Print Form

TOWN OF ERIE
Community Development Department – Planning Division
645 Holbrook Street – PO Box 750 – Erie, CO 80516
Tel: 303.926.2770 – Fax: 303.926.2706 – Web: www.erieco.gov

LAND USE APPLICATION

Please fill in this form completely. Incomplete applications will not be processed.

STAFF USE ONLY

FILE NAME:

FILE NO: DATE SUBMITTED: FEES PAID:

PROJECT/BUSINESS NAME: Lazy Dog Substation

PROJECT ADDRESS: TBD

PROJECT DESCRIPTION: Application for a new electrical substation within the Town of Erie proposed to be developed by United Power and Tri-State Generation and Transmission Association, Inc.

LEGAL DESCRIPTION *(attach legal description if Metes & Bounds)*

Subdivision Name: See attached Exhibit A

Filing #: Lot #: Block #: Section: 28 Township: 1N Range: 68W

OWNER *(attach separate sheets if multiple)*

Name/Company: United Power
Contact Person: Steve Barwick
Address: 500 Cooperative Way
City/State/Zip: Brighton, CO 80603
Phone: 303-637-1234 Fax:
E-mail: sbarwick@UnitedPower.com

AUTHORIZED REPRESENTATIVE

Company/Firm: Same as owner
Contact Person:
Address:
City/State/Zip:
Phone: Fax:
E-mail:

MINERAL RIGHTS OWNER *(attach separate sheets if multiple)*

Name/Company:
Address:
City/State/Zip:

MINERAL LEASE HOLDER *(attach separate sheets if multiple)*

Name/Company:
Address:
City/State/Zip:

LAND-USE & SUMMARY INFORMATION

Present Zoning: Public Lands and Institutions
Proposed Zoning: No change proposed
Gross Acreage: 8 acres
Gross Site Density (du/ac): NA
Lots/Units Proposed: No change
Gross Floor Area: NA

SERVICE PROVIDERS

Electric: United Power
Metro District:
Water *(if other than Town)*: Town of Erie
Gas: None required
Fire District: Mountain View Fire and Rescue
Sewer *(if other than Town)*: None required

PAGE TWO MUST BE SIGNED AND NOTARIZED

DEVELOPMENT REVIEW FEES			
ANNEXATION		**SUBDIVISION**	
☐ Major (10+ acres)	$ 4000.00	☐ Sketch Plan	$ 1000.00 + 10.00 per lot
☐ Minor (less than 10 acres)	$ 2000.00	☐ Preliminary Plat	$ 2000.00 + 40.00 per lot
☐ Deannexation	$ 1000.00	☐ Final Plat	$ 2000.00 + 20.00 per lot
COMPREHENSIVE PLAN AMENDMENT		☐ Minor Subdivision Plat	$ 2000.00
☐ Major	$ 3000.00	☐ Minor Amendment Plat	$ 1000.00 + 10.00 per lot
☐ Minor	$ 1200.00	☐ Road Vacation (constructed)	$ 1000.00
ZONING/REZONING		☐ Road Vacation (paper)	$ 100.00
☐ Rezoning	$ 1700.00 + 10.00 per acre	**SITE PLAN**	
☐ PUD Rezoning	$ 1700.00 + 10.00 per acre	☐ Residential	$ 1400.00 + 10.00 per unit
☐ PUD Amendment	$ 1700.00 + 10.00 per acre	☐ Non-Resi. (>10,000 sq. ft.)	$ 2200.00
☐ Major PD Amendment	$ 3700.00 + 10.00 per acre	☐ Non-Resi. (>2,000 sq. ft.)	$ 1000.00
☐ Minor PD Amendment	$ 500.00	☐ Non-Resi. (<2,000 sq. ft.)	$ 200.00
SPECIAL REVIEW USE		☐ Amendment (major)	$ 1100.00
☑ Major	$ 1000.00	☐ Amendment (minor)	$ 350.00
☐ Minor	$ 400.00	**VARIANCE**	$ 600.00
☐ Oil & Gas	$ 1200.00	**SERVICE PLAN**	$ 10,000.00
*All fees **include** both Town of Erie Planning & Engineering review. These fees **do not include** referral agency review fees, outside consultant review fees, or review fees incurred by consultants acting on behalf of staff. See Town of Erie Municipal Code, Title 2-10-5 for all COMMUNITY DEVELOPMENT FEES.*			

The undersigned is fully aware of the request/proposal being made and the actions being initiated on the referenced property. The undersigned understand that the application must be found to be complete by the Town of Erie before the request can officially be accepted and the development review process initiated. The undersigned is aware that the applicant is fully responsible for all reasonable costs associated with the review of the application/request being made to the Town of Erie. Pursuant to Chapter 7 (Section 7.2.B.5) of the Unified Development Code (UDC) of the Town of Erie, applicants shall pay all costs billed by the Town for legal, engineering and planning costs incurred by staff, including consultants acting on behalf of staff, necessary for project review. By this acknowledgement, the undersigned hereby certify that the above information is true and correct.

Owner: _____ Date: _____

Owner: Robert Maxwell Date: 1/15/2019

Applicant: Robert Maxwell III Date: 1/15/2019

STATE OF COLORADO)
) ss.
County of Adams)

The foregoing instrument was acknowledged before me this 15 day of January, 2019, by Robert Maxwell.

STEVEN BARWICK
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20164027845
MY COMMISSION EXPIRES JULY 22, 2020

My commission expires: 7/22/2020.
Witness my hand and official seal.

Notary Public

EXHIBIT "A"
(SPECIAL WARRANTY DEED)

PROPERTY DESCRIPTION

ALL OF THAT PARCEL OF LAND KNOWN AS TRACT A OF FRONT RANGE LANDFILL MINOR SUBDIVISION PLAT, ACCORDING TO THE MAP OR PLAT THEREOF FILED FOR RECORD IN THE OFFICE OF THE WELD COUNTY CLERK AND RECORDER AT RECEPTION NUMBER 3722553. SAID TRACT A IS LOCATED IN THE NORTHEAST ONE-QUARTER OF SECTION 28, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF SAID SECTION 28, AS MONUMENTED BY A 2 INCH ALUMINUM CAP MARKED “PLS 25937”; THENCE ALONG THE NORTH LINE OF SAID NORTHEAST ONE-QUARTER OF SECTION 28, SOUTH 89°23'50” WEST, A DISTANCE OF 933.46 FEET; THENCE SOUTH 00°36'10 EAST, DEPARTING THE NORTH LINE OF SAID NORTHEAST ONE-QUARTER OF SECTION 28, A DISTANCE OF 40.00 FEET, MORE OR LESS, TO THE NORTHWEST CORNER OF SAID TRACT A, SAID NORTHWEST CORNER ALSO BEING ON THE SOUTH LINE OF A 40.00 FOOT RIGHT-OF-WAY DEDICATED ON SAID MINOR SUBDIVISION PLAT AND THE **POINT OF BEGINNING**;

THENCE NORTH 89°23'50" EAST, ALONG THE NORTH LINE OF SAID TRACT A, A DISTANCE OF 833.41 FEET;

THENCE ALONG A CURVE TO THE RIGHT, HAVING A RADIUS OF 30.00 FEET, AN ARC LENGTH OF 47.15 FEET, A CENTRAL ANGLE OF 90°02'41", AND A CHORD BEARING AND DISTANCE OF SOUTH 45°34'50" EAST, 42.44 FEET;

THENCE SOUTH 00°33'29" EAST, ALONG THE EAST LINE OF SAID TRACT A, SAID LINE ALSO BEING THE WEST LINE OF A 70.00 FOOT RIGHT-OF-WAY DEDICATED ON SAID MINOR SUBDIVISION PLAT, A DISTANCE OF 863.36 FEET;

THENCE SOUTH 89°23'50" WEST, ALONG THE SOUTH LINE OF SAID TRACT A, A DISTANCE OF 863.43 FEET;

THENCE NORTH 00°33'29" WEST, ALONG THE WEST LINE OF SAID TRACT A, A DISTANCE OF 893.38 FEET TO THE **POINT OF BEGINNING**.

THE TOTAL AREA OF THE ABOVE DESCRIBED PARCEL IS 17.704 ACRES (771,178 SQUARE FEET) OF LAND, MORE OR LESS.

NOTES:

1. THIS DESCRIPTION WAS PREPARED WITH THE BENEFIT OF A TITLE COMMITMENT ISSUED THROUGH THE OFFICE OF ……, ORDER NUMBER ……., DATED …… FOR ALL INFORMATION REGARDING EASEMENTS, RIGHTS OF WAY, OR TITLE OF RECORD.
2. BEARINGS SHOWN HEREON ARE BASED ON GPS OBSERVATIONS AND/OR THE ONLINE POSITIONING USER SERVICE OFFERED BY THE N.G.S. AND PROJECTED TO "COLORADO COORDINATE SYSTEM OF 1983 NORTH ZONE" (C.R.S. 38-52-105 & 106).
3. DISTANCES SHOWN HEREON ARE IN US SURVEY FEET GROUND. THE COMBINED FACTOR USED TO OBTAIN THE GRID DISTANCES IS 0.99971527.
4. THE BASIS OF BEARINGS FOR THIS SURVEY IS THE EAST LINE OF THE NORTHEAST ONE-QUARTER OF SECTION 28, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., SAID LINE BEING MONUMENTED ON THE NORTH BY THE NORTHEAST CORNER OF SAID SECTION 28, BEING A FOUND 2 INCH ALUMINUM CAP MARKED “PLS 25937” AND ON THE SOUTH BY THE EAST ONE-QUARTER CORNER OF SAID SECTION 28, BEING A FOUND 3.25 INCH ALUMINUM CAP ILLEGIBLY MARKED AND BEARS SOUTH 00°33'29” EAST.

REVISIONS

NO.	DATE	BY	DESCRIPTION

PROJ. NO. 176018
PREPARED BY: H. LAWRENCE SINCO
DATE PREPARED: 06/04/19
FOR AND ON BEHALF OF ACKLAM, INC..
195 TELLURIDE ST., SUITE 7, CO 80601
303.659.6267

Figures

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Appendix A:
Proof of Ownership and Title Commitment

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Appendix A1:
Proof of Ownership

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LAND TITLE GUARANTEE COMPANY
195 SOUTH TELLURIDE ST #10
BRIGHTON, CO 80601
Phone: (303) 655-9973
Fax: (303) 393-4928

"PURCHASERS" STATEMENT OF SETTLEMENT

PROPERTY ADDRESS: **VACANT, Erie, CO 80516**

SELLER(S): **TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION**

BUYER(S): **UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION**

SETTLEMENT DATE: **January 05, 2018** DATE OF PRORATION: **January 05, 2018**

DESCRIPTION	DEBIT	CREDIT
Sales Price & Earnest Money		
Sales Price	344,466.20	
Earnest Money from LTGC - Earnest Money		10,000.00
Title Fees to Land Title Guarantee Company		
Total for Endorsements (DELETION)	100.00	
Title Insurance ALTA Owner's Policy	609.00	
Tax Certificate	26.00	
Closing Fees to Land Title Guarantee Company		
Closing Fee	300.00	
Escrow Set Up Fee	50.00	
Recording Fees to Land Title Guarantee Company		
Record Warranty Deed	33.00	
Record Easement Agreement	28.00	
Record Ordinance	18.00	
Recording Escrow	50.00	
Documentary Fee	34.45	
SubTotals	345,714.65	10,000.00
Due from Buyer/Borrower		**335,714.65**
Totals	345,714.65	345,714.65

The above figures do not include sales or use taxes on property

APPROVED AND ACCEPTED

PURCHASER(S)

UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

By: John Parker

JOHN PARKER, CEO

LAND TITLE CLOSING AGENT:

Debbie Pinkerton

FOREIGN INVESTMENT IN REAL PROPERTY TAX ACT OF 1980
(26 U.S.C. 1445)("FIRPTA")

CERTIFICATION BY TRANSFEROR (ENTITY)
(Pursuant to Regulation C.F.R.1.1445-2(b)(2)(i))

To: **UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION**, (hereinafter referred to as the "Transferee",)

Section 1445 of the Internal Revenue Code provides that a transferee of a U. S. real property interest must withhold tax if the transferor is a foreign person. For U.S. tax purposes (including section 1445), the owner of a disregarded entity (which is legal title to a U.S. real property interest under local law) will be the transferor of the property and not the disregarded entity.

To inform the transferee that withholding of tax is not required upon the disposition of a U. S. real property interest, by **TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION**, hereinafter referred to as the transferor, the undersigned hereby certifies the following on behalf of the transferor:

1. The transferor is not a foreign corporation, foreign partnership, foreign trust, or foreign estate (as those items are defined in the Internal Revenue Code and Income Tax Regulation);
2. The transferor is not a disregarded entity as defined in section 1.1445-2(b)(iii);
3. The transferor's U.S. employer identification number is [redacted]; and
4. The tranferor's office address is:
   [redacted]
5. The transferor understands that this certification will be disclosed to the Internal Revenue Service by the transferee and that any false statement contained therein could be punished by fine, imprisonment, or both.
6. Under penalties of perjury I declare that I have examined this certification and to the best of my knowledge and belief it is true, correct and complete, and I further declare that I have authority to sign this document on behalf of the transferor (i.e. a responsible officer if a corporation, by a general partner if a partnership, and by a trustee or equivalent fiduciary of the case of a trust or estate).

All information required to be obtained in connection with document has been obtained from information supplied by the transferor to Land Title Guarantee Company. For privacy and security reasons, Land Title will retain this information. In the event you are contacted by the Internal Revenue Service concerning FIRPTA, please contact the Company immediately for a copy of this Affidavit which discloses the transferor's Tax Indentification Number.

TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION

Date: **01/04/2018**

By: _____
TINA HARRIS, MAYOR

By: _____
NANCY PARKER, TOWN CLERK

State of **Colorado**)
)ss.
County of Weld)

Sworn to before me on this day of January 4, 2018 by **TINA HARRIS, MAYOR AND NANCY PARK, TOWN CLERK OF TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION**

Witness my hand and official seal

My Commission expires: 11/14/18

Notary Public

JESSICA ANNE KOENIG
NOTARY PUBLIC - STATE OF COLORADO
Notary Identification #20144044046
My Commission Expires 11/14/2018

Note:

1. If you have any questions or concerns arising from your obligation as transferor in regard to this tax, it is suggested that you immediately contact your local Internal Revenue Service office, attorney or accountant if you do not fully understand these regulations. More information, including the regulations promulgated under FIRPTA, is available at the website for the Internal

Revenue Service, www.irs.gov/businesses/small/international

2. The transferee is required to retain this certification until the end of the fifth taxable year following the taxable year in which the transfer takes place. The transferee must make this certification available to the Internal Revenue Service when requested in accordance with the requirements of 26 U.S.C 6001 and regulations thereunder.

COMMERCIAL CLOSING INSTRUCTIONS

TO:Land Title Guarantee Company

RE:VACANT, Erie, CO 80516

1. The Seller(s) and Buyer(s) listed below employ Land Title Guarantee Company (hereinafter referred to as Closing Agent) to act as closing and settlement agent in connection with the real property identified in title commitment No. **25153920.**
2. Closing Agent is authorized to prepare, obtain, deliver and record all documents (including if applicable the Warranty Deed), excluding preparation of legal documents, necessary to carry out the terms and conditions of the Contract by and between the undersigned with amendments and counter proposals attached. Closing Agent is authorized to act as Loan Closing Agent and, if required, as custodian for any lender selected under the terms of the contract.
3. Closing Agent is authorized to receive funds; and to disburse funds under the following conditions:
   a. All funds received are either available for immediate withdrawal as a matter of right from the financial institution in which funds have been deposited; or are available for immediate withdrawal as a consequence of an agreement of a financial institution in which the funds are to be deposited or a financial institution upon which the funds are to be drawn.
4. Seller(s) and Buyer(s) will furnish any additional information and documents required by Closing Agent which will be necessary to complete this transaction, and to comply with the provision of the Contract.
5. Closing Agent will prepare and deliver an accurate and detailed Closing Statement to Seller(s) and Buyer(s) at time of closing.
6. Nothing contained herein shall be construed to alter or supersede the Contract.
7. Should a default occur by either Seller(s) or Buyer(s), Closing Agent is authorized to return all documents, monies, and things of value to the depositing party and Closing Agent will be relieved from any further duty, responsibility or liability in connection with these instructions.
8. In the event of any conflicting demands made on the Closing Agent concerning these instructions, in the sole judgment of the Closing Agent, and at the election of the Closing Agent, Closing Agent may hold any monies, documents, and things of value until Closing Agent received mutual written instructions from Seller(s) and Buyer(s) or until a civil action shall have been finally concluded in a court of competent jurisdiction, determining the rights of all parties. In the alternative, Closing Agent may, at its discretion, at any time, commence a civil action to interplead any conflicting demands to a court of competent jurisdiction. Deposit with the court by the Closing Agent of all monies, documents, and other things of value concerning this transaction, shall relieve Closing Agent of all further liability and responsibility.
9. These closing instructions may be amended or terminated by written instructions from the Seller(s) and Buyer(s) to the Closing Agent.

APPROVED AND ACCEPTED: 1-5-18

SELLER(S)

TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION

By: _____
TINA HARRIS, MAYOR

Signed in Counterpart

By: _____
NANCY PARKER, TOWN CLERK

BUYER(S)

UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

By: John Parker
JOHN PARKER, CEO

APPROVED AND ACCEPTED:
Land Title Guarantee Company
By: _____

COMMERCIAL CLOSING INSTRUCTIONS

TO:Land Title Guarantee Company

RE:VACANT, Erie, CO 80516

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APPROVED AND ACCEPTED: _____

SELLER(S)

TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION

By: _____
TINA HARRIS, MAYOR

By: _____
NANCY PARKER, TOWN CLERK

BUYER(S)

UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

By: Signed in Counterpart
JOHN PARKER, CEO

APPROVED AND ACCEPTED:

Land Title Guarantee Company

By: _____

Agreement for Taxes

It is hereby understood and agreed between the Buyer(s) and Seller(s) of the property known as: **VACANT, Erie, CO 80516**

Tax Schedule Number: R6779088 - EXEMPT
Current Year Taxes have been adjusted as of the date of closing based on _____

☒ Other: **NO TAX PRORATION DUE TO SELLER'S TAX EXEMPT STATUS**

This adjustment shall be:

☒ A final settlement.

☐ Re-adjusted between the Buyer(s) and Seller(s) as soon as the taxes have been billed by the County Treasurer. If a re-adjustment is necessary, Land Title Guarantee Company will not make or be responsible for this re-adjustment.

It is further understood and agreed between the Buyer(s) and Seller(s) that:

☐ No governmental body taxing authority has certified an assessment lien to the County Treasurer for special improvements installed prior to the date of the Buyer's execution of the Agreement for Purchase.

☐ Special Taxing District Assessments being paid in annual installments are to be assumed by the Buyer(s), with current annual assessments in the amount of **$0.00**, with the total payoff amount of this assessment being **$0.00**. This assessment will be fully paid on _____.

Note: Land Title Guarantee Company and/or its underwriter assumes no responsibility or any liability for the adjustment of special taxes on assessments unless they are shown on the County Treasurer's Certificate of Taxes Due. Any adjustment shall be made between the Buyer's and Seller(s), if necessary, and Land Title Guarantee Company, or its underwriter will not make or be responsible for the re-adjustment or liability in connection therewith.

This Agreement made and executed this day of **January 4th, 2018**

Seller(s)

TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION

By: _____
TINA HARRIS, MAYOR
Signed in Counterpart

By: _____
NANCY PARKER, TOWN CLERK

Buyer(s)

UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

By: John Parker
JOHN PARKER, CEO

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Seller(s)

TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION

By: _____
TINA HARRIS, MAYOR

By: _____
NANCY PARKER, TOWN CLERK

Buyer(s)

UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

By: Signed in Counterpart
JOHN PARKER, CEO

UTILITY AGREEMENT

At the closing of **VACANT, Erie, CO 80516** (Property Address)

IT IS THE SELLER(S) RESPONSIBILITY to call the gas and/or electric company for a final reading and to give them a forwarding address for the final bill. It is also the Seller(s) responsibility to notify the telephone company, cable company, trash company and present insurance agent.

IT IS THE BUYER(S) RESPONSIBILITY to call the gas and/or electric company, giving them the personal information they may require for their records, the telephone company, the trash company and the cable company to put service into your name(s) with the correct mailing address, if different than the property just purchased.

____ $**0.00** Is being escrowed from the Seller(s) for the final Account #

____ $**0.00** Is being escrowed from the Buyer(s) for the final Account #

Upon receipt of the Final bill for water and/or sewer, Land Title Guarantee Company will prorate the bill if applicable and pay same. Any refund of any moneys in excess of the Final Bill will be forwarded to the applicable party. In the event that the final water and/or sewer charges exceed the escrowed amounts, any additional charges are the responsibility of the Seller(s), if necessary, and Land Title Guarantee Company, or its underwriter will not make or be responsible for this re-adjustment or have any liability in connection therewith.

____ The billing has been prorated on the basis of a verbal quote via a telephone conversation with

____ The water and sewer is included in the monthly maintenance fees. The monthly maintenance fees and/or reserves have been adjusted pursuant to information received from the Owners Association or the Association's Management Company. Land Title Guarantee Company or its underwriter assumes no responsibility or any liability in the event the figures were misquoted. Any adjustment shall be made between the Buyer(s) and Seller(s), if necessary, and Land Title Guarantee Company, or its underwriter will not make or be responsible for this re-adjustment or have any liability in connection therewith.

__X__ It is hereby agreed by the undersigned Seller(s) and Buyer(s) that Land Title Guarantee Company has not asked for a final reading of the metered water and sewer account or calculated a proration of any standard bills, including water, sewer and storm drainage. Furthermore, Land Title Guarantee Company makes no representations or guarantee as to the status of said account(s). The Seller(s) and Buyer(s) herein agree to hold Land Title Guarantee Company or its underwriter harmless for any penalties for non-payment.

____ _____

____ Seller(s) and Buyer(s) acknowledge that there is not currently a formal or informal landowners/tenant association which may require periodic assessments and/or other fees as a result of this transaction. If there is an association heretofore not known to the settlement agent and/or Seller(s) agent, Land Title Guarantee Company shall escrow funds from Seller(s) pending receipt of a written status letter from the association.

This Agreement was made and executed this day of **January 4th, 2018**

SELLER(S)

TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION

By: _____
TINA HARRIS, MAYOR

By: Signed in Counterpart
NANCY PARKER, TOWN CLERK

BUYER(S)

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IT IS THE BUYER(S) RESPONSIBILITY to call the gas and/or electric company, giving them the personal information they may require for their records, the telephone company, the trash company and the cable company to put service into your name(s) with the correct mailing address, if different than the property just purchased.

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____ The billing has been prorated on the basis of a verbal quote via a telephone conversation with

____ The water and sewer is included in the monthly maintenance fees. The monthly maintenance fees and/or reserves have been adjusted pursuant to information received from the Owners Association or the Association's Management Company. Land Title Guarantee Company or its underwriter assumes no responsibility or any liability in the event the figures were misquoted. Any adjustment shall be made between the Buyer(s) and Seller(s), if necessary, and Land Title Guarantee Company, or its underwriter will not make or be responsible for this re-adjustment or have any liability in connection therewith.

X It is hereby agreed by the undersigned Seller(s) and Buyer(s) that Land Title Guarantee Company has not asked for a final reading of the metered water and sewer account or calculated a proration of any standard bills, including water, sewer and storm drainage. Furthermore, Land Title Guarantee Company makes no representations or guarantee as to the status of said account(s). The Seller(s) and Buyer(s) herein agree to hold Land Title Guarantee Company or its underwriter harmless for any penalties for non-payment.

____ _____

____ Seller(s) and Buyer(s) acknowledge that there is not currently a formal or informal landowners/tenant association which may require periodic assessments and/or other fees as a result of this transaction. If there is an association heretofore not known to the settlement agent and/or Seller(s) agent, Land Title Guarantee Company shall escrow funds from Seller(s) pending receipt of a written status letter from the association.

This Agreement was made and executed this day of **January 4th, 2018**

SELLER(S)

TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION

By: _____
TINA HARRIS, MAYOR

By: _____
NANCY PARKER, TOWN CLERK

BUYER(S)

UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

By: Signed in Counterpart
JOHN PARKER, CEO

DISCLOSURES

The undersigned hereby acknowledge that they understand and agree to the following provisions:

Laws Relating to Unclaimed Funds

All parties are hereby advised that checks issued by Land Title Guarantee Company ("Land Title") and not cashed by the payee are subject to laws of escheat and/or unclaimed property. Should Land Title transfer such funds to a state office, pursuant to such laws, Land Title shall be released from all further responsibility under this agreement and shall not be liable to any Party.

FDIC Limit Notice

The insurance coverage provided by the Federal Deposit Insurance Corporation protects a depositor up to cumulative maximum deposit of $250,000.00 for each insured financial institution. Ownership is determined by the deposit records of the financial institution and/or the records of the named custodian of any escrow accounts. Land Title and its underwriter assume no responsibility for nor will the undersigned hold same liable for any loss which arises from the fact that the amount of the above deposit may cause the aggregate amount of any individual depositor's accounts to exceed $250,000.00.

Funds Held by Land Title

Land Title shall deposit all funds received pursuant to any closing and settlement services separate and apart from the assets of the company, in an account designated as an escrow account or custodial account and so recognized by the depository institution in the name of Land Title as Escrow Agent (Escrow Account). Similar deposits from other customers conducting other real estate transactions are included in this Escrow Account. The majority of these funds are received at closing and on completion of the transaction, are disbursed for the benefit of the seller, buyer or in the case of a refinance, for the benefit of the owner.

Land Title will pay any and all costs associated with the use of the Escrow Account, but in order to help keep settlement costs and fees down, Land Title may arrange for the bank to provide it with a number of services at a reduced rate, or at no charge, or may earn interest on the Escrow Account balance. Interest earned, if any, shall be paid to Land Title. In no event will any such arrangement restrict or limit in any way the disbursement of the funds you deposit in accordance with the instructions given by you and the Statement of Settlement relating to your transaction.

The party for whose benefit the funds are disbursed (most often the seller or owner, in the case of a refinance) may elect to have a portion of the interest earned on the fiduciary funds in the Escrow Account paid to that party. If the seller or owner makes this election, please (i) inform Land Title immediately, (ii) check the box provided below on this form and (iii) complete an IRS Form W-9 (which will be provided by Land Title). It is important to know that the fiduciary funds cannot be placed in a separate interest bearing account for that party's benefit until Land Title is in receipt of all required forms. A non-refundable administrative fee of $50.00 will be collected by Land Title as compensation for processing the documentation, set up and transfer of funds to the separate account, maintaining of audit and reconcilliation records and coordinating the tax documentation.

Authorized and accepted this day of **January 4th, 2018**.

Seller(s):

TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION

By: _____
TINA HARRIS, MAYOR

By: Signed in Counterpart
NANCY PARKER, TOWN CLERK

Buyer(s):

UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

By: John Parker
JOHN PARKER, CEO

If the election is made to have a portion of the interest earned on the fiduciary funds in the Escrow Account paid to you, please check the appropriate box below.

- ☐ Seller hereby elects to have Seller's fiduciary funds invested and agrees to the administrative fee of $50.00.
- ☐ Buyer hereby elects to have Buyer's fiduciary funds invested and agrees to the administrative fee of $50.00.
- ☐ Owner (Refinance) hereby elects to have Owner's fiduciary funds invested and agrees to the administrative fee of $50.00.

DISCLOSURES

The undersigned hereby acknowledge that they understand and agree to the following provisions:

Laws Relating to Unclaimed Funds

All parties are hereby advised that checks issued by Land Title Guarantee Company ("Land Title") and not cashed by the payee are subject to laws of escheat and/or unclaimed property. Should Land Title transfer such funds to a state office, pursuant to such laws, Land Title shall be released from all further responsibility under this agreement and shall not be liable to any Party.

FDIC Limit Notice

The insurance coverage provided by the Federal Deposit Insurance Corporation protects a depositor up to cumulative maximum deposit of $250,000.00 for each insured financial institution. Ownership is determined by the deposit records of the financial institution and/or the records of the named custodian of any escrow accounts. Land Title and its underwriter assume no responsibility for nor will the undersigned hold same liable for any loss which arises from the fact that the amount of the above deposit may cause the aggregate amount of any individual depositor's accounts to exceed $250,000.00.

Funds Held by Land Title

Land Title shall deposit all funds received pursuant to any closing and settlement services separate and apart from the assets of the company, in an account designated as an escrow account or custodial account and so recognized by the depository institution in the name of Land Title as Escrow Agent (Escrow Account). Similar deposits from other customers conducting other real estate transactions are included in this Escrow Account. The majority of these funds are received at closing and on completion of the transaction, are disbursed for the benefit of the seller, buyer or in the case of a refinance, for the benefit of the owner.

Land Title will pay any and all costs associated with the use of the Escrow Account, but in order to help keep settlement costs and fees down, Land Title may arrange for the bank to provide it with a number of services at a reduced rate, or at no charge, or may earn interest on the Escrow Account balance. Interest earned, if any, shall be paid to Land Title. In no event will any such arrangement restrict or limit in any way the disbursement of the funds you deposit in accordance with the instructions given by you and the Statement of Settlement relating to your transaction.

The party for whose benefit the funds are disbursed (most often the seller or owner, in the case of a refinance) may elect to have a portion of the interest earned on the fiduciary funds in the Escrow Account paid to that party. If the seller or owner makes this election, please (i) inform Land Title immediately, (ii) check the box provided below on this form and (iii) complete an IRS Form W-9 (which will be provided by Land Title). It is important to know that the fiduciary funds cannot be placed in a separate interest bearing account for that party's benefit until Land Title is in receipt of all required forms. A non-refundable administrative fee of $50.00 will be collected by Land Title as compensation for processing the documentation, set up and transfer of funds to the separate account, maintaining of audit and reconcilliation records and coordinating the tax documentation.

Authorized and accepted this day of **January 4th, 2018.**

Seller(s):

TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION

By: _____
TINA HARRIS, MAYOR

By: _____
NANCY PARKER, TOWN CLERK

Buyer(s):

UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

Signed in Counterpart

By: _____
JOHN PARKER, CEO

If the election is made to have a portion of the interest earned on the fiduciary funds in the Escrow Account paid to you, please check the appropriate box below.

- ☐ Seller hereby elects to have Seller's fiduciary funds invested and agrees to the administrative fee of $50.00.
- ☐ Buyer hereby elects to have Buyer's fiduciary funds invested and agrees to the administrative fee of $50.00.
- ☐ Owner (Refinance) hereby elects to have Owner's fiduciary funds invested and agrees to the administrative fee of $50.00.

Bill of Sale
(Commercial)

KNOW ALL MEN BY THESE PRESENTS, that **TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION** of the **County of Weld**, State of **Colorado**, (Seller), for and in consideration of **$0.00** (***ZERO and 00/100***) Dollars, to Seller in hand paid,at or before the ensealing or delivery of these presents by **UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION**, of the County of **Adams**, in the State of **Colorado**, (Buyer), the receipt of which is hereby acknowledged, has bargained and sold, and by these presents does hereby grant and convey unto the said Buyer, Buyer's personal representatives, successors and assigns, the following property, all as stated in Section 2.5 Inclusions and 2.6 Exclusions of the Contract to Buy and Sell Real Estate (Land) dated **November 14, 2017** and entered into between the Seller and Buyer:

2.5.1 Inclusions-Attached. If attached to the Property on the date of the Contract, the following items are included unless excluded under **Exclusions:** lighting, heating, plumbing, ventilating, and air conditioning units, TV antennas, inside telephone, network and coaxial (cable) wiring and connecting blocks/jacks, plants, mirrors, floor coverings, intercom systems, built-in kitchen appliances, sprinkler systems and controls, built-in vacuum systems (including accessories), garage door openers (including remote controls). If checked, the following are owned by the Seller and included: **[ ] None [ ] Solar Panels [ ] Water Softeners [ ] Security Systems [ ] Satellite Systems** (including satellite dishes). If any additional items are attached to the Property after the date of the Contract, such additional items are also included in the Purchase Price.

2.5.2. Inclusions-Not Attached. If on the Property whether attached or not on the date of the Contract, the following items are included unless excluded under **Exclusions:** storm windows, storm doors, window and porch shades, awnings, blinds, screens, window coverings and treatments, curtain rods, drapery rods, fireplace inserts, fireplace screens, fireplace grates, heating stoves, storage sheds, carbon monoxide alarms, smoke/fire detectors and all keys.

2.5.3 Personal Property – Conveyance. Any personal property must be conveyed at Closing by Seller free and clear of all taxes (except personal property taxes for the year of Closing), liens and encumbrances, except _____.

2.5.4 Other Inclusions. The following items, whether fixtures or personal property, are also included in the Purchase Price:

2.6. Exclusions. The following items are excluded:

Located at **VACANT, Erie, CO 80516**

TO HAVE AND TO HOLD the same unto the said Buyer, Buyer's personal representatives, successors and assigns, forever. The said Seller covenants and agrees to and with the Buyer, Buyer's personal representatives, successors and assigns, to WARRANT AND DEFEND the sale of the property, goods, and chattels, against all and every person or persons whomever. When used herein, the singular shall include the plural.

Executed, by the Seller on **January 4th, 2018**

TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION

By: _____
TINA HARRIS, MAYOR

By: _____
NANCY PARKER, TOWN CLERK

Approval of Deed, Bill of Sale and Tenancy

The undersigned **UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION** Buyer(s) hereby acknowledge that they intend to take title to the following described property:

A PORTION OF TRACT A, FRONT RANGE LANDFILL MINOR SUBDIVISION, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, LOCATED IN THE NE 1/4 OF SECTION 28, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., COUNTY OF WELD, STATE OF COLORADO, DESCRIBED AS FOLLOWS:
COMMENCING AT THE NE CORNER OF SAID SECTION 28; THENCE ALONG THE NORTH LINE OF SAID SECTION 28, S 89° 24' 50" W, A DISTANCE OF 543.32 FEET, TO A POINT ON SAID NORTH LINE; THENCE LEAVING SAID NORTH LINE, S 00° 33' 29" E, A DISTANCE OF 40.00 FEET, MORE OR LESS, TO A POINT ON THE NORTH LINE OF SAID TRACT A, SAID NORTH LINE ALSO BEING THE SOUTH LINE OF A 40 FOOT RIGHT OF WAY DEDICATED IN SAID MINOR SUBDIVISION AND THE POINT OF BEGINNING;
THENCE LEAVING SAID NORTH LINE OF SAID NORTH LINE OF SAID TRACT A, OVER AND ACROSS SAID TRACT A, S 00° 33' 29" E, A DISTANCE OF 893.38 FEET TO A POINT ON THE SOUTH LINE OF SAID TRACT A; THENCE ALONG SAID SOUTH LINE OF SAID TRACT A, S 89° 24' 50" W, A DISTANCE OF 390.07 FEET TO A POINT ON THE WEST LINE OF SAID TRACT A; THENCE ALONG SAID WEST LINE OF SAID TRACT A, N 00° 33' 29" W, A DISTANCE OF 893.38 FEET TO A POINT ON THE NORTH LINE OF SAID TRACT A, ALSO BEING A POINT ON THE SOUTH LINE OF SAID 40 FOOT RIGHT OF WAY; THENCE ALONG SAID NORTH LINE OF SAID TRACT A, N 89° 24' 50" E, A DISTANCE OF 390.07 FEET, TO THE POINT OF BEGINNING.

As ☐ **Joint Tenants** ☐ **Tenants in Common** ☒ **Other** _____

Whose mailing address is:**P.O. BOX 929, BRIGHTON, CO 80601**

They have reviewed the **SPECIAL WARRANTY DEED** and **Bill of Sale** dated **January 4th, 2018** from **TOWN OF ERIE, A COLORADO MUNICIPAL CORPORATION** to **UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION** and by their signature hereto approve the deed and confirm that it correctly reflects the choice of tenancy, if applicable.

Date: **January 04, 2018**

UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

By: John Parker

JOHN PARKER, CEO

PURCHASER
FINAL AFFIDAVIT AND AGREEMENT

Commitment No. **25153920**

RE: Real property and improvements located at: **VACANT, Erie, CO 80516** in the County of **Weld** State of Colorado, more particularly described as follows:

See attached "Exhibit A"

Whereas, Land Title Guarantee Company has issued its Commitment No. **25153920** covering said Property, the Undersigned, Purchaser of the Real Estate and improvements located on the herein described Property, being first duly sworn on oath, for the purpose of inducing Land Title Guarantee Company to issue its ALTA Policy of Title Insurance, in connection with the Property described in said commitment, do hereby make the following representations to Land Title Guarantee Company, with full knowledge and intent that said company shall rely thereon:

1. That those certain persons, firms and corporations, including the General Contractors, and all subcontractors hired by or under contract with the undersigned who have furnished services, labor or materials, according to plans and specifications or otherwise, used in connection with the construction of improvements on the real estate herein described, have been paid in full.
2. That no claims have been made to the undersigned, nor is any suit now pending on behalf of any contractor, subcontractor, laborer or materialman, nor any other suit of any kind, and that no chattel mortgages, conditional bills of sale, security agreements or financing statements have been made. Further, the undersigned has no knowledge of any liens or encumbrances, not reflected on the commitment, recorded or unrecorded affecting the subject property.
3. That there has been no architectural service or other work of any kind, contracted for or otherwise ordered by the undersigned within the last 120 days, paid or unpaid, which could establish a priority for any future mechanics' lien claimant. If services or other work has been contracted for within the preceding 120 days, the undersigned is required to attach a description of same with the corresponding payment information.
4. That the purchaser(s) have or will take possession of the premises on or about the date of closing
5. That the full purchase price has been paid by said purchaser(s) to said Owner-Seller.

In light of the foregoing facts, the Undersigned, in consideration of the issuance by Land Title Guarantee Company of a policy of Title Insurance covering said property in the manner described by the undersigned as set out above, hereby promise, covenant and agree to hold harmless, protect and indemnify Land Title Guarantee Company, and any title insurance company that has issued an ALTA Policy of insurance pursuant to the commitment described above, from and against those liabilities, losses, damage expenses and charges, including but not limited to reasonable attorneys' fees (including attorney's fees in the enforcement of this agreement) and expenses of litigation arising out of any inaccuracies in the above representations.

UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

By: John Parker

JOHN PARKER, CEO

State of **Colorado**)
)ss.
County of Adams)

The foregoing Final Affidavit and Agreement was subscribed and affirmed before me on this day of January 5th 2018 by **JOHN PARKER, CEO OF UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION**

Witness my hand and official seal

My Commission expires: July 22, 2020

Notary Public

STEVEN BARWICK
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20164027945
MY COMMISSION EXPIRES JULY 22, 2020

Exhibit A

A PORTION OF TRACT A, FRONT RANGE LANDFILL MINOR SUBDIVISION, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, LOCATED IN THE NE 1/4 OF SECTION 28, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., COUNTY OF WELD, STATE OF COLORADO, DESCRIBED AS FOLLOWS:
COMMENCING AT THE NE CORNER OF SAID SECTION 28; THENCE ALONG THE NORTH LINE OF SAID SECTION 28, S 89° 24' 50" W, A DISTANCE OF 543.32 FEET, TO A POINT ON SAID NORTH LINE; THENCE LEAVING SAID NORTH LINE, S 00° 33' 29" E, A DISTANCE OF 40.00 FEET, MORE OR LESS, TO A POINT ON THE NORTH LINE OF SAID TRACT A, SAID NORTH LINE ALSO BEING THE SOUTH LINE OF A 40 FOOT RIGHT OF WAY DEDICATED IN SAID MINOR SUBDIVISION AND THE POINT OF BEGINNING; THENCE LEAVING SAID NORTH LINE OF SAID NORTH LINE OF SAID TRACT A, OVER AND ACROSS SAID TRACT A, S 00° 33' 29" E, A DISTANCE OF 893.38 FEET TO A POINT ON THE SOUTH LINE OF SAID TRACT A; THENCE ALONG SAID SOUTH LINE OF SAID TRACT A, S 89° 24' 50" W, A DISTANCE OF 390.07 FEET TO A POINT ON THE WEST LINE OF SAID TRACT A; THENCE ALONG SAID WEST LINE OF SAID TRACT A, N 00° 33' 29" W, A DISTANCE OF 893.38 FEET TO A POINT ON THE NORTH LINE OF SAID TRACT A, ALSO BEING A POINT ON THE SOUTH LINE OF SAID 40 FOOT RIGHT OF WAY; THENCE ALONG SAID NORTH LINE OF SAID TRACT A, N 89° 24' 50" E, A DISTANCE OF 390.07 FEET, TO THE POINT OF BEGINNING.

4367039 01/11/2018 03:58 PM
Total Pages: 5 Rec Fee: $33.00 Doc Fee: $34.45
Carly Koppes - Clerk and Recorder, Weld County, CO

AFTER RECORDING RETURN TO:

SHERMAN & HOWARD L.L.C.
675 SNAPDRAGON WAY, SUITE 350
STEAMBOAT SPRINGS, COLORADO 80487
ATTN: ALAN M. KEEFFE, ESQ.

State Documentary Fee
Date
$ 34.45

SPECIAL WARRANTY DEED

This **SPECIAL WARRANTY DEED**, made this 4th day of January, 2018, between the **TOWN OF ERIE**, a Colorado municipal corporation, whose legal address is P.O. Box 8, Erie, Colorado 80516, of the Counties of Boulder and Weld, State of Colorado ("**Grantor**"), and **UNITED POWER, INC.**, a Colorado cooperative association, whose legal address is P.O. Box 929, Brighton, Colorado 80601, of the County of Adams, State of Colorado ("**Grantee**").

Grantor, for the consideration of Three Hundred Thirty-Five Thousand and 00/100 Dollars ($335,000.00), grants, sells and conveys to Grantee, its successors and assigns, the real property located in Weld County, Colorado, described in the ***Exhibit A*** attached hereto and made a part hereof (the "**Property**"), and warrants the title to the Property for the benefit of Grantee against all persons claiming under Grantor, subject to the matters shown on ***Exhibit B*** attached hereto and made a part hereof, to the extent (but no further) that the same are valid and subsisting as of the date hereof and affect the Property (the "**Exceptions**"). Grantor's warrants herein do not include or extend to availability, quantity or quality of any water or water rights, claims or title to water.

[Signature Page Follows]

IN WITNESS WHEREOF, the Grantor has executed this Special Warranty Deed on the date set forth above.

TOWN OF ERIE,
a Colorado municipal corporation

By: _____
Tina Harris, Mayor

ATTEST:

By: _____
Nancy Parker, Town Clerk

STATE OF COLORADO)
) ss.
COUNTY OF WELD)

The foregoing instrument was acknowledged before me this 4th day of January, 2018, by Tina Harris, Mayor, and Nancy Parker, Town Clerk, Town of Erie, a Colorado municipal corporation.

WITNESS my hand and official seal.
My commission expires: 11/14/18

JESSICA ANNE KOENIG
NOTARY PUBLIC - STATE OF COLORADO
Notary Identification #20144044046
My Commission Expires 11/14/2018

_____
Notary Public

Exhibit A

EXHIBIT "A"
(SPECIAL WARRANTY DEED)

PROPERTY DESCRIPTION

A PORTION OF TRACT "A" OF FRONT RANGE LANDFILL MINOR SUBDIVISION RECORDED AT RECEPTION NUMBER 3722553, ACCORDING TO THE MAP OR PLAT THEREOF FILED FOR RECORD IN THE OFFICE OF THE WELD COUNTY CLERK AND RECORDER. SAID PARCEL IS LOCATED IN THE NORTHEAST ONE-QUARTER OF SECTION 28, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF SAID SECTION 28; THENCE ALONG THE NORTH LINE OF SAID SECTION 28 SOUTH 89°24'50" WEST, A DISTANCE OF 543.32 FEET, TO A POINT ON SAID NORTH LINE; THENCE LEAVING SAID NORTH LINE SOUTH 00°33'29 EAST, A DISTANCE OF 40.00', MORE OR LESS, TO A POINT ON THE NORTH LINE OF SAID "TRACT A", SAID NORTH LINE ALSO BEING THE SOUTH LINE OF A 40' RIGHT OF WAY DEDICATED IN SAID MINOR SUBDIVISION AND THE POINT OF BEGINNING;

THENCE LEAVING SAID NORTH LINE OF SAID "TRACT A", OVER AND ACROSS SAID "TRACT A" SOUTH 00°33'29" EAST, A DISTANCE OF 893.38 FEET TO A POINT ON THE SOUTH LINE OF SAID "TRACT A";
THENCE ALONG SAID SOUTH LINE OF SAID "TRACT A" SOUTH 89°24'50" WEST, A DISTANCE OF 390.07 FEET TO A POINT ON THE WEST LINE OF SAID "TRACT A";
THENCE ALONG SAID WEST LINE OF SAID "TRACT A" NORTH 00°33'29" WEST, A DISTANCE OF 893.38 FEET TO A POINT ON THE NORTH LINE OF SAID "TRACT A", ALSO BEING A POINT ON THE SOUTH LINE OF SAID 40' RIGHT OF WAY;
THENCE ALONG SAID NORTH LINE OF SAID "TRACT A" NORTH 89°24'50" EAST, A DISTANCE OF 390.07 FEET; TO THE POINT OF BEGINNING.

THE TOTAL AREA OF THE ABOVE DESCRIBED PARCEL IS 8.000 ACRES (348,481 SQUARE FEET) OF LAND, MORE OR LESS.

NOTES:

1. THIS DESCRIPTION WAS PREPARED WITHOUT THE BENEFIT OF A TITLE COMMITMENT, THEREFORE ACKLAM, INC. HAS NOT RESEARCHED OR SHOWN ANY OTHER EASEMENTS, RIGHTS OF WAY, VARIANCES AND OR AGREEMENTS OF RECORD EXCEPT AS SHOWN HEREON.
2. BEARINGS SHOWN HEREON ARE BASED ON GPS OBSERVATIONS AND/OR THE ONLINE POSITIONING USER SERVICE OFFERED BY THE N.G.S. AND PROJECTED TO "COLORADO COORDINATE SYSTEM OF 1983 NORTH ZONE" (C.R.S. 38-52-106 & 106).
3. DISTANCES SHOWN HEREON ARE IN US SURVEY FEET GROUND. THE COMBINED FACTOR USED TO OBTAIN THE GRID DISTANCES IS 0.99971527.
4. THE BASIS OF BEARINGS FOR THIS SURVEY IS THE EAST LINE OF THE NORTHEAST ONE-QUARTER OF SECTION 28, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., SAID LINE BEING MONUMENTED ON THE NORTH BY THE NORTHEAST CORNER OF SAID SECTION 28, BEING A FOUND 2 INCH ALUMINUM CAP MARKED "PLS 25937" AND ON THE SOUTH BY THE EAST ONE-QUARTER CORNER OF SAID SECTION 28, BEING A FOUND 3.25 INCH ALUMINUM CAP ILLEGIBLY MARKED AND BEARS SOUTH 00°33'29" EAST.

PROJ. NO. 175018
PREPARED BY: H. LAWRENCE SINCO
DATE PREPARED: 01/04/18
FOR AND ON BEHALF OF ACKLAM, INC.
195 TELLURIDE ST., SUITE 7, CO 80601
303.659.6267
LAST_DOC_EXH_DESC_REV_2.dwg
PRINTED: 1/4/2018 12:21:05 PM Lawrence Sinco

REVISIONS

NO.	DATE	BY	DESCRIPTION
1	12/28/17	DWC	REVISE PREAMBLE & REFERENCE
2	01/03/18	HLS	REVISE EXHIBIT NAME

Exhibit B

1. (A) TAXES OR ASSESSMENTS THAT ARE NOT SHOWN AS EXISTING LIENS BY THE RECORDS OF ANY TAXING AUTHORITY THAT LEVIES TAXES OR ASSESSMENTS ON REAL PROPERTY OR BY THE PUBLIC RECORDS; (B) PROCEEDINGS BY A PUBLIC AGENCY THAT MAY RESULT IN TAXES OR ASSESSMENTS, OR NOTICES OF SUCH PROCEEDINGS, WHETHER OR NOT SHOWN BY THE RECORDS OF SUCH AGENCY OR BY THE PUBLIC RECORDS.

2. ALL OIL, GAS, MINERALS AND OTHER MINERAL RIGHTS AS RESERVED IN INSTRUMENT RECORDED DECEMBER 23, 1937, IN BOOK 1020 AT PAGE 37, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.

3. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS OF DECREE OF TAKING RECORDED JANUARY 26, 1950 IN BOOK 1261 AT PAGE 385.

4. RIGHT OF WAY EASEMENT AS GRANTED TO VESSELS OIL & GAS COMPANY IN INSTRUMENT RECORDED OCTOBER 20, 1986, UNDER RECEPTION NO. 2073905 AND 2073906 AND 2073907 AND 2073908 AND 2073909 AND 2073910 AND 2073911 AND 2073912.

5. TERMS, CONDITIONS AND PROVISIONS OF ORDER RECORDED AUGUST 28, 1990 AT RECEPTION NO. 2224977.

6. MATTERS AS SET FORTH ON SURVEY RECORDED MAY 11, 1992 AT RECEPTION NO. 2287666

7. TERMS, CONDITIONS AND PROVISIONS OF SITE SPECFIC DEVELOPMENT PLAN RECORDED JANUARY 03, 1992 AT RECEPTION NO. 2274087.

8. TERMS, CONDITIONS AND PROVISIONS OF ROAD MAINTENANCE AGREEMENT RECORDED NOVEMBER 05, 1992 AT RECEPTION NO. 2309797.

9. TERMS, CONDITIONS AND PROVISIONS OF AMENDMENT TO ROAD MAINTENANCE AGREEMENT RECORDED MARCH 29, 1994 AT RECEPTION NO. 2380579.

10. TERMS, CONDITIONS AND PROVISIONS OF ANNEXATION AGREEMENTS RECORDED JUNE 25, 1996 AT RECEPTION NO. 2498056 AND 2498057.

11. TERMS, CONDITIONS AND PROVISIONS OF ORDINANCE RECORDED AUGUST 29, 1997 AT RECEPTION NO. 2566356.

12. EASEMENTS, CONDITIONS, COVENANTS, RESTRICTIONS, RESERVATIONS AND NOTES ON THE PLAT OF FRONT RANGE LANDFILL MINOR SUBDIVISION RECORDED OCTOBER 01, 2010 UNDER RECEPTION NO. 3722553.

13. TERMS, CONDITIONS AND PROVISIONS OF AGREEMENT RECORDED OCTOBER 01, 2010 AT RECEPTION NO. 3722554.

14. OIL AND GAS LEASE RECORDED JUNE 22, 2017 UNDER RECEPTION NO. 4312577 AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

15. ANY FACTS, RIGHTS, INTERESTS OR CLAIMS WHICH MAY EXIST OR ARISE BY REASON OF THE FOLLOWING FACTS SHOWN ON ALTA/NSPS LAND TITLE SURVEY CERTIFIED JANUARY 3, 2018 PREPARED BY ACKLAM, INC., JOB NAME "LAZY DOG": A. OVERHEAD POWER LINE WITHOUT AN EASEMENT B. ALL UNDERGROUND UTILITY LINES MAY NOT HAVE BEEN LOCATED.

END OF EXCEPTIONS

REAL PROPERTY TRANSFER DECLARATION - (TD-1000)

GENERAL INFORMATION

Purpose: The Real Property Transfer Declaration provides essential information to the county assessor to help ensure fair and uniform assessments for all property for property tax purposes. Refer to 39-14-102(4), Colorado Revised Statutes (C.R.S.).

Requirements: All conveyance documents (deeds) subject to the documentary fee submitted to the county clerk and recorder for recordation must be accompanied by a Real Property Transfer Declaration. This declaration must be completed and signed by the grantor (seller) or grantee (buyer). Refer to 39-14-102(1)(a), C.R.S.

Penalty for Noncompliance: Whenever a Real Property Transfer Declaration does not accompany the deed, the clerk and recorder notifies the county assessor who will send a notice to the buyer requesting that the declaration be returned within thirty days after the notice is mailed.
If the completed Real Property Transfer Declaration is not returned to the county assessor within the 30 days of notice, the assessor may impose a penalty of $25.00 or .025% (.00025) of the sale price, whichever is greater. This penalty may be imposed for any subsequent year that the buyer fails to submit the declaration until the property is sold. Refer to 39-14-102(1)(b), C.R.S.

Confidentiality: The assessor is required to make the Real Property Transfer Declaration available for inspection to the buyer. However, it is only available to the seller if the seller filed the declaration. Information derived from the Real Property Transfer Declaration is available to any taxpayer or any agent of such taxpayer subject to confidentiality requirements as provided by law. Refer to 39-5-121.5, C.R.S. and 39-13-102(5)(c), C.R.S.

---

1. Address and/or legal description of the real property sold: Please do not use P.O. Box numbers
   VACANT, Erie, CO 80516
2. Type of Property purchased: ☐ Single Family Residential ☐ Townhome ☐ Condominium ☐ Multi-Use Res ☐ Commercial
   ☐ Industrial ☐ Agricultural ☐ Mixed Use ☒ Vacant Land ☐ Other _____
3. Date of Closing: **January 04, 2018**

   Date of Contract if different than date of closing: **November 14, 2017**
4. Total sale price: Including all real and personal property. **$344,466.20**
5. Was any personal property included in the transaction? Personal property would include, but not limited to, carpeting, draperies, free standing appliances, equipment, inventory, furniture. If the personal property is not listed, the entire purchase price will be assumed to be for the real property as per 39-13-102, C.R.S.
   ☐ Yes ☒ No If yes, approximate value $_____ Describe:_____
6. Did the total sales price include a trade or exchange of additional real or personal property? If yes, give the approximate value of the goods or services as of the date of closing.
   ☐ Yes ☒ No If yes, value $ _____
   If yes, does this transaction involve a trade under IRS Code Section 1031? ☐ Yes ☒ No
7. Was 100% interest in the real property purchased? Mark "no" if only a partial interest is being purchased.
   ☒ Yes ☐ No If no, interest purchased: _____ %
8. Is this a transaction among related parties? Indicate whether the buyer or seller are related. Related parties include persons within the same family, business affiliates, or affiliated corporations.
   ☐ Yes ☒ No
9. Check any of the following that apply to the condition of the improvements at the time of purchase:
   ☐ New ☐ Excellent ☐ Good ☐ Average ☐ Fair ☐ Poor ☐ Salvage

If the property is financed, please complete the following:

10. Total amount financed: $ _____
11. Type of financing: (Check all that apply)
    ☐ New ☐ Assumed ☐ Seller ☐ Third Party ☐ Combination; Explain

12. Terms:
    Variable Starting interest rate %
    ☐ Fixed Interest rate %
    Length of time years
    Balloon Payment ☐ Yes ☐ No If yes, amount $0.00 Due Date

13. Mark any that apply: ☐ Seller assisted down payment ☐ Seller concessions ☐ Special terms of financing.

    If marked, please specify:

For properties other than residential (Residential is defined as: single family detached, townhomes, apartments, and condominiums) please complete questions 14-16 if applicable. Otherwise, skip to #17 to complete.

14. Did the purchase price include a franchise or license fee? ☐ Yes ☐ No
    If yes, franchise or license fee value?

15. Did the purchase price involve an installment land contract? ☐ Yes ☐ No
    If yes, date of contract:

16. If this was a vacant land sale, was an on-site inspection of the property conducted by the buyer prior to the closing?
    ☐ Yes ☐ No

    Remarks: Please include any additional information concerning the sale you may feel is important.

17. Signed on this day of **12/29/2017**
    Have at least one of the parties to the transaction sign the document, and include an address and a daytime phone number.
    Signature of ☒ Grantee(Buyer) ☐ or Grantor(Seller)

    UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

    By: John Parker
    JOHN PARKER, CEO

18. All future correspondence (tax bills, property valuations, etc.) regarding this property should be mailed to:
    UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION
    P.O. BOX 929 BRIGHTON, CO 80601
    Phone: Email:

4367040 01/11/2018 03:58 PM
Total Pages: 4 Rec Fee: $28.00
Carly Koppes - Clerk and Recorder, Weld County, CO

EASEMENT AGREEMENT

RECORDING INFORMATION ABOVE

R/W # _____

GRANT OF EASEMENT

Town of Erie, a Colorado municipal corporation, GRANTOR, whose address is 645 Holbrook St., Erie, Colorado 80516, in consideration of Nine Thousand Four Hundred Sixty-six and 20/100 Dollars ($9,466.20), receipt of which is hereby acknowledged, grants and conveys unto UNITED POWER, INC., a Colorado cooperative association, GRANTEE, whose address is P.O. Box 929, Brighton, Colorado 80601, its successors and assigns, a perpetual easement and the right to construct, operate, maintain, replace, enlarge, reconstruct, improve, inspect, repair and remove utility, electrical and communications facilities and all fixtures and devices appurtenant thereto, as may from time to time be useful to, or required by Grantee, on, over, under, and across the following described property in the County of Weld, State of Colorado to-wit:

Easement description as set forth in Exhibit A-1 and as depicted in Exhibit A-2 attached hereto and incorporated herein by reference.

Those facilities may be overhead, underground and/or at grade and may include, but shall not be limited to, poles, cables, conduits, wire, conductors, transformers, manholes and supports of whatever materials, including braces, guides, and other fixtures or devices used or useful in connection therewith.

Grantee shall have the right of ingress and egress 24 hours a day, 7 days a week, over and across the easement property described in Exhibit A to survey, construct, operate, maintain, replace, enlarge, reconstruct, improve, inspect, repair and remove utility, electrical and communications facilities and all fixtures and devices appurtenant thereto, and the right to remove any objects interfering therewith, including but not limited to, the trimming of trees and bushes as may be necessary. Grantee shall also have the right to use any portion of the easement property described in Exhibit A during surveying, construction, maintenance, replacement, enlargement, reconstruction, improvement, inspection, repairs and removal as may be required to permit the operation of standard utility construction or repair machinery or the operation of any other company within the boundaries of this easement.

Grantor reserves the right to occupy, use, and landscape said easement for all purposes not inconsistent with the rights granted to Grantee so long as said use does not damage or interfere with the Grantee's facilities or the construction, operation, maintenance, replacement, enlargement, reconstruction, improvement, inspection, repair and removal thereof. Grantor shall not plant any tree or bush within 5.0 feet of any existing Grantee facilities or within 10.0 feet of the opening side of any transformer or cabinet without the prior written approval of Grantee. Grantor shall not install, or permit the installation of, any buildings or permanent structures or facilities of any kind on, over, under, or across said easement without the prior written approval of Grantee.

Upon completion of construction, Grantee shall restore the surface of Grantor's property to substantially the same level and condition as existed prior to construction.

Each and every one of the benefits and burdens of this Grant of Easement shall run with the land and shall inure to and be binding upon the respective legal representatives, heirs, executors, administrators, successors and assigns of the parties hereto. The rights of Grantee hereunder may be exercised by its employees, licensees, contractors and permittees.

Grantor warrants that Grantor is the fee owner of the encumbered property and has the full right and lawful authority to make the grant contained herein.
Grantee shall defend, indemnify and hold harmless Grantor, its affiliates and the officers, directors, employees and agents of both, from any and all claims for personal injury to Grantor's personnel or damage to Grantor's property or to the property of Grantor's personnel, occurring as a result of Grantee's activities described herein, howsoever caused.
The venue for any dispute arising from this Grant of Easement shall be in the courts of Weld County, Colorado.
Unless special provisions are listed below and/or attached, the above constitutes the entire agreement between the parties and no additional or different oral representation; promise or agreement shall be binding on any of the parties with respect to the subject matter of this Grant of Easement.

SIGNED AND SEALED BY GRANTOR this 3rd **day of** January, 2018

GRANTOR:
Town of Erie, a Colorado municipal corporation

BY: _____
Tina Harris, Mayor

ATTEST:

By: _____
Nancy Parker, CMC, Town Clerk

STATE OF COLORADO)
)
COUNTY OF WELD)

ACKNOWLEDGMENT

I, Jessica Anne Koenig, a Notary Public for said County and State, do hereby certify that **Tina Harris, Mayor,** and **Nancy Parker, Town Clerk,** personally came before me this day and acknowledged that she is the Mayor / Town Clerk, respectively, of the Town of Erie, a Colorado municipal corporation, and being authorized to do so, executed the foregoing Grant of Easement on behalf of Grantor.

WITNESS my hand and official Notarial Seal, this 31st day of January, 2018

_____
Notary Public

My Commission Expires: 11/14/2018

JESSICA ANNE KOENIG
NOTARY PUBLIC - STATE OF COLORADO
Notary Identification #20144044046
My Commission Expires 11/14/2018

EXHIBIT "A-1"
(GRANT OF EASEMENT)

PERMANENT EASEMENT DESCRIPTION

A TWENTY (20) FOOT WIDE STRIP BEING A PORTION OF "TRACT "A" OF FRONT RANGE LANDFILL MINOR SUBDIVISION RECORDED AT RECEPTION NUMBER 3722553, ACCORDING TO THE MAP OR PLAT THEREOF FILED FOR RECORD IN THE OFFICE OF THE WELD COUNTY CLERK AND RECORDER. SAID PARCEL IS LOCATED IN THE NORTHEAST ONE-QUARTER OF SECTION 28, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, SAID TWENTY (20) FOOT WIDE STRIP, BEING TEN (10) FEET, AS MEASURED PERPENDICULAR, LEFT AND RIGHT OF THE FOLLOWING DESCRIBED CENTERLINE:

COMMENCING AT THE NORTHEAST CORNER OF SAID SECTION 28; THENCE SOUTH 03°46'37" WEST, A DISTANCE OF 926.06 FEET, MORE OR LESS, TO A POINT ON THE EAST LINE OF SAID "TRACT A", SAID EAST LINE ALSO BEING THE WEST LINE OF A 70' RIGHT OF WAY DEDICATED IN SAID MINOR SUBDIVISION AND THE **POINT OF BEGINNING**;

THENCE LEAVING SAID EAST LINE OF SAID "TRACT A", OVER AND ACROSS SAID "TRACT A" SOUTH 89°24'50" WEST, A DISTANCE OF 473.32 FEET, MORE OR LESS, TO THE **POINT OF TERMINUS** FROM WHICH THE EAST ONE-QUARTER CORNER OF SAID SECTION 28 BEARS SOUTH 18°05'19" EAST, A DISTANCE OF 1803.78 FEET.

THE SIDELINES OF THE HEREIN DESCRIBED RIGHT OF WAY ARE SHORTENED OR LENGTHENED TO MEET AT ANGLE POINTS AND TO BEGIN ON SAID EAST LINE OF SAID "TRACT A" AND END ON A LINE PERPENDICULAR TO THE LAST COURSE AT THE POINT OF TERMINUS.

THE TOTAL AREA OF THE ABOVE DESCRIBED EASEMENT IS 0.217 ACRES (9,466 SQUARE FEET) OF LAND, MORE OR LESS.

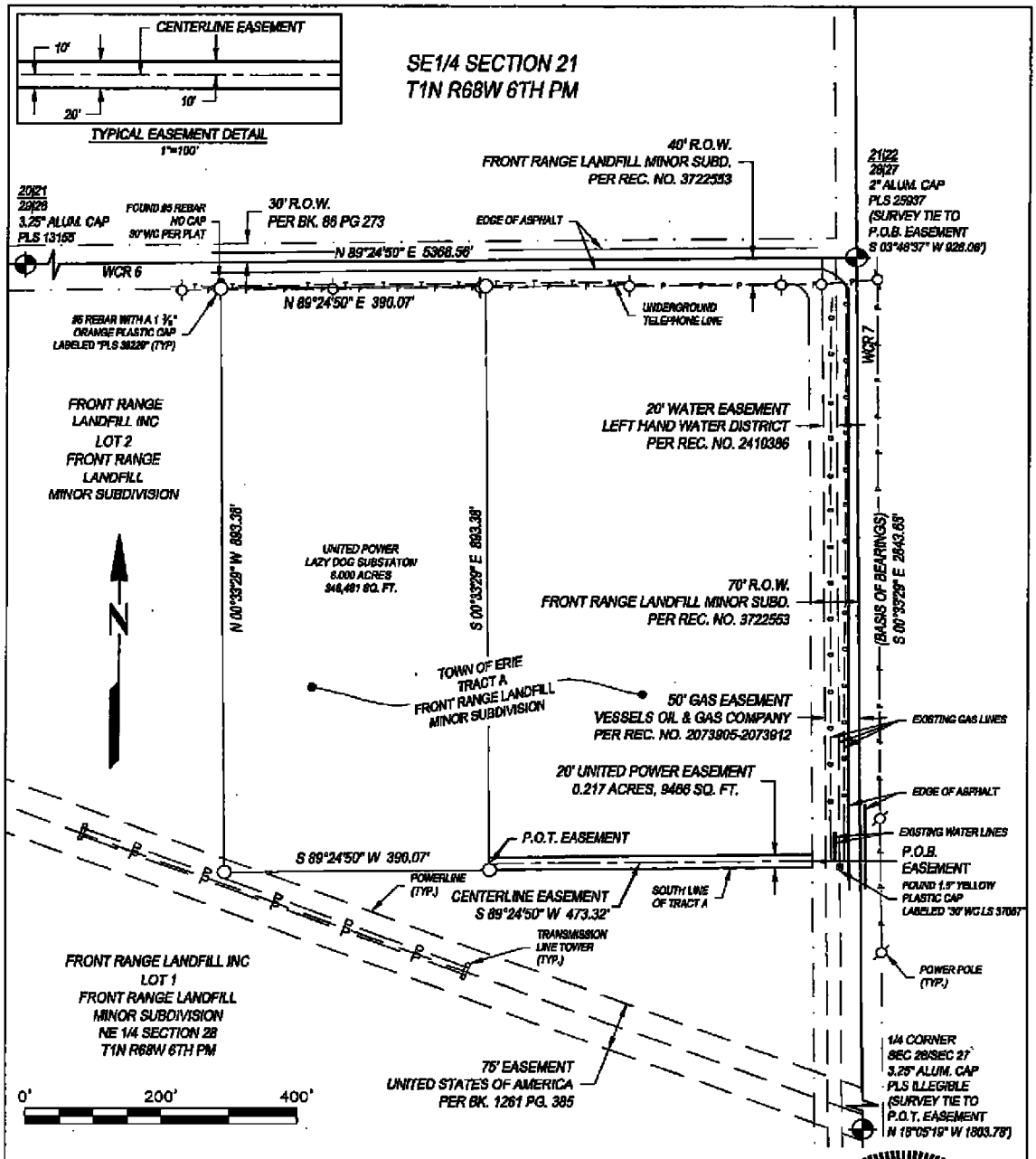
NOTES:

1. SEE THE ATTACHED EXHIBIT "A-2" ILLUSTRATION BY WHICH THIS REFERENCE IS MADE PART HEREOF.
2. THIS DESCRIPTION WAS PREPARED WITHOUT THE BENEFIT OF A TITLE COMMITMENT. THEREFORE ACKLAM, INC. HAS NOT RESEARCHED OR SHOWN ANY OTHER EASEMENTS, RIGHTS OF WAY, VARIANCES AND OR AGREEMENTS OF RECORD EXCEPT AS SHOWN HEREON.
3. BEARINGS SHOWN HEREON ARE BASED ON GPS OBSERVATIONS AND/OR THE ONLINE POSITIONING USER SERVICE OFFERED BY THE N.G.S. AND PROJECTED TO "COLORADO COORDINATE SYSTEM OF 1983 NORTH ZONE" (C.R.S. 38-52-105 & 106).
4. DISTANCES SHOWN HEREON ARE IN US SURVEY FEET GROUND. THE COMBINED FACTOR USED TO OBTAIN THE GRID DISTANCES IS 0.99971527.
5. THE BASIS OF BEARINGS FOR THIS SURVEY IS THE EAST LINE OF THE NORTHEAST ONE-QUARTER OF SECTION 28, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., SAID LINE BEING MONUMENTED ON THE NORTH BY THE NORTHEAST CORNER OF SAID SECTION 28, BEING A FOUND 2 INCH ALUMINUM CAP MARKED "PLS 25937" AND ON THE SOUTH BY THE EAST ONE-QUARTER CORNER OF SAID SECTION 28, BEING A FOUND 3.25 INCH ALUMINUM CAP ILLEGIBLY MARKED AND BEARS SOUTH 00°33'29" EAST.

PROJ. NO. 176018
PREPARED BY: H. LAWRENCE SINCO
DATE PREPARED: 01/04/18
FOR AND ON BEHALF OF ACKLAM, INC..
195 TELLURIDE ST., SUITE 7, CO 80601
303.659.6267
LAZY_DO3_ESMT_DESC.docx
PRINTED: 1/4/2018 12:20:00 PM Lawrence Sinco

REVISIONS

NO.	DATE	BY	DESCRIPTION



NOTES

1. LOCATIONS OF UTILITIES AND FOREIGN PIPELINES WERE DETERMINED FROM VISIBLE SURFACE EVIDENCE. THESE LOCATIONS IF SHOWN MAY NOT BE ACCURATE OR COMPLETE. OTHER UTILITIES MAY EXIST AND ARE TO BE FIELD LOCATED BY OTHERS PRIOR TO EXCAVATION.
2. THIS EXHIBIT WAS PREPARED WITHOUT THE BENEFIT OF A TITLE COMMITMENT, THEREFORE ACKLAM, INC. HAS NOT RESEARCHED OR SHOWN ANY OTHER EASEMENTS, RIGHTS OF WAY, VARIANCES AND OR AGREEMENTS OF RECORD EXCEPT AS SHOWN HEREON.
3. THIS EXHIBIT IS NOT A LAND SURVEY PLAT OR IMPROVEMENT SURVEY PLAT. IT IS NOT TO BE RELIED UPON FOR THE ESTABLISHMENT OF ANY LAND BOUNDARY, EASEMENT, FENCE, BUILDING, OR OTHER FUTURE IMPROVEMENT LINES.
4. BEARINGS SHOWN HEREON ARE BASED ON GPS OBSERVATIONS VIA "YRS NOW" POSITIONING SYSTEM AND/OR THE ONLINE POSITIONING USER SERVICE OFFERED BY THE N.G.S. AND PROJECTED TO "COLORADO COORDINATE SYSTEM OF 1983 NORTH ZONE" (C.R.S. 38-52-105 & 106). DISTANCES SHOWN HEREON ARE IN US SURVEY FEET GROUND. THE COMBINED FACTOR USED TO OBTAIN THE GRID DISTANCES IS 0.99971527.
5. 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.
6. THIS EXHIBIT WAS PREPARED BY H. LAWRENCE SIMOO, PLS 38229, FOR AND ON BEHALF OF ACKLAM, INC. 195 TELLURIDE ST., SUITE 7, BRIGHTON, CO 80601.

Acklam, Inc. 195 Telluride St., Suite 7 Brighton CO, 80601	UNITED POWER EXHIBIT "A-2" NE1/4 SECTION 28 T1N R68W 6TH PM, WELD COUNTY, COLORADO	SCALE: 1"=200' DATE: 01/03/17 SR JOB NO.: 176018 JOB NAME: LAZY DOG SUBSTATION SHEET 2 OF 2 REV: - WORK ORDER NO.: 201707016

Z:\Acklam Jobs\2017\United Power\176018_WO_201711019_LAZY DOG SUBSTATION\Drawings\176018_LAZY DOG_EASEMENT_EXHIBIT.dwg, 1/4/2018 11:40:51 AM

REAL PROPERTY TRANSFER DECLARATION - (TD-1000)

GENERAL INFORMATION

Purpose: The Real Property Transfer Declaration provides essential information to the county assessor to help ensure fair and uniform assessments for all property for property tax purposes. Refer to 39-14-102(4), Colorado Revised Statutes (C.R.S.).

Requirements: All conveyance documents (deeds) subject to the documentary fee submitted to the county clerk and recorder for recordation must be accompanied by a Real Property Transfer Declaration. This declaration must be completed and signed by the grantor (seller) or grantee (buyer). Refer to 39-14-102(1)(a), C.R.S.

Penalty for Noncompliance: Whenever a Real Property Transfer Declaration does not accompany the deed, the clerk and recorder notifies the county assessor who will send a notice to the buyer requesting that the declaration be returned within thirty days after the notice is mailed.
If the completed Real Property Transfer Declaration is not returned to the county assessor within the 30 days of notice, the assessor may impose a penalty of $25.00 or .025% (.00025) of the sale price, whichever is greater. This penalty may be imposed for any subsequent year that the buyer fails to submit the declaration until the property is sold. Refer to 39-14-102(1)(b), C.R.S.

Confidentiality: The assessor is required to make the Real Property Transfer Declaration available for inspection to the buyer. However, it is only available to the seller if the seller filed the declaration. Information derived from the Real Property Transfer Declaration is available to any taxpayer or any agent of such taxpayer subject to confidentiality requirements as provided by law. Refer to 39-5-121.5, C.R.S. and 39-13-102(5)(c), C.R.S.

