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: SCHMIDT

PROJECT ADDRESS: NW OF INTERSECTION JAY ROAD AND NE COUNTY LINE ROAD

PROJECT DESCRIPTION: SUBDIVISION OF 118 DWELLING UNITS

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

Subdivision Name: SCHMIDT

Filing #: Lot #: Block #: Section: 13 Township: 1 NORTH Range: 69

OWNER *(attach separate sheets if multiple)*

Name/Company: TI RESIDENTIAL, LLC

Contact Person: ANDREW TRIETLEY

Address: 9801 E. EASTER AVE

City/State/Zip: CENTENNIAL, CO 80112

Phone: 720.413.3948 Fax:

E-mail: ATRIETLEY@VENTANACAP.COM

AUTHORIZED REPRESENTATIVE

Company/Firm: RICK ENGINEERING

Contact Person: TROY W. BALES

Address: 9801 E. EASTER AVE

City/State/Zip: CENTENNIAL, CO 80112

Phone: 303.537.8020 Fax:

E-mail: TBALES@RICKENGINEERING.COM

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: OPEN SPACE, LOW DENSITY RESIDENTIAL

Proposed Zoning: OPEN SPACE, LOW DENSITY RESIDENTIAL

Gross Acreage: 90.032

Gross Site Density (du/ac): 1.32

Lots/Units Proposed: 118

Gross Floor Area:

SERVICE PROVIDERS

Electric: UNITED POWER AND XCEL

Metro District:

Water *(if other than Town)*:

Gas: XCEL AND SOURCEGAS

Fire District: MOUNTAIN VIEW FIRE RESCUE AND STATION 6

Sewer *(if other than Town)*:

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: DARWIN HORAN, MANAGER OF TI RESIDENTIAL LLC Date: 11/17/17

~~Owner:~~ Date:

~~Applicant:~~ Date:

STATE OF COLORADO)
County of Arapahoe) ss.
)

The foregoing instrument was acknowledged before me this 21 day of November, 2017, by Darwin Horan.

My commission expires: 5/12/2021

Witness my hand and official seal.

ASHLEY WEISS
Notary Public
State of Colorado
Notary ID # 20174020366
My Commission Expires 05-12-2021

Notary Public

RICK
ENGINEERING COMPANY

May 16th, 2018

Town of Erie Planning Department
645 Holbrook St
Erie, CO 80516

PROPERTY: Schmidt Property (Meadowlark) – Town of Erie Colorado

APPLICANT: TI Residential L.L.C

SUBJECT: Preliminary Plat Letter of Intent – 2nd Submittal

To whom it may concern:

Rick Engineering Company (RICK) is pleased to resubmit the attached Preliminary Plat Application on behalf of TI Residential, L.L.C., the Applicant, for the Meadowlark Subdivision.

The Meadowlark development proposes 118 dwelling units on approximately 86.5 acres. Within the 86.5 acres there will be open space of 23.04 acres and a currently undeveloped mine subsidence area of 33.66 acres located south of the 0% strain line. The project site is located northwest of the intersection of Jay Rd and NE Countyline Rd. The adjacent zoning consists of low density residential and open space to the north and east, rural residential to the south and west. The project recently went through the process of Annexation and Zoning in 2016 and the sketch plan process in October of 2017. The existing zoning as defined in the approved Zoning Map is open space and Low Density Residential. The project as zoned is permitted to have up to 150 single family units within the LR zone. As a part of the annexation and zoning process the projects analyzed the impacts of the additional 150 units to the existing school infrastructure and fire protection services and have determined that both meet minimum standards. Will serve letters have been obtained from the electric, gas and communication providers as a part of the annexation and zoning process which assessed existing infrastructure and determined allowable service is available. The plan proposed has been designed to incorporate key environmental factors; including topography, geology, soils, watersheds and drainage, visual resources, and transportation. The goal of the development is to create a distinct and balanced community that integrates both the natural and built environment. The plan proposed has been designed to meet the Town of Erie Zoning Standards, Engineering Standards and Specifications and comments provided by the Town planning and engineering staff and comments received from the Planning Commission and Board of Trustees on the plan throughout the sketch plan process.

The project is concurrently processing a minor subdivision plat for the development. The proposed preliminary plat re-subdivides the tract within the minor subdivision plat into 118 single family lots and 10 tracts.

Additional improvements within the Meadowlark development consist of road improvements and utilities. A key regional roadway improvement is proposed with the extension of Lombardi Street from the Erie Village subdivision to the intersection of Jay and 123rd Street. This Right of Way will be dedicated on the plat for areas within the property and be dedicated by separate document for areas outside of the property. The documents including this narrative have been included in the resubmittal package for review and approval

- Preliminary Plat
- Preliminary Construction Plans
- Preliminary Landscape Plans
- Tree Survey and Narrative
- Phase II Drainage Study
- Preliminary Erosion Control Plans and Report
- IGA for trail construction
- Exhibit for Jay/123rd/Jasper Road
- Preliminary Utility Report
- Mine Subsidence Report (WEE)
- Revised ALTA
- Surface Use Agreement (Supplement)
- Response Letter to Referrals
- Response Letter to Town comments
- Ecological Site Assessment (Walsh)
- Overall Corner Lot fit and block length Exhibit
- open space calculation exhibit

The following items were in included in the original submittal and not included in the resubmittal as there are no changes to the document or plan.

- Application
- Fee Check
- Letter of Authorization
- Title Report
- Existing Special Agreements inclusive of a Surface Use agreement and Avigation Easement agreement
- Cultural Resources Review
- Phase I ESA
- Traffic Impact Study

If you have any questions regarding the documents provided with this application, please contact us at 303-537-8020.

Troy Bales
Associate
Rick Engineering Company

TOWN OF ERIE
AFFIDAVIT OF NOTICE POSTING

MEADOWLARK PRELIMINARY PLAT BOARD OF TRUSTEES PUBLIC HEARING

I, *KEVIN SAN* ATTEST THAT NOTICE WAS POSTED IN ACCORDANCE WITH THE ERIE MUNICIPAL CODE, TITLE 10, – "UNIFIED DEVELOPMENT CODE AND DESIGN GUIDELINES," AT LEAST 15 DAYS BEFORE THE SCHEDULED HEARING TO BE HELD ON THE 26TH DAY OF MARCH, 2019 A.D. THE PHOTO, ABOVE, IS A TRUE AND CORRECT PHOTO OF THE NOTICE SO POSTED.

____
(SIGNATURE OF PERSON LISTED ABOVE)

STATE OF COLORADO)
) ss.
COUNTY OF Arapahoe)

ACKNOWLEDGED BEFORE ME THIS 7 DAY OF March, 2019 BY Kevin San
AS Associate Engineering Designer

WITNESS MY HAND AND OFFICIAL SEAL

____
NOTARY PUBLIC

MY COMMISSION EXPIRES: 5/12/2021

ASHLEY WEISS
Notary Public
State of Colorado
Notary ID # 20174020366
My Commission Expires 05-12-2021

TOWN OF ERIE
AFFIDAVIT OF NOTICE POSTING

SCHMIDT PRELIMINARY PLAT PLANNING COMMISSION PUBLIC HEARING

I, *KEVIN SAN* ATTEST THAT NOTICE WAS POSTED IN ACCORDANCE WITH THE ERIE MUNICIPAL CODE, TITLE 10, – "UNIFIED DEVELOPMENT CODE AND DESIGN GUIDELINES," AT LEAST 15 DAYS BEFORE THE SCHEDULED HEARING TO BE HELD ON THE 20TH DAY OF FEBRUARY, 2019 A.D. THE PHOTO, ABOVE, IS A TRUE AND CORRECT PHOTO OF THE NOTICE SO POSTED.

