geotextiles could also be considered as a stabilization technique. Lightweight excavation equipment may be required to reduce subgrade pumping.

Material Types

Fill for this project should consist of engineered fill. Engineered fill is fill that meets the criteria presented in this report and has been properly documented.

Engineered fill should meet the following material property requirements:

Fill Type [1,2]	USCS Classification	Acceptable location for placement
On-site sand soils	SC-SM, SC, SP	On-site sand soils are considered suitable for reuse as engineered fill below foundation areas and as general fill for this project.

Fill Type [1,2]	USCS Classification	Acceptable location for placement
On-site clay soils	CL	On-site clay soils are considered suitable for reuse as engineered fill below foundation areas and as general fill for this project.
Imported soils	Varies	Imported soils meeting the gradation outlined herein can be considered acceptable for use as engineered fill beneath foundation areas and as general fill for this project.

1. Engineered fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation.
2. Care should be taken during the fill placement process to avoid zones of dis-similar fill. Improvements constructed over varying fill types are at a higher risk of differential movement compared to improvements over a uniform fill zone.

Imported soils for engineered fill (if required) should meet the following material property requirements:

Gradation	Percent finer by weight (ASTM C136)
1”	100
No. 4 Sieve	30-100
No. 200 Sieve	>35

- Liquid Limit..... 30 (max)
- Plasticity Index..... 10 (max)
- Maximum Expansive Potential (%)..... 0.0*

  *Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at optimum water content. The sample is confined under a 200-psf surcharge and submerged.

Compaction Requirements

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift.

Item	Description
Fill lift thickness	8-inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6-inches in loose thickness when hand-guided equipment (i.e. jumping jack, plate compactor) is used
Compaction requirements [1,2]	Minimum of 98% of the material's standard Proctor maximum dry density (ASTM D698) for sand soils, and minimum of 95% of the material's standard Proctor maximum dry density (ASTM D698) for clay soils
Moisture content cohesionless soils (sand soils)	-2 to +2% of the optimum moisture content
Moisture content cohesive soils (clay soils)	0 to +3% of the optimum moisture content

1. We recommend that engineered fill be tested for water content and compaction during placement. Should the results of the in-place density tests indicate the specified water or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified water and compaction requirements are achieved.
2. Water levels should be maintained low enough to allow for satisfactory compaction to be achieved without the compacted fill material pumping when proofrolled.

Excavation

Excavations into the subsurface soils will encounter a variety of conditions. The individual contractor(s) is responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local and federal regulations, including current Occupational Safety and Health Administration (OSHA) excavation and trench safety standards.

Soils penetrated by the proposed excavations may vary significantly across the site. The soil classifications are based solely on the materials encountered in the exploratory borings. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, the actual conditions should be evaluated to determine any excavation modifications necessary to maintain safe conditions.

Grading and Drainage

All grades must be adjusted to provide positive drainage away from the proposed structures during construction and maintained throughout the life of the proposed project. Infiltration of water into utility or foundation excavations must be prevented during construction. Landscaped irrigation adjacent to the foundation systems, if present, should be minimized or eliminated. Water permitted to pond near or adjacent to the perimeter of the structures (either during or post-construction) can result in higher soil movements than those discussed in this report. As a result, any estimations of potential movement described in this report cannot be relied upon if positive drainage is not obtained and maintained, and water is allowed to infiltrate the fill and/or subgrade.

Permanent grades of the subgrade soils below any surface gravel should be sloped at a minimum of 10 percent grade for at least 5 feet beyond the perimeter of the structures. Backfill against foundations and in utility trenches should be compacted in accordance with recommendations in this report and free of all construction debris to reduce the possibility of water infiltration. Prior to placing surface gravel, we recommend that verification of final grading be performed to document that positive drainage, as described above, has been achieved.

Earthwork Construction Considerations

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of existing vegetation and topsoil, proofrolling, and mitigation of areas delineated by the proofroll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content.

In areas of foundation excavations, the subgrade should be evaluated under the direction of the Geotechnical Engineer. If unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

Foundation Recommendations

Based upon the results of the field exploration and laboratory testing program for this exploration, the following foundation systems were evaluated for the proposed equipment and support structures:

- Mat foundations on properly prepared native soils or new engineered fill.
- Drilled piers embedded in native soils or socketed into claystone and sandstone bedrock

Based on our engineering analysis, it is our opinion the proposed circuit breakers could be constructed on mat foundation systems bottomed on native soils or engineered fill.

The proposed tapered tubular structures, steel support structures, and transformers may be constructed on drilled piers installed into the native soils or socketed into claystone and sandstone bedrock.

The following sections present geotechnical recommendations for mat foundations and drilled pier foundation systems for the proposed substation.

Mat Foundation Recommendations

Design recommendations for mat foundation systems are presented in the following tables and paragraphs:

Description	Value
Foundation Subgrade Preparation	Soils at the base of all foundation excavations must be scarified to a minimum depth of 12 inches, moisture conditioned, and compacted prior to placement of new engineered fill.
Supporting Stratum	Properly prepared native soils or new engineered fill
Maximum Allowable Bearing Pressure (Mat Foundations) [1,2]	1,000 psf
Maximum Mat Size (assumed based on previous experience)	15 feet by 25 feet

Description	Value
Modulus of Subgrade Reaction	Square: $K_{(BXB)} = K_1\left(\frac{B+1}{2B}\right)^2$ Rectangle: $K_{(BXL)} = K_1\left(\frac{1+0.5B/L}{1.50}\right)$ K_1 = 36 pounds per square inch per inch (psi/in) Where: K_1 = modulus of subgrade reaction of a foundation measuring 1 ft x 1 ft $K_{(BXB)}$ = modulus of subgrade reaction for a foundation having a square dimension B $K_{(BXL)}$ = modulus of subgrade reaction for a foundation having dimensions of B by L
Allowable passive resistance [3]	250 psf/ft
Coefficient of Friction (Sliding)	0.3
Minimum Embedment Below Finished Grade	3 feet
Approximate Total Movement [4,5]	About 1 inch
Estimated Differential Movement [4,5,6]	About ½ to ¾ inch of total movement

1. The recommended bearing pressure assumes that any existing fill or lower strength soils, if encountered, will be excavated and replaced with engineered fill.
2. The maximum allowable soil bearing pressure can be increased by 1/3 for transient loading conditions.
3. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete paced near against these vertical faces, or that the footing forms be removed and compacted engineered fill be placed against the vertical footing face. Assumes no hydrostatic pressure.
4. Foundation movement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of engineered fill, and the quality of the earthwork operations and footing construction.
5. Footings should be proportioned on the basis of equal total dead load pressure to reduce differential movement between adjacent footings.
6. Differential movement is considered over a distance of about 40 feet.

Additional foundation movements could occur if water from any source infiltrates the foundation soils; therefore, proper drainage should be provided in the final design and during construction and throughout the life of the structures. Failure to maintain the

proper drainage as recommended in the **Grading and Drainage** section of **Earthwork** will nullify the movement estimates provided above.

The base of all foundation excavations should be free of water and loose soil prior to concrete placement. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the soils at bearing level become excessively dry, disturbed or saturated, or frozen, the affected soil should be removed prior to placing concrete.

Foundations should be detailed and reinforced as necessary to reduce the potential for distress caused by differential foundation movement.

Drilled Pier Recommendations

We understand the dead end tapered tubular and steel support structures will be constructed on drilled piers. Drilled piers can also be considered for the construction of heavily loaded structures and equipment when socketed into the underlying claystone and sandstone bedrock. The following recommendations should be followed for drilled pier foundations:

Description	Value
Minimum Pier Diameter	18 inches
Minimum Pier Length	6 feet
Pier concrete slump (uncased piers)	5 to 7 inches
Pier concrete slump (cased piers)	7 to 9 inches
Approximate axial movement (bearing on overburden soils)	About 1 inch
Approximate axial movement (bearing in claystone and sandstone bedrock)	Less than ½ inch

Recommended soil stratigraphy and corresponding design parameters are presented in the **Drilled Pier Design Parameters** section of this report.

Side resistance should be applied to the surface area of the drilled pier for that given length interval below a depth of 3 feet to reduce the effect of frost. The skin friction value with a $^{2}/_{3}$ reduction should be used to determine the uplift capacity of the drilled piers. The contribution of soil resistance within the frost zone should be neglected in computations of vertical and lateral capacity.