---

1. Address and/or legal description of the real property sold: Please do not use P.O. Box numbers
   VACANT, Erie, CO 80516
2. Type of Property purchased: ☐ Single Family Residential ☐ Townhome ☐ Condominium ☐ Multi-Use Res ☐ Commercial
   ☐ Industrial ☐ Agricultural ☐ Mixed Use ☒ Vacant Land ☐ Other _____
3. Date of Closing: **January 04, 2018**

   Date of Contract if different than date of closing: **November 14, 2017**
4. Total sale price: Including all real and personal property. **$344,466.20**
5. Was any personal property included in the transaction? Personal property would include, but not limited to, carpeting, draperies, free standing appliances, equipment, inventory, furniture. If the personal property is not listed, the entire purchase price will be assumed to be for the real property as per 39-13-102, C.R.S.
   ☐ Yes ☒ No If yes, approximate value $_____ Describe:_____
6. Did the total sales price include a trade or exchange of additional real or personal property? If yes, give the approximate value of the goods or services as of the date of closing.
   ☐ Yes ☒ No If yes, value $ _____
   If yes, does this transaction involve a trade under IRS Code Section 1031? ☐ Yes ☒ No
7. Was 100% interest in the real property purchased? Mark "no" if only a partial interest is being purchased.
   ☒ Yes ☐ No If no, interest purchased: _____ %
8. Is this a transaction among related parties? Indicate whether the buyer or seller are related. Related parties include persons within the same family, business affiliates, or affiliated corporations.
   ☐ Yes ☒ No
9. Check any of the following that apply to the condition of the improvements at the time of purchase:
   ☐ New ☐ Excellent ☐ Good ☐ Average ☐ Fair ☐ Poor ☐ Salvage

If the property is financed, please complete the following:

10. Total amount financed: $ _____
11. Type of financing: (Check all that apply)
    ☐ New ☐ Assumed ☐ Seller ☐ Third Party ☐ Combination; Explain

12. Terms:

Variable	Starting interest rate	%
☐ Fixed	Interest rate	%
	Length of time	years
	Balloon Payment	☐ Yes ☐ No If yes, amount $0.00 Due Date

13. Mark any that apply: ☐ Seller assisted down payment ☐ Seller concessions ☐ Special terms of financing.

If marked, please specify:

For properties other than residential (Residential is defined as: single family detached, townhomes, apartments, and condominiums) please complete questions 14-16 if applicable. Otherwise, skip to #17 to complete.

14. Did the purchase price include a franchise or license fee? ☐ Yes ☐ No
If yes, franchise or license fee value?

15. Did the purchase price involve an installment land contract? ☐ Yes ☐ No
If yes, date of contract:

16. If this was a vacant land sale, was an on-site inspection of the property conducted by the buyer prior to the closing?
☐ Yes ☐ No

Remarks: Please include any additional information concerning the sale you may feel is important.

17. Signed on this day of **12/29/2017**
Have at least one of the parties to the transaction sign the document, and include an address and a daytime phone number.
Signature of ☒ Grantee(Buyer) ☐ or Grantor(Seller)

UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

By: John Parker

JOHN PARKER, CEO

18. All future correspondence (tax bills, property valuations, etc.) regarding this property should be mailed to:
UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

P.O. BOX 929 BRIGHTON, CO 80601

Phone: Email:

Appendix A2:
Title Commitment

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Land Title Guarantee Company
Customer Distribution

PREVENT FRAUD - Please remember to call a member of our closing team when initiating a wire transfer or providing wiring instructions.

Order Number: **FCC25153920.1** Date: **08/07/2019**

Property Address: **VACANT, Erie, CO 80516**

PLEASE CONTACT YOUR CLOSER OR CLOSER'S ASSISTANT FOR WIRE TRANSFER INSTRUCTIONS

For Closing Assistance
Debbie Pinkerton
195 SOUTH TELLURIDE ST #10
BRIGHTON, CO 80601
(303) 224-2283 (Work)
(303) 393-4928 (Work Fax)
dpinkerton@ltgc.com
Contact License: CO270869
Company License: CO44565

For Title Assistance
Larimer/Weld County Title Team
772 WHALERS WAY #100
FORT COLLINS, CO 80525
(970) 282-3649 (Work)
(970) 282-3652 (Work Fax)
customercare@ltgc.com

Buyer/Borrower
UNITED POWER, INC.
Attention: STEVE BARWICK
P.O. BOX 929
BRIGHTON, CO 80601
(303) 637-1234 (Work)
SBARWICK@UNITEDPOWER.COM
Delivered via: Electronic Mail

Land Title Guarantee Company
Estimate of Title Fees

Order Number: **FCC25153920.1** Date: **08/07/2019**

Property Address: **VACANT, Erie, CO 80516**

Parties: **UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION**

UNITED POWER INC., A COLORADO COOPERATIVE ASSOCIATION

Visit Land Title's Website at **www.ltgc.com** for directions to any of our offices.

Estimate of Title insurance Fees	
"ALTA" Owner's Policy 06-17-06	$0.00
Endorsement 107.12-06 PARCEL A	$129.00
	Total $129.00
If Land Title Guarantee Company will be closing this transaction, the fees listed above will be collected at closing.	
Thank you for your order!	

Note: The documents linked in this commitment should be reviewed carefully. These documents, such as covenants conditions and restrictions, may affect the title, ownership and use of the property. You may wish to engage legal assistance in order to fully understand and be aware of the implications of the effect of these documents on your property.

Chain of Title Documents:

Weld county recorded 01/11/2018 under reception no. 4367039

Weld county recorded 10/11/2000 under reception no. 2799484

Plat Map(s):

Weld county recorded 10/01/2010 under reception no. 3722553

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule A

Order Number: FCC25153920.1

Property Address:

VACANT, Erie, CO 80516

1. **Effective Date:**

   08/02/2019 at 5:00 P.M.

2. **Policy to be Issued and Proposed Insured:**

   "ALTA" Owner's Policy 06-17-06 $344,466.20
   Proposed Insured:
   UNITED POWER, INC., A COLORADO COOPERATIVE ASSOCIATION

3. **The estate or interest in the land described or referred to in this Commitment and covered herein is:**

   A Fee Simple Interest in Parcel A, Easement Estate contained in GRANT OF EASEMENT recorded JANUARY 11, 2018, at Reception No. **4367040**.

4. **Title to the estate or interest covered herein is at the effective date hereof vested in:**

   UNITED POWER INC., A COLORADO COOPERATIVE ASSOCIATION

5. **The Land referred to in this Commitment is described as follows:**

   PARCEL A:

   A PORTION OF TRACT A, FRONT RANGE LANDFILL MINOR SUBDIVISION, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, LOCATED IN THE NE 1/4 OF SECTION 28, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., COUNTY OF WELD, STATE OF COLORADO, DESCRIBED AS FOLLOWS: COMMENCING AT THE NE CORNER OF SAID SECTION 28; THENCE ALONG THE NORTH LINE OF SAID SECTION 28, S 89° 24' 50" W, A DISTANCE OF 543.32 FEET, TO A POINT ON SAID NORTH LINE; THENCE LEAVING SAID NORTH LINE, S 00° 33' 29" E, A DISTANCE OF 40.00 FEET, MORE OR LESS, TO A POINT ON THE NORTH LINE OF SAID TRACT A, SAID NORTH LINE ALSO BEING THE SOUTH LINE OF A 40 FOOT RIGHT OF WAY DEDICATED IN SAID MINOR SUBDIVISION AND THE POINT OF BEGINNING;
   THENCE LEAVING SAID NORTH LINE OF SAID NORTH LINE OF SAID TRACT A, OVER AND ACROSS SAID TRACT A, S 00° 33' 29" E, A DISTANCE OF 893.38 FEET TO A POINT ON THE SOUTH LINE OF SAID TRACT A; THENCE ALONG SAID SOUTH LINE OF SAID TRACT A, S 89° 24' 50" W, A DISTANCE OF 390.07 FEET TO A POINT ON THE WEST LINE OF SAID TRACT A; THENCE ALONG SAID WEST LINE OF SAID TRACT A, N 00° 33' 29" W, A DISTANCE OF 893.38 FEET TO A POINT ON THE NORTH LINE OF SAID TRACT A, ALSO BEING A POINT ON THE SOUTH LINE OF SAID 40 FOOT RIGHT OF WAY; THENCE ALONG SAID NORTH LINE OF SAID TRACT A, N 89° 24' 50" E, A DISTANCE OF 390.07 FEET, TO THE POINT OF BEGINNING.

   PARCEL B (EASEMENT):

   A TWENTY (20) FOOT WIDE STRIP BEING A PORTION OF ”TRACT A” OF FRONT RANGE LANDFILL MINOR SUBDIVISION RECORDED AT RECEPTION NO. 3722553, ACCORDING TO THE MAP OR PLAT THEREOF FILED FOR RECORD IN THE OFFICE OF THE WELD COUNTY CLERK AND RECORDER, SAID PARCEL IS LOCATED IN THE NORTHEAST ONE-QUARTER OF SECTION 28, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, SAID TWENTY (20) FOOT WIDE STRIP, BEING TEN (10) FEET, AS MEASURED PERPENDICULAR, LEFT AND RIGHT OF THE FOLLOWING DESCRIBED CENTERLINE:

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule A

Order Number: FCC25153920.1

COMMENCING AT THE NORTHEAST CORNER OF SAID SECTION 28; THENCE SOUTH 03°46'37" WEST A DISTANCE OF 926.06 FEET, MORE OR LESS, TO A POINT ON THE EAST LINE OF SAID "TRACT A", SAID EAST LINE ALSO BEING THE WEST LINE OF A 70' RIGHT OF WAY DEDICATED IN SAID MINOR SUBDIVISION AND THE POINT OF BEGINNING;
THENCE LEAVING SAID EAST LINE OF SAID "TRACT A", OVER AND ACROSS SAID "TRACT A" SOUTH 89°24'50" WEST, A DISTANCE OF 473.32 FEET, MORE OR LESS, TO THE POINT OF TERMINUS FROM WHICH THE EAST ONE-QUARTER CORNER OF SAID SECTION 28 BEARS SOUTH 18°05'19" EAST, A DISTANCE OF 1803.78 FEET

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ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B, Part I

(Requirements)

Order Number: FCC25153920.1

All of the following Requirements must be met:

This proposed Insured must notify the Company in writing of the name of any party not referred to in this Commitment who will obtain an interest in the Land or who will make a loan on the Land. The Company may then make additional Requirements or Exceptions.

Pay the agreed amount for the estate or interest to be insured.

Pay the premiums, fees, and charges for the Policy to the Company.

Documents satisfactory to the Company that convey the Title or create the Mortgage to be insured, or both, must be properly authorized, executed, delivered, and recorded in the Public Records.

1. PAYMENT OF PREMIUM FOR ENDORSEMENT 107.12.

   NOTE: COVERAGE FOR DELETION OF EXCEPTIONS 1-4 IS NOT EXTENDED.

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B, Part II

(Exceptions)

Order Number: FCC25153920.1

This commitment does not republish any covenants, condition, restriction, or limitation contained in any document referred to in this commitment to the extent that the specific covenant, conditions, restriction, or limitation violates state or federal law based on race, color, religion, sex, sexual orientation, gender identity, handicap, familial status, or national origin.

1. **Any facts, rights, interests, or claims thereof, not shown by the Public Records but that could be ascertained by an inspection of the Land or that may be asserted by persons in possession of the Land.**
2. **Easements, liens or encumbrances, or claims thereof, not shown by the Public Records.**
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.**
4. **Any lien, or right to a lien, for services, labor or material heretofore or hereafter furnished, imposed by law and not shown by the Public Records.**
5. **Defects, liens, encumbrances, adverse claims or other matters, if any, created, first appearing in the public records or attaching subsequent to the effective date hereof but prior to the date of the proposed insured acquires of record for value the estate or interest or mortgage thereon covered by this Commitment.**
6. **(a) Taxes or assessments that are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the Public Records; (b) proceedings by a public agency that may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the Public Records.**
7. **(a) Unpatented mining claims; (b) reservations or exceptions in patents or in Acts authorizing the issuance thereof; (c) water rights, claims or title to water.**
8. TAXES AND ASSESSMENTS.
9. ALL OIL, GAS, MINERALS AND OTHER MINERAL RIGHTS AS RESERVED IN INSTRUMENT RECORDED DECEMBER 23, 1937, IN BOOK 1020 AT PAGE 37, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.
10. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS OF DECREE OF TAKING RECORDED JANUARY 26, 1950 IN BOOK 1261 AT PAGE 385.
11. RIGHT OF WAY EASEMENT AS GRANTED TO VESSELS OIL & GAS COMPANY IN INSTRUMENT RECORDED OCTOBER 20, 1986, UNDER RECEPTION NO. 2073905 AND 2073906 AND 2073907 AND 2073908 AND 2073909 AND 2073910 AND 2073911 AND 2073912.
12. TERMS, CONDITIONS AND PROVISIONS OF ORDER RECORDED AUGUST 28, 1990 AT RECEPTION NO. 2224977.
13. MATTERS AS SET FORTH ON SURVEY RECORDED MAY 11, 1992 AT RECEPTION NO. 2287666
14. TERMS, CONDITIONS AND PROVISIONS OF SITE SPECFIC DEVELOPMENT PLAN RECORDED JANUARY 03, 1992 AT RECEPTION NO. 2274087.

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B, Part II

(Exceptions)

Order Number: FCC25153920.1

15. TERMS, CONDITIONS AND PROVISIONS OF ROAD MAINTENANCE AGREEMENT RECORDED NOVEMBER 05, 1992 AT RECEPTION NO. **2309797**.
16. TERMS, CONDITIONS AND PROVISIONS OF AMENDMENT TO ROAD MAINTENANCE AGREEMENT RECORDED MARCH 29, 1994 AT RECEPTION NO. **2380579**.
17. TERMS, CONDITIONS AND PROVISIONS OF ANNEXATION AGREEMENTS RECORDED JUNE 25, 1996 AT RECEPTION NO. **2498056** AND **2498057**.
18. TERMS, CONDITIONS AND PROVISIONS OF ORDINANCE RECORDED AUGUST 29, 1997 AT RECEPTION NO. **2566356**.
19. EASEMENTS, CONDITIONS, COVENANTS, RESTRICTIONS, RESERVATIONS AND NOTES ON THE PLAT OF FRONT RANGE LANDFILL MINOR SUBDIVISION RECORDED OCTOBER 01, 2010 UNDER RECEPTION NO. **3722553**.
20. TERMS, CONDITIONS AND PROVISIONS OF AGREEMENT RECORDED OCTOBER 01, 2010 AT RECEPTION NO. **3722554**.
21. OIL AND GAS LEASE RECORDED JUNE 22, 2017 UNDER RECEPTION NO. **4312577** AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.
22. FAILURE TO COMPLY WITH THE TERMS, CONDITIONS AND PROVISIONS OF GRANT OF EASEMENT RECORDED JANUARY 11, 2018, AT RECEPTION NO. **4367040**.
23. ANY FACTS, RIGHTS, INTERESTS OR CLAIMS WHICH MAY EXIST OR ARISE BY REASON OF THE FOLLOWING FACTS SHOWN ON ALTA/NSPS LAND TITLE SURVEY CERTIFIED JANUARY 3, 2018 PREPARED BY ACKLAM, INC., JOB NAME "LAZY DOG":
    A. OVERHEAD POWER LINE WITHOUT AN EASEMENT
    B. ALL UNDERGROUND UTILITY LINES MAY NOT HAVE BEEN LOCATED.
    (SAID SURVEY STORED AS OUR ESI **34956619**)
24. THE EFFECT OF ORDINANCE NO. 26-2017, RECORDED FEBRUARY 22, 2018, UNDER RECEPTION NO. **4377261**.

LAND TITLE GUARANTEE COMPANY
DISCLOSURE STATEMENTS

Note: Pursuant to CRS 10-11-122, notice is hereby given that:

(A) The Subject real property may be located in a special taxing district.

(B) A certificate of taxes due listing each taxing jurisdiction will be obtained from the county treasurer of the county in which the real property is located or that county treasurer's authorized agent unless the proposed insured provides written instructions to the contrary. (for an Owner's Policy of Title Insurance pertaining to a sale of residential real property).

(C) The information regarding special districts and the boundaries of such districts may be obtained from the Board of County Commissioners, the County Clerk and Recorder, or the County Assessor.

Note: Effective September 1, 1997, CRS 30-10-406 requires that all documents received for recording or filing in the clerk and recorder's office shall contain a top margin of at least one inch and a left, right and bottom margin of at least one half of an inch. The clerk and recorder may refuse to record or file any document that does not conform, except that, the requirement for the top margin shall not apply to documents using forms on which space is provided for recording or filing information at the top margin of the document.

Note: Colorado Division of Insurance Regulations 8-1-2 requires that "Every title entity shall be responsible for all matters which appear of record prior to the time of recording whenever the title entity conducts the closing and is responsible for recording or filing of legal documents resulting from the transaction which was closed". Provided that Land Title Guarantee Company conducts the closing of the insured transaction and is responsible for recording the legal documents from the transaction, exception number 5 will not appear on the Owner's Title Policy and the Lenders Policy when issued.

Note: Affirmative mechanic's lien protection for the Owner may be available (typically by deletion of Exception no. 4 of Schedule B, Section 2 of the Commitment from the Owner's Policy to be issued) upon compliance with the following conditions:

(A) The land described in Schedule A of this commitment must be a single family residence which includes a condominium or townhouse unit.

(B) No labor or materials have been furnished by mechanics or material-men for purposes of construction on the land described in Schedule A of this Commitment within the past 6 months.

(C) The Company must receive an appropriate affidavit indemnifying the Company against un-filed mechanic's and material-men's liens.

(D) The Company must receive payment of the appropriate premium.

(E) If there has been construction, improvements or major repairs undertaken on the property to be purchased within six months prior to the Date of Commitment, the requirements to obtain coverage for unrecorded liens will include: disclosure of certain construction information; financial information as to the seller, the builder and or the contractor; payment of the appropriate premium fully executed Indemnity Agreements satisfactory to the company, and, any additional requirements as may be necessary after an examination of the aforesaid information by the Company.

No coverage will be given under any circumstances for labor or material for which the insured has contracted for or agreed to pay.

Note: Pursuant to CRS 10-11-123, notice is hereby given:

This notice applies to owner's policy commitments disclosing that a mineral estate has been severed from the surface estate, in Schedule B-2.

(A) That there is recorded evidence that a mineral estate has been severed, leased, or otherwise conveyed from the surface estate and that there is substantial likelihood that a third party holds some or all interest in oil, gas, other minerals, or geothermal energy in the property; and

(B) That such mineral estate may include the right to enter and use the property without the surface owner's permission.

Note: Pursuant to CRS 10-1-128(6)(a), It is unlawful to knowingly provide false, incomplete, or misleading facts or information to an insurance company for the purpose of defrauding or attempting to defraud the company. Penalties may include imprisonment, fines, denial of insurance, and civil damages. Any insurance company or agent of an insurance company who knowingly provides false, incomplete, or misleading facts or information to a policyholder or claimant for the purpose of defrauding or attempting to defraud the policyholder or claimant with regard to a settlement or award payable from insurance proceeds shall be reported to the Colorado Division of Insurance within the Department of Regulatory Agencies.

Note: Pursuant to Colorado Division of Insurance Regulations 8-1-3, notice is hereby given of the availability of a closing protection letter for the lender, purchaser, lessee or seller in connection with this transaction.

JOINT NOTICE OF PRIVACY POLICY OF LAND TITLE GUARANTEE COMPANY, LAND TITLE GUARANTEE COMPANY OF SUMMIT COUNTY LAND TITLE INSURANCE CORPORATION AND OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY

This Statement is provided to you as a customer of Land Title Guarantee Company as agent for Land Title Insurance Corporation and Old Republic National Title Insurance Company.

We want you to know that we recognize and respect your privacy expectations and the requirements of federal and state privacy laws. Information security is one of our highest priorities. We recognize that maintaining your trust and confidence is the bedrock of our business. We maintain and regularly review internal and external safeguards against unauthorized access to your non-public personal information ("Personal Information").

In the course of our business, we may collect Personal Information about you from:

- applications or other forms we receive from you, including communications sent through TMX, our web-based transaction management system;
- your transactions with, or from the services being performed by us, our affiliates, or others;
- a consumer reporting agency, if such information is provided to us in connection with your transaction;

  and
- The public records maintained by governmental entities that we obtain either directly from those entities, or from our affiliates and non-affiliates.

Our policies regarding the protection of the confidentiality and security of your Personal Information are as follows:

- We restrict access to all Personal Information about you to those employees who need to know that information in order to provide products and services to you.
- We may share your Personal Information with affiliated contractors or service providers who provide services in the course of our business, but only to the extent necessary for these providers to perform their services and to provide these services to you as may be required by your transaction.
- We maintain physical, electronic and procedural safeguards that comply with federal standards to protect your Personal Information from unauthorized access or intrusion.
- Employees who violate our strict policies and procedures regarding privacy are subject to disciplinary action.
- We regularly assess security standards and procedures to protect against unauthorized access to Personal Information.

WE DO NOT DISCLOSE ANY PERSONAL INFORMATION ABOUT YOU WITH ANYONE FOR ANY PURPOSE THAT IS NOT STATED ABOVE OR PERMITTED BY LAW.

Consistent with applicable privacy laws, there are some situations in which Personal Information may be disclosed. We may disclose your Personal Information when you direct or give us permission; when we are required by law to do so, for example, if we are served a subpoena; or when we suspect fraudulent or criminal activities. We also may disclose your Personal Information when otherwise permitted by applicable privacy laws such as, for example, when disclosure is needed to enforce our rights arising out of any agreement, transaction or relationship with you.

Our policy regarding dispute resolution is as follows: Any controversy or claim arising out of or relating to our privacy policy, or the breach thereof, shall be settled by arbitration in accordance with the rules of the American Arbitration Association, and judgment upon the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof.

Commitment For Title Insurance

Issued by Old Republic National Title Insurance Corporation

NOTICE

IMPORTANT—READ CAREFULLY: THIS COMMITMENT IS AN OFFER TO ISSUE ONE OR MORE TITLE INSURANCE POLICIES. ALL CLAIMS OR REMEDIES SOUGHT AGAINST THE COMPANY INVOLVING THE CONTENT OF THIS COMMITMENT OR THE POLICY MUST BE BASED SOLELY IN CONTRACT.

THIS COMMITMENT IS NOT AN ABSTRACT OF TITLE, REPORT OF THE CONDITION OF TITLE, LEGAL OPINION, OPINION OF TITLE, OR OTHER REPRESENTATION OF THE STATUS OF TITLE. THE PROCEDURES USED BY THE COMPANY TO DETERMINE INSURABILITY OF THE TITLE, INCLUDING ANY SEARCH AND EXAMINATION, ARE PROPRIETARY TO THE COMPANY, WERE PERFORMED SOLELY FOR THE BENEFIT OF THE COMPANY, AND CREATE NO EXTRACONTRACTUAL LIABILITY TO ANY PERSON, INCLUDING A PROPOSED INSURED.

THE COMPANY'S OBLIGATION UNDER THIS COMMITMENT IS TO ISSUE A POLICY TO A PROPOSED INSURED IDENTIFIED IN SCHEDULE A IN ACCORDANCE WITH THE TERMS AND PROVISIONS OF THIS COMMITMENT. THE COMPANY HAS NO LIABILITY OR OBLIGATION INVOLVING THE CONTENT OF THIS COMMITMENT TO ANY OTHER PERSON. .

COMMITMENT TO ISSUE POLICY

Subject to the Notice; Schedule B, Part I—Requirements; Schedule B, Part II—Exceptions; and the Commitment Conditions, Old Republic National Title Insurance Company, a Minnesota corporation (the "Company"), commits to issue the Policy according to the terms and provisions of this Commitment. This Commitment is effective as of the Commitment Date shown in Schedule A for each Policy described in Schedule A, only when the Company has entered in Schedule A both the specified dollar amount as the Proposed Policy Amount and the name of the Proposed Insured. If all of the Schedule B, Part I—Requirements have not been met within 6 months after the Commitment Date, this Commitment terminates and the Company's liability and obligation end.

COMMITMENT CONDITIONS

1. DEFINITIONS
   (a) "Knowledge" or "Known": Actual or imputed knowledge, but not constructive notice imparted by the Public Records.
   (b) "Land": The land described in Schedule A and affixed improvements that by law constitute real property. The term "Land" does not include any property beyond the lines of the area described in Schedule A, nor any right, title, interest, estate, or easement in abutting streets, roads, avenues, alleys, lanes, ways, or waterways, but this does not modify or limit the extent that a right of access to and from the Land is to be insured by the Policy.
   (c) "Mortgage": A mortgage, deed of trust, or other security instrument, including one evidenced by electronic means authorized by law.
   (d) "Policy": Each contract of title insurance, in a form adopted by the American Land Title Association, issued or to be issued by the Company pursuant to this Commitment.
   (e) "Proposed Insured": Each person identified in Schedule A as the Proposed Insured of each Policy to be issued pursuant to this Commitment.
   (f) "Proposed Policy Amount": Each dollar amount specified in Schedule A as the Proposed Policy Amount of each Policy to be issued pursuant to this Commitment.
   (g) "Public Records": Records established under state statutes at the Commitment Date for the purpose of imparting constructive notice of matters relating to real property to purchasers for value and without Knowledge.
   (h) "Title": The estate or interest described in Schedule A.

2. If all of the Schedule B, Part I—Requirements have not been met within the time period specified in the Commitment to Issue Policy, Comitment terminates and the Company's liability and obligation end.

3. The Company's liability and obligation is limited by and this Commitment is not valid without:
   (a) the Notice;
   (b) the Commitment to Issue Policy;
   (c) the Commitment Conditions;
   (d) Schedule A;
   (e) Schedule B, Part I—Requirements; and
   (f) Schedule B, Part II—Exceptions; and
   (g) a counter-signature by the Company or its issuing agent that may be in electronic form.

4. **COMPANY'S RIGHT TO AMEND**

   The Company may amend this Commitment at any time. If the Company amends this Commitment to add a defect, lien, encumbrance, adverse claim, or other matter recorded in the Public Records prior to the Commitment Date, any liability of the Company is limited by Commitment Condition 5. The Company shall not be liable for any other amendment to this Commitment.

5. **LIMITATIONS OF LIABILITY**
   (a) The Company's liability under Commitment Condition 4 is limited to the Proposed Insured's actual expense incurred in the interval between the Company's delivery to the Proposed Insured of the Commitment and the delivery of the amended Commitment, resulting from the Proposed Insured's good faith reliance to:
      i. comply with the Schedule B, Part I—Requirements;
      ii. eliminate, with the Company's written consent, any Schedule B, Part II—Exceptions; or
      iii. acquire the Title or create the Mortgage covered by this Commitment.
   (b) The Company shall not be liable under Commitment Condition 5(a) if the Proposed Insured requested the amendment or had Knowledge of the matter and did not notify the Company about it in writing.
   (c) The Company will only have liability under Commitment Condition 4 if the Proposed Insured would not have incurred the expense had the Commitment included the added matter when the Commitment was first delivered to the Proposed Insured.
   (d) The Company's liability shall not exceed the lesser of the Proposed Insured's actual expense incurred in good faith and described in Commitment Conditions 5(a)(i) through 5(a)(iii) or the Proposed Policy Amount.
   (e) The Company shall not be liable for the content of the Transaction Identification Data, if any.

(f) In no event shall the Company be obligated to issue the Policy referred to in this Commitment unless all of the Schedule B, Part I—Requirements have been met to the satisfaction of the Company.
(g) In any event, the Company's liability is limited by the terms and provisions of the Policy.

6. **LIABILITY OF THE COMPANY MUST BE BASED ON THIS COMMITMENT**
   (a) Only a Proposed Insured identified in Schedule A, and no other person, may make a claim under this Commitment.
   (b) Any claim must be based in contract and must be restricted solely to the terms and provisions of this Commitment.
   (c) Until the Policy is issued, this Commitment, as last revised, is the exclusive and entire agreement between the parties with respect to the subject matter of this Commitment and supersedes all prior commitment negotiations, representations, and proposals of any kind, whether written or oral, express or implied, relating to the subject matter of this Commitment.
   (d) The deletion or modification of any Schedule B, Part II—Exception does not constitute an agreement or obligation to provide coverage beyond the terms and provisions of this Commitment or the Policy.
   (e) Any amendment or endorsement to this Commitment must be in writing and authenticated by a person authorized by the Company.
   (f) When the Policy is issued, all liability and obligation under this Commitment will end and the Company's only liability will be under the Policy.

7. **IF THIS COMMITMENT HAS BEEN ISSUED BY AN ISSUING AGENT**

   The issuing agent is the Company's agent only for the limited purpose of issuing title insurance commitments and policies. The issuing agent is not the Company's agent for the purpose of providing closing or settlement services.
8. **PRO-FORMA POLICY**

   The Company may provide, at the request of a Proposed Insured, a pro-forma policy illustrating the coverage that the Company may provide. A pro-forma policy neither reflects the status of Title at the time that the pro-forma policy is delivered to a Proposed Insured, nor is it a commitment to insure.
9. **ARBITRATION**

   The Policy contains an arbitration clause. All arbitrable matters when the Proposed Policy Amount is $2,000,000 or less shall be arbitrated at the option of either the Company or the Proposed Insured as the exclusive remedy of the parties. A Proposed Insured may review a copy of the arbitration rules at http://www.alta.org/arbitration.

IN WITNESS WHEREOF, Land Title Insurance Corporation has caused its corporate name and seal to be affixed by its duly authorized officers on the date shown in Schedule A to be valid when countersigned by a validating officer or other authorized signatory.

Issued by:
Land Title Guarantee Company
3033 East First Avenue Suite 600
Denver, Colorado 80206
303-321-1880

President

Old Republic National Title Insurance Company, a Stock Company
400 Second Avenue South
Minneapolis, Minnesota 55401
(612)371-1111

Mark Bilbrey, President

Rande Yeager, Secretary

This page is only a part of a 2016 ALTA® Commitment for Title Insurance issued by Land Title Insurance Corporation. This Commitment is not valid without the Notice; the Commitment to Issue Policy; the Commitment Conditions; Schedule A; Schedule B, Part I—Requirements; and Schedule B, Part II—Exceptions; and a counter-signature by the Company or its issuing agent that may be in electronic form.

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Appendix C:
Phase III Drainage Report, Construction Plan, and Operation and Maintenance Plan

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Appendix C1:
Phase III Drainage Report and Construction Plan

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TRI-STATE GENERATION & TRANSMISSION, INC.

LAZY DOG SUBSTATION
PHASE III - DRAINAGE REPORT

August 7, 2019

Prepared by:

DEL-MONT CONSULTANTS, INC.
ENGINEERING ▼ SURVEYING
125 Colorado Ave. ▼ Montrose, CO 81401 ▼ (970) 249-2251 ▼ (970) 249-2342 FAX
www.del-mont.com ▼ service@del-mont.com

TRI-STATE GENERATION & TRANSMISSION, INC.

LAZY DOG SUBSTATION
PHASE III- DRAINAGE REPORT

ENGINEER'S CERTIFICATION

I hereby certify that this drainage report for the drainage design of the Lazy Dog Substation was prepared by me (or under my direct supervision) in accordance with the provisions of the *Town of Erie Standards and Specifications for Design and Construction* for the owners thereof. I understand that the Town of Erie does not and will not assume liability for drainage facilities designed by others, including the designs presented in this report.

David Schieldt
Registered Professional Engineer
State of Colorado No. 47195

TOWN ACCEPTANCE

This report has been reviewed and found to be in general compliance with the *Town of Erie Standards and Specifications for Design and Construction* and other Town requirements. The accuracy and validity of the engineering design, details, dimensions, quantities, and concepts in this report remains the sole responsibility of the professional engineer whose stamp and signature appear hereon:

Accepted by: _____ _____

Town Engineer Date

TABLE OF CONTENTS

1.0 General Location and Description

Tri-State Generation and Transmission (TSGT) and United Power (UP) in coordination with Del-Mont Consultants, Inc. (DMC) is in the process of designing a new substation yard. The scope of work includes the construction of the substation yard, driveway, detention pond and swales, installation of new perimeter and property fence, and the addition of high voltage electrical equipment and facilities. The purpose of this report is to present the findings from the hydrologic and hydraulic analyses that were performed on the existing property as well as present the results from a detailed analysis performed on the proposed improvements to the property.

1.1 Site Location

The proposed substation yard is located on an 8.0 acre parcel owned by UP, situated in the NE ¼ of NE ¼ of Section 28, Township 1 North, Range 68 West, 6th Principal Meridian in Weld County, Colorado. The substation site is accessed from County Road 6 approximately 0.15 miles West of County Road 7.

1.2 Site Description

The site naturally drains from southwest to northeast and is currently covered in agricultural crops. There are currently no features on the site to provide water quality or quantity treatment for discharge from the site. Site layout details will be discussed in more detail in **Section 2**.

The site receives run on from the south and west from the neighboring property. Coal Creek is approximately 2 miles to the west and the site is not located within a floodplain. There are no developments on or near the site with the exception of a processing facility located across County Road 6 which has no impact on the site. No wetlands are present on the site.

2.0 Drainage Basins and Sub-Basins

The property functions overall as one drainage basin flowing to the northeast, towards Weld County Road 6. Water then enters the roadside ditch and heads north and east away from the site via overland swales/drainage, ultimately ending up in Little Dry Creek. Proposed conditions produce several smaller sub-basins and will be discussed in detail in the following sections.

2.1 Existing Drainage Sub-Basins

The existing sub-basins consist of two offsite basins (Offsite West and Offsite South) and one overall basin for the entire 8-acre property (Existing Site). The entire property discharges northeasterly to the road side swale on the south side of CR 6. A map illustrating the delineation of the existing property can be found in **Appendix A**. There is currently no development present on the neighboring property located to the south and west. Run-on from the South will be routed around the site and discharged to the East. Run-on from the West will be collected and routed through the site. **Table 2-1** presents the existing sub-basin and its corresponding acreage.

Table 2-1: Existing Sub-Basins Acreages

Sub-Basin	Total Area (Acres)
Existing Site	8.00
Offsite West	6.00
Offsite South	3.50

2.2 Proposed Drainage Sub-Basins

The proposed site is divided into four different sub-basins; North Yard, South Yard, East, and West. A map illustrating the delineation of the sub-basins can be found in **Appendix A**. The South Yard sub-basin drains to a ditch located on the east side of the yard, eventually being routed under the driveway to the detention pond. The North Yard sub-basin contains the detention pond and portions of the access driveway and the entire basin flows directly to the detention pond. The West sub-basin flows to the northeast to a culvert located on the south side of CR6 under the driveway. The East sub-basin leaves the property flowing to the north east, ultimately ending in the road side ditch on the south side of CR6. A portion of the East sub-basin includes a 200-foot section of the driveway that will be paved with asphalt or crushed asphalt. This impervious area is less than 20% of the site, so it is not required to be detained. **Table 2-2** presents the proposed sub-basins and their corresponding acreages.

Table 2-2: Proposed Sub-Basin Acreages

Sub-Basin	Total Area (Acres)
North Yard	1.77
South Yard	1.34
East	1.56
West	3.33

3.0 Drainage Design Criteria

3.1 Methodology

The hydrologic/hydraulic analysis of the site was performed using Autodesk Storm and Sanitary analysis utilizing the Rational Method model for a 5-year, 1-hour rainfall event of 1.11 total inches and a 100-year, 1-hour rainfall event of 2.68 total inches. Runoff Coefficients and rainfall depths were obtained from the Town of Erie Storm Drainage Facilities Standards and Specifications. Modeling results are presented in **Appendix D**.

The Urban Drainage *Detention Basin Design Workbook* was utilized to determine the required water quality capture volume (WQCV) and to design the outlet structure. The spreadsheets/worksheets can be found in **Appendix C** and are discussed in more detail in **Section 4.0**.

Soil data was obtained from a USDA Soils Report, and gives a hydrologic soil group C for the site. The soils report is included in **Appendix B**.

The described methods/tools used in the analysis, are in accordance with Weld County's and the Town of Erie's storm drainage criteria.

3.2 Land Cover Hydrologic Properties

Runoff Coefficients and Percent Impervious numbers, for hydrologic soil group C, were assigned to the various land cover types found on the project, both existing and proposed, per Town of Erie Standards, and are presented in **Table 3-1**.

Table 3-1: Land Cover Hydrologic Properties

Land Cover Type	Percent Impervious	Runoff Coefficient* 5 year	Runoff Coefficient* 100 year
Pasture or Range Land, Fair Condition (Existing Site)	2%	0.05	0.49
Open Graded Aggregate Topping Over Compacted Base (Substation Yard)	40%	0.36	0.65
Compacted Base Material (Driveways)	40%	0.36	0.65
Pavement/Concrete	90%	0.77	0.85
Pond	100%	0.85	0.89

*Runoff Coefficient values from Table 6-5 of the Urban Storm Drainage Criteria Manual

3.3 Weighted Design Values

Utilizing the land cover hydrologic properties presented above, a weighted Runoff Coefficient and Percent Impervious value was calculated for each of the sub-basins, presented in **Section 2.0** to be used for analysis. **Table 3-2** presents the weighted design values for existing conditions and **Table 3-3** presents the weighted design values for proposed conditions. Detailed calculations can be found in **Appendix C**.

Table 3-2: Existing Sub-Basin Weighted Design Values

Sub-Basin	Total Area (Acres)	Weighted Percent Impervious	Weighted Runoff Coefficient 5 year	Weighted Runoff Coefficient 100 year
Existing Site	8.00	2%	0.05	0.49
Offsite West	6.00	2%	0.05	0.49
Offsite South	3.50	2%	0.05	0.49

Table 3-3: Proposed Sub-Basin Weighted Design Values

Sub-Basin	Total Area (Acres)	Weighted Percent Impervious	Weighted Runoff Coefficient 5 year	Weighted Runoff Coefficient 100 year
North Yard	1.77	75%	0.65	0.79
South Yard	1.34	43%	0.38	0.66
East	1.56	13%	0.14	0.54
West	3.33	5%	0.07	0.50

4.0 Drainage Facility Design

4.1 Historical Drainage

Per Town of Erie requirements, the historical discharge rate from the 5 year – 1-hour storm and 100 year – 1-hour storm shall be utilized to determine the allowable discharge rate for the proposed improvements. Values presented in **Table 3-2** were used in the model to calculate a historical discharge rate for the existing property. **Table 4-1** presents the discharge rate for the existing property for both the 5-year and 100-year 1-hour storm events. Since the drainage from the Offsite West Basin will be routed through the site, existing runoff values will be calculated by adding the Existing Site and the Offsite West runoff values.

Table 4-1: Existing Property Discharge Values

Sub-Basin	5-Year Discharge (CFS)	100-Year Discharge (CFS)
Existing Site	1.34	31.80
Offsite West	1.06	25.06
Offsite South	0.62	14.62

4.2 Proposed Drainage

Values presented in **Table 3-3** were utilized in the model to calculate the runoff for the proposed conditions as well as to size the culverts and outlet structure and verify the size of the detention pond. As previously discussed, the runoff from the substation will be routed to the pond and the other areas will be routed around the site, following historical discharge patterns.

The proposed detention pond is intended to provide water quality treatment as well as over detain the 100-year storm event. No calculations for the overflow portion of the outlet structure are provided as the 100-year event is fully detained. The proposed detention pond stage-storage curve is presented in **Table 4-2**.

Table 4-2: Detention Pond Stage-Storage Table

Elevation	Surface Area (Sq. Ft.)
5208.86	0
5209	722
5209.5	10,132
5210	16,308
5210.5	17,334
5211	18,388
5211.5	19,659
5212	24,124
5212.5	28,853

The Urban Drainage *Detention Basin Design Workbook* was utilized to design the outlet structure to not only retain the correct WQCV but to also discharge at or less than the required historic discharge rates presented in **Table 4-1.** The spreadsheet showing the detailed calculations can be found in **Appendix C.** The design of the outlet structure is detailed in the grading drawings provided in **Appendix A.**

The model of the proposed site conditions was utilized to calculate discharge flow rates from the substation site in order to size the culverts/pipes located within the project. **Table 4-3** presents the hydraulic capacity of the culverts and the required capacity to discharge flow from the improvements. All pipes were sized to pass both the 5-year and 100-year events. Detailed design of the culverts is provided in **Appendix A**.

Table 4-3: Interior Drain Line Hydraulic Capacity (100-year event)

Drainage Feature	Pipe Diameter (in)	Total Capacity (cfs)	Required Flow Capacity (cfs)	Remaining Capacity (cfs)
Channel to Pond	18	11.03	7.34	3.71
Pond Outlet	18	8.05	0.07	7.98
Driveway Culvert	2 x 21	34.33	27.40	6.93

Table 4-4 presents the discharge rates for the proposed sub-basins for both the 5-year and 100-year storm events prior to detention. This discharge value represents the flow rate that the pond is receiving. The discharge from the pond and overflow weirs (total discharge from site) is summarized in **Table 5-1.**

Table 4-4: Proposed Sub-Basin Discharge Values (Pre-Detention)

Sub-Basin	5-Year Discharge (CFS)	100-Year Discharge (CFS)
North Yard	4.90	14.43
South Yard	1.84	7.67
East	1.05	9.82
West	1.03	17.83

Utilizing the flow rates presented above, the model was utilized to analyze the flow path of water through the piping and pond system. With the installation of the outlet structure, the pond passes both the 5-year and 100-year events, treats the required WQCV, and slowly releases the water in the required 120 hours after the end of an event greater than a 5-year storm set forth by the State. The North and South sub-basins both drain to the pond and the combined discharge rates leaving the pond, through the outlet structure, are presented in **Table 5-1.**

The forebay was designed according to USDCM per Town of Erie Standards. The release rate is 2% of the un-detained 100-year event peak flow from the South Yard sub-basin via a wall/ notch configuration. The forebay is sized to have a minimum volume equivalent to 1%

of the WQCV for the North Yard sub-basin. Detailed calculations can be found in **Appendix C.**

The valley pan trickle channel is required to have a minimum capacity of either the maximum forebay discharge or 1cfs. Since the forebay outlet discharge is less than 1cfs, the trickle channel has been designed to carry 1cfs. Detailed calculations can be found in **Appendix C.**

The emergency spillway is required to discharge at double the 100-year event discharge flow rates. Due to the spillway flowing over the secondary access road, it has been oversized to ensure a shallow water depth of only 2 inches (of the available 12 inches) if the entirety of the 100-year event discharges over the spillway. Detailed Calculations can be found in **Appendix C.**

4.3 Offsite Drainage

Offsite runoff will be addressed with two swales to convey water around the substation site. Drainage areas were estimated using 10-foot contours sourced from USGS, and found to be 6 acres draining to the West Channel and 3.5 acres draining to the South Channel. Both sub-basins showed an estimated average slope of 3%. All other design values were assumed to be the same as the existing site values. Channel capacities and flow rates from both 5-year, 1-hour and 100-year, 1-hour events are presented in **Table 4-5**. The channels were both designed to maintain a minimum 3" of freeboard at the minimum channel depth during the 100-year event. Minimum channel dimensions are presented in the grading drawing details.

Table 4-5: Offsite Drainage Conveyance

Drainage Feature	Total Capacity (cfs)	5-year Flow Rate (cfs)	100-year Flow Rate (cfs)
West Channel	43.81	0.82	22.31
South Channel	20.62	0.50	12.11

5.0 Conclusions

5.1 Drainage Concept

The drainage design has been prepared using sound engineering judgement and practices and will provide an effective means of controlling runoff on the project site as well as protect the site from damage. The design has been completed according to Town of Erie Standards and will result in no downstream impacts to any people or structures. Historic flow paths, discharge rates, and water quality have been maintained.

5.2 Compliance with the Town of Erie Code

Per Town of Erie requirements, the historical discharge rate from the 100-year – 1-hour storms shall be utilized to determine the allowable discharge rate for the proposed improvements. To demonstrate compliance with this requirement, both the existing and proposed conditions were combined into one overall sub-basin. **Table 5-1** presents the overall discharge rates for the overall basin.

Table 5-1: Overall Sub-Basin Discharge Values

5-Year Discharge (CFS)		100-Year Discharge (CFS)	
Existing	**Proposed**	**Existing**	**Proposed**
2.40	1.87	56.85	32.24

Table 5-1 illustrates the proposed condition discharge rate is less than the required discharge rate from the 100-year,1-hour storm event, resulting in compliance. Existing discharge rates were calculated by combining discharge from the Existing Site and the Offsite West sub-basin.

As discussed in previous sections, the detention pond has also been designed to meet all criteria set forth in the Town of Erie Code and provides over detention by detaining the entirety of the 100-year event with the orifice plate.

Maintenance of the outlet structure, forebay, and detention pond will be performed by United Power (the owner of the property) in accordance with the recommendations set forth by Urban Drainage. The structures will be accessed from the western driveway, traveling through the pond if equipment is necessary.

6.0 References

United States Department of Agriculture Natural Resources Conservation Service. Web Soil Survey

United States Department of Agriculture Natural Resources Conservation Service. Web Soil Survey

Urban Drainage and Flood Control District. *Detention Basin Design Workbook,* Version 3.07, February 2017.

Urban Drainage and Flood Control District. *Urban Storm Drainage Criteria Manual,* Volume *1-3*, June 2001.

NOAA Atlas 14, Volume 8, Precipitation-Frequency Atlas of the United States. U.S. Department of Commerce, 2013.

Town of Erie Engineering Standards & Specifications, *Section 800 – Storm Drainage Facilities*, 2019

Appendix A
Site Maps & Design Drawings

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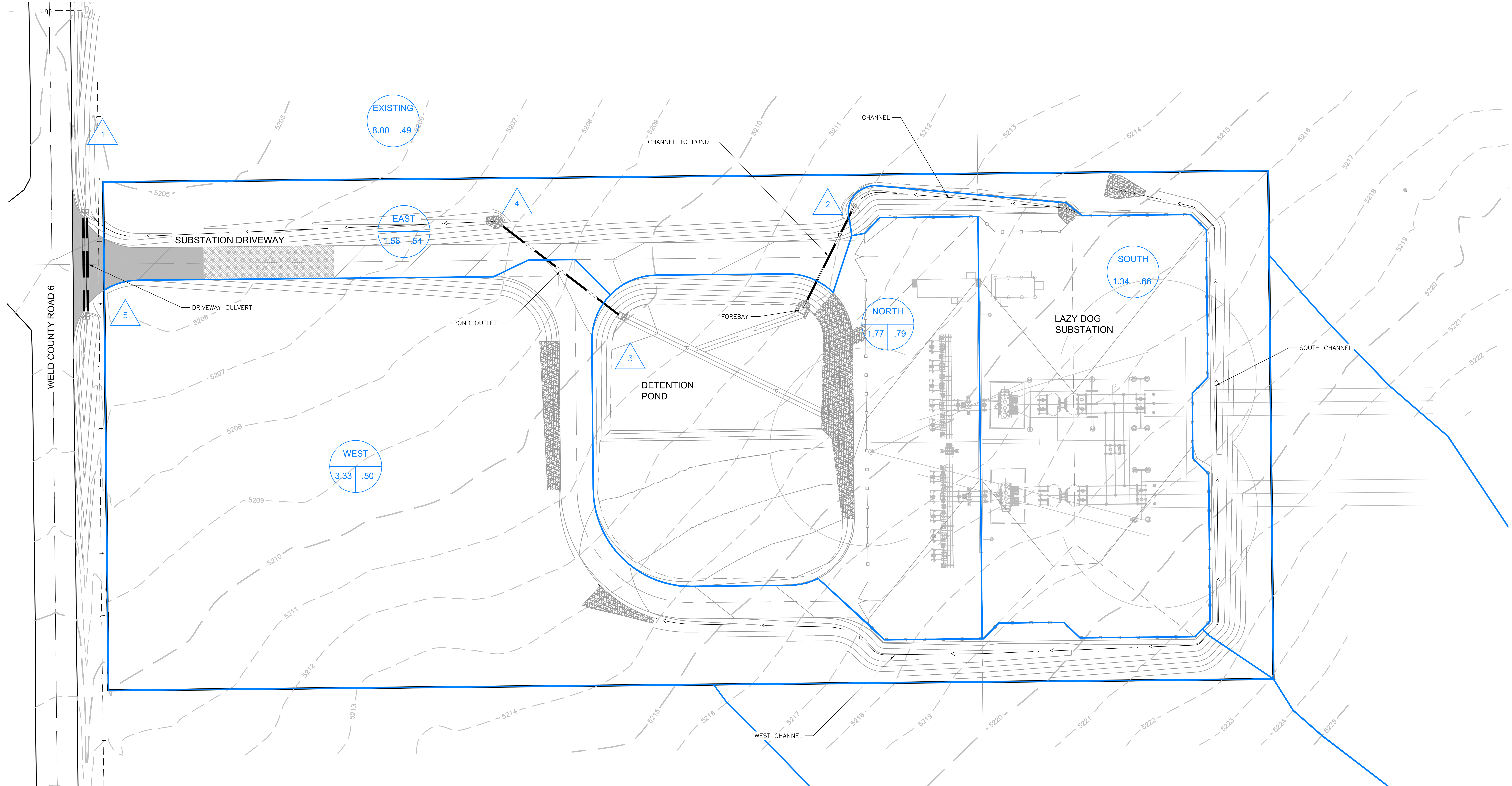


LEGEND

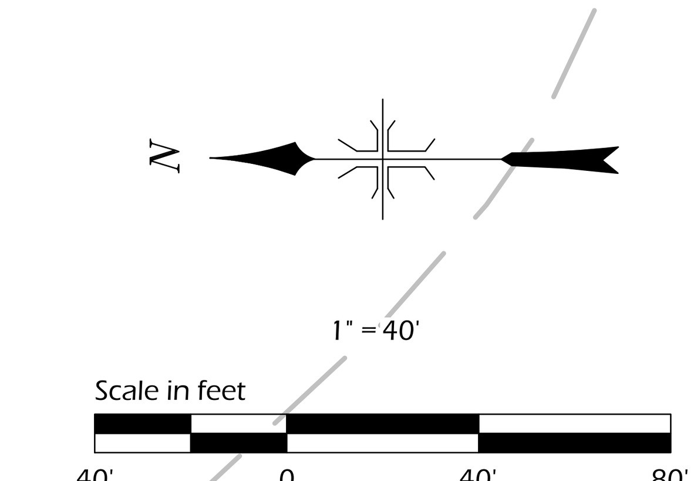
EXISTING INDEX CONTOUR
EXISTING INTERMEDIATE CONTOUR
PROPOSED CULVERT
PROPOSED INDEX CONTOUR
PROPOSED INTERMEDIATE CONTOUR
PROPOSED DRAINAGE FLOWLINE
PROPOSED LOT FLOW ARROW

A = BASIN
B = AREA IN ACRES
C = WEIGHTED RUNOFF COEFFICIENT

D = DESIGN POINT DESIGNATION

Sumarry Runoff Tables

Design Point	Contributing Area	Runoff Peak 5-year Event	Runoff Peak 100-year Event
Existing			
	(acres)	(cfs)	(cfs)
1	12	2.40	56.85
Proposed			
	(acres)	(cfs)	(cfs)
1	12	1.87	32.24
2	1.34	1.72	7.34
3	3.11	5.84	18.98
4	3.11	0.04	0.07
5	3.33	1.03	27.40



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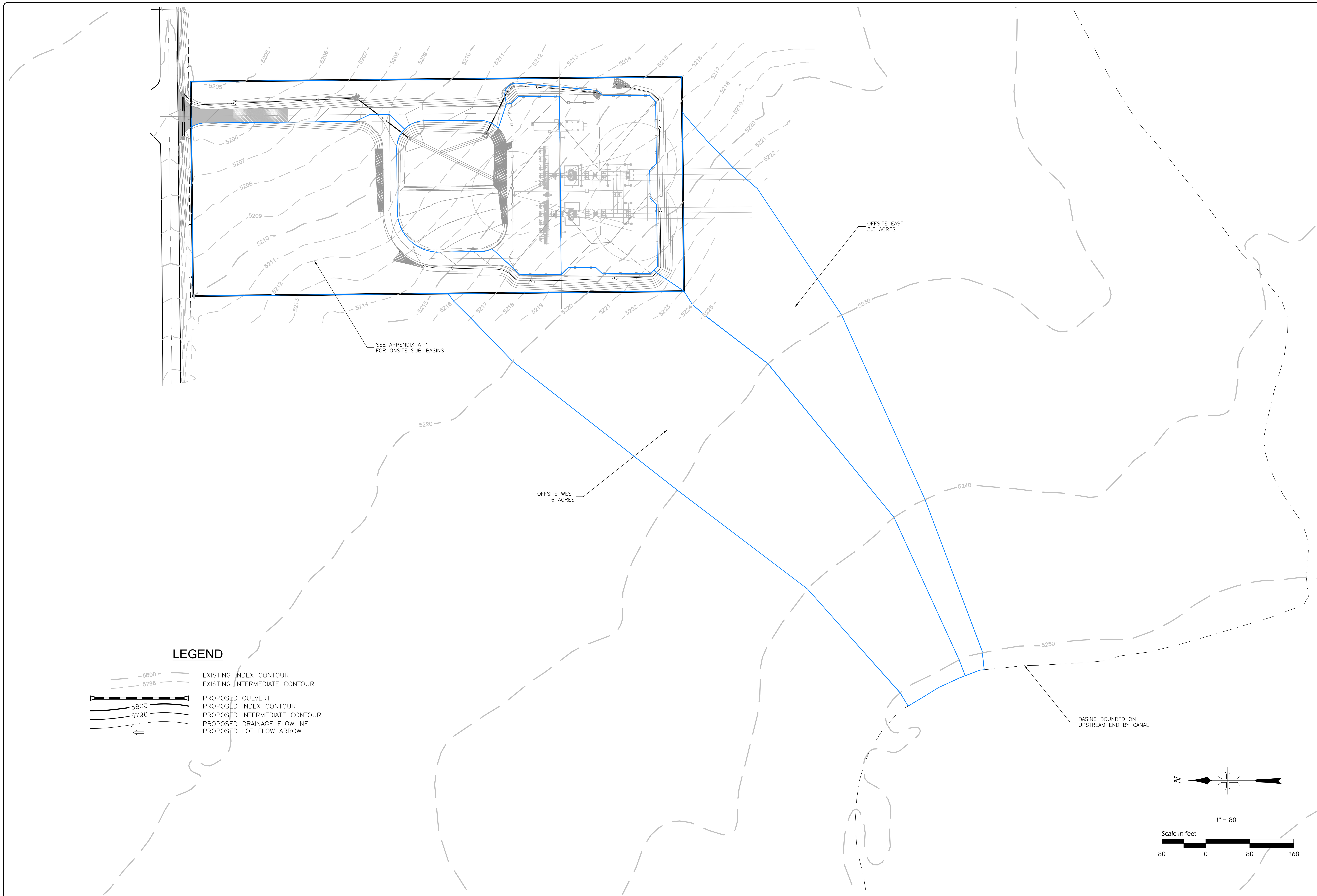
DRAWN BY: TMC
SCALE: AS NOTED
CHECKED BY: DWS
DATE ISSUED: 08/07/19
FILE NAME: 17179C-DRAINAGE.DWG

TRI-STATE GENERATION & TRANSMISSION
LAZY DOG SUBSTATION
ERIE, COLORADO

LAZY DOG SUBSTATION
DRAINAGE BASIN DELINIATION

DMC JOB NO.: 17179

SHEET NO.: A-1



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ERIE, COLORADO

LAZY DOG SUBSTATION OVERALL DRAINAGE BASINS

DMC JOB NO.: 17179

SHEET NO.: A-2

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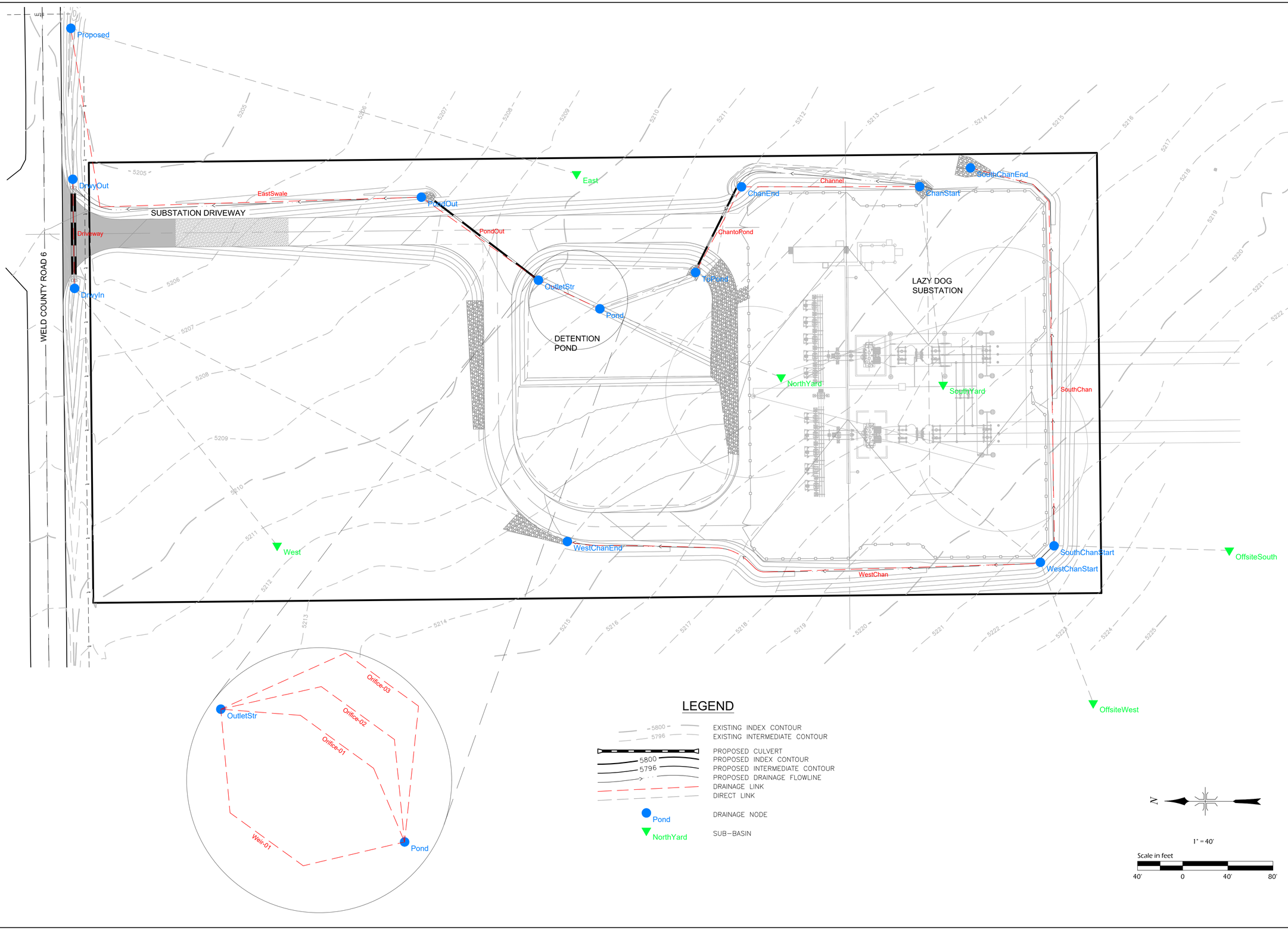

LEGEND

- EXISTING INDEX CONTOUR (5800)
- EXISTING INTERMEDIATE CONTOUR (5796)
- PROPOSED CULVERT
- PROPOSED INDEX CONTOUR (5800)
- PROPOSED INTERMEDIATE CONTOUR (5796)
- PROPOSED DRAINAGE FLOWLINE
- DRAINAGE LINK
- DIRECT LINK
- Pond — DRAINAGE NODE
- NorthYard — SUB-BASIN

N

1" = 40'

Scale in feet

40' 0 40' 80'

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LAZY DOG SUBSTATION
MODEL SCHEMATIC

DMC JOB NO.: 17179

SHEET NO.: A-3

OF ---- SHEETS

Appendix B
NRCS Soils 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 Weld County, Colorado, Southern Part

Lazy Dog Substation

June 21, 2018

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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

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.

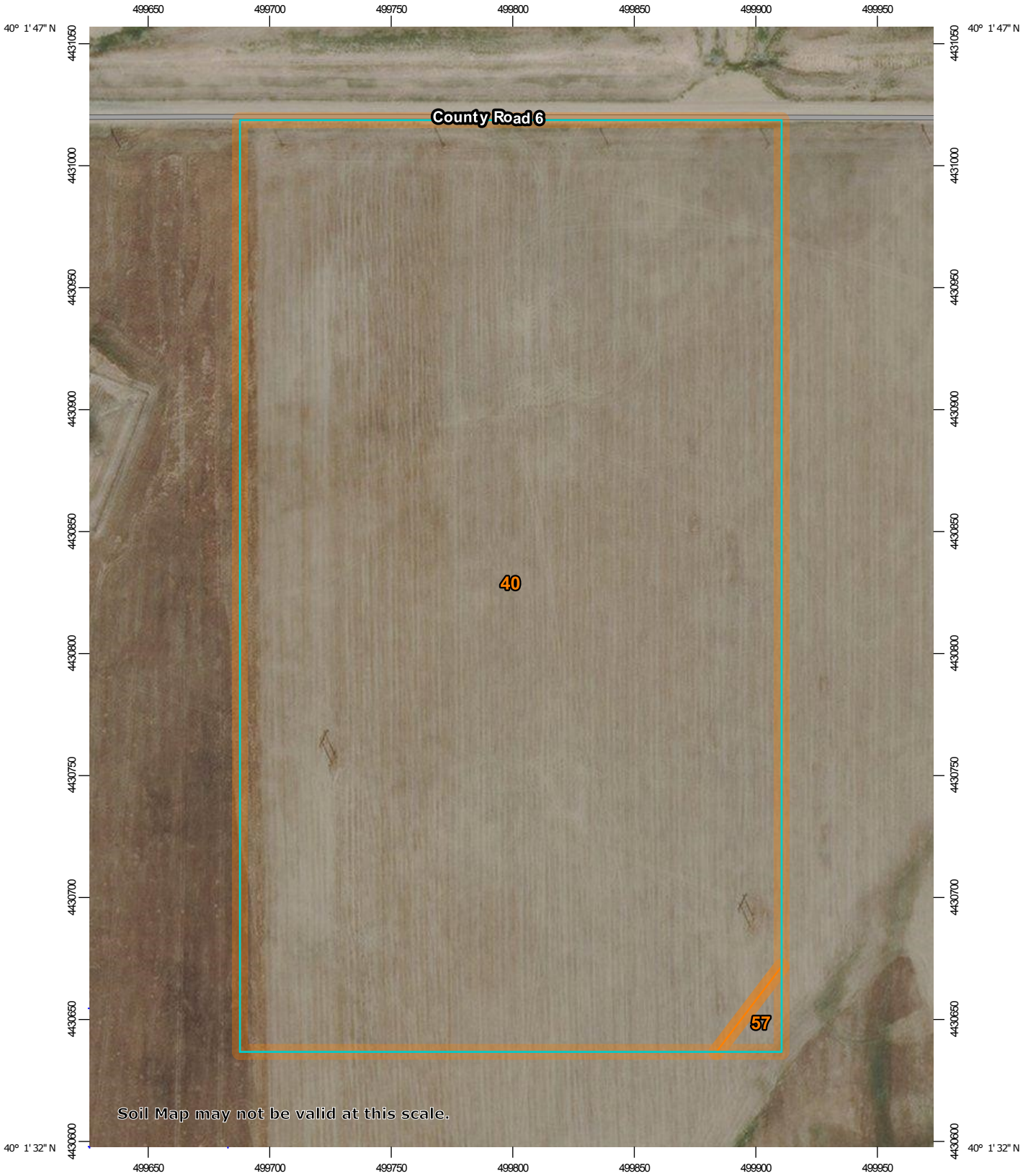
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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: 1:2,240 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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 1:24,000.

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: Weld County, Colorado, Southern Part
Survey Area Data: Version 16, Oct 10, 2017

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

Date(s) aerial images were photographed: Sep 20, 2015—Oct 15, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background 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
40	Nunn loam, 1 to 3 percent slopes	21.0	99.4%
57	Renohill clay loam, 3 to 9 percent slopes	0.1	0.6%
Totals for Area of Interest		**21.1**	**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.