____

(SIGNATURE OF PERSON LISTED ABOVE)

STATE OF COLORADO)
) ss.
COUNTY OF Arapahoe)

ACKNOWLEDGED BEFORE ME THIS 8 DAY OF February 2019 BY Kevin San
AS Associate Engineering Designer.

WITNESS MY HAND AND OFFICIAL SEAL

NOTARY PUBLIC

MY COMMISSION EXPIRES: 5/12/2021

ASHLEY WEISS
Notary Public
State of Colorado
Notary ID # 20174020366
My Commission Expires 05-12-2021

From:	Troy Bales
To:	Chris LaRue
Subject:	FW: D1048 - Schmidt Neighborhood Meeting 6/12/18 Summary
Date:	Wednesday, November 28, 2018 8:58:22 AM
Attachments:	PDF Document.pdf 2018-0612_Neighborhood Meeting.pptx

Chris

We had our neighborhood meeting on the Meadowlark Subdivision per Town code for the Preliminary Plat Application on 6/12/2018. Attached is the sign in sheet and the PowerPoint slides that we presented at the meeting.

The sign in sheet indicated 13 people were in attendance

Most people who attended were just looking for more information. Residents with concerns were properties in Boulder County along the west side of Jay and 123rd and further west along Jasper.

People were generally supportive of the proposed site plan and most who lived in Erie Village liked the large buffer between their properties and the proposed homes in Meadowlark (aka Schmidt). Specific concerns that were brought up were safety of the current alignment of Jay and jasper road and the proposed Lombardi Street connection, and mine subsidence in the area.

Please advise if you have any questions

Thanks

Troy Bales P.E.
ASSOCIATE

RICK ENGINEERING COMPANY
9801 East Easter Ave / Centennial, CO 80112

t 303.537.8020 / **d** 303.537.8025 / **c** 619.540.6848
tbales@rickengineering.com / www.**rickengineering**.com

TOWN OF ERIE
AFFIDAVIT OF NEIGHBORHOOD MEETING NOTICE POSTING

Meadowlark Subdivision Preliminary Plat

(Taken at the intersection of Jasper Rd and 123rd Street)

(Taken on Jay Rd.)

I, (*TROY BALES*), ATTEST THAT NOTICE WAS POSTED IN ACCORDANCE WITH THE ERIE MUNICIPAL CODE, TITLE 10.7.2 D. NOTICE WAS POSTED ON MAY 25TH FOR THE NEIGHBORHOOD MEETING ON JUNE,12TH,2018 WHICH IS AT LEAST 15 DAYS BEFORE THE SCHEDULED NEIGHBORHOOD MEETING. THE PHOTOS, ABOVE, ARE A TRUE AND CORRECT REPRESENTATION OF THE NEIGHBORHOOD MEETING NOTICE SIGNS THAT HAVE BEEN POSTED.

[signature]
(*SIGNATURE OF PERSON THAT POSTED NOTICE*)

STATE OF COLORADO)
) ss.
COUNTY OF Arapahoe)

ACKNOWLEDGED BEFORE ME THIS 29 DAY OF May, 2018
BY Troy Bales AS Project Manager.

WITNESS MY HAND AND OFFICIAL SEAL

ASHLEY WEISS
Notary Public
State of Colorado
Notary ID # 20174020366
My Commission Expires 05-12-2021

MY COMMISSION EXPIRES: 5-12-2021

[signature]
NOTARY PUBLIC

ALTA/NSPS LAND TITLE SURVEY

LOCATED IN NORTHEAST QUARTER OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST 6TH P.M. TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO

LEGAL DESCRIPTION

A PARCEL OF LAND BEING A PORTION OF COUNTY ROAD BOOK B, PAGE 32, ALL OF THE LAND DESCRIBED IN RECEPTION NUMBER 3566775, ALL OF THE LAND DESCRIBED IN RECEPTION NUMBER 2622331, ALL OF THAT PARCEL DESCRIBED IN RECEPTION NUMBER 90603799, A PORTION OF THE LAND DESCRIBED IN RECEPTION NUMBER 03466895 ALL OF THE BOULDER COUNTY RECORDS, LOCATED IN THE NORTHEAST QUARTER OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF BOULDER, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT EAST QUARTER CORNER OF SAID SECTION 13;

THENCE NORTH 78°19'29" WEST, A DISTANCE OF 530.49 FEET TO THE POINT OF BEGINNING;

THENCE NORTH 89°03'44" WEST, A DISTANCE OF 146.94 FEET;

THENCE NORTH 88°40'57" WEST, A DISTANCE OF 257.83 FEET;

THENCE NORTH 86°53'01" WEST, A DISTANCE OF 494.38 FEET;

THENCE NORTH 84°46'00" WEST, A DISTANCE OF 930.87 FEET;

THENCE SOUTH 05°27'34" WEST, A DISTANCE OF 3.99 FEET;

THENCE NORTH 84°32'26" WEST, A DISTANCE OF 321.33 FEET;

THENCE NORTH 00°28'28" WEST, A DISTANCE OF 24.95 FEET;

THENCE SOUTH 84°39'05" EAST, A DISTANCE OF 2.60 FEET TO THE WEST LINE OF THE SOUTHWEST QUARTER OF THE NORTHEAST QUARTER OF SAID SECTION 13;

THENCE ALONG SAID WEST LINE NORTH 00°07'34" EAST, A DISTANCE OF 852.61 FEET;

THENCE ALONG A NON-TANGENT CURVE TO THE LEFT, HAVING A RADIUS OF 256.00 FEET, A CENTRAL ANGLE OF 90°00'02", WHOSE CHORD BEARS NORTH 44°52'39" WEST A DISTANCE OF 362.04 FEET, FOR AN ARC DISTANCE OF 402.13 FEET;

THENCE NORTH 00°05'43" EAST, A DISTANCE OF 40.34 FEET;

THENCE SOUTH 89°54'17" EAST, A DISTANCE OF 256.04 FEET TO THE WEST LINE OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SAID SECTION 13;

THENCE ALONG SAID WEST LINE NORTH 00°07'34" EAST, A DISTANCE OF 1,264.78 FEET TO THE NORTH QUARTER CORNER OF SAID SECTION 13;

THENCE ALONG THE NORTH LINE OF THE NORTHEAST QUARTER OF SAID SECTION 13 SOUTH 89°08'12" EAST, A DISTANCE OF 1,789.05 FEET TO A POINT ON THE APPROXIMATE CENTERLINE OF AN IRRIGATION DITCH;

THENCE ALONG SAID DITCH CENTERLINE THE FOLLOWING FIVE (5) COURSES AND DISTANCES;

1) THENCE SOUTH 05°18'53" WEST, A DISTANCE OF 85.95 FEET;

2) THENCE SOUTH 09°21'45" WEST, A DISTANCE OF 18.85 FEET;

3) THENCE ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 171.00 FEET, A CENTRAL ANGLE OF 71°01'12", WHOSE CHORD BEARS SOUTH 44°52'21" WEST A DISTANCE OF 198.65 FEET, FOR AN ARC DISTANCE OF 211.96 FEET;

4) THENCE SOUTH 80°22'57" WEST, A DISTANCE OF 39.94 FEET;