For lateral load and overturning design, we have included LPILE© and MFAD© parameters in the **Drilled Pier Design Parameters** section of this report. Lateral load design parameters are valid for maximum soil strain of 1 percent for the native soils acting over a distance of one shaft diameter. The passive pressure, coefficient of horizontal

subgrade reaction, and LPILE© parameters are ultimate values; therefore, appropriate factors of safety should be applied in the pier design.

Piers should be considered to work in group action if the center-to-center horizontal spacing is less than three pier diameters. A minimum practical center-to-center horizontal spacing between piers of at least three diameters should be maintained, and adjacent piers should bottom at the same elevation. The capacity of individual piers must be reduced when considering the effects of group action. Capacity reduction is a function of pier spacing and the number of piers within a group. The following table presents capacity reductions for closely spaced piers.

Description	Value		
Drilled Pier Spacing (Center-to-Center)	>3 diameters	>2 to 3 diameters	1 to 2 diameters
Pier Capacity Reduction	None	30 percent	50 percent

1. End bearing values do not need to be reduced for closely spaced piers if bottom of piers are at the same elevation.

Lateral analysis should account for the center-to-center spacing and P-Y multiplier values per the following table:

Pier Center-to-Center Spacing (In Direction of Loading)	P-multiplier, P_M Row 1	P-multiplier, P_M Row 2	P-multiplier, P_M Row 3 and Higher
3 x diameter	0.8	0.4	0.3
5 x diameter	1.0	0.85	0.7

The structural engineer should determine the reinforcement necessary for the piers. At a minimum, all piers should be reinforced full depth for the applied axial, lateral, and uplift stresses imposed.

While not anticipated, pier casing may be required during the construction of the drilled piers if groundwater, loose soils, or caving soils are encountered. Casing should be withdrawn in a slow continuous manner maintaining a sufficient head of concrete to prevent infiltration of water or caving soils or the creation of voids in pier concrete. Pier concrete should have a relatively high fluidity when placed in cased pier holes or through a tremie. Pier concrete with slump in the range of 5 to 7 inches is recommended for uncased piers. For cased piers, a slump in the range of 7 to 9 inches is recommended.

Groundwater, if encountered, should be removed from each pier hole prior to concrete placement. Pier concrete should be placed immediately after completion of drilling and cleaning. If pier concrete cannot be placed in dry conditions, a tremie should be used for concrete placement. Free-fall concrete placement in piers will only be acceptable if

provisions are taken to avoid striking the concrete on the sides of the hole or reinforcing steel. The use of a bottom-dump hopper, or an elephant's trunk discharging near the bottom of the hole where concrete segregation will be reduced, is recommended.

Pier concrete must be poured the same day the pier hole is drilled.

Due to potential sloughing and raveling, foundation concrete quantities may exceed calculated geometric volumes. Pier-bearing surfaces must be cleaned prior to concrete placement. A Terracon representative should observe the bearing surface and shaft configuration.

The top of the piers should be cylindrical in shape. Forms may be necessary at the top of the piers in order to minimize the disturbance of the soils and to maintain a cylindrical shape. Failure to provide this shape (i.e., allowing mushrooming of pier tops) may result in additional uplift forces and unanticipated movement.

The drilled pier installation process should be performed under the observation of the Geotechnical Engineer. The Geotechnical Engineer should document the pier installation process including soil/rock and groundwater conditions observed, consistency with expected conditions, and details of the installed pier.

Seismic Considerations

The following table presents the seismic site classification based on the 2018 International Building Code (IBC), and the subsurface conditions encountered within the borings:

Code Used	Site Classification
2018 International Building Code (IBC) [1,2]	D

1. In general accordance with the 2018 International Building Code.
2. The 2018 International Building Code (IBC) requires a site subsurface profile determination extending a depth of 100 feet for seismic site classification. The current scope requested does not include the required 100-foot subsurface profile determination. The deepest borings of this exploration extended to a maximum depth of about 40 feet and this seismic site class definition considers that similar subsurface conditions exist below the maximum depth of the subsurface exploration.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration.

Variations will occur between exploration point locations 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. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services 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.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

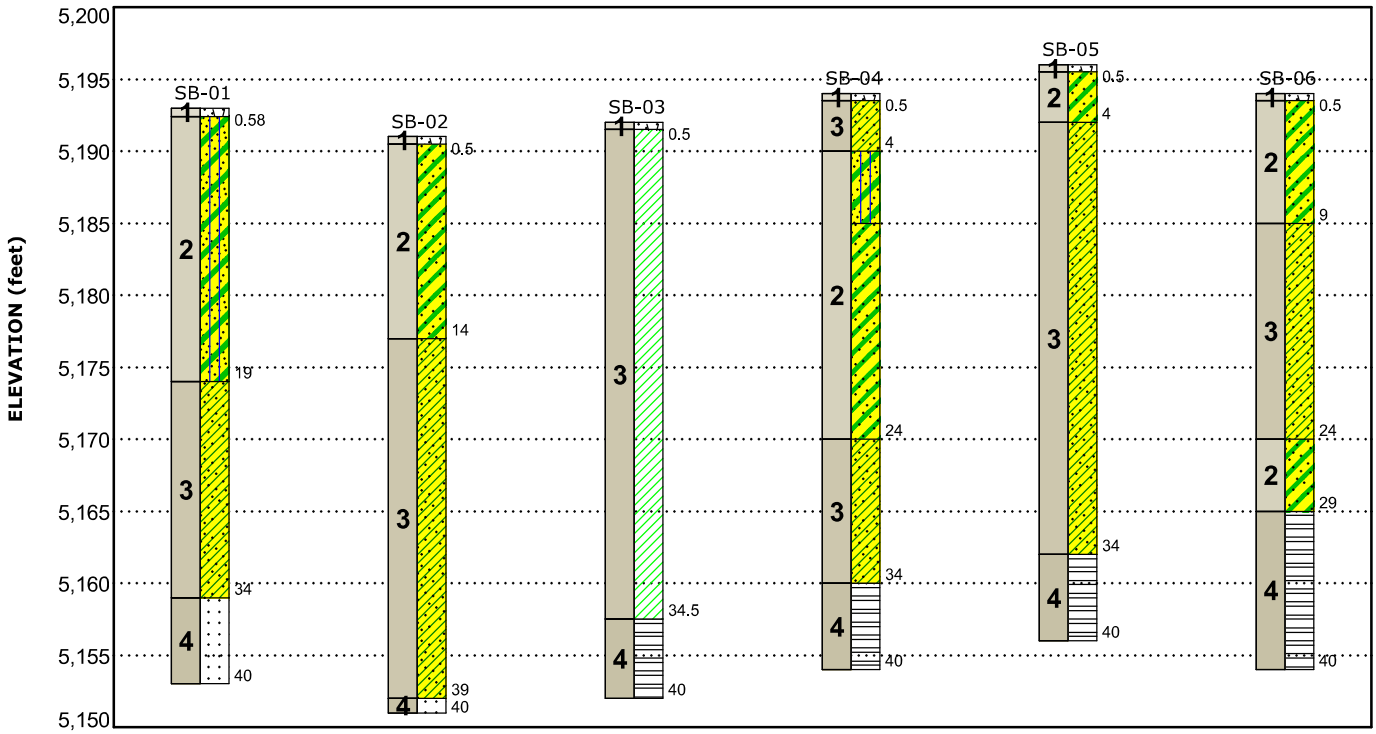
Figures

Contents:

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
Terracon Project No. 25255177

Terracon
10625 W I70 Frontage Rd N
Ste 3
Wheat Ridge, CO

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	**Topsoil**	Topsoil; about 6 to 7 inches
2	**Native Sand**	Native sand with varying amounts of silt and clay; very loose to medium dense
3	**Native Clay**	Native lean clay with varying amounts of sand; stiff to hard
4	**Bedrock**	Bedrock consisting of claystone and sandstone; firm to hard

Legend

- Topsoil
- Silty Clayey Sand
- Sandy Lean Clay
- Sandstone
- Clayey Sand
- Lean Clay
- Claystone

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

Attachments

Exploration and Testing Procedures

Field Exploration

Boring Layout and Elevations: The locations of the borings are presented in the **Site Location and Exploration Plans**. Locations of the borings were obtained by using a handheld, recreational-grade GPS unit. The accuracy of the latitude and longitude values is typically about +/- 25 feet when obtaining the values using this method. Elevations at the boring locations were obtained using Google Earth. The accuracy of the boring locations and elevations should only be assumed to the level implied by the methods used.