Weld County, Colorado, Southern Part

40—Nunn loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tln2
Elevation: 3,900 to 6,250 feet
Mean annual precipitation: 13 to 16 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 135 to 160 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Nunn and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nunn

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Pleistocene aged alluvium and/or eolian deposits

Typical profile

Ap - 0 to 6 inches: loam
Bt1 - 6 to 10 inches: clay loam
Bt2 - 10 to 26 inches: clay loam
Btk - 26 to 31 inches: clay loam
Bk1 - 31 to 47 inches: loam
Bk2 - 47 to 80 inches: loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 7 percent
Salinity, maximum in profile: Nonsaline (0.1 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 0.5
Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Loamy Plains (R067BY002CO)
Hydric soil rating: No

Minor Components

Wages

Percent of map unit: 8 percent
Landform: Alluvial fans, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Plains (R067BY002CO)
Hydric soil rating: No

Fort collins

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Plains (R067BY002CO)
Hydric soil rating: No

Haverson, very rarely flooded

Percent of map unit: 2 percent
Landform: Terraces, drainageways, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear, concave
Ecological site: Overflow (R067BY036CO)
Hydric soil rating: No

57—Renohill clay loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 3636
Elevation: 4,850 to 5,200 feet
Mean annual precipitation: 11 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 100 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Renohill and similar soils: 85 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Renohill

Setting

Landform: Ridges, hills
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Residuum weathered from shale

Typical profile

H1 - 0 to 9 inches: clay loam
H2 - 9 to 32 inches: clay loam
H3 - 32 to 36 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: Clayey Plains (R067BY042CO)
Hydric soil rating: No

Minor Components

Shingle

Percent of map unit: 8 percent
Hydric soil rating: No

Ulm

Percent of map unit: 5 percent
Hydric soil rating: No

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Appendix C
Site Specific Physical Design Properties

Lazy Dog Drainage Design

Existing Conditions-5 Year

Area Name	Total Area (sf)	(acres)	Flow Length	Slope (%)	TOC (min)
Existing Site	348480	8.00	975	0.02	7.04
Offsite West	261360	6.00	1000	0.03	6.14
Existing Site	152460	3.50	1000	0.03	6.14

Land Cover Type	Percent Impervious	Runoff Coefficient
Pasture or Range Land, Fair Condition	2%	0.05
Open Graded Aggregate Topping Over Compacted Base	40%	0.36
Compacted Base Material	40%	0.36
Pavement/Concrete/Drainage Features	90%	0.77

Roughness Coefficient and Curve Number Analysis

Existing

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Existing Site	8.00	0.05	0.40	2%	16%
		sum	0.40		16%
Total Area (ac)	**8.000**	Weighted	0.05		2%
Weighted Runoff Coefficient	**0.05**				
Weighted Percent Impervious	**2%**				

Offsite West

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Existing Site	6.00	0.05	0.30	2%	12%
		sum	0.30		12%
Total Area (ac)	**6.000**	Weighted	0.05		2%
Weighted Runoff Coefficient	**0.05**				
Weighted Percent Impervious	**2%**				

Offsite South

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Existing Site	3.50	0.05	0.18	2%	7%
		sum	0.18		7%
Total Area (ac)	**3.500**	Weighted	0.05		2%
Weighted Runoff Coefficient	**0.05**				
Weighted Percent Impervious	**2%**				

Lazy Dog Drainage Design

Existing Conditions-100 Year

Area Name	Total Area (sf)	(acres)	Flow Length	Slope (%)	TOC (min)
Existing Site	348480	8.00	975	0.02	7.04
Offsite West	261360	6.00	1000	0.03	6.14
Existing Site	152460	3.50	1000	0.03	6.14

Land Cover Type	Percent Impervious	Runoff Coefficient
Pasture or Range Land, Fair Condition	2%	0.49
Open Graded Aggregate Topping Over Compacted Base	40%	0.65
Compacted Base Material	40%	0.65
Pavement/Concrete/Drainage Features	90%	0.85

Roughness Coefficient and Curve Number Analysis

Existing

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Existing Site	8.00	0.49	3.92	2%	16%
		sum	3.92		16%
Total Area (ac)	**8.000**	Weighted	0.49		2%
Weighted Runoff Coefficient	**0.49**				
Weighted Percent Impervious	**2%**				

Offsite West

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Existing Site	6.00	0.49	2.94	2%	12%
		sum	2.94		12%
Total Area (ac)	**6.000**	Weighted	0.49		2%
Weighted Runoff Coefficient	**0.49**				
Weighted Percent Impervious	**2%**				

Offsite South

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Existing Site	3.50	0.49	1.72	2%	7%
		sum	1.72		7%
Total Area (ac)	**3.500**	Weighted	0.49		2%
Weighted Runoff Coefficient	**0.49**				
Weighted Percent Impervious	**2%**				

Lazy Dog Drainage Design

Proposed Conditions-5 Year

Area Name	Total Area (sf)	Total Area (acres)	Flow Length	Slope (%)	TOC (min)
South Yard & Channel	58370.4	1.34	545	1.03%	5.81
North Yard & Pond	77101.2	1.77	400	1.03%	4.58
East Area	67953.6	1.56	390	2.00%	3.48
West Area	145054.8	3.33	970	2.00%	7.01

Land Cover Type	Percent Impervious	Runoff Coefficient
Pasture or Range Land, Fair Condition	2%	0.05
Open Graded Aggregate Topping Over Compacted Base	40%	0.36
Compacted Base Material	40%	0.36
Pavement/Concrete/Drainage Features	90%	0.77
Pond	100%	0.85

Roughness Coefficient and Curve Number Analysis

South Yard and Channel

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Substation Yard - South Portion	1.26	0.36	0.45	40%	50.6%
Swale	0.08	0.77	0.06	90%	6.9%
		sum	0.51		57.4%
Total Area (ac)	**1.34**	Weighted	0.38		43%
Weighted Runoff Coefficient	**0.38**				
Weighted Percent Impervious	**43%**				

North Yard and Pond

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Substation Yard - North Portion	0.73	0.36	0.26	40%	29.2%
Pond	1.04	0.85	0.88	100%	104.0%
		sum	1.15		133.2%
Total Area (ac)	**1.77**	Weighted	0.65		75%
Weighted Runoff Coefficient	**0.65**				
Weighted Percent Impervious	**75%**				

East Area

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
East Area Around Site	1.24	0.05	0.06	2%	2.5%
Driveway (Paved)	0.10	0.77	0.08	90%	9.4%
Driveway (Gravel)	0.22	0.36	0.08	40%	8.8%
		sum	0.22		20.6%
Total Area (ac)	**1.56**	Weighted	0.14		13%
Weighted Runoff Coefficient	**0.14**				
Weighted Percent Impervious	**13%**				

West Area

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
West Area Around Site	3.09	0.05	0.15	2%	6.2%
Driveway	0.24	0.36	0.08	40%	9.4%
		sum	0.24		15.6%
Total Area (ac)	**3.33**	Weighted	0.07		5%
Weighted Runoff Coefficient	**0.07**				
Weighted Percent Impervious	**5%**				

Lazy Dog Drainage Design

Proposed Conditions-100 Year

Area Name	Total Area (sf)	Total Area (acres)	Flow Length	Slope (%)	TOC (min)
South Yard & Channel	58370.4	1.34	545	1.03%	5.81
North Yard & Pond	77101.2	1.77	400	1.03%	4.58
East Area	67953.6	1.56	390	2.00%	3.48
West Area	145054.8	3.33	970	2.00%	7.01

Land Cover Type	Percent Impervious	Runoff Coefficient
Pasture or Range Land, Fair Condition	2%	0.49
Open Graded Aggregate Topping Over Compacted Base	40%	0.65
Compacted Base Material	40%	0.65
Pavement/Concrete/Drainage Features	90%	0.85
Pond	100%	0.89

Roughness Coefficient and Curve Number Analysis

South Yard and Channel

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Substation Yard - South Portion	1.26	0.65	0.82	40%	50.6%
Swale	0.08	0.85	0.06	90%	6.9%
		sum	0.89		57.4%
Total Area (ac)	**1.34**	Weighted	0.66		43%
Weighted Runoff Coefficient	**0.66**				
Weighted Percent Impervious	**43%**				

North Yard and Pond

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
Substation Yard - North Portion	0.73	0.65	0.47	40%	29.2%
Pond	1.04	0.89	0.93	100%	104.0%
		sum	1.40		133.2%
Total Area (ac)	**1.77**	Weighted	0.79		75%
Weighted Runoff Coefficient	**0.79**				
Weighted Percent Impervious	**75%**				

East Area

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
East Area Around Site	1.24	0.49	0.61	2%	2.5%
Driveway (Paved)	0.10	0.85	0.09	90%	9.4%
Driveway (Gravel)	0.22	0.65	0.14	40%	8.8%
		sum	0.84		20.6%
Total Area (ac)	**1.56**	Weighted	0.54		13%
Weighted Runoff Coefficient	**0.54**				
Weighted Percent Impervious	**13%**				

West Area

Description	Total Area (ac)	Runoff Coefficient	A*C	Percent Impervious	A*%
West Area Around Site	3.09	0.49	1.52	2%	6.2%
Driveway	0.24	0.65	0.15	40%	9.4%
		sum	1.67		15.6%
Total Area (ac)	**3.33**	Weighted	0.50		5%
Weighted Runoff Coefficient	**0.50**				
Weighted Percent Impervious	**5%**				

Forebay Sizing Calculations

Forebay Sizing		
Variables		
100yr Discharge (cfs) from model	8.680	
WQCV (ac*ft) for South Yard Area	0.021	
	Required	Provided
Release Rate (cfs) 2% of 100yr discharge	0.174	0.174
Volume (cf) 1% of WQCV	9.148	16.75
Max Depth (ft)	1	0.67

Weir Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Aug 7 2019

Forebay Notch

Rectangular Weir

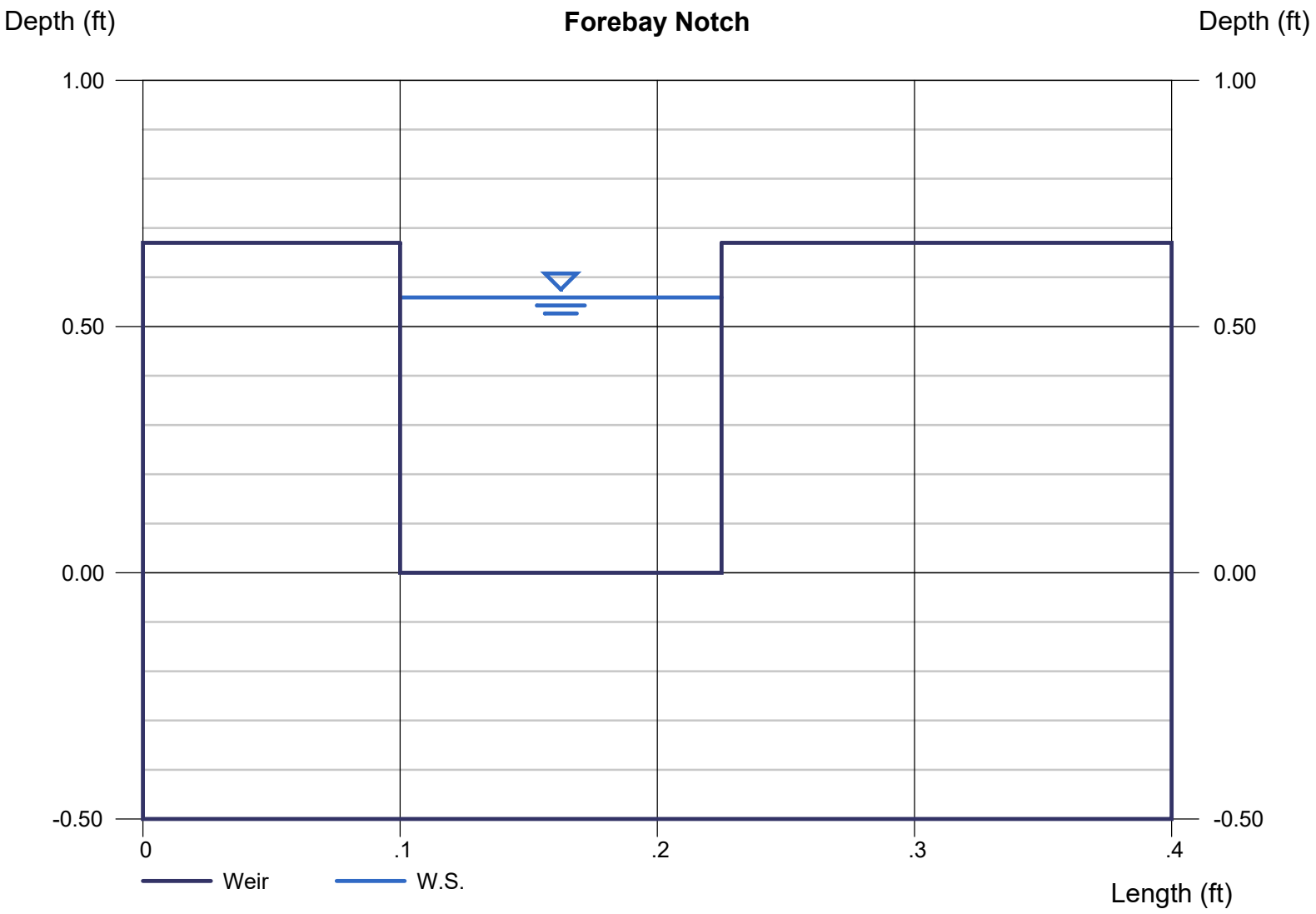
Crest	= Sharp
Bottom Length (ft)	= 0.13
Total Depth (ft)	= 0.67

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Known Q
Known Q (cfs)	= 0.17

Highlighted

Depth (ft)	= 0.56
Q (cfs)	= 0.174
Area (sqft)	= 0.07
Velocity (ft/s)	= 2.49
Top Width (ft)	= 0.13



Channel Report

Concrete Valley Pan

Triangular

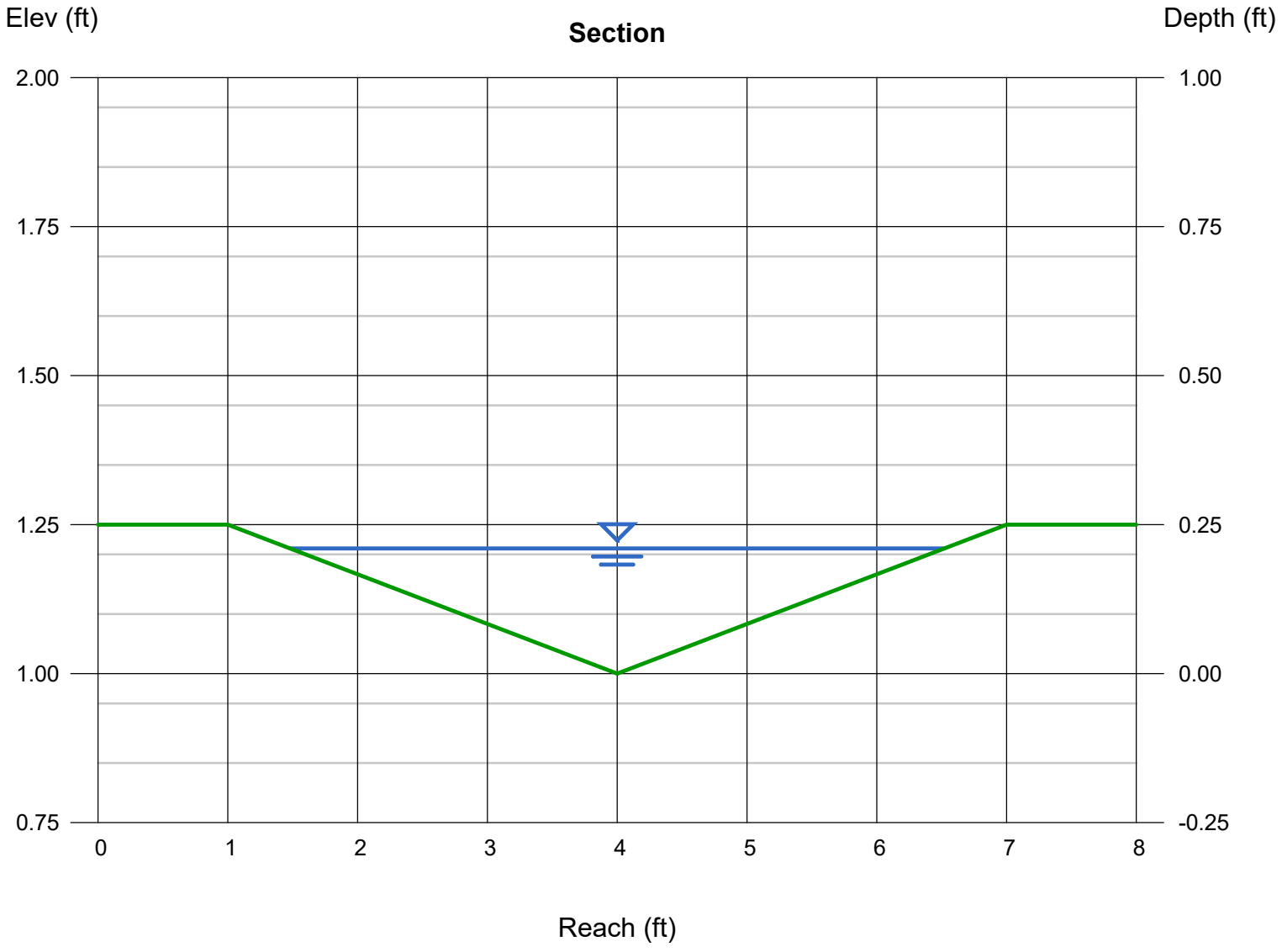
Side Slopes (z:1)	= 12.00, 12.00
Total Depth (ft)	= 0.25
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.012

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.00

Highlighted

Depth (ft)	= 0.21
Q (cfs)	= 1.000
Area (sqft)	= 0.53
Velocity (ft/s)	= 1.89
Wetted Perim (ft)	= 5.06
Crit Depth, Yc (ft)	= 0.22
Top Width (ft)	= 5.04
EGL (ft)	= 0.27



Emergency Spillway Calculations

Trapezoidal Broad-Crested Weir Sizing

Required Weir Width

Francis Weir Equation: Q=2/3 C1 b√2g H^(3/2)

Solve For b: b=Q/(2/3 C1 √2g H^(3/2))

Variable	Input	Units
Discharge Rate (Q)	18.89	cfs
Disharge Coefficient (C1)	0.5	
Weir Height (H)	0.5	ft
Gravity Constant (g)	32.2	ft/s^2
Width of Weir (b) - Required	**19.97**	ft

Trapezoidal Broad-Crested Weir Sizing

Maximum Flow Capacity at full 6" depth

Francis Weir Equation: Q=2/3 C1 b√2g H^(3/2)

Variable	Input	Units
Width of Weir (b)	100	ft
Disharge Coefficient (C1)	0.5	
Weir Height (H)	0.5	ft
Gravity Constant (g)	32.2	ft/s^2
Discharge Rate (Q)	**94.58**	cfs

Trapezoidal Broad-Crested Weir Sizing

Water depth for full 100-year discharge

Francis Weir Equation: Q=2/3 C1 b√2g H^(3/2)

Solve For H: H=(9^(1/3)*Q^(2/3))/(2*(g*(C1^2)*b^2)^(1/3))

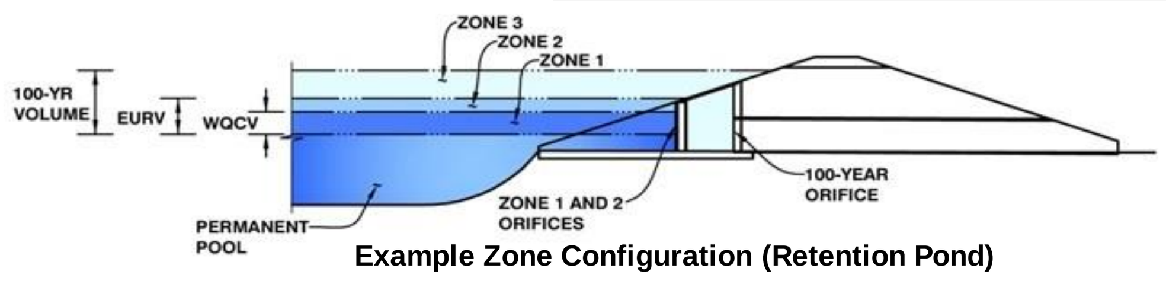
Variable	Input	Units
Discharge Rate (Q)	18.89	cfs
Disharge Coefficient (C1)	0.5	
Width of Weir (b)	100	ft
Gravity Constant (g)	32.2	ft/s^2
Water Depth	**0.17**	ft
Water Depth	**2.05**	in

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Lazy Dog Substation

Basin ID: Detention Pond



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	**EDB**			
Watershed Area =	3.11	acres		
Watershed Length =	780	ft		
Watershed Slope =	0.010	ft/ft		
Watershed Imperviousness =	59.00%	percent		
Percentage Hydrologic Soil Group A =	0.0%	percent		
Percentage Hydrologic Soil Group B =	0.0%	percent		
Percentage Hydrologic Soil Groups C/D =	100.0%	percent		
Desired WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	Erie			
Water Quality Capture Volume (WQCV) =	0.060	acre-feet	Optional User Override 1-hr Precipitation	
Excess Urban Runoff Volume (EURV) =	0.176	acre-feet		
2-yr Runoff Volume (P1 = 0.81 in.) =	0.114	acre-feet	0.81	inches
5-yr Runoff Volume (P1 = 1.11 in.) =	0.177	acre-feet	1.11	inches
10-yr Runoff Volume (P1 = 1.39 in.) =	0.238	acre-feet	1.39	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	0.361	acre-feet	1.84	inches
50-yr Runoff Volume (P1 = 2.24 in.) =	0.462	acre-feet	2.24	inches
100-yr Runoff Volume (P1 = 2.68 in.) =	0.588	acre-feet	2.68	inches
500-yr Runoff Volume (P1 = 3.89 in.) =	0.911	acre-feet	3.89	inches
Approximate 2-yr Detention Volume =	0.107	acre-feet		
Approximate 5-yr Detention Volume =	0.167	acre-feet		
Approximate 10-yr Detention Volume =	0.205	acre-feet		
Approximate 25-yr Detention Volume =	0.254	acre-feet		
Approximate 50-yr Detention Volume =	0.284	acre-feet		
Approximate 100-yr Detention Volume =	0.336	acre-feet		

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.060	acre-feet
Zone 2 Volume (100-year - Zone 1) =	0.276	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.336	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 = 0.5 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		
	--	0.14	--	--	--	722	0.017	50	0.001
	--	0.64	--	--	--	10,132	0.233	2,663	0.061
	--	1.14	--	--	--	16,308	0.374	9,211	0.211
	--	1.64	--	--	--	17,334	0.398	17,611	0.404
	--	2.14	--	--	--	18,388	0.422	26,715	0.613
	--	2.64	--	--	--	19,659	0.451	36,227	0.832
	--	3.14	--	--	--	24,124	0.554	47,172	1.083
	--	3.64	--	--	--	28,853	0.662	60,416	1.387
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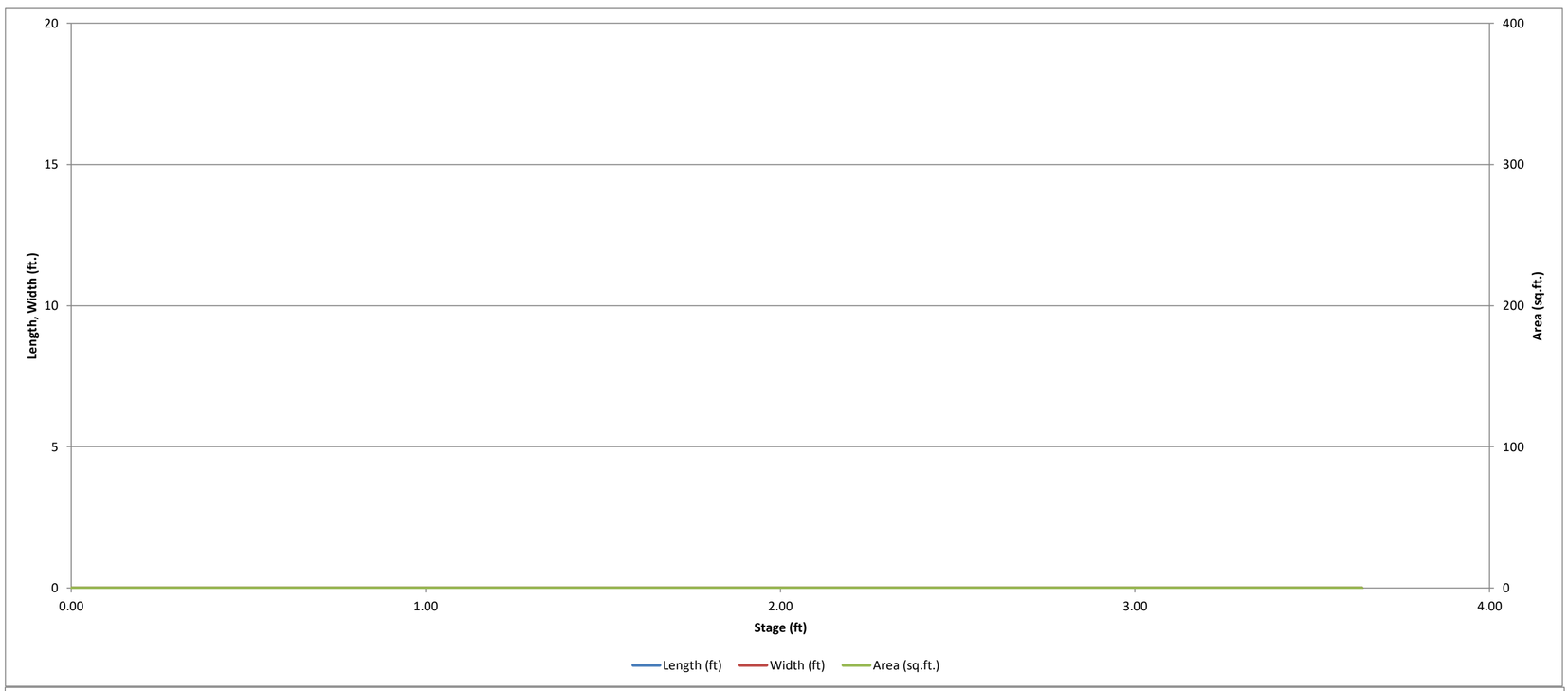
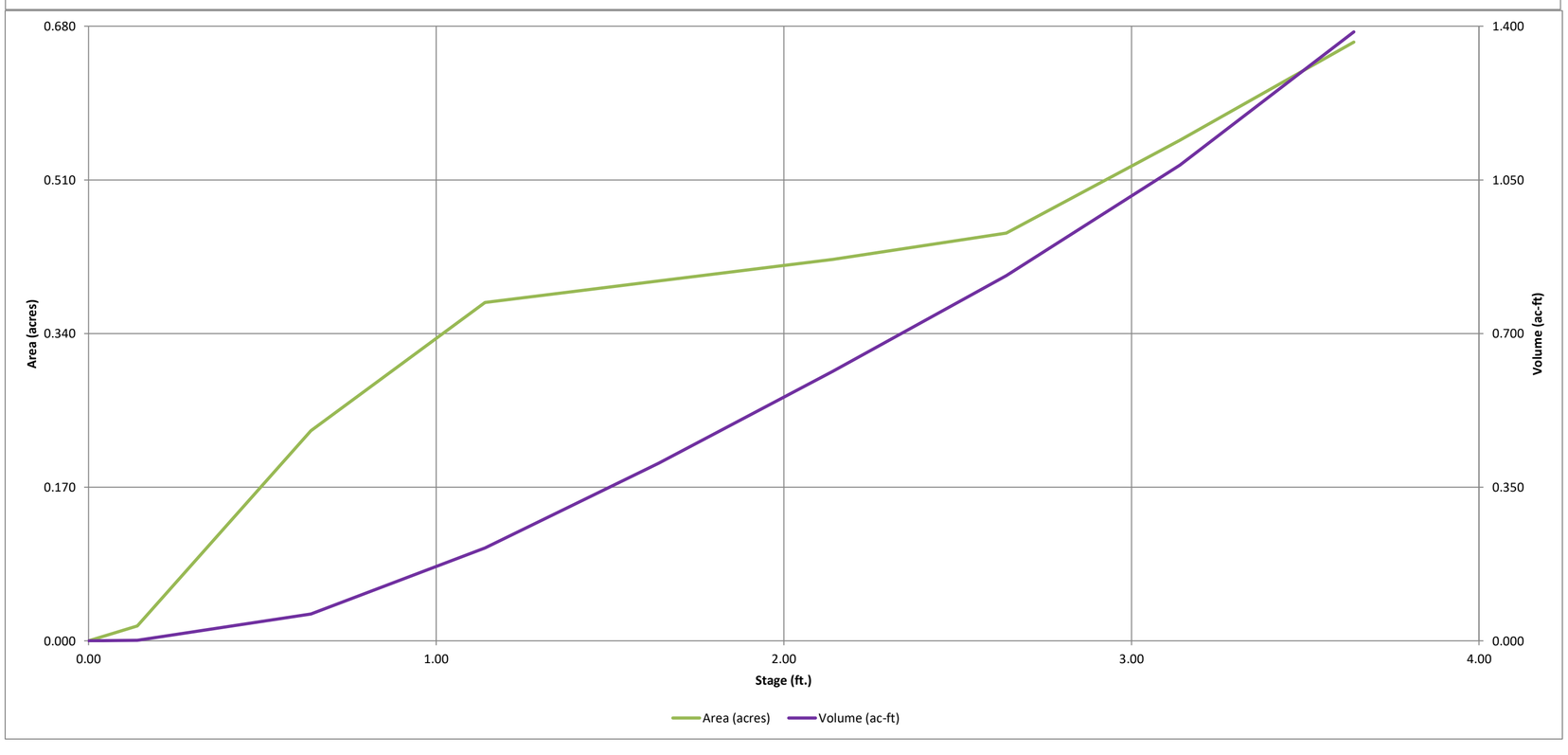
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



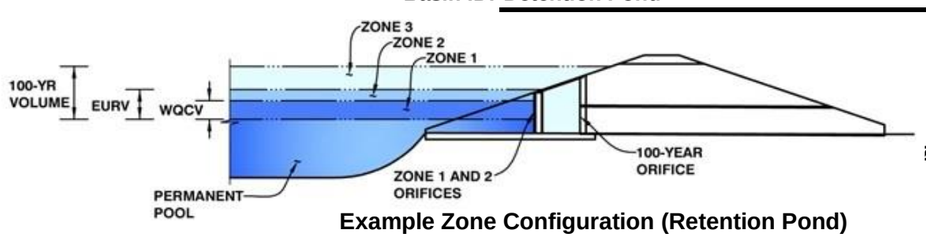


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Lazy Dog Substation

Basin ID: Detention Pond



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.63	0.060	Orifice Plate
Zone 2 (100-year)	1.46	0.276	Weir&Pipe (Circular)
Zone 3			
		0.336	Total

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.00	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	6.00	inches
Orifice Plate: Orifice Area per Row =	1.01	sq. inches (diameter = 1-1/8 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	7.014E-03	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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	0.50	1.00					
Orifice Area (sq. inches)	1.01	1.01	1.01					

	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	
Invert of Vertical Orifice =		N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =		N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =		N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =		N/A	ft^2
Vertical Orifice Centroid =		N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.14		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00		feet
Overflow Weir Slope =	0.00		H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	0.00		feet
Overflow Grate Open Area % =	70%		%, grate open area/total area
Debris Clogging % =	50%		%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	2.14		feet
Over Flow Weir Slope Length =	0.00		feet
Grate Open Area / 100-yr Orifice Area =			should be ≥ 4
Overflow Grate Open Area w/o Debris =	0.00		ft^2
Overflow Grate Open Area w/ Debris =	0.00		ft^2

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

	Zone 2 Circular	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Circular	Not Selected	
Outlet Orifice Area =			ft^2
Outlet Orifice Centroid =			feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	1.50	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =		feet
Spillway End Slopes =		H:V
Freeboard above Max Water Surface =		feet

Calculated Parameters for Spillway

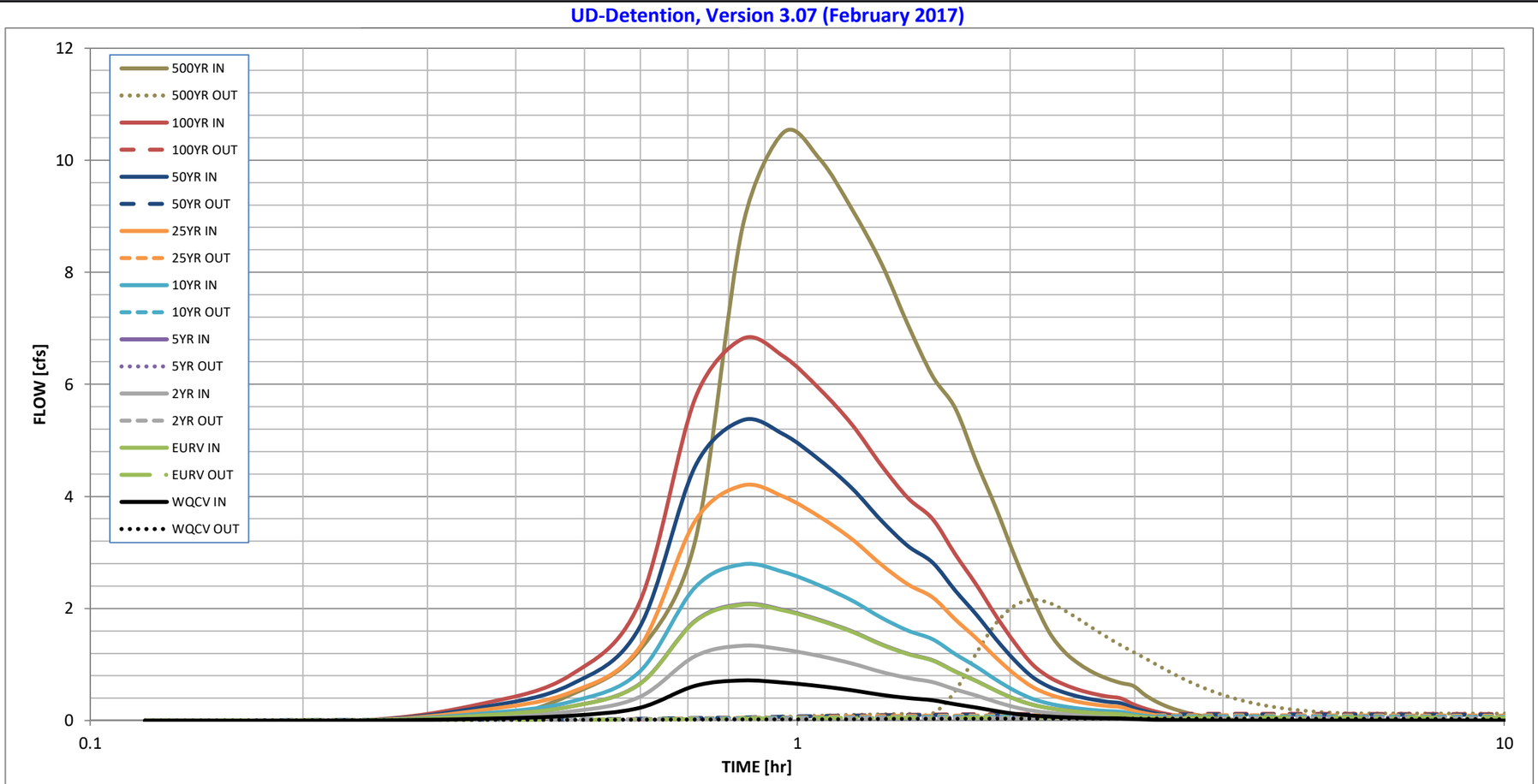
Spillway Design Flow Depth=		feet
Stage at Top of Freeboard =		feet
Basin Area at Top of Freeboard =		acres

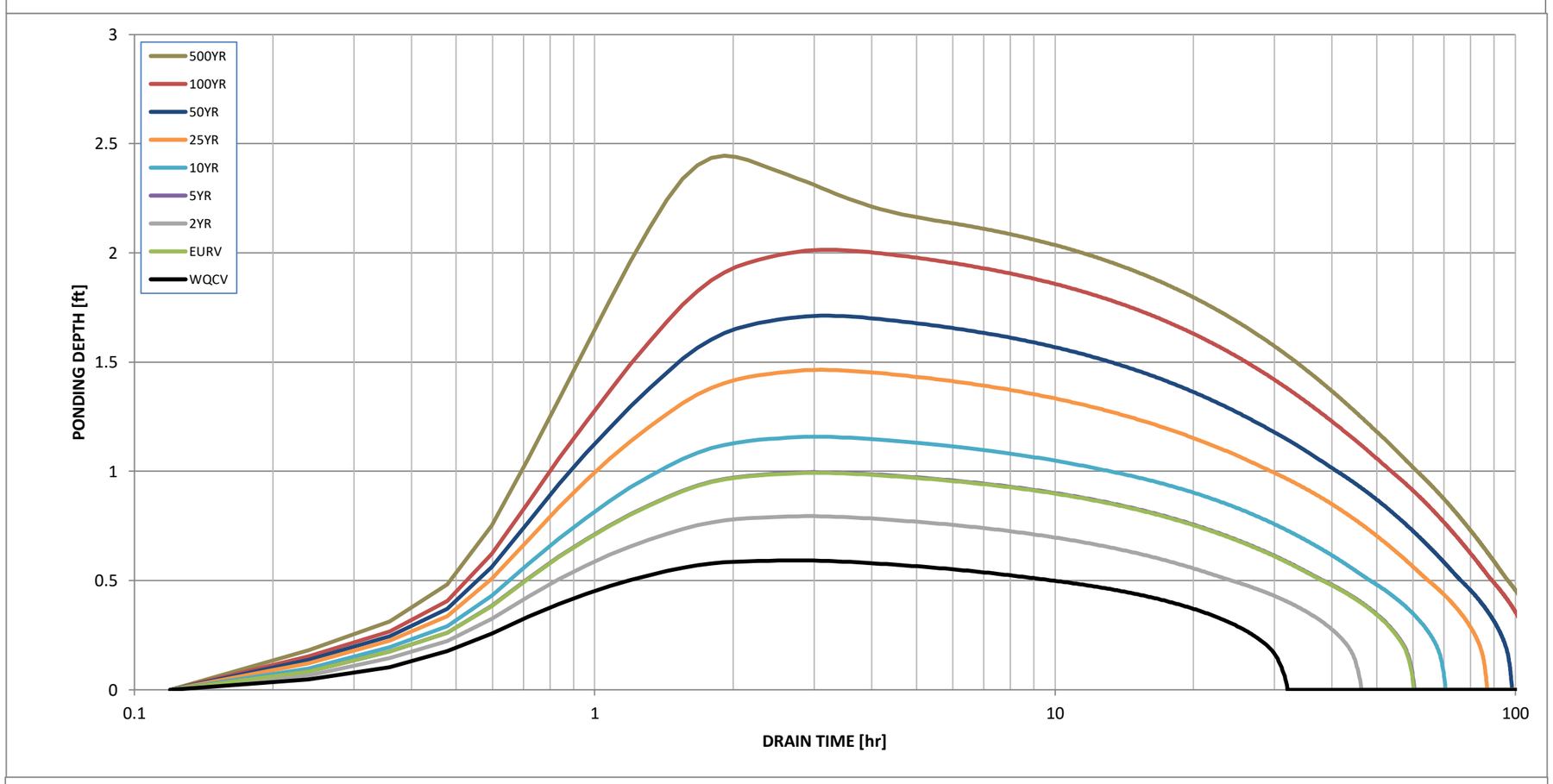
Routed Hydrograph Results

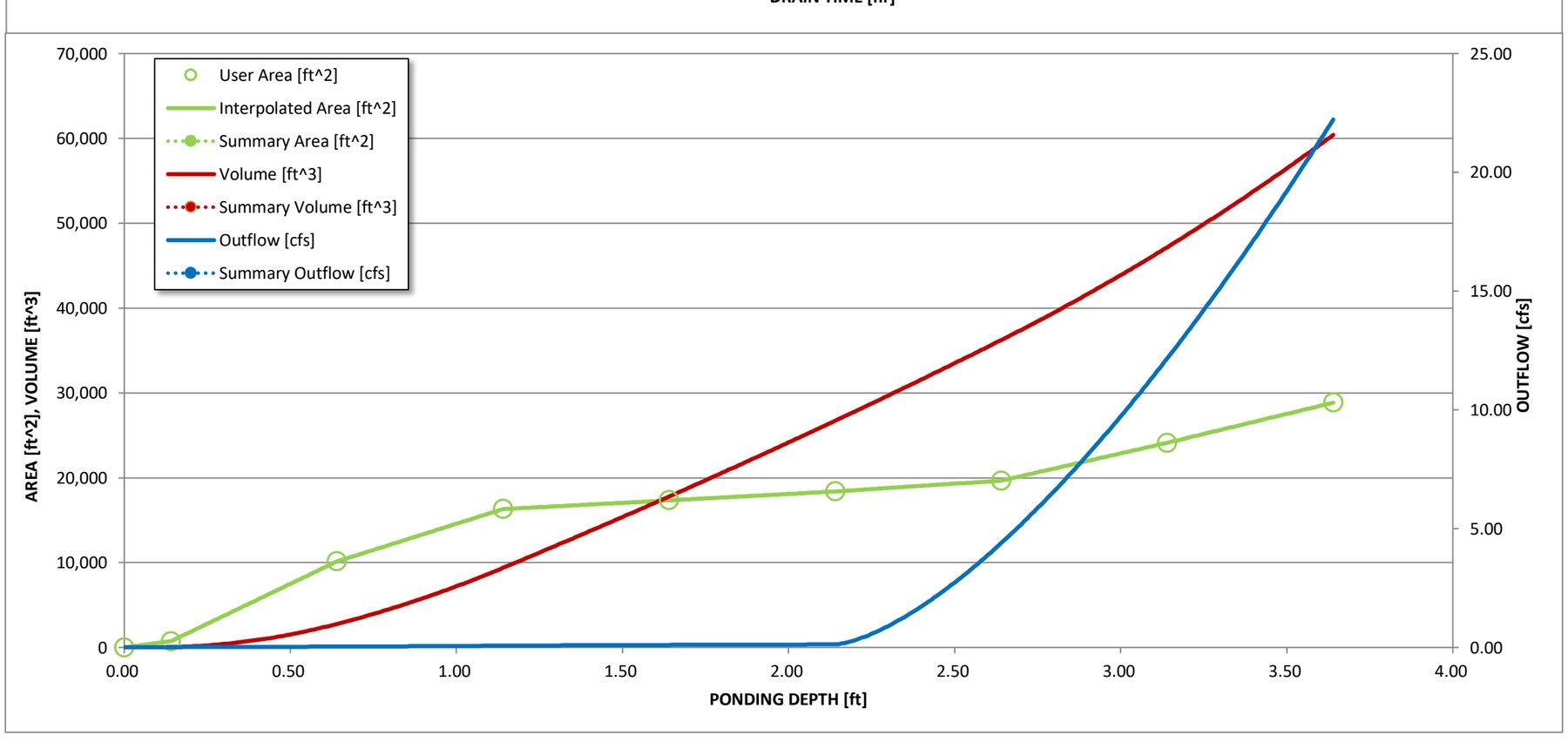
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.81	1.11	1.39	1.84	2.24	2.68	3.89
Calculated Runoff Volume (acre-ft) =	0.060	0.176	0.114	0.177	0.238	0.361	0.462	0.588	0.911
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.060	0.176	0.113	0.177	0.238	0.360	0.461	0.588	0.909
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.06	0.17	0.48	0.69	0.97	1.65
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.2	0.5	1.5	2.1	3.0	5.1
Peak Inflow Q (cfs) =	0.7	2.1	1.3	2.1	2.8	4.2	5.4	6.8	10.5
Peak Outflow Q (cfs) =	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	2.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	0.1	0.1	0.1	0.0	0.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Overflow Grate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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) =	30	55	43	56	64	78	88	99	101
Time to Drain 99% of Inflow Volume (hours) =	**31**	58	45	58	68	83	94	106	111
Maximum Ponding Depth (ft) =	0.59	0.99	0.79	1.00	1.16	1.46	1.71	2.01	2.44
Area at Maximum Ponding Depth (acres) =	0.21	0.33	0.28	0.33	0.37	0.39	0.40	0.42	0.44
Maximum Volume Stored (acre-ft) =	0.052	0.162	0.102	0.162	0.219	0.337	0.436	0.559	0.743

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







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:

Storm Inflow Hydrographs **UD-Detention, Version 3.07 (February 2017)**

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

	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
Time Interval	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]
7.17 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:07:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:14:20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:21:31	0.03	0.09	0.06	0.09	0.13	0.19	0.24	0.30	0.46
0.697	0:28:41	0.09	0.25	0.16	0.25	0.34	0.50	0.64	0.81	1.25
	0:35:51	0.23	0.64	0.42	0.65	0.86	1.30	1.65	2.09	3.20
	0:43:01	0.62	1.77	1.15	1.78	2.38	3.56	4.53	5.75	8.80
	0:50:11	0.72	2.07	1.34	2.08	2.79	4.19	5.36	6.81	10.49
	0:57:22	0.68	1.97	1.27	1.98	2.65	4.00	5.11	6.50	10.02
	1:04:32	0.61	1.79	1.15	1.80	2.41	3.64	4.65	5.92	9.13
	1:11:42	0.54	1.58	1.02	1.59	2.14	3.24	4.15	5.28	8.16
	1:18:52	0.46	1.36	0.87	1.36	1.84	2.78	3.57	4.56	7.06
	1:26:02	0.40	1.19	0.76	1.19	1.61	2.43	3.12	3.97	6.15
	1:33:13	0.36	1.07	0.69	1.08	1.45	2.20	2.82	3.60	5.57
	1:40:23	0.29	0.87	0.56	0.88	1.19	1.80	2.32	2.97	4.61
	1:47:33	0.23	0.70	0.45	0.71	0.96	1.47	1.89	2.42	3.78
	1:54:43	0.17	0.53	0.33	0.53	0.73	1.12	1.45	1.86	2.93
	2:01:53	0.12	0.38	0.24	0.39	0.53	0.82	1.07	1.38	2.19
	2:09:04	0.09	0.28	0.18	0.28	0.39	0.60	0.78	1.00	1.58
	2:16:14	0.07	0.22	0.14	0.22	0.30	0.47	0.61	0.78	1.22
	2:23:24	0.06	0.18	0.12	0.18	0.25	0.39	0.50	0.64	1.00
	2:30:34	0.05	0.16	0.10	0.16	0.21	0.33	0.42	0.54	0.85
	2:37:44	0.05	0.14	0.09	0.14	0.19	0.29	0.37	0.48	0.75
	2:44:55	0.04	0.12	0.08	0.13	0.17	0.26	0.34	0.43	0.67
	2:52:05	0.04	0.12	0.07	0.12	0.16	0.24	0.31	0.40	0.62
	2:59:15	0.03	0.09	0.05	0.09	0.12	0.18	0.23	0.29	0.45
	3:06:25	0.02	0.06	0.04	0.06	0.08	0.13	0.17	0.21	0.33
	3:13:35	0.02	0.05	0.03	0.05	0.06	0.09	0.12	0.16	0.24
	3:20:46	0.01	0.03	0.02	0.03	0.05	0.07	0.09	0.12	0.18
	3:27:56	0.01	0.02	0.01	0.02	0.03	0.05	0.06	0.08	0.13
	3:35:06	0.01	0.02	0.01	0.02	0.02	0.03	0.05	0.06	0.09
	3:42:16	0.00	0.01	0.01	0.01	0.02	0.02	0.03	0.04	0.07
	3:49:26	0.00	0.01	0.00	0.01	0.01	0.02	0.02	0.03	0.04
	3:56:37	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.03
	4:03:47	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	4:10:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:18:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:32:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:39:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:46:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:53:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:01:08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:08:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:22:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:29:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:36:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:44:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:51:20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:58:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:05:40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:12:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:20:01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:27:11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:34:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:41:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:48:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:55:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:03:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:10:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:17:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:24:32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:31:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:38:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:46:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:53:13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:00:23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:07:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:14:44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:21:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:29:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:36:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

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]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

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).

Appendix D
Rational Method Modeling Results

Project Description

File Name	Lazy Dog Drainage (RM5YR).SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	Kirpich
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	May 31, 2018	00:00:00
End Analysis On	May 31, 2018	01:00:00
Start Reporting On	May 31, 2018	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	7
Nodes	14
Junctions	11
Outfalls	2
Flow Diversions	0
Inlets	0
Storage Nodes	1
Links	14
Channels	4
Pipes	6
Pumps	0
Orifices	3
Weirs	1
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	5 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Average Slope (%)	Flow Length (ft)	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	East	1.56	0.1400	2.0000	390.00	0.28	0.04	0.06	1.05	0 00:03:28
2	ExistingSite	8.00	0.0500	2.0000	1000.00	0.40	0.02	0.16	1.34	0 00:07:10
3	NorthYard	1.77	0.6500	1.0300	400.00	0.32	0.21	0.37	4.90	0 00:04:34
4	OffsiteSouth	3.50	0.0500	3.0000	1000.00	0.36	0.02	0.06	0.62	0 00:06:08
5	OffsiteWest	6.00	0.0500	3.0000	1000.00	0.36	0.02	0.11	1.06	0 00:06:08
6	SouthYard	1.34	0.3800	1.0300	545.00	0.35	0.13	0.18	1.84	0 00:05:48
7	West	3.33	0.0700	2.0000	500.00	0.31	0.02	0.07	1.03	0 00:04:12

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	ChanEnd	Junction	5211.30	5215.00	0.00	0.00	0.00	1.73	5211.79	0.00	3.21	0 00:00	0.00	0.00
2	ChanStart	Junction	5214.03	5215.00	0.00	0.00	0.00	1.84	5214.50	0.00	0.53	0 00:00	0.00	0.00
3	DrwyIn	Junction	5203.60	5206.50	0.00	0.00	0.00	1.05	5203.81	0.00	2.69	0 00:00	0.00	0.00
4	DrwyOut	Junction	5202.80	5208.00	0.00	0.00	0.00	1.03	5204.59	0.00	3.41	0 00:00	0.00	0.00
5	OutletStr	Junction	5208.28	5212.50	0.00	0.00	0.00	0.04	5208.36	0.00	4.14	0 00:00	0.00	0.00
6	PondOut	Junction	5207.69	528.69	0.00	0.00	0.00	0.04	5207.85	0.00	1.34	0 00:00	0.00	0.00
7	SouthChanEnd	Junction	5215.00	5216.00	0.00	0.00	0.00	0.50	5216.00	0.00	0.00	0 00:00	0.00	0.00
8	SouthChanStart	Junction	5216.70	5217.90	0.00	0.00	0.00	0.62	5217.09	0.00	0.83	0 00:00	0.00	0.00
9	Topond	Junction	5210.47	5212.00	0.00	0.00	0.00	1.72	5210.87	0.00	1.13	0 00:00	0.00	0.00
10	WestChanEnd	Junction	5212.86	5215.00	0.00	0.00	0.00	0.82	5214.00	0.00	1.00	0 00:00	0.00	0.00
11	WestChanStart	Junction	5216.92	5217.96	0.00	0.00	0.00	1.06	5217.11	0.00	1.31	0 00:00	0.00	0.00
12	Existing	Outfall	5200.00					1.34	5200.00					
13	Proposed	Outfall	5200.00					1.87	5204.01					
14	Pond	Storage Node	5208.86	5212.50	0.00		0.00	5.84	5209.41				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	ChantoPond	Pipe	ChanEnd	Topond	88.00	5211.30	5210.47	0.9400	18.000	0.0120	1.72	11.05	0.16	4.57	0.40	0.27	0.00	Calculated
2	Driveway	Pipe	DrwyIn	DrwyOut	80.00	5203.60	5202.80	1.0000	21.000	0.0120	1.03	34.33	0.03	3.24	0.21	0.12	0.00	Calculated
3	Link-03	Pipe	Topond	Pond	968.20	5209.37	5209.00	0.0400	0.000	0.0150	1.72	0.00	0.01	0.00	0.16	0.16	0.00	Calculated
4	Link-05	Pipe	DrwyOut	Proposed	1375.96	5204.59	5200.00	0.3300	0.000	0.0150	1.03	0.00	0.01	0.00	0.16	0.16	0.00	Calculated
5	Link-11	Pipe	WestChanEnd	DrwyIn	2961.75	5214.00	5203.60	0.3500	0.000	0.0150	0.82	0.00	0.01	0.00	0.16	0.16	0.00	Calculated
6	PondOut	Pipe	OutletStr	PondOut	118.00	5208.28	5207.69	0.5000	18.000	0.0120	0.04	8.05	0.00	1.17	0.08	0.05	0.00	Calculated
7	Channel	Channel	ChanStart	ChanEnd	165.00	5214.03	5211.33	1.6400	12.000	0.0350	1.73	13.41	0.13	5.90	0.46	0.46	0.00	
8	EastSwale	Channel	PondOut	Proposed	318.90	5207.69	5203.85	1.2000	12.000	0.0350	0.04	5.45	0.01	0.80	0.16	0.16	0.00	
9	SouthChan	Channel	SouthChanStart	SouthChanEnd	438.05	5216.92	5214.07	0.6500	12.000	0.0350	0.50	16.93	0.03	1.55	0.12	0.12	0.00	
10	WestChan	Channel	WestChanStart	WestChanEnd	475.00	5216.92	5212.86	0.8500	18.000	0.0350	0.82	43.93	0.02	2.33	0.15	0.10	0.00	
11	Orifice-01	Orifice	Pond	OutletStr		5208.86	5208.28		1.125		0.02							
12	Orifice-02	Orifice	Pond	OutletStr		5208.86	5208.28		1.125		0.02							
13	Orifice-03	Orifice	Pond	OutletStr		5208.86	5208.28		1.125		0.00							
14	Weir-01	Weir	Pond	OutletStr		5208.86	5208.28				0.00							

Subbasin Hydrology

Subbasin : East

Input Data

Area (ac) 1.56
Weighted Runoff Coefficient 0.1400
Average Slope (%) 2.0000
Flow Length (ft) 390.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.56	-	0.14
Composite Area & Weighted Runoff Coeff.	1.56		0.14

Time of Concentration

TOC Method : Kirpich

Sheet Flow Equation :

Tc = (0.0078 * ((Lf^0.77) * (Sf^-0.385)))

Where :

Tc = Time of Concentration (min)
Lf = Flow Length (ft)
Sf = Slope (ft/ft)

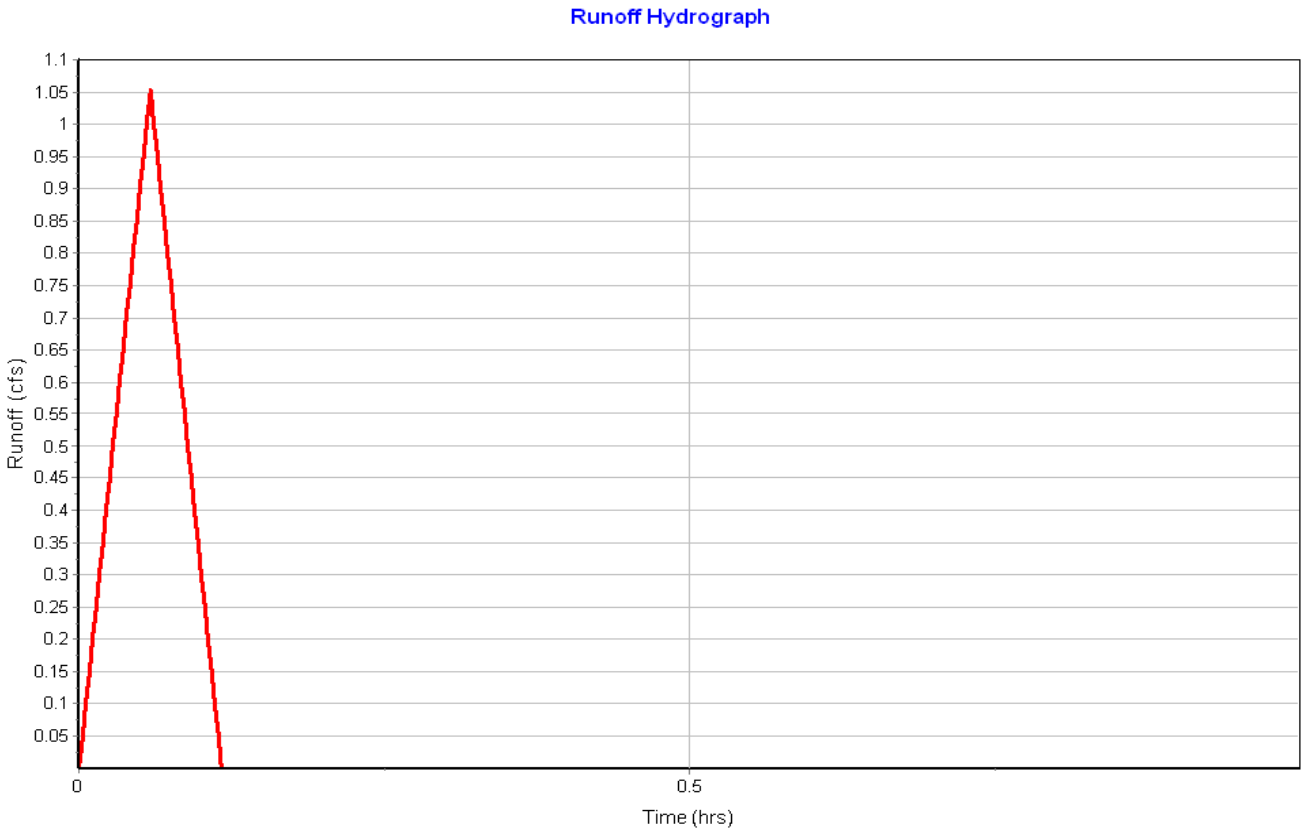
Flow Length (ft) 390.00
Slope (%) 2
Computed TOC (min) 3.48

Subbasin Runoff Results

Total Rainfall (in) 0.28
Total Runoff (in) 0.04
Peak Runoff (cfs) 1.05
Rainfall Intensity 4.822
Weighted Runoff Coefficient 0.1400
Time of Concentration (days hh:mm:ss) 0 00:03:29

Lazy Dog Drainage
5-Year Event

Subbasin : East



Lazy Dog Drainage
5-Year Event

Subbasin : ExistingSite

Input Data

Area (ac)	8.00
Weighted Runoff Coefficient	0.0500
Average Slope (%)	2.0000
Flow Length (ft)	1000.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	8.00	-	0.05
Composite Area & Weighted Runoff Coeff.	8.00		0.05

Time of Concentration

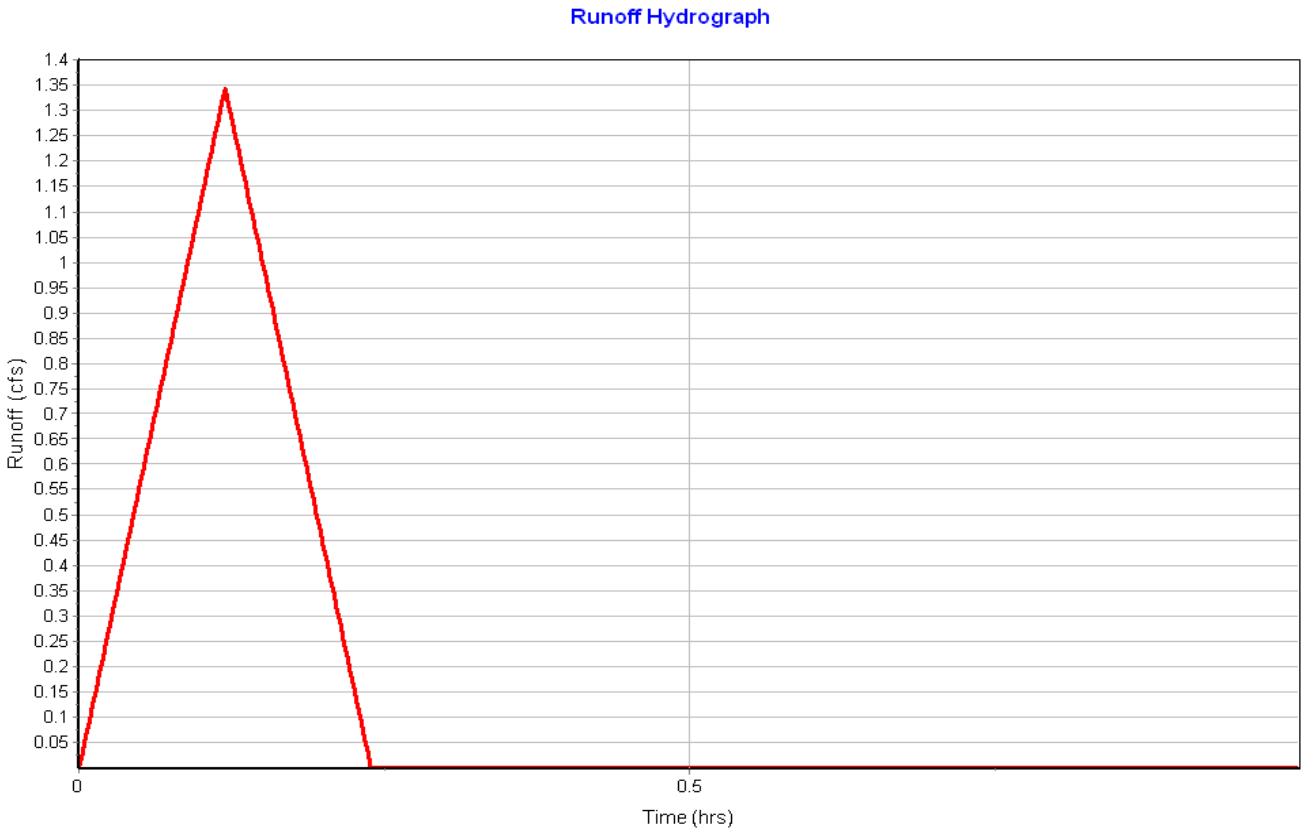
Flow Length (ft)	1000.00
Slope (%)	2
Computed TOC (min)	7.18

Subbasin Runoff Results

Total Rainfall (in)	0.40
Total Runoff (in)	0.02
Peak Runoff (cfs)	1.34
Rainfall Intensity	3.359
Weighted Runoff Coefficient	0.0500
Time of Concentration (days hh:mm:ss)	0 00:07:11

Lazy Dog Drainage
5-Year Event

Subbasin : ExistingSite



Subbasin : NorthYard

Input Data

Area (ac)	1.77
Weighted Runoff Coefficient	0.6500
Average Slope (%)	1.0300
Flow Length (ft)	400.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.77	-	0.65
Composite Area & Weighted Runoff Coeff.	1.77		0.65

Time of Concentration

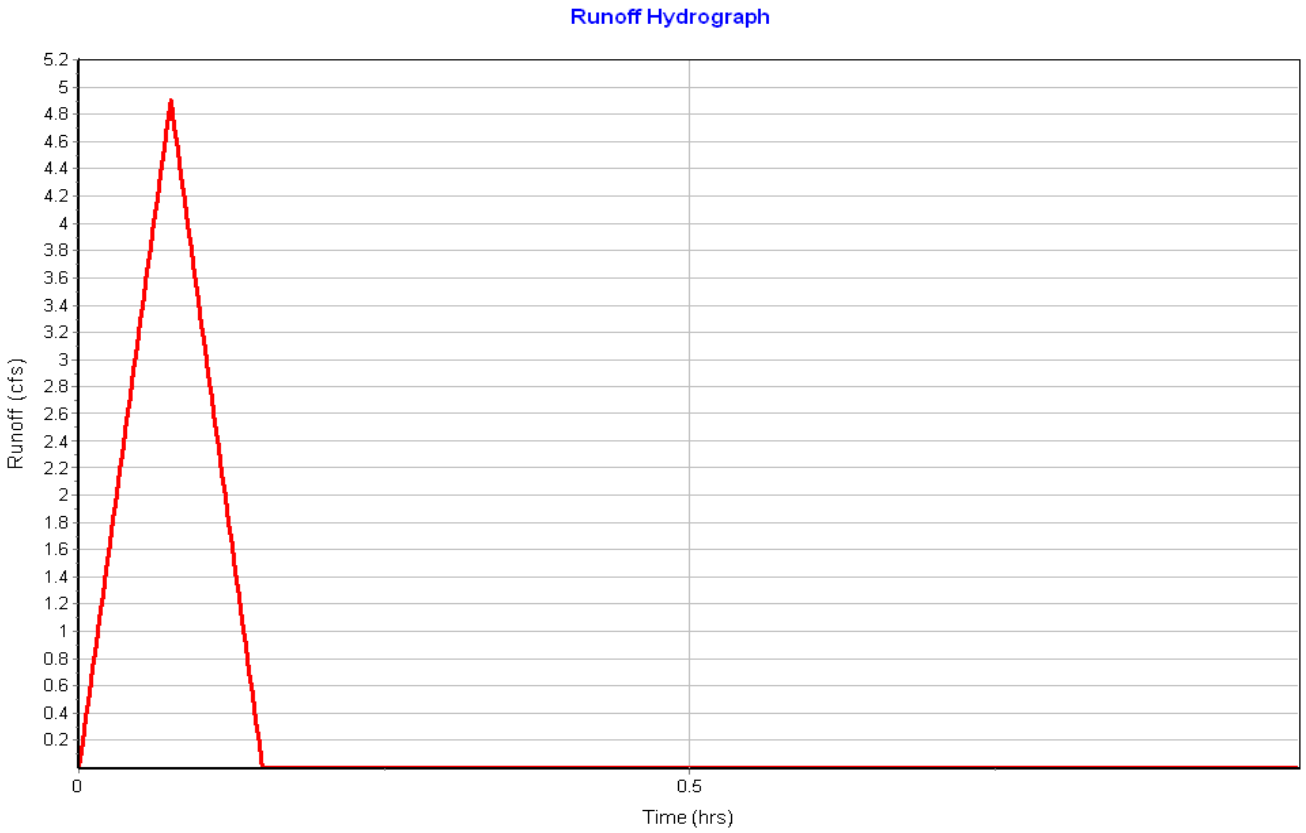
Flow Length (ft)	400.00
Slope (%)	1.03
Computed TOC (min)	4.58

Subbasin Runoff Results

Total Rainfall (in)	0.32
Total Runoff (in)	0.21
Peak Runoff (cfs)	4.90
Rainfall Intensity	4.262
Weighted Runoff Coefficient	0.6500
Time of Concentration (days hh:mm:ss)	0 00:04:35

Lazy Dog Drainage
5-Year Event

Subbasin : NorthYard



Subbasin : OffsiteSouth

Input Data

Area (ac)	3.50
Weighted Runoff Coefficient	0.0500
Average Slope (%)	3.0000
Flow Length (ft)	1000.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	3.50	-	0.05
Composite Area & Weighted Runoff Coeff.	3.50		0.05

Time of Concentration

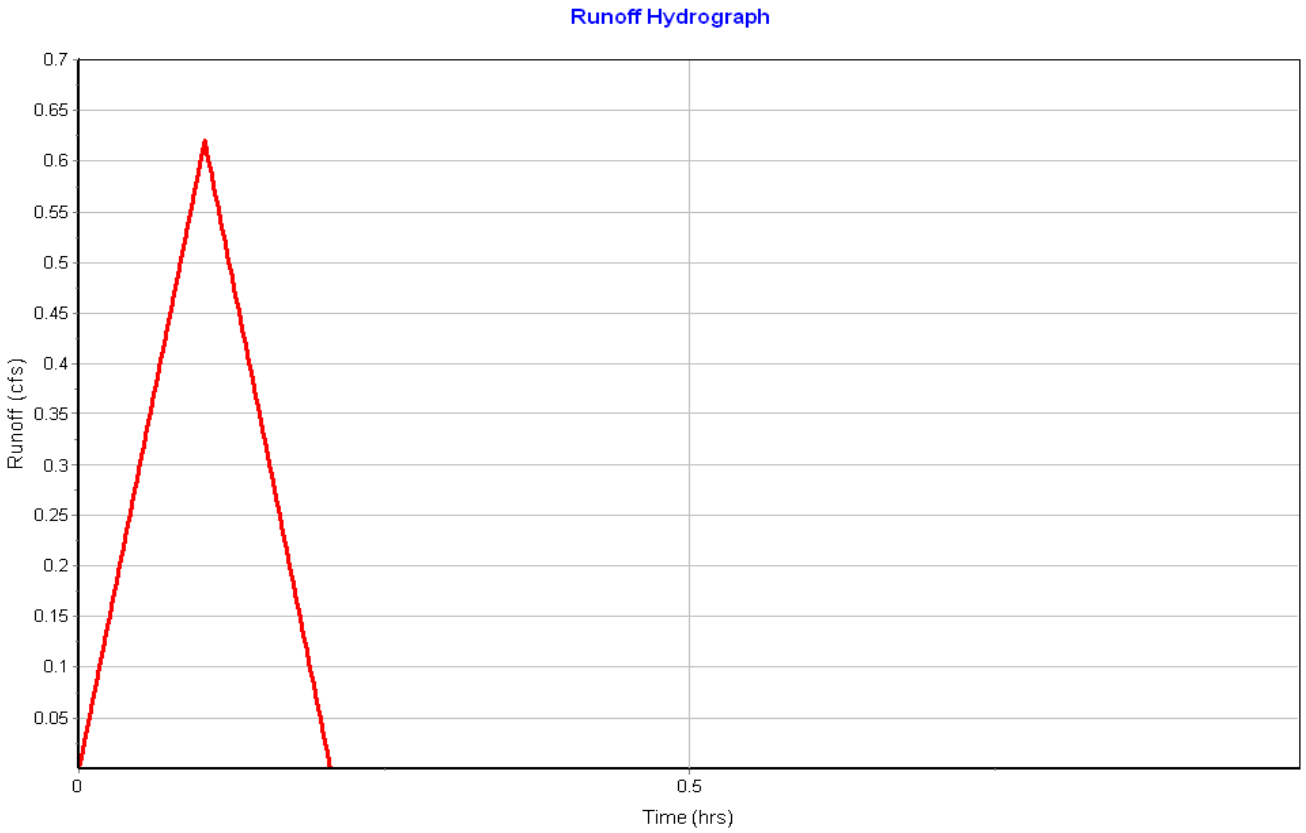
Flow Length (ft)	1000.00
Slope (%)	3
Computed TOC (min)	6.14

Subbasin Runoff Results

Total Rainfall (in)	0.36
Total Runoff (in)	0.02
Peak Runoff (cfs)	0.62
Rainfall Intensity	3.543
Weighted Runoff Coefficient	0.0500
Time of Concentration (days hh:mm:ss)	0 00:06:08

Lazy Dog Drainage
5-Year Event

Subbasin : OffsiteSouth



Subbasin : OffsiteWest

Input Data

Area (ac)	6.00
Weighted Runoff Coefficient	0.0500
Average Slope (%)	3.0000
Flow Length (ft)	1000.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	6.00	-	0.05
Composite Area & Weighted Runoff Coeff.	6.00		0.05

Time of Concentration

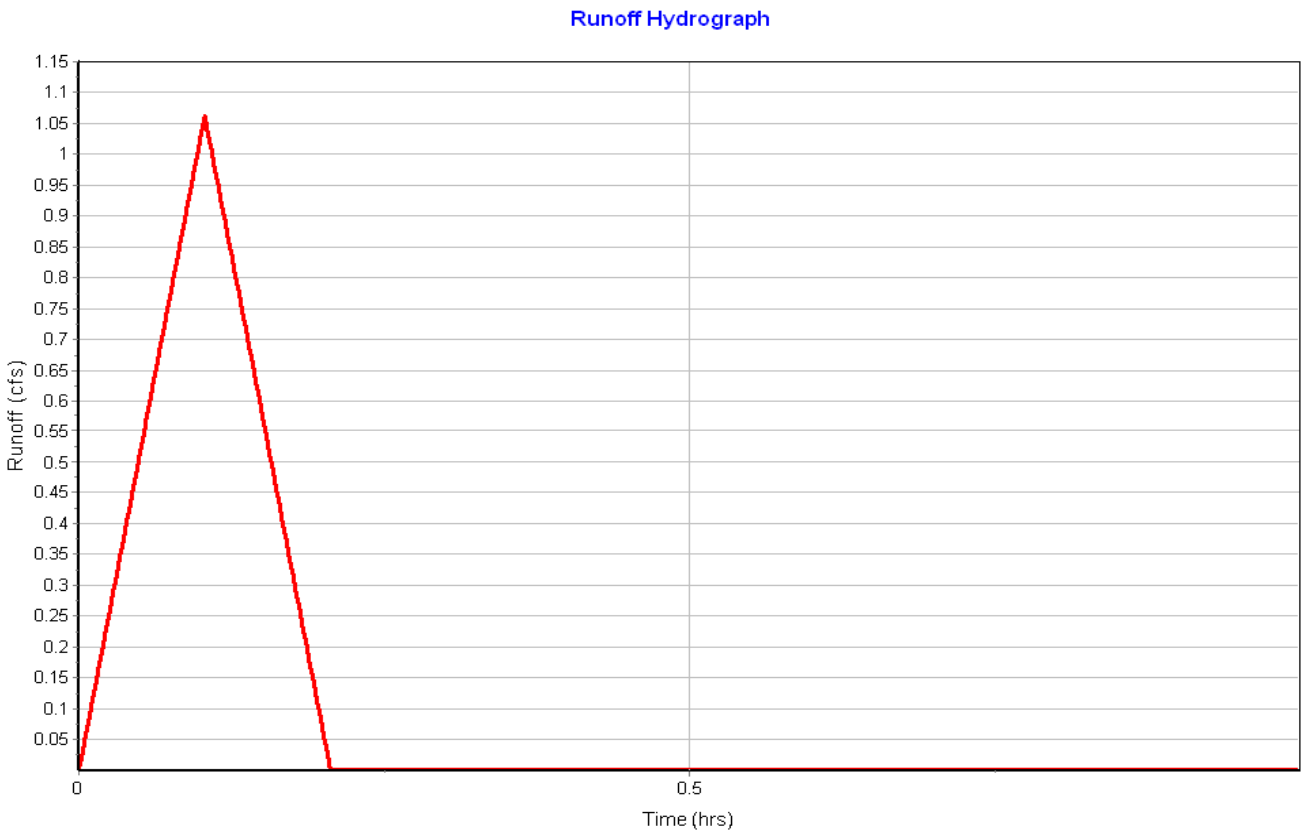
Flow Length (ft)	1000.00
Slope (%)	3
Computed TOC (min)	6.14

Subbasin Runoff Results

Total Rainfall (in)	0.36
Total Runoff (in)	0.02
Peak Runoff (cfs)	1.06
Rainfall Intensity	3.543
Weighted Runoff Coefficient	0.0500
Time of Concentration (days hh:mm:ss)	0 00:06:08

Lazy Dog Drainage
5-Year Event

Subbasin : OffsiteWest



Subbasin : SouthYard

Input Data

Area (ac)	1.34
Weighted Runoff Coefficient	0.3800
Average Slope (%)	1.0300
Flow Length (ft)	545.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.34	-	0.38
Composite Area & Weighted Runoff Coeff.	1.34		0.38

Time of Concentration

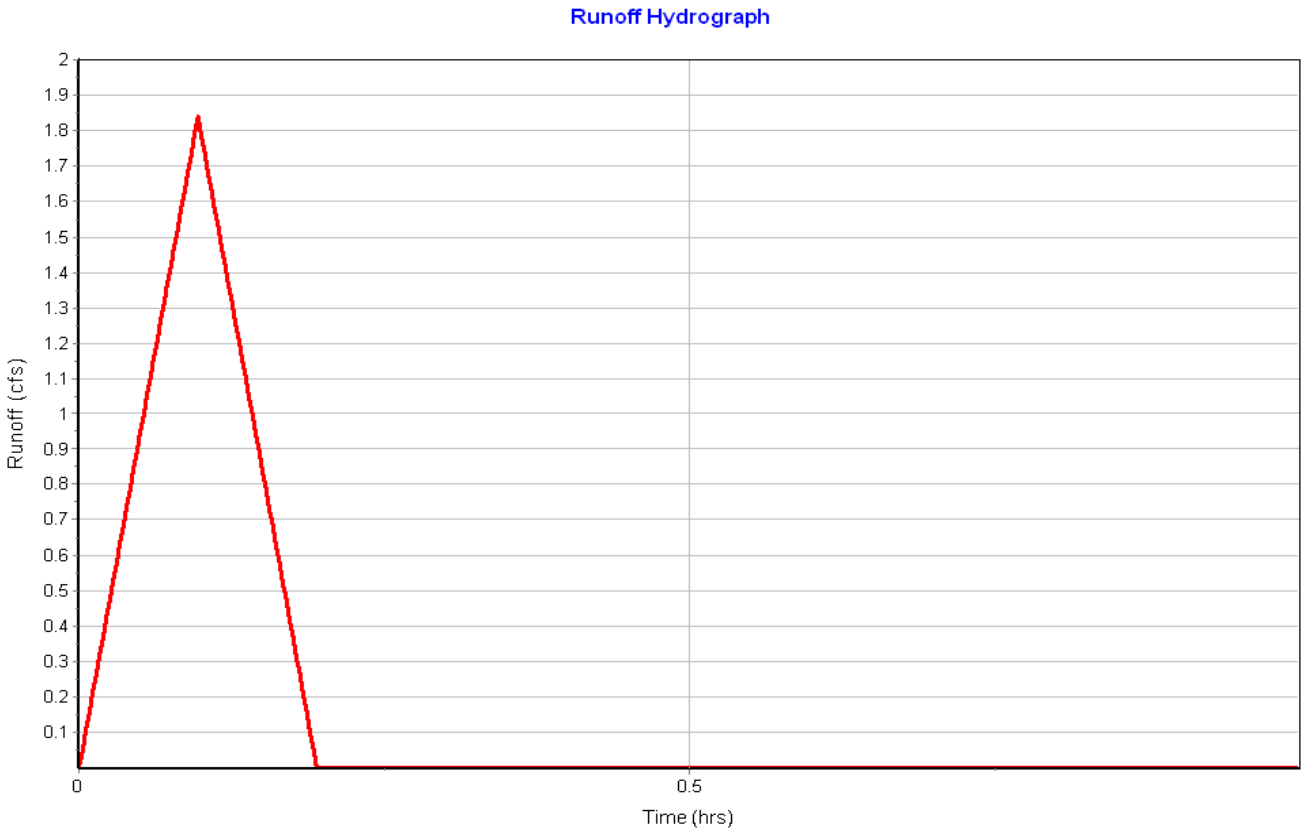
Flow Length (ft)	545.00
Slope (%)	1.03
Computed TOC (min)	5.81

Subbasin Runoff Results

Total Rainfall (in)	0.35
Total Runoff (in)	0.13
Peak Runoff (cfs)	1.84
Rainfall Intensity	3.610
Weighted Runoff Coefficient	0.3800
Time of Concentration (days hh:mm:ss)	0 00:05:49

Lazy Dog Drainage
5-Year Event

Subbasin : SouthYard



Lazy Dog Drainage
5-Year Event

Subbasin : West

Input Data

Area (ac)	3.33
Weighted Runoff Coefficient	0.0700
Average Slope (%)	2.0000
Flow Length (ft)	500.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	3.33	-	0.07
Composite Area & Weighted Runoff Coeff.	3.33		0.07

Time of Concentration

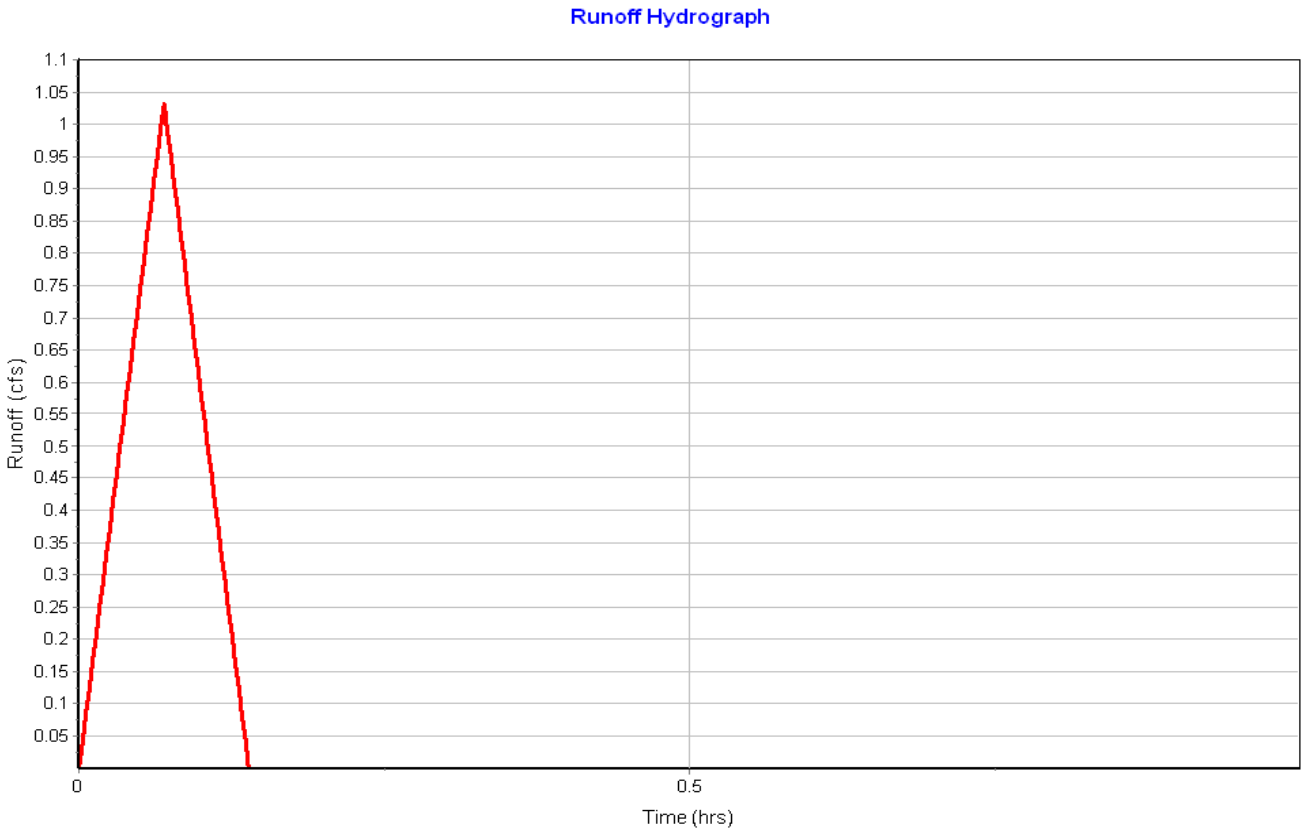
Flow Length (ft)	500.00
Slope (%)	2
Computed TOC (min)	4.21