5) THENCE SOUTH 84°33'07" WEST, A DISTANCE OF 108.82 FEET TO A POINT ON THE NORTH LINE OF AN EASEMENT FOR THE LOWER BOULDER IRRIGATION CANAL, AS RECORDED AT BOOK 986, PAGES 266 AND 269, BOULDER COUNTY CLERK AND RECORDER'S OFFICE;

THENCE ALONG THE NORTH LINE OF SAID EASEMENT THE FOLLOWING TWO (2) COURSES AND DISTANCES:

1) THENCE NORTH 76°16'12" WEST, A DISTANCE OF 118.14 FEET;

2) THENCE SOUTH 67°07'48" WEST, A DISTANCE OF 46.69 FEET TO A POINT ON THE WEST LINE OF THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF SAID SECTION 13;

THENCE SOUTH 00°09'11" WEST, A DISTANCE OF 847.48 FEET TO A POINT, EVIDENCED BY A 5/8" REBAR AND PLASTIC CAP, PLS 6716;

THENCE NORTH 89°29'13" EAST, A DISTANCE OF 104.55 FEET;

THENCE SOUTH 00°09'16" WEST, A DISTANCE OF 17.93 FEET A POINT ON THE APPROXIMATE CENTERLINE OF AN IRRIGATION DITCH;

THENCE ALONG SAID DITCH CENTERLINE THE FOLLOWING NINE (9) COURSES AND DISTANCES:

1) THENCE SOUTH 87°53'01" EAST, A DISTANCE OF 96.53 FEET;

2) THENCE SOUTH 54°47'37" EAST, A DISTANCE OF 37.79 FEET;

3) THENCE SOUTH 35°58'27" EAST, A DISTANCE OF 46.95 FEET;

4) THENCE SOUTH 30°22'26" EAST, A DISTANCE OF 187.12 FEET;

5) THENCE SOUTH 27°11'53" EAST, A DISTANCE OF 237.04 FEET;

6) THENCE SOUTH 20°56'33" EAST, A DISTANCE OF 133.69 FEET;

7) THENCE SOUTH 08°05'21" EAST, A DISTANCE OF 67.96 FEET;

8) THENCE SOUTH 01°39'24" EAST, A DISTANCE OF 209.10 FEET;

9) THENCE SOUTH 00°14'08" WEST, A DISTANCE OF 273.40 FEET TO A POINT ON THE NORTH LINE OF A PARCEL OF LAND RECORDED AT RECEPTION NO. 2484649, BOULDER COUNTY CLERK AND RECORDER'S OFFICE;

THENCE NORTH 89°36'22" WEST, A DISTANCE OF 0.66 FEET TO THE NORTHWEST CORNER OF SAID PARCEL, EVIDENCED BY A 5/8" REBAR AND ALUMINUM CAP, PLS 4846;

THENCE SOUTH 00°14'06" WEST, A DISTANCE OF 75.50 FEET TO A POINT, EVIDENCED BY A 1-1/2" ALUMINUM CAP SET IN CONCRETE, PLS 2152;

THENCE NORTH 73°58'04" WEST, A DISTANCE OF 114.01 FEET TO A POINT, AS EVIDENCED BY A 1-1/2" ALUMINUM CAP SET IN CONCRETE, PLS 2152;

THENCE SOUTH 02°13'11" WEST, A DISTANCE OF 239.47 FEET;

THENCE SOUTH 88°40'57" EAST, A DISTANCE OF 257.08 FEET;

THENCE SOUTH 89°03'44" EAST, A DISTANCE OF 146.43 FEET;

THENCE SOUTH 00°23'41" WEST, A DISTANCE OF 40.00 FEET TO THE POINT OF BEGINNING.

GENERAL NOTES

1. THIS SURVEY DOES NOT CONSTITUTE A TITLE SEARCH BY JEHN ENGINEERING TO DETERMINE OWNERSHIP OR EASEMENTS OF RECORD. FOR ALL INFORMATION REGARDING EASEMENTS, RIGHTS-OF-WAY AND TITLE OF RECORD, JEHN ENGINEERING RELIED UPON INFORMATION BINDER ORDER NUMBER ABZ 70583040, ISSUED BY LAND TITLE GUARANTEE COMPANY AND HAVING AN EFFECTIVE DATE OF AUGUST 17, 2018.

2. 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 CERTIFICATION SHOWN HEREON.

3. THIS SURVEY IS VALID ONLY IF PRINT HAS ORIGINAL SEAL AND SIGNATURE OF SURVEYOR.

4. BASIS OF BEARINGS: BEARINGS ARE BASED UPON THE SOUTH LINE OF THE NORTHEAST QUARTER OF SECTION 13 AS BEARING N89°18'28"W BETWEEN THE MONUMENTS SHOWN HEREON.

5. UNITS: ALL DIMENSIONS SHOWN HEREON ARE IN U.S. SURVEY FEET. ALL BEARINGS SHOWN HERE ON ARE IN DEGREE-MINUTES-SECONDS.

6. GROSS LAND AREA (TABLE A #4): THE SUBJECT PROPERTY IS 4,099,846 SQ. FT OR 94.120 ACRES±.

7. ZONING (TABLE A #6) LR & AG/OS

8. UTILITIES (TABLE A #11) UTILITIES SHOWN HEREON ARE FROM VISIBLE FIELD INFORMATION, CONSTRUCTION DOCUMENTS AND UTILITY LOCATES PROVIDED BY DIVERSIFIED UNDERGROUND. JEHN ENGINEERING DOES NOT GUARANTEE THESE LOCATIONS, OR THAT THE UTILITIES SHOWN HEREON COMPRISE ALL UTILITIES IN THIS AREA, EITHER IN SERVICE OR ABANDONED. FOR THE EXACT LOCATION OF ALL UNDERGROUND UTILITIES, CONTACT THE APPROPRIATE UTILITY COMPANY PRIOR TO CONSTRUCTION.

VICINITY MAP
1"=600'

SURVEYOR'S CERTIFICATE

TO: TI RESIDENTIAL LLC, A COLORADO LIMITED LIABILITY COMPANY
SUE OWEN SCHMIDT
LAND TITLE GUARANTEE COMPANY

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2016 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 1, 4, 8, AND 11 OF TABLE A THEREOF. THE ACCOMPANYING PLAT ACCURATELY AND PROPERLY WITHIN APPLICABLE STANDARDS OF PRACTICE SHOWS SAID SURVEY BASED UPON MY KNOWLEDGE, INFORMATION AND BELIEF. THIS SURVEY IS NOT A GUARANTY OR WARRANTY, EITHER EXPRESSED OR IMPLIED.