Subsurface Exploration Procedures: The borings were drilled with a CME-55/300 track-mounted rotary drill rig and a Mobile B-57 truck-mounted rotary drill rig with solid-stem augers. During the drilling operations, lithologic logs of the borings were recorded by the field engineer. Relatively undisturbed samples were obtained at selected intervals utilizing a 2½-inch outside diameter modified California barrel sampler. Bulk samples were obtained from auger cuttings. Penetration resistance values were recorded in a manner similar to the standard penetration test (SPT), or in the same manner when split spoon samplers were used. This test consists of driving the sampler into the ground with a 140-pound hammer free falling through a distance of 30 inches. The number of blows required to advance the barrel sampler 12 inches (18 inches for standard split-spoon samplers, final 12 inches are recorded) or the interval indicated is recorded and can be correlated to the standard penetration resistance value (N-value). The blow count values are indicated on the boring logs at the respective sample depths, barrel sampler blow counts are not considered N-values.

An automatic hammer was used to advance the samplers in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The standard penetration test provides a reasonable indication of the in-place density of sandy type materials, but only provides an indication of the relative stiffness of cohesive materials since the blow count in these soils may be affected by the soil moisture content. In addition, considerable care should be exercised in interpreting the N-values in gravelly soils, particularly where the size of the gravel particle exceeds the inside diameter of the sampler.

Groundwater measurements were obtained in the borings at the time of drilling. Due to safety concerns, the borings were backfilled with auger cuttings after drilling. Some settlement of the backfill may occur and should be repaired as soon as possible.

Laboratory Testing

Samples retrieved during the field exploration were returned to the laboratory for observation by the Geotechnical Engineer and were classified in general accordance with the Unified Soil Classification System presented in the **Supporting Information**.

At this time, an applicable laboratory-testing program was formulated to determine engineering properties of the subsurface materials. Following the completion of the laboratory testing, the field descriptions were confirmed or modified as necessary, and the boring logs were prepared. The boring logs are included in the **Exploration Results**.

Laboratory test results are included in the **Exploration Results**. These results were used for the geotechnical engineering analyses and the development of foundation and earthwork recommendations. All laboratory tests were performed in general accordance with the applicable local or other accepted standards.

Selected soil samples were tested for the following engineering properties:

- Water content
- Dry density
- Grain size distribution
- Atterberg limits
- Swell/consolidation
- Water-soluble sulfate
- Sulfide
- Chloride
- Red-Ox
- pH
- Electrical resistivity
- Total salts

Site Location and Exploration Plans

Contents:

Note: All attachments are one page unless noted above.

Site Location

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

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan with Aerial Image

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

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan with Project Overlay

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

MAP PROVIDED BY MICROSOFT BING MAPS

Field Electrical Resistivity Testing Plan

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

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Note: All attachments are one page unless noted above.

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
Terracon Project No. 25255177

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Log No. SB-01

Location: See Exploration Plan

Latitude: 39.9353° Longitude: -104.7138°

Depth (Ft.) Elevation: 5193 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Elevation (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Swell (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.6	5192.42	**TOPSOIL**, about 7 inches									
2		19.0	5174	**SILTY CLAYEY SAND (SC-SM)**, fine to coarse grained, brown, very loose to medium dense				2-3		6.5	101	21-16-5	43
								4-6	-2.4 @ 500 psf	5.9	94		
					5								
								8-7		10.2	118		
					10								
								7-12		12.6	117		
					15								
3		34.0	5159	**SANDY LEAN CLAY (CL)**, brown, very stiff to hard				11-17		14.4	118		
					20								
								12-25		13.9	116		
					25								
								10-13		13.5	117		
					30								
4		40.0	5153	**SANDSTONE**, fine to coarse grained, brown, hard, weak cementation				50/7"		10.5	106		
					35								
								50/8"		16.4	107		
				Bottom of Hole at 40 Feet	40								

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Approximate ground surface elevation obtained using Google Earth.

Water Level Observations
None encountered while drilling

Drill Rig
Mobile B-57

Hammer Type
Automatic

Driller
Terracon

Logged by
KT

Boring Started
09-05-2025

Boring Completed
09-05-2025

Notes
Modified California Ring Samples are 1.92 inches in diameter.

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
Terracon Project No. 25255177

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Log No. SB-02

Location: See Exploration Plan

Latitude: 39.9354° Longitude: -104.7130°

Depth (Ft.) Elevation: 5191 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Swell (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5 **TOPSOIL**, about 6 inches 5190.5								
2		**CLAYEY SAND (SC)**, fine to coarse grained, brown, loose to medium dense			4-6		8.5	102		
					3-12		7.0	114		
					7-11		9.8	116	28-14-14	39
		14.0 5177								
3		**SANDY LEAN CLAY (CL)**, brown, stiff to very stiff			11-12		14.8	115		
					11-14		13.6	119	32-16-16	61
					11-14		11.7	122		
					8-13		18.5	113		
					6-10		16.5	112		
		39.0 5152								
4		40.0 **SANDSTONE**, fine to coarse grained, brown, hard, moderate cementation 5151			50/9"		22.5	105		
		Bottom of Hole at 40 Feet								

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Approximate ground surface elevation obtained using Google Earth.

Water Level Observations
None encountered while drilling

Drill Rig
Mobile B-57

Hammer Type
Automatic

Driller
Terracon

Logged by
KT

Boring Started
09-05-2025

Boring Completed
09-05-2025

Notes
Modified California Ring Samples are 1.92 inches in diameter.

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Log No. SB-03

Location: See Exploration Plan

Latitude: 39.9354° Longitude: -104.7122°

Depth (Ft.) Elevation: 5192 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Swell (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5 **TOPSOIL**, about 6 inches 5191.5								
3		**LEAN CLAY (CL)**, with sand, brown, stiff to hard			6-7		11.3	90		
					8-9		10.3	111	34-13-21	76
					8-10		11.1	120		
					8-13		10.4	119		
					7-15		16.1	115		
					10-17		11.6	121		
					10-17		21.6	103		
4		34.5 5157.5 **CLAYSTONE**, gray to brown, medium hard			11-26		27.2	98		
		40.0 5152			50/10"		20.6	107		
		Bottom of Hole at 40 Feet								

5 10 15 20 25 30 35 40

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Approximate ground surface elevation obtained using Google Earth.

Water Level Observations
None encountered while drilling

Drill Rig
Mobile B-57

Hammer Type
Automatic

Driller
Terracon

Logged by
KT

Boring Started
09-05-2025

Boring Completed
09-05-2025

Notes
Modified California Ring Samples are 1.92 inches in diameter.

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Log No. SB-04

Location: See Exploration Plan

Latitude: 39.9350° Longitude: -104.7126°

Depth (Ft.) Elevation: 5194 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Swell (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5 **TOPSOIL**, about 6 inches 5193.5								
3		**SANDY LEAN CLAY (CL)**, brown, stiff			5-7		9.8	118		
		4.0 5190								
2		**SILTY CLAYEY SAND (SC-SM)**, fine to coarse grained, brown, medium dense			7-8		5.7	108	20-14-6	27
		9.0 5185								
		CLAYEY SAND (SC), fine to coarse grained, brown, medium dense			8-12		9.7	123		
					10-18		12.5	121	34-17-17	48
					12-14		8.2	116		
3		**SANDY LEAN CLAY (CL)**, brown, very stiff			9-17		13.1	117		
					10-14		12.3	121		
		34.0 5160								
4		**CLAYSTONE**, gray, firm to medium hard			12-20		29.0	95		
		40.0 5154			16-23		29.2	94		
		Bottom of Hole at 40 Feet								

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Approximate ground surface elevation obtained using Google Earth.

Water Level Observations
None encountered while drilling

Drill Rig
CME-55/300

Hammer Type
Automatic

Driller
Terracon

Logged by
PA

Boring Started
09-05-2025

Boring Completed
09-05-2025

Notes
Modified California Ring Samples are 1.92 inches in diameter.

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
Terracon Project No. 25255177

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Log No. SB-05

Location: See Exploration Plan

Latitude: 39.9347° Longitude: -104.7129°

Model Layer	Graphic Log	Depth (Ft.)	Elevation: 5196 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Swell (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5	**TOPSOIL**, about 6 inches 5195.5									
2			**CLAYEY SAND (SC)**, fine to coarse grained, brown, loose				5-8	-2.3 @ 500 psf	6.3	101		
		4.0	5192									
3			**SANDY LEAN CLAY (CL)**, brown, stiff to very stiff	5			5-7		6.1			
				10			5-7		12.0	104	32-13-19	62
				15			8-12		13.0	117		
				20			11-18		11.6	119		
				25			10-19		12.8	122		
				30			10-18		11.8	122		
		34.0	5162									
4			**CLAYSTONE**, gray, firm to medium hard	35			10-16		28.5	97		
		40.0	5156									
			Bottom of Hole at 40 Feet	40			15-28		27.7	97		

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Approximate ground surface elevation obtained using Google Earth.