Subbasin Runoff Results

Total Rainfall (in)	0.31
Total Runoff (in)	0.02
Peak Runoff (cfs)	1.03
Rainfall Intensity	4.427
Weighted Runoff Coefficient	0.0700
Time of Concentration (days hh:mm:ss)	0 00:04:13

Lazy Dog Drainage
5-Year Event

Subbasin : West



Lazy Dog Drainage
5-Year Event

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
1	ChanEnd	5211.30	5215.00	3.70	0.00	-5211.30	0.00	-5215.00	0.00	0.00
2	ChanStart	5214.03	5215.00	0.97	0.00	-5214.03	0.00	-5215.00	0.00	0.00
3	DrwyIn	5203.60	5206.50	2.90	0.00	-5203.60	0.00	-5206.50	0.00	0.00
4	DrwyOut	5202.80	5208.00	5.20	0.00	-5202.80	0.00	-5208.00	0.00	0.00
5	OutletStr	5208.28	5212.50	4.22	0.00	-5208.28	0.00	-5212.50	0.00	0.00
6	PondOut	5207.69	528.69	-4679.00	0.00	-5207.69	0.00	-528.69	0.00	0.00
7	SouthChanEnd	5215.00	5216.00	1.00	0.00	-5215.00	0.00	-5216.00	0.00	0.00
8	SouthChanStart	5216.70	5217.90	1.20	0.00	-5216.70	0.00	-5217.90	0.00	0.00
9	Topond	5210.47	5212.00	1.53	0.00	-5210.47	0.00	-5212.00	0.00	0.00
10	WestChanEnd	5212.86	5215.00	2.14	0.00	-5212.86	0.00	-5215.00	0.00	0.00
11	WestChanStart	5216.92	5217.96	1.04	0.00	-5216.92	0.00	-5217.96	0.00	0.00

Lazy Dog Drainage
5-Year Event

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	ChanEnd	1.73	0.00	5211.79	0.49	0.00	3.21	5211.42	0.12	0 00:06	0 00:00	0.00	0.00
2	ChanStart	1.84	1.84	5214.50	0.47	0.00	0.53	5214.10	0.07	0 00:06	0 00:00	0.00	0.00
3	DrwyIn	1.05	1.03	5203.81	0.21	0.00	2.69	5203.67	0.07	0 00:04	0 00:00	0.00	0.00
4	DrwyOut	1.03	0.00	5204.59	1.79	0.00	3.41	5204.59	1.79	0 00:00	0 00:00	0.00	0.00
5	OutletStr	0.04	0.00	5208.36	0.08	0.00	4.14	5208.35	0.07	0 00:15	0 00:00	0.00	0.00
6	PondOut	0.04	0.00	5207.85	0.16	0.00	1.34	5207.84	0.15	0 00:16	0 00:00	0.00	0.00
7	SouthChanEnd	0.50	0.00	5216.00	1.00	0.00	0.00	5215.94	0.94	0 00:03	0 00:00	0.00	0.00
8	SouthChanStart	0.62	0.62	5217.09	0.39	0.00	0.83	5216.94	0.24	0 00:06	0 00:00	0.00	0.00
9	Topond	1.72	0.00	5210.87	0.40	0.00	1.13	5210.53	0.06	0 00:07	0 00:00	0.00	0.00
10	WestChanEnd	0.82	0.00	5214.00	1.14	0.00	1.00	5214.00	1.14	0 00:00	0 00:00	0.00	0.00
11	WestChanStart	1.06	1.06	5217.11	0.19	0.00	1.31	5216.95	0.03	0 00:06	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Channel	165.00	5214.03	0.00	5211.33	0.03	2.70	1.6400	Triangular	1.000	8.000	0.0350	0.5000	0.5000	0.0000	0.00	No
2	EastSwale	318.90	5207.69	0.00	5203.85	3.85	3.84	1.2000	Triangular	1.000	4.000	0.0350	0.5000	0.5000	0.0000	0.00	No
3	SouthChan	438.05	5216.92	0.22	5214.07	-0.93	2.85	0.6500	Trapezoidal	1.000	12.000	0.0350	0.5000	0.5000	0.0000	0.00	No
4	WestChan	475.00	5216.92	0.00	5212.86	0.00	4.06	0.8500	Trapezoidal	1.500	11.500	0.0350	0.5000	0.5000	0.0000	0.00	No

Lazy Dog Drainage
5-Year Event

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Channel	1.73	0 00:06	13.41	0.13	5.90	0.47	0.46	0.46	0.00		
2	EastSwale	0.04	0 00:29	5.45	0.01	0.80	6.64	0.16	0.16	0.00		
3	SouthChan	0.50	0 00:12	16.93	0.03	1.55	4.71	0.12	0.12	0.00		
4	WestChan	0.82	0 00:12	43.93	0.02	2.33	3.40	0.15	0.10	0.00		

Lazy Dog Drainage
5-Year Event

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	ChantoPond	88.00	5211.30	0.00	5210.47	0.00	0.83	0.9400	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
2	Driveway	80.00	5203.60	0.00	5202.80	0.00	0.80	1.0000	CIRCULAR	21.000	21.000	0.0120	0.5000	0.5000	0.0000	0.00	No	2
3	Link-03	968.20	5209.37	-1.10	5209.00	0.14	0.37	0.0400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
4	Link-05	1375.96	5204.59	1.79	5200.00	0.00	4.59	0.3300	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
5	Link-11	2961.75	5214.00	1.14	5203.60	0.00	10.40	0.3500	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
6	PondOut	118.00	5208.28	0.00	5207.69	0.00	0.59	0.5000	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1

Lazy Dog Drainage
5-Year Event

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	ChantoPond	1.72	0 00:07	11.05	0.16	4.57	0.32	0.40	0.27	0.00		Calculated
2	Driveway	1.03	0 00:04	34.33	0.03	3.24	0.41	0.21	0.12	0.00		Calculated
3	Link-03	1.72	0 00:07	0.00	0.01	0.00		0.16	0.16	0.00		Calculated
4	Link-05	1.03	0 00:04	0.00	0.01	0.00		0.16	0.16	0.00		Calculated
5	Link-11	0.82	0 00:12	0.00	0.01	0.00		0.16	0.16	0.00		Calculated
6	PondOut	0.04	0 00:16	8.05	0.00	1.17	1.68	0.08	0.05	0.00		Calculated

Storage Nodes

Storage Node : Pond

Input Data

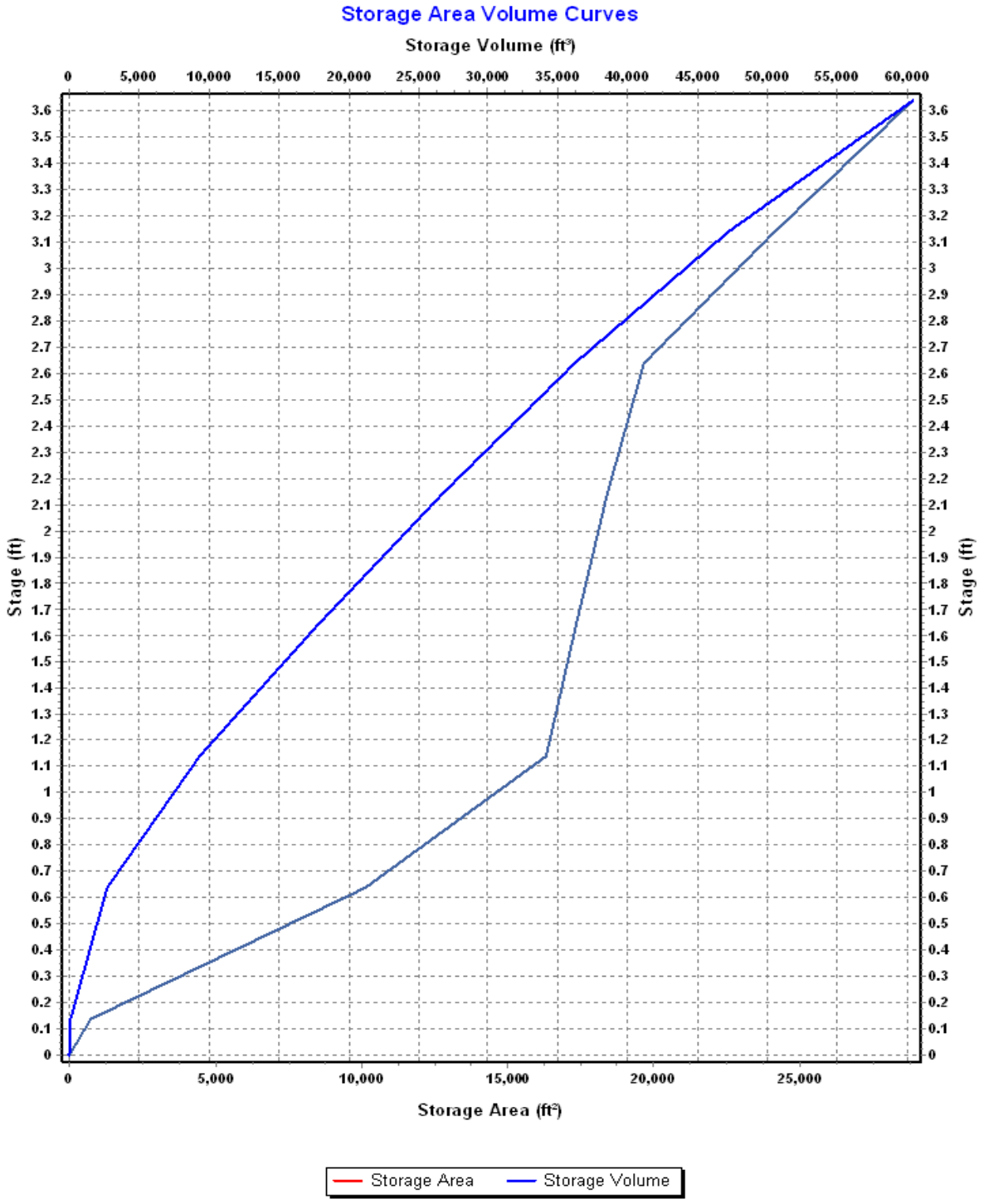
Invert Elevation (ft)	5208.86
Max (Rim) Elevation (ft)	5212.50
Max (Rim) Offset (ft)	3.64
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-5208.86
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0	0.000
.14	722.03	50.54
.64	10132.4	2764.15
1.14	16308	9374.25
1.64	17334	17784.75
2.14	18388	26715.25
2.64	19659	36227.00
3.14	24123.77	47172.69
3.64	28852.91	60416.86

Lazy Dog Drainage
5-Year Event



Storage Node : Pond (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Weir-01	Rectangular	No	5210.00	1.14	4.00	1.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-01	Side	CIRCULAR	No	1.13			5208.65	0.61
2	Orifice-02	Side	CIRCULAR	No	1.13			5209.15	0.61
3	Orifice-03	Side	CIRCULAR	No	1.13			5209.65	0.61

Output Summary Results

Peak Inflow (cfs)	5.84
Peak Lateral Inflow (cfs)	4.90
Peak Outflow (cfs)	0.04
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	5209.41
Max HGL Depth Attained (ft)	0.55
Average HGL Elevation Attained (ft)	5209.37
Average HGL Depth Attained (ft)	0.51
Time of Max HGL Occurrence (days hh:mm)	0 00:15
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Lazy Dog Drainage
100 Year Event

Project Description

File Name	Lazy Dog Drainage (RM100YR).SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	Kirpich
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	May 31, 2018	00:00:00
End Analysis On	May 31, 2018	01:00:00
Start Reporting On	May 31, 2018	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	7
Nodes	14
Junctions	11
Outfalls	2
Flow Diversions	0
Inlets	0
Storage Nodes	1
Links	14
Channels	4
Pipes	6
Pumps	0
Orifices	3
Weirs	1
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	100 year(s)

Lazy Dog Drainage
100 Year Event

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Average Slope (%)	Flow Length (ft)	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	East	1.56	0.5400	2.0000	390.00	0.68	0.37	0.57	9.82	0 00:03:28
2	ExistingSite	8.00	0.4900	2.0000	1000.00	0.97	0.48	3.80	31.80	0 00:07:10
3	NorthYard	1.77	0.7900	1.0300	400.00	0.77	0.61	1.08	14.43	0 00:04:34
4	OffsiteSouth	3.50	0.4900	3.0000	1000.00	0.88	0.43	1.50	14.62	0 00:06:08
5	OffsiteWest	6.00	0.4900	3.0000	1000.00	0.88	0.43	2.57	25.06	0 00:06:08
6	SouthYard	1.34	0.6600	1.0300	545.00	0.84	0.56	0.75	7.67	0 00:05:48
7	West	3.33	0.5000	2.0000	500.00	0.74	0.37	1.24	17.83	0 00:04:12

Lazy Dog Drainage
100 Year Event

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	ChanEnd	Junction	5211.30	5215.00	0.00	0.00	0.00	7.36	5212.20	0.00	2.80	0 00:00	0.00	0.00
2	ChanStart	Junction	5214.03	5215.00	0.00	0.00	0.00	7.67	5214.84	0.00	0.19	0 00:00	0.00	0.00
3	DrwyIn	Junction	5203.60	5206.50	0.00	0.00	0.00	27.41	5204.78	0.00	1.72	0 00:00	0.00	0.00
4	DrwyOut	Junction	5202.80	5208.00	0.00	0.00	0.00	27.40	5204.59	0.00	3.41	0 00:00	0.00	0.00
5	OutletStr	Junction	5208.28	5212.50	0.00	0.00	0.00	0.07	5208.38	0.00	4.12	0 00:00	0.00	0.00
6	PondOut	Junction	5207.69	528.69	0.00	0.00	0.00	0.07	5207.89	0.00	1.30	0 00:00	0.00	0.00
7	SouthChanEnd	Junction	5215.00	5216.00	0.00	0.00	0.00	12.11	5216.00	0.00	0.00	0 00:00	0.00	0.00
8	SouthChanStart	Junction	5216.70	5217.90	0.00	0.00	0.00	14.62	5217.85	0.00	0.07	0 00:00	0.00	0.00
9	Topond	Junction	5210.47	5212.00	0.00	0.00	0.00	7.34	5211.36	0.00	0.64	0 00:00	0.00	0.00
10	WestChanEnd	Junction	5212.86	5215.00	0.00	0.00	0.00	22.31	5214.00	0.00	1.00	0 00:00	0.00	0.00
11	WestChanStart	Junction	5216.92	5217.96	0.00	0.00	0.00	25.06	5218.05	0.00	0.37	0 00:00	0.00	0.00
12	Existing	Outfall	5200.00					31.79	5200.00					
13	Proposed	Outfall	5200.00					32.24	5204.05					
14	Pond	Storage Node	5208.86	5212.50	0.00		0.00	18.98	5209.81				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	ChantoPond	Pipe	ChanEnd	Topond	88.00	5211.30	5210.47	0.9400	18.000	0.0120	7.34	11.05	0.66	6.71	0.89	0.60	0.00	Calculated
2	Driveway	Pipe	DrwyIn	DrwyOut	80.00	5203.60	5202.80	1.0000	21.000	0.0120	27.40	34.33	0.80	7.95	1.18	0.68	0.00	Calculated
3	Link-03	Pipe	Topond	Pond	968.20	5209.37	5209.00	0.0400	0.000	0.0150	7.34	0.00	0.01	0.00	0.20	0.20	0.00	Calculated
4	Link-05	Pipe	DrwyOut	Proposed	1375.96	5204.59	5200.00	0.3300	0.000	0.0150	27.40	0.00	0.01	0.00	0.20	0.20	0.00	Calculated
5	Link-11	Pipe	WestChanEnd	DrwyIn	2961.75	5214.00	5203.60	0.3500	0.000	0.0150	22.31	0.00	0.01	0.00	0.20	0.20	0.00	Calculated
6	PondOut	Pipe	OutletStr	PondOut	118.00	5208.28	5207.69	0.5000	18.000	0.0120	0.07	8.05	0.01	1.40	0.10	0.07	0.00	Calculated
7	Channel	Channel	ChanStart	ChanEnd	165.00	5214.03	5211.33	1.6400	12.000	0.0350	7.36	13.41	0.55	7.85	0.79	0.80	0.00	
8	EastSwale	Channel	PondOut	Proposed	318.90	5207.69	5203.85	1.2000	12.000	0.0350	0.07	5.45	0.01	0.92	0.20	0.20	0.00	
9	SouthChan	Channel	SouthChanStart	SouthChanEnd	438.05	5216.92	5214.07	0.6500	12.000	0.0350	12.11	16.93	0.72	4.36	0.83	0.83	0.00	
10	WestChan	Channel	WestChanStart	WestChanEnd	475.00	5216.92	5212.86	0.8500	18.000	0.0350	22.31	43.93	0.51	6.05	1.05	0.70	0.00	
11	Orifice-01	Orifice	Pond	OutletStr		5208.86	5208.28		1.125		0.03							
12	Orifice-02	Orifice	Pond	OutletStr		5208.86	5208.28		1.125		0.03							
13	Orifice-03	Orifice	Pond	OutletStr		5208.86	5208.28		1.125		0.01							
14	Weir-01	Weir	Pond	OutletStr		5208.86	5208.28				0.00							

Subbasin Hydrology

Subbasin : East

Input Data

Area (ac) 1.56
Weighted Runoff Coefficient 0.5400
Average Slope (%) 2.0000
Flow Length (ft) 390.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.56	-	0.54
Composite Area & Weighted Runoff Coeff.	1.56		0.54

Time of Concentration

TOC Method : Kirpich

Sheet Flow Equation :

Tc = (0.0078 * ((Lf^0.77) * (Sf^-0.385)))

Where :

Tc = Time of Concentration (min)
Lf = Flow Length (ft)
Sf = Slope (ft/ft)

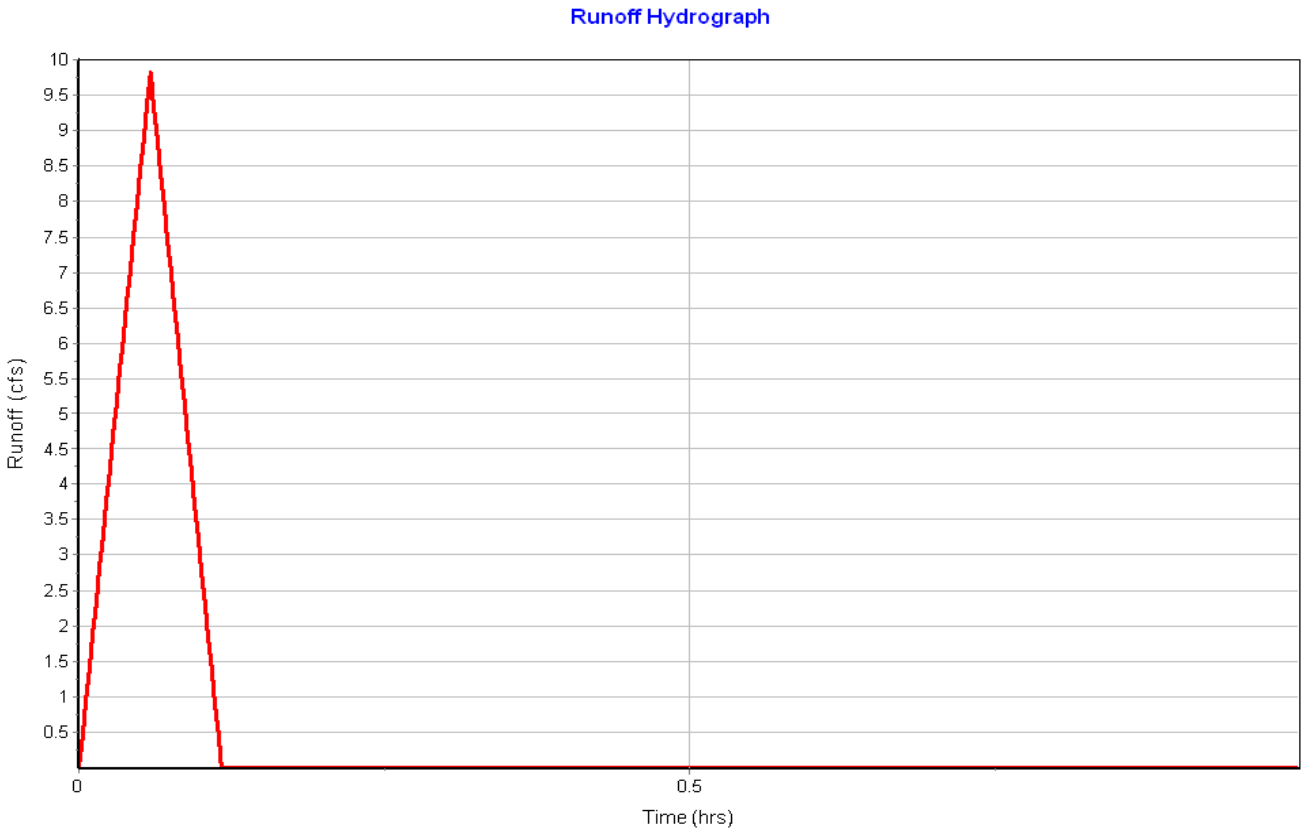
Flow Length (ft) 390.00
Slope (%) 2
Computed TOC (min) 3.48

Subbasin Runoff Results

Total Rainfall (in) 0.68
Total Runoff (in) 0.37
Peak Runoff (cfs) 9.82
Rainfall Intensity 11.651
Weighted Runoff Coefficient 0.5400
Time of Concentration (days hh:mm:ss) 0 00:03:29

Lazy Dog Drainage
100 Year Event

Subbasin : East



Subbasin : ExistingSite

Input Data

Area (ac)	8.00
Weighted Runoff Coefficient	0.4900
Average Slope (%)	2.0000
Flow Length (ft)	1000.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	8.00	-	0.49
Composite Area & Weighted Runoff Coeff.	8.00		0.49

Time of Concentration

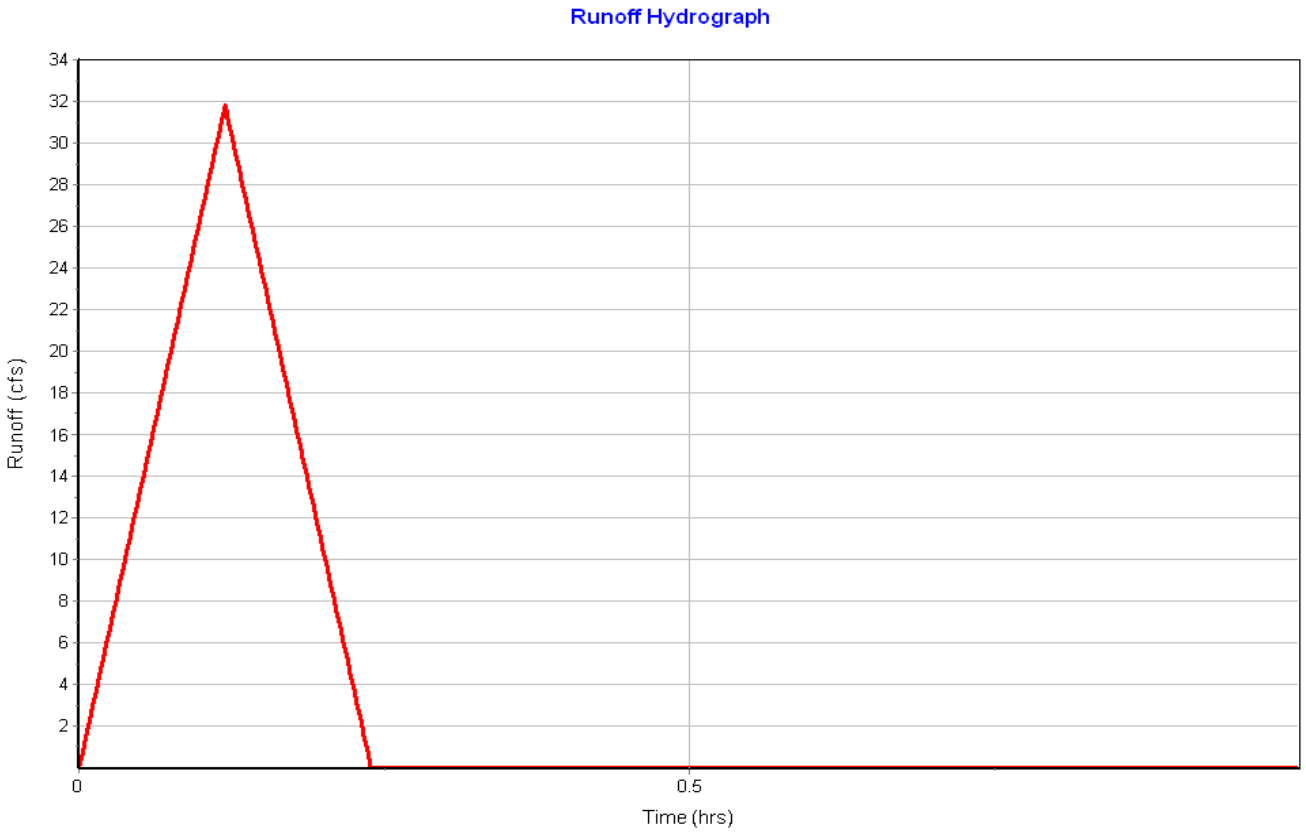
Flow Length (ft)	1000.00
Slope (%)	2
Computed TOC (min)	7.18

Subbasin Runoff Results

Total Rainfall (in)	0.97
Total Runoff (in)	0.48
Peak Runoff (cfs)	31.80
Rainfall Intensity	8.111
Weighted Runoff Coefficient	0.4900
Time of Concentration (days hh:mm:ss)	0 00:07:11

Lazy Dog Drainage
100 Year Event

Subbasin : ExistingSite



Subbasin : NorthYard

Input Data

Area (ac)	1.77
Weighted Runoff Coefficient	0.7900
Average Slope (%)	1.0300
Flow Length (ft)	400.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.77	-	0.79
Composite Area & Weighted Runoff Coeff.	1.77		0.79

Time of Concentration

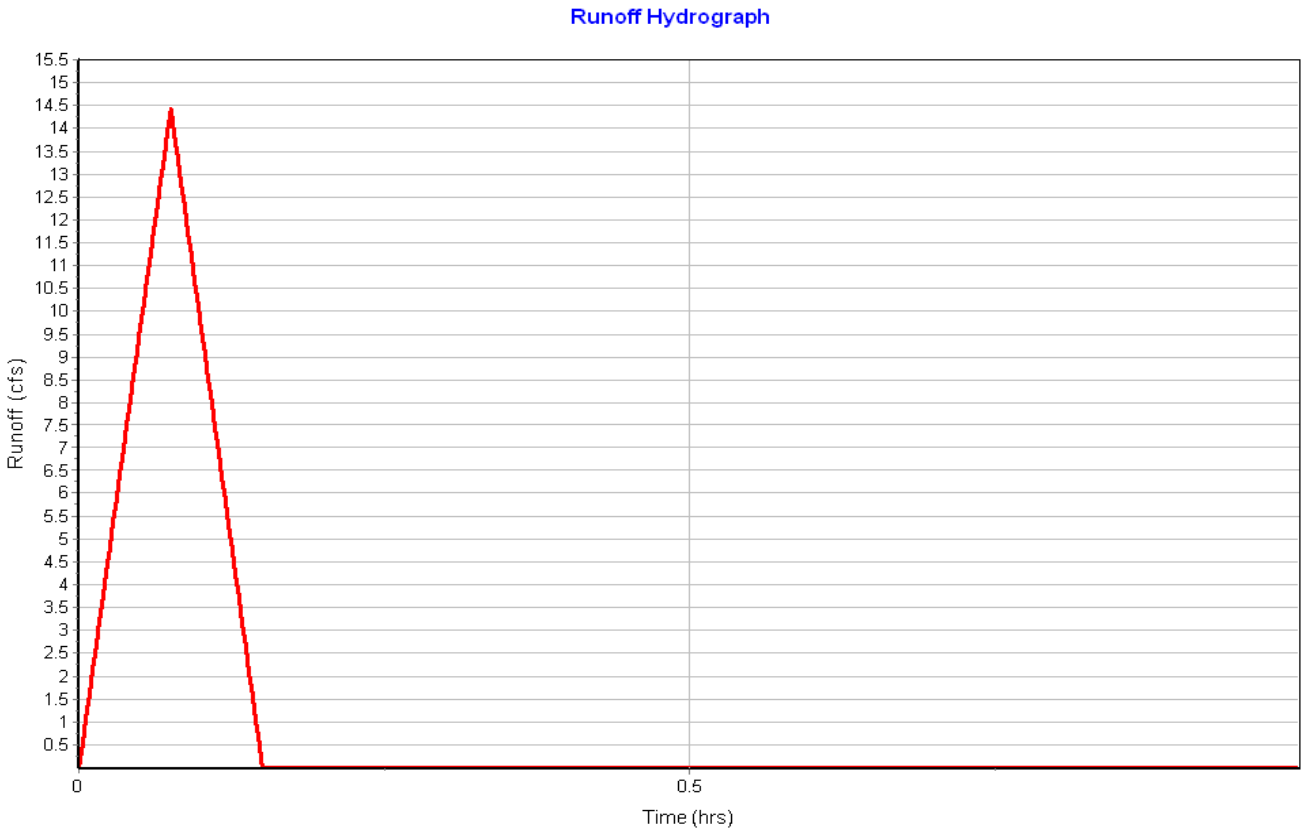
Flow Length (ft)	400.00
Slope (%)	1.03
Computed TOC (min)	4.58

Subbasin Runoff Results

Total Rainfall (in)	0.77
Total Runoff (in)	0.61
Peak Runoff (cfs)	14.43
Rainfall Intensity	10.316
Weighted Runoff Coefficient	0.7900
Time of Concentration (days hh:mm:ss)	0 00:04:35

Lazy Dog Drainage
100 Year Event

Subbasin : NorthYard



Subbasin : OffsiteSouth

Input Data

Area (ac)	3.50
Weighted Runoff Coefficient	0.4900
Average Slope (%)	3.0000
Flow Length (ft)	1000.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	8.00	-	0.49
Composite Area & Weighted Runoff Coeff.	8.00		0.49

Time of Concentration

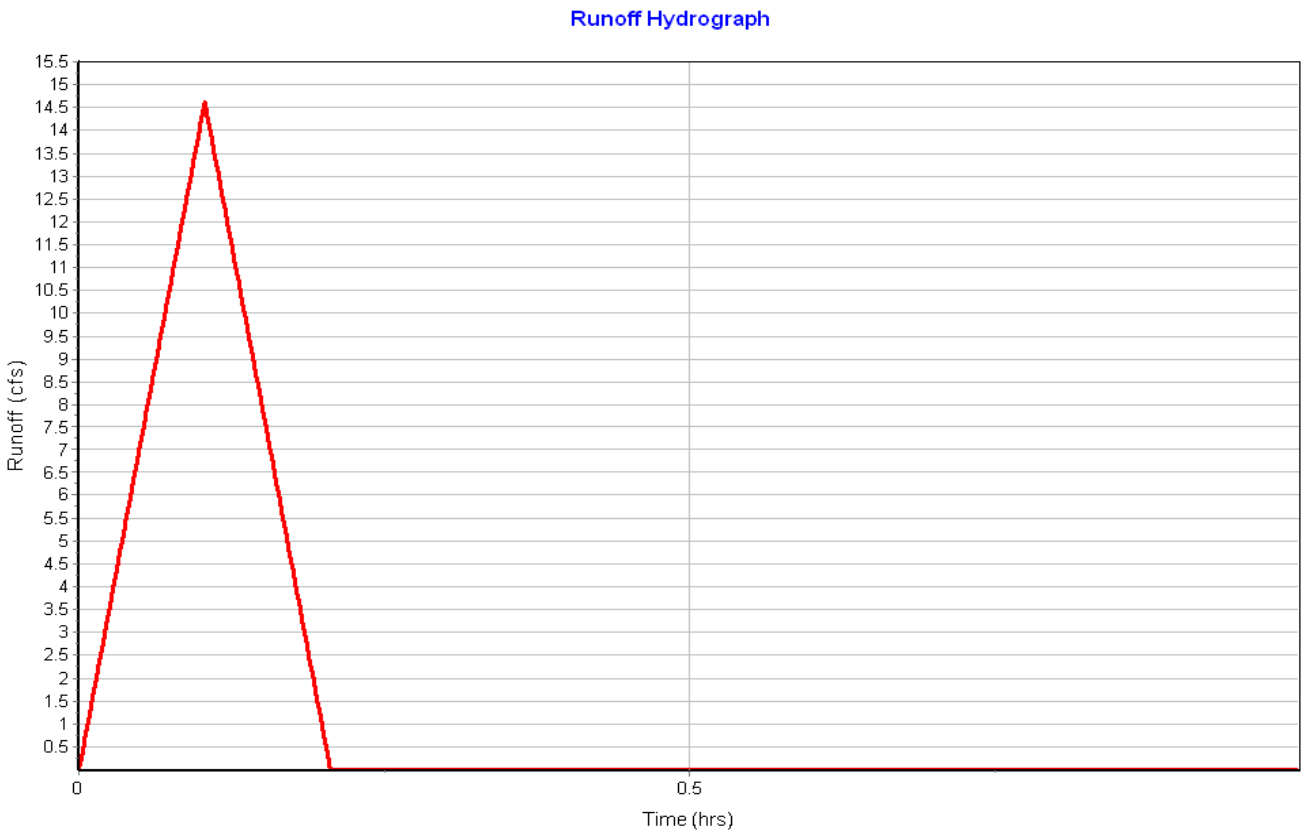
Flow Length (ft)	1000.00
Slope (%)	3
Computed TOC (min)	6.14

Subbasin Runoff Results

Total Rainfall (in)	0.88
Total Runoff (in)	0.43
Peak Runoff (cfs)	14.62
Rainfall Intensity	8.525
Weighted Runoff Coefficient	0.4900
Time of Concentration (days hh:mm:ss)	0 00:06:08

Lazy Dog Drainage
100 Year Event

Subbasin : OffsiteSouth



Subbasin : OffsiteWest

Input Data

Area (ac)	6.00
Weighted Runoff Coefficient	0.4900
Average Slope (%)	3.0000
Flow Length (ft)	1000.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	9.00	-	0.49
Composite Area & Weighted Runoff Coeff.	9.00		0.49

Time of Concentration

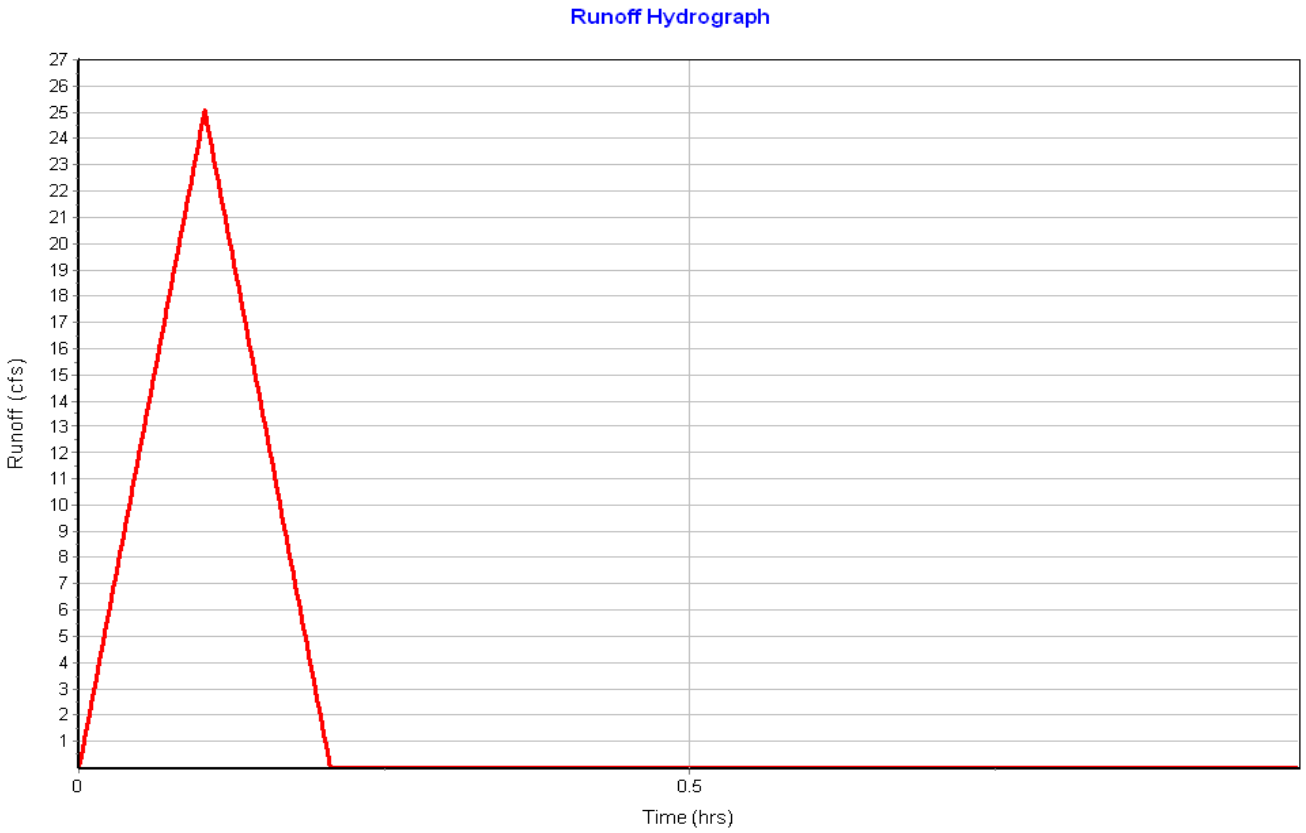
Flow Length (ft)	1000.00
Slope (%)	3
Computed TOC (min)	6.14

Subbasin Runoff Results

Total Rainfall (in)	0.88
Total Runoff (in)	0.43
Peak Runoff (cfs)	25.06
Rainfall Intensity	8.525
Weighted Runoff Coefficient	0.4900
Time of Concentration (days hh:mm:ss)	0 00:06:08

Lazy Dog Drainage
100 Year Event

Subbasin : OffsiteWest



Lazy Dog Drainage
100 Year Event

Subbasin : SouthYard

Input Data

Area (ac)	1.34
Weighted Runoff Coefficient	0.6600
Average Slope (%)	1.0300
Flow Length (ft)	545.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.34	-	0.66
Composite Area & Weighted Runoff Coeff.	1.34		0.66

Time of Concentration

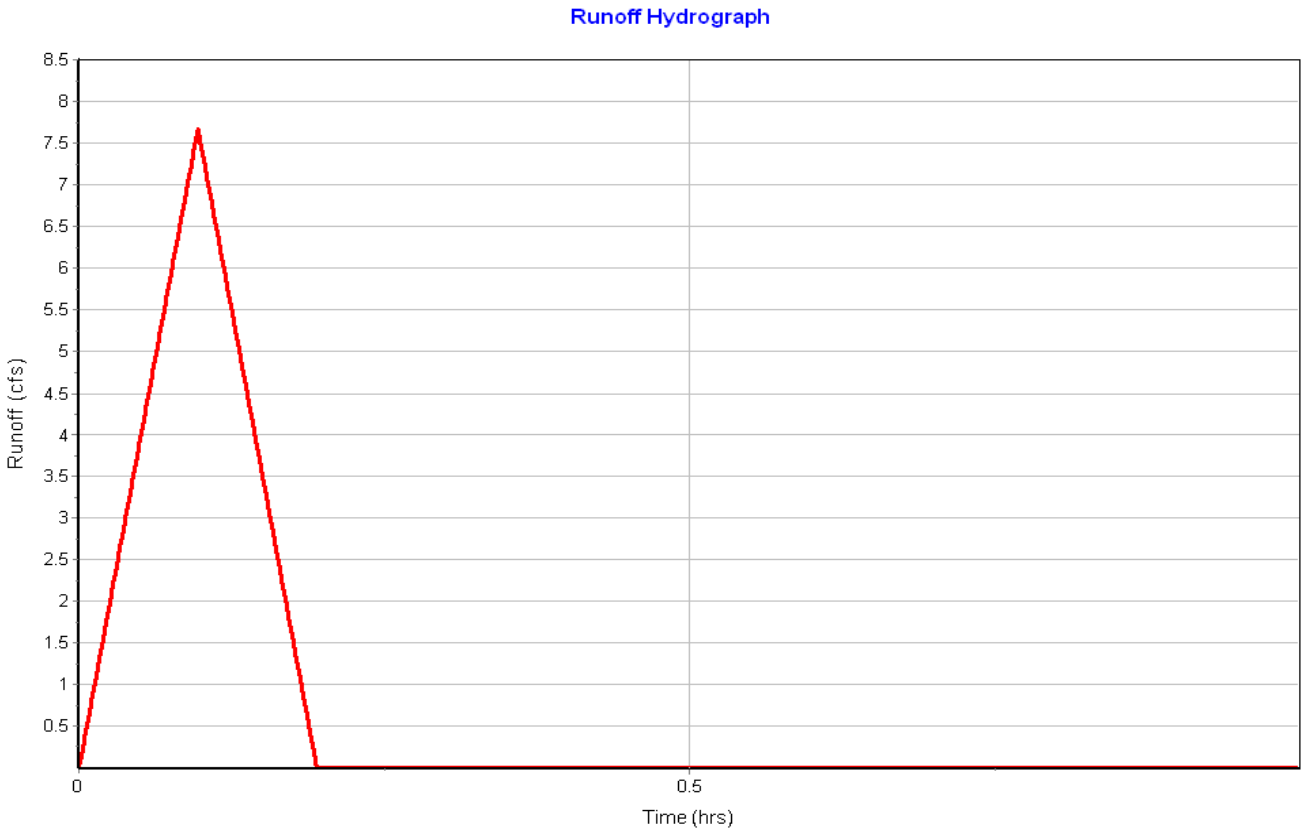
Flow Length (ft)	545.00
Slope (%)	1.03
Computed TOC (min)	5.81

Subbasin Runoff Results

Total Rainfall (in)	0.84
Total Runoff (in)	0.56
Peak Runoff (cfs)	7.67
Rainfall Intensity	8.676
Weighted Runoff Coefficient	0.6600
Time of Concentration (days hh:mm:ss)	0 00:05:49

Lazy Dog Drainage
100 Year Event

Subbasin : SouthYard



Lazy Dog Drainage
100 Year Event

Subbasin : West

Input Data

Area (ac)	3.33
Weighted Runoff Coefficient	0.5000
Average Slope (%)	2.0000
Flow Length (ft)	500.00

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	3.33	-	0.50
Composite Area & Weighted Runoff Coeff.	3.33		0.50

Time of Concentration

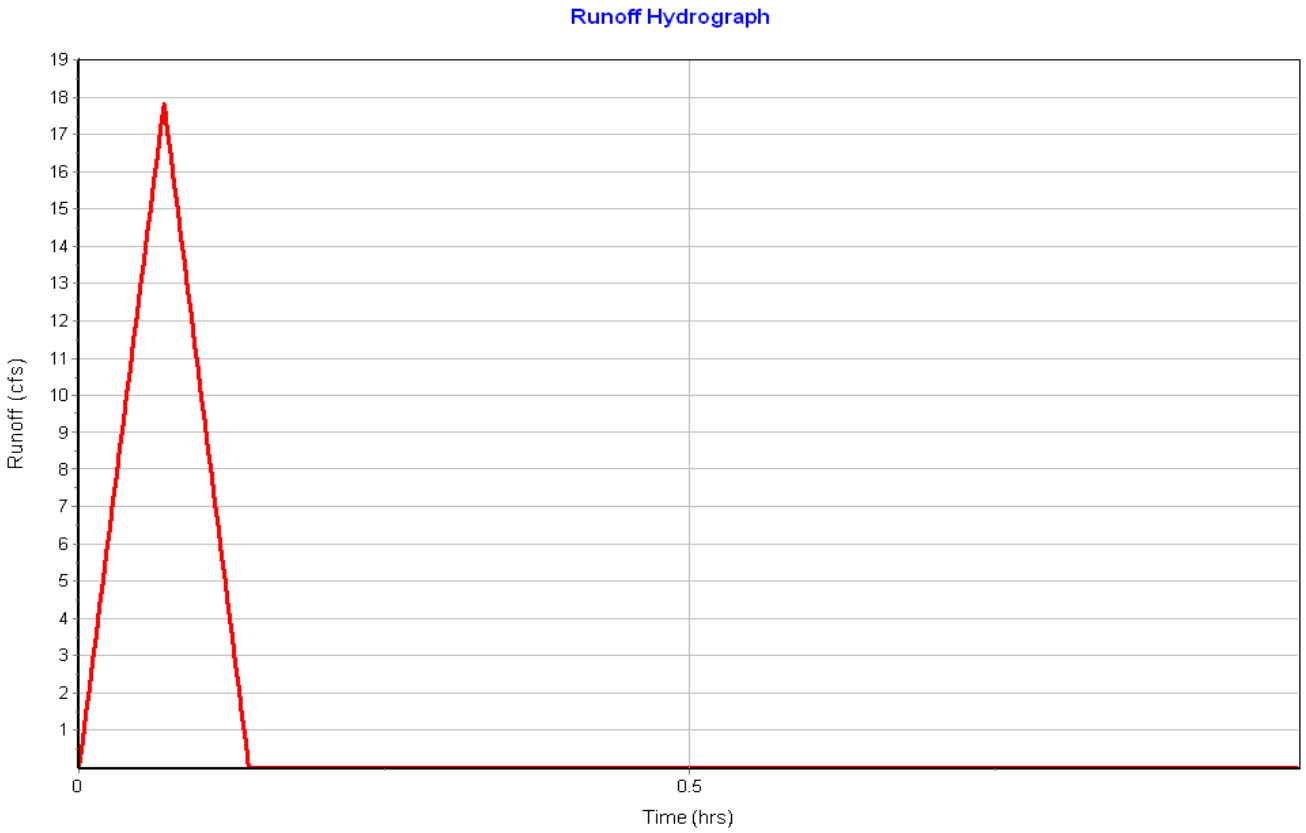
Flow Length (ft)	500.00
Slope (%)	2
Computed TOC (min)	4.21

Subbasin Runoff Results

Total Rainfall (in)	0.74
Total Runoff (in)	0.37
Peak Runoff (cfs)	17.83
Rainfall Intensity	10.709
Weighted Runoff Coefficient	0.5000
Time of Concentration (days hh:mm:ss)	0 00:04:13

Lazy Dog Drainage
100 Year Event

Subbasin : West



Lazy Dog Drainage
100 Year Event

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
1	ChanEnd	5211.30	5215.00	3.70	0.00	-5211.30	0.00	-5215.00	0.00	0.00
2	ChanStart	5214.03	5215.00	0.97	0.00	-5214.03	0.00	-5215.00	0.00	0.00
3	DrwyIn	5203.60	5206.50	2.90	0.00	-5203.60	0.00	-5206.50	0.00	0.00
4	DrwyOut	5202.80	5208.00	5.20	0.00	-5202.80	0.00	-5208.00	0.00	0.00
5	OutletStr	5208.28	5212.50	4.22	0.00	-5208.28	0.00	-5212.50	0.00	0.00
6	PondOut	5207.69	528.69	-4679.00	0.00	-5207.69	0.00	-528.69	0.00	0.00
7	SouthChanEnd	5215.00	5216.00	1.00	0.00	-5215.00	0.00	-5216.00	0.00	0.00
8	SouthChanStart	5216.70	5217.90	1.20	0.00	-5216.70	0.00	-5217.90	0.00	0.00
9	Topond	5210.47	5212.00	1.53	0.00	-5210.47	0.00	-5212.00	0.00	0.00
10	WestChanEnd	5212.86	5215.00	2.14	0.00	-5212.86	0.00	-5215.00	0.00	0.00
11	WestChanStart	5216.92	5217.96	1.04	0.00	-5216.92	0.00	-5217.96	0.00	0.00

Lazy Dog Drainage
100 Year Event

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	ChanEnd	7.36	0.00	5212.20	0.90	0.00	2.80	5211.47	0.17	0 00:06	0 00:00	0.00	0.00
2	ChanStart	7.67	7.67	5214.84	0.81	0.00	0.19	5214.14	0.11	0 00:06	0 00:00	0.00	0.00
3	DrwyIn	27.41	17.83	5204.78	1.18	0.00	1.72	5203.84	0.24	0 00:06	0 00:00	0.00	0.00
4	DrwyOut	27.40	0.00	5204.59	1.79	0.00	3.41	5204.59	1.79	0 00:00	0 00:00	0.00	0.00
5	OutletStr	0.07	0.00	5208.38	0.10	0.00	4.12	5208.37	0.09	0 00:15	0 00:00	0.00	0.00
6	PondOut	0.07	0.00	5207.89	0.20	0.00	1.30	5207.87	0.18	0 00:16	0 00:00	0.00	0.00
7	SouthChanEnd	12.11	0.00	5216.00	1.00	0.00	0.00	5215.97	0.97	0 00:01	0 00:00	0.00	0.00
8	SouthChanStart	14.62	14.62	5217.85	1.15	0.00	0.07	5217.05	0.35	0 00:06	0 00:00	0.00	0.00
9	Topond	7.34	0.00	5211.36	0.89	0.00	0.64	5210.60	0.13	0 00:06	0 00:00	0.00	0.00
10	WestChanEnd	22.31	0.00	5214.00	1.14	0.00	1.00	5214.00	1.14	0 00:00	0 00:00	0.00	0.00
11	WestChanStart	25.06	25.06	5218.05	1.13	0.00	0.37	5217.07	0.15	0 00:06	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Channel	165.00	5214.03	0.00	5211.33	0.03	2.70	1.6400	Triangular	1.000	8.000	0.0350	0.5000	0.5000	0.0000	0.00	No
2	EastSwale	318.90	5207.69	0.00	5203.85	3.85	3.84	1.2000	Triangular	1.000	4.000	0.0350	0.5000	0.5000	0.0000	0.00	No
3	SouthChan	438.05	5216.92	0.22	5214.07	-0.93	2.85	0.6500	Trapezoidal	1.000	12.000	0.0350	0.5000	0.5000	0.0000	0.00	No
4	WestChan	475.00	5216.92	0.00	5212.86	0.00	4.06	0.8500	Trapezoidal	1.500	11.500	0.0350	0.5000	0.5000	0.0000	0.00	No

Lazy Dog Drainage
100 Year Event

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Channel	7.36	0 00:06	13.41	0.55	7.85	0.35	0.79	0.80	0.00		
2	EastSwale	0.07	0 00:27	5.45	0.01	0.92	5.78	0.20	0.20	0.00		
3	SouthChan	12.11	0 00:08	16.93	0.72	4.36	1.67	0.83	0.83	0.00		
4	WestChan	22.31	0 00:07	43.93	0.51	6.05	1.31	1.05	0.70	0.00		

Lazy Dog Drainage
100 Year Event

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	ChantoPond	88.00	5211.30	0.00	5210.47	0.00	0.83	0.9400	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
2	Driveway	80.00	5203.60	0.00	5202.80	0.00	0.80	1.0000	CIRCULAR	21.000	21.000	0.0120	0.5000	0.5000	0.0000	0.00	No	2
3	Link-03	968.20	5209.37	-1.10	5209.00	0.14	0.37	0.0400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
4	Link-05	1375.96	5204.59	1.79	5200.00	0.00	4.59	0.3300	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
5	Link-11	2961.75	5214.00	1.14	5203.60	0.00	10.40	0.3500	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1
6	PondOut	118.00	5208.28	0.00	5207.69	0.00	0.59	0.5000	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1

Lazy Dog Drainage
100 Year Event

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	ChantoPond	7.34	0 00:06	11.05	0.66	6.71	0.22	0.89	0.60	0.00		Calculated
2	Driveway	27.40	0 00:07	34.33	0.80	7.95	0.17	1.18	0.68	0.00		Calculated
3	Link-03	7.34	0 00:06	0.00	0.01	0.00		0.20	0.20	0.00		Calculated
4	Link-05	27.40	0 00:07	0.00	0.01	0.00		0.20	0.20	0.00		Calculated
5	Link-11	22.31	0 00:07	0.00	0.01	0.00		0.20	0.20	0.00		Calculated
6	PondOut	0.07	0 00:16	8.05	0.01	1.40	1.40	0.10	0.07	0.00		Calculated

Storage Nodes

Storage Node : Pond

Input Data

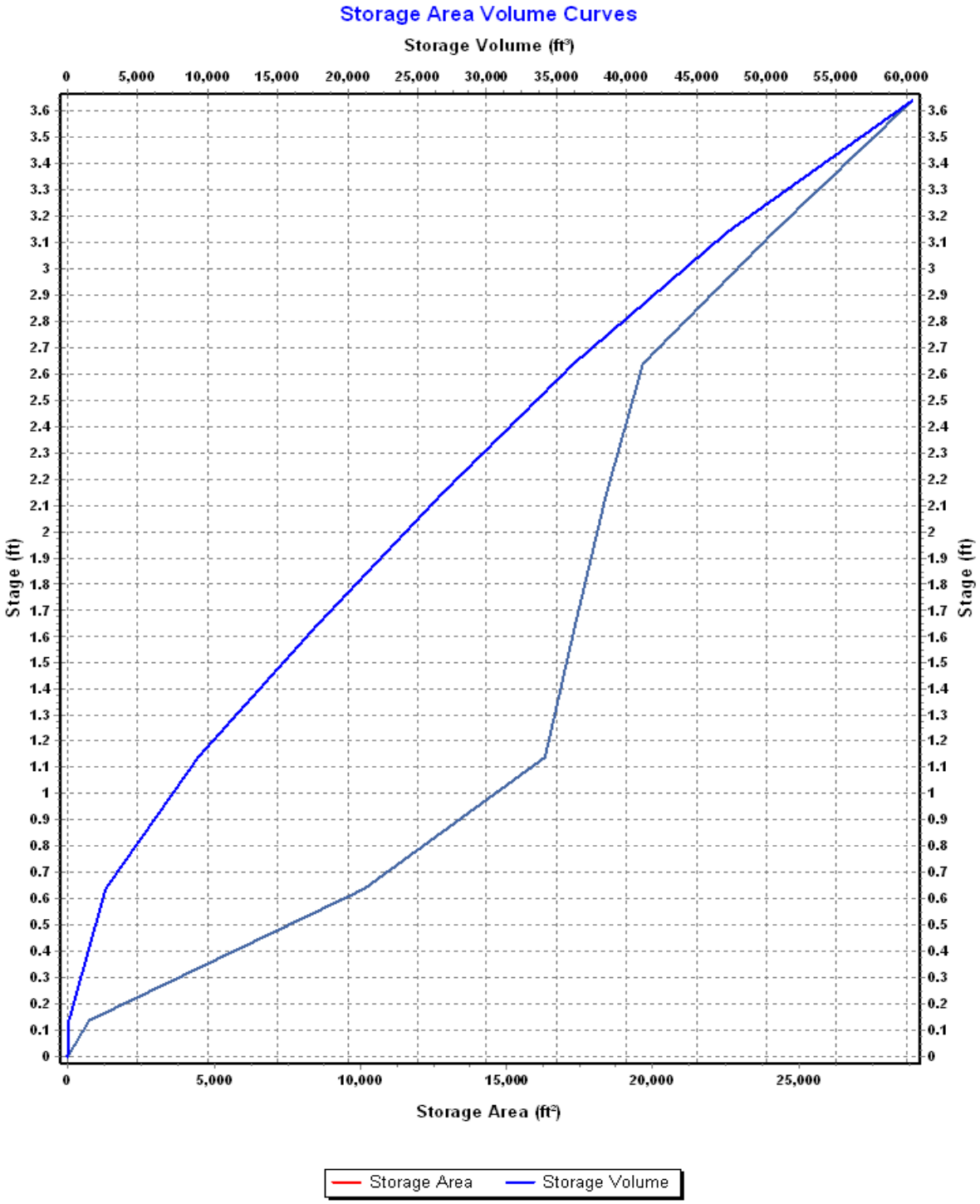
Invert Elevation (ft)	5208.86
Max (Rim) Elevation (ft)	5212.50
Max (Rim) Offset (ft)	3.64
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-5208.86
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0	0.000
.14	722.03	50.54
.64	10132.4	2764.15
1.14	16308	9374.25
1.64	17334	17784.75
2.14	18388	26715.25
2.64	19659	36227.00
3.14	24123.77	47172.69
3.64	28852.91	60416.86

Lazy Dog Drainage
100 Year Event



Storage Node : Pond (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Weir-01	Rectangular	No	5210.00	1.14	4.00	1.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-01	Side	CIRCULAR	No	1.13			5208.65	0.61
2	Orifice-02	Side	CIRCULAR	No	1.13			5209.15	0.61
3	Orifice-03	Side	CIRCULAR	No	1.13			5209.65	0.61

Output Summary Results

Peak Inflow (cfs)	18.98
Peak Lateral Inflow (cfs)	14.43
Peak Outflow (cfs)	0.07
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	5209.81
Max HGL Depth Attained (ft)	0.95
Average HGL Elevation Attained (ft)	5209.74
Average HGL Depth Attained (ft)	0.88
Time of Max HGL Occurrence (days hh:mm)	0 00:15
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Appendix C2:
Operation and Maintenance Plan

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Lazy Dog Substation

Detention Pond Operations & Maintenance Plan

The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as described:

What to Look For:	What to Do:
Structural Components	
Inlets/ Outlets	• Remove sediment, debris and litter from catch basins, valley pans, orifice plates, trash racks, stainless screens and pipes to maintain at least 80% conveyance capacity at all times.
Cracked Drain Pipes	• Repair/ seal cracks or replace when repair is insufficient.
Forebay	• Remove sediment, debris and trash from forebay.
Vegetation	
Dead or strained vegetation	• Replant based on original planting plan. • Irrigate as needed. Mulch banks as needed. • DO NOT use fertilizers, herbicides.
Tall grass and vegetation	• Cut grass and prune overgrowth 1-2 times per year or as needed. Remove plant debris.
Weeds	• Manually remove weeds. Remove all plant debris.
Pond banks/ bottom	
Gullies	• Fill, lightly compact, and plant vegetation to disperse flow.
Erosion	• Replace or add rip-rap as necessary.
Slope Slippage	• Stabilize 3:1 slopes/ banks with plantings similar to those surrounding the substation or utilize rip-rap.
Ponding	• Rake, till or amend to restore original design grades.
Vectors	
Mosquitoes and Rodents	• Monitor for mosquito larvae or rodent holes/ burrows around pond. • Call a pest control company for assistance to eradicate vectors. • DO NOT use pesticides.

Maintenance Schedule:

All detention pond components shall be inspected for proper operations and structural stability at least quarterly for the first 2 years from the date of installation and at least 2 times per year thereafter. An inspection shall also occur within 48 hours after each major storm event.

Access: Maintain ingress/ egress to design standards.

Release Rate*:* All facilities should drain within 72 hours for major storm events. Record time, date, weather and site conditions when ponding occurs.

Appendix D:
Geological Report

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GEOTECHNICAL ENGINEERING REPORT
LAZY DOG SUBSTATION
AGGREGATE SURFACE ROADWAY AND YARD
WELD COUNTY ROADS 6 & 7
WELD COUNTY, COLORADO

KLEINFELDER PROJECT NO.: 20191280.001A

September 10, 2018

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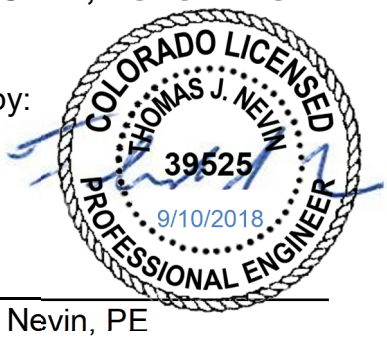
ONLY THE CLIENT OR ITS DESIGNATED REPRESENTATIVES MAY USE THIS DOCUMENT AND ONLY FOR THE SPECIFIC PROJECT FOR WHICH THIS REPORT WAS PREPARED.

A Report Prepared for:

Tri-State Generation and Transmission Association, Inc.
PO Box 33695
Denver, CO 80233-0695

GEOTECHNICAL ENGINEERING REPORT
LAZY DOG SUBSTATION
AGGREGATE SURFACE ROADWAY AND YARD
WELD COUNTY ROADS 6 & 7
WELD COUNTY, COLORADO

Prepared by:



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September 10, 2018
Kleinfelder Project No. 20191280.001A

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1 INTRODUCTION

1.1 PURPOSE AND OBJECTIVE

The purpose of this geotechnical engineering report is to summarize geological and geotechnical engineering data obtained from Kleinfelder's recent site exploration at the proposed Lazy Dog Substation in Weld County, Colorado, and to provide aggregate roadway thickness design and field electrical resistivity testing results.

This report includes information obtained from an exploratory test pit and in-place testing, laboratory testing of the soil, and field electrical resistivity measurements. The information within this report will be used by Tri-State Generation and Transmission Association, Inc. (Tri-State) to facilitate the construction of the proposed Lazy Dog Substation gravel roadway. The geotechnical data provided are subject to the provisions in the Limitations section. In addition, an article prepared by Geoprofessional Business Association (GBA), *Important Information about This Geotechnical Engineering Report*, has been included in Appendix D. We recommend that all individuals who read the report understand the report limitations along with the included GBA document.

1.2 SCOPE OF SERVICES

The scope of service performed for this project included the following:

- Coordination and project initialization,
- Site characterization, including preparation, coordination and execution of a subsurface exploration program and electrical resistivity testing,
- Laboratory testing,
- Engineering analysis, and
- Report preparation

1.3 PROJECT LOCATION AND DESCRIPTION

The project is located southwest of the intersection of Weld County Road 6 and County Road 7, in Weld County, Colorado, as shown in Figure 1. The geotechnical exploration and evaluation for the proposed substation was completed by others. Kleinfelder was contracted to provide gravel roadway thickness design and related construction recommendations and field electrical

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resistivity testing only. Foundation design recommendations for the substation are not part of this scope.

The extents of the proposed private gravel road or grading plan have not been provided. We understand the private gravel roadway and substation yard will be designed to carry the greater of either a static load of 6 kips per square foot or a dynamic AASHTO H-20 highway loading with an allowable deflection of 1 inch and the traffic frequency will be equivalent to low volume rural roads. We understand the typical roadway and yard surface consists of 8 inches of 1-1/2-inch crushed stone overlaid with 8 to 12 inches of Colorado Department of Transportation (CDOT) Type 5 or 6 Aggregate Base. We assume that site maximum site grading cuts and fills to establish the road grade will be less than 1 to 2 feet.

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2 FIELD EXPLORATIONS AND LABORATORY TESTING

2.1 GENERAL

The geotechnical field exploration was performed on August 8, 2018. This section provides a summary of the subsurface explorations completed as part of this project.

2.2 SUBSURFACE EXPLORATION

A shallow test pit was drilled to explore the near-surface conditions at the proposed substation location. The Exploration Location Plan and Vicinity Map, Figure 1 shows the test pit and field electrical resistivity test locations. The test pit was terminated at a depth of six feet beneath the ground surface (bgs).

The test pit was drilled with a track-mounted CME-55 drill rig equipped with solid stem, continuous flight auger. Samples were obtaining using the Modified California (2.5-inch O.D.) sampler. The samplers were driven 12-inches into relatively undisturbed material using a 30-inch drop of a 140-pound hammer (ASTM D1586). The samples were packaged and sealed in the field to reduce moisture loss and disturbance.

During drilling, a Kleinfelder geotechnical professional observed drilling and logged the test pit by visually identifying and classifying soils in general accordance with ASTM D 2488 and the Unified Soil Classification System (USCS). Upon completion of laboratory testing, soil classifications were further evaluated in general accordance with ASTM D 2487 and are presented on the test pit log in Appendix A. The lines defining boundaries between soil types on the logs are based on drill rig observation and interpolation between samples and are therefore approximate. Transitions between soil types may be abrupt or gradual.

Electrical resistivity (ER) testing was performed at the substation location. The electrical resistivity testing was conducted by Kleinfelder utilizing AGI Super Sting R1 and the Wenner 4-pin array method. The tests were performed using two perpendicular array arrangements at ‘a’ spacing ranging from 2 to 600 feet. The results of the electrical resistivity tests are presented in Appendix C.

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2.3 LABORATORY TESTING

Laboratory tests were performed on select soils samples obtained during drilling to evaluate their physical and engineering properties. The tests were performed in general accordance with the current ASTM standards. Results of the laboratory tests are included in Appendix B. Selected laboratory results are also summarized in the test pit log (Appendix A).

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3 SITE CONDITIONS

3.1 SITE DESCRIPTION

The project site is located southwest of the intersection of Weld County Road 6 and County Road 7 in Weld County, Colorado. The site consists of an undeveloped, relatively flat, open space with grass and tall grain-like vegetation. The site is bordered to the west and south by an irrigation ditch. A relatively recent oil and gas facility, situated directly west of the proposed project location, showed no obvious evidence of significant building or pavement distress.

3.2 GEOLOGY

The geology of the site was evaluated by reviewing published geologic maps, including: *Geologic Map of Colorado: U.S. Geological Survey Special Geologic Map,* U.S. Geological Survey, Tweto, Ogden, 1979. Mapped local geology indicates the bedrock at the proposed project location consists of Laramie Formation shale, claystone, and/ or sandstone material from the Cretaceous period.

3.3 SUBSURFACE CONDITIONS

Native soils were encountered from below the surface to the test pit termination depth of six feet. The native soils were comprised of lean clay with trace amounts of sand. Soils were generally observed to be dry to moist and stiff in terms of consistency.

The material recovered from the subsurface exploration program consisted of only overburden soil, no bedrock was encountered.

3.4 GROUNDWATER

Groundwater was not encountered at the time of the subsurface exploration program. Soil moisture levels and groundwater levels commonly vary over time depending upon seasonal precipitation, irrigation practices, land use and runoff conditions. The soil moisture and groundwater data in this report pertain only to the locations and time when the test pit was drilled. Groundwater may be shallower during spring when runoff is present.

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4 CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL

Based on the subsurface conditions encountered in the test pit and our experience with similar projects, it is Kleinfelder's opinion that the unpaved roadway and substation yard development of the site as planned is geotechnically feasible, provided that the recommendations in this report are incorporated in the design and construction of the project.

Our geotechnical design and construction recommendations for site preparation, foundations, and other related construction topics are provided in the following sections.

4.2 CONSTRUCTION CONSIDERATIONS

4.2.1 Site Preparation and Grading

All site preparation and earthwork operations should be performed in accordance with applicable codes, safety regulations and other local, state or federal guidelines.

Prior to site grading or development, the construction area should be stripped of vegetation and deleterious or organic material. Stripping operations should be observed by the geotechnical engineer, and should include removing materials that, in the judgment of the geotechnical engineer, are not suitable for the anticipated loading conditions.

Based upon our relatively shallow test pit, we anticipate grading and earthmoving can be performed with conventional heavy-duty earthmoving equipment. Groundwater was not observed in the test pit at the time of drilling implies temporary dewatering measures are not anticipated to be required for shallow excavations.

4.2.2 Compaction Recommendations

All fill should be moistened, placed in loose lifts of 8 inches or less thickness, and compacted to the following specifications presented in Table 2.

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TABLE 2. COMPACTION SPECIFICATIONS			
Fill Location	**Material Type**	**Compaction**	**Moisture Content (%)**
Site Grading Fill/ Structural Fill	Sand, Silty Sand, Clayey Sand, and Structural Fill	Minimum 95% of maximum dry density (ASTM Method D1557)	-2 to +2 of optimum
	Clay	Minimum 95% of maximum dry density (ASTM Method D698)	-1 to +3 of optimum

4.2.3 Construction in Wet or Cold Weather

During construction, grade the site such that surface water can drain readily away from the improvement areas. Promptly pump out or otherwise remove any water that may accumulate in excavations or on subgrade surfaces and allow these areas to dry before resuming construction. The use of berms, ditches, and similar means may be used to prevent storm water from entering the work area and to convey any water off site efficiently.

If construction occurs during cold weather, fill and concrete elements should not be constructed on frozen soil. Frozen subgrade soils should be completely removed, or thawed, scarified and re-compacted. The amount of time passing between subgrade preparation and placing fill or concrete should be minimized during freezing conditions to prevent the prepared soils from freezing. Blankets, soil cover or heating as required may be utilized to prevent the subgrade from freezing.

4.2.4 Construction Testing and Observation

Fill construction should be observed and tested by Kleinfelder to support our professional opinion as to whether the earthwork does or does not substantially conform to the recommendations in this report. The opinions and conclusions of a geotechnical report are based on the interpretation of a limited amount of information obtained from the field exploration. It is therefore not uncommon to find that actual site conditions differ somewhat from those indicated in the report. Kleinfelder should remain involved throughout the project to evaluate such differing conditions as they appear, and to modify or add to the geotechnical recommendations as necessary.

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4.2.5 Subsurface and Surface Drainage

Positive drainage away from the structures is essential to the performance of foundations and should be provided during the life of the structures. Surface drainage should be created such that water is diverted off the site and away from equipment foundations.

4.3 UNPAVED ROADWAY AND YARD DESIGN

The aggregate surface roadway and yard was designed in general accordance with the American Association of State Highway and Transportation Officials (AASHTO) 1993 Guide for the Design of Pavement Structures. Performance of the unpaved roadways is directly related to the physical properties of the subgrade soils and traffic loadings. Soils are represented for pavement design purposes by means of a soil support value. Unpaved roadway design procedures are based on strength properties of the subgrade and pavement materials, along with the design traffic conditions.

4.3.1 Anticipated Unpaved Subgrade Conditions and Preparation

The unpaved roadways and substation yard may be established upon properly prepared, native clay soils, or structural fill extending to these soils. We recommend any non-engineered fills or deleterious materials be completely removed from beneath pavements.

Prior to the placement of pavements or structural fill, the exposed subgrade should be scarified to a depth of at least eight inches, moisture conditioned, and compacted to the requirements of structural fill as specified in Section 4.2.2.

We also recommend proof rolling of the pavement subgrade prior to the placement of structural fill and the top of subgrade prior to paving. Proof rolling should be completed with a fully loaded, pneumatic-tired dump truck or similar weight equipment done with several passes over the pavement area under the observation of a qualified Kleinfelder representative. Soft areas identified during the proof roll should be completely removed to a depth of at least two feet and replaced. If soft soil is encountered to a depth greater than two feet below the final subgrade elevation, we should be contacted to provide alternative options for subgrade stabilization. Further stabilization could include placement of a geotextile, large aggregate, or a combination of both.

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4.3.2 Design Traffic

As mentioned previously, the private gravel roadway and substation yard will be designed to carry the greater of either a static load of 6 kips per square foot of 1 inch or a dynamic AASHTO H-20 highway loading with an allowable deflection of 1 inch and the traffic frequency will be equivalent to low volume rural roads. For this design, we assumed a traffic criteria to include an equivalent 18-kip single axle loads (ESAL's) of 10,000 over the design life. Use of this criteria was based on our experience with similar projects. If the actual traffic varies from these assumptions, we should be contacted to adjust the design accordingly

4.3.3 Roadway Thickness Design

Based upon the anticipated subgrade of clay soils, an assumed R-value of 5 (resilient modulus (M_R) of 3,025 psi) was used for the design. Based upon a one-inch rut depth, the minimum unpaved roadway and substation yard should consist of 8 inches of 1-1/2-inch crushed stone overlaid with 12 inches of CDOT Type 5 or 6 Aggregate Base.

4.3.4 Material Specifications

ABC should consist of crushed gravel or crushed stone and filler, constructed on the prepared subgrade. Construction should be in accordance with the requirements in Section 304 of CDOT's Standard Specifications. ABC should have a minimum R-value of 78 and meet the requirements of a Class 5 or 6 ABC, according to Section 703.03 of CDOT's Standard Specifications. The ABC should be placed uniform layers without segregation of size and compacted as recommended in Section 4.2.2.

4.3.5 Unpaved Roadway and Yard Maintenance

Periodic maintenance of the unpaved roadway and yard will be required and generally refers to regrading of the roadway and yard to provide positive drainage away for the roadway and yard and repairing of any soft subgrade. Particular attention and maintenance will likely be required during the Spring months or during or following periods of extensive wet weather.

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4.4 CORROSIVITY

The degradation of concrete or cement grout can be caused by constituents in the soil or groundwater that react with cement. The concentration of water-soluble sulfates in the soils is a good indicator of the potential for chemical attack of concrete or cement grout. Laboratory test results indicate a water-soluble sulfate concentration of 0.394 percent on the tested bulk sample from the test pit. Based on the sulfate exposure guidance of the American Concrete Institute (ACI) the samples present a Class S2 (severe) sulfate exposure to concrete. Based on the test results, ACI recommends the use of Type V cement with a maximum C_3A content of 5 percent. Blended cements Types IP (HS) and IS (<70) (HS) under ASTM 595 and Type HS under ASTM 1157 can also be used.