THE FIELD WORK WAS COMPLETED ON 4/12/2018
DATE OF PLAT OR MAP; 4/13/2018

____
MARK T. WILSON
REGISTERED COLORADO LAND SURVEYOR NO. 36062
FOR AND ON BEHALF OF JEHN ENGINEERING, INC.

CLERK AND RECORDER CERTIFICATE

STATE OF COLORADO)
) SS
COUNTY OF BOULDER)

DEPOSITED THIS ________ DAY OF __________________, 201_, AT __________, M., IN BOOK ___________ OF

THE COUNTY SURVEYOR'S LAND SURVEY/RIGHT-OF-WAY SURVEYS AT PAGE(S) _______________,

RECEPTION NUMBER______________________,

____
COUNTY SURVEYOR/DEPUTY COUNTY SURVEYOR

J:\1814\217-089\SURVEY\ALTA\ALTA SUPERBLOCK REV 9-06-18.DWG

JēHN ENGINEERING
Est. 1982
5690 WEBSTER STREET
ARVADA, CO 80002
PH. (303) 423-6036 FAX (303) 467-9438

ALTA/NSPS LAND TITLE SURVEY
LOCATED IN NORTHEAST QUARTER OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST 6TH P.M. TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO
SHEET 2 OF 3

TITLE COMMITMENT B2 EXCEPTION NOTE

THE SURVEYED PROPERTY IS SUBJECT TO THE TERMS, PROVISIONS, COVENANTS, CONDITIONS, RESTRICTIONS, OBLIGATIONS AND RESERVATIONS CONTAINED IN THE FOLLOWING RECORDED DOCUMENTS IN THE TITLE COMMITMENT AS REFERENCED IN GENERAL NOTE 1. *(ITALIC TEXT IS THE SURVEYOR'S PARENTHETICAL NOTE)*

-INDICATES THE EXCEPTION NUMBER WITHIN THE SCHEDULE B-2 OF THE TITLE COMMITMENT REFERENCED IN NOTE NUMBER 1 *(EXCEPTIONS 1-6 ARE STANDARD EXCEPTIONS).*

1. EXISTING LEASES AND TENANCIES, IF ANY.
NOT A SURVEY ISSUE.

2. ALL OIL, GAS AND OTHER MINERALS AND TERMS THEREIN AS RESERVED IN DEED RECORDED JANUARY 17, 1921, IN BOOK 445 AT PAGE 534.
APPLIES TO THOSE PORTIONS LYING IN THE WEST HALF OF THE NORTHEAST QUARTER AND THE WEST HALF OF THE SOUTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 13.

NOTE: MINERAL DEED WAS RECORDED JUNE 16, 2008 UNDER RECEPTION NO. 2936492.
TRANSFER OF THE PRECEDING DOCUMENT PARCELS.
NOTE: REQUEST FOR NOTICE OF SURFACE DEVELOPMENT WAS RECORDED SEPTEMBER 28, 2009 UNDER RECEPTION NO. 03032258.
REFERS TO PRECEDING DOCUMENTS PARCELS.

3. OIL AND GAS LEASE BETWEEN THE ROCKY MOUNTAIN FUEL COMPANY, LESSOR, AND THE VESSELS COMPANY, LESSEE, AS MEMORIALIZED BY MEMORANDUM OF LEASE RECORDED OCTOBER 31, 1980 UNDER RECEPTION NO. 420402, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.
BLANKET.
DECLARATION OF UNITIZATION RECORDED APRIL 21, 1981 UNDER RECEPTION NO. 442785 AND AMENDMENT THERETO RECORDED SEPTEMBER 14, 1992 UNDER RECEPTION NO. 01219238.
APPLIES TO THOSE PORTIONS LYING IN THE WEST HALF OF THE NORTHEAST QUARTER AND THE WEST HALF OF THE SOUTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 13.
PRODUCTION AFFIDAVIT RECORDED JULY 27, 1981 UNDER RECEPTION NO. 456647.

NOTICE OF RIGHT TO USE SURFACE OF LANDS WAS RECORDED DECEMBER 24, 1996 UNDER RECEPTION NO. 1666157.
APPLIES TO THOSE PORTIONS LYING IN THE WEST HALF OF THE NORTHEAST QUARTER AND THE WEST HALF OF THE SOUTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 13.

REQUEST FOR NOTIFICATION OF SURFACE DEVELOPMENT WAS RECORDED APRIL 11, 2006 UNDER RECEPTION NO. 2769128.
INCLUDES THOSE PORTIONS LYING IN THE WEST HALF OF THE NORTHEAST QUARTER AND THE WEST HALF OF THE SOUTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 13.

AMENDMENT TO LEASES RECORDED DECEMBER 13, 2007 UNDER RECEPTION NOS. 2899426 AND DECEMBER 13, 2007 UNDER RECEPTION NO. 2899427.

DECLARATION OF POOLING RECORDED FEBRUARY 5, 2013 UNDER RECEPTION NO. 03287549 AND FEBRUARY 5, 2013 UNDER RECEPTION NO. 03287555.
INCLUDES THE SOUTH HALF OF THE NORTHEAST QUARTER OF SECTION 13.

(AFFECTS W1/2 NE1/4)

4. OIL AND GAS LEASE BETWEEN RUSSELL L. PEATE, LESSOR, AND THE VESSELS COMPANY, LESSEE, RECORDED MARCH 11, 1981 UNDER RECEPTION NO. 437378, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.
AFFECTS THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 13

NOTE: PRODUCTION AFFIDAVIT RECORDED JULY 27, 1981, UNDER RECEPTION NO. 456647.
AFFECTS THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 13

REQUEST FOR NOTIFICATION OF SURFACE DEVELOPMENT RECORDED APRIL 11, 2006 AT RECEPTION NO. 2769128.
INCLUDES THOSE PORTIONS LYING IN THE WEST HALF OF THE NORTHEAST QUARTER AND THE WEST HALF OF THE SOUTHEAST QUARTER OF THE NORTHEAST QUARTER, AND PARCELS LYING IN THE REMAINDER OF THE NORTHEAST QUARTER OF SECTION 13.

AMENDMENT TO LEASES RECORDED DECEMBER 13, 2007 UNDER RECEPTION NOS. 2899426 AND DECEMBER 13, 2007 UNDER RECEPTION NO. 2899427.
INCLUDES THOSE PORTIONS LYING IN THE WEST HALF OF THE NORTHEAST QUARTER AND THE WEST HALF OF THE SOUTHEAST QUARTER OF THE NORTHEAST QUARTER, AND PARCELS LYING IN THE REMAINDER OF THE NORTHEAST QUARTER OF SECTION 13.

DECLARATION OF POOLING WAS RECORDED FEBRUARY 5, 2013 UNDER RECEPTION NO. 03287549.
INCLUDES THOSE PORTIONS LYING IN THE NORTH HALF OF SECTION 13
MEMORANDUM OF AGREEMENT RECORDED APRIL 19, 2018 UNDER RECEPTION NO. 03651404
MAINTENANCE AND LEASE AGREEMENT, NOT PLOTTABLE

5. DECLARATION OF POOLING RECORDED FEBRUARY 5, 2013 UNDER RECEPTION NO. 03287559. (AFFECTS PORTION NE1/4 NE1/4)
INCLUDES THOSE PORTIONS LYING IN THE EAST HALF OF THE NORTHEAST QUARTER OF SECTION 13.

6. EASEMENT AND RIGHT OF WAY FOR THE LOWER BOULDER EXTENSION DITCH AS FILED OCTOBER 25, 1910 IN PLAT BOOK D AT PAGE 189 AND AS SET FORTH IN AFFIDAVIT RECORDED SEPTEMBER 24, 1999, UNDER RECEPTION NO. 1984825.
SHOWN HEREON.

TITLE COMMITMENT B2 EXCEPTION NOTES (CONTINUED)

7. EASEMENT AND RIGHT OF WAY FOR WATER PIPELINE PURPOSES AS GRANTED TO THE TOWN OF ERIE BY INSTRUMENT RECORDED JULY 06, 1923, IN BOOK 465 AT PAGE 483.
DOCUMENT REFERS TO THE EAST HALF OF SECTION 13 (AMONGST OTHERS) AS CONTAINING A 16.5' RIGHT-OF-WAY FOR CONVEYING WATER TO THE TOWN OF ERIE. EXACT LOCATION IS NOT FURTHER DESCRIBED.