Water Level Observations
None encountered while drilling

Drill Rig
CME-55/300

Hammer Type
Automatic

Driller
Terracon

Logged by
PA

Boring Started
09-05-2025

Boring Completed
09-05-2025

Notes
Modified California Ring Samples are 1.92 inches in diameter.

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
Terracon Project No. 25255177

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Log No. SB-06

Location: See Exploration Plan

Latitude: 39.9346° Longitude: -104.7122°

Model Layer	Graphic Log	Depth (Ft.)	Elevation: 5194 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Swell (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5	**TOPSOIL**, about 6 inches 5193.5									
2			**CLAYEY SAND (SC)**, fine to coarse grained, brown, very loose to loose				4-4	-1.1 @ 500 psf	9.5	109	23-15-8	47
				5			2-2		10.2			
		9.0	5185									
3			**SANDY LEAN CLAY (CL)**, brown, stiff to very stiff	10			10-11	+2.0 @ 500 psf	18.1	107		
				15			8-10		12.6	115	27-13-14	52
				20			12-15		12.4	122		
		24.0	5170									
2			**CLAYEY SAND (SC)**, fine to coarse grained, brown, medium dense	25			8-12		13.1	119		
		29.0	5165									
4			**CLAYSTONE**, gray, medium hard	30			15-24		22.2	106		
				35			16-30		25.3	98		
		40.0	5154									
			Bottom of Hole at 40 Feet	40			12-26		24.4	101		

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Approximate ground surface elevation obtained using Google Earth.

Water Level Observations
None encountered while drilling

Drill Rig
CME-55/300

Hammer Type
Automatic

Driller
Terracon

Logged by
PA

Boring Started
09-05-2025

Boring Completed
09-05-2025

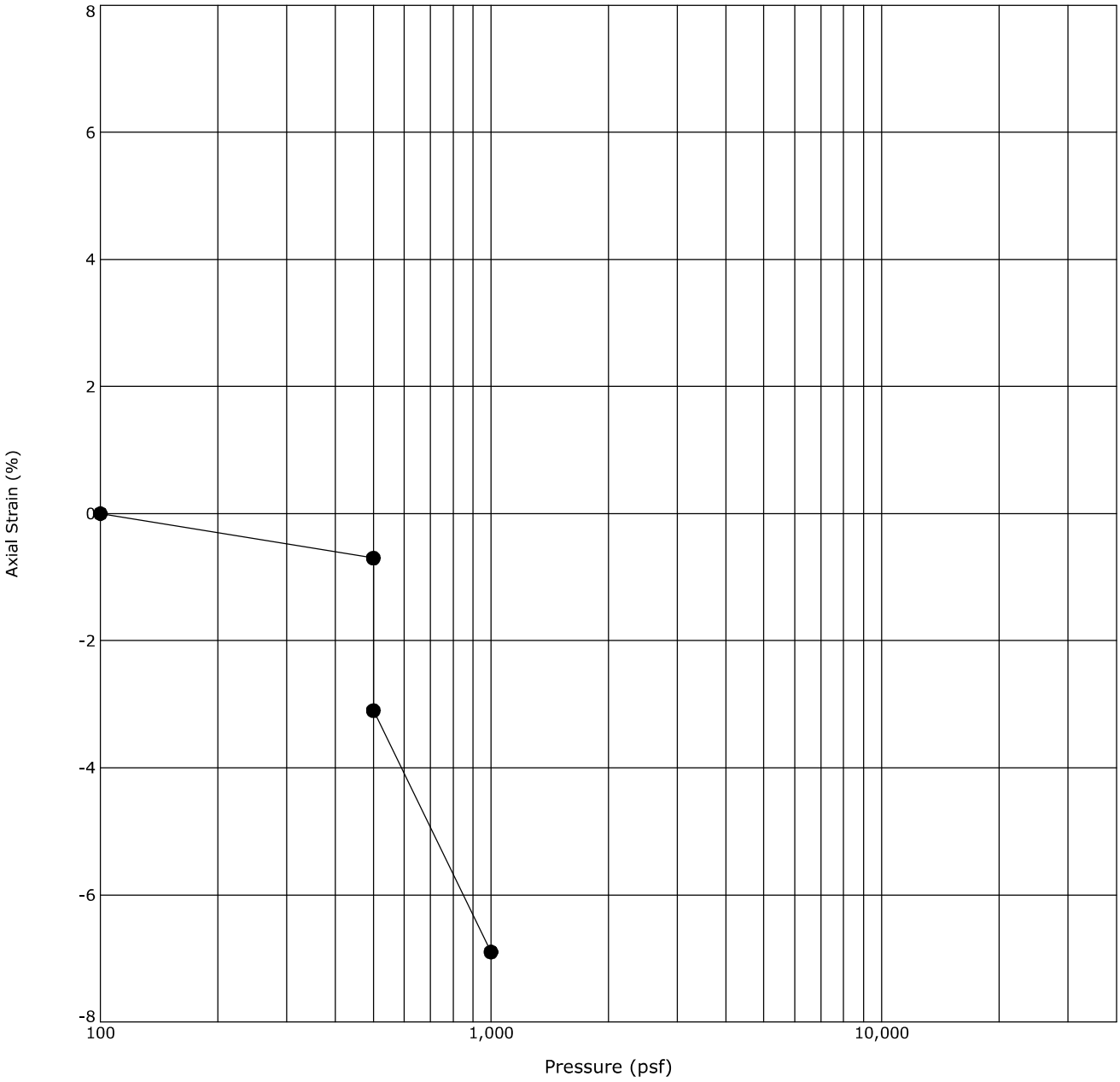
Notes
Modified California Ring Samples are 1.92 inches in diameter.