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5 LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by members of Kleinfelder's' profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is likely that subsurface conditions could vary at other locations.

It should be recognized that definition and evaluation of subsurface conditions is difficult. Judgments leading to conclusions and recommendations are generally made with incomplete knowledge of the subsurface conditions present due to the limitations of data from field studies. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk. The client and key members of the design team should discuss the issues covered in this report with Kleinfelder, so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk and expectations for future performance and maintenance.

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. It is possible that soil, rock, or groundwater conditions could vary between or beyond the points explored. If soil, rock, or groundwater conditions are encountered during construction that differ from those described herein, the client is responsible for ensuring that Kleinfelder is notified immediately so that we may reevaluate the recommendations of this report. If the scope of the proposed construction changes from that described in this report, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed, and the conclusions of this report are modified or approved in writing by Kleinfelder.

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As the geotechnical engineering firm that performed the geotechnical evaluation for this project, Kleinfelder should be retained to confirm that the recommendations of this report are properly incorporated in the design of this project, and properly implemented during construction. This may avoid misinterpretation of the information by other parties and will allow us to review and modify our recommendations if variations in the soil conditions are encountered. Kleinfelder cannot be responsible for interpretation by others of this report.

The scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

This report may be used only by the client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two years from the date of the report.

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FIGURES

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LEGEND

- SOIL BORING
- ELECTRICAL RESISTIVITY TEST

NOTE:
BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS COMPILED BY ESRI PRODUCTS AND 2018 MICROSOFT CORPORATION. COORDINATE SYSTEM: GCS WGS 1984

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VICINITY MAP

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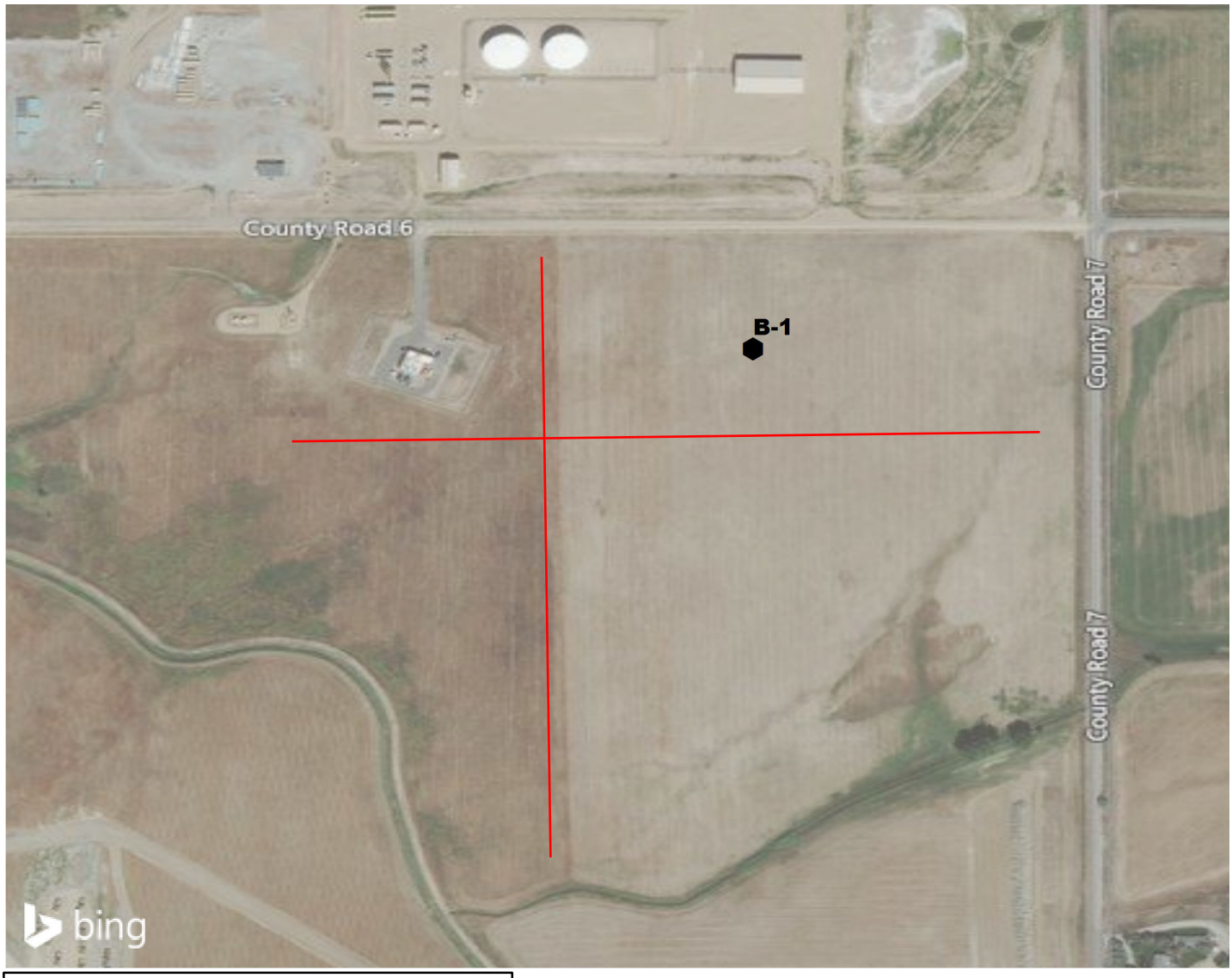

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DRAWN BY:	MAP
CHECKED BY:	KCG
DATE:	08-21-2018
REVISED:	-

EXPLORATION LOCATION PLAN AND VICINITY MAP

Tri-State, Lazy Dog Substation
County Roads 6 and 7
Weld County, CO

FIGURE

1

APPENDIX A
TEST PIT LOG

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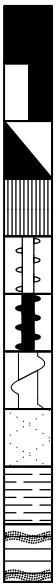
SAMPLER AND DRILLING METHOD GRAPHICS



MODIFIED CALIFORNIA SAMPLER
(2 or 2-1/2 in. (50.8 or 63.5 mm.) outer diameter)

CALIFORNIA SAMPLER
(3 in. (76.2 mm.) outer diameter)

STANDARD PENETRATION SPLIT SPOON SAMPLER
(2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

NQ CORE SAMPLE
(1.874 in. (47.6 mm.) core diameter)

HOLLOW STEM AUGER

SOLID STEM AUGER

AUGER CUTTINGS

HAND AUGER

AIR ROTARY

MUD ROTARY

GROUND WATER GRAPHICS

WATER LEVEL (level where first observed)

WATER LEVEL (level after exploration completion)

WATER LEVEL (additional levels after exploration)

OBSERVED SEEPAGE

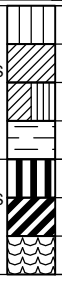
NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS
PID - Photoionization Detector

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu ≥4 and 1≤ Cc≤3		**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu <4 and/ or 1>Cc >3		**GP**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu ≥4 and 1≤ Cc≤3		**GW-GM**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu <4 and/ or 1>Cc >3		**GP-GM**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES			**GM**	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
					GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
					GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu ≥6 and 1≤ Cc≤3		**SW**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu <6 and/ or 1>Cc >3		**SP**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu ≥6 and 1≤ Cc≤3		**SW-SM**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu <6 and/ or 1>Cc >3		**SP-SM**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES			**SM**	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
					SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
					SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		**ML**	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit greater than 50)		**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

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GRAPHICS KEY

Tri-State, Lazy Dog Substation
County Roads 6 and 7
Weld County, CO

PLOTTED: 09/04/2018 03:56 PM BY: KGosz
OFFICE FILTER: DENVER
PROJECT NUMBER: 20191280.001A_01-0000
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [LEGEND 1 (GRAPHICS KEY) USCS_COLO]

PLOTTED: 09/04/2018 03:57 PM BY: KGosz
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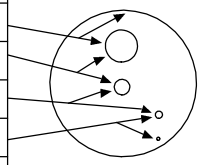
PROJECT NUMBER: 20191280.001A_01-0000
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [LEGEND 2 (SOIL DESC KEY)]

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3 in. (19 - 76.2 mm.)	3/4 -3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



SECONDARY CONSTITUENT

	AMOUNT	
Term of Use	Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT - N_{60} (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Thumb will penetrate more than 1 inch (25 mm). Extrudes between fingers when squeezed.
Soft	2 - 4	0.25≤ PP <0.5	500 - 1000	Thumb will penetrate soil about 1 inch (25 mm). Remolded by light finger pressure.
Medium Stiff	4 - 8	0.5≤ PP <1	1000 - 2000	Thumb will penetrate soil about 1/4 inch (6 mm). Remolded by strong finger pressure.
Stiff	8 - 15	1≤ PP <2	2000 - 4000	Can be imprinted with considerable pressure from thumb.
Very Stiff	15 - 30	2≤ PP <4	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail.
Hard	>30	4≤ PP	>8000	Thumbnail will not indent soil.

FROM TERZAGHI AND PECK, 1948; LAMBE AND WHITMAN, 1969; FHWA, 2002; AND ASTM D2488

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

FROM TERZAGHI AND PECK, 1948

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness.
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

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SOIL DESCRIPTION KEY

Tri-State, Lazy Dog Substation
County Roads 6 and 7
Weld County, CO

PLOTTED: 09/07/2018 12:12 PM BY: KGosz

Date Begin - End:	8/08/2018	**Drilling Company:**	Vine	**BORING LOG B-1**	
Logged By:	K Gosz	**Drill Crew:**	Seth & Renee		
Hor.-Vert. Datum:	WGS 1984 - Not Available	**Drilling Equipment:**	CME-55 track	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Solid Stem Auger		
Weather:	70°F Cloudy	**Exploration Diameter:**	4 in. O.D.		

FIELD EXPLORATION

Latitude: 40.02838° N
Longitude: -105.00196° E
Surface Condition: Grass

Depth (feet)	Graphical Log	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		Lean CLAY (CL): medium plasticity, brown mottled gray, dry to moist, stiff, trace sand											
				BC=7 12	12"		12.1	107.3			41	27	**ASTM D1557 Method A=** Max. Dry Unit Wt.: 116.7 pcf Opt. Water Content: 13.3%
				BC=6 13	12"		13.7	106.8					
5				BC=8 14	12"		13.0	106.8					
10													

The boring was terminated at approximately 6 ft. below ground surface. The boring was not backfilled at time of drilling completion because .

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
An iPad integrated GPS unit was used to locate the exploration with an accuracy of 5 meters.

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PROJECT NO.:	20191280
DRAWN BY:	K GOSZ
CHECKED BY:	T NEVIN
DATE:	9/7/2018
REVISED:	-

BORING LOG B-1

Tri-State, Lazy Dog Substation
Weld County Roads 6 and 7
Weld County, CO

gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [_KLF_BORING/TEST PIT SOIL LOG]
PROJECT NUMBER: 20191280.001A_01-0000
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APPENDIX B
LABORATORY TEST RESULTS

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Exploration ID	Depth (ft.)	Sample Description	Water Content (%)	Dry Unit Wt. (pcf)	Sieve Analysis (%)			Atterberg Limits			Additional Tests
					Passing 3/4"	Passing #4	Passing #200	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	1.0	LEAN CLAY (CL): BROWN MOTTLED GRAY	12.1	107.3				41	14	27	**ASTM D1557 Method A=**
											Maximum Dry Unit Weight: 116.7 pcf
											Optimum Water Content: 13.3%
B-1	3.0	LEAN CLAY (CL): BROWN MOTTLED GRAY	13.7	106.8							
B-1	5.0	LEAN CLAY (CL): BROWN MOTTLED GRAY	13.0	106.8							

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NP = NonPlastic

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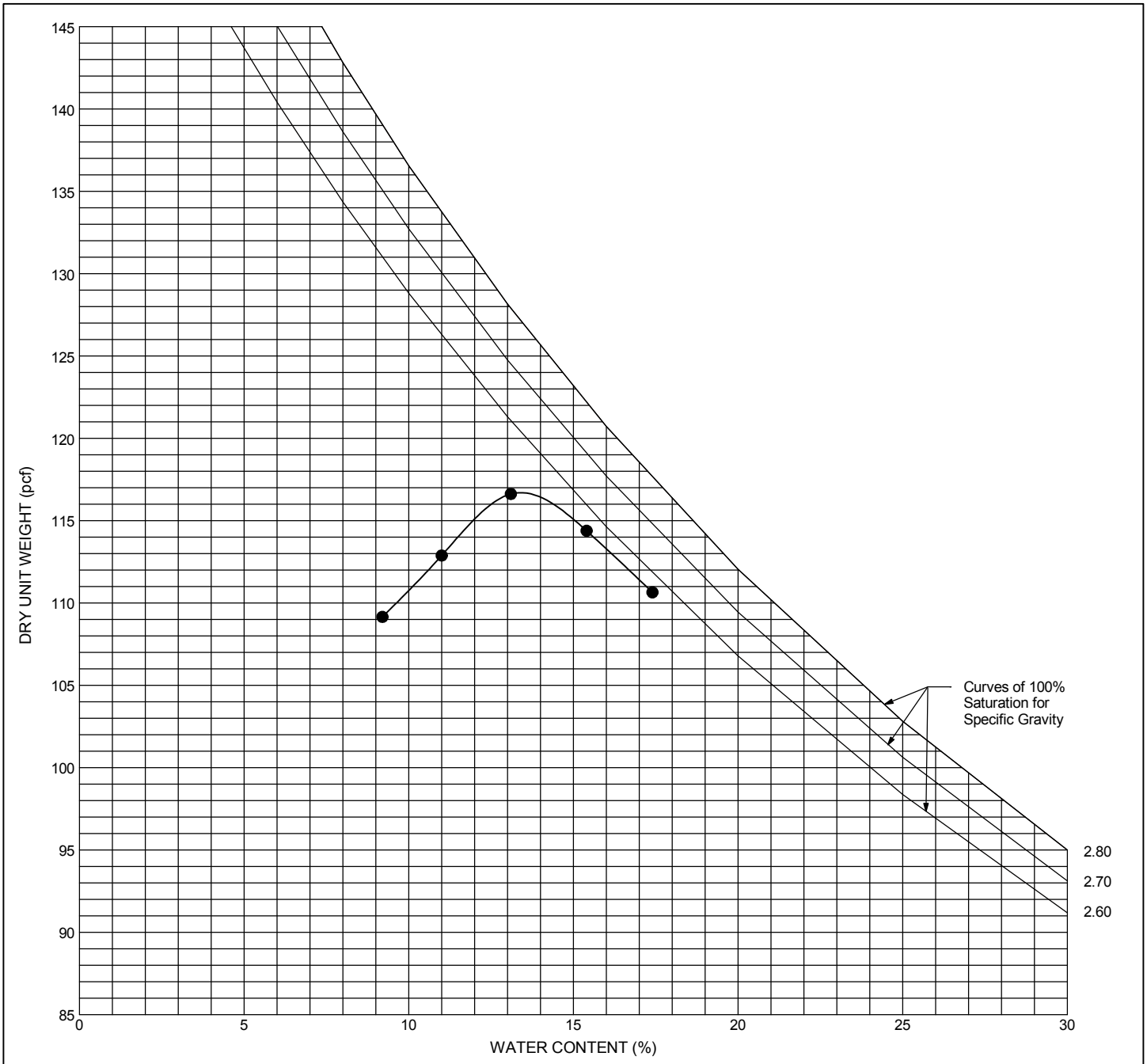
LABORATORY TEST RESULT SUMMARY

Tri-State, Lazy Dog Substation
County Roads 6 and 7
Weld County, CO

TABLE



Exploration ID	Depth (ft.)	Sample Description
● B-1	1 - 5	LEAN CLAY (CL): BROWN MOTTLED GRAY

Passing 3/4"	Passing #4	Passing #200	LL	PL	PI	Maximum Dry Unit Weight (pcf)	Optimum Water Content (%)
NM	NM	11	41	14	27	116.7	13.3

Testing performed in general accordance with ASTM D1557 Method A.
NP = Nonplastic
NM = Not Measured

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PROJECT NO.:	20191280
DRAWN BY:	K Gosz
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DATE:	
REVISED:	-

COMPACTION CURVE

Tri-State, Lazy Dog Substation
County Roads 6 and 7
Weld County, CO

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PROJECT NUMBER: 20191280.001A_01-0000
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APPENDIX C

FIELD ELECTRICAL RESISTIVITY TEST RESULTS

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1801 California Street; Suite 1100
Denver, CO 80202
Tel: (303) 237-6601
Fax: (303) 237-6602

Project Number	Project Name		Client	
20191280.001A	Lazy Dog Substation		Tri-State	
Date and Time	Location		Test Engineer(s)	
	ER1		Kayla Gosz &	
Type of Test	Weather		Surface Conditions	
4-Point Test (Wenner)	Sunny, 85 degrees F		Lean Clay, dry	
Equipment Make	Model			Checked by
AGI	Super Sting R1			

Probe Spacing "A" (feet)	**Probe depth "B"** (inches)	**Apparent Resistance** (Ω)	**Apparent Resistivity** ρ (Ω-m)	**Notes:**
North - South				
2	**4 & 2**	4.983	**19.09**	
3	**4 & 2**	3.748	**21.53**	
5	**4 & 2**	1.348	**12.91**	
7	**4 & 2**	0.5837	**7.82**	
10	**4 & 2**	0.3234	**6.19**	
20	**4 & 2**	0.1535	**5.88**	
30	**12 & 6**	0.09872	**5.67**	
50	**12 & 6**	0.05594	**5.36**	
70	**12 & 6**	0.04204	**5.64**	
100	**12 & 6**	0.03476	**6.66**	
200	**12 & 6**	0.02193	**8.40**	
300	**12 & 6**	0.01588	**9.12**	
500	**12 & 6**	0.01093	**10.47**	
600	**12 & 6**	0.009955	**11.44**	
East - West				
2	**4 & 2**	8.427	**32.28**	
3	**4 & 2**	3.99	**22.92**	
5	**4 & 2**	1.542	**14.77**	
7	**4 & 2**	0.9536	**12.78**	
10	**4 & 2**	0.4971	**9.52**	
20	**4 & 2**	0.1658	**6.35**	
30	**12 & 6**	0.1087	**6.25**	
50	**12 & 6**	0.06722	**6.44**	
70	**12 & 6**	0.05042	**6.76**	
100	**12 & 6**	0.03796	**7.27**	
200	**12 & 6**	0.02324	**8.90**	
300	**12 & 6**	0.01605	**9.22**	
500	**12 & 6**	0.009997	**9.57**	
600	**12 & 6**	0.009548	**10.97**	

Notes:

APPENDIX D
IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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Geotechnical Engineering Report

Lazy Dog Electrical Substation

SW of Weld County Road (WCR) 6 and WCR 7

Town of Erie, Weld County, Colorado

January 15, 2018

Terracon Project No. 22175130

Prepared for:

Spectrum Engineering Resources
3001 North Taft Road, Suite 120
Loveland, Colorado 80538

Prepared by:

Terracon Consultants, Inc.
1242 Bramwood Place
Longmont, Colorado 80501

Offices Nationwide Established in 1965
Employee-Owned terracon.com

Terracon

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities

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January 15, 2018

Spectrum Engineering Resources
3001 North Taft Road, Suite 120
Loveland, Colorado 80538

Attn: Mr. Calvin Rand
P: [303] 709 1167
E: crand@spectrumeng.net

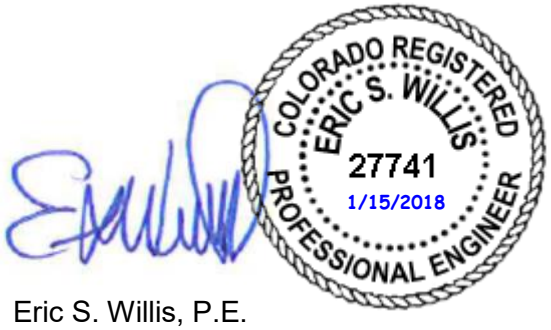
RE: Geotechnical Engineering Report
Lazy Dog Electrical Substation
SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado
Terracon Project Number: 22175130

Mr. Rand:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the project referenced above. This study was performed in general accordance with our proposal number P22175129 dated December 5, 2017. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. Materials testing and construction observation services are provided by Terracon as well. We would be pleased to discuss these services with you. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.



Eric S. Willis, P.E.
Senior Project Manager/Engineer

Eric D. Bernhardt, P.E.
Geotechnical Department Manager

Copies to: Addressee (via email)

EXECUTIVE SUMMARY

A geotechnical engineering exploration has been performed for the proposed Lazy Dog electrical substation to be constructed southwest of WCR 6 and WCR 7 in the Town of Erie, Weld County, Colorado. As requested, eleven (11) borings, designated TB-1 through TB-11, were performed to depths of about 20 to 30 feet below existing ground surface.

Based on the information obtained from our subsurface exploration and laboratory testing program, the site appears suitable for the proposed construction from a geotechnical point of view provided certain precautions and design and construction recommendations presented in this report are followed. The following geotechnical conditions and considerations were identified:

- Subsoils encountered in the exploratory borings generally consisted of about 6 to 19½ feet of lean clay with varying amounts of sand over sedimentary bedrock. The bedrock consisted of claystone and claystone/siltstone/sandstone and these materials extended to the maximum depths explored. The claystone/siltstone/sandstone is typically very hard and contains cemented lenses/layers at some locations. Practical auger refusal was encountered in this bedrock unit in borings TB-4 and 6 at depths of about 24½ to 27½ feet below ground surface.

- Swell testing indicates the clay soils have low to high swell potential, with most of the samples tested showing high swell. The claystone bedrock samples tested typically showed high to very high swell potential. Based on physical properties and limited swell testing, we judge the claystone/siltstone/sandstone bedrock to have low to moderate swell potential.

- Groundwater/perched water was measured in 4 of the borings on the northern part of the site at depths of about 19½ to 23 feet below existing ground surface when checked about 24 hours after completion of drilling. The other borings remained dry to depths of about 19 to 29 feet. Groundwater/perched water levels can and should be expected to fluctuate with varying seasonal and weather conditions, irrigation demands on or adjacent to the site and with fluctuations in nearby water features.

- Considering the expansive nature of the soils and bedrock on this site, we believe the use of straight shaft piers socketed into bedrock are appropriate for support of the proposed structures and would offer a reliable method to mitigate post-construction foundation movement. Groundwater/perched water conditions indicate some water seepage may be encountered in drilled pier holes during installation, depending upon final design depths and location on the site. Concrete should be on site and placed shortly after completion of drilling, cleaning and observation. Very hard bedrock with cemented lenses/layers are present at some locations on the site. Appropriate sized drill rigs in good working condition will be required to facilitate the required bedrock penetration and minimum pier length. In

some instances, the use a “rock bit”, core barrel or other specialized tooling may be required to penetrate these materials.

- We judge slab performance risk on this site is high. Based on existing conditions and the laboratory swell data, we estimate potential surface/slab heave could be on the order of about 3½ to 5 inches, or more, depending upon depth of post-construction wetting, location on the site and other factors. In our opinion, the use of a structural floor supported independent of the ground is an appropriate method to mitigate the impact of swelling soils/bedrock on floor construction and should be used for the proposed enclosure building.

- On-site clay soils typically appear suitable for use as general engineered fill/backfill on the site provided they are placed and compacted as described in this report. Claystone bedrock materials should be avoided for use as fill/backfill on this site. Import materials (if needed) should be evaluated and approved by the geotechnical engineer prior to delivery to the site.

- Surface drainage should be designed, constructed and maintained to provide rapid removal of surface water runoff away from the proposed structures. Water should not be allowed to pond adjacent to foundations to reduce wetting of foundation soils. Excessive wetting of foundation soils can cause movement and distress to structures and on-grade slabs.

- Close monitoring of the construction operations and implementing drainage recommendations discussed herein will be critical in achieving the intended foundation and other site improvements performance. We therefore recommend Terracon be retained to monitor this portion of the work.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
LAZY DOG ELECTRICAL SUBSTATION
SW OF WELD COUNTY ROAD (WCR) 6 AND WCR 7
TOWN OF ERIE, WELD COUNTY, COLORADO

Terracon Project No. 22175130
January 15, 2018

1.0 INTRODUCTION

A geotechnical engineering report has been completed for the proposed Lazy Dog electrical substation to be constructed southwest of WCR 6 and WCR 7 in the Town of Erie, Weld County, Colorado. As requested, eleven (11) borings, designated TB-1 through TB-11, were performed to depths of about 20 to 30 feet below existing ground surface. Boring Logs along with a Boring Location Plan and vicinity map are included in Appendix A.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil and bedrock conditions
- groundwater conditions
- earthwork
- foundation design and construction
- floor slab design and construction
- site drainage considerations

The recommendations contained in this report are based on the results of field and laboratory testing, engineering analyses, experience with similar soil/bedrock conditions and structures, and our understanding of the proposed project.

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Site layout	See Appendix A, Exhibit A-2, Boring Location Plan
Proposed construction	An electrical substation will be constructed on the 8-acre property. We understand the substation pad will include about 2½ acres. At the time of the field exploration, the final location of the substation pad had not been determined; although, recent information indicates it will likely be situated on the approximate southern ½ of the property.

Item	Description
Structures	The substation will likely include A-frame type dead-end transmission line towers, bus and switch support structures, power circuit breakers and transformers, take-off structures and static mast towers. An electrical equipment enclosure structure will also be constructed. Based on similar projects, the enclosure structure will have dimensions of about 45 feet by 15 feet and will consist of a pre-fabricated structure supported on a reinforced concrete foundation.
Foundations	Shallow spread footings/mat foundations and/or drilled piers (or other deep foundations) are typically used for support of the various structures, depending upon subsurface conditions, loading conditions, tolerance for movement and other factors. Structural loads were not available at the time of this report. However, based on the size and type of construction planned, we anticipate relatively light to moderate vertical (gravity) foundation loads. The magnitude of loads and overturning moments due to wind or other lateral forces are not known at this time, but these loading conditions may control the design for certain types of structures.
Grading	Final grading plans were not developed at the time of this report. However, considering existing topography (approximately 5½ and 6½ feet of elevation difference across the north one-half and south one-half of the site, respectively), we anticipate some cuts and fills will be required to develop final pad grades. We estimate cuts/fills on the order of about 3 to 5 feet may be necessary.
Cut and fill slopes	Assumed to be no steeper than 3H:1V (Horizontal to Vertical)

If project information or assumptions vary from what is described above or if location of construction changes, we should be contacted as soon as possible to confirm and/or modify our recommendations accordingly.

2.2 Site Location and Description

Item	Description
Location	The project site is located on the south side of WCR 6 and about 550 feet west of WCR 7 in the Town of Erie, Colorado. The property encompasses 8 acres. The general location of the project site is 40.0280° N 105.0019° W.

Item	Description
Existing improvements/site features	The property is currently a vacant parcel of land with no improvements and appears to have been used for agricultural purposes in the recent past. In general, the site is surrounded by undeveloped agricultural land and scattered oil/gas facilities. An existing transmission line is located near the south end of the property and runs in an NW-SE direction. The Front Range/Denver solid waste landfills are located to the south and west.
Current ground cover	Ground cover on the site consists of relatively barren ground with crop remnants.
Existing topography	Review of the USGS 7.5-minute series topographic map of the area and our boring elevations indicates the ground surface generally slopes down to the north and east. Surface slopes are estimated to be on the order of about 1 to 2½ percent. We estimate a maximum difference in elevation of about 12 to 15 feet across the entire property.
Water features	Natural water features were not observed on or in the immediate vicinity of the project site. However, irrigation ditches (Community Ditch and other) are located approximately 700 to 800 feet, or more, to the south and west of the site. These features appear to be situated topographically up-gradient of the site.

3.0 SUBSURFACE CONDITIONS

3.1 Typical Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Approximate Depth to Bottom of Stratum	Material Encountered	Consistency or Relative Density/ Hardness	General Engineering Properties
About 6 inches	Vegetative soil layer	N/A	N/A
About 6 to 19½ feet	Lean clay with sand	Stiff to hard	Low to high swell potential, with most samples tested showing high swell, low compressibility (settlement potential), moderate load bearing capacity

Approximate Depth to Bottom of Stratum	Material Encountered	Consistency or Relative Density/ Hardness	General Engineering Properties
About 16 feet in borings TB-3 and 4 only	Sandy lean clay, varying amounts of gravel	Very stiff to hard	Judged to have low to moderate swell potential, low compressibility (settlement potential), moderate load bearing capacity
About 18 to 27 feet in borings TB-2, 3, 4, 6, 7, 8, 9, 10 and 11, extended to bottom of borings TB-1 and 5	Claystone bedrock	Firm to very hard	High to very high swell potential, moderate to high load bearing capacity
Extended to bottom of borings TB-2, 3, 4, 6, 7, 8, 9, 10 and 11	Claystone/siltstone/sandstone bedrock, cemented in places (practical auger refusal in borings TB-4 and 6)	Hard to very hard	Judged to have low to moderate swell potential, high load bearing capacity

Subsurface conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil/bedrock types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs in Appendix A.

3.2 Laboratory Testing

The laboratory testing program was designed to provide index and/or engineering properties for those soils/bedrock which influence foundation and floor slab design and performance. The soil/bedrock samples tested for this study have the following physical and/or engineering properties:

Boring No.	Sample Depth (ft.)	Silt or Clay Content (%)	Liquid Limit (%)	Plasticity Index (%)	Expansion/Consolidation (%/Surcharge Load, psf)	Unconfined Compressive Strength (psf)
TB-1	3				+7.6/500	
TB-1	6					24,010
TB-1	9	84	39	25	+1.5/1000	
TB-2	3	82	49	30	+6.8/500	
TB-2	9				+6.2/1000	

Boring No.	Sample Depth (ft.)	Silt or Clay Content (%)	Liquid Limit (%)	Plasticity Index (%)	Expansion/Consolidation (%/Surcharge Load, psf)	Unconfined Compressive Strength (psf)
TB-2	14					23,750
TB-2	19				+0.3/2500	
TB-3	3				+5.8/500	
TB-3	9				+2.4/1000	
TB-3	14				+0.5/1750	
TB-4	6	77	39	24	+4.8/750	
TB-4	9				+5.5/1000	
TB-4	19					20,560
TB-5	3					24,110
TB-5	6				+6.5/1000	
TB-5	9					9,510
TB-5	14	96	62	39	+2.9/1750	
TB-6	3					9,640
TB-6	9				+5.9/1000	
TB-6	14					22,180
TB-6	19				+4.7/2500	
TB-7	3					24,150
TB-7	6	77	45	30	+5.1/750	
TB-7	9				+4.9/1000	
TB-7	19					15,040
TB-8	3				+3.3/500	
TB-8	14				+4.5/1750	
TB-8	19					23,610
TB-9	3				+3.9/500	
TB-9	9	97	71	47	+6.3/1000	
TB-9	14				+2.4/1750	
TB-9	19				+3.5/2500	
TB-10	1 to 3	70	44	27		
TB-10	6				+5.8/1000	
TB-10	19					11,600
TB-11	6				+4.1/750	
TB-11	14				+4.2/1750	9,510

3.3 Groundwater

The boreholes were observed while drilling and after completion for the presence and level of groundwater. In addition, delayed water levels were also obtained in the borings. The water levels observed in the boreholes are noted on the attached boring logs, and are summarized below:

Boring Number	Depth to groundwater during or shortly after drilling, ft.	Depth to groundwater about 24 hours after drilling, ft.
TB-1	None encountered	23
TB-2	29	19½
TB-3	None encountered	23
TB-4	None encountered	22½
TB-5	None encountered	Dry at 20 feet
TB-6	None encountered	Dry at 24 feet
TB-7	None encountered	Dry at 24 feet
TB-8	None encountered	Dry at 29 feet
TB-9	None encountered	Dry at 29 feet
TB-10	None encountered	Dry at 29 feet
TB-11	None encountered	Dry at 19 feet

These observations represent short-term groundwater conditions at the time of and shortly after the field exploration, and may not be indicative of other times, or at other locations.

Groundwater/perched water levels can and should be expected to fluctuate with varying seasonal and weather conditions, irrigation demands on or adjacent to the site and with fluctuations in nearby water features. Therefore, groundwater levels during construction or at other times in the future may be higher or lower than the levels indicated on the boring logs.

Fluctuations in groundwater levels can best be determined by implementation of a groundwater monitoring plan. Such a plan would include installation of groundwater monitoring wells, and periodic measurement of groundwater levels over a sufficient period of time. The possibility of groundwater/perched water level fluctuations should be considered when developing the design and construction plans for the project.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Based on subsurface conditions encountered in our test borings, the site appears suitable for the proposed construction from a geotechnical point of view provided certain precautions and design and construction recommendations presented in this report are followed and the owner understands the inherent risks associated with construction on sites underlain by expansive soils and bedrock. We have identified several geotechnical conditions that could impact design, construction and performance of foundations and other site improvements. These include expansive clays and claystone bedrock, and to a lesser degree mine subsidence potential. These

conditions will require particular attention in project planning, design and during construction and are discussed in greater detail in the following sections.

4.1.1 Expansive Soils/Bedrock

Expansive clay soils and bedrock are present on this site and these conditions constitute a geologic hazard. This report provides recommendations to help mitigate the effects of soil movement/heave associated with these materials. However, even if these procedures are followed, some movement of structures and other site improvements is possible. The severity of structure movements will probably increase if modification of the site results in excessive wetting of the expansive materials. Eliminating the risk of movement is generally not feasible, particularly for slabs-on-grade and other lightly loaded at-grade features, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during design and construction. Some of these options are discussed in this report. We would be pleased to discuss other construction alternatives with you upon request.

Swell-consolidation tests indicate the clay soils on the site typically have moderate to high swell potential, while the claystone has high to very high swell potential when wetted. The expansive soil/bedrock will present a substantial risk of heave and related damage to shallow foundations (i.e. spread footings) and floor slabs constructed directly on or near these materials. Based on existing conditions and the laboratory swell data, we estimate potential surface heave could be on the order of about 3½ to 5 inches, or more, depending upon depth of post-construction wetting, location on the site and other factors. Consequently, special designs and/or earthwork recommendations will be required for this project in order to mitigate the impact of the expansive soils/bedrock on proposed improvements. It should be recognized these mitigation procedures will not eliminate risk. Mitigation techniques are discussed in other sections of this report.

4.1.2 Mine Subsidence Potential

Review of coal mine subsidence maps completed by the Colorado Geological Survey ([1]Amuedo and Ivey, 1975), indicates the subject property is not located within the boundaries of coal mine subsidence hazard as defined by this study. However, low to severe subsidence hazard zones are located within about ¼ to ¾ miles of the project site. Evaluation of risk associated with subsidence at the site is beyond the scope of this report. If the owner is concerned about the potential for such subsidence hazards, other studies should be undertaken.

4.2 Earthwork

The following presents recommendations for site preparation, excavation, subgrade preparation and placement of engineered fills on the project. Earthwork on the project should be observed

[1]Amuedo & Ivey, 1975, ***Ground Subsidence and Land-Use Considerations Over Coal Mines in the Boulder-Weld Coal Field, Colorado***, Colorado Geological Survey, Environmental Geology No. 9.

and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils/bedrock, and other geotechnical conditions exposed during the construction of the project.

4.2.1 Site Preparation

Site preparation should commence with removal of existing vegetation, topsoil and any loose, soft, or otherwise unsuitable material from the proposed construction areas. Stripped materials consisting of vegetation and organic materials should be wasted from the site, or used to re-vegetate landscaped areas or exposed slopes after completion of grading operations.

Exposed surfaces should be free of mounds and depressions that could prevent uniform compaction. The subgrade should then be proof-rolled to help delineate weak or disturbed areas at or near the ground surface. Unsuitable areas should be improved by moisture adjustment and compaction or by undercutting and placement of suitable compacted fill.

Although evidence of existing fills or underground facilities such as utilities, grease pits, septic tanks, cesspools, existing foundations and basements was not observed during the site reconnaissance, 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. Terracon should observe the excavation prior to backfill placement and/or construction.

4.2.2 Fill Material Types

On-site clay soils free of vegetation, organic matter and other unsuitable materials or low volume change import materials approved by Terracon may be used as fill/backfill material on the site.

Because of the high plasticity and swell potential of the claystone, we believe these materials (if encountered) should be avoided for use as engineered fill/backfill below or adjacent to proposed structures. If the claystone has to be used on the site, these materials should be placed in areas of the development that will never be under structures or other movement sensitive features.

In general, imported materials meeting the properties presented below should be acceptable for use on the site. However, imported soils (if needed) should be evaluated and approved by the geotechnical engineer prior to delivery to the site.

Gradation/Property	Percent Finer by Weight (ASTM C136)
3-inch	100
No. 4 Sieve	50 to 100
No. 200 Sieve	40 to 75

Gradation/Property	Percent Finer by Weight (ASTM C136)
■ Liquid Limit (LL)	40 (max.)
■ Plasticity Index (PI)	20 (max.)
■ Maximum Volumetric Expansion[1] (%)	2

1. Measured on a sample compacted to about 95 percent of the ASTM D698 maximum dry density at about optimum water content. The sample is confined under a 250 psf surcharge load and inundated with water.

Other import fill material types may be suitable for use on the site depending upon proposed application and location on the site and could be tested and approved for use on a case-by-case basis. In general, granular fill materials should be avoided in order to reduce water intrusion/penetration to the expansive soils/bedrock and resulting soil movements.

4.2.3 Compaction Requirements

Item	Description
Fill lift thickness	■ 9 to 12-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 or plate compactor) is used
Compaction requirements[1]	At least 95% of the standard Proctor maximum dry density (ASTM D698)
Moisture content on-site or import cohesive soils[2] (Clays)	0 to +3% of the optimum moisture content as determined by the standard Proctor test
Moisture content claystone bedrock materials (if encountered)	+1 to +4% of the optimum moisture content as determined by the standard Proctor test Claystone fill not recommended below or adjacent to structures

1. 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. A construction disc or other suitable processing equipment will be needed to thoroughly process the materials and to aid in achieving uniform moisture content throughout the fill.
2. The contractor should expect significant moisture adjustment and processing of the site soils will be needed prior to or during compaction operations.
3. Moisture conditioned cohesive soils (clays and clay-based bedrock) should not be allowed to dry out. A loss of moisture within these materials will likely result in an increase of the materials swell potential. Subsequent wetting of these materials could result in undesirable movements.

4. Care should be taken during the fill placement process to avoid zones of dissimilar fill. Improvements constructed over varying fill types are at a higher risk of differential movement compared to improvements over a uniform fill zone.

The recommendations for placement and compaction criteria presented assume fill depths will be 5 feet or less. Fills on the order of 5 feet in depth, when placed and compacted as recommended in this report, will experience some self-weight induced compression/settlement, generally on the order of about ½ inch. The amount and rate of settlement will be increased if water is introduced into the fill. In any event, sufficient time should be allowed for deeper fills to consolidate/compress prior to construction. If fill depths exceed about 5 feet, we should be contacted to determine whether modifications to the fill placement and compaction criteria are needed.

4.2.4 Slopes

For new slopes in compacted fill or cut areas where saturation of the slopes will not occur, we suggest slopes of 3H:1V, or less to reduce erosion and maintenance problems. Some local raveling and/or surface sloughing should be anticipated on slopes constructed at this angle until vegetation is re-established. If saturated or steeper slopes and/or slopes over about 10 feet in height are anticipated, or if structures or other surcharge loads will be located within a distance of the slope height from the crest of the slope, the slopes should be evaluated for stability on an individual basis.

The face of all slopes should be compacted to the minimum specifications described in section **4.2.3 Compaction Requirements**. Ideally, fill slopes should be over-built and trimmed to compacted soil. Slopes should be revegetated as soon as possible to reduce the potential for erosion problems. Seeded slopes should be protected with erosion mats until the vegetation is established. Surface drainage should be designed and constructed to direct water away from slope faces and to prevent ponding adjacent to the crest or toe of the slope.

4.2.5 Excavation and Utility Trench Construction

We anticipate excavations up to about 5 feet may be necessary for construction. We believe the clay soils encountered in our exploratory borings can be excavated with conventional excavation equipment. We do not expect excavations for this project will extend into bedrock. Groundwater seepage is not expected for shallow excavations on this site. However, if seepage occurs or rain or snow-melt water accumulates in the excavation, it should be removed as soon as possible.

Utility trench and structure excavations should be made with sufficient working space to permit construction including backfill placement and compaction. Backfill should consist of on-site clay soils or approved imported materials and should be placed and compacted as described in section **4.2.3 Compaction Requirements**. Granular backfill and bedding should be avoided to the extent possible in order to reduce water intrusion/penetration to the expansive soils/bedrock and resulting

soil movements. It is strongly recommended a representative of the geotechnical engineer provide full-time observation and compaction testing of trench backfill within structural areas of the site.

Underground piping within or near the proposed structures should be designed and constructed to accommodate anticipated movements so deviations in alignment do not result in breakage or distress. Utility knockouts in grade beams/foundation walls (if any) should be oversized to accommodate soil movements.

The individual contractor(s) is responsible for designing and constructing stable, temporary excavations in order to maintain stability of excavation sides and bottom as well as any adjacent structures, foundations and utilities. 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. As a safety measure, it is suggested vehicles and soil piles be kept to a minimum lateral distance from the crest of the slope equal to no less than the slope height. Exposed slope faces should be protected against the elements.

The soils to be penetrated by the proposed excavations may vary significantly across the site. The preliminary soil classifications are based solely on the materials encountered in widely spaced exploratory test borings. The contractor should verify 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.

4.2.6 Grading and Drainage

Proper drainage and surface water management is critical to the performance of foundations, floor slabs and other site improvements. The following recommendations are considered good practice for any site and should be implemented where applicable and/or to the extent possible.

Grades must be adjusted to provide positive drainage away from structures and other site improvements during construction and maintained throughout the life of the proposed facility. Infiltration of water into utility or foundation excavations must be prevented during construction.

Exposed ground should be sloped at about 10 percent grade for at least 10 feet beyond the structures, where practical. The ground surface should be sloped in such a manner that water will not pond between or adjacent to structures and other site improvements. Drainage swales and/or open area drains may also be needed to facilitate drainage.

Backfill against foundations and in utility trenches should consist of the on-site clays or approved cohesive import materials and should be well compacted and free of construction debris to reduce moisture infiltration. Some settlement of backfill should be expected even if properly compacted.

Areas where backfill has settled should be repaired and re-graded immediately to maintain proper slope away from structures.

Water permitted to pond near or adjacent to structures (either during or post-construction) can result in higher soil movements than those discussed in this report. As a result, 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.

After construction and prior to project completion, we recommend verification of final grading be performed to document that positive drainage, as described in this section, has been achieved. Maintenance of surface drainage is imperative subsequent to construction and becomes the responsibility of the owner.

4.2.7 Earthwork Construction Considerations

The clay soils on this site are not expected to "pump" or deform excessively upon initial exposure. However, cohesive soils, such as those found on this site, can lose strength when elevated in moisture content. In addition, overall stability of the subgrade can be significantly affected by precipitation events, excessive compaction water, repetitive construction traffic, or other factors. Consequently, subgrade "pumping" and unstable conditions could develop during earthwork operations or other construction activities.

If unstable or soft ground conditions develop during earthwork or other construction activities, some method of soil improvement or stabilization will be needed prior to fill placement and/or construction. There are a number of stabilization methods that can be used to improve the subgrade and depend, in part, on the extent and severity of the unstable soils exposed during construction as well as other factors. For isolated or small areas requiring stabilization, moisture conditioning and recompaction or mechanical stabilization with granular materials and/or geogrid may be effective. If large areas require stabilization, chemical treatment of the soils may be a more effective alternative. If chemical treatment is used, additional laboratory evaluation and mix design preparation is recommended to determine the effect of chemical stabilization on subgrade soils. In any event, we feel the appropriate method and level of stabilization (if any) should be evaluated and can best be determined on a case-by-case basis during construction once the entire subgrade and overall conditions are exposed.

The subgrade should be evaluated by a Terracon representative upon completion of filling operations. Care should be taken to maintain the subgrade moisture content during construction. If the subgrade should become dry or desiccated, the affected material should be removed or these materials should be scarified, moisture conditioned and recompacted. Likewise, completed subgrades that have become saturated, frozen, disturbed or altered by construction activity should be restored to the conditions recommended in this report.

4.3 Structure Foundations

Deep foundations, such as drilled piers socketed into bedrock, are typically recommended for support of structures where expansive soils/bedrock are present. Drilled piers can extend foundation elements through the expansive materials that are more likely to be subjected to wetting and swelling and can penetrate the zone of probable moisture variation. At the same time, drilled piers provide a method to concentrate structure dead loads to resist uplift forces created by swelling soils/bedrock when they become wetted. Considering the subsurface conditions encountered in our test borings, it is our opinion the use of straight shaft piers socketed into bedrock are appropriate for support of the various structures and would offer a reliable method to mitigate post-construction foundation movement and distress.

Detailed recommendations for design and construction of drilled pier foundations are presented in the following sections.

4.3.1 Drilled Pier Design Recommendations

Description		Drilled Pier Design Parameter	
Pier bearing stratum [1]		Unweathered bedrock	
Minimum bedrock penetration [2]		12 feet	
Minimum pier length		25 feet	
Axial compression loads	**Maximum allowable end-bearing pressure** [3]	25,000 psf	
	Allowable skin friction [3,4]	Upper 5 feet of bedrock penetration	1,200 psf
		Greater than 5 feet of bedrock penetration	2,000 psf
Ultimate uplift force on pier (and resulting tensile forces due to soil/bedrock heave) U_p, kips [5]		$U_p = 60 \times D$ U_p = uplift force in kips D = pier diameter in feet	

1. Our experience in the area indicates a thin layer of weathered bedrock is likely present at the contact between the overburden clays and the bedrock. Actual depth to competent bedrock should be determined by a representative of Terracon during pier drilling operations. In addition, our experience in the area indicates soft carbonaceous layers may be present at some locations within the bedrock unit. If encountered, drilled piers should not “bottom-out” on these materials.

2. The bedrock penetration provided above is an estimate of the minimum amount needed below the anticipated zone of wetting to resist potential uplift forces due to soil/bedrock expansion without the requirement for dead load. As such, no minimum dead load pressure has been specified. Should piers be subject to additional uplift forces (wind, seismic, etc.), sufficient dead load and/or additional penetration into the bearing strata beyond the minimum specified may be required.
3. The allowable end-bearing pressure and skin friction values are applicable for the portion of the pier in unweathered bedrock. Skin friction values apply for both upward and downward loading.
4. The overburden clay soils/engineered fill and bedrock materials within the upper 10 feet of the ground surface should not be considered when calculating resistance to uplift forces and axial loads.
5. The amount of reinforcing steel for expansion can be determined by the tensile force created by the uplift force on each pier, with allowance for structure dead load on the pier.
6. Movement of properly designed and constructed drilled piers should be on the order of 1 inch, or less.

Piers should have a center-to-center spacing of at least 3 pier diameters when designing for vertical loading conditions, or they should be designed as a group. Piers aligned in the direction of lateral forces should have a center-to-center spacing of at least 6 pier diameters. Terracon should be contacted to help evaluate pier group effects and capacity reductions for closely spaced piers if needed.

Drilled piers should be designed to resist lateral loads applied to the structure by seismic, wind and other lateral forces. The following table summarizes suggested material values that can be used to develop deflection versus moment curves for laterally loaded shafts/piers using the LPILE computer program.

Material Type	LPILE Soil Type	Average Unit Weight, γ (pcf)	Angle of Internal Friction, ϕ (degrees)	Average Undrained Shear Strength, c_u (psf)	Modulus of Horizontal Subgrade Reaction, k (pci)	Strain at 50% of Maximum Stress, ε_{50}
Clay	Stiff clay w/o free water	125	0	4,000	Static – 1,000 Cyclic – 400	0.005
Claystone bedrock	Stiff clay w/o free water	130	0	8,000	Static - 2,000 Cyclic - 800	0.004

It should be noted the above design values do not include factors of safety, which should be applied.

Piers should be reinforced full depth for the applied axial, lateral and uplift stresses imposed. As a minimum, we suggest reinforcement with at least 0.005 times the gross cross-sectional area of the pier using Grade 60 (or better) steel. More reinforcement may be required because of structural considerations. The structural engineer should specify the amount of reinforcement.

Piers should have a minimum diameter of 16 inches and a preferred maximum L/D ratio of 20 to 25, with 30 considered the typical limit. Larger pier diameters may be needed to accommodate actual foundation load and other structural design requirements.

A 6-inch (or greater) void space should be provided beneath pier caps/grade beams and between piers to concentrate dead-loads onto piers. The void material should be of suitable strength to support the weight of fresh concrete used in pier cap/grade beam construction and to avoid collapse when foundation backfill is placed.

4.3.2 Drilled Pier Construction Considerations

Although not encountered at our boring locations and sampling intervals, our experience in the area indicates soft lignitic/carbonaceous layers may be present within the bedrock unit on this site. Drilled piers should not “bottom-out” on these materials. If soft carbonaceous layers are encountered during drilling, additional penetration into competent bedrock will be required and could result in pier lengths greater than anticipated. Normally, additional penetration at least equal to thickness of the soft layer is specified.

Appropriate sized drill rigs in good working condition will be required to facilitate the required bedrock penetration and minimum pier length. Our experience in the area indicates the firm to hard claystone bedrock can normally be penetrated with typical auger drill methods. However, our boring data indicates lenses/layers of cemented materials are present within the claystone/siltstone/sandstone bedrock unit and we encountered practical auger refusal in 2 of the test borings. The use a “rock bit”, core barrel or other specialized tooling will likely be required to penetrate these materials. The means and methods of bedrock penetration should be evaluated and determined by the drilling contractor.

Boring data indicates perched water and/or water-bearing seams are present within the bedrock at some locations on this site and water seepage into the pier hole may occur at some locations. Free-fall concrete placement in piers will only be acceptable if they can be adequately dewatered (less than about 3 inches of water at the time of placement) and provisions are taken to avoid striking the concrete on the sides of the hole or reinforcing steel. If concrete placement by free-fall is used or desired, the structural engineer should specify the maximum free-fall distance. If excessive water develops in the pier, pumping or underwater concrete placement are recommended. Pier concrete should be on site and placed shortly after completion of drilling, cleaning and observation and reinforcing steel is set to avoid collecting excessive water and possible contamination (sloughing) of open pier holes.

Pier concrete with slump in the range of 5 to 7 inches is recommended. Pier concrete should be designed to achieve its 28-day design strength at these higher slumps.

Pier drilling should produce shafts with relatively undisturbed bedrock exposed. Excessive remolding and caking of bedrock on pier walls must be removed. The bedrock should be rough or roughened to help mobilize skin friction. This can be accomplished by placing a retractable tooth on the auger or by other approved methods.

Formation of mushrooms or enlargements at the top of piers should be avoided during drilling and subsequent construction operations. Construction of drilled piers should be observed by a representative of Terracon on a full-time basis in order to identify the appropriate bearing strata, observe the construction methods used and to confirm subsurface conditions are consistent with those encountered in our test borings.

4.4 Seismic Considerations

Code Used	Site Classification
2015 International Building Code (IBC) [1]	C [2]

1. In general accordance with the *2015 International Building Code,* which refers to ASCE 7, Chapter 20 (Table 20.3-1 of ASCE 7-10). IBC Site Class is based on the average characteristics of the upper 100 feet of the subsurface profile.
2. The deepest boring for this project extended to a maximum depth of approximately 30 feet and this seismic site class definition considers that similar bedrock conditions continue below the maximum depth of the subsurface exploration.

4.5 Floor Systems (Enclosure Building)

Laboratory testing indicates the clay soils typically have moderate to high swell potential, while the claystone has high to very high swell potential. We judge slab performance risk on this site is high as defined by the Colorado Association of Geotechnical Engineers (**CAGE**). Based on existing conditions and the laboratory swell data, we estimate potential surface/slab heave could be on the order of about 3½ to 5 inches, or more, depending upon depth of wetting and other factors. In our opinion, the use of a structural floor supported independent of the ground is an appropriate method to mitigate the impact of swelling soils/bedrock on floor construction and should be used for the proposed enclosure building.

4.5.1 Structural Floor/Crawl Space Design Recommendations

Building codes should be followed for clear space requirements below structurally supported floors with crawl space areas and will depend, in part, upon the type of materials used to construct the floor as well as the volumetric expansion potential of the underlying soil/bedrock. Clear spaces for these types of floors normally range from about 18 to 24 inches, or more.

Surface water can penetrate backfill adjacent to the building and collect at the bottom of the crawl space excavation resulting in a perched groundwater condition. Experience indicates over a period

of time, moist conditions, soft soils and possibly standing water can develop in crawl space areas, particularly if proper surface drainage away from the foundation is not provided and maintained. As a precautionary measure, we recommend the provision of a drain where a suspended structural floor with a crawl space area is used.

At a minimum, the drain trench and pipe should be constructed around the interior perimeter of the building foundation, and should be sloped at a minimum ½ percent to a suitable outlet, such as a sump and pump system or to a positive gravity outfall. The drainage system should consist of a minimum 4-inch diameter rigid perforated pipe, embedded in free-draining gravel, placed in a trench at least 12-inches in width. The invert of the drain pipe should be at least 4 inches below the bottom of the grade beam void or the crawl space subgrade at the highest point. The pipe should be encased with washed gravel and the gravel should extend laterally to the grade beam void and at least ½ the height of the void. The gravel should be covered with drainage fabric to reduce infiltration of fines into and clogging of the gravel media and pipe. The drain layout could be located exterior to the foundation walls; however, an interior location is preferred. If an exterior drain is desired, we should be contacted to discuss possible implications and to provide supplemental recommendations.

Crawl space areas should be well ventilated for indoor air quality to help manage humidity and to facilitate moisture release. To help promote drainage towards the perimeter of the structure, the crawl space subgrade should be excavated to a minimum 1 percent slope from the high point at the center of crawl space area to the perimeter of the building foundation. To further manage humidity, we believe best current practice involves placing a vapor retarder (10 mil polyethylene membrane material, or equivalent) on the exposed soil in the crawl space. The vapor retarder should be sealed at joints and attached to concrete foundation walls and other elements.

Grade beams/foundation walls with unbalanced backfill levels on opposite sides (such as crawl space walls) should be designed for lateral earth pressures imposed by the backfill. Earth pressures will primarily be influenced by structural design of the walls, conditions of wall restraint and type, compaction and drainage of the backfill. For purposes of design, we have assumed about 3 to 4 feet of fill will be retained by crawl space walls and backfill will consist of the on-site clays or approved import materials. If taller walls are planned, or if different type of backfill is used, we should be contacted to review our data and confirm or modify the design criteria presented below.

Grade beams/foundation walls with unbalanced backfill levels on opposite sides should be designed for earth pressures indicated in the following table.

Earth Pressure Conditions	Backfill Soil Type	Equivalent Fluid Density (pcf)
Active (K_a)	On-site clay	60
At-Rest (K_o)	On-site clay	80
Passive (K_p)	On-site clay	250

The equivalent fluid densities given above do not include allowances for surcharge loads such as adjacent foundations, sloping backfill, equipment or floor loading, or hydrostatic pressure and do not include a factor of safety.

4.6 Additional Design and Construction Considerations

4.6.1 Soluble Sulfate Test Results (Concrete)

Soluble sulfate concentrations were measured for samples of the soil/bedrock that will likely be in contact with project concrete. The sulfate concentrations measured in the samples varied from 0.11 to 3.3 percent. Most of the samples tested showed sulfate concentrations in the range of 0.11 to 0.69 percent. Sulfate concentrations in the range of 0.2 to less than 2 percent indicate Class 2 exposure to sulfate attack for concrete in contact with the subsoils, according to the American Concrete Institute (ACI) *Guide to Durable Concrete*.

For Class 2 sulfate exposure, ACI recommends the use of Type V cement (or equivalent) and a maximum water-cement ratio of 0.45. As an alternative, ACI allows the use of cement that conforms to ASTM C150 Type II requirements, if it meets the Type V performance requirements (ASTM C452) of ASTM C150 Table 4. ACI 201 also allows a blend of any type of portland cement and fly ash with an expansion of less than 0.05 percent at 6 months when tested in accordance with ASTM C1012. Foundation concrete should be designed in accordance with the provisions of the *ACI Design Manual*, Section 318, Chapter 4.

Sulfate concentrations above 0.2 percent can cause an adverse reaction between the sulfates and calcium based stabilizing agents, resulting in heaving of the subgrade if lime or fly ash stabilization is performed. Based on the test results, we believe there is a high risk of increased swelling due to sulfate reaction to chemical stabilizing agents at this site. If chemical treatment is used, additional laboratory evaluation and mix design preparation is recommended to determine the effect of chemical stabilization on subgrade soils.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing

services during grading, excavation, foundation construction and other earth-related construction phases of the project.

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

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

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event changes in the nature, design, or location of the project as described in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION

Field Exploration Description

As requested, eleven (11) test borings were drilled at the site on December 14, 2017. The borings were drilled and sampled to depths of about 20 to 30 feet at the approximate locations shown on the Boring Location Plan, Exhibit A-2. Borings were advanced with a CME-45 truck-mounted drilling rig, utilizing 4-inch diameter solid stem auger.

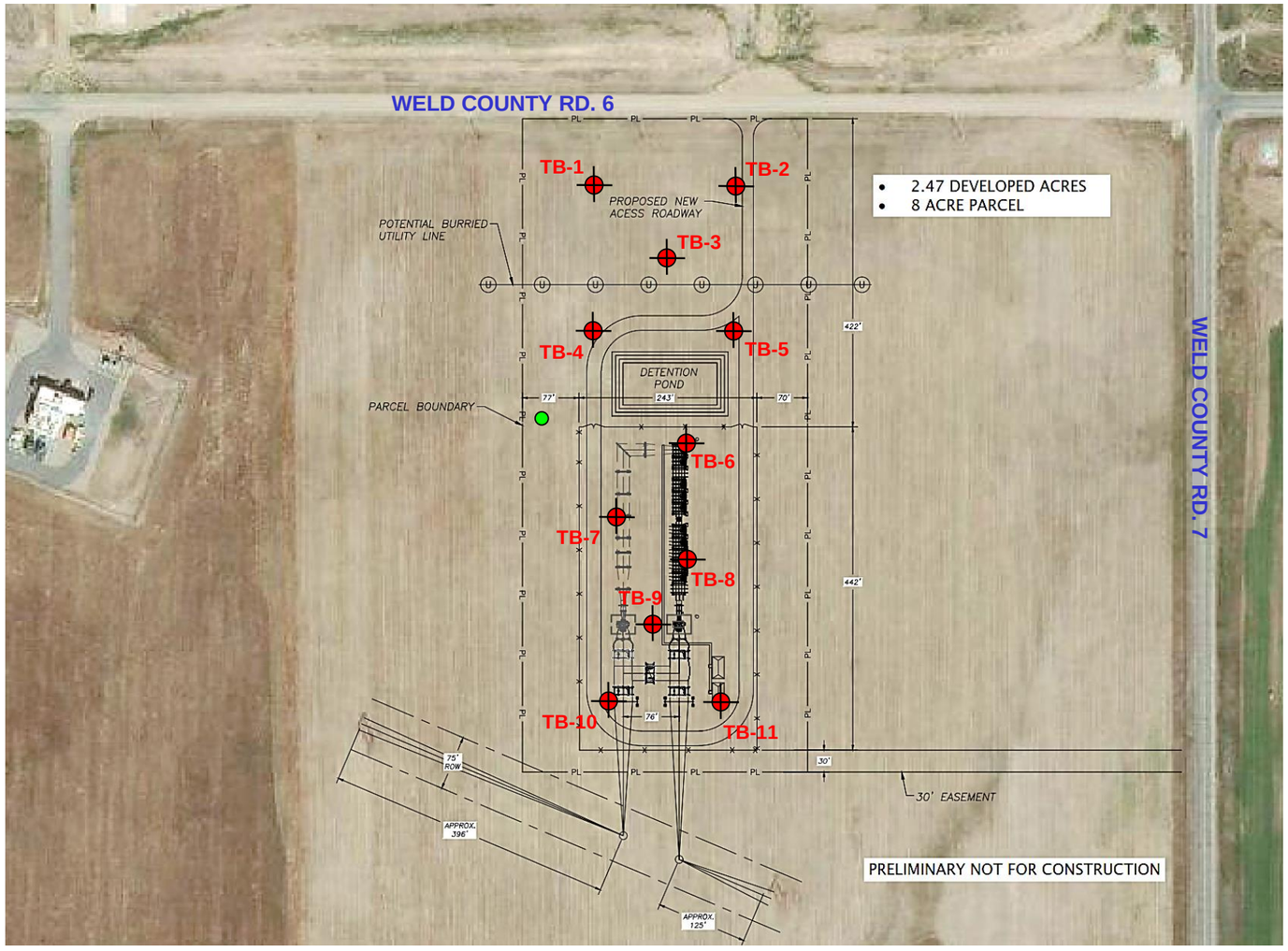
The latitude and longitude coordinates of the boring locations were obtained by locating the borings in our GIS database and recording the values. The borings were located in the field using a recreational grade GPS device. The accuracy of these coordinates is typically about +/- 25 feet. Approximate ground surface elevations at the boring locations for this exploration were obtained by measurements with an engineer's level and rod from a temporary bench mark (TBM) shown on the Boring Location Plan. The accuracy of boring locations and elevations should only be assumed to the level implied by the methods used.

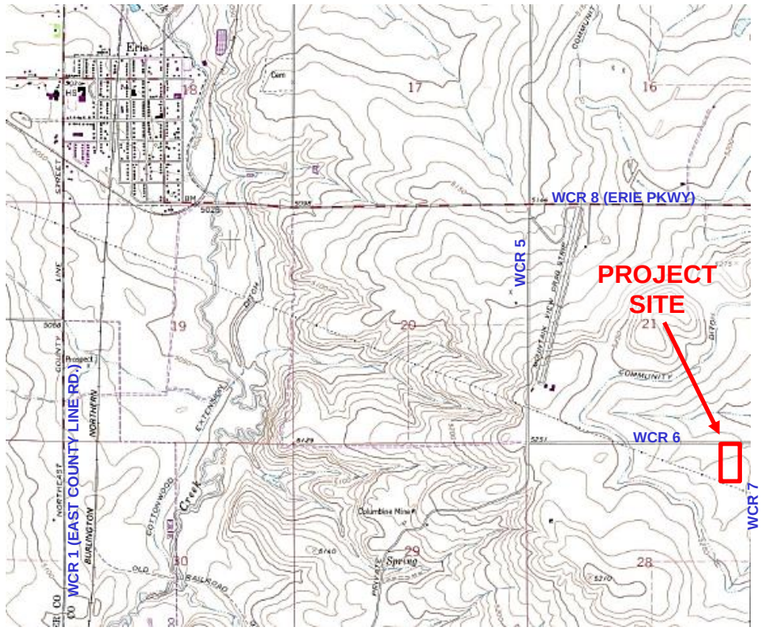
A geotechnical engineer recorded lithologic logs of each boring during the drilling operations. At selected intervals, samples of the subsurface materials were taken by means of driving a 2.5-inch O.D. modified California barrel sampler. Bulk samples were also obtained from some of the test borings. Penetration resistance measurements were obtained by driving the California barrel into the subsurface materials with a 140-pound hammer falling 30 inches. The penetration resistance value, when properly interpreted, is a useful index in estimating the consistency, relative density, or hardness of the materials encountered.

Groundwater levels were recorded in each boring at the time of site exploration and about 24 hours after completion of drilling. After the groundwater levels were checked, the borings were backfilled with on-site soils (auger cuttings). Some settlement of the backfill may occur over time and should be repaired as soon as possible.

A CME automatic hammer was used to advance the California barrel sampler 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 penetration values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the 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 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 soils moisture content.





VICINITY MAP
N.T.S.

N

0' 100' 200'

APPROX. GRAPHIC SCALE

LEGEND:

APPROXIMATE LOCATION OF TEST BORING DRILLED ON DECEMBER 14, 2017

TEMPORARY BENCH MARK (TBM) TOP OF SET PINK WOOD STAKE ASSIGNED ELEV. = 100.0 FEET

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

Project Manager:	ESW
Drawn by:	GMM
Checked by:	ESW
Approved by:	ESW

Project No.	22175130
Scale:	1" = 200' +/-
File Name:	22175130 BLP
Date:	12/15/2017

Terracon
Consulting Engineers & Scientists
1242 Bramwood Place Longmont, Colorado 80501
PH. (303) 776-3921 FAX. (303) 776-4041

BORING LOCATION PLAN

SPECTRUM ENGINEERING RESOURCES
LAZY DOG ELECTRICAL SUBSTATION
SW OF WELD COUNTY ROAD (WCR) 6 AND WCR 7
TOWN OF ERIE, WELD COUNTY, COLORADO

EXHIBIT

A-2

BORING LOG NO. TB-1

PROJECT: Lazy Dog Electrical Substation

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

LOCATION See Exhibit A-2

Latitude: 40.0291° Longitude: -105.0022°

Surface Elev.: 95.3 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOL / LOAD, (% / psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.5	95										
VEGETATIVE SOIL LAYER, CLAY soil with vegetation and root penetration												
LEAN CLAY with SAND (CL), brown, rust, tan/beige to olive brown, hard to stiff												
						30/12"	+7.6/500		11	119		
			5									
						27/12"		24010	10	124		
						30/12"	+1.5/1000		13	122	39-14-25	84
			10									
						17/12"			18	113		
			15									
	19.5	76				7/6"-13/6"			15	120		
CLAYSTONE, olive, grey, rust, firm to hard			20	▽								
	25.0	70.5				50/9"			16	118		
Boring Terminated at 25 Feet			25									

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

Hammer Type: Automatic

Advancement Method:
4-inch diameter solid flight auger

Abandonment Method:
Boring backfilled with soil cuttings after delayed water level was measured.

See Exhibit A-1 for description of field procedures

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

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None encountered after completion of drilling

▽ *23 feet when checked on 12/15/2017*

Terracon
1242 Bramwood Pl
Longmont, CO

Boring Started: 12-14-2017 | Boring Completed: 12-14-2017

Drill Rig: CME-45 | Driller: ODELL

Project No.: 22175130 | Exhibit: A-3

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

BORING LOG NO. TB-2

PROJECT: Lazy Dog Electrical Substation

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

LOCATION See Exhibit A-2

Latitude: 40.0291° Longitude: -105.0014°

Surface Elev.: 91.7 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.5	91	**VEGETATIVE SOIL LAYER**, CLAY soil with vegetation and root penetration
		LEAN CLAY with SAND (CL), brown, orange brown/rust with beige/white, very stiff
6.5	85	**CLAYSTONE**, olive-tan, olive, grey, rust, medium hard to hard
19.0	72.5	**CLAYSTONE/SILTSTONE/SANDSTONE**, olive-tan, rust, grey, very hard, iron concretions Cemented lense/layer between about 21 to 23 feet
30.0	61.5	***Boring Terminated at 30 Feet***

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOL / LOAD, (% / psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
5		33/12"	+6.8/500		12	123	49-19-30	82
		37/12"			16	116		
10		45/12"	+6.2/1000		16	115		
15		50/7"		23750	11	127		
20		50/6"	+0.3/2500		13	120		
25		50/5"			12	122		
30		50/5"			12	107		

WATER LEVEL OBSERVATIONS

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

Hammer Type: Automatic

Advancement Method:
4-inch diameter solid flight auger

Abandonment Method:
Boring backfilled with soil cuttings after delayed water level was measured.

See Exhibit A-1 for description of field procedures

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

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

29 feet after completion of drilling

19.5 feet when checked on 12/15/2017

Terracon
1242 Bramwood Pl
Longmont, CO

Boring Started: 12-14-2017 | Boring Completed: 12-14-2017

Drill Rig: CME-45 | Driller: ODELL

Project No.: 22175130 | Exhibit: A-4

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

BORING LOG NO. TB-3

PROJECT: Lazy Dog Electrical Substation

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

LOCATION See Exhibit A-2

Latitude: 40.0288° Longitude: -105.0018°

Surface Elev.: 94.1 (Ft.)

DEPTH	ELEVATION (Ft.)	DESCRIPTION
0.5	93.5	**VEGETATIVE SOIL LAYER**, CLAY soil with vegetation and root penetration
		LEAN CLAY with SAND (CL), brown, rust, tan/beige to olive brown, hard to very stiff
14.0	80	**SANDY LEAN CLAY (CL)**, olive brown, rust, grey, very stiff, coarse SAND, trace fine GRAVEL
16.0	78	**CLAYSTONE**, olive, grey, rust
19.0	75	**CLAYSTONE/SILTSTONE/SANDSTONE**, olive-tan, rust, grey, hard to very hard
30.0	64	***Boring Terminated at 30 Feet***

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOL / LOAD, (% / psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
5		36/12"	+5.8/500		14	120		
		47/12"			10	124		
10		36/12"	+2.4/1000		11	121		
15		24/12"	+0.5/1750		16	121		
20		50/9"			15	117		
25		50/6"			12	114		
30		50/4"			11			

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

Hammer Type: Automatic

Advancement Method:
4-inch diameter solid flight auger

Abandonment Method:
Boring backfilled with soil cuttings after delayed water level was measured.

See Exhibit A-1 for description of field procedures

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

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None encountered after completion of drilling

23 feet when checked on 12/15/2017

Terracon
1242 Bramwood Pl
Longmont, CO

Boring Started: 12-14-2017 | Boring Completed: 12-14-2017

Drill Rig: CME-45 | Driller: ODELL

Project No.: 22175130 | Exhibit: A-5

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

BORING LOG NO. TB-4

PROJECT: Lazy Dog Electrical Substation

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

LOCATION See Exhibit A-2

Latitude: 40.0286° Longitude: -105.0022°

Surface Elev.: 97.2 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.5	96.5	**VEGETATIVE SOIL LAYER**, CLAY soil with vegetation and root penetration
		LEAN CLAY with SAND (CL), brown, light brown, tan/beige, hard to very stiff
13.0	84	**SANDY LEAN CLAY (CL)**, brown, rust, hard, coarse SAND, fine GRAVEL
16.0	81	**CLAYSTONE**, olive-tan, olive, grey, rust, medium hard to hard
26.0	71	**CLAYSTONE/SILTSTONE/SANDSTONE**, rust, orange, very hard, cemented, iron concretions
27.5	69.5	***Practical Auger Refusal on Cemented Bedrock at 27.5 Feet***

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOL / LOAD, (% / psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		29/12"			12	110		
5								
		37/12"	+4.8/750		9	131	39-15-24	77
		34/12"	+5.5/1000		9	127		
10								
		50/10"			8	131		
15								
		50/11"		20560	13	123		
20								
		50/8"			14	123		
25								
		50/0"						

WATER LEVEL OBSERVATIONS

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

Hammer Type: Automatic

Advancement Method:
4-inch diameter solid flight auger

Abandonment Method:
Boring backfilled with soil cuttings after delayed water level was measured.

See Exhibit A-1 for description of field procedures

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

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None encountered after completion of drilling

22.5 feet when checked on 12/15/2017

Terracon
1242 Bramwood Pl
Longmont, CO

Boring Started: 12-14-2017 | Boring Completed: 12-14-2017

Drill Rig: CME-45 | Driller: ODELL

Project No.: 22175130 | Exhibit: A-6

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

BORING LOG NO. TB-5

PROJECT: Lazy Dog Electrical Substation

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

LOCATION See Exhibit A-2

Latitude: 40.0286° Longitude: -105.0014°

Surface Elev.: 93.5 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOL / LOAD, (% / psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.5	93										
		VEGETATIVE SOIL LAYER, CLAY soil with vegetation and root penetration										
		LEAN CLAY with SAND (CL), brown, orange brown/rust with beige/tan, very stiff to hard										
					☒	36/12"		24110	11	122		
	6.0	87.5	5									
		CLAYSTONE, olive, olive, grey, rust, tan, firm to hard, with lenticular beds of CLAYSTONE/SILTSTONE/SANDSTONE			☒	35/12"	+6.5/1000		17	114		
					☒	34/12"		9510	20	107		
			10									
					☒	50/10"	+2.9/1750		18	114	62-23-39	96
			15									
	20.0	73.5			☒	50/9"			17	116		
		Boring Terminated at 20 Feet	20									

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

Hammer Type: Automatic

Advancement Method:
4-inch diameter solid flight auger

Abandonment Method:
Boring backfilled with soil cuttings after delayed water level was measured.

See Exhibit A-1 for description of field procedures

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

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None encountered after completion of drilling

Dry at 20 feet when checked on 12/15/2017

Terracon
1242 Bramwood Pl
Longmont, CO

Boring Started: 12-14-2017 | Boring Completed: 12-14-2017

Drill Rig: CME-45 | Driller: ODELL

Project No.: 22175130 | Exhibit: A-7

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

BORING LOG NO. TB-6

PROJECT: Lazy Dog Electrical Substation

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

LOCATION See Exhibit A-2

Latitude: 40.0281° Longitude: -105.0017°

Surface Elev.: 97.1 (Ft.)