8. EASEMENTS AND RIGHTS OF WAY FOR COMMUNICATION LINE PURPOSES AS GRANTED TO MOUNTAIN STATES TELEPHONE AND TELEGRAPH COMPANY BY INSTRUMENT RECORDED AUGUST 05, 1928, IN BOOK 559 AT PAGE 436 AND RECORDED FEBRUARY 14, 1955, IN BOOK 971 AT PAGE 495.
BLANKET EASEMENT FOR UTILITY POLES IN THE SOUTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 13.

9. ANY RIGHTS OF THIRD PARTIES OR THE PUBLIC IN AND TO THAT PORTION OF SUBJECT PROPERTY LYING WITHIN JAY ROAD, JASPER ROAD AND NORTH 123RD STREET RIGHTS OF WAY.
NOT PLOTTABLE.

10. EASEMENT AND RIGHT OF WAY FOR IRRIGATION CANAL AND INCIDENTAL PURPOSES AS GRANTED TO THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT BY INSTRUMENT RECORDED JULY 28, 1955, IN BOOK 986 AT PAGE 269 FOR THE LOWER BOULDER CANAL, ALSO KNOWN AS SOUTH PLATTE SUPPLY CANAL.
CANAL SHOWN HEREON.

11. EASEMENT AND RIGHT OF WAY FOR WATER PIPELINE PURPOSES AS GRANTED TO FOOTHILLS WATER USERS ASSOCIATION BY INSTRUMENT RECORDED OCTOBER 21, 1963, IN BOOK 1306 AT PAGE 160.
AS SHOWN HEREON.

12. EASEMENT AND RIGHT OF WAY FOR WATER PIPELINE PURPOSES AS GRANTED TO FOOTHILLS WATER USERS ASSOCIATION BY INSTRUMENT RECORDED OCTOBER 31, 1963, IN BOOK 1307 AT PAGE 494.
AS SHOWN HEREON.

13. EASEMENT AND RIGHT OF WAY FOR AN OIL AND GAS PIPELINE AS GRANTED TO PANHANDLE EASTERN PIPE LINE COMPANY BY INSTRUMENT RECORDED MARCH 12, 1983, UNDER RECEPTION NO. 549198.
SHOWN HEREON.

14. EASEMENT AND RIGHT OF WAY FOR AN UNNAMED IRRIGATION DITCH AND ANY AND ALL LATERAL DITCHES AS REFERENCED IN DECREE RECORDED JANUARY 31, 1986, UNDER RECEPTION NO. 739581.
SHOWN HEREON.

15. TERMS, CONDITIONS, PROVISIONS, BURDENS, OBLIGATIONS AND EASEMENTS AS SET FORTH AND GRANTED IN GRANT OF PERMANENT ACCESS AND UTILITIES EASEMENT AGREEMENT DATED JANUARY 31, 2004 AND RECORDED MARCH 06, 2007 UNDER RECEPTION NO. 2840481.
SHOWN HEREON.

16. ANY TAX, LIEN, FEE, OR ASSESSMENT BY REASON OF INCLUSION OF SUBJECT PROPERTY IN THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT, AS EVIDENCED BY INSTRUMENT RECORDED APRIL 22, 2005, UNDER RECEPTION NO. 2682176.
INCLUDES THE NORTHEAST QUARTER OF SECTION 13.

17. UNRECORDED COMPATIBLE DEVELOPMENT AND SURFACE USE AGREEMENT DATED APRIL 1, 2008 AS EVIDENCED IN MEMORANDUM OF COMPATIBLE DEVELOPMENT AND SURFACE USE AGREEMENT BY AND BETWEEN ENCANA OIL & GAS (USA INC., AND TI RESIDENTIAL LLC, RECORDED SEPTEMBER 5, 2008 UNDER RECEPTION NO. 2953523.
INCLUDES THE ENTIRE NORTHEAST QUARTER OF SECTION 13.

18. TERMS, CONDITIONS, PROVISIONS, BURDENS, OBLIGATIONS AND EASEMENTS AS SET FORTH AND GRANTED IN SCHMIDT PROPERTY PUBLIC TRAIL CONSTRUCTION COMPREHENSIVE DEVELOPMENT PLAN INTERGOVERNMENTAL AGREEMENT RECORDED OCTOBER 15, 2008 UNDER RECEPTION NO. 2959619 AND RECORDED NOVEMBER 06, 2008 UNDER RECEPTION NO. 2963193.
DOCUMENT IS A GENERAL AGREEMENT TO EXPEDITE THE CONSTRUCTION OF A PUBLIC TRAIL AND DESCRIBES ONLY THE PROPERTY UPON WHICH IT SHALL BE CONSTRUCTED. ACTUAL DOCUMENT CREATING THE EASEMENT IS CALLED FOR IN ITEM 19 AND AGAIN IN ITEM 26 BELOW.

19. TERMS, CONDITIONS, PROVISIONS, BURDENS, OBLIGATIONS AND EASEMENTS AS SET FORTH AND GRANTED IN PUBLIC TRAIL EASEMENT AGREEMENT RECORDED OCTOBER 15, 2008 UNDER RECEPTION NO. 2959794.
SHOWN HEREON (SAME AS 20 BELOW).

20. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN SCHMIDT PARCEL PRE-DEVELOPMENT AGREEMENT RECORDED OCTOBER 15, 2008 UNDER RECEPTION NO. 2959795. ACKNOWLEDGEMENT OF PAYMENT AND PERFORMANCE UNDER SCHMIDT PARCEL PRE- DEVELOPMENT AGREEMENT RECORDED DECEMBER 4, 2014 UNDER RECEPTION NO. 03416132
SHOWN HEREON (SAME AS 19 ABOVE)

21. EASEMENTS, CONDITIONS, COVENANTS, RESTRICTIONS, RESERVATIONS AND NOTES ON THE MAP OF 119TH JASPER JAY ANNEXATION #13 TO THE TOWN OF ERIE RECORDED FEBRUARY 17, 2016 UNDER RECEPTION NO. 03501287.
AS SHOWN HEREON.

22. EASEMENTS, CONDITIONS, COVENANTS, RESTRICTIONS, RESERVATIONS AND NOTES ON THE 119TH JASPER JAY ZONING MAP TO THE TOWN OF ERIE RECORDED FEBRUARY 17, 2016 UNDER RECEPTION NO. 03501288.
AS SHOWN HEREON.

TITLE COMMITMENT B2 EXCEPTION NOTES (CONTINUED)

23. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN ANNEXATION ORDINANCE RECORDED FEBRUARY 17, 2016 UNDER RECEPTION NO. 03501301.
AS SHOWN HEREON.

24. TERMS, CONDITIONS AND PROVISIONS OF ANNEXATION ORDINANCE RECORDED DECEMBER 30, 2016 AT RECEPTION NO. 03566775.
APPLIES TO THE ENTIRE SUBJECT PARCEL (NOT INCLUDING THE RIGHT-OF-WAY).

25. THE EFFECT OF SCHMIDT PROPERTY ANNEXATION MAP TO THE TOWN OF ERIE RECORDED DECEMBER 30, 2016, UNDER RECEPTION NO. 03566776.
APPLIES TO THE ENTIRE SUBJECT PARCEL (NOT INCLUDING THE RIGHT-OF-WAY).