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

One-Dimensional Swell or Collapse

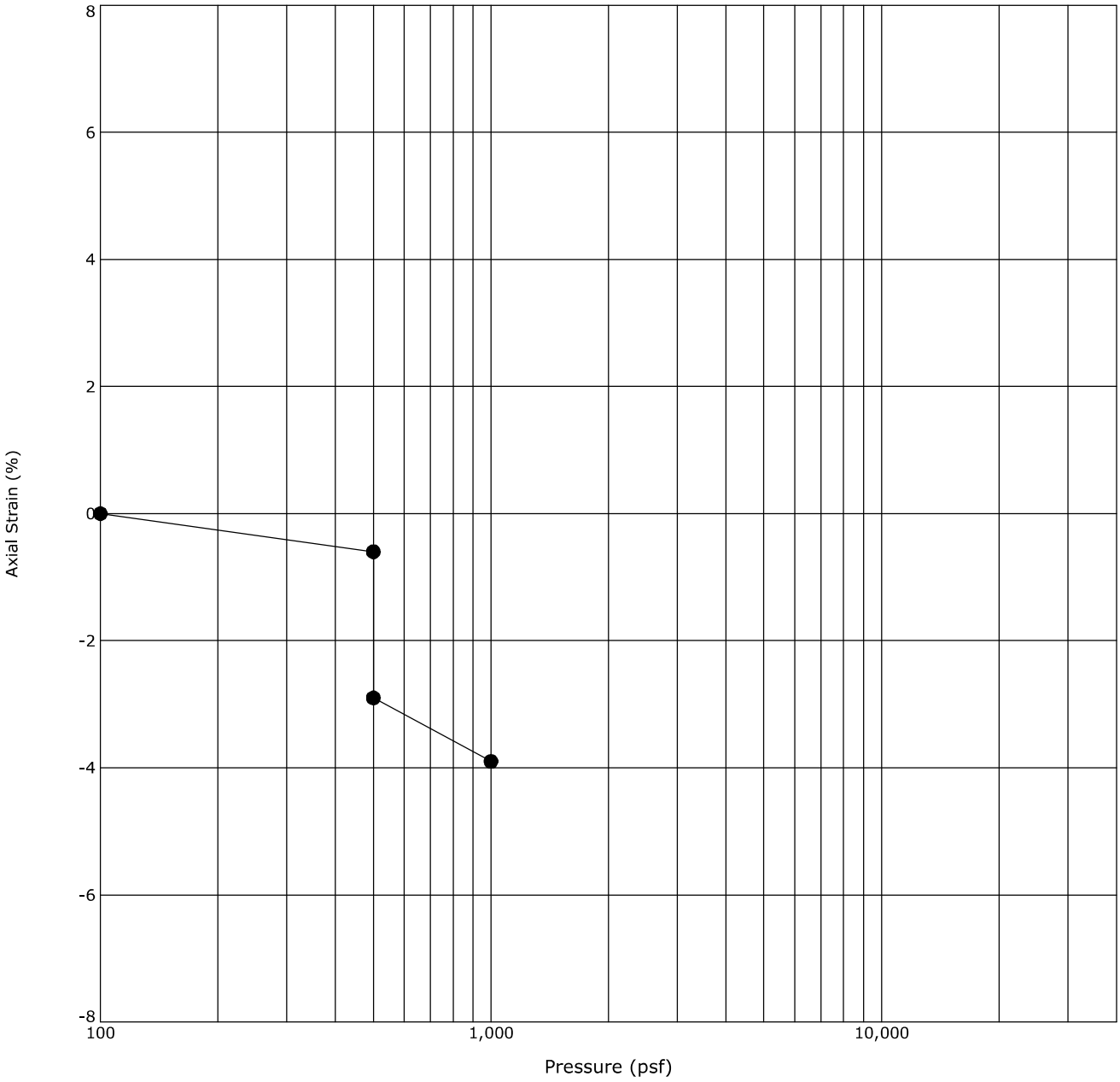


Boring ID		Depth (Ft)	Description	USCS	γ_d(pcf)	WC (%)
●	SB-01	4 - 5	SILTY CLAYEY SAND	SC-SM	94	5.9

Notes: Water was added at 500 psf. Sample disturbed.

10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

One-Dimensional Swell or Collapse

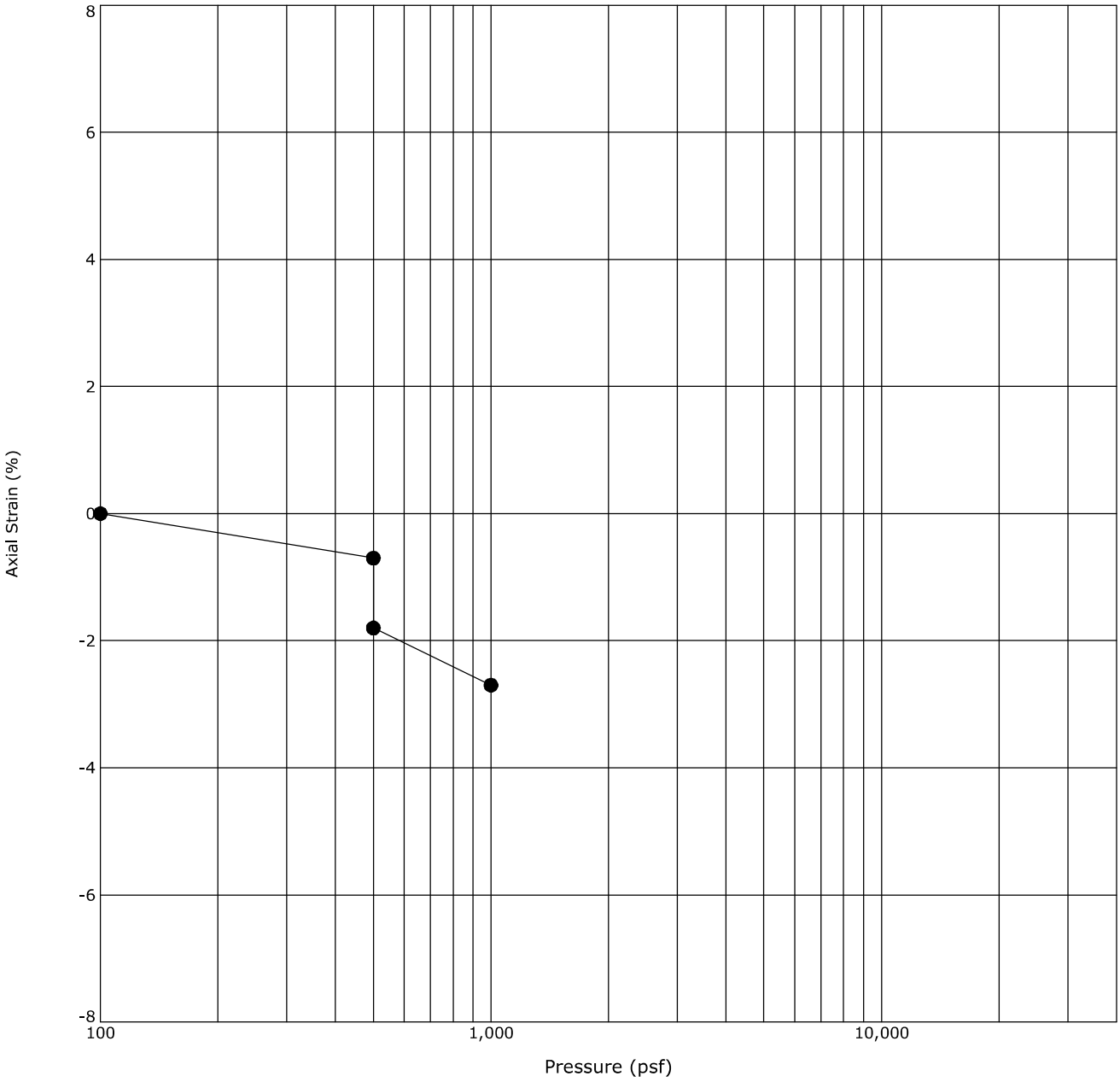


Boring ID		Depth (Ft)	Description	USCS	γ_d(pcf)	WC (%)
●	SB-05	2 - 3	CLAYEY SAND	SC	101	6.3

Notes: Water was added at 500 psf.

10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

One-Dimensional Swell or Collapse

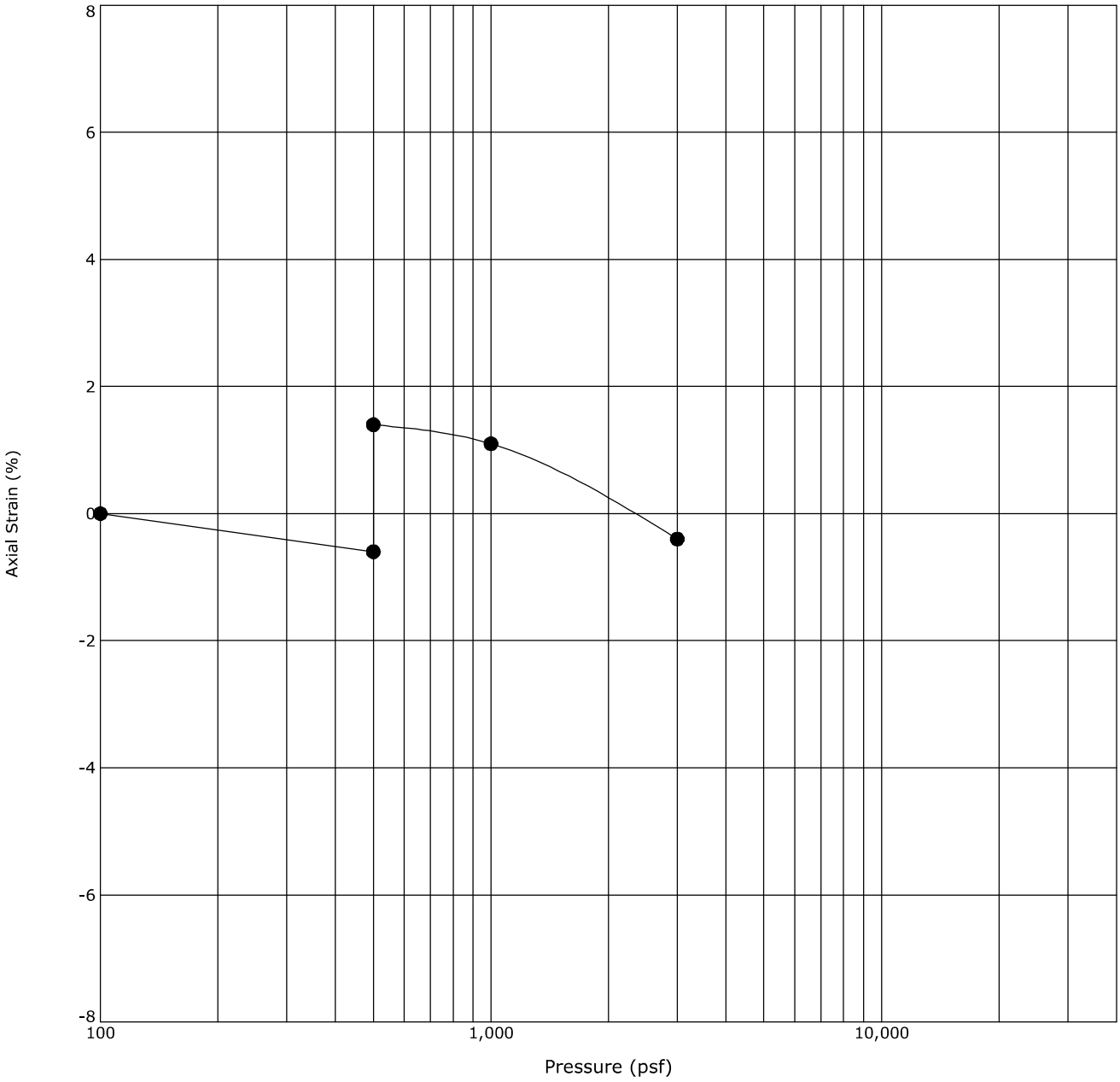


Boring ID		Depth (Ft)	Description	USCS	γ_d(pcf)	WC (%)
●	SB-06	2 - 3	CLAYEY SAND	SC	109	9.5

Notes: Water was added at 500 psf.