DEPTH	ELEVATION (Ft.)	
0.5	96.5	**VEGETATIVE SOIL LAYER**, CLAY soil with vegetation and root penetration
		LEAN CLAY with SAND (CL), brown, orange brown, light brown with tan/beige, hard to very stiff, calcareous in places
8.0	89	**CLAYSTONE**, olive-tan, olive, grey, rust, medium hard to hard, slightly lignitic/carbonaceous
23.5	73.5	
24.5	72.5	**CLAYSTONE/SILTSTONE/SANDSTONE**, rust, orange, very hard, cemented, iron concretions
		Practical Auger Refusal on Cemented Bedrock at 24.5 Feet

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOL / LOAD, (% / psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		14/12"		9640	13	98		
5								
		25/12"			12	121		
		42/12"	+5.9/1000		19	111		
10								
		50/10"		22180	15	120		
15								
		50/7"	+4.7/2500		18	114		
20								
		50/1"			12			

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

Hammer Type: Automatic

Advancement Method:
4-inch diameter solid flight auger

Abandonment Method:
Boring backfilled with soil cuttings after delayed water level was measured.

See Exhibit A-1 for description of field procedures

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

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None encountered after completion of drilling

Dry at 24 feet when checked on 12/15/2017

Terracon
1242 Bramwood Pl
Longmont, CO

Boring Started: 12-14-2017 | Boring Completed: 12-14-2017

Drill Rig: CME-45 | Driller: ODELL

Project No.: 22175130 | Exhibit: A-8

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

BORING LOG NO. TB-7

PROJECT: Lazy Dog Electrical Substation

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

LOCATION See Exhibit A-2

Latitude: 40.0278° Longitude: -105.002°

Surface Elev.: 100.2 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOL / LOAD, (% / psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.5	99.5										
VEGETATIVE SOIL LAYER, CLAY soil with vegetation and root penetration												
LEAN CLAY with SAND (CL), brown, light brown, rust, with beige/white, very stiff to hard, calcareous in places												
					■	32/12"		24150	13	117		
			5									
					■	41/12"	+5.1/750		10	129	45-15-30	77
					■	50/12"	+4.9/1000		9	123		
			10									
	14.5	85.5			■	44/12"			9	123		
CLAYSTONE, olive, grey, rust, medium hard to hard			15									
	21.0	79			■	50/9"		15040	14	123		
			20									
CLAYSTONE/SILTSTONE/SANDSTONE, olive-tan, rust, grey, very hard, varies to Clayey SANDSTONE/SILTSTONE Cemented lense/layer between about 21 to 23 feet												
	25.0	75			■	50/3"			11			
Boring Terminated at 25 Feet			25									

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

Hammer Type: Automatic

Advancement Method:
4-inch diameter solid flight auger

Abandonment Method:
Boring backfilled with soil cuttings after delayed water level was measured.

See Exhibit A-1 for description of field procedures

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

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None encountered after completion of drilling

Dry at 24 feet when checked on 12/15/2017

Terracon
1242 Bramwood Pl
Longmont, CO

Boring Started: 12-14-2017 | Boring Completed: 12-14-2017

Drill Rig: CME-45 | Driller: ODELL

Project No.: 22175130 | Exhibit: A-9

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

BORING LOG NO. TB-8

PROJECT: Lazy Dog Electrical Substation

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

LOCATION See Exhibit A-2

Latitude: 40.0277° Longitude: -105.0017°

Surface Elev.: 99.5 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.5	99	**VEGETATIVE SOIL LAYER**, CLAY soil with vegetation and root penetration
		LEAN CLAY with SAND (CL), light brown, tan/beige, very stiff to stiff, calcareous in places
7.0	92.5	**CLAYSTONE**, olive, grey, rust/orange, firm to hard, slightly lignitic/carbonaceous
23.5	76	**CLAYSTONE/SILTSTONE/SANDSTONE**, olive-tan, rust, grey, beige, very hard, iron concretions Cemented lense/layer between about 23-1/2 to 27 feet
30.0	69.5	***Boring Terminated at 30 Feet***

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOL / LOAD, (% / psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
5		35/12"	+3.3/500		14	119		
		18/12"			15	111		
10		25/12"			17	112		
15		50/9"	+4.5/1750		14	122		
20		50/8"		23610	13	124		
25		50/1"			3			
30		50/4"			10	105		

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

Hammer Type: Automatic

Advancement Method:
4-inch diameter solid flight auger

Abandonment Method:
Boring backfilled with soil cuttings after delayed water level was measured.

See Exhibit A-1 for description of field procedures

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

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None encountered after completion of drilling

Dry at 29 feet when checked on 12/15/2017

Terracon
1242 Bramwood Pl
Longmont, CO

Boring Started: 12-14-2017 | Boring Completed: 12-14-2017

Drill Rig: CME-45 | Driller: ODELL

Project No.: 22175130 | Exhibit: A-10

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

BORING LOG NO. TB-9

PROJECT: Lazy Dog Electrical Substation

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

LOCATION See Exhibit A-2

Latitude: 40.0275° Longitude: -105.0018°

Surface Elev.: 101.2 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.5	100.5	**VEGETATIVE SOIL LAYER**, CLAY soil with vegetation and root penetration
		LEAN CLAY with SAND (CL), brown, orange brown with tan/beige, hard to very stiff, calcareous in places, trace fine GRAVEL with depth
8.0	93	**CLAYSTONE**, olive, grey, rust, firm to hard
24.5	76.5	**CLAYSTONE/SILTSTONE/SANDSTONE**, olive-tan, rust, light grey, very hard, varies to Clayey SANDSTONE/SILTSTONE with depth
30.0	71	***Boring Terminated at 30 Feet***

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOL / LOAD, (% / psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
5		45/12"	+3.9/500		10	119		
		33/12"			6	131		
10		35/12"	+6.3/1000		20	110	71-24-47	97
15		50/11"	+2.4/1750		17	116		
20		50/7"	+3.5/2500		15	119		
25		50/5"			11	123		
30		50/3"			8			

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

Hammer Type: Automatic

Advancement Method:
4-inch diameter solid flight auger

Abandonment Method:
Boring backfilled with soil cuttings after delayed water level was measured.

See Exhibit A-1 for description of field procedures

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

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None encountered after completion of drilling

Dry at 29 feet when checked on 12/15/2017

Terracon
1242 Bramwood Pl
Longmont, CO

Boring Started: 12-14-2017 | Boring Completed: 12-14-2017

Drill Rig: CME-45 | Driller: ODELL

Project No.: 22175130 | Exhibit: A-11

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

BORING LOG NO. TB-10

PROJECT: Lazy Dog Electrical Substation

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

LOCATION See Exhibit A-2

Latitude: 40.0272° Longitude: -105.002°

Surface Elev.: 103.3 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.5	103	**VEGETATIVE SOIL LAYER**, CLAY soil with vegetation and root penetration
		LEAN CLAY with SAND (CL), light brown, red brown with beige/white, hard, calcareous in places
10.0	93.5	
		Sandy SILTSTONE/CLAYSTONE, olive-tan, rust, beige, iron concretions
12.0	91.5	
		CLAYSTONE, olive, grey, rust/orange, firm to very hard, lignitic/carbonaceous in places
27.0	76.5	
		CLAYSTONE/SILTSTONE/SANDSTONE, tan, beige, grey, very hard, cemented in places
30.0	73.5	
		Boring Terminated at 30 Feet

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOL / LOAD, (% / psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
							44-17-27	70
		40/12"			11	114		
5								
		50/12"	+5.8/1000		10	126		
		50/12"			11	126		
10								
		31/12"			23	102		
15								
		30/12"		11600	16	112		
20								
		50/4"			9			
25								
		50/3"			13			
30								

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

Hammer Type: Automatic

Advancement Method:
4-inch diameter solid flight auger

Abandonment Method:
Boring backfilled with soil cuttings after delayed water level was measured.

See Exhibit A-1 for description of field procedures

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

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None encountered after completion of drilling

Dry at 29 feet when checked on 12/15/2017

Terracon
1242 Bramwood Pl
Longmont, CO

Boring Started: 12-14-2017 | Boring Completed: 12-14-2017

Drill Rig: CME-45 | Driller: ODELL

Project No.: 22175130 | Exhibit: A-12

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

BORING LOG NO. TB-11

PROJECT: Lazy Dog Electrical Substation

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

LOCATION See Exhibit A-2

Latitude: 40.0272° Longitude: -105.0015°

Surface Elev.: 101.6 (Ft.)

DEPTH	ELEVATION (Ft.)	LITHOLOGY
0.5	101	**VEGETATIVE SOIL LAYER**, CLAY soil with vegetation and root penetration
		LEAN CLAY with SAND (CL), light brown, orange brown with beige/white, hard to very stiff, calcareous in places, coarse SAND and trace fine GRAVEL around 3 feet
8.0	93.5	
		CLAYSTONE, olive, grey, rust, firm, slightly lignitic/carbonaceous
18.0	83.5	
		Sandy SILTSTONE/CLAYSTONE, light olive-tan, grey, rust, very hard
20.0	81.5	
		Boring Terminated at 20 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOL / LOAD, (% / psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
5			46/12"			10	123		
			33/12"	+4.1/750		11	120		
10			35/12"			16	114		
15			35/12"	+4.2/1750	9510	16	118		
20			50/3"			10	119		

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

Hammer Type: Automatic

Advancement Method:
4-inch diameter solid flight auger

Abandonment Method:
Boring backfilled with soil cuttings after delayed water level was measured.

See Exhibit A-1 for description of field procedures

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

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None encountered after completion of drilling

Dry at 19 feet when checked on 12/15/2017

Terracon
1242 Bramwood Pl
Longmont, CO

Boring Started: 12-14-2017 | Boring Completed: 12-14-2017

Drill Rig: CME-45 | Driller: ODELL

Project No.: 22175130 | Exhibit: A-13

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

APPENDIX B

LABORATORY TESTING

Laboratory Testing

Samples retrieved during the field exploration were returned to the laboratory for observation by the project geotechnical engineer and were visually classified in general accordance with the Unified Soil Classification System described in Appendix C. Samples of bedrock were classified in accordance with the general notes for Rock Classification.

After sample review by the project engineer, an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials. Following completion of the laboratory testing, the field and visual descriptions were confirmed or modified as necessary, and Logs of Borings were prepared. These logs are presented in Appendix A.

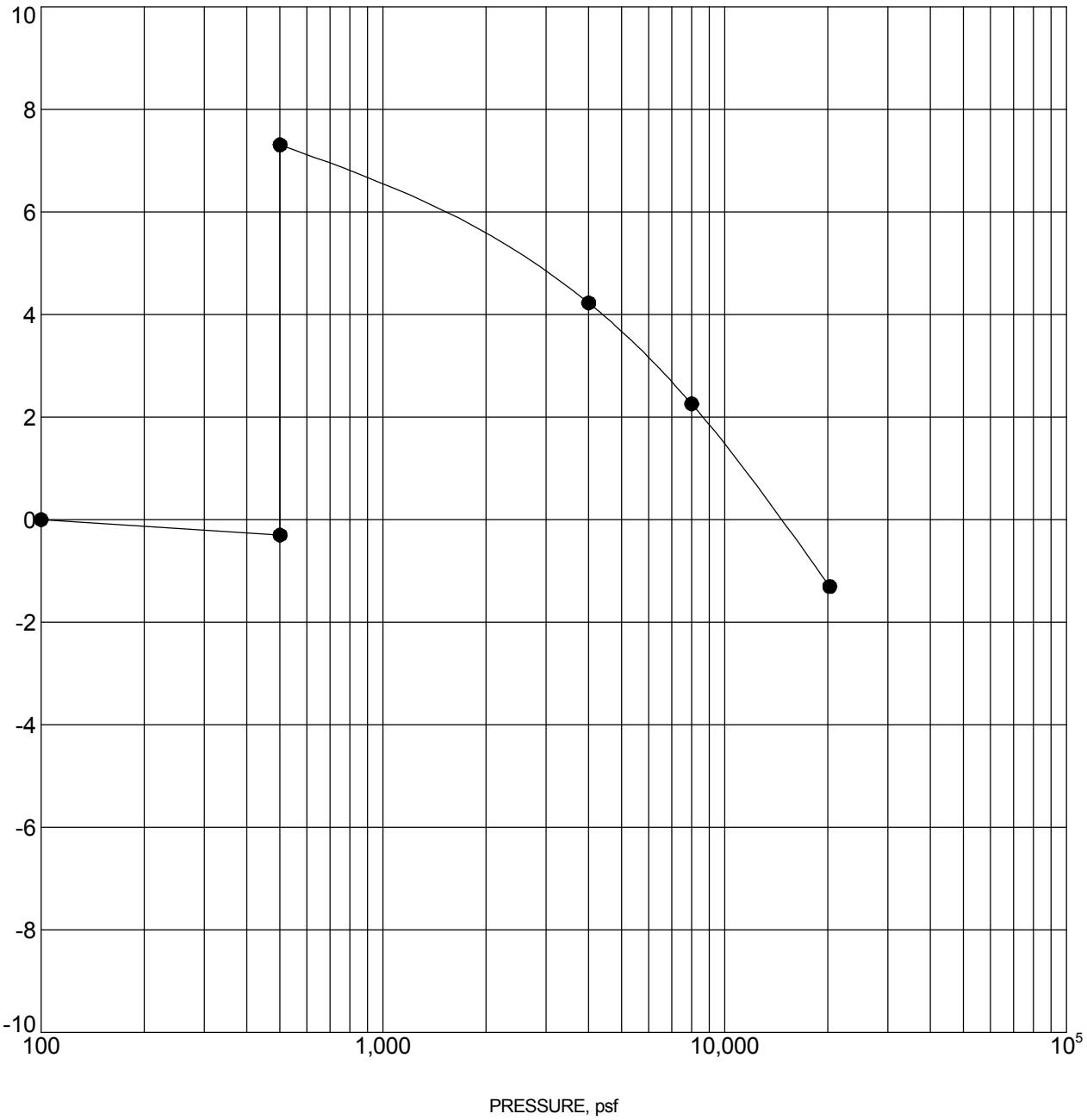
Selected samples were tested for the following physical and/or engineering properties:

- Water Content
- Dry Unit Weight
- Unconfined Compressive Strength
- Swell-Consolidation Potential
- Percent Fines
- Atterberg Limits
- Water Soluble Sulfate Content

Laboratory test results are indicated on the boring logs included in Appendix A and presented in depth in Appendix B. The test results were used for the geotechnical engineering analyses and the development of foundation, on-grade slab and earthwork recommendations. Laboratory tests were performed in general accordance with applicable local standards or other accepted standards. Procedural standards noted in this report are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Descriptive classifications of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. Also shown are estimated Unified Soil Classification Symbols. A brief description of this classification system is attached to this report. Classification was by visual-manual procedures. Selected samples were further classified using the results of Atterberg limit testing. The Atterberg limit test results are also provided in Appendix B.

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-1	3 - 4 ft	LEAN CLAY with SAND (CL)	119	11

NOTES: Sample exhibited 7.6 percent expansion upon wetting under an applied pressure of 500 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

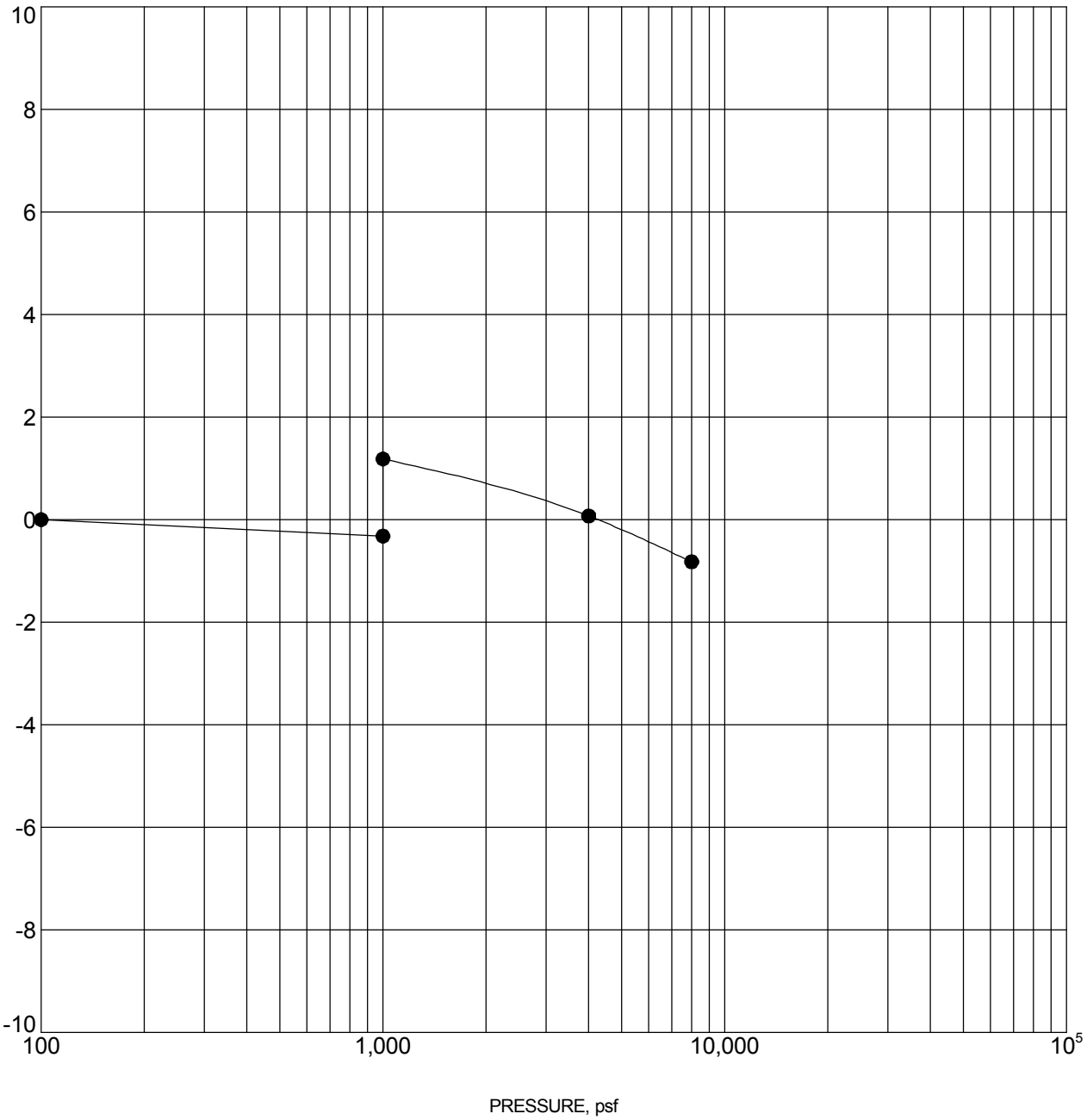
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-2

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-1	9 - 10 ft	LEAN CLAY with SAND(CL)	122	13

NOTES: Sample exhibited 1.5 percent expansion upon wetting under an applied pressure of 1,000 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

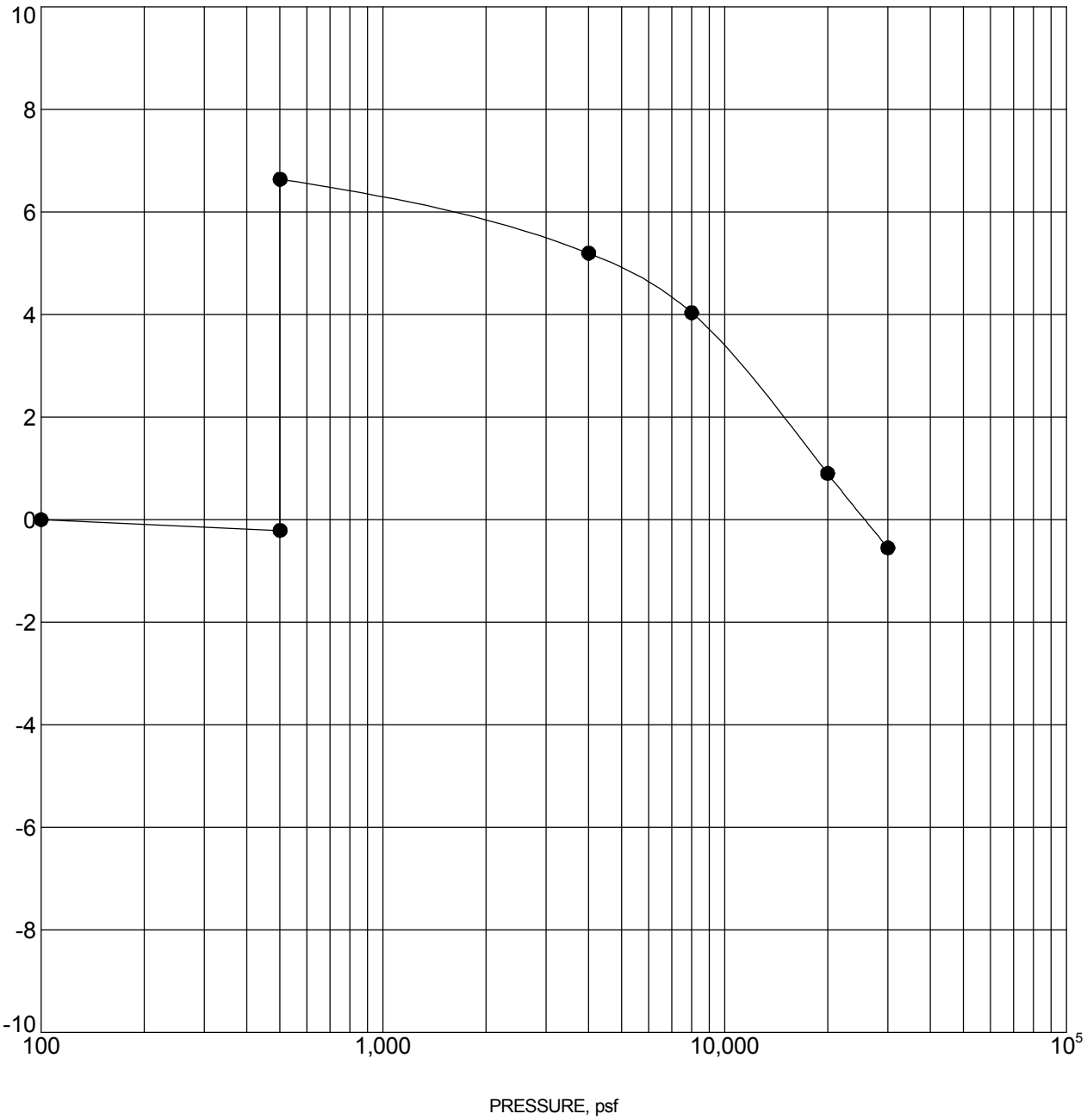
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-2	3 - 4 ft	LEAN CLAY with SAND(CL)	123	12

NOTES: Sample exhibited 6.8 percent expansion upon wetting under an applied pressure of 500 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

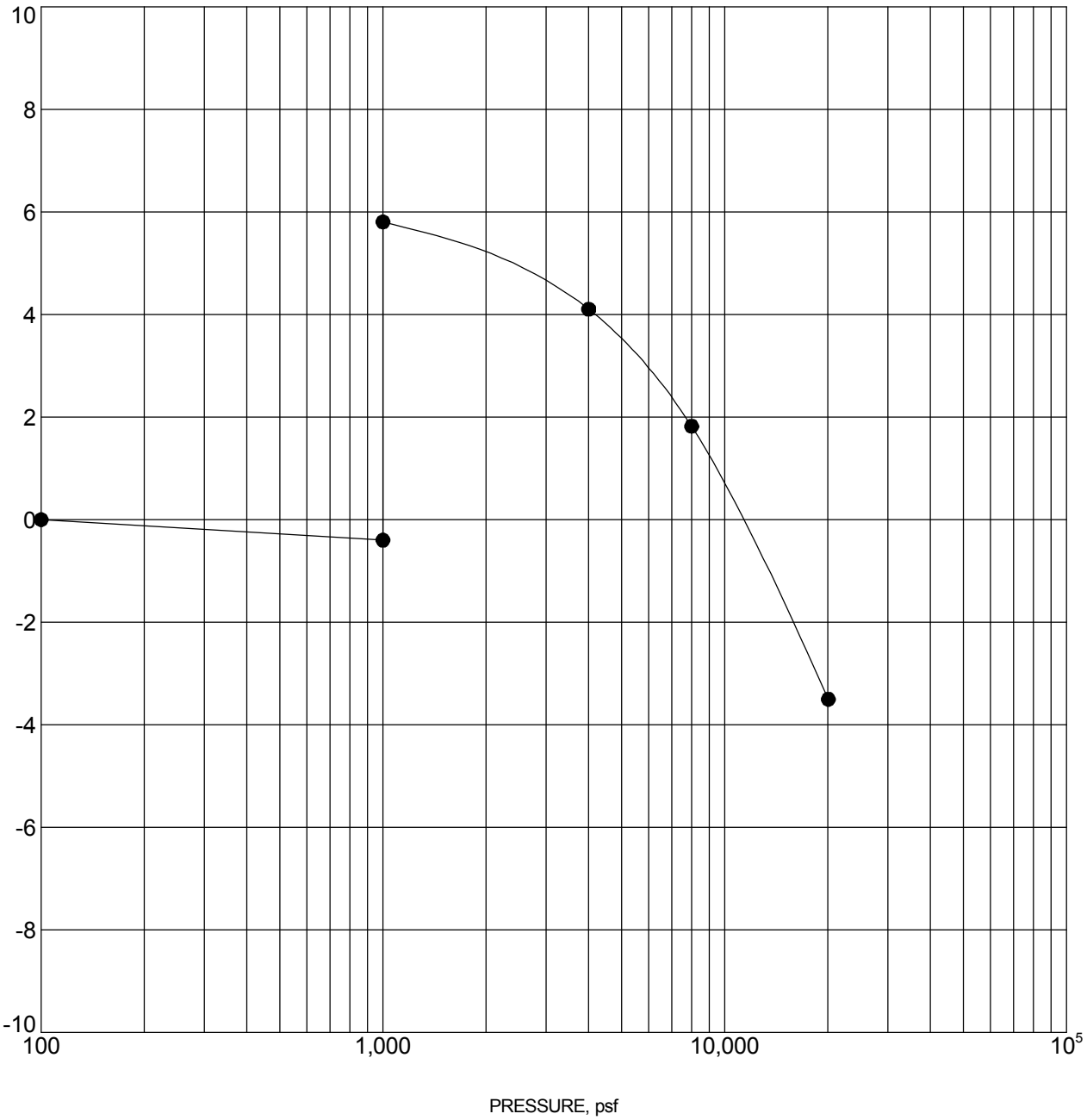
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-4

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification		Classification	γ_d, pcf	WC, %
● TB-2	9 - 10 ft	CLAYSTONE	115	16

NOTES: Sample exhibited 6.2 percent expansion upon wetting under an applied pressure of 1,000 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

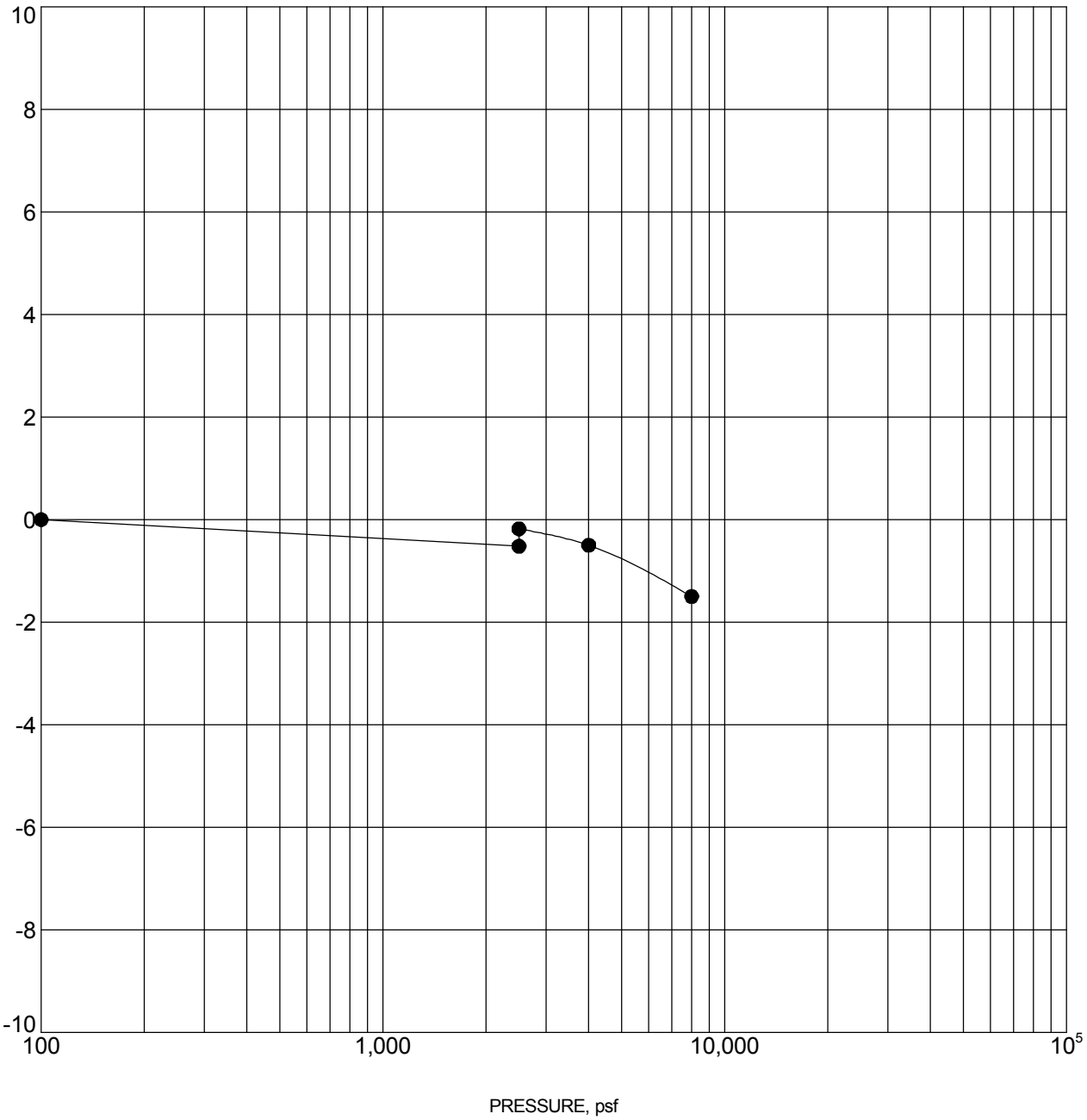
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-5

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-2	19 - 20 ft	CLAYSTONE/SILTSTONE/SANDSTONE	120	13

NOTES: Sample exhibited 0.3 percent expansion upon wetting under an applied pressure of 2,500 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

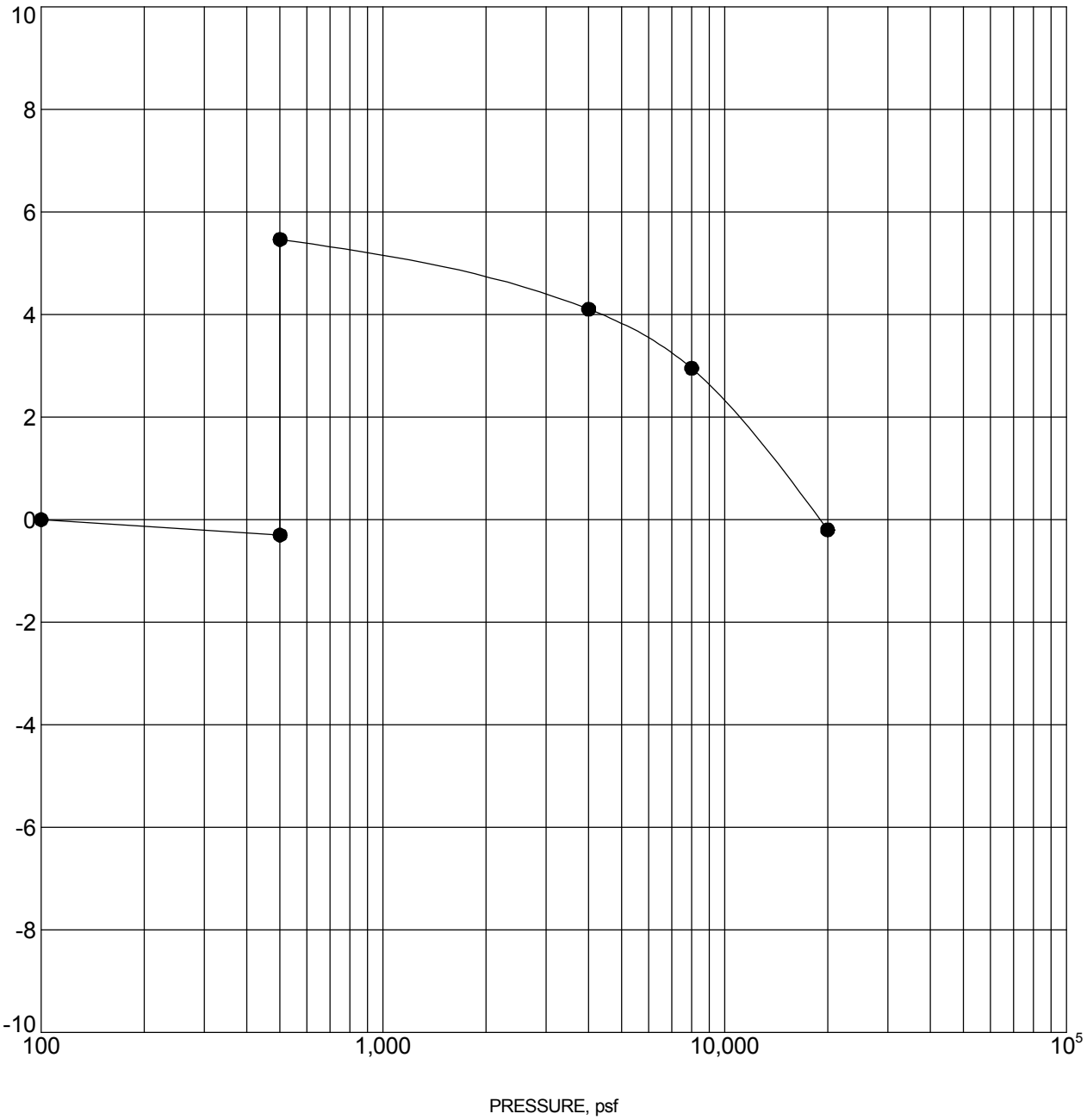
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-6

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-3	3 - 4 ft	LEAN CLAY with SAND (CL)	120	14

NOTES: Sample exhibited 5.8 percent expansion upon wetting under an applied pressure of 500 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

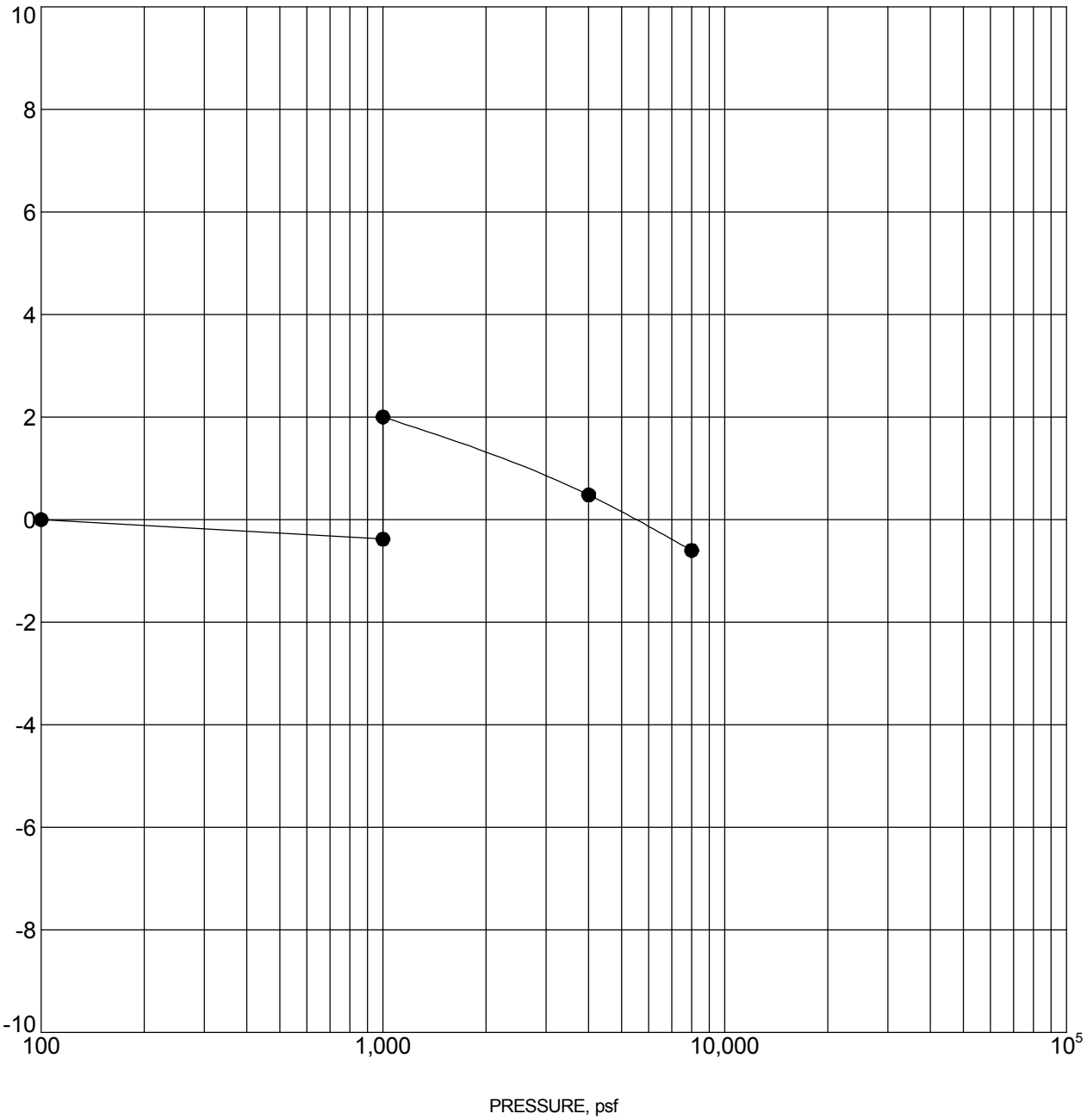
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-7

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-3	9 - 10 ft	LEAN CLAY with SAND (CL)	121	11

NOTES: Sample exhibited 2.4 percent expansion upon wetting under an applied pressure of 1,000 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

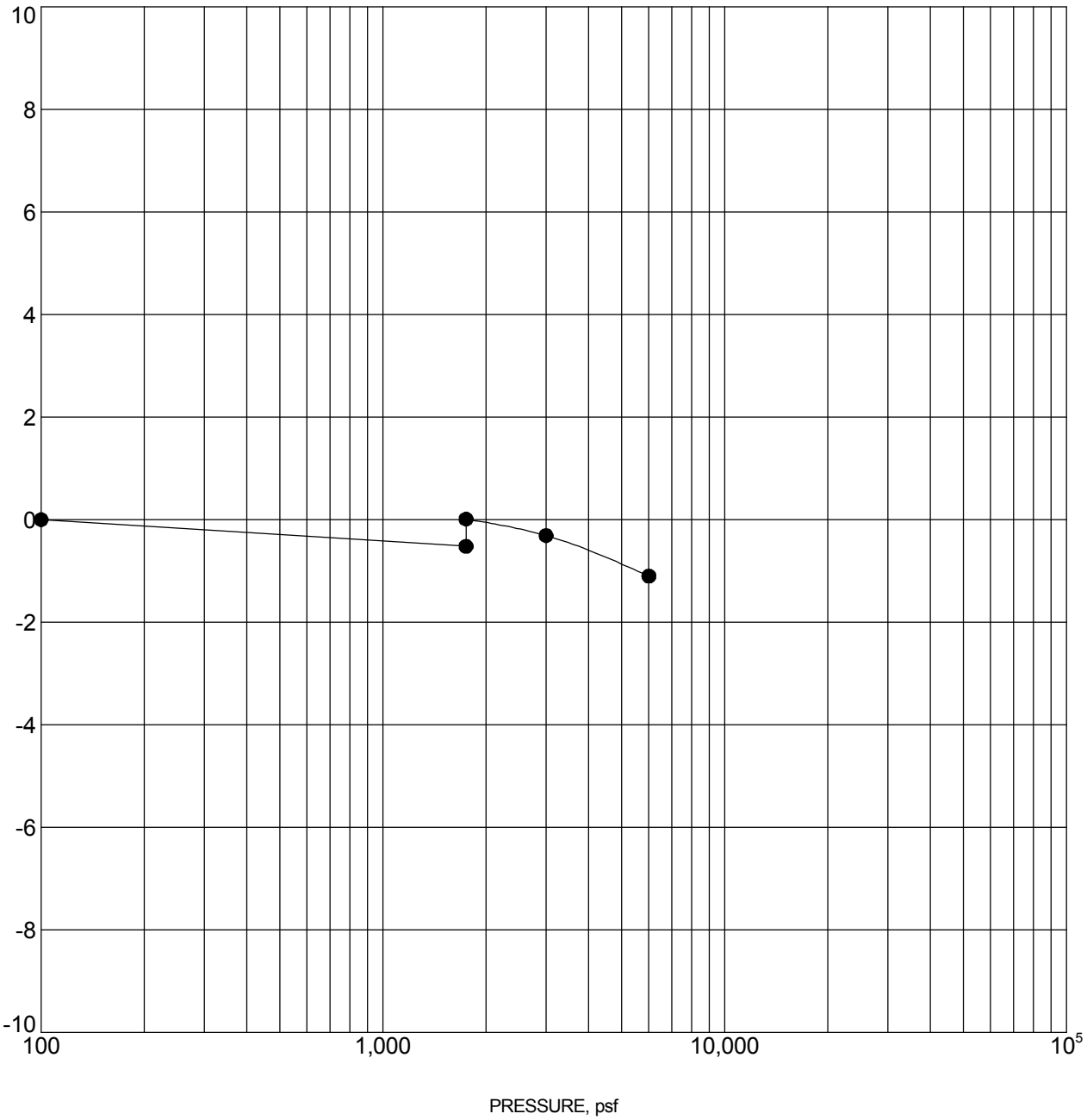
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-8

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification		Classification	γ_d, pcf	WC, %
●	TB-3 14 - 15 ft	SANDY LEAN CLAY (CL)	121	16

NOTES: Sample exhibited 0.5 percent expansion upon wetting under an applied pressure of 1,750 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

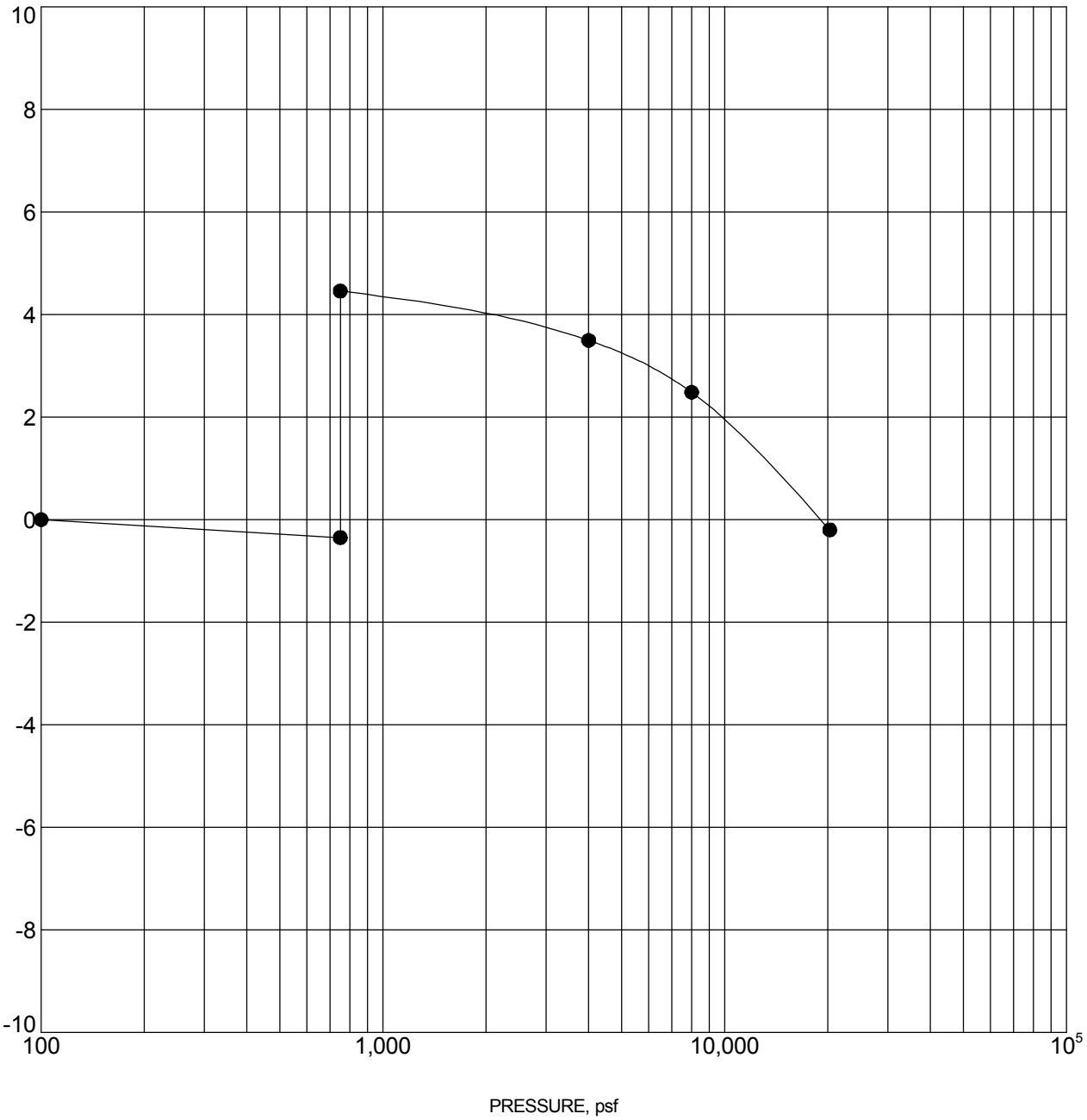
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-9

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-4	6 - 7 ft	LEAN CLAY with SAND(CL)	131	9

NOTES: Sample exhibited 4.8 percent expansion upon wetting under an applied pressure of 750 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

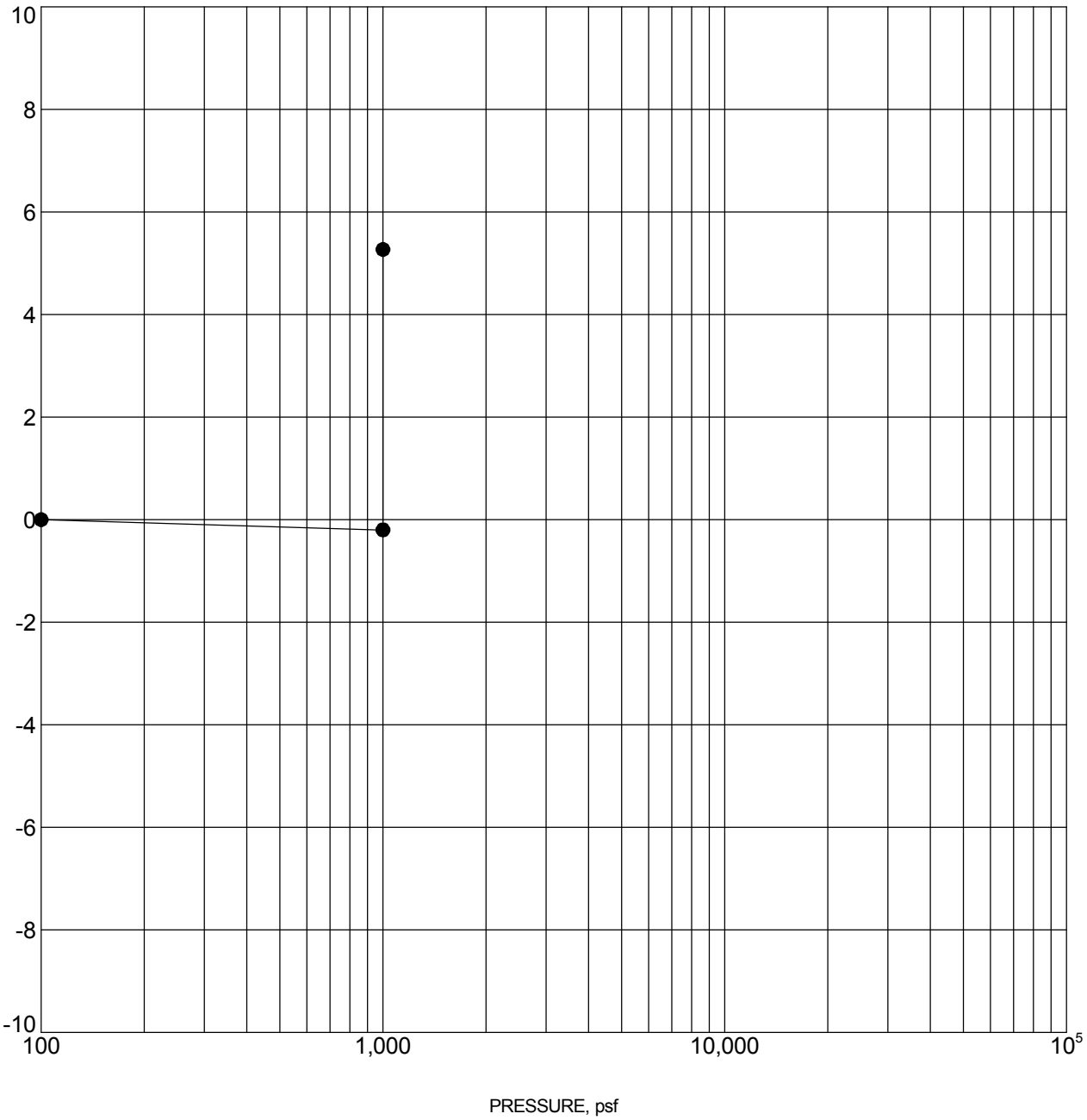
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-10

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-4	9 - 10 ft	LEAN CLAY with SAND (CL)	127	9

NOTES: Sample exhibited 5.5 percent expansion upon wetting under an applied pressure of 1,000 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

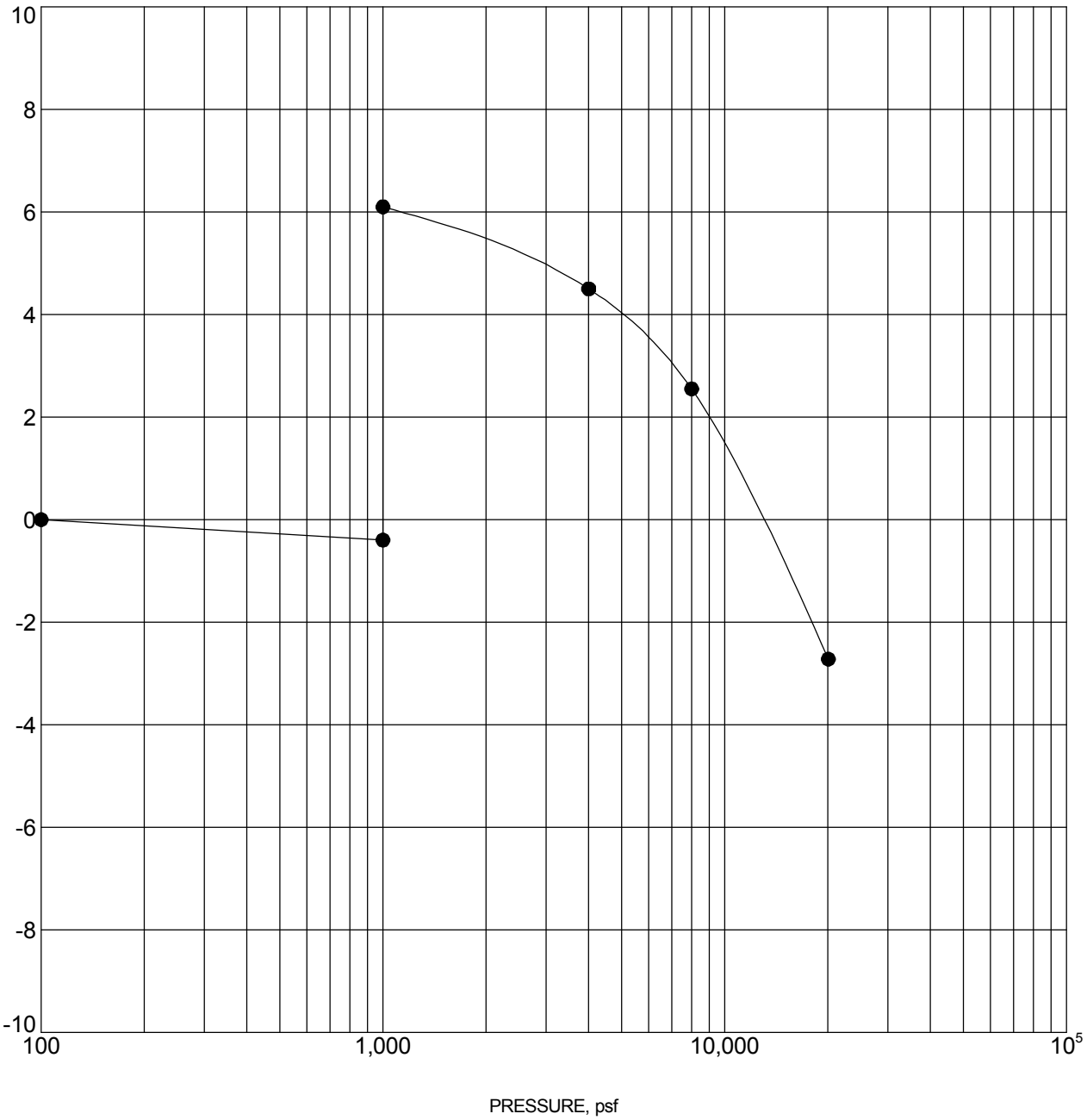
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-11

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-5	6 - 7 ft	CLAYSTONE	114	17

NOTES: Sample exhibited 6.5 percent expansion upon wetting under an applied pressure of 1,000 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

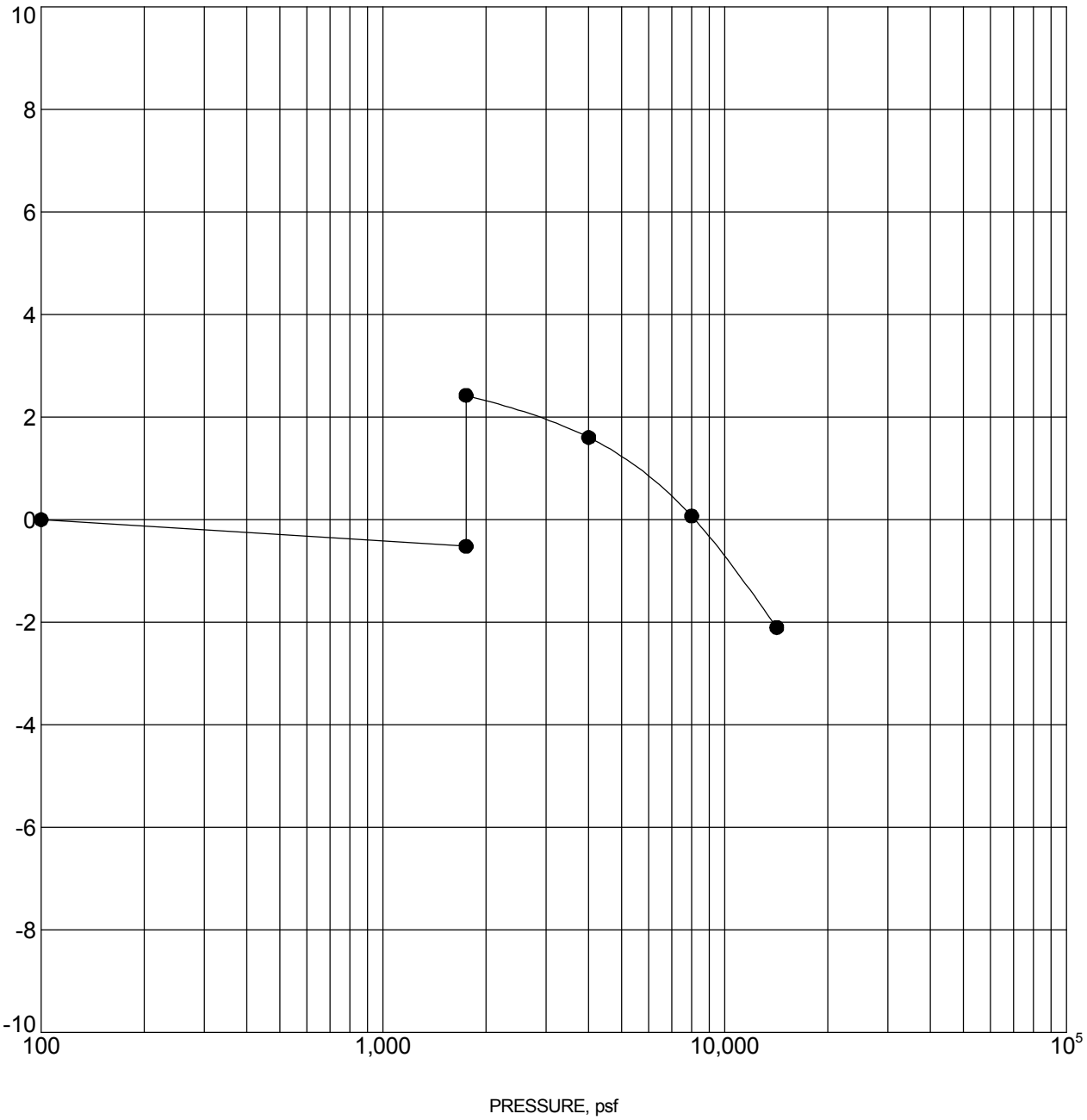
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-12

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification		Classification	γ_d, pcf	WC, %
●	TB-5 14 - 15 ft	CLAYSTONE	114	18

NOTES: Sample exhibited 2.9 percent expansion upon wetting under an applied pressure of 1,750 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

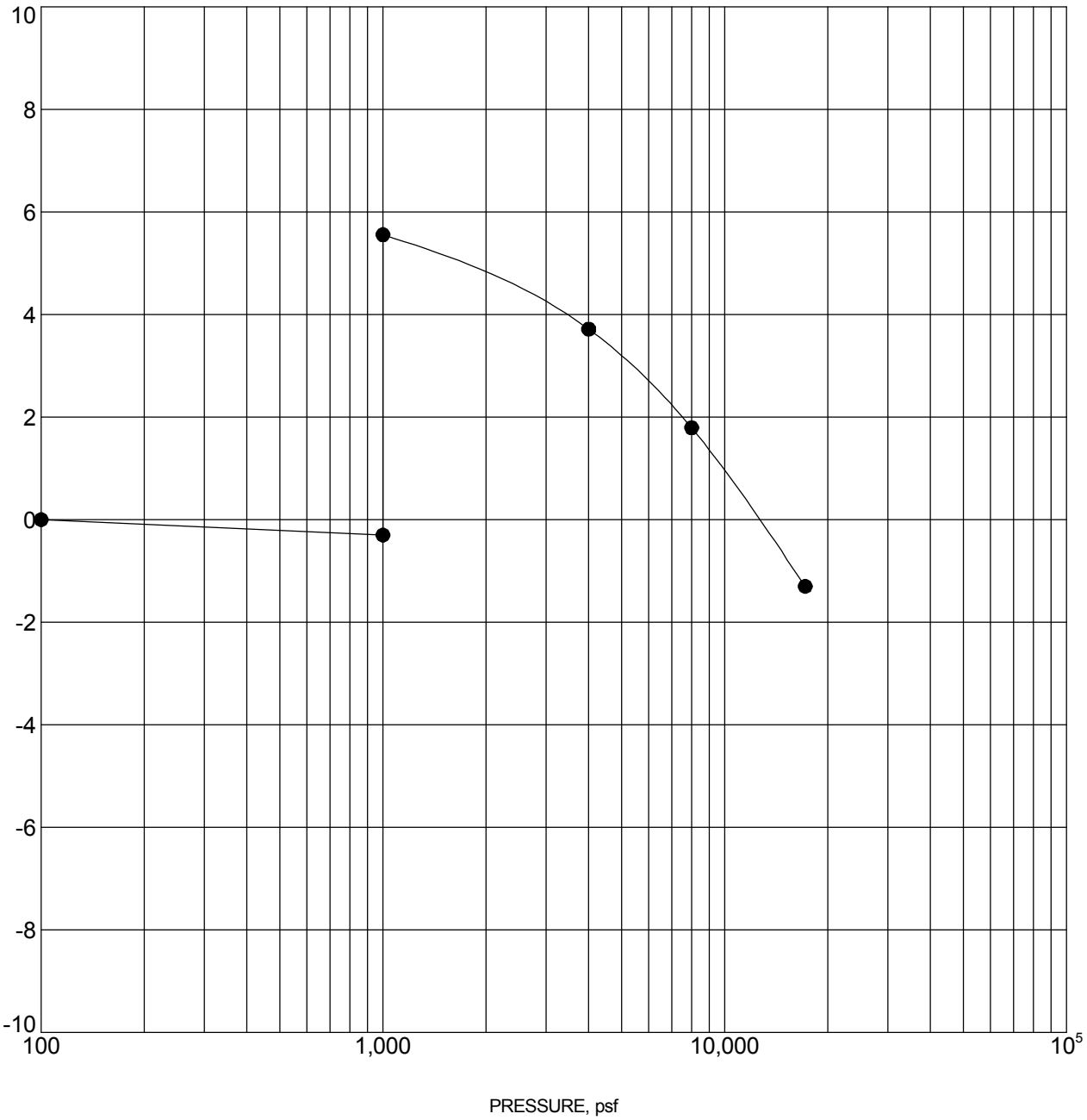
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-13

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-6	9 - 10 ft	CLAYSTONE	111	19

NOTES: Sample exhibited 5.9 percent expansion upon wetting under an applied pressure of 1,000 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

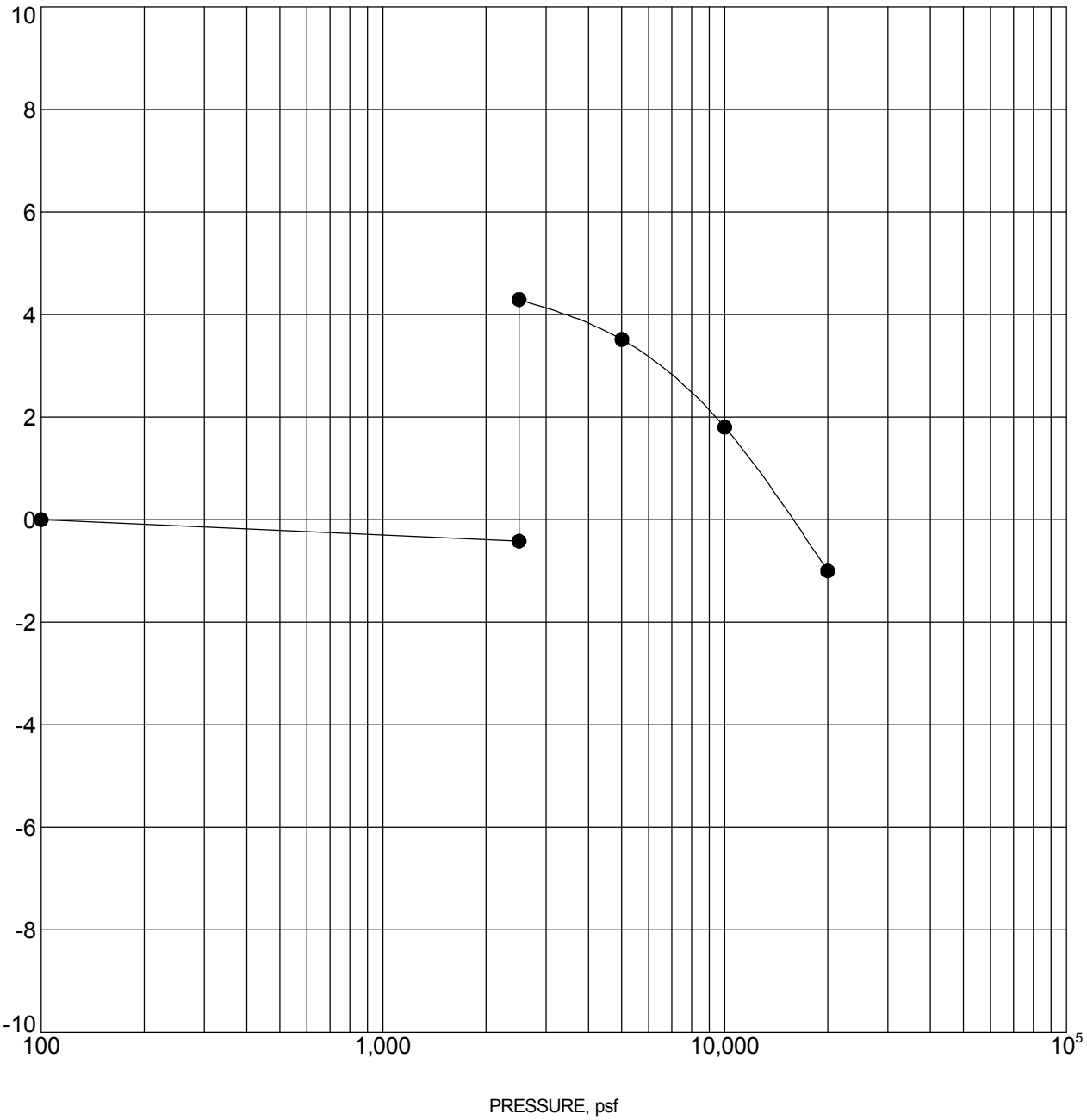
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-14

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification		Classification	γ_d, pcf	WC, %
●	TB-6 19 - 20 ft	CLAYSTONE	114	18

NOTES: Sample exhibited 4.7 percent expansion upon wetting under an applied pressure of 2,500 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

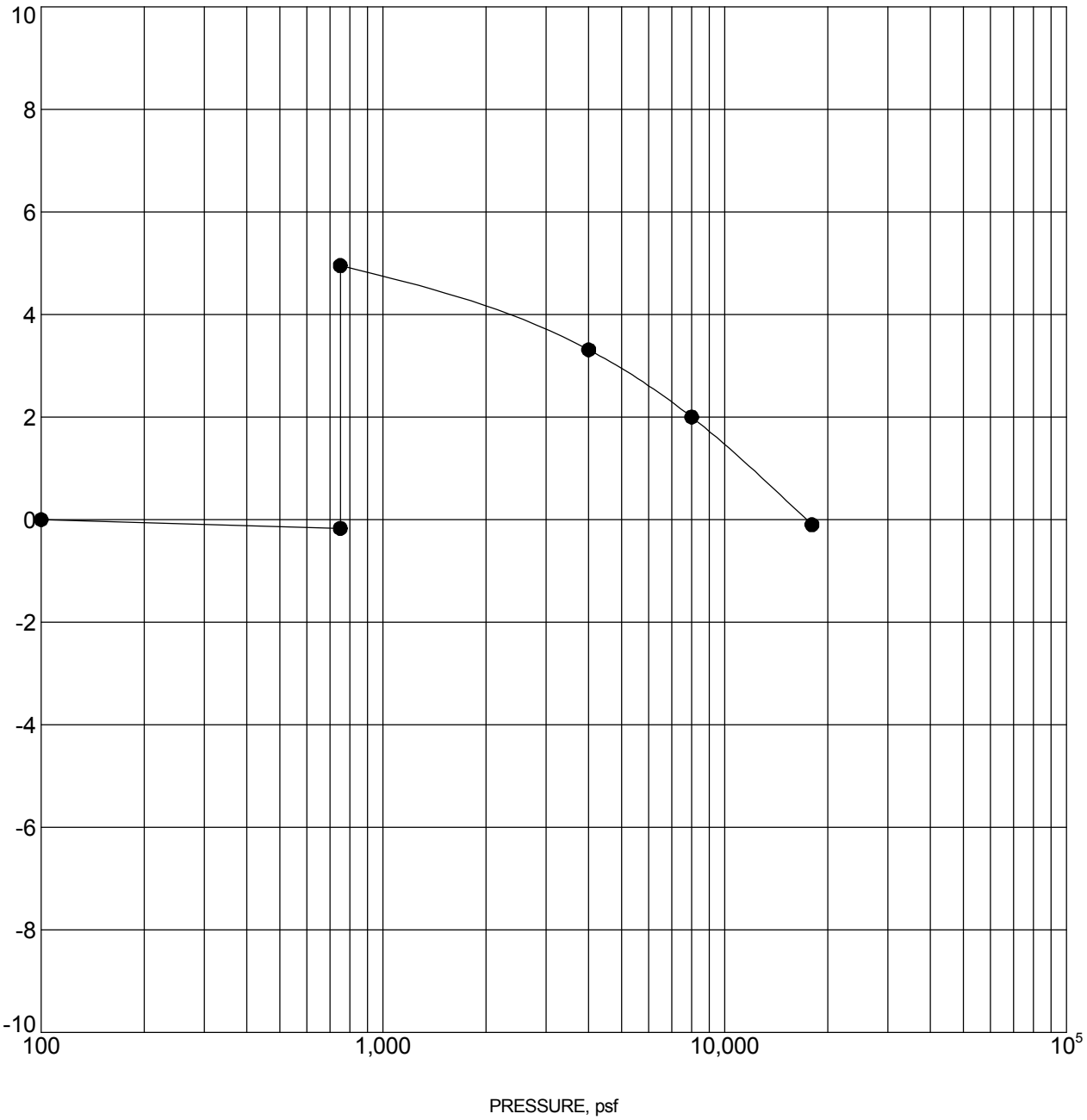
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-15

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-7	6 - 7 ft	LEAN CLAY with SAND(CL)	129	10

NOTES: Sample exhibited 5.1 percent expansion upon wetting under an applied pressure of 750 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

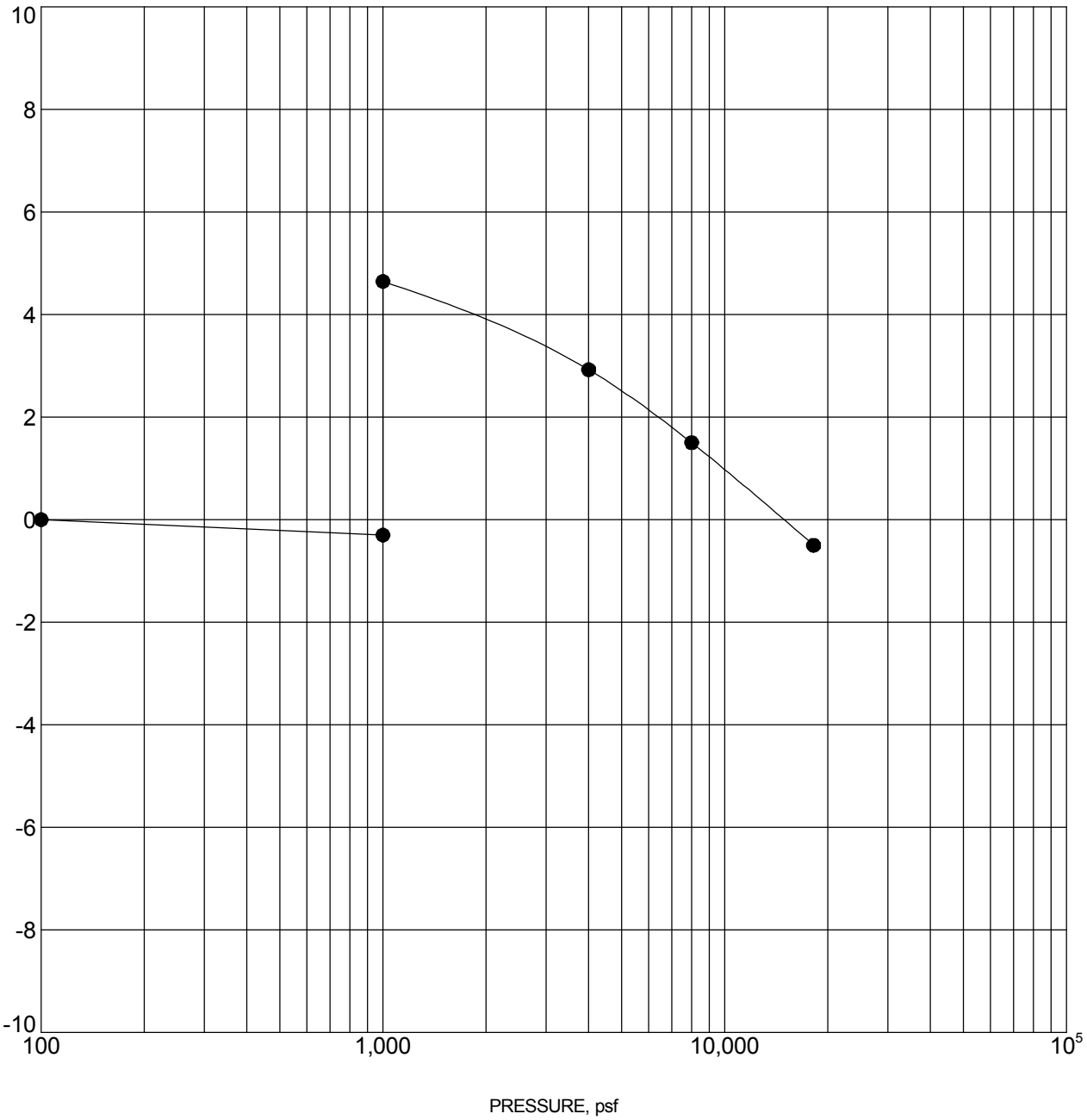
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-16