26. TERMS, CONDITIONS AND PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN SCHMIDT PROPERTY TI RESIDENTIAL ANNEXATION AGREEMENT RECORDED DECEMBER 30, 2016 AT RECEPTION NO. 03566777.
APPLIES TO THE ENTIRE SUBJECT PARCEL (NOT INCLUDING THE RIGHT-OF-WAY) AND INCLUDES PROVISION FOR ZONING "LOW DENSITY RESIDENTIAL (LR) AND AGRICULTURAL/OPEN SPACE (AG/OS) ZONING.

27. TERMS, CONDITIONS AND PROVISIONS OF ANNEXATION AGREEMENT RECORDED DECEMBER 30, 2016 AT RECEPTION NO. 03566778.
APPLIES TO THE SCHMIDT PROPERTY AND APPLIES A ZONING OF "LOW DENSITY RESIDENTIAL (LR).

28. TERMS, CONDITIONS AND PROVISIONS OF ZONING ORDINANCE RECORDED DECEMBER 30, 2016 AT RECEPTION NO. 03566779.
APPLIES TO THE ENTIRE SUBJECT PARCEL (NOT INCLUDING THE TOWN REQUESTED RIGHT-OF-WAY INCLUSION) AND INCLUDES PROVISION FOR ZONING "LOW DENSITY RESIDENTIAL (LR) AND AGRICULTURAL/OPEN SPACE (AG/OS) ZONING.

29. THE EFFECT OF SCHMIDT PROPERTY ZONING MAP RECORDED DECEMBER 30, 2016, UNDER RECEPTION NO. 03566780.
APPLIES TO THE ENTIRE SUBJECT PARCEL.

30. ANY TAX, LIEN, FEE, OR ASSESSMENT BY REASON OF INCLUSION OF SUBJECT PROPERTY IN THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT, MUNICIPAL SUBDISTRICT, AS EVIDENCED BY INSTRUMENT RECORDED OCTOBER 13, 2017, UNDER RECEPTION NO. 03619917.
NOT A SURVEY ISSUE.

31. ANY TAX, LIEN, FEE, OR ASSESSMENT BY REASON OF INCLUSION OF SUBJECT PROPERTY IN THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT, AS EVIDENCED BY INSTRUMENT RECORDED OCTOBER 31, 2017, UNDER RECEPTION NO. 03623188.
NOT A SURVEY ISSUE.

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ARVADA, CO 80002
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J:\1814\217-089\SURVEY\ALTA\ALTA SUPERBLOCK REV 9-06-18.DWG

ALTA/NSPS LAND TITLE SURVEY

LOCATED IN NORTHEAST QUARTER OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST 6TH P.M. TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO

SHEET 3 OF 3

MEADOWLARK–PRELIMINARY PLAT

LOCATED IN NORTHEAST QUARTER OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST 6TH P.M. TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO

118 LOTS, 5 TRACTS CONTAINING 86.495 ACRES±

PROJECT #PP-000946-2017

LEGAL DESCRIPTION

COMMENCING AT THE EAST QUARTER CORNER OF SAID SECTION 13,

THENCE NORTH 82 DEGREES 21 MINUTES 26 SECONDS WEST, A DISTANCE OF 1,333.92 FEET TO A POINT ON THE APPARENT NORTH RIGHT OF WAY LINE OF JAY ROAD AND THE TRUE POINT OF BEGINNING;

THENCE NORTH 86 DEGREES 53 MINUTES 01 SECOND WEST, A DISTANCE OF 93.00 FEET;

THENCE NORTH 84 DEGREES 46 MINUTES 00 SECONDS WEST, A DISTANCE OF 929.46 FEET TO A POINT OF CURVE;

THENCE ALONG THE ARC OF A CURVE TO THE RIGHT HAVING A RADIUS OF 300.00 FEET AND A CENTRAL ANGLE OF 84 DEGREES 10 MINUTES 43 SECONDS, AN ARC DISTANCE OF 440.76 FEET, (CHORD BEARS NORTH 42 DEGREES 40 MINUTES 38 SECONDS WEST, A DISTANCE OF 402.17 FEET TO A POINT OF TANGENT;

THENCE NORTH 00 DEGREES 35 MINUTES 17 SECONDS WEST, A DISTANCE OF 708.07 FEET:

THENCE NORTH 00 DEGREES 07 MINUTES 43 SECONDS EAST, A DISTANCE OF 156.84 FEET;

THENCE NORTH 89 DEGREES 54 MINUTES 17 SECONDS WEST, A DISTANCE OF 40.13 FEET TO A POINT ON THE WEST LINE OF THE SAID NORTHEAST QUARTER OF SECTION 13 FROM WHENCE THE SOUTHWEST CORNER OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SAID SECTION BEARS SOUTH 00 DEGREES 07 MINUTES 34 SECONDS WEST, A DISTANCE OF 65.45 FEET;

THENCE NORTH 00 DEGREES 07 MINUTES 34 SECONDS EAST ALONG SAID WEST LINE, A DISTANCE OF 1264.78 FEET TO THE NORTH QUARTER CORNER OF SAID SECTION 13, EVIDENCED BY A 4" BRASS CAP SET IN CONCRETE, PLS 13446;

THENCE NORTH 89 DEGREES 08 MINUTES 12 SECONDS EAST ALONG THE NORTH LINE OF THE NORTHEAST QUARTER OF SAID SECTION 13, A DISTANCE OF 1789.05 FEET TO A POINT ON THE APPROXIMATE CENTERLINE OF AN IRRIGATION DITCH;

THENCE ALONG SAID DITCH CENTERLINE THE FOLLOWING FIVE COURSES:

1. SOUTH 05 DEGREES 18 MINUTES 53 SECONDS WEST, A DISTANCE OF 85.95 FEET;
2. SOUTH 09 DEGREES 21 MINUTES 45 SECONDS WEST, A DISTANCE OF 18.85 FEET TO A POINT OF CURVE;
3. ALONG THE ARC OF A CURVE TO THE RIGHT HAVING A RADIUS OF 171.00 FEET AND A CENTRAL ANGLE OF 71 DEGREES 01 MINUTE 12 SECONDS, AN ARC DISTANCE OF 211. 96 FEET; (CHORD BEARS SOUTH 44 DEGREES 52 MINUTES 21 SECONDS WEST, A DISTANCE OF 198.65 FEET) TO A POINT OF TANGENT;
4. SOUTH 80 DEGREES 22 MINUTES 57 SECONDS WEST, A DISTANCE OF 39.94 FEET;
5. SOUTH 84 DEGREES 33 MINUTES 07 SECONDS WEST, A DISTANCE OF 108.82 FEET TO A POINT ON THE NORTH LINE OF AN EASEMENT FOR THE LOWER BOULDER IRRIGATION CANAL, AS RECORDED AT BOOK 986, PAGES 266 AND 269, BOULDER COUNTY CLERK AND RECORDER'S OFFICE;

THENCE ALONG THE NORTH LINE OF SAID EASEMENT THE FOLLOWING TWO COURSES:

1. NORTH 76 DEGREES 16 MINUTES 12 SECONDS WEST, A DISTANCE OF 118.14 FEET;
2. SOUTH 67 DEGREES 07 MINUTES 48 SECONDS WEST, A DISTANCE OF 46.69 FEET TO A POINT ON THE WEST LINE OF THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF SAID SECTION 13;