10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

One-Dimensional Swell or Collapse



Boring ID		Depth (Ft)	Description	USCS	γ_d(pcf)	WC (%)
●	SB-06	9 - 10	SANDY LEAN CLAY	CL	107	18.1

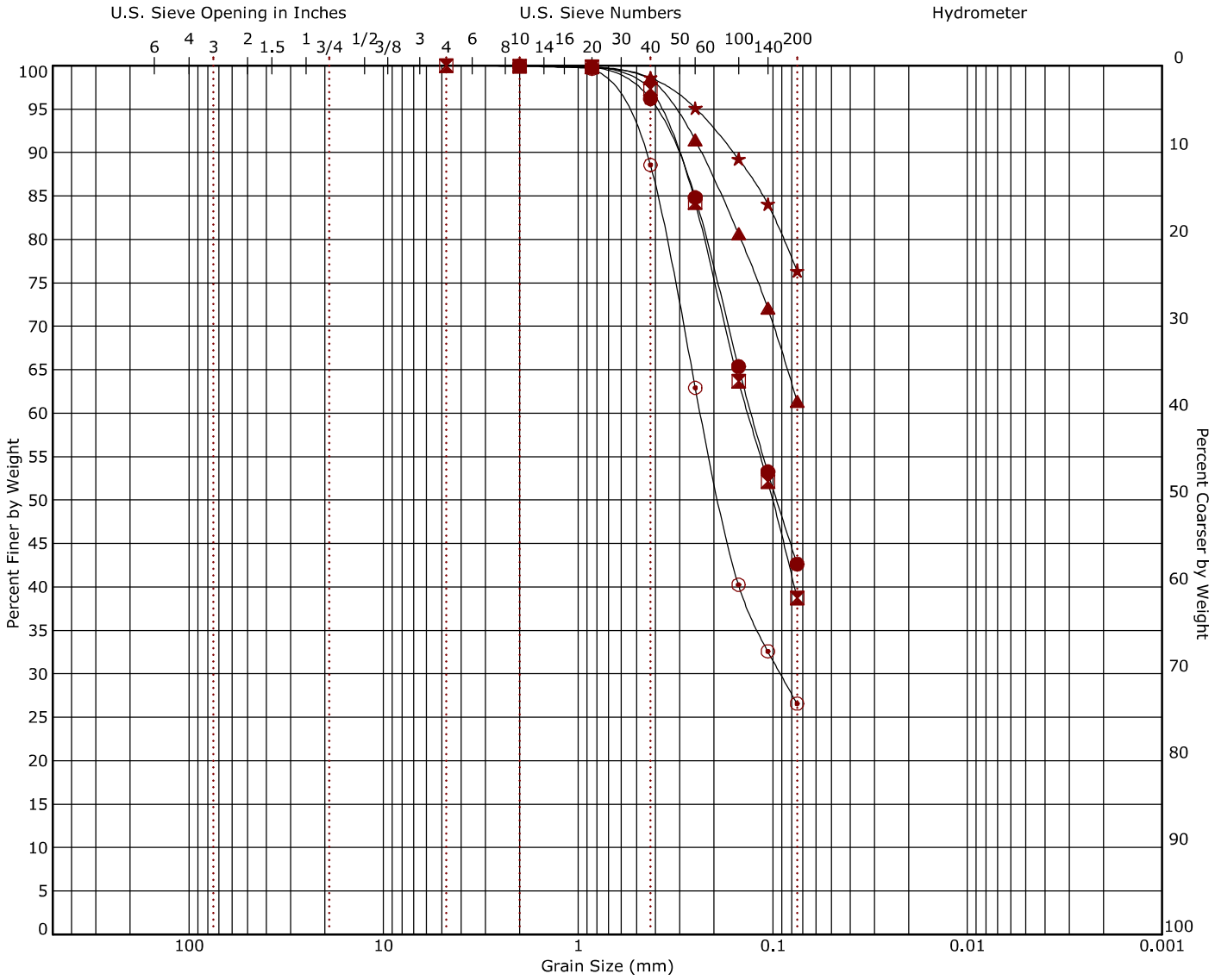
Notes: Water was added at 500 psf.

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
Terracon Project No. 25255177

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Grain Size Distribution

ASTM D422 / ASTM C136



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	USCS Classification	USCS	AASHTO	LL	PL	PI	Cc	Cu
●	SB-01	2 - 3	SILTY, CLAYEY SAND	SC-SM	A-4 (0)	21	16	5		
⊠	SB-02	9 - 10	CLAYEY SAND	SC	A-6 (2)	28	14	14		
▲	SB-02	19 - 20	SANDY LEAN CLAY	CL	A-6 (7)	32	16	16		
★	SB-03	4 - 5	LEAN CLAY with SAND	CL	A-6 (14)	34	13	21		
⊙	SB-04	4 - 5	SILTY, CLAYEY SAND	SC-SM	A-2-4 (0)	20	14	6		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
●	SB-01	2 - 3	2	0.129			0.0	0.0	57.4	42.6		
⊠	SB-02	9 - 10	4.75	0.134			0.0	0.0	61.3	38.7		
▲	SB-02	19 - 20	2				0.0	0.0	38.6	61.4		
★	SB-03	4 - 5	2				0.0	0.0	23.6	76.4		
⊙	SB-04	4 - 5	2	0.234	0.091		0.0	0.0	73.4	26.6		

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
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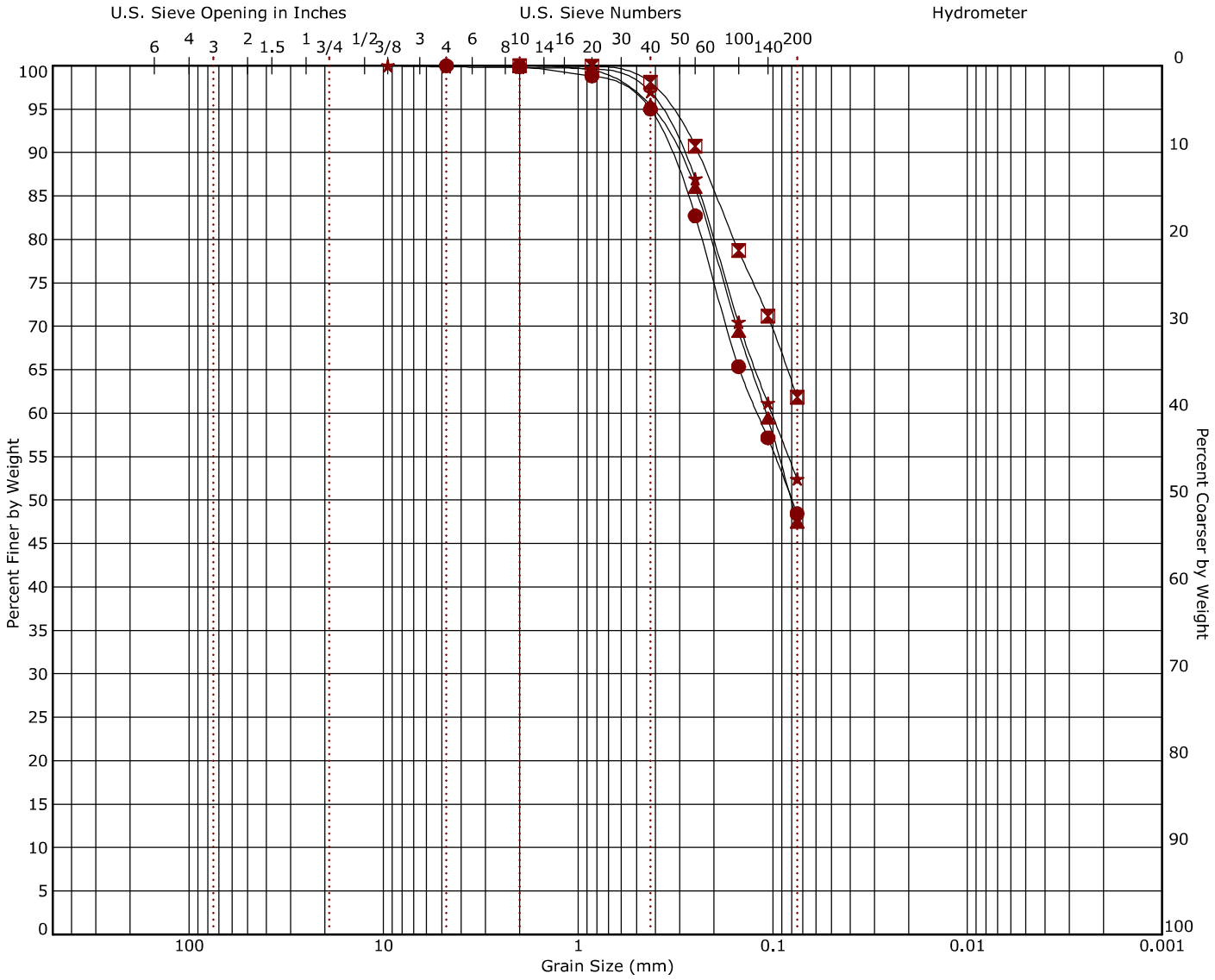
Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Grain Size Distribution