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-7	9 - 10 ft	LEAN CLAY with SAND (CL)	123	9

NOTES: Sample exhibited 4.9 percent expansion upon wetting under an applied pressure of 1,000 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

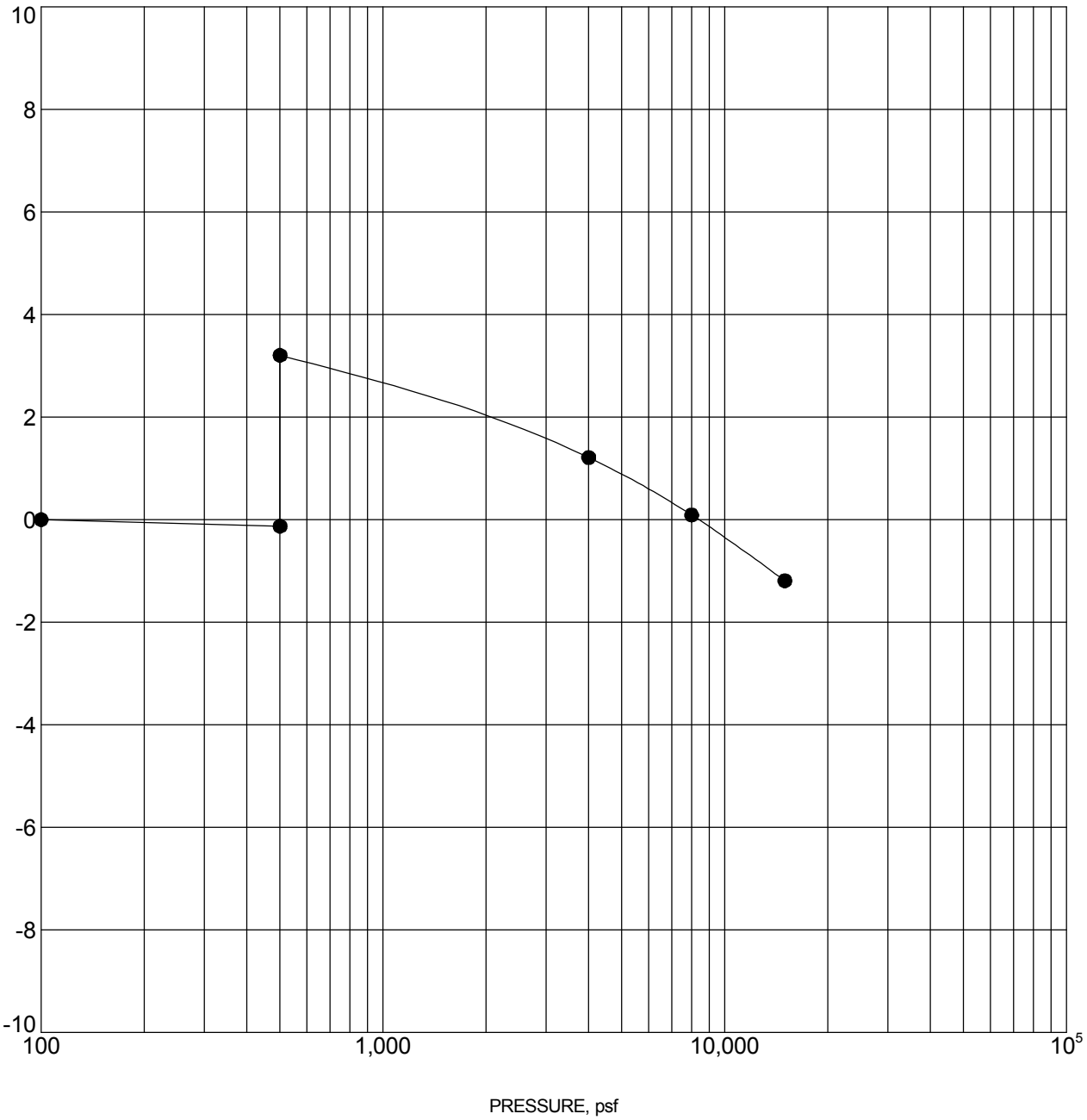
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-17

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-8	3 - 4 ft	LEAN CLAY with SAND (CL)	119	14

NOTES: Sample exhibited 3.3 percent expansion upon wetting under an applied pressure of 500 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

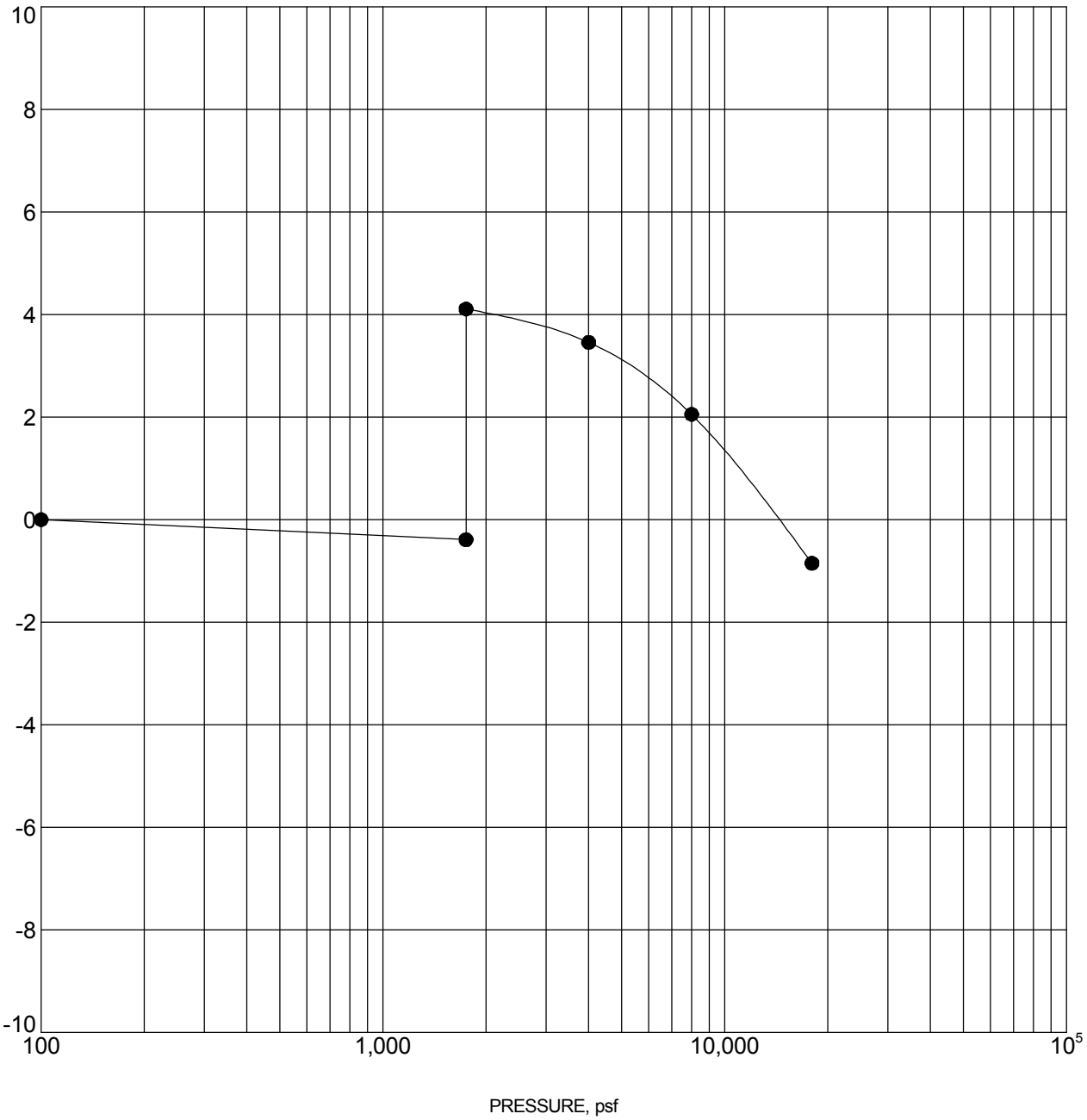
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-18

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification		Classification	γ_d, pcf	WC, %
●	TB-8 14 - 15 ft	CLAYSTONE	122	14

NOTES: Sample exhibited 4.5 percent expansion upon wetting under an applied pressure of 1,750 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

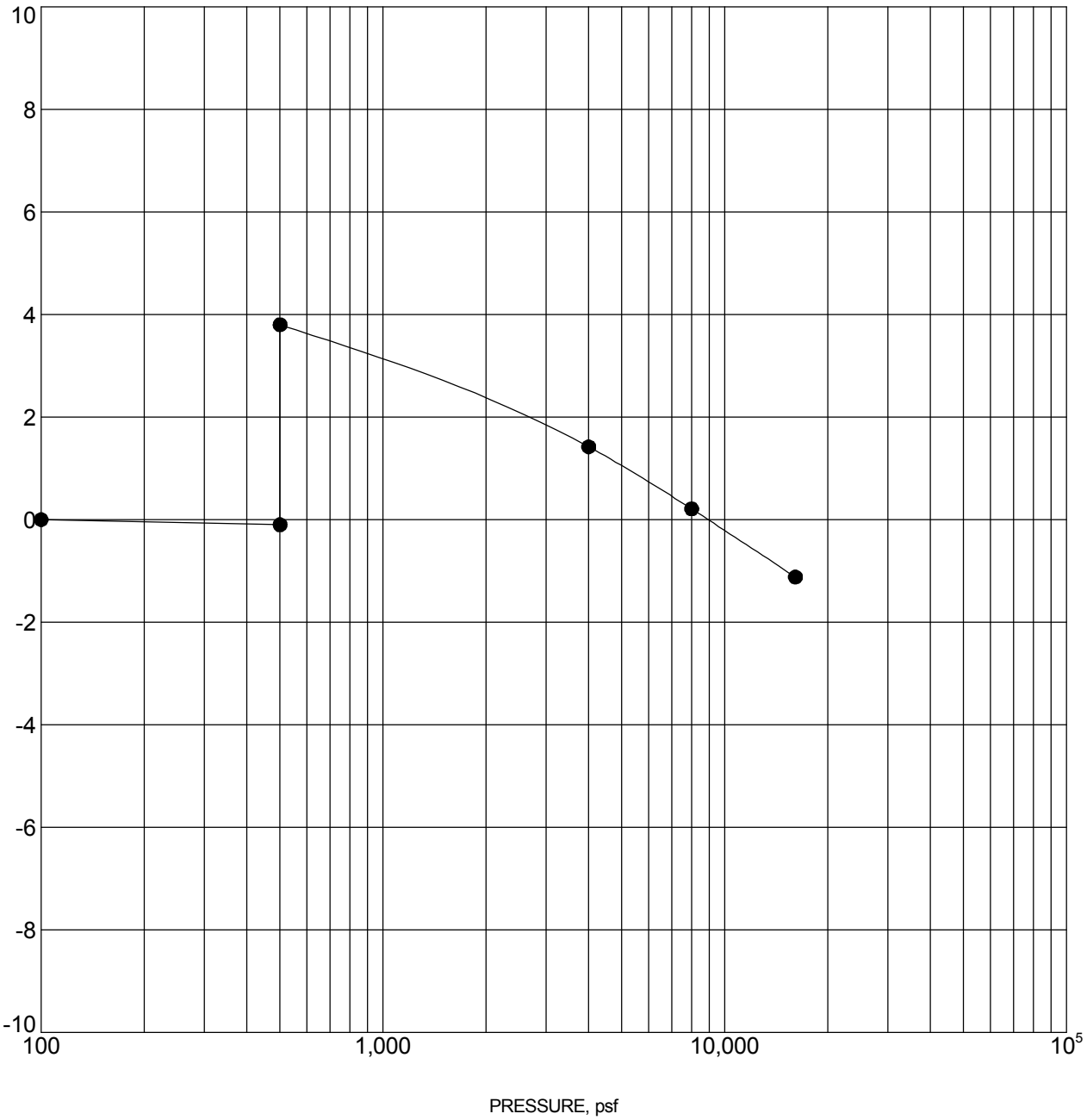
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-19

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-9	3 - 4 ft	LEAN CLAY with SAND (CL)	119	10

NOTES: Sample exhibited 3.9 percent expansion upon wetting under an applied pressure of 500 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

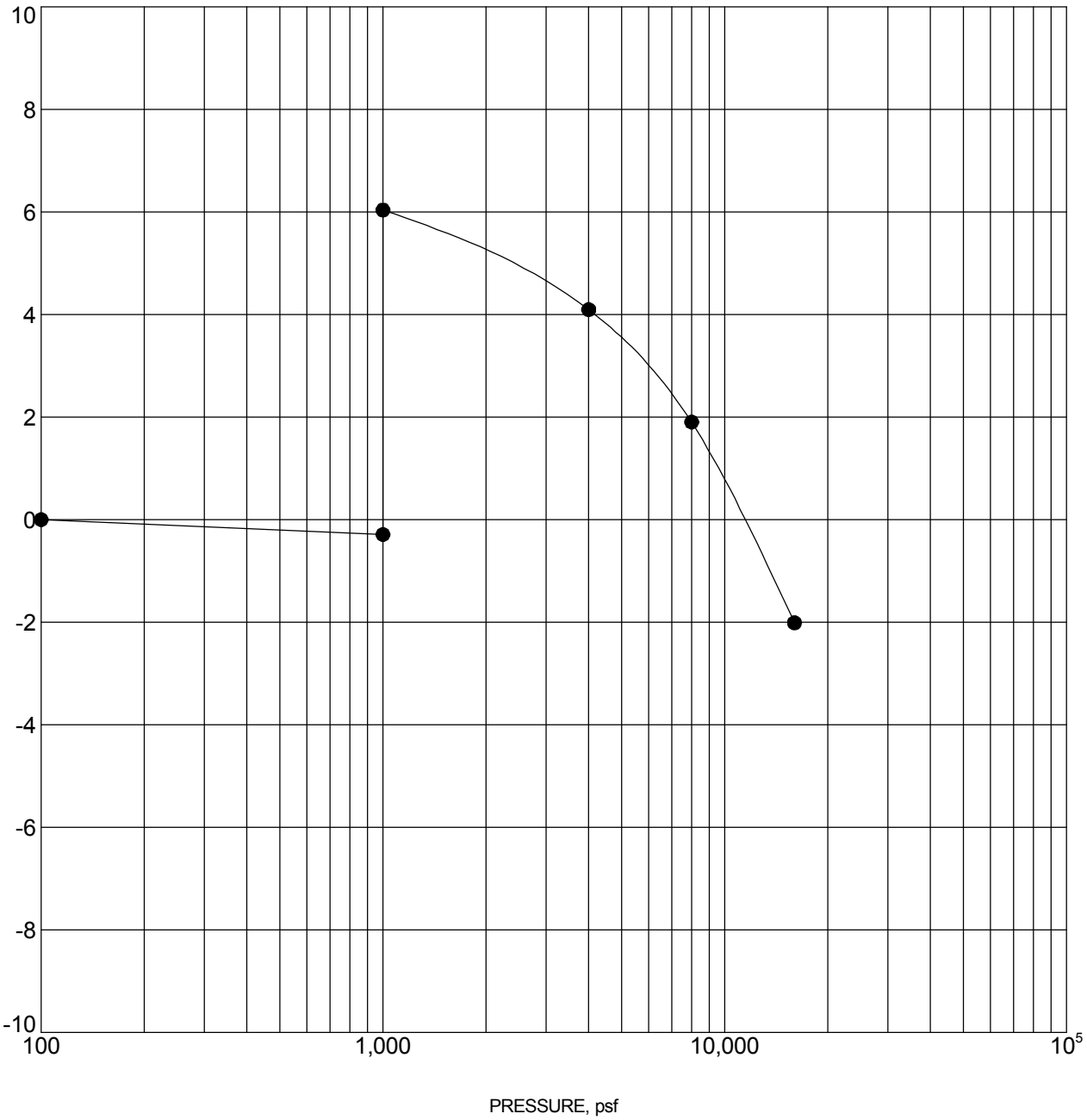
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-20

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-9	9 - 10 ft	CLAYSTONE	110	20

NOTES: Sample exhibited 6.3 percent expansion upon wetting under an applied pressure of 1,000 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

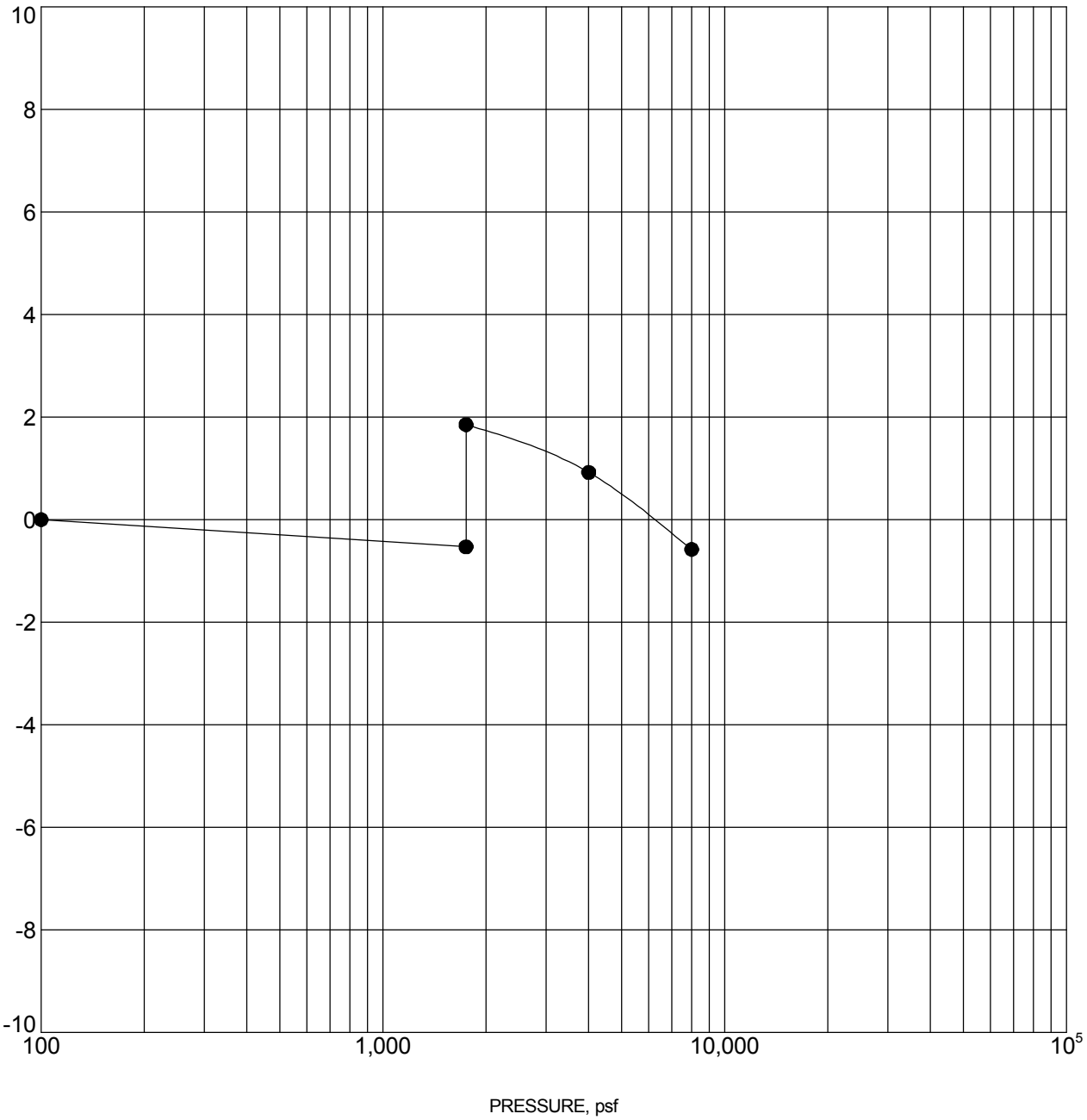
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-21

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification		Classification	γ_d, pcf	WC, %
●	TB-9 14 - 15 ft	CLAYSTONE	116	17

NOTES: Sample exhibited 2.4 percent expansion upon wetting under an applied pressure of 1,750 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

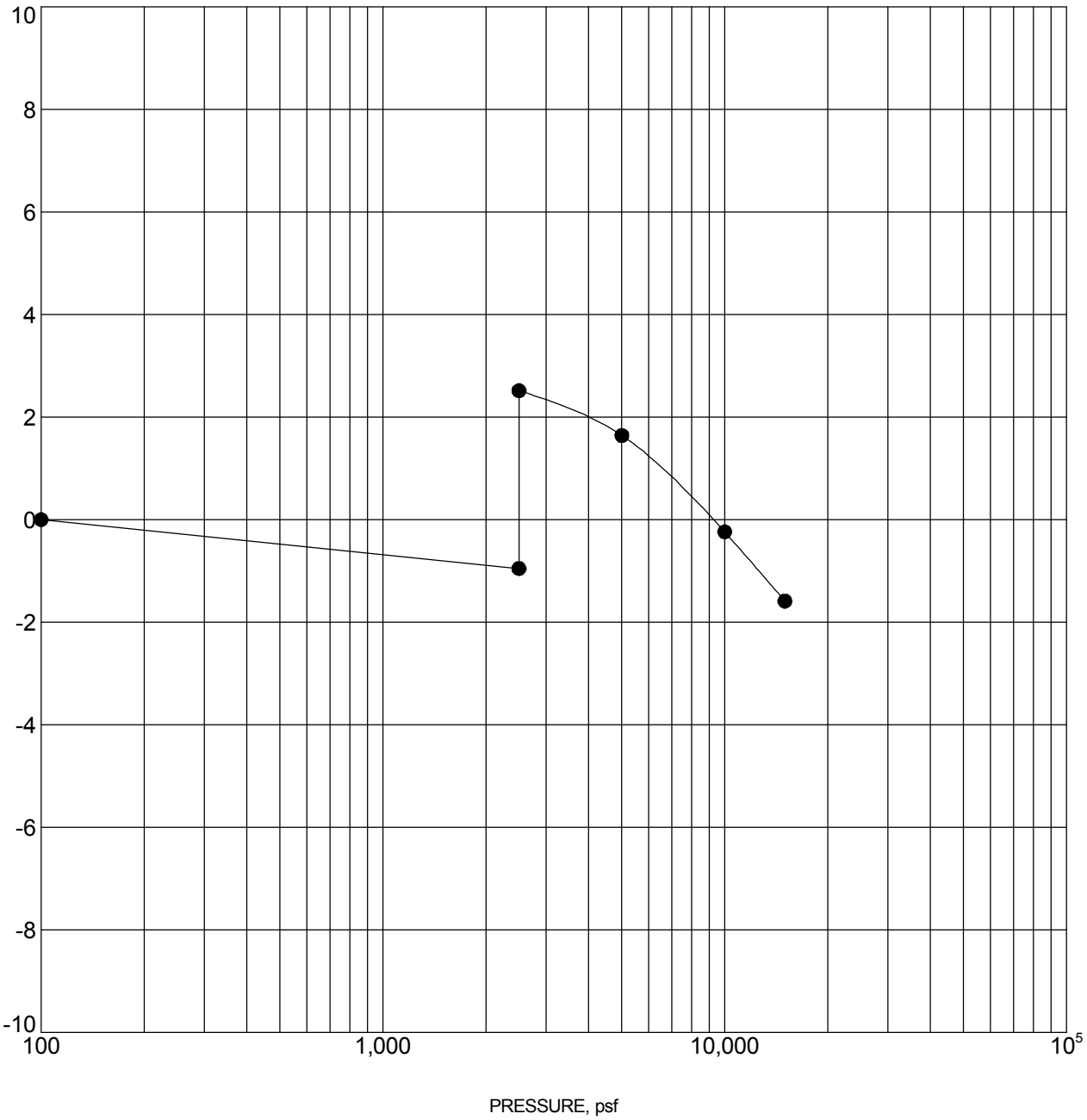
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-22

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification		Classification	γ_d, pcf	WC, %
●	TB-9 19 - 20 ft	CLAYSTONE	119	15

NOTES: Sample exhibited 3.5 percent expansion upon wetting under an applied pressure of 2,500 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

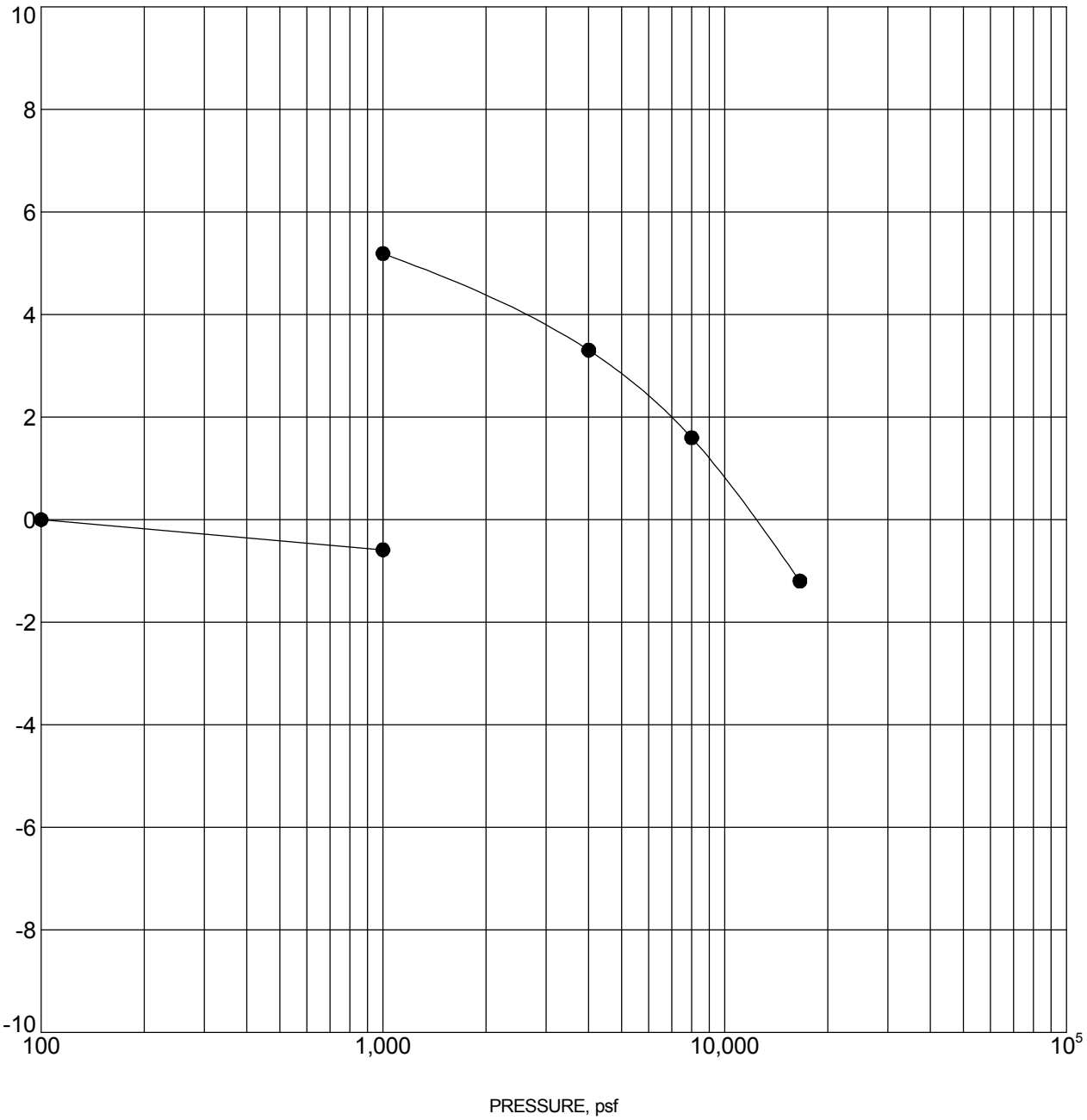
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-23

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-10	6 - 7 ft	LEAN CLAY with SAND (CL)	126	10

NOTES: Sample exhibited 5.8 percent expansion upon wetting under an applied pressure of 1,000 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

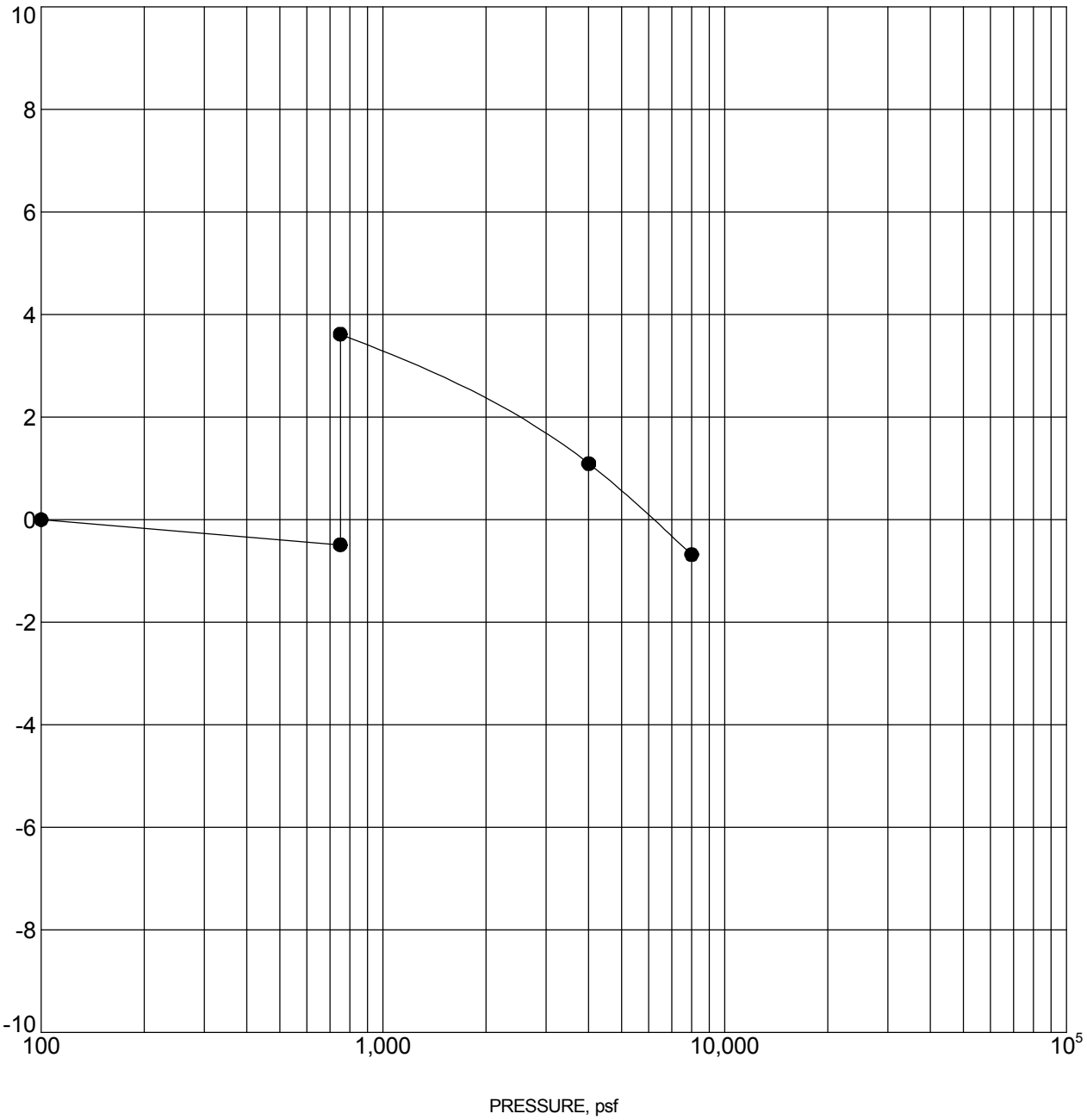
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-24

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification			Classification	γ_d, pcf	WC, %
●	TB-11	6 - 7 ft	LEAN CLAY with SAND (CL)	120	11

NOTES: Sample exhibited 4.1 percent expansion upon wetting under an applied pressure of 750 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

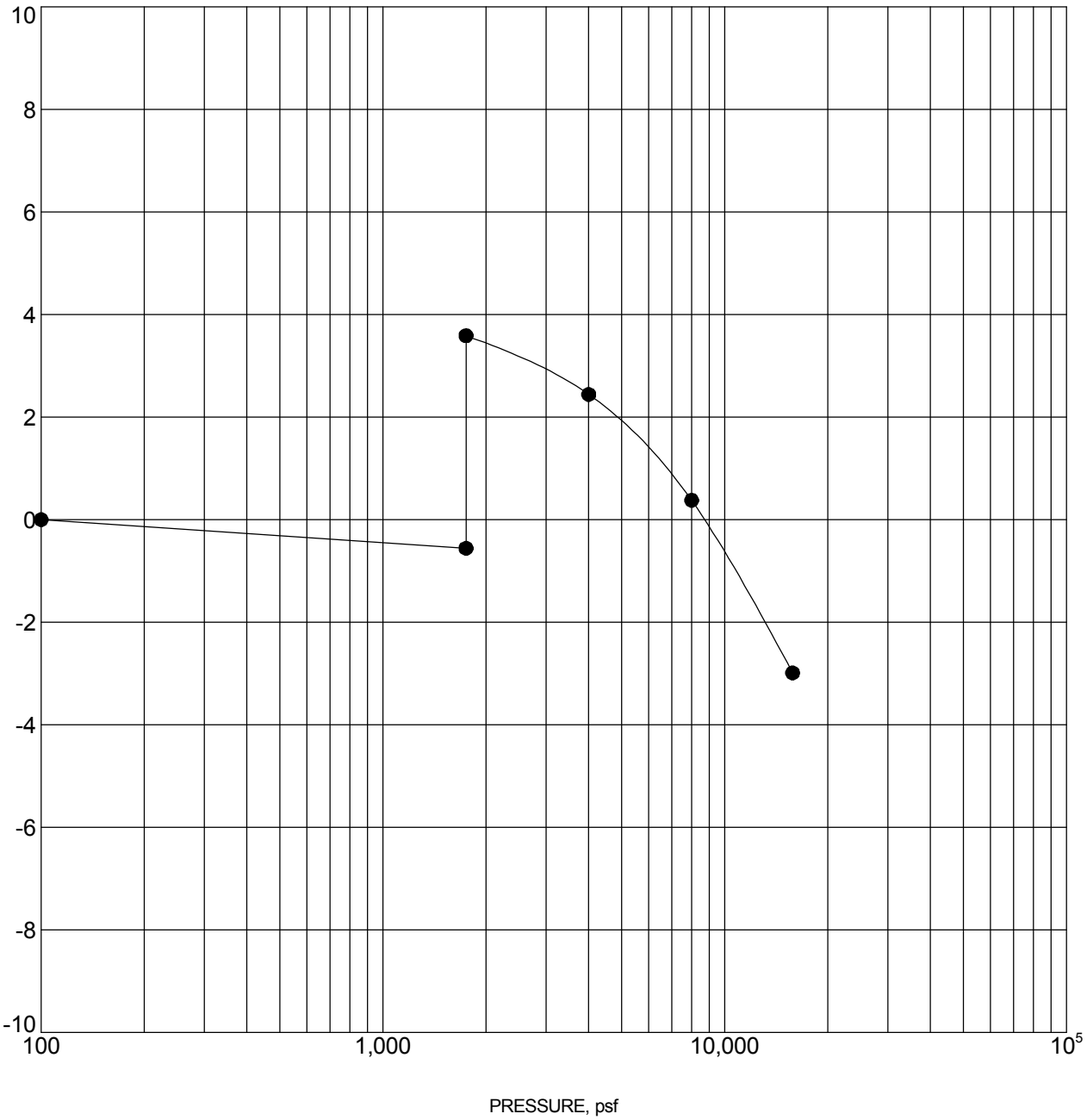
PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-25

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

SWELL CONSOLIDATION TEST



Specimen Identification		Classification	γ_d, pcf	WC, %
●	TB-11 14 - 15 ft	CLAYSTONE	118	16

NOTES: Sample exhibited 4.2 percent expansion upon wetting under an applied pressure of 1,750 psf.

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

PROJECT NUMBER: 22175130

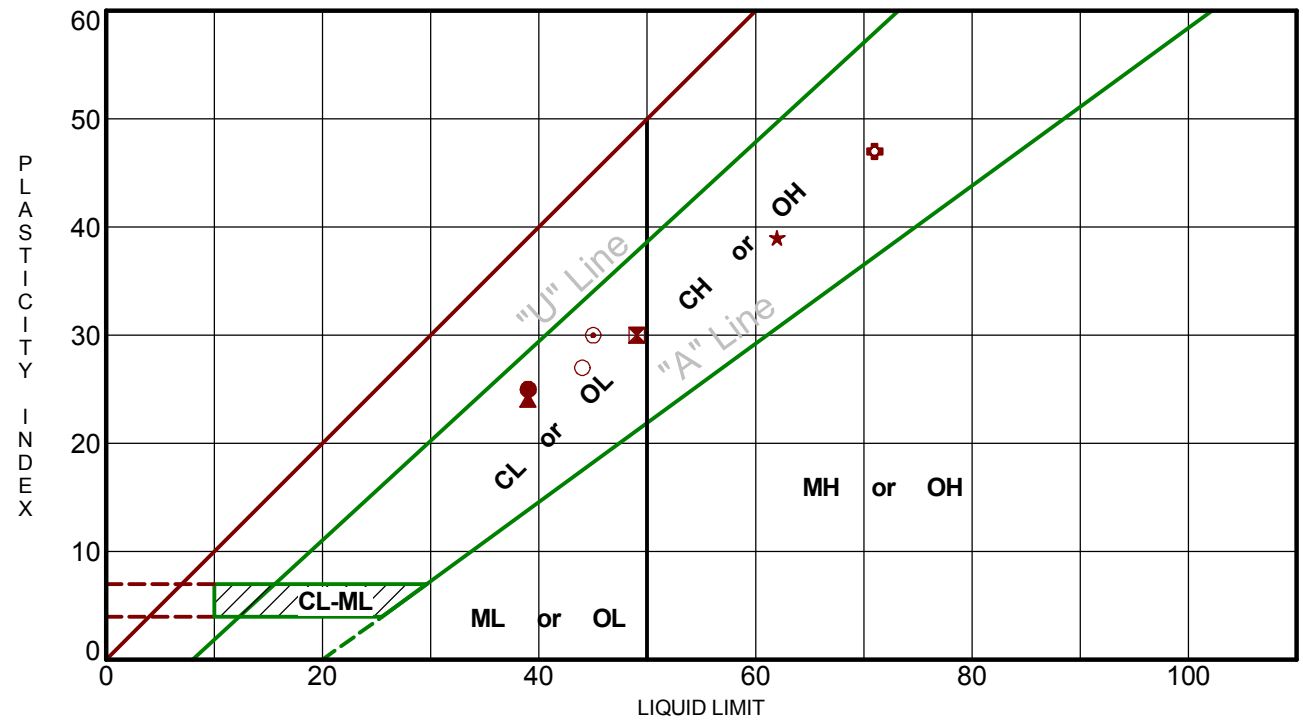
CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-26

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
TB-1	9 - 10	39	14	25	84	CL	LEAN CLAY with SAND
TB-2	3 - 4	49	19	30	82	CL	LEAN CLAY with SAND
TB-4	6 - 7	39	15	24	77	CL	LEAN CLAY with SAND
TB-5	14 - 15	62	23	39	96	CH	CLAYSTONE
TB-7	6 - 7	45	15	30	77	CL	LEAN CLAY with SAND
TB-9	9 - 10	71	24	47	97	CH	CLAYSTONE
TB-10	1 - 3	44	17	27	70	CL	LEAN CLAY with SAND

PROJECT: Lazy Dog Electrical Substation

SITE: SW of Weld County Road (WCR) 6 and WCR 7
Town of Erie, Weld County, Colorado

Terracon
1242 Bramwood Pl
Longmont, CO

PROJECT NUMBER: 22175130

CLIENT: Spectrum Engineering Resources
Loveland, Colorado

EXHIBIT: B-27

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS 22175130 LAZY DOG ELECTRIC.GPJ TERRACON_DATATEMPLATE.GDT 12/28/17

APPENDIX C

SUPPORTING DOCUMENT

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING


Auger


Split Spoon


Shelby Tube


Macro Core


Ring Sampler


Rock Core


Grab Sample


No Recovery

WATER LEVEL


Water Initially Encountered


Water Level After a Specified Period of Time


Water Level After a Specified Period of Time

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

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

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

LOCATION AND ELEVATION NOTES

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

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			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				BEDROCK		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**
Very Loose	0 - 3	0 - 5	Very Soft	less than 500	0 - 1	< 3	< 24	< 20	Weathered
Loose	4 - 9	6 - 14	Soft	500 to 1,000	2 - 4	3 - 5	24 - 35	20 - 29	Firm
Medium Dense	10 - 29	15 - 46	Medium-Stiff	1,000 to 2,000	4 - 8	6 - 10	36 - 60	30 - 49	Medium Hard
Dense	30 - 50	47 - 79	Stiff	2,000 to 4,000	8 - 15	11 - 18	61 - 96	50 - 79	Hard
Very Dense	> 50	≥ 80	Very Stiff	4,000 to 8,000	15 - 30	19 - 36	> 96	>79	Very Hard
			Hard	> 8,000	> 30	> 36			

RELATIVE PROPORTIONS OF SAND AND GRAVEL

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

GRAIN SIZE TERMINOLOGY

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

RELATIVE PROPORTIONS OF FINES

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

PLASTICITY DESCRIPTION

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

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

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

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

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

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

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

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

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

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

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

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

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

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

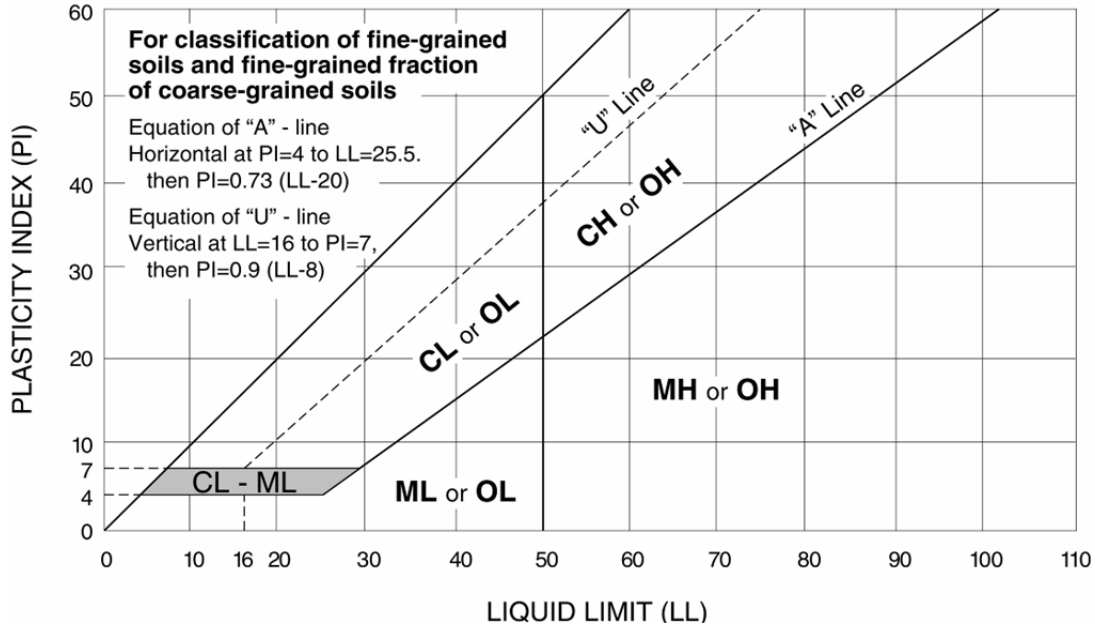
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

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

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

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

[Q] PI plots below "A" line.



Terracon

Exhibit C-2

ROCK CLASSIFICATION

(Based on ASTM C-294)

Sedimentary Rocks

Sedimentary rocks are stratified materials laid down by water or wind. The sediments may be composed of particles or pre-existing rocks derived by mechanical weathering, evaporation or by chemical or organic origin. The sediments are usually indurated by cementation or compaction.

Chert Very fine-grained siliceous rock composed of micro-crystalline or cyrptocrystalline quartz, chalcedony or opal. Chert is various colored, porous to dense, hard and has a conchoidal to splintery fracture.

Claystone Fine-grained rock composed of or derived by erosion of silts and clays or any rock containing clay. Soft massive and may contain carbonate minerals.

Conglomerate Rock consisting of a considerable amount of rounded gravel, sand and cobbles with or without interstitial or cementing material. The cementing or interstitial material may be quartz, opal, calcite, dolomite, clay, iron oxides or other materials.

Dolomite A fine-grained carbonate rock consisting of the mineral dolomite [$CaMg(CO_3)_2$]. May contain noncarbonate impurities such as quartz, chert, clay minerals, organic matter, gypsum and sulfides. Reacts with hydrochloric acid (HCL).

Limestone A fine-grained carbonate rock consisting of the mineral calcite ($CaCO_3$). May contain noncarbonate impurities such as quartz, chert, clay minerals, organic matter, gypsum and sulfides. Reacts with hydrochloric acid (HCL).

Sandstone Rock consisting of particles of sand with or without interstitial and cementing materials. The cementing or interstitial material may be quartz, opal, calcite, dolomite, clay, iron oxides or other material.

Shale Fine-grained rock composed of or derived by erosion of silts and clays or any rock containing clay. Shale is hard, platy, or fissile and may be gray, black, reddish or green and may contain some carbonate minerals (calcareous shale).

Siltstone Fine grained rock composed of or derived by erosion of silts or rock containing silt. Siltstones consist predominantly of silt sized particles (0.0625 to 0.002 mm in diameter) and are intermediate rocks between claystones and sandstones and may contain carbonate minerals.

Appendix E:
Assessment of Impact Report

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Introduction

United Power, Inc. (United Power) is proposing to construct and operate a new electric substation on an approximate 8-acre parcel owned by United Power and located near the southwestern corner of the intersection of Weld County Road 6 and Weld County Road 7. The proposed Lazy Dog Substation Project (Project) would serve the growing electrical needs of the surrounding area. The Project is located entirely within the limits of the Town of Erie (Erie) in Weld County, Colorado.

The Project would include the following components: substation yard and equipment, driveway and access road, detention basin and swales, a screen wall, landscaping, and high voltage electrical equipment and facilities to connect into the existing Western Area Power Administration's (Western) existing Erie–Terry Street 115-kilovolt (kV) transmission line. The transmission interconnection would require Western remove a single transmission structure (Structure 29-7) and install two new structures (29-7A, 29-7B) along the Erie–Terry Street transmission line to provide a source of electricity to the Lazy Dog Substation. The substation would be built on property owned by United Power and the new transmission structures would be placed within the existing Western right-of-way for the Erie–Terry Street transmission line.

The substation site is accessed from County Road 6 approximately 0.15 mile West of County Road 7 and is currently grassland; no structures are present on the site. The Project is located in the northeast quarter of Section 28, Township 1 North, Range 68 West.

1a. Town and County Special Districts

The Project does not overlap or touch any special districts[1]. No impacts to special districts are anticipated.

1b. Utilities

The Project would not impact any of the following services defined as utility facilities by the Erie Unified Development Code: wastewater; water storage tanks; electric or gas substations; water or wastewater pumping stations, or similar structures used for electricity, natural gas, water, or wastewater; passageways, including easements, for the express purpose of transmitting or transporting electricity, gas, water, sewage, or other similar services; any energy device or system that generates energy from renewable energy resources including solar, hydro, wind, wood, geothermal, or similar sources; and accessory uses including control, monitoring, data, or transmission equipment.

The Project would utilize Erie water supply to irrigate the proposed landscaping. The irrigation design would tap into the existing 12-inch water pipeline located in Weld County Road 6. This irrigation tap would not be expected to significantly impact the availability of Erie water to the surrounding landowners. United Power would buy the water used for irrigation.

[1] Colorado State Demography Office, 2018. Special Districts Map. Available Online: https://demography.dola.colorado.gov/CO_SpecialDistrict/ Accessed Dec., 5 2018

The Project is proposed adjacent to the Denver Regional Landfill, east of the landfill's primary operating area. The Project would complement and be compatible with Denver Regional Landfill because the substation can be considered a "passive" use of land. The substation would not cause increased vehicle traffic. The substation would be an unstaffed facility and would be monitored remotely; no parking is proposed outside the screen wall. Visits from utility personnel would be limited to emergencies or maintenance activities.

The Project is proposed adjacent to the Erie Gas to Energy Project, which is a biofuels energy generating plant. The Project would complement and be compatible with Erie Gas to Energy Project because the substation can be considered a "passive" use of land. The substation would not cause increased vehicle traffic. The substation would be an unstaffed facility and would be monitored remotely; no parking is proposed outside the screen wall. Visits from utility personnel would be limited to emergencies or maintenance activities.

The Project would tap into the existing Western Area Power Administration 115kV transmission line located along the southwestern corner of the parcel. The Project is not expected to impact services provided by this transmission line. During construction of the tie-in of the transmission line to the substation, two new structures would replace existing structures that are located adjacent to the site boundary. During construction, a shoe-fly design would be used to keep the existing transmission line in service until the crossover of equipment has been completed. Interruption of service is not expected.

The required electricity would not have an adverse effect on the capability of local government to continue to provide services, nor would it exceed the capacity of service delivery systems. No disruption to local utility services is expected occur during construction or operation of the Project.

1c. Open Space and Recreation

The proposed Project site was formerly owned by Erie and was an open space parcel. The sale of the parcel by the Town of Erie effectively took the open space area out of use; however; it appears that the parcel was vacant prior to sale. The parcel did not contain any open space uses of infrastructure prior to the sale.

The Project is not expected to impact any area recreational uses since it is a passive use of land. The substation would not cause increased vehicle traffic. The substation would be an unstaffed facility and would be monitored remotely; no parking is proposed outside the screen wall. Visits from utility personnel would be limited to emergencies or maintenance activities. The Project may be visible from the Sunset Single-Track Bike Park located approximately 1 mile to the east during clear days; however, the important viewpoints in this park are the views of the foothills and mountains to the west, and the Project would be located to the east. The change to the view is expected to be minor from this distance.

1d. Law Enforcement and Fire Protection

The proposed Project would not increase the need for police or fire protection services during construction or operation and would be monitored by United Power using the security and emergency response procedures described in the following paragraphs.

The Project would be located within one fire district: Mountain View Fire Protection District. The Project would not increase fire protection demands. The Project is not expected to cause additional demand on law enforcement services. Local law enforcement would be contacted based on the type and degree of an emergency if one were to occur.

United Power's facilities are designed, constructed, operated and maintained to meet or exceed all applicable requirements of the Institute of Electrical and Electronics Engineers (IEEE) standards and accepted industry standards and practices including IEEE 979, *Guide for Substation Fire Protection*. All applicable fire laws and regulations, as outlined in CRS 31-16-601, would be observed during construction and normal operation of the substation.

Tri-State and United Power are coordinating with Mountain Fire Rescue regarding emergency response procedures should a fire occur at the substation. United Power and Tri-State maintain emergency procedures for electrical fires at substations. These procedures indicate that emergency personnel should not enter the substation unless they are escorted by either Tri-State or United Power personnel. If they are responding to an emergency onsite, such as a fire, responders should remain outside of the substation fence or wall and await the arrival of trained utility staff. Accessing the substation requires that proper clearances from equipment be maintained to avoid potential contact with high voltage electricity or equipment being operated during an emergency to mitigate the issue (such as opening a switch or breaker to cut the flow of electricity). Only trained United Power and Tri-State substation emergency personnel should enter the substation enclosure to control emergencies and/or fires involving the high voltage energized equipment, and water should not be applied to an electrical fire. In the event of a fire, fire department personnel should be onsite to control any fire that occurs outside of the substation fence.

1e. Schools

St. Vrain Valley Schools and Boulder Valley Schools serve the Erie area. The schools closest to the Project include the following within the St. Vrain system: Erie High School, Erie Middle School, Erie Elementary School, Black Rock Elementary, and Red Hawk Elementary; and Meadowlark School in the Boulder Valley system. The closest private schools include Vista Ridge Academy and Aspen Ridge Prep School. Impacts to school districts in Erie are not anticipated because the majority of construction workers are expected to be local.

Appendix F:
Biological Resources Report and Raptor Nest Survey Report

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Lazy Dog Delivery Point Project—Erie, Colorado

Biological Resources Report

May 2018

Prepared for:

TRI-STATE Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

1100 W. 116th Ave., Westminster, CO 80234

Prepared by:

TETRA TECH

216 16th St., Ste. 1500, Denver, CO 80202

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Contents

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Attachments

Tables

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1. Introduction

Tri-State Generation and Transmission Association, Inc. (Tri-State) is proposing to build the Lazy Dog Delivery Point, a new electric substation and transmission line tap (Project) in the town of Erie in Weld County, Colorado for their Member, United Power. The purpose of this report is to provide an assessment of the biological resources present within the Survey area. The Survey area is an 8-acre parcel along with an easement that extends to Weld County Road 7 as depicted on Figure 1, Attachment 1. A desktop analysis and a site visit were conducted to identify and evaluate the potential presence of the following resources:

- Special-Status Species
- Noxious Weeds
- Wetlands and other Waters of the United States (WOTUS)

Raptor nest surveys for the Project are ongoing and results will be provided in a separate report.

1.1 Project Description and Location

The Project is located in the town of Erie, Weld County, Colorado, at the southwestern corner of the intersection of Weld County Road 6 and Weld County Road 7. The Project consists of a new electric substation, Lazy Dog Substation, to be built on an approximate 8-acre parcel and a transmission tap south of the substation to interconnect the project to the existing electric system (Attachment 1, Figure 1). Tri-State is coordinating with Western Area Power (WAPA) on the Project as the transmission tap would occur on facilities owned by WAPA and will be required to comply with the National Environmental Policy Act (NEPA) for their portion of the Project. Tri-State's member distribution cooperative, United Power, is completing a permit for the Project with the town of Erie.

1.2 Regulatory Setting

Several biological resources within the Survey area are protected by federal and state laws. The following subsections describe these regulations and permitting processes where applicable.

1.2.1 Special-Status Species

The Endangered Species Act (ESA) and its implementing regulations in Title 50 of the Code of Federal Regulations (CFR) Section 17 prohibit the take of any fish or wildlife species that is federally listed as threatened or endangered without prior approval pursuant to either Section 7 or Section 10 of the ESA. Section 3 of the ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or to attempt to engage in any such conduct" (16 United States Code [USC] § 1532 (19)). Harm, in this case, means an act that actually kills or injures a federally listed wildlife species and "may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering." To harass means to perform "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering" (50 CFR §17.3). In addition, Section 9 of the ESA details

generally prohibited acts, and Section 11 provides for both civil and criminal penalties for violators regarding species federally listed as threatened or endangered. The U.S. Fish and Wildlife Service (USFWS) is responsible for the implementation of the ESA.

The Migratory Bird Treaty Act (MBTA) of 1918 (50 CFR § 10.13), as amended (16 USC 703 et seq.), implements and regulates bilateral protocols with Canada, Mexico, Japan, and Russia (Manville 2016). The MBTA states, “Unless and except as permitted by regulations … it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill … possess, offer for sale, sell … purchase … ship, export, import …transport or cause to be transported… any migratory bird, any part, nest, or eggs of any such bird …” (16 USC 703). The word “take” is defined by regulation as “to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect” (50 CFR 10.12). A December 22, 2017, memorandum from the U.S. Department of the Interior’s Office of the Solicitor and an April 11, 2018, memorandum from the USFWS clarified that the prohibitions of take under the MBTA apply only to purposeful take.

The Bald and Golden Eagle Protection Act (BGEPA) prohibits the take of Bald or Golden Eagles by any party. The BGEPA defines “take” as “to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, and disturb individuals, their nests and eggs” (16 USC 668c). “Disturb” is defined by regulation at 50 CFR 22.3 in 2007 as “to agitate or bother a Bald or Golden Eagle to a degree that causes…injury to an eagle, a decrease in productivity, or nest abandonment…”.

Colorado Revised Statute (CRS) 33-2-105 states that it is unlawful to “take, possess, transport, export, process, sell or offer for sale, or ship” any species listed as threatened or endangered by Colorado Parks and Wildlife (CPW). According to CRS 33-1-102 "Take" means to acquire possession of wildlife; but such term shall not include the accidental wounding or killing of wildlife by a motor vehicle, vessel, or train.”

CPW recommends a set of seasonal buffers for specific nesting raptors that commonly occur in Colorado, including but not limited to bald and golden eagles (CPW 2008). These buffers are for active nests and range from 0.25 mile to 0.5 mile depending on the species. The associated date range for each seasonal buffer is based on breeding periods in Colorado and varies among species.

1.2.2 Noxious Weeds

The State of Colorado promulgated the Colorado Noxious Weed Act (Act) in 1990 within Title 35, Article 5.5, Parts 110 through 119, in 1990. The Act initially created three lists: A, B, and C (CDA 2017). The state subsequently added a watch list. The most recent update to the weed lists became effective March 31, 2017.

1.2.3 Wetlands and Other Waters of the United States

All discharges of dredged or fill material that result in permanent or temporary losses of potential wetlands or other WOTUS are regulated by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (CWA). The USACE regulates projects in navigable waters under Section 10 of the Rivers and Harbors Act.

Under USACE and U.S. Environmental Protection Agency (EPA) regulations, wetlands are defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." In non-tidal waters, the lateral extent of USACE jurisdiction is determined by the ordinary high water mark, which is defined as the "line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas" (33 CFR 328[e]).

Depending upon the level of impacts to the jurisdictional features, a preconstruction notification (PCN) and an approved jurisdictional determination by the USACE may be necessary for the Project. For permanent impacts less than 0.1 acre, no PCN would be required. If impacts to jurisdictional waters cannot be avoided, the Project will require permitting under the CWA § 404 program administered by USACE. The Denver Regulatory Office of USACE recommends consultation on projects that may exceed these thresholds to determine the need and/or type of permitting. Because there are no wetlands or other WOTUS in the Project (see Section 2.6 below), no Section 404 permits would be required for this Project.

2. Desktop Analysis

A desktop analysis for the Project was conducted prior to the site visit. The desktop analysis collected background data from publicly available sources.

2.1 Ecoregional Setting

The Project is in the High Plains Level III Ecoregion, which includes four Level IV ecoregions. The Survey area lies within the Flat to Rolling Plains Level IV ecoregion (Chapman et al. 2001). This ecoregion is characterized by moderate topological relief, silty and sandy soils, shortgrass prairie vegetation, and intermittent streams with few perennial streams. This ecoregion is known to have small scattered depressional "playa" wetlands. Land use includes rangeland, agriculture, and oil and gas production. Elevation in the Survey area is between 4,900 and 5,100 feet above sea level. According to the National Land Cover Database (NLCD; Homer et al. 2015), the Survey area consists of cultivated crops land cover (Attachment 1, Figure 2).

Field surveys confirmed the general ecoregional setting, i.e., flat to rolling topography and nearby intermittent streams. The Project is entirely within a managed agricultural field. A roadside ditch is present along the northern border and a man-made earthen canal outside the Project boundary to the south. The surrounding land uses include oil and gas production to the north, cropland to the east and south, and a mix of oil and gas and cropland to the west. The Front Range Landfill occurs to the southwest of the site. Representative photos of the general habitat are included in Attachment 2.

2.2 Special-Status Species Desktop Methods

Prior to conducting the field surveys, research was conducted to identify the special-status species that may be present in the Survey area. The resources listed below were used to evaluate the likelihood of occurrence of special-status species and their habitat in the Survey area:

- USFWS Region 6 Information for Planning and Consultation (IPaC) search results for federally listed threatened and endangered species that may occur near the Survey area, including critical habitat (USFWS 2018a, Attachment 3)
- CPW threatened, endangered, and species of concern for the state (CPW 2018b)
- CPW Species Profiles (CPW 2018a)
- CPW Species Activity Mapping Data (CPW 2017)
- U.S. Department of Agriculture (USDA) Farm Service National Agricultural Imagery Program Aerial photography for Project location (USDA 2015)

2.3 Special-Status Species Desktop Results

2.3.1 USFWS Threatened and Endangered Species Desktop Results

According to the IPaC output for the Survey area, there are four birds, one fish, one mammal, and three plants that are federally listed as threatened or endangered that are known or expected to occur within or near the Survey area (USFWS 2018a). Table 1 lists these species and summarizes the likelihood of occurrence within the Survey area based on habitat suitability and known geographic ranges. None of the species are likely to occur within the Survey area. The Survey area does not include USFWS-designated critical habitat for any federally listed species.

Table 1:
Federally Listed Species Known or Expected to Occur in the Survey area per the USFWS IPaC Resource List

Common Name	Scientific Name	Status[2]	Likelihood of Occurrence in Survey area/Habitat Suitability[3]
Birds			
Least tern (interior population)[3]	*Sternula antillarum*	FE	Unlikely to occur. Habitat consists of bare sandy shorelines of reservoirs, lakes, and rivers. These habitat components are not present in the Survey area. The Survey area is outside the typical breeding and wintering distribution for this species. The species occurs in the Platte River watershed downstream in Nebraska. Critical habitat has not been designated for this species.
Mexican spotted owl	*Strix occidentalis lucida*	FT	Unlikely to occur. Habitat consists of mature mixed-conifer, pine-oak, and riparian forest in canyon habitat. These habitat components are not present in the Survey area. There is no designated critical habitat for this species in the Survey area.
Piping plover[3]	*Charadrius melodus*	FT	Unlikely to occur. Suitable habitat includes sparsely vegetated sandbars of rivers and sparsely vegetated and frequently alkaline beaches, lakeshores, and wetlands. These habitat components are not present in the Survey area. The Survey area is outside the typical breeding and wintering distribution for this species. This species occurs in the Platte River watershed downstream in Nebraska. There is no designated critical habitat for this species in the Survey area.

Table 1:
Federally Listed Species Known or Expected to Occur in the Survey area per the USFWS IPaC Resource List

Common Name	Scientific Name	Status[2]	Likelihood of Occurrence in Survey area/Habitat Suitability[3]
Whooping crane[3]	*Grus americana*	FE	Unlikely to occur. Suitable habitat includes a variety of habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows, rivers, and agricultural fields. These habitat components are not present in the Survey area. The Survey area is outside the typical distribution for this species. There is no designated critical habitat for this species in the Survey area.
Fishes			
Pallid sturgeon[3]	*Scaphirhynchus albus*	FE	Not present in Colorado. Pallid sturgeon are a bottom-oriented, large river obligate fish inhabiting the systems of the Missouri and Mississippi rivers. Critical habitat has not been designated for this species.
Mammals			
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	FT	Unlikely to occur. The species prefers riparian areas with adjacent undisturbed grasslands. Preble's meadow jumping mouse habitat includes areas within 330 feet of the 100-year floodplain. The Project has no riparian areas and does not occur within a 100-year floodplain. There is no designated critical habitat for this species in the Survey area.
Plants			
Colorado butterfly plant	*Oenothera coloradensis* spp. *coloradensis*	FT	Unlikely to occur. An early successional plant (although probably not a pioneer) adapted to use sub-irrigated alluvial stream channel sites and floodplains surrounded by mixed grass prairie that are periodically disturbed. Known to occur in Weld County; however, it was not observed in the Survey area during the site visit and potential habitat does not exist in the Survey area. There is no designated critical habitat for this species in the Survey area.
Ute ladies'-tresses orchid	*Spiranthes diluvialis*	FT	Unlikely to occur. Suitable habitat includes perennial stream terraces, floodplains, and oxbows at elevations between 4,300 and 7,000 feet. Recent surveys since 1992 have expanded the number of vegetation and hydrology types occupied by this species to include seasonally flooded river terraces, sub irrigated or spring-fed abandoned stream channels and valleys, and lakeshores. Twenty-six populations have been discovered along irrigation canals, berms, levees, irrigated meadows, excavated gravel pits, roadside barrow pits, reservoirs, and other human-modified wetlands. These habitat components are not present in the Survey area. Critical habitat has not been designated for this species.
Western prairie fringed orchid[3]	*Platanthera praeclara*	FT	Not present in Colorado. Western prairie fringed orchid is a perennial orchid of the North American tall grass prairie and is found most often on unplowed calcareous prairies and sedge meadows. This species is dependent on mycorrhizal fungi, and its persistence is dependent on periodic disturbance by fire, mowing, or grazing. The species occurs in Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and Oklahoma. Critical habitat has not been designated for this species.

Source: USFWS (2018a)

1 Status: FE—Federally Endangered; FT—Federally Threatened

2 Per USFWS (2018a), this species only needs to be considered if water-related activities/use in the North Platte, South Platte, and Laramie river basins may affect listed species in Nebraska. The Project is not expected to affect these river basins.

2.3.2 State-Listed Species

CPW's threatened and endangered list includes state listed endangered and threatened species (CPW 2018b). This list of 30 species includes amphibians, birds, fish, and mammals and is included as Attachment 4. This list was evaluated for species with the potential to occur in the region of the Project. Species that are not known to occur in the plains region were eliminated from consideration for this Project. Table 2 summarizes the state listed species and the likelihood of occurrence in the Survey area. State Species of Concern are not included in this list because they do not have any regulatory protection in Colorado.

Table 2:
State-Listed Species Potentially Occurring Within the Survey Area

Common Name	Scientific Name	State Status[1]	Likelihood of Occurrence within the Survey Area[2]
Birds[3]			
Burrowing owl	*Athene cunicularia*	ST	Unlikely to occur. Burrowing owls are known to utilize prairie dog colonies for habitat. No prairie dog colonies were observed in the Survey area; however, one colony was located approximately 0.5 mile to the northwest
Least tern (interior population)	*Sternula antillarum*	SE	Unlikely to occur. Habitat consists of bare sandy shorelines of reservoirs, lakes, and rivers. These habitat components are not present in the Survey area. The Survey area is outside the typical breeding and wintering distribution for this species. The species occurs in the Platte River watershed downstream in Nebraska.
Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	SE	Unlikely to occur. Project is outside species' range. Occurs in native grassland habitats with shrub cover or grain fields.
Mammals[4]			
Black-footed ferret	*Mustela nigripes*	SE	Unlikely to occur. This species is very rare. Habitat once included the eastern plains, the mountain parks, and the western valleys—grasslands or shrublands that supported some species of prairie dog, the ferret's primary prey. Ferrets have been released from the captive breeding program in Colorado, but not near this Survey area.
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	ST	Unlikely to occur. The species prefers riparian areas with adjacent undisturbed grasslands. Preble's meadow jumping mouse habitat includes areas within 330 feet of the 100-year floodplain. The Project has no riparian areas and does not occur within a 100-year floodplain.

1 Status: SE—State Endangered; ST—State Threatened.

2 Potential for Occurrence: Unlikely—No species range overlap in the Project or unsuitable habitat; Low—species range overlaps with Project with marginally suitable habitat; Moderate—species range overlaps with Project with suitable habitat or species is known to occur in habitat similar to habitat in Project; High—suitable habitat is present in the Project or known populations exist in the Project; Present—species observed during field surveys.

3 Source: Sibley (2014)

4 Source: Armstrong et al. (2011)

2.4 Noxious Weeds Desktop Results

The Colorado Noxious Weed Act identifies three categories of weeds: A-list, B-list, C-list, and watch list. The Act requires **A-list** species to be eradicated wherever detected to protect neighboring communities and the state as a whole. There are 25 species on the A-list. The **B-list** represents those species for which the state of Colorado and local governments will develop noxious weed management plans to stop the continued spread of these species. The B-list contains 38 species. Species on the **C-list** are those species that the state will assist governing bodies manage through education, research, and biological controls. The C-list includes 15 species. The **watch list** includes 24 species of weeds that are documented for advisory and educational purposes only at this time. The state listed noxious weeds are provided in Table 3.

Table 3:
Colorado Noxious Weed List

Common Name	Scientific Name[1]
A-List	
African rue	*Peganum harmala*
Camelthorn	*Alhagi pseudalhagi*
Common crupina	*Crupina vulgaris*
Cypress spurge	*Euphorbia cyparissias*
Dyer's woad	*Isatis tinctoria*
Elongated mustard	*Brassica elongata*
Flowering rush	*Butomus umbellatus*
Giant reed	*Arundo donax*
Giant salvinia	*Salvinia molesta*
Hairy willow-herb	*Epilobium hirsutum*
Hydrilla	*Hydrilla verticillata*
Bohemian knotweed	*Polygonium x bohemicum*
Giant knotweed	*Polygonium sachalinese*
Japanese knotweed	*Polygonium cuspidatum*
Meadow knapweed	*Centaurea pratensis*
Mediterranean sage	*Salvia aethiopis*
Medusahead	*Taeniatherum caput-medusae*
Myrtle spurge	*Euphorbia myrsinites*
Orange hawkweed	*Hieracium aurantiacum*
Parrotfeather	*Myriophyllum aquaticum*
Purple loosestrife	*Lythrum salicaria*
Rush skeletonweed	*Chondrilla juncea*
Squarrose knapweed	*Centaurea virgata*
Tansy ragwort	*Senecio jacobaea*
Yellow starthistle	*Centaurea solstitialis*
Colorado B-List	
Absinth wormwood	*Artemisia absinthium*
Black henbane	*Hyoscyamus niger*
Bouncingbet	*Saponaria officinalis*
Bull thistle	*Cirsium vulgare*
Canada thistle	*Breea arvensis* (*Cirsium arvense*)
Chinese clematis	*Clematis orientalis*
Corn chamomile	*Anthemis arvensis*
Mayweed chamomile	*Anthemis cotula*
Scentless chamomile	*Tripleurospermum perforatum*
Chinese clematis	*Clematis orientalis*
Common tansy	*Tanacetum vulgare*
Common teasel	*Dipsacus fullonum*
Corn chamomile	*Anthemis arvensis*
Common teasel	*Dipsacus fullonum*

Table 3:
Colorado Noxious Weed List

Common Name	Scientific Name[1]
Cutleaf teasel	*Dipsacus laciniatus*
Dalmatian toadflax	*Linaria dalmatica*
Dame's rocket	*Hesperis matronalis*
Diffuse knapweed	*Acosta diffusa (Centaurea diffusa)*
Eurasian watermilfoil	*Myriophyllum spicatum*
Hoary cress	*Cardaria draba*
Houndstongue	*Cynoglossum officinale*
Jointed goatgrass	*Aegilops cylindrica*
Leafy spurge	*Euphorbia esula*
Moth mullein	*Verbascum blattaria*
Musk thistle	*Carduus nutans*
Oxeye daisy	*Chrysanthemum leucanthemum*
Perennial pepperweed	*Lepidium latifolium*
Plumeless thistle	*Carduus acanthoides*
Russian knapweed	*Acroptilon repens*
Russian-olive	*Elaeagnus angustifolia*
Salt cedar	*Tamarix chinensis, T.parviflora, and T. ramosissima*
Scentless chamomile	*Matricaria perforata*
Scotch thistle	*Onopordum acanthium, and O. tauricum*
Spotted knapweed	*Centaurea maculosa*
Sulfur cinquefoil	*Potentilla recta*
Wild caraway	*Carum carvi*
Yellow nutsedge	*Cyperus esculentus*
Yellow toadflax	*Linaria vulgaris*
Colorado C-List	
Bulbous goatgrass	*Poa bulbosa*
Chicory	*Cichorium intybus*
Common burdock	*Arctium minus*
Common mullein	*Verbascum thapsus*
Common St. Johnswort	*Hypericum perforatum*
Downy brome (cheatgrass)	*Bromus tectorum*
Field bindweed	*Convolvulus arvensis*
Halogeton	*Halogeton glomeratus*
Perennial sowthistle	*Sonchus arvensis*
Poison hemlock	*Conium maculatum*
Puncturevine	*Tribulus terrestris*
Quackgrass	*Elymus repens*
Redstem fillaree	*Erodium cicutarium*
Velvetleaf	*Abutilon theophrasti*
Wild proso millet	*Panicum miliaceum*

Source: CDA (2017)

2.5 Wetlands and Other WOTUS Methods

Prior to conducting the field surveys, research was conducted to identify locations for potential wetlands and other WOTUS that may be present in the Survey area. The resources listed below were used to evaluate potential wetlands and other WOTUS in the Survey area:

- USFWS online National Wetland Inventory (NWI) (USFWS 2018b)
- U.S. Geological Survey National Hydrography Dataset (NHD) (USGS 2018)
- U.S. Department of Agriculture (USDA Farm Service National Agricultural Imagery Program aerial photography (USDA 2017)

2.6 Wetlands and Other WOTUS Desktop Results

Desktop analysis was performed for the Survey area and are displayed in Attachment 1, Figure 1. This figure shows NWI wetlands, NHD intermittent stream lines, and Federal Emergency Management Agency (FEMA)-mapped 100-year floodplains (FEMA 2018). There are no NHD, NWI, or FEMA 100-year floodplains in the Survey area. Aerial imagery of the Project shows a potential stream or wetland intersecting the easement as identified by the darker colors of the feature and the surrounding area. The closest NWI- and NHD-identified features are located approximately 600 feet to the north of the Project.