THENCE SOUTH 00 DEGREES 09 MINUTES 11 SECONDS WEST ALONG SAID WEST LINE, A DISTANCE OF 847.48 FEET TO A POINT, EVIDENCED BY A 5/8" REBAR AND PLASTIC CAP, PLS 6716;

THENCE NORTH 89 DEGREES 29 MINUTES 13 SECONDS EAST, A DISTANCE OF 104.55 FEET;

THENCE SOUTH 00 DEGREES 09 MINUTES 16 SECONDS WEST, A DISTANCE OF 17.93 FEET TO A POINT ON THE APPROXIMATE CENTERLINE OF AN IRRIGATION DITCH;

THENCE ALONG SAID DITCH CENTERLINE THE FOLLOWING NINE COURSES:

1. SOUTH 87 DEGREES 53 MINUTES 01 SECOND EAST, A DISTANCE OF 96.53 FEET;
2. SOUTH 54 DEGREES 47 MINUTES 37 SECONDS EAST, A DISTANCE OF 37.79 FEET;
3. SOUTH 35 DEGREES 58 MINUTES 27 SECONDS EAST, A DISTANCE OF 46.95 FEET;
4. SOUTH 30 DEGREES 22 MINUTES 26 SECONDS EAST, A DISTANCE OF 187.12 FEET;
5. SOUTH 27 DEGREES 11 MINUTES 53 SECONDS EAST, A DISTANCE OF 237.04 FEET;
6. SOUTH 20 DEGREES 56 MINUTES 33 SECONDS EAST, A DISTANCE OF 133.69 FEET;
7. SOUTH 8 DEGREES 5 MINUTES 21 SECONDS EAST, A DISTANCE OF 67.96 FEET;
8. SOUTH 1 DEGREES 39 MINUTES 24 SECONDS EAST, A DISTANCE OF 209.10 FEET;
9. SOUTH 00 DEGREES 14 MINUTES 08 SECONDS WEST, A DISTANCE OF 178.90 FEET TO THE NORTHEAST CORNER OF LOT 1, SCHMIDT PROPERTY FILING NO. 1;

THENCE ALONG SAID LOT 1 THE FOLLOWING SIX (6) COURSES AND DISTANCES;

1. THENCE NORTH 87°31'40" WEST, A DISTANCE OF 246.29 FEET;
2. THENCE ALONG A NON–TANGENT CURVE TO THE RIGHT, HAVING A RADIUS OF 50.00 FEET, A CENTRAL ANGLE OF 82°34'31", WHOSE CHORD BEARS SOUTH 53°56'45" WEST A DISTANCE OF 65.98 FEET, FOR AN ARC DISTANCE OF 72.06 FEET;
3. THENCE NORTH 84°46'00" WEST, A DISTANCE OF 128.96 FEET;
4. THENCE ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 20.00 FEET, A CENTRAL ANGLE OF 65°46'18", WHOSE CHORD BEARS SOUTH 62°20'51" WEST A DISTANCE OF 21.72 FEET, FOR AN ARC DISTANCE OF 22.96 FEET;
5. THENCE ALONG A COMPOUND CURVE TO THE LEFT, HAVING A RADIUS OF 525.00 FEET, A CENTRAL ANGLE OF 26°20'43", WHOSE CHORD BEARS SOUTH 16°17'21" WEST A DISTANCE OF 239.28 FEET, FOR AN ARC DISTANCE OF 241.40 FEET;
6. THENCE SOUTH 03°06'59" WEST, A DISTANCE OF 100.00 FEET TO THE POINT OF BEGINNING.

VICINITY MAP
1"=1000'

LAND SUMMARY CHART

TYPE	AREA	% OF TOTAL AREA
RESIDENTIAL LOTS	20.533 ACRES±	23.74%±
TRACTS	56.497 ACRES±	65.32%±
DEDICATED AS PUBLIC RIGHT–OF–WAY	9.463 ACRES±	10.94%±
TOTAL	86.493 ACRES±	100%

TRACT SUMMARY CHART

TRACT	PURPOSE(S)	OWNER/MAINTAINED BY	SQ. FT.	ACRES
A	PUBLIC ACCESS, OPEN SPACE, DRAINAGE	TOWN OF ERIE	777,959±	17.86±
B	DRAINAGE, PUBLIC ACCESS, OPEN SPACE	DISTRICT	186,425±	4.28±
C	PUBLIC ACCESS, OPEN SPACE, DRAINAGE	DISTRICT	3,918±	0.09±
D	DRAINAGE, PUBLIC ACCESS, OPEN SPACE, PARK, STRAIN ISOLATION TRENCH	DISTRICT	110,256±	2.53±
E	VACANT, DRAINAGE, PUBLIC ACCESS, ISOLATION TRENCH	DISTRICT	1,382,471±	31.74±

	SHEET INDEX LIST
SHEET 1	COVER
SHEET 2	FULL BOUNDARY AND SECTION LINE TIE.
SHEET 3	TRACT A DETAIL.
SHEET 4–6	LOTS AND TRACT C DETAILS
SHEET 7	FULL GRAPHIC FOR TRACT D & E (SHOWN IN PART ON OTHER SHEETS).
SHEET 8	FULL GRAPHIC FOR TRACT B (SHOWN IN PART ON OTHER SHEETS).

ALL LOTS SHOWN AS PARTIAL ON ANY SHEET APPEAR IN FULL ON THE MATCH SHEET.

NOTE: LINE AND CURVE TABLES ARE ON SHEET 6

GENERAL NOTES:

1.) THE LINEAL UNITS USED ON THIS PLAT ARE IN U.S. SURVEY FEET. ALL BEARINGS SHOWN HEREON ARE IN DEGREES–MINUTES–SECONDS.

2.) ANY PERSON WHO KNOWINGLY REMOVES, ALTERS OR DEFACES ANY PUBLIC LAND SURVEY MONUMENT, LAND SURVEY BOUNDARY MONUMENT OR ACCESSORY COMMITS A CLASS TWO (2) MISDEMEANOR PURSUANT TO STATE STATUE 18–4–508, C.R.S.

3.) NOTICE: ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF CERTIFICATION SHOWN HEREON.

4.) LAND TITLE GUARANTEE COMPANY PROPERTY INFORMATION BINDER ORDER NO., ABZ70583040, EFFECTIVE DATE OF POLICY: AUGUST 10, 2018 AT 5:00 P.M., WAS ENTIRELY RELIED UPON FOR RECORDED RIGHTS–OF–WAY, EASEMENTS AND ENCUMBRANCES IN THE PREPARATION OF THIS SURVEY.

5.) JEHN ENGINEERING, INC. HAS MADE NO INVESTIGATION OR INDEPENDENT SEARCH FOR RECORDED/UNRECORDED EASEMENTS, ENCUMBRANCES, RESTRICTIVE COVENANTS, OWNERSHIP TITLE EVIDENCE OR ANY OTHER FACTS THAT AN ACCURATE AND CURRENT TITLE SEARCH MAY DISCLOSE.

6.) ALL LOT CORNER MONUMENTS SHALL BE SET PER COLORADO STATE STATUTE 38–51–105.

7.) TRACT A IS UNBUILDABLE UNTIL A REPLAT IS RECORDED FOR THE TRACT FOR WHICH BUILDING IS INTENDED.

8.) BASIS OF BEARINGS: BEARINGS ARE BASED ON THE SOUTH LINE OF THE NORTHEAST QUARTER OF SECTION 13, ASSUMED TO BEAR NORTH 89°18'28" WEST BETWEEN THE MONUMENTS AS SHOWN HEREON.

9.) REQUEST FOR NOTICE OF SURFACE DEVELOPMENT IS RECORDED UNDER RECEPTION NUMEBRS 03032258 AND 2769128,

10.) NOTICE OF RIGHT TO USE SURFACE OF LANDS IS RECORDED UNDER RECEPTION NUMBER 01666167.

11.) THE SITE, SOUTH OF STRAIN LINE, IS SUBJECT TO UNDERMINING AND THE POTENTIAL FOR SUBSIDENCE.

12.) A BLANKET PUBLIC ACCESS AND DRAINAGE EASEMENT IS GRANTED ON TRACTS A THROUGH E INTENDED/REQUIRED FOR SUCH USE.

REVISIONS

NO.	DESCRIPTION	DATE	BY
1	TOWN REDLINES	5/10/18	RH
2	TOWN REDLINES AND REVISIONS	8/29/18	RJH
3	ENGINEERING UPDATES	1/2/19	RJH
#	#	#	#
#	#	#	#
#	#	#	#

Est. 1982

JēHN ENGINEERING
5690 WEBSTER STREET
ARVADA, CO 80002
PH. (303) 423-6036 FAX (303) 467-9438

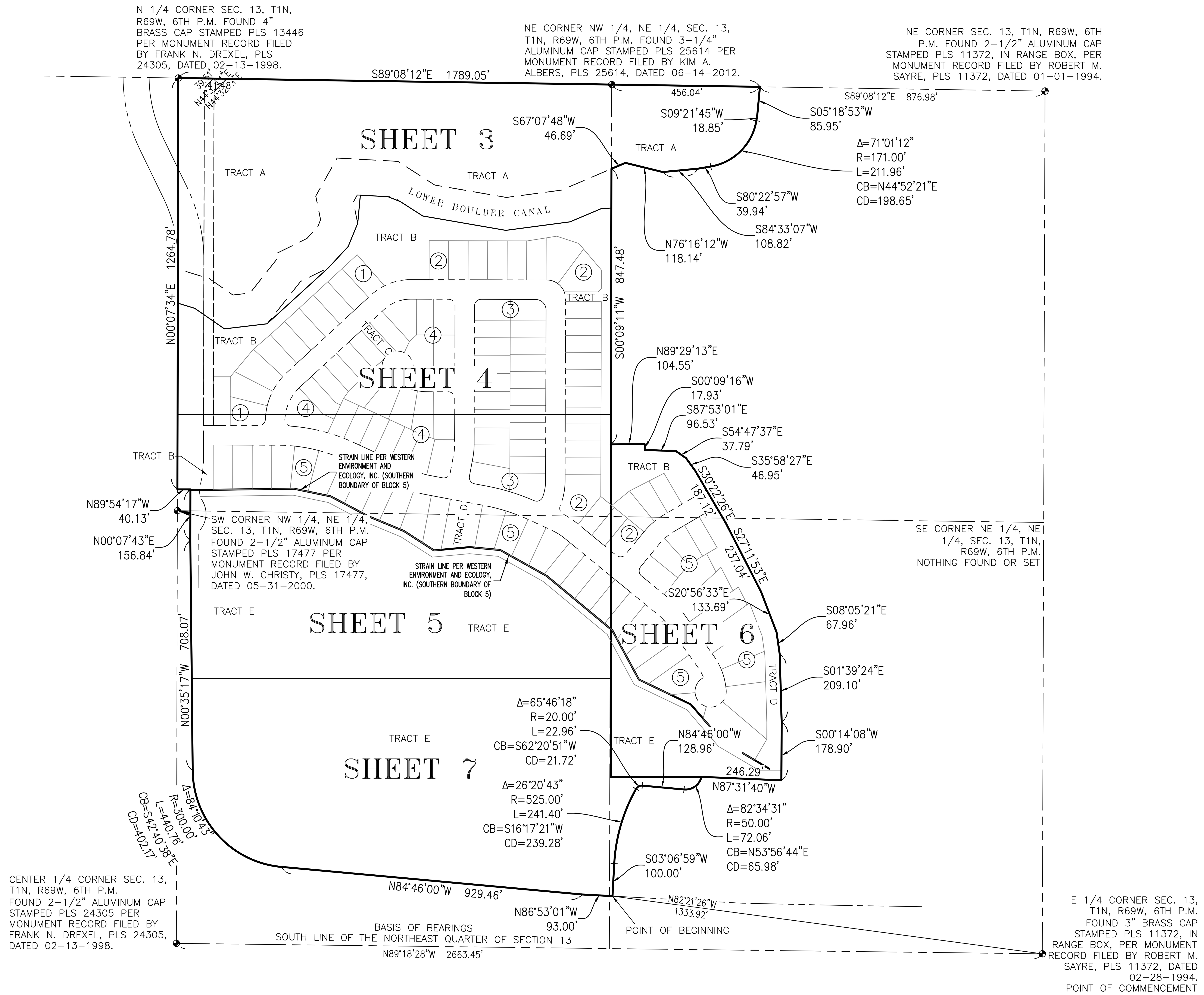
J:\1814\217–089\SURVEY\PLAT\7089 PRELIM PLAT 1–5–19.DWG

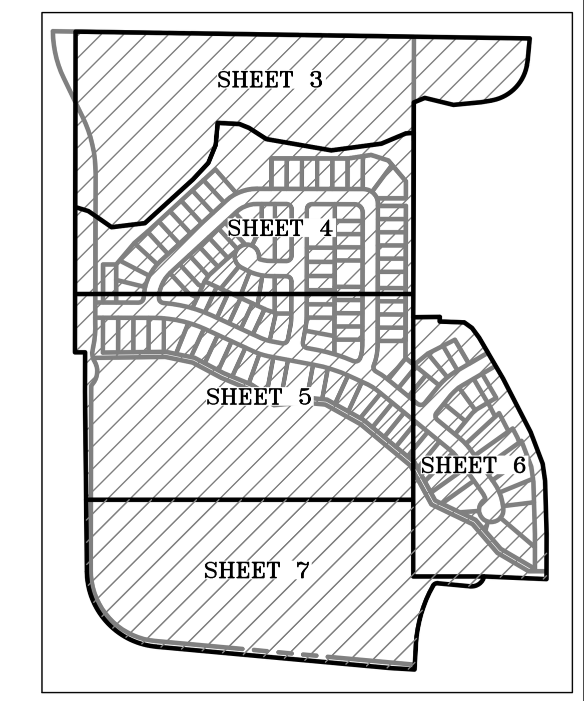
MEADOWLARK–PRELIMINARY PLAT

LOCATED IN NORTHEAST QUARTER OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST 6TH P.M. TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO

118 LOTS, 5 TRACTS CONTAINING 86.495 ACRES±

PROJECT #PP-000946-2017





SHEET INDEX
1"=600'

LEGEND

- SET #5X24" REBAR AND 1" RED PLASTIC CAP PLS 36062
- FOUND SECTION CORNER AS DESCRIBED HEREON
- LOT LINE
- EASEMENT LINE
- SECTION LINE
- BOUNDARY LINE
- RIGHT-OF-WAY LINE
- # BLOCK NUMBER DESIGNATION

N

200 0 100 200 400
ORIGINAL SCALE: 1"= 200' HORIZ.

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MEADOWLARK–PRELIMINARY PLAT

LOCATED IN NORTHEAST QUARTER OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST 6TH P.M. TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO

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