ASTM D422 / ASTM C136



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	USCS Classification	USCS	AASHTO	LL	PL	PI	Cc	Cu
●	SB-04	14 - 15	CLAYEY SAND	SC	A-6 (5)	34	17	17		
⊠	SB-05	9 - 10	SANDY LEAN CLAY	CL	A-6 (9)	32	13	19		
▲	SB-06	2 - 3	CLAYEY SAND	SC	A-4 (1)	23	15	8		
★	SB-06	14 - 15	SANDY LEAN CLAY	CL	A-6 (4)	27	13	14		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
●	SB-04	14 - 15	4.75	0.119			0.0	0.0	51.6	48.4		
⊠	SB-05	9 - 10	2				0.0	0.0	38.2	61.8		
▲	SB-06	2 - 3	2	0.108			0.0	0.0	52.6	47.4		
★	SB-06	14 - 15	9.5	0.101			0.0	0.1	47.4	52.4		

Client
Ulteig Engineers, Inc.

Project
United Power Stonehouse Substation
25255177

Results from Corrosion Testing

Sample Location	SB-04	SB-05
Sample Depth (ft.)	0 - 5	0 - 5
pH Analysis, ASTM D4972	7.35	7.33
Water Soluble Sulfate (SO4), AASHTO T290, (%)	<0.10	<0.10
Sulfides, ASTM A674 - X1.6, (Negative/Trace/ Present)	Negative	Negative
Chlorides, AASHTO T291, (mg/kg)	1	2
Red-Ox, ASTM G200, (mV)	+372	+345
Resistivity (Saturated), ASTM G57, (ohm-cm)	2600	2800
Total Salts (mg/Kg)	513	500

Analyzed By: Daryl Lee
Laboratory Supervisor

The tests were performed in general accordance with applicable ASTM and AASHTO test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

SUMMARY OF LABORATORY TEST RESULTS

United Power Stonehouse Substation - Adams County, Colorado
Terracon Project No. 25255177

Boring No.	Depth (ft)	USCS Class.	Initial Water Content (%)	Initial Dry Density (pcf)	Swell/Consolidation		Particle Size Distribution, Percent Passing by Weight					Atterberg Limits		Water Soluble Sulfates (%)	Chlorides (mg/kg)	pH	Sulfides (mg/kg)	Red-Ox (mV)	Resistivity (ohm-cm)	Total Salts (mg/kg)	Remarks
					Surcharge (ksf)	Swell (%)	3/4"	#4	#10	#40	#200	LL	PI								
SB-01	2	SC-SM	6.5	101			100	100	100	96	43	21	5								
SB-01	4	SC-SM	5.9	94	0.5	-2.4															3
SB-01	9	SC-SM	10.2	118																	
SB-01	14	SC-SM	12.6	117																	
SB-01	19	CL	14.4	118																	
SB-01	24	CL	13.9	116																	
SB-01	29	CL	13.5	117																	
SB-01	34		10.5	106																	
SB-01	39		16.4	107																	
SB-02	2	SC	8.5	102																	
SB-02	4	SC	7.0	114																	
SB-02	9	SC	9.8	116			100	100	100	97	39	28	14								
SB-02	14	CL	14.8	115																	
SB-02	19	CL	13.6	119			100	100	100	99	61	32	16								
SB-02	24	CL	11.7	122																	
SB-02	29	CL	18.5	113																	
SB-02	34	CL	16.5	112																	
SB-02	39		22.5	105																	
SB-03	2	CL	11.3	90																	
SB-03	4	CL	10.3	111			100	100	100	99	76	34	21								
SB-03	9	CL	11.1	120																	
SB-03	14	CL	10.4	119																	
SB-03	19	CL	16.1	115																	
SB-03	24	CL	11.6	121																	
SB-03	29	CL	21.6	103																	
SB-03	34	CL	27.2	98																	
SB-03	39		20.6	107																	
SB-04	0 - 5	CL												<0.10	1	7.35	Negative	+372	2600	513	
SB-04	2	CL	9.8	118																	
SB-04	4	SC-SM	5.7	108			100	100	100	89	27	20	6								
SB-04	9	SC	9.7	123																	
SB-04	14	SC	12.5	121			100	100	100	95	48	34	17								
SB-04	19	SC	8.2	116																	
SB-04	24	CL	13.1	117																	
SB-04	29	CL	12.3	121																	
SB-04	34		29.0	95																	
SB-04	39		29.2	94																	
SB-05	0 - 5	SC												<0.10	2	7.33	Negative	+345	2800	500	
SB-05	2	SC	6.3	101	0.5	-2.3															3

Notes:
Initial Dry Density and Initial Water Content are in-situ values unless otherwise notes
* – Partially disturbed sample
- – Compression/settlement
NV = no value
NP = non-plastic

Remarks:
1 Remolded Compacted density (about 95% of ASTM D698 maximum density near optimum moisture content)
2 Remolded Compacted density (about 95% of ASTM D1557 maximum density near optimum moisture content)
3 Water added to sample
4 Minus #200 Only
5 Moisture-Density Relationship Test Method ASTM D698/AASHTO T99
6 Moisture-Density Relationship Test Method ASTM D1557/AASHTO T180

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SUMMARY OF LABORATORY TEST RESULTS

United Power Stonehouse Substation - Adams County, Colorado
Terracon Project No. 25255177

Boring No.	Depth (ft)	USCS Class.	Initial Water Content (%)	Initial Dry Density (pcf)	Swell/Consolidation		Particle Size Distribution, Percent Passing by Weight					Atterberg Limits		Water Soluble Sulfates (%)	Chlorides (mg/kg)	pH	Sulfides (mg/kg)	Red-Ox (mV)	Resistivity (ohm-cm)	Total Salts (mg/kg)	Remarks
					Surcharge (ksf)	Swell (%)	3/4"	#4	#10	#40	#200	LL	PI								
SB-05	4	CL	6.1																		
SB-05	9	CL	12.0	104			100	100	100	98	62	32	19								
SB-05	14	CL	13.0	117																	
SB-05	19	CL	11.6	119																	
SB-05	24	CL	12.8	122																	
SB-05	29	CL	11.8	122																	
SB-05	34		28.5	97																	
SB-05	39		27.7	97																	
SB-06	2	SC	9.5	109	0.5	-1.1	100	100	100	95	47	23	8								3
SB-06	4	SC	10.2																		
SB-06	9	CL	18.1	107	0.5	+2.0															3
SB-06	14	CL	12.6	115			100	100	100	97	52	27	14								
SB-06	19	CL	12.4	122																	
SB-06	24	SC	13.1	119																	
SB-06	29		22.2	106																	
SB-06	34		25.3	98																	
SB-06	39		24.4	101																	

Notes:
Initial Dry Density and Initial Water Content are in-situ values unless otherwise notes
* – Partially disturbed sample
- – Compression/settlement
NV = no value
NP = non-plastic

Remarks:
1 Remolded Compacted density (about 95% of ASTM D698 maximum density near optimum moisture content)
2 Remolded Compacted density (about 95% of ASTM D1557 maximum density near optimum moisture content)
3 Water added to sample
4 Minus #200 Only
5 Moisture-Density Relationship Test Method ASTM D698/AASHTO T99
6 Moisture-Density Relationship Test Method ASTM D1557/AASHTO T180

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Field Electrical Resistivity Test Results

Contents:

Field Electrical Resistivity Test Data

Note: All attachments are one page unless noted above.