3. Field Surveys

3.1 Field Survey Methods

A Tetra Tech biologist qualified to identify Colorado flora, fauna, noxious weeds, and wetlands and other WOTUS conducted the field effort. The field survey for the Project was performed April 24, 2018. The following subsections provide descriptions of survey methods and results for each component of the field survey. Vegetation identified during the field survey was verified using the *Flora of Colorado* (Ackerfield 2015).

3.1.1 Special-Status Species—Habitat Suitability Assessment

A Tetra Tech biologist conducted a pedestrian survey to evaluate the Survey area. Notes were taken for observations of unique habitat that could be suitable for federally or state threatened or endangered species potentially occurring in the Survey area (Tables 1 and 2). If a unique area was identified, dominant surface soils and vegetation were noted as was the general topography. GPS points and overview photographs were taken to document the location. Field notes, GPS points, and digital photographs were collected within the Survey area of suitable habitat characteristics that would support species listed in Tables 1 and 2.

3.1.2 Noxious Weeds Inventory

The biologist collected field notes for listed noxious weeds observed in the Survey area. Field notes included dominant vegetation as well as the density and spatial extent of the noxious weed populations.

3.1.3 Wetlands and Other WOTUS Inventory

All potential wetlands and other WOTUS were documented during the field survey. While no formal delineations were conducted for wetlands or other WOTUS, general notes were taken to describe the rationale for recording features. Wetlands, if observed in the field, would be described by dominant vegetation, topographic position, and hydrologic function (if visible). No soil pits were established during the field survey. A GPS point was collected to record the location of the features and photographs were taken.

3.2 Field Survey Results

The following sections describe the results of the biological resources assessment completed for the Survey area.

3.2.1 Special-Status Species—Habitat Suitability Assessment

3.2.1.1 Federally Listed Species

Of the nine species identified in the IPaC resource list as known or expected to be on or near the Survey area, none were identified as likely to occur in the Survey area during the field survey (Table 1).

3.2.1.2 State-Listed Species

Four species have the potential to occur in the Survey area. All four species were deemed unlikely to occur based upon habitat requirements, as noted in Table 2. The field survey found the Survey area located entirely within an active agricultural field lacking native vegetation. The Survey area lacked habitat for the four state listed species (Table 2). One prairie dog colony is present, although it is located approximately 0.5 mile northwest of the Survey area. The associated species and their potential influence on the Project are discussed in a separate raptor survey report.

3.2.2 Noxious Weeds

The field survey identified one plant listed as a noxious weed in Colorado: downy brome (cheatgrass). Cheatgrass was identified along the roadsides in small patches as well as were individual specimens throughout the Survey area in the agricultural field. Cheatgrass is a List-C noxious weed in Colorado.

3.2.3 Wetlands and Other Waters of the U.S.

No wetlands or other WOTUS were identified during the field survey. One potential feature identified using aerial imagery during the desktop review was evaluated as a shallow swale (Swale 1) during the field survey (Attachment 1, Figure 1). Swale 1 had no evidence of a defined channel and the vegetation did not change from the surrounding area. There is also a roadside ditch that paralleled the northern boundary of the Survey area along Weld County Road 6. This feature may be considered jurisdictional because the roadside ditch drains through a culvert across Weld County Road 6 into a larger roadside ditch eventually flowing into a stream feature. The stream feature appears to contribute to a canal system.

3.2.4 Wildlife Observations

Wildlife observations were limited during the field survey because it was raining/snowing on the day of the survey. Visual wildlife observations included a cottontail rabbit and a raven. No other wildlife observations were made during the field survey.

Additional wildlife observations were documented during the raptor nest survey visits on March 14 and May 12, 2018. Swainson's hawks, red-tailed hawks, and prairie dogs were observed within the vicinity of the Survey area and are discussed in a separate raptor survey report.

3.2.5 Vegetation

A list of the plants located in the Survey area was generated during the field survey. Because the Survey area is located in an active agricultural field, a majority of the Survey area consists of introduced or cultivated species. The dominant species in the Project is wheatgrass (*Triticum aestivum*), a cultivated crop. To a lesser degree, smooth brome (*Bromus inermus*) was also located throughout the Survey area. Additional vegetation included blue mustard (*Chorispora tenella*), flixweed (*Descurainia sophia*), cheatgrass, and dandelion (*Taraxacum officinale*).

4. Conclusions

The field survey documented the existing biological resources identified including special status species, noxious weeds, and wetlands and other WOTUS within the Survey area. No potential habitat for federally or state listed species were identified during the field survey. One noxious weed, cheatgrass, was identified in the Survey area. Cheatgrass is a List-C species. The State of Colorado does not have a plan to implement for controlling the spread of List-C species; however, they recommend implementing controls to limit the spread of these species. One roadside ditch and one swale were noted during the field survey. Tetra Tech recommends minimizing impacts to less than 0.1 acre to the roadside ditch to avoid the need for a Section 404 permit and/or to consult with the USACE to determine the jurisdictional status of the feature.

5. Literature Cited

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Attachment 1: Figures

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TRI-STATE Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

Lazy Dog Delivery Point Project

Figure 1
Field Survey

Weld County, CO

May 2018

Legend

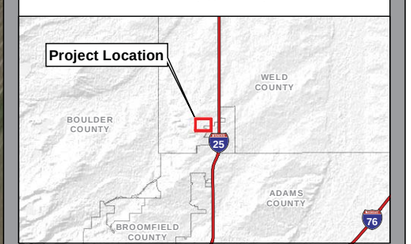
- Swale 1
- Survey Area

Hydrology

- Perennial Stream
- Intermittent Stream
- Canal/Ditch
- NWI Wetland

0 250 500 Feet

Scale is 1:2,400 when printed at 22x34"



TETRA TECH

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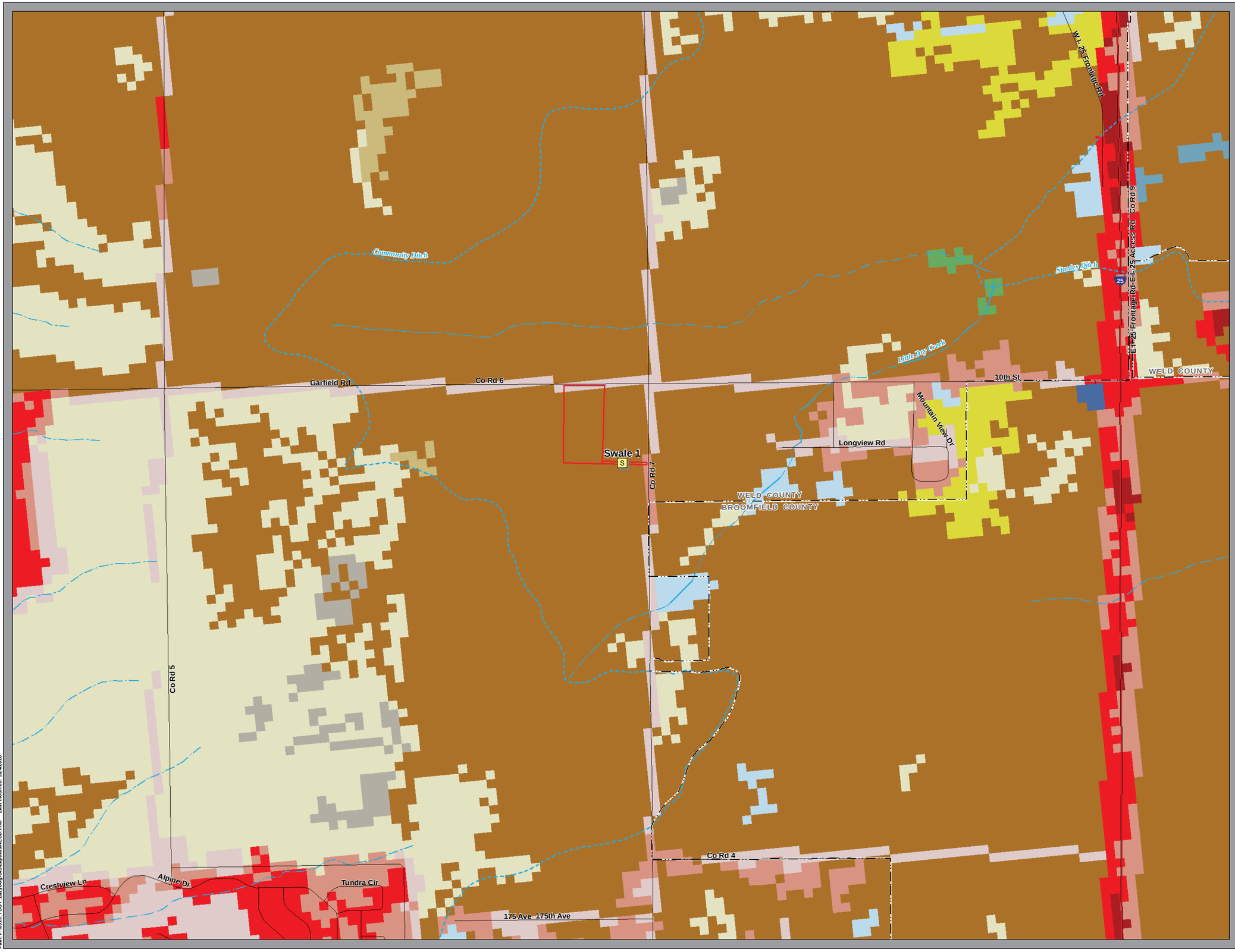
TRI-STATE Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

Lazy Dog Delivery Point Project

Figure 2
NLCD Land Cover

Weld County, CO

May 2018



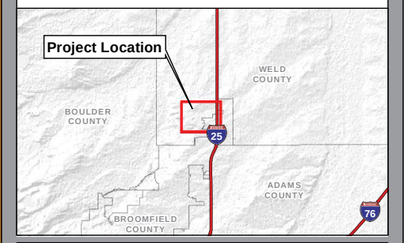
Legend

- Survey Area

Hydrology
- Perennial Stream
- Intermittent Stream
- Canal/Ditch

NLCD Land Cover
- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land (Rock/Sand/Clay)
- Deciduous Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

0 250 500 Feet
Scale is 1:6,000 when printed at 22x34"



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Attachment 2:
Field Survey Photo Log

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Photo 1: Overview of general habitat of consisting of a managed agricultural field. Photo taken from the northern boundary of the Survey area looking south.

Photo 2: View of the 30-foot-wide easement from the southeast corner of the 8-acre parcel looking east across the easement towards Weld County Road 7. The shallow depression in the middle of the photo is the north-south trending swale (Swale 1).

Photo 3: Photo from within the western side of the easement looking north towards Weld County Road 6. Swale 1 is visible in the right side of the photo.

Photo 4: Photo of the roadside ditch along the northern boundary of the Survey area along Weld County Road 6.

Attachment 3:
USFWS IPaC

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IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

Weld County, Colorado

Local office

Colorado Ecological Services Field Office

(303) 236-4773
(303) 236-4005

MAILING ADDRESS
Denver Federal Center
P.O. Box 25486
Denver, CO 80225-0486

PHYSICAL ADDRESS

134 Union Boulevard, Suite 670
Lakewood, CO 80228-1807

http://www.fws.gov/coloradoES
http://www.fws.gov/platteriver

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

NOT FOR CONSULTATION

Mammals

NAME	STATUS
Preble's Meadow Jumping Mouse Zapus hudsonius preblei There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/4090	Threatened

Birds

NAME	STATUS
Least Tern Sterna antillarum This species only needs to be considered if the following condition applies: • Water-related activities/use in the N. Platte, S. Platte and Laramie River Basins may affect listed species in Nebraska. No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8505	Endangered
Mexican Spotted Owl Strix occidentalis lucida There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8196	Threatened
Piping Plover Charadrius melodus This species only needs to be considered if the following condition applies: • Water-related activities/use in the N. Platte, S. Platte and Laramie River Basins may affect listed species in Nebraska. There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6039	Threatened
Whooping Crane Grus americana This species only needs to be considered if the following condition applies: • Water-related activities/use in the N. Platte, S. Platte and Laramie River Basins may affect listed species in Nebraska. There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/758	Endangered

NOT FOR CONSULTATION

Fishes

NAME	STATUS
Pallid Sturgeon Scaphirhynchus albus This species only needs to be considered if the following condition applies: • Water-related activities/use in the N. Platte, S. Platte and Laramie River Basins may affect listed species in Nebraska. No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7162	Endangered

Flowering Plants

NAME	STATUS
Colorado Butterfly Plant Gaura neomexicana var. coloradensis There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6110	Threatened
Ute Ladies'-tresses Spiranthes diluvialis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2159	Threatened
Western Prairie Fringed Orchid Platanthera praeclara This species only needs to be considered if the following condition applies: • Water-related activities/use in the N. Platte, S. Platte and Laramie River Basins may affect listed species in Nebraska. No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1669	Threatened

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Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

MIGRATORY BIRD INFORMATION IS NOT AVAILABLE AT THIS TIME

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the counties which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

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Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird entry on your migratory bird species list indicates a breeding season, it is probable that the bird breeds in your project's counties at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the BGEPA should such impacts occur.

Facilities

Wildlife refuges and fish hatcheries

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REFUGE AND FISH HATCHERY INFORMATION IS NOT AVAILABLE AT THIS TIME

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

THERE ARE NO KNOWN WETLANDS AT THIS LOCATION.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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Attachment 4:
Colorado Parks and Wildlife Threatened and Endangered Species List

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Colorado Parks and Wildlife Threatened and Endangered Species List

Taxonomic group	Common Name	Scientific Name	State Status
Amphibians	Boreal toad	*Bufo boreas boreas*	SE
	Couch's spadefoot	*Scaphiopus couchii*	SC
	Great Plains narrow-mouthed toad	*Gastrophryne olivacea*	SC
	Northern cricket frog	*Acris crepitans*	SC
	Northern leopard frog	*Rana/Lithobates pipiens*	SC
	Plains leopard frog	*Rana/Lithobates blairi*	SC
	Wood frog	*Rana sylvatica/Lithobates sylvaticus*	SC
Birds	American peregrine falcon	*Falco peregrinus anatum*	SC
	Bald eagle	*Haliaeetus leucocephalus*	SC
	Burrowing owl	*Athene cunicularia*	ST
	Columbian sharp tailed grouse	*Tympanuchus phasianellus columbianus*	SC
	Ferruginous hawk	*Buteo regalis*	SC
	Greater sage grouse	*Centrocercus urophasianus*	SC
	Greater sandhill crane	*Grus canadensis*	SC
	Gunnison sage grouse	*Centrocerus minimus*	SC
	Least tern	*Sterna antillarum*	SE
	Lesser prairie chicken	*Tympanuchus pallidicintus*	ST
	Long-billed curlew	*Numenius americanus*	SC
	Mexican spotted owl	*Strix occidentalis lucida*	ST
	Mountain plover	*Charadrius montanus*	SC
	Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	SE
	Piping plover	*Charadrius melodus circumcinctus*	ST
	Southwestern willow flycatcher	*Empidonax traillii extimus*	SE
	Western snowy plover	*Charadrius nivosus ssp. nivosus)*	SC
	Western yellow-billed cuckoo	*Coccyzus americanus*	SC
	Whooping crane	*Grus americana*	SE
Fish	Arkansas darter	*Etheostoma Cragini*	ST
	Bonytail	*Gila elegans*	SE
	Brassy minnow	*Hybognathus hankinsoni*	ST
	Colorado pikeminnow	*Ptychocheilus lucius*	ST
	Colorado River cutthroat trout	*Oncorhynchus clarki pleuriticus*	SC
	Colorado roundtail chub	*Gila robusta*	SC
	Common shiner	*Luxilus cornutus*	ST
	Flathead chub	*Platygobio gracilus*	SC
	Greenback cutthroat trout	*Oncorhynchus clarki stomias*	ST
	Humpback chub	*Gila cypha*	ST
	Iowa darter	*Etheostoma exile*	SC
	Lake chub	*Couesius plumbeus*	SE
	Mountain sucker	*Catostomus playtrhynchus*	SC
	Northern redbelly dace	*Phoxinus eos*	SE

Taxonomic group	Common Name	Scientific Name	State Status
	Plains minnow	*Hybognathus placitus*	SE
	Plains orangethroat darter	*Etheostoma spectabile*	SC
	Rio Grande Chub	*Gila pandora*	SC
	Rio Grande cutthroat trout	*Oncorhynchus clarki virginalis*	SC
	Rio Grande sucker	*Catostomus plebeius*	SE
	Razorback sucker	*Xyrauchen texanus*	SE
	Southern redbelly dace	*Phoxinus erythrogaster*	SE
	Stonecat	*Noturus flavus*	SC
	Suckermouth minnow	*Phenacobius mirabilis*	SE
Mammals	Black-footed ferret	*Mustela nigripes*	SE
	Black-tailed prairie dog	*Cynomys ludovicianus*	SC
	Botta's pocket gopher	*Thomomy bottae rubidus*	SC
	Gray wolf	*Canis lupus*	SE
	Grizzly bear	*Ursus arctos*	SE
	Kit fox	*Vulpes macrotis*	SE
	Lynx	*Lynx canadensis*	SE
	Northern pocket gopher	*Thomomys talpoides macrotis*	SC
	Preble's meadow jumping mouse	*Zapus hudsonius preblei*	ST
	River otter	*Lontra canadensis*	ST
	Swift fox	*Vulpes velox*	SC
	Townsend's big eared bat	*Corynorhinus townsendii pallescens*	SC
	Wolverine	*Gulo gulo*	SE
Mollusks	Cylindrical papershell	*Anodontoides ferussacianus*	SC
	Rocky Mountain capshell	*Acroloxus coloradensis*	SC
Reptiles	Triploid checkered whiptail	*Cnemidophorus neotesselatus*	SC
	Midget faded rattlesnake	*Crotalus viridis concolor*	SC
	Longnose leopard lizard	*Gambelia wislizenii*	SC
	Yellow mud turtle	*Kinosternon flavescens*	SC
	Common king snake	*Lampropeltis getula*	SC
	Texas blind snake	*Leptotyphlops dulcis*	SC
	Texas horned lizard	*Phrynosoma cornutum*	SC
	Roundtail horned lizard	*Phrynosoma modestum*	SC
	Massasauga Rattlesnake	*Sistrurus catenatus*	SC
	Common garter snake	*Thamnophis sirtalis*	SC

1 Status: SE—State Endangered; ST—State Threatened; SC – State Special Concern (not a statutory category)

June 4, 2018 Sent via email

Ms. Selina Koler
Senior Transmission Siting and Environmental Planner
Tri-State Generation and Transmission Association, Inc.
1100 West 116th Avenue
Westminster, CO 80234

Re: Lazy Dog Delivery Point Project—Raptor Nest Surveys

Dear Ms. Koler,

Tri-State Generation and Transmission Association, Inc (Tri-State) is proposing to build a new electric substation and transmission line tap on an 8-acre parcel of land in the town of Erie located in Weld County, Colorado (Project; Figure 1). As part of its environmental due diligence, Tri-State contracted Tetra Tech, Inc. (Tetra Tech) to conduct ground-based raptor nest surveys in the area surrounding the Project. The purpose of the raptor nest surveys was to determine the location and status of raptor nests near the Project and the potential need for spatial and temporal setbacks during construction to minimize disturbance. This letter describes the raptor nest surveys that were conducted for the Project in spring 2018.

Regulatory Framework

Three federal environmental regulations pertain to protection of breeding raptors in proximity to construction sites: Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (BGEPA), and the Endangered Species Act (ESA). Under the MBTA, it is unlawful to intentionally take (e.g., injure, kill, or collect) any native migratory bird, their nests, or nest contents. Incidental take to otherwise lawful activities is not prohibited under the MBTA. The BGEPA prohibits the take of any bald or golden eagles, alive or dead, including any part, nest, or egg. The federal ESA mandates protection of species federally listed as threatened or endangered and their associated habitats. The federal ESA makes it unlawful to "take" a listed species.

In addition to federal regulations, Colorado Revised Statute 33-2-105 states that it is unlawful to "take, possess, transport, export, process, sell or offer for sale, or ship" any species listed as threatened or endangered by Colorado Parks and Wildlife (CPW).

CPW recommends seasonal non-encroachment buffers for the active nests of specific raptors that occur in Colorado, including but not limited to, Swainson's hawks, red-tailed hawks, bald eagles, and golden eagles. These recommendations are included in the document "Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors".[1] CPW defines "Active," as "Any nest that is frequented or occupied by a raptor during the breeding season, or

[1] CPW (Colorado Parks and Wildlife). Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors. https://cpw.state.co.us/Documents/WildlifeSpecies/LivingWithWildlife/RaptorBufferGuidelines2008.pdf. Accessed April 2018.

which has been active in any of the five previous breeding seasons." The buffers range from 0.25 mile to 0.5 mile depending on the species, and each species' buffer has an associated seasonal restriction of activity. CPW states that some species have adapted to urbanization and may tolerate human habitation closer to their nest. For the purposes of this document, this decreased buffer is referred to as an "urban buffer."

Raptor Nest Survey Methods

The raptor nest survey included a desktop database search and two field surveys. The largest CPW-recommended buffer for active nests is 0.5 mile; therefore, Tetra Tech applied a 0.5-mile buffer to the Project to determine the raptor nest survey area (Survey Area; Figure 1).

Prior to conducting the first field survey, Tetra Tech reviewed the publicly available CPW "All Species Activity Mapping" database for known raptor nests within and near the Survey Area.[2] The database provides data on osprey and bald eagles; the search did not identify any bald eagle or osprey nests within the Survey Area. According to the database, there is one active bald eagle nest approximately 3.5 miles to the southeast of the Project.

Two field surveys were conducted from the ground during the breeding season: one survey was completed on March 14, 2018 (Survey Round 1), and the second was conducted on May 10, 2018 (Survey Round 2). The surveys were timed to capture local raptor species (e.g. bald eagles, great horned owls, red-tailed hawks), as well as migratory raptors (Swainson's hawks) that arrive in Colorado later in the breeding season. The surveys were completed by a local biologist experienced in identifying Colorado raptors and raptor nests. The biologist was equipped with binoculars and a spotting scope to aid in identification. Surveys were conducted from public roads from a vehicle throughout the Survey Area. Surveys focused on raptors that nest in trees or other structures.

All raptor nests observed during the surveys were recorded. Tetra Tech assigned a unique identifier (Nest ID) to refer to the nests observed during the survey. When possible, nests were assigned to a species based on raptor use in and around the nest. When the biologist came across an unoccupied nest of an indiscernible species, the nest was recorded as an unoccupied nest with an unknown species determination. Raptor nest activity status was recorded for each nest observed and is defined as follows:[3]

a. In-Use: a nest characterized by the presence of one or more eggs, dependent young, or adult on the nest.
b. Inactive: Defined by the absence of any adult, egg, or dependent young at the nest.

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2 CPW (Colorado Parks and Wildlife). 2017. CPW All Species Activity Mapping Data. Available online at: http://www.arcgis.com/home/item.html?id=190573c5aba643a0bc058e6f7f0510b7. Accessed April 2018.

3 USFWS (U.S. Fish and Wildlife Service). 2016. Eagle Permits; Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests. Federal Register/Vol. 81. No. 242/December 16, 2016.

c. Unknown: A nest that could not be visited (e.g., road or access limitations) or that was visually obscured (e.g., vegetation around the nest site obscured the view of nest, wind speeds too high to determine status, etc.).
d. No longer present: A nest that was located during a previous survey, but has subsequently been found to be destroyed and no longer exists. No evidence remains.

In addition to potential nest locations, Tetra Tech noted sources of potential disturbance, unrelated to Project activities, within 0.5 mile of the Project that could impact raptors. High activity areas included construction activity including machines (bulldozers, excavators, cranes, etc.) moving and making noise. Nest locations and other sources of potential disturbance were recorded using the ArcGIS Collector Application and converted to shapefiles for use with ArcGIS software.

Results

The Project is located entirely within an agricultural field. There are no trees within the Project. A prairie dog colony was observed approximately 0.5 mile west of the Survey Area.

Nests

Four nests were observed over the course of the two nest survey rounds within the Survey Area (Figure 1).

Nest 1—No Longer Present

A nest in excellent condition was documented within the Survey Area during Survey Round 1. This nest was not located during Survey Round 2 and is deemed to be no longer present.

Nest 2—No Longer Present

A dilapidated nest was documented within the Survey Area during Survey Round 1. This nest was not located during Survey Round 2 and is deemed to be no longer present.

Nest 3—In-use Red-tailed Hawk

Nest 3 is located approximately 0.13 mile away from the proposed Project. One adult red-tailed hawk was observed brooding during Survey Round 2. No eggs or young were observed; however, based on observed behavior, the adult appeared to feed young.

Nest 4—In-use Swainson's Hawk

Nest 4 is located approximately 0.30 mile away from the Proposed Project. One adult Swainson's hawk was observed adding material to a new nest within the Survey Area during Survey Round 2. No eggs or young were observed.

Unrelated Areas of High Activity

High Activity Area 1—Front Range Landfill

High Activity Area 1 is located southwest of the Project Area (Figure 1). Large semi-tractor trailers were regularly observed driving around the landfill. This site has had activity since the initial survey in March and is estimated to be approximately 0.40 mile from Nest 3.

High Activity Area 2—Oil and Gas Facility

High Activity Area 2 is located north of the Project Area (Figure 1). This site has had activity since the initial survey in March. The main activity of the site is estimated to be over 0.25 mile from Nest 4 and 0.40 mile from Nest 3.

High Activity Area 3—Pumping Station

High Activity Area 3 is located west of the Project Area (Figure 1). This site has minimal activity; however, noise from the facility was evident from the Weld County Road 6. This site is estimated to be approximately 0.33 mile from Nest 3.

Conclusion and Recommendations

Four active raptor nests and no inactive nests were observed with the Survey Area as of May 10, 2018. The Project is within the breeding range of bald eagles; however, the closest known active bald eagle nest is approximately 3.5 miles from the Project. The CPW-recommended seasonal non-disturbance buffer zone for bald eagles is 0.5 mile from active nests. No eagles or their nests were observed during surveys, and nesting eagles are not expected to be affected by Project-related construction activities.

Please feel free to contact me with any questions or comments that you may have regarding these surveys or this report.

Sincerely,
TETRA TECH, INCORPORATED

Evonne Schroeder
Biologist
214.766.5150
Evonne.Schroeder@tetratech.com
Attachments (1):

(1) Figure 1—Project Location and Raptor Nest Survey Results

Figure 1

Lazy Dog

TRI-STATE Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

Raptor Nest Survey Results Spring 2018

WELD COUNTY, CO

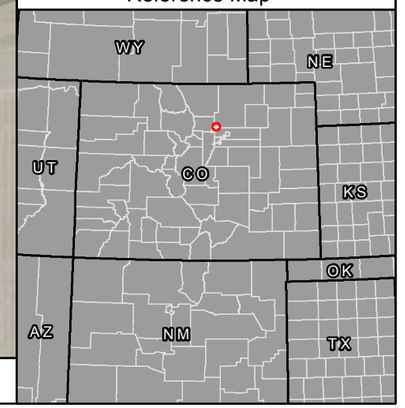
- Substation Parcel
- Easement
- Study Area
- Local Road
- HighActivityAreas
- Cleland Dairy
- Prairie Dog Colony

Species Using Nest, Nest Status

- Red-tailed hawk, In-Use
- Swainson's hawk, In-Use
- No Longer Present
- 1/3 Mile Buffer of Nest
- 1/4 Mile Buffer of Nest

TETRA TECH

Reference Map



County Road 7
County Road 6
Carol Dr
Mountain View Dr
Longview Rd
Weld County
Broomfield
County

1:8,000 WGS 1984 UTM Zone 13N

0 0.25 0.5 0.75 1 Miles

P:\GIS_PROJECTS\TriState\LazyDog\MXDs\Avian\TriState_LZD_2018RaptorNestSurvey_11i17i_20180531.mxd

Appendix G:
Alternative Equivalent Compliance

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Alternative Equivalent Compliance

Alternative Equivalent Compliance (AEC) for the height of the screen wall and planting pocket requirements is being requested for the Lazy Dog Substation Project. Screen wall maximum height is addressed in the Erie Unified Development Code (UDC) Section 10.6.4 Landscaping Requirements, Subsection H.5.a, regarding maximum height of fences and walls. The requirement for planting pockets is addressed in UDC Section 10.6.4, Subsection G.10.a.

Wall Height

To provide additional screening of the electrical equipment and provide security for the substation facility, the screen wall is proposed to be 8 feet tall, an alternative to the standard 6 feet. The following criteria, outlined in Section 10.6.1.5 of the UDC, have been met by the proposed alternative:

a. *The proposed alternative achieves the intent of the subject design standard to the same or better degree than the subject standard.*

The proposed alternative meets the intent of the design standards for the fencing and wall. The additional height of the wall would further block the view of the facility from adjacent property owners and travelers on Weld County Roads 6 and 7, while still complementing the existing setting. The wall height must be 8 feet high to provide required security for the substation equipment as an equivalent to the 8-foot-high chain link and barbed-wire fence typically used to secure electrical substations.

b. The proposed alternative substantially achieves the goals and policies of the Town's Comprehensive Master Plan to the same or better degree than the subject standard.

The 8-foot-high wall would achieve the goals and policies of Erie's Comprehensive Master Plan. The parcel of land to be used for the Project is designated as Public/Quasi Public (P/QP) land use on the comprehensive plan map (Erie 2016[1]). This land use category, Public/Quasi Public, is designated for facilities needed for essential public services, including electrical substations. Because it would be part of a larger system that provides electricity to local customers of United Power, the Project would provide an essential service to the community at large, and this intended use would be consistent with Erie's intended and designated use.

c. The proposed alternative result's in benefits to the community that are equivalent to or better than compliance with the subject design standard.

The Project would result in a bolstered reliable electric supply to local customers of United Power. In addition, the property development would result in tax revenue to the Town of Erie. The difference in a 6-foot wall and 8-foot wall would increase the expected benefits to the community by providing additional screening of the electrical equipment.

[1] Erie, 2016. Comprehensive Plan. Available Online: https://www.erieco.gov/DocumentCenter/View/369/2015-Comp-Plan---Updated-2162016 Accessed: December 5, 2018.

Planting Pockets

To comply with Section 10.6.4G of Erie's UDC, planting pockets would be installed every 150 feet along the east, south, and west sides of the screen wall to break up continuous runs of the screen wall. Planting pocket requirements cannot be met for the northern side of the screen wall. The proximity of the detention basin to the substation facility's northern screen wall prevents the planting pocket design on the wall and planting of vegetation adjacent to the screen wall.

The space left between the substation equipment and the wall, on the interior of the wall (the substation yard), is sized to be able to accommodate vehicles for substation maintenance while also maintaining safe distance of those vehicles from energized equipment per the National Electric Safety Code. Space between the substation equipment and wall is also needed in order to construct future underline electric distribution feeders that will go out from the substation and connect into United Power's existing distribution system. Those feeders will be placed underground but need adequate space to be installed and maintained.

The detention basin cannot be moved further north, because that would create an issue with added depth for the distribution feeders to be buried. They are going to be routed beneath the detention pond, however, the current configuration is preferred to ensure functionality and avoid line losses by burying deeper. Moving the detention pond would also be a major design change that would result in significant changes to the substation and site design overall.

The current landscaping layout will provide screening from nearby viewing locations. Placement of vegetation between the screen wall and Weld County Road 6 would interrupt the view of the screen wall from adjacent property owners and travelers on Weld County Road 6. The street trees along Weld County Road 6 and the trees and shrubs directly south of those would serve to screen the view of the substation wall and break up any continuous runs. This is illustrated in the substation elevations Appendix I, view 4 showing the proposed view of the Project from Weld County Road 6.

The following criteria, outlined in Section 10.6.1.5 of the UDC, have been met by the proposed alternative:

d. The proposed alternative achieves the intent of the subject design standard to the same or better degree than the subject standard.

The proposed alternative meets the intent of the design standards for the planting pockets. While the planting pockets on the north side of the screen wall are not proposed, placement of vegetation between the screen wall and Weld County Road 6 would interrupt the view of the screen wall from adjacent property owners and travelers on Weld County Road 6, while still complementing the existing setting.

e. The proposed alternative substantially achieves the goals and policies of the Town's Comprehensive Master Plan to the same or better degree than the subject standard.

The Project would achieve the goals and policies of Erie's Comprehensive Master Plan. The parcel of land to be used for the Project is designated as Public/Quasi Public (P/QP) land use on the

comprehensive plan map (Erie 2016). This land use category, Public/Quasi Public, is designated for facilities needed for essential public services, including electrical substations. Because it would be part of a larger system that provides electricity to local customers of United Power, the Project would provide an essential service to the community at large, and this intended use would be consistent with Erie's intended and designated use.

f. The proposed alternative results in benefits to the community that are equivalent to or better than compliance with the subject design standard.

The Project will result in a bolstered reliable electric supply to local customers of United Power. In addition, the property development would result in tax revenue to the Town of Erie. The variance in planting pocket design would not affect the expected benefits to the community.

Appendix H:
Substation Photo Simulations, Material Samples and Elevations

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Appendix H-1:
Photo Simulations

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LAZY DOG SUBSTATION PROJECT

Photo Simulation
WCR 6/WCR 7

Existing condition

Simulated condition

Landscape material illustrated in the simulated condition photo depicts 5 years growth from the time of installation.

Viewing Location:

Photo Location

PHOTOGRAPH INFORMATION

View Location: Northeast corner of the WCR 6/WCR 7 intersection.

Date of photograph: 8/2/2018

Time of photograph: 10:08 AM

Weather Condition: Sunny

Viewing Direction: Southwest

Latitude: 40° 01’ 46.13”N

Longitude: -104° 59’ 56.47”W

UNITED POWER
Your Touchstone Energy® Cooperative

TRI-STATE
Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

LAZY DOG SUBSTATION PROJECT

Photo Simulation
WCR 7 South of WCR 6

Existing condition

Simulated condition

Landscape material illustrated in the simulated condition photo depicts 5 years growth from the time of installation.

Viewing Location:

Photo Location

PHOTOGRAPH INFORMATION

View Location: WCR 7, approximately 0.5 mile south of WCR 6.

Date of photograph: 8/2/2018

Time of photograph: 12:05 PM

Weather Condition: Sunny

Viewing Direction: Northwest

Latitude: 40° 01’ 31.55”N

Longitude: -104° 59’ 59.62”W

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Appendix H-2: Materials Samples

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LAZY DOG SUBSTATION PROJECT

Materials Samples

ALLAN BLOCK (AB) FENCE SYSTEM

FENCE BLOCK COLORS

WALL
MATERIAL: CONCRETE
COLOR: 385

COLUMN AND BAND
MATERIAL: CONCRETE
COLOR: 386

V-TRACK SECURITY GATE

MATERIAL: WEATHERING (COR-TEN) STEEL OR ALUMINUM
COLOR: NATURAL PATINA OR POWDER COAT COLOR TO MATCH WEATHERING STEEL NATURAL PATINA

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Appendix H-3:
Substation Elevations

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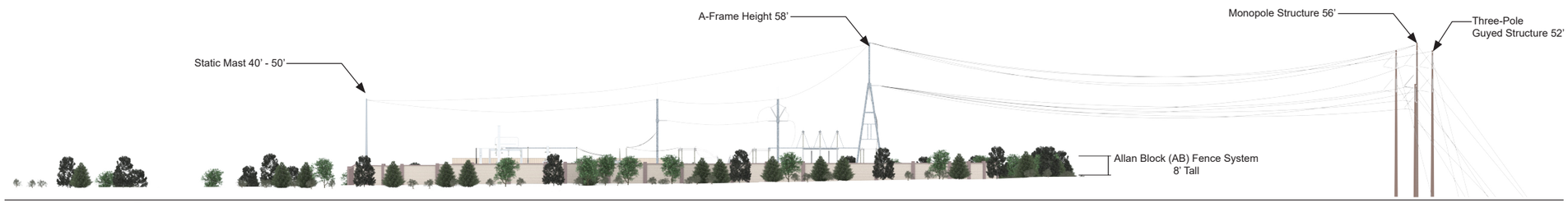
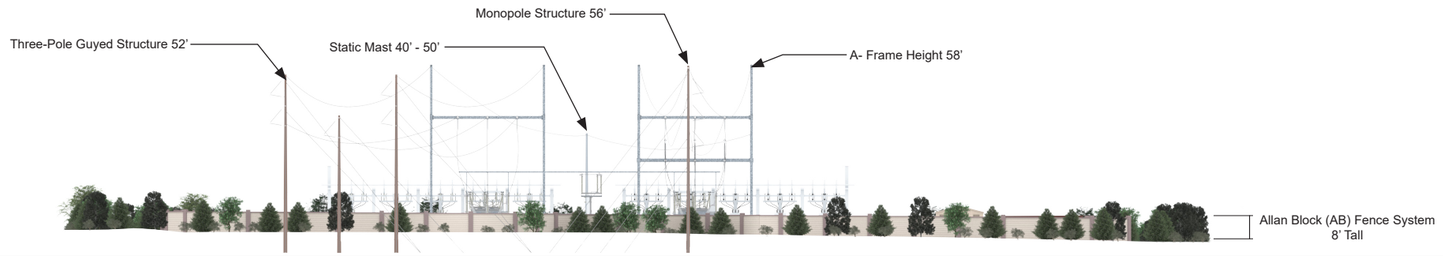
LAZY DOG SUBSTATION PROJECT

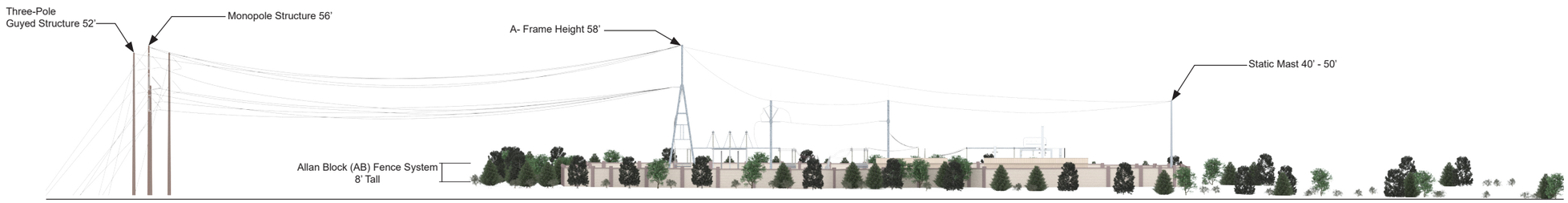
Substation Elevations



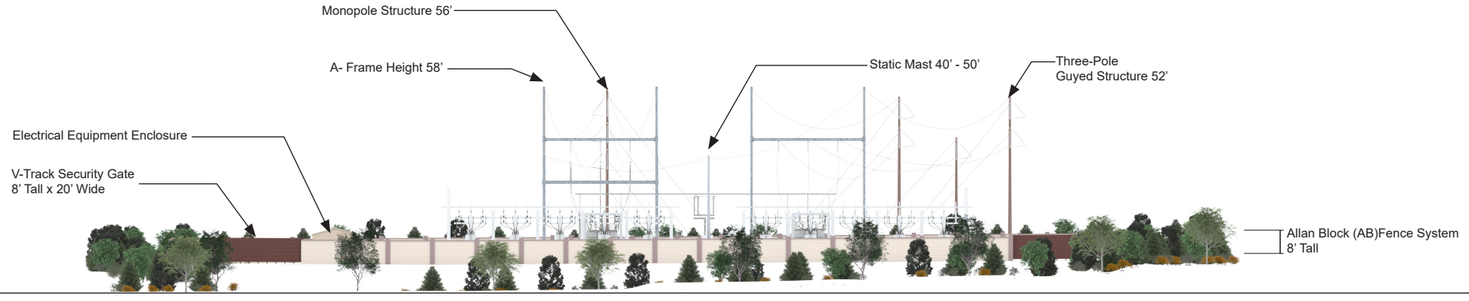
1 Site Plan View (West)



2 Site Plan View (South)



3 Weld County Rd 7 (East)



4 Weld County Rd 6 (North)

UNITED POWER
Your Touchstone Energy® Cooperative

TRI-STATE
Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

Steve Barwick
United Power, Inc.
500 Cooperative Way
Brighton, CO 80603
Telephone: (303) 637-1234
sbarwick@UnitedPower.com

August 27, 2019

Chris LaRue, Senior Planner
Town of Erie Planning and Development
645 Holbrook Street
Erie, CO 80516

Re: Response to Second Round of Agency Referral Comments and Staff Comments on the Lazy Dog Substation Project—Site Plan, Special Review Use and Minor Subdivision Applications

Dear Mr. LaRue:

United Power, Inc. (United Power), in coordination with Tri-State Generation and Transmission Association, Inc. (Tri-State), is proposing to construct and operate a new electric substation (Project) on a parcel owned by United Power located near the southwestern corner of the intersection of Weld County Road 6 and Weld County Road 7. The new substation, to be named Lazy Dog Substation, would serve the growing electrical needs of the surrounding area and is proposed to be located entirely within the limits of the Town of Erie (Erie) in Weld County, Colorado.

United Power submitted Site Plan, Special Use Review, and Minor Subdivision permit applications in accordance with Chapter 7 Section 12 from Title 10—Unified Development Code on January 30, 2019. United Power received the completeness review for all three concurrent permit applications from Erie on February 15, 2019, and subsequently submitted the agency referral packets on February 22, 2019. United Power received a first round of referral agency comments on April 25, 2019 and Town of Erie Staff comments on April 25, 2019 and May 9, 2019 and submitted responses and a new set of three permit applications on June 5, 2019. This letter addresses the following sets of comments on the Project permit applications, all transmitted by email:

- Referral Agency comments from John Ehrhardt, Ehrhart Land Surveying LuAnn Penfold, Mountainview Fire Rescue; and Jeanne Boyle and Clare Steninger, Merrick & Company received July 19, 2019
- Town of Erie, Ashley Tucker, Storm Water Coordinator, received July 18, 2019
- Town of Erie, Chad Schroeder, P.E. CFM, Development Engineering, received July 19, 2019
- Town of Erie, Chris LaRue, Senior Planner, Planning and Development, received July 17, 2019

Site Plan, Special Use Review and Minor Subdivision permit applications are being resubmitted for review by the referral agencies and the Town of Erie along with this comment and response letter. A letter from Northern Colorado Water Conservancy District (Attachment 1) is attached to this comment response document.

We look forward to working with you during the ongoing permit review process. Please do not hesitate to contact us if we can assist with any additional information or questions regarding United Power's responses to comments. Please contact me by telephone at 303-637-1234 or email at sbarwick@UnitedPower.com or contact Jennifer Chester by telephone at 303-291-6299 or by email at jennifer.chester@tetratech.com.

Sincerely,

Steve Barwick
Land Acquisition
United Power
500 Cooperative Way
Brighton, CO 80603

John Ehrhardt, Ehrhardt Land Surveying

Final Plat

John Ehrhardt Comment 1: Dedication Statement: Remove the word "plat" from "Front Range Landfill Minor Subdivision Plat". Refer to recorded subdivision title verbatim.

Response: The name of the original subdivision has been updated to "Front Range Landfill Minor Subdivision" on the Minor Subdivision Final Plat Exhibit. References to the recorded subdivision title in the Minor Subdivision permit application have been updated.

John Ehrhardt Comment 2: Dedication Statement: Reference date of plat recording 10/01/2010.

Response: The Dedication Statement on Sheet 1 of the Minor Subdivision Final Plat Exhibit has been updated to include the date of plat recording, 10/01/2010.

John Ehrhardt Comment 3: Survey Notes No. 10: Add title information.

Response: The title information found in the Survey Notes section of the Minor Subdivision Final Plat Exhibit has been updated to include the title search order number and date.

John Ehrhardt Comment 4: Clerk & Recorder Certificate: This certificate is unnecessary – Weld County does not use it.

Response: The Clerk & Recorder Certificate was originally included per the requirement stated in the Town of Erie Minor Subdivision User's Guide but has been removed based on this comment.

John Ehrhardt Comment 5: Sheet 2: Check with Planning, but I think the new policy is to not reference zoning and land use of adjacent properties.

Response: Zoning and land use information was provided per request from Chris LaRue in Town of Erie Planning and Development Department. No changes made.

John Ehrhardt Comment 6: Sheet 2: State the recording dates of all documents referenced.

Response: Recording dates have been added to instances where documents are referenced on the Minor Subdivision Final Plat Exhibit. The Western Area Power Administration transmission line easement has not yet been recorded, and a placeholder has been left.

John Ehrhardt Comment 7: Sheet 2: Give dimensions for the overlap of easement.

Response: Dimensions for the overlap of the property boundary with the WAPA electric transmission line easement have been included on the Minor Subdivision Final Plat Exhibit.

John Ehrhardt Comment 8: Sheet 2: Just a suggestion, spell out the road names. "Weld County Rd. 6", maybe even size them up a bit and darken them.

Response: Road names have been spelled out on the Minor Subdivision Final Plat Exhibit.

Mountain View Fire Rescue—LuAnn Penfold, Fire Prevention Specialist

Mountain View Fire Rescue Comment 1: I have reviewed and submitted material for the proposed Lazy Dog Substation proposed for construction at the southwest corner of Weld County Road 6 and 7 in Erie and have no additional comments to add at this time. The request to waive the installation of a Knox Box is under review by the Fire Marshal and Operations Staff and has not been granted at this time. Nothing in this review is intended to authorize or approve of any aspect of this project that does not comply with all applicable codes and standards. We appreciate being in involved in the planning process.

Response: The request to waive the installation of a Knox Box on the substation fence is still under review by the Fire Marshal and Operations Staff. United Power and Tri-State have made multiple attempts to contact Mountain View Fire Rescue for an update on their review but have not received a response.

Merrick—Jeanne Boyle, PE, CFM and Clare Steninger, PE

Phase III Drainage Report

Merrick Comment 1: The rational method runoff coefficients mentioned in section 3.3 of the report are for the 100-year storm event. Update references to include the proper storm event.

Response: Runoff coefficients have been updated to reflect the respective storms per Table 6-5 of the Urban Drainage Manual Vol. 1.

Merrick Comment 2: The required flow capacity for interior site culvert pipes does not match the design flows shown on the Drainage Delineation Map in Appendix A or in Table 4-4 of the report. Verify that all storm pipes are sized using the correct flow values.

Response: Pipe sizes have been updated to match the design flows and all tables match.

Merrick Comment 3: The report indicates that the East and West Channels that convey offsite runoff around the site do not have sufficient capacity to contain the 100-year design flow. Without sufficient capacity, runoff would overtop the swales and flow through the project sites to the Onsite Channel and detention pond. These drainage improvements are not designed to intercept this additional runoff. Regrade these channels to have adequate capacity. It appears that there is space to widen the channels or make them slightly deeper which should be adequate. In addition, 1 foot of freeboard is required per Town criteria, but a minimum freeboard depth of 3 inches will be allowed for these channels. Since the grading appears to be tight for these channels, extra care must be given when constructing them to ensure they are constructed per the plans and have adequate capacity.

Response: Swales have been resized to a 4' flat bottom and will maintain 3" of freeboard during the 100-year storm event.

Phase III Drainage Report, Appendix A – Site Maps and Design Drawings

Merrick Comment 4: Provide a drainage map that shows the entire drainage basin boundary for the offsite tributary basins. If needed, subdivide the offsite basins to provide peak flows at critical locations along the offsite channels.

Response: A map of offsite basins using 10-foot contours sourced from USGS, has been provided in Appendix A of the Phase III Drainage Report.

Merrick Comment 5: The riprap discharge pads at the outfall of the West Channel does not appear to be at the end of the channel. Flow spreading must occur before tying into undisturbed areas. In addition, sizing calculations to determine the minimum width of the flow spread to reduce the depth and velocity must be provided.

Response: Discharge pads have been sized and calculations provided in Appendix C of the Phase III Drainage Report. Both discharge pads are located at the end of the channels.

Merrick Comment 6: The contours on the Drainage Basin Delineation Map do not match those provided in the construction plans (Sheet S9302-A-01-004). In particular, the channel downstream of the pond outlet pipe is not shown on the Drainage Basin Delineation Map. Provide the same grading on both drawings.

Response: All Phase III Drainage Report drawings have been updated to the Project's current design as of 08-07-19.

Phase III Drainage Report, Appendix C – Site Specific Physical Design Properties

Merrick Comment 7: The following comments relate to the calculations in the Detention Basin Spreadsheet.

a. ***The elevations for the pond stage-storage curve determined from the UD-Detention spreadsheet and presented in Table 4-2 of the report do not match the elevations shown on the construction plans (i.e. Pond 1 Orifice plate detail on Sheet S9302-A-01-011). Revise pond details and sizing with actual elevations and areas proposed.***

b. ***The UD-Detention spreadsheet used for the pond design does not have outlet structure sizing calculations for the 100-year storm event. Clarify how the 0.08 cubic feet per second (cfs)release rate was determined (i.e., it appears that this is only the water quality release rate) and provide sizing calculations to include EURV and 100-year release rate controls. Update all modeling with corrected outlet release rates.***

c. ***Provide calculations for the forebay, trickle channels, and emergency overflow designs.***

Response:

a. All stage storage tables have been updated to reflect the invert of the trickle channel.

b. The 100-year storm event is completely detained below the overflow weir in an attempt to reduce runoff from the site. No overflow design is needed in UDFCD spreadsheet. The flow rate of 0.07 cfs was calculated in the model and matches the 0.1 cfs presented in the UDFCD spreadsheet. The model was also utilized to verify drain down time of the detention pond to meet state standards.

c. Calculations for the forebay, trickle channels, and emergency overflow designs have been provided in Appendix C of the Phase III Drainage Report.

Phase III Drainage Report, Appendix D – Rational Method Modeling Results

Merrick Comment 8: Provide a plan schematic to show the Rational Method Modeling elements and include as part of the drainage report documents since these calculations are hard to follow.

Response: A site map with a schematic of the drainage model has been provided in Appendix A of the Phase III Drainage Report.

Merrick Comment 9: The lengths, slopes, and characteristics provided in the Rational Method Modeling do not match those shown on the construction plans. Update all modeling with the correct values.

Response: All elements have been updated to reflect the correct values.

Merrick Comment 10: The resulting runoff values using the AutoDesk Storm & Sanitary Analysis tool appear to be incorrect. The resulting intensity values at the time of concentrations do not match the Rainfall Duration Intensity Curves in the Town of Erie Standards and Specifications. All Rational Method runoff calculations must be recalculated based on the Town's criteria. In addition, the sizing for all drainage improvements must be adjusted using the recalculated flows.

Response: IDF curves have been checked and updated to match Town standards

Merrick Comment 11: For the Onsite Channel in the South Yard basin, a roughness value of 0.027 was used. Clarify the materials that will be used to construct this channel since this value is too low for grass-lined channels.

Response: Material roughness coefficients have been modified to reflect a grass lined swale of 0.035 or similar.

Construction Plans

Merrick Comment 12: On Sheet S9302-A-01-004, show the dimensions for the flow spreads at the outfalls of the East and West Channels. Provide enlarged details if needed.

Response: Rip-rap dimensions have been added to the construction plans.

Merrick Comment 13: On Sheet S9302-A-01-011, in both the Pond 1 Orifice Plate detail and the Profile view, the 5-year water surface elevation is shown below the WQCV elevation which is not possible. Also, the 100-year water surface elevation is shown below the top of the orifice plate/overflow which is not typical unless it is intended to control the 100-year release rate by the orifices only and provide overdetention. Correct these details as needed.

Response: The intent was to provide over-detention and not have the 100-year event overtop the weir. Details have been updated to reflect correct water surface elevations.

Merrick Comment 14: Provide details including: all channel cross sections (shape dimensions and minimum depth), storm pipe profiles (including HGLs), and pond emergency overflow.

Response: Channel cross sections are shown in detail on the construction plans. Minimum depths have been added to details on sheet S9302-A-01-010 of the construction plans. Profiles with HGL's have been added for all culverts. Detail for the pond emergency overflow has been added.

Planning Comments—Ashley Tucker, Storm Water Coordinator, Town of Erie

Final Plat

1. ***Stormwater facilities associated with this project need drainage easements.***

2. ***Final plat should include the following dedication statement for drainage easements:***
   The undersigned, as owner(s) of the lands described herein, are responsible for the maintenance and operation of all drainage easements shown hereon and related drainage facilities, as provided in the Town of Erie Engineering Standards and Specifications, as amended. The undersigned grants the Town of Erie a perpetual right of ingress and egress from and to adjacent property to: inspect, maintain, operate and reconstruct the drainage easements and related facilities covered by the Erie Municipal Code, as amended; and to inspect, maintain, operate and reconstruct the drainage easements and related facilities, when the owner(s) fail to adequately maintain such drainage easements and related facilities, which inspection, maintenance, operation and reconstruction shall be at the cost of the owner(s).

Response: Per phone conversation between Ashley Tucker and Selina Koler on 7/24, a statement has been added to the plat which reads the following: *The undersigned, as owner(s) of the lands described herein, are responsible for the maintenance and operation of all drainage easements shown hereon and related drainage facilities, as provided in the Town of Erie Engineering Standards and Specifications, as amended. The undersigned grants the Town of Erie a perpetual right of ingress and egress from and to adjacent property to: inspect, maintain, operate and reconstruct the drainage easements and related facilities covered by the Erie Municipal Code, as amended; and to inspect, maintain, operate and reconstruct the drainage easements and related facilities, when the owner(s) fail to adequately maintain such drainage easements and related facilities, which inspection, maintenance, operation and reconstruction shall be at the cost of the owner(s).*

Phase III Drainage Report

1. ***Drainage Report***
   a. Please provide documentation of agreement of maintenance for permanent stormwater control measures (facilities).

   b. Please provide operation and maintenance plan for long-term maintenance of permanent stormwater control measures

Response:

a. United Power will be responsible for maintenance of permanent stormwater control measures as noted in Section 5.2 of the Drainage Report.

b. A Project specific O&M Plan for long-term maintenance of permanent stormwater control measures. This plan is included in the Drainage Report.

Erosion Control Plans

1. ***SWMP & Erosion Control Plan Comments***
   a. Currently in review for grading permit.

Response: None required.

Development Engineering Comments—Chad Schroeder, P.E. CFM, Town of Erie

Comments for Phase III Drainage Report:

See Merrick follow-on comments from 10 July 2019 and address accordingly

Response: The Drainage Report comments provided by Merrick and dated July 19, 2019, have been addressed. (See section above regarding Merrick comments.)

Planning Comments— Development Review Team, Town of Erie

Final Plat Comments:

1. ***Remove the irrigation easements from the plat and the recording reference. Since that will be in ROW the easement isn't necessary.***

Response: Irrigation easements have been removed from the Minor Subdivision Final Plat exhibit, and all sheets of the Site Plan set.

2. ***The easement on the south of Lot 1 appears to already have been recorded per the easement agreement in Appendix A. Rather than dedicating this by plat, simply reference the recording information.***

Response: The recording number has been referenced for the easement of the south of Lot 1, for the 20-foot electric distribution easement for United Power, on the Site Plan.

3. ***Development Agreement – The Town will need to determine if this will be required.***

Response: No further communications have been received from the Town of Erie. United Power assumes a Development Agreement is not required at this time.

4. ***The property will need to be included within the Northern Water District and Sub-District. This will be a condition on the project.***

   a. Per Chris LaRue: Regarding the Northern Water inclusion, as that is necessary to obtain water from the Town, we would like to have confirmation of that application being submitted prior to hearings. A condition of approval would also be included that the property be included in to the district before the Town could provide water to the site. I'm not exactly sure of the condition wording yet.

Response: United Power received a letter from Todd Fessenden (Attachment 1), Public Works Director from the Town of Erie, stating that Parcel No. 146728101004 is being included within the Northern Colorado Water Conservancy District boundaries, and no further action by United Power is required.

5. ***Final construction documents to be signed by the Town Engineering will be required for plat recordation.***

Response: Final construction drawings will be provided to Town Engineering for the Final Plat recording.

Site Plan

6. ***The planting legend should be updated to include the planting symbol for each tree category.***

Response: The legend has been updated and is reflected on the revised plan.

7. ***The access road shall comply with Section 10.6.14 in order to minimize the impact on streets and tracking of debris onto streets. This section states the developer shall improve the access road from the point of connection to a street a minimum distance of 200 feet on the access road. The access road shall be improved as a hard surface (concrete or asphalt) for the first 100 feet from the street and then improved as a crushed surface (concrete or asphalt) for 100 feet past the hard surface in the appropriate***

depth to support the weight load requirements of the vehicles accessing the site. Please discuss this further with engineering.

Response: Access road design has been modified to meet this requirement. See revised construction and site plan drawings.

8. The Town's preference is to not locate landscaping within detention areas. The proposed landscaping in this area should be moved to the eastern property line to provide further visual screening into the site from the surrounding roads.

Response: The proposed landscaping has been moved to the eastern property line as requested and is shown on the Landscape Plan within the Site Plan set.

9. Buried rip rap – The Town is still considering this issue.

Response: Per email from Chris LaRue to Stephanie Wiedmeyer on July 25, 2019, rip rap is not required to be buried.

TOWN OF ERIE
1874

April 25, 2019

United Power, Inc.
500 Cooperative Way
Brighton, CO 80603

Re: Your Property Under Weld County Assessor Parcel No. 146728101004 - Inclusion into Northern Water Boundaries

Dear Property Owner:

As you are aware, the Town of Erie ("Town") is your water provider. The Town receives much of its raw water from the Northern Colorado Water Conservancy District ("Northern Water"), which the Town then treats and provides to its residents. In order for any property to use water which is provided from Northern Water lawfully, the property must be formally "included" within the boundaries of Northern Water – a standard administrative and judicial process for Northern Water. As a result, every property in the Town receiving water service from the Town is legally required to be included in the Northern Water boundaries. The requirement to include in Northern Water boundaries is a mandatory step in the Town's development process.

Northern Water recently brought to the Town's attention that several properties, one of which is yours, have not been formally included in the boundaries of Northern Water yet, even though the properties receive Town water service. Accordingly, your property must be included in the Northern Water boundaries at this time. On April 9, 2019, the Town Board of Trustees adopted ordinances to approve the inclusion of your property, and the other properties, into the boundaries of Northern Water. Currently, the Town is working with its water attorneys and Northern Water staff to complete the inclusion of all properties not currently included into Northern Water. **You do not need to take any action.**

Once the inclusion is finalized, the only impact to your property will be the imposition of a one (1) mill levy by Northern Water on your property. All properties within the Town that receive Town water service are required to pay this one (1.0) mill levy to Northern Water, and this inclusion will make your property similarly situated as all other Town properties, in this respect. One (1) mill equals $7.20 per $100,000 in property valuation. In addition, please note that, typically, when individual properties that have been receiving Town water service go through this inclusion process, they are required to pay back taxes, calculated and accrued from the present back to 1937 – the year in which Northern Water was established. However, because the Town is handling this particular inclusion process, you are not required to pay any back taxes.

It should be noted that your property might also be included into the Municipal Subdistrict of Northern Water, if it is not already so included. That inclusion will not result in any additional mill levy or cost to you.

The one (1) mill levy from Northern Water should appear on your tax assessments moving forward, starting later this year. If you have any questions, you may contact the Town's water attorneys as follows: Paul Zilis or Andrea Kehrl, of Vranesh and Raisch, LLP, at 303.443.6151.

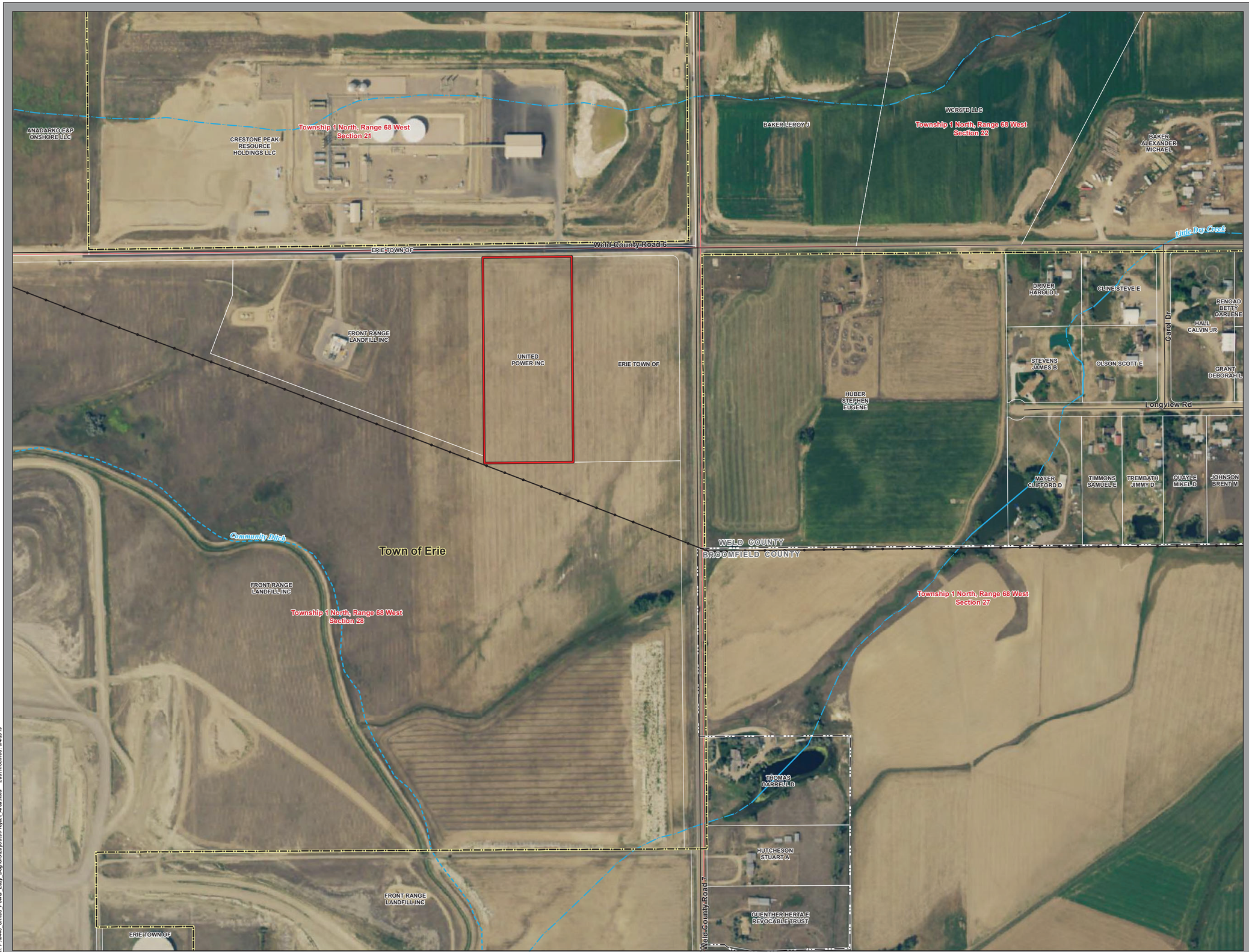
Thank you for your attention to this matter.

Todd Fessenden
Public Works Director
Town of Erie

Lazy Dog Substation Project

Figure 1
Project Area

Town of Erie, Weld County, CO
June 2019



Legend

- Project Area
- Town of Erie
- County Border

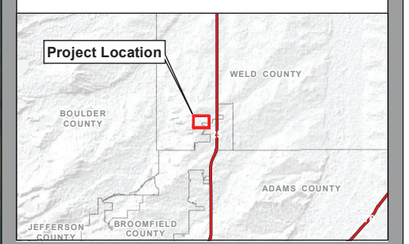
Hydrology

- Perennial Stream
- Intermittent Stream
- Canal/Ditch

Existing Electric Infrastructure

- 115kV Transmission Line

0 250 500 Feet



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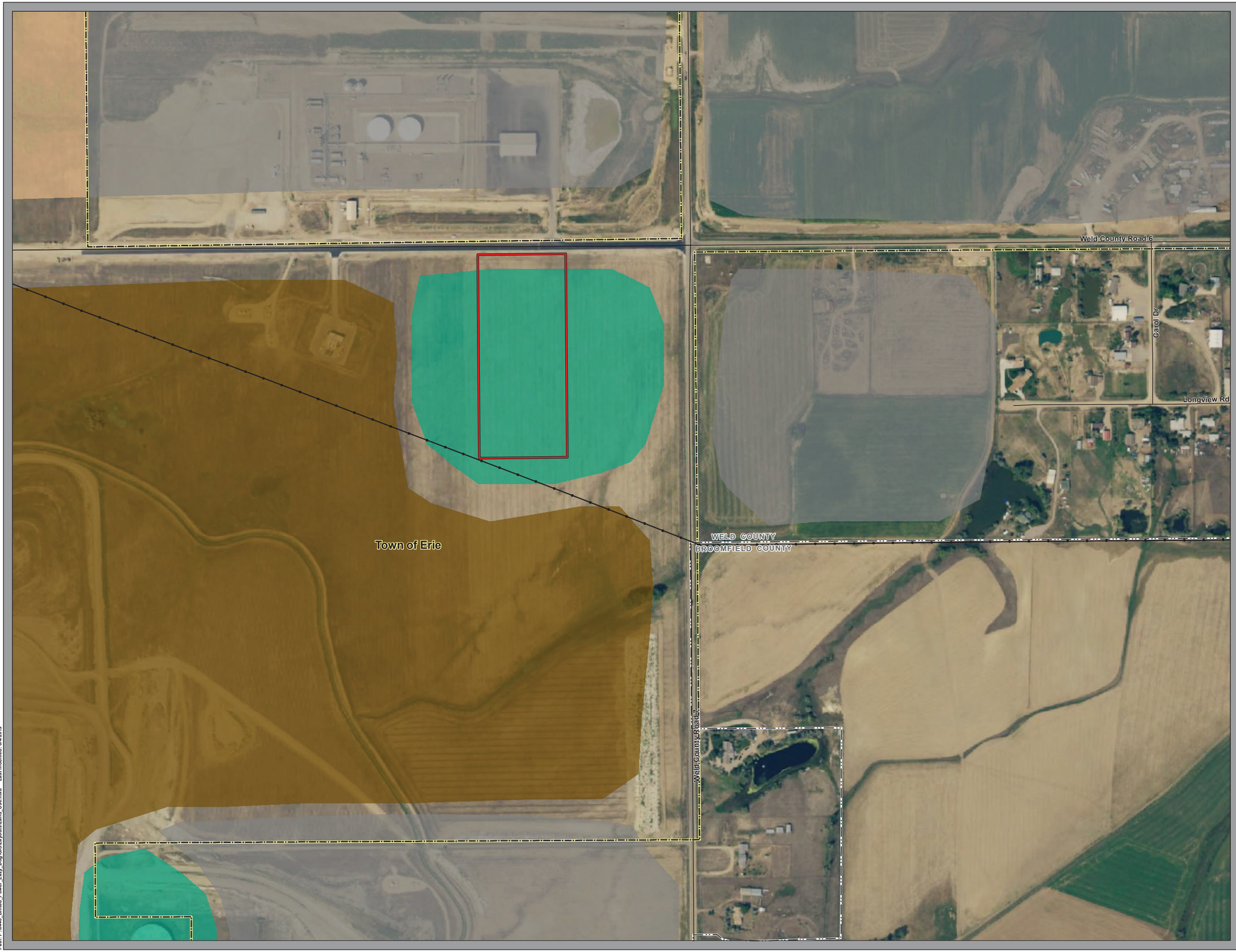
Lazy Dog Substation Project

Figure 2
Existing Land Use

Town of Erie, Weld County, CO
June 2019



Legend

- Project Area
- Town of Erie
- County Border

Hydrology

- Perennial Stream
- Intermittent Stream
- Canal/Ditch

Existing Electric Infrastructure

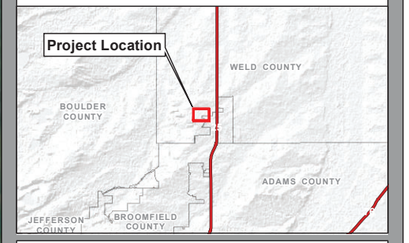
- 115kV Transmission Line

Town of Erie Land Use

- Industrial
- Landfill
- Public/QuasiPublic
- Rural Residential

N

0 250 500 Feet



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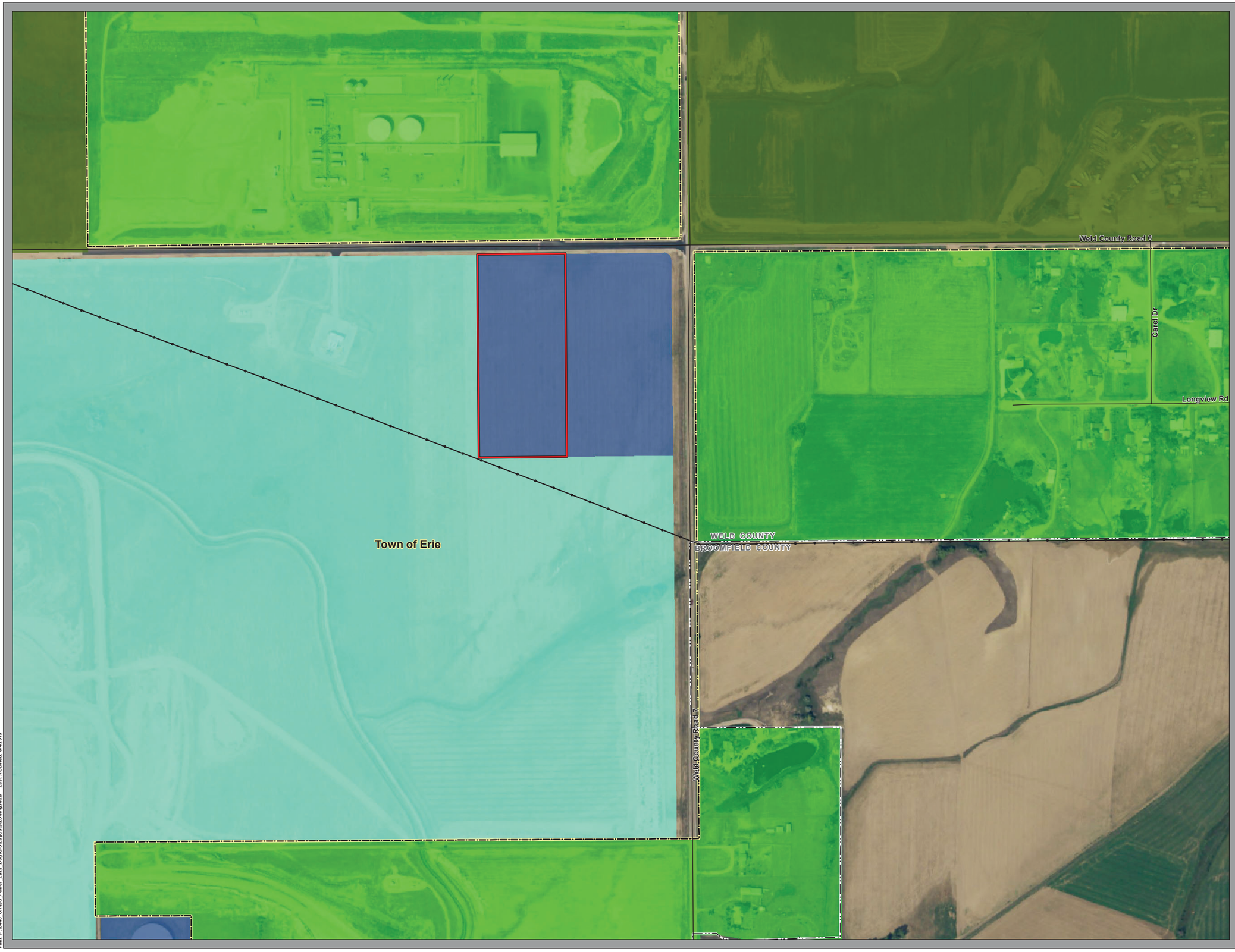
Lazy Dog Substation Project

Figure 3
Zoning

Town of Erie, Weld County, CO
June 2019



Legend

- Project Area
- Town of Erie
- County Border

Hydrology

- Perennial Stream
- Intermittent Stream
- Canal/Ditch

Existing Electric Infrastructure

- 115kV Transmission Line

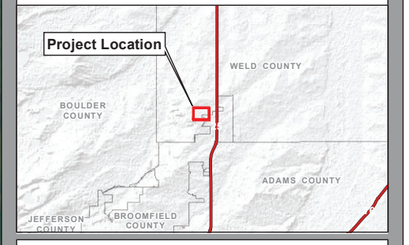
Town of Erie Zoning

- Planned Development
- Public Lands & Institutions
- Rural Preservation 3

Weld County Zoning

- Agriculture

0 250 500 Feet



TETRA TECH

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