FIELD ELECTRICAL RESISTIVITY TEST DATA

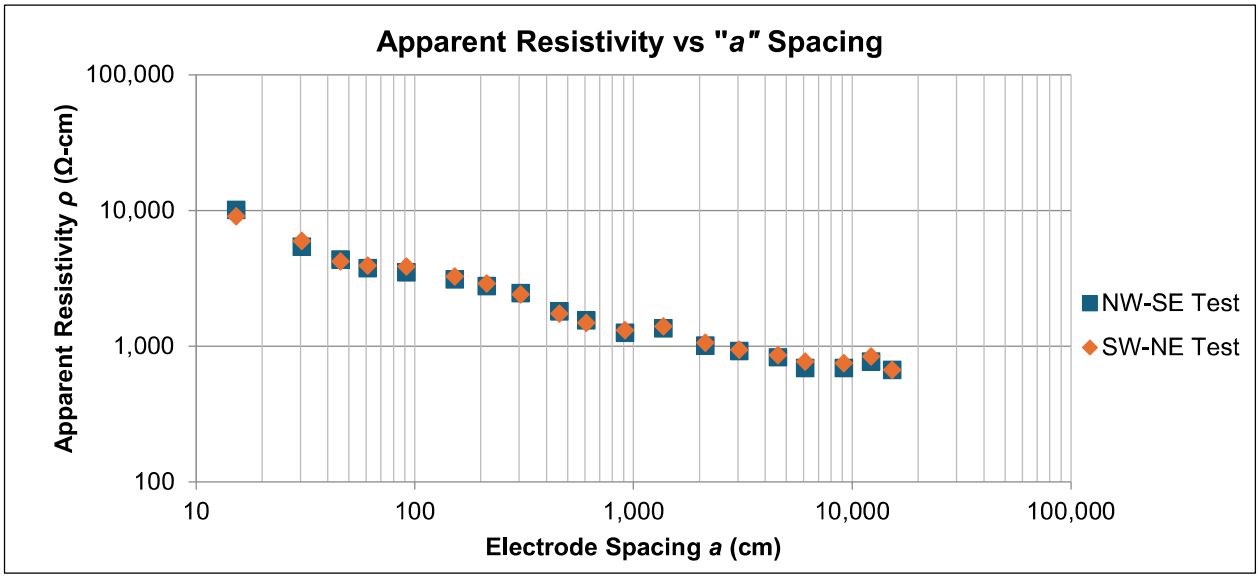
Stonehouse Substation ■ Adams County, Colorado
October 3, 2025 ■ Terracon Project No. 25255177

Array Loc.	FER-1 Center at 39.9348º, -104.7121º		
Instrument	L&R Mini Res	**Weather**	70ºF, Clear
Serial #	SN-375	**Ground Cond.**	Dry
Cal. Check	9/4/2025	**Tested By**	WRL & NC
Test Date	9/4/2025	**Method**	Wenner 4-pin (ASTM G57-06 (2020); IEEE 81-2012)
Notes & Conflicts			

Apparent resistivity ρ is calculated as :

$$\rho = \frac{4\pi a R}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$

Electrode Spacing *a*		Electrode Depth *b*		NW-SE Test		SW-NE Test	
(feet)	(centimeters)	(inches)	(centimeters)	Measured Resistance *R*	Apparent Resistivity ρ	Measured Resistance *R*	Apparent Resistivity ρ
				Ω	(Ω-cm)	Ω	(Ω-cm)
0.5	15	6	15	62.8	10,080	56.5	9,070
1	30	6	15	21.6	5,410	23.8	5,970
1.5	46	6	15	13.111	4,370	12.622	4,210
2	61	6	15	8.904	3,740	9.355	3,930
3	91	6	15	5.846	3,510	6.426	3,860
5	152	6	15	3.192	3,110	3.359	3,270
7	213	6	15	2.047	2,770	2.141	2,890
10	305	12	30	1.270	2,470	1.233	2,400
15	457	12	30	0.622	1,800	0.601	1,740
20	610	12	30	0.403	1,550	0.388	1,490
30	914	12	30	0.217	1,250	0.228	1,310
45	1,372	12	30	0.157	1,350	0.162	1,400
70	2,134	12	30	0.075	1,010	0.079	1,060
100	3,048	12	30	0.048	920	0.049	940
150	4,572	12	30	0.029	830	0.030	860
200	6,096	12	30	0.018	690	0.020	770
300	9,144	12	30	0.012	690	0.013	750
400	12,192	12	30	0.010	770	0.011	840
500	15,240	12	30	0.007	670	0.007	670



Drilled Pier Design Parameters

Contents:

Drilled Pier Design Parameters

Note: All attachments are one page unless noted above.

United Power Stonehouse Substation
Recommended Soil Parameters for MFAD and LPile Analysis

Boring No.	Soil Type (p-y) Curve Model	Applicable Layer for Design Parameters (feet) [1]	Depth to Ground-water (feet)	Ultimate Soil Parameters (Lateral Loading)						Allowable Pressure for Vertical Loading	
				Effective Unit Weight (pcf)	Cohesion (psf)	Internal Friction Angle (deg.)	Modulus of Deformation (ksi)	Soil Modulus (pci)	e50	Skin Friction (psf) [3,4]	Maximum End Bearing (psf) [2,3]
SB-01 through SB-06	Sand (Reese)	0 to 3	Not Encountered	110	---	30	0.5	Allow L-Pile Program to choose values based on the other parameters in this table.		---	---
	Sand (Reese)	3 to 10		110	---	30	0.5			150	1,500
	Stiff Clay w/o Free Water	10 to 15		110	1,000	---	1.1			500	5,500
	Stiff Clay w/o Free Water	15 to 30		110	1,250	---	1.5			700	7,500
	Stiff Clay w/o Free Water	30 to 40		130	5,000	---	3.1			1,100	15,000

1. Depth below existing ground surface.
2. Applicable for a minimum two times the pier diameter socket into the bearing stratum and at least 3 feet below existing grade.
3. A factor of safety of 3 was used to determine the allowable bearing pressure, while a factor of safety of 2 was used to determine the allowable compressive skin friction.
4. Applicable for compressive loading only. Reduce 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.

Supporting Information

Contents:

Note: All attachments are one page unless noted above.

Terracon
10625 W I70 Frontage Rd N
Ste 3
Wheat Ridge, CO

General Notes

Sampling

Water Level

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Cave In Encountered

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
UC	Unconfined Compressive Strength
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. 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

Relative Density	Standard Penetration or N-Value (Blows/Ft.)	Ring Sampler (Blows/Ft.)
Very Loose	0 - 3	0 - 5
Loose	4 - 9	6 - 14
Medium Dense	10 - 29	15 - 46
Dense	30 - 50	47 - 79
Very Dense	> 50	≥ 80

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

Consistency	Unconfined Compressive Strength Qu (psf)	Standard Penetration or N-Value (Blows/Ft.)	Ring Sampler (Blows/Ft.)
Very Soft	less than 500	0 - 1	< 3
Soft	500 to 1,000	2 - 4	3 - 5
Medium Stiff	1,000 to 2,000	4 - 8	6- 10
Stiff	2,000 to 4,000	8 - 15	11 - 18
Very Stiff	4,000 to 8,000	15 - 30	19 - 36
Hard	> 8,000	> 30	> 36

Bedrock

Consistency	Standard Penetration or N-Value (Blows/Ft.)	Ring Sampler (Blows/Ft.)
Weathered	< 20	< 24
Firm	20 - 29	24 - 35
Medium Hard	30 - 49	36 - 60
Hard	50 - 79	61 - 96
Very Hard	>79	> 96

Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Terracon
10625 W I70 Frontage Rd N
Ste 3
Wheat Ridge, CO

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≥4 and 1≤Cc≤3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [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≥6 and 1≤Cc≤3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [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 above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OL	Organic clay [K, L, M, N]
					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:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OH	Organic clay [K, L, M, P]
					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] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[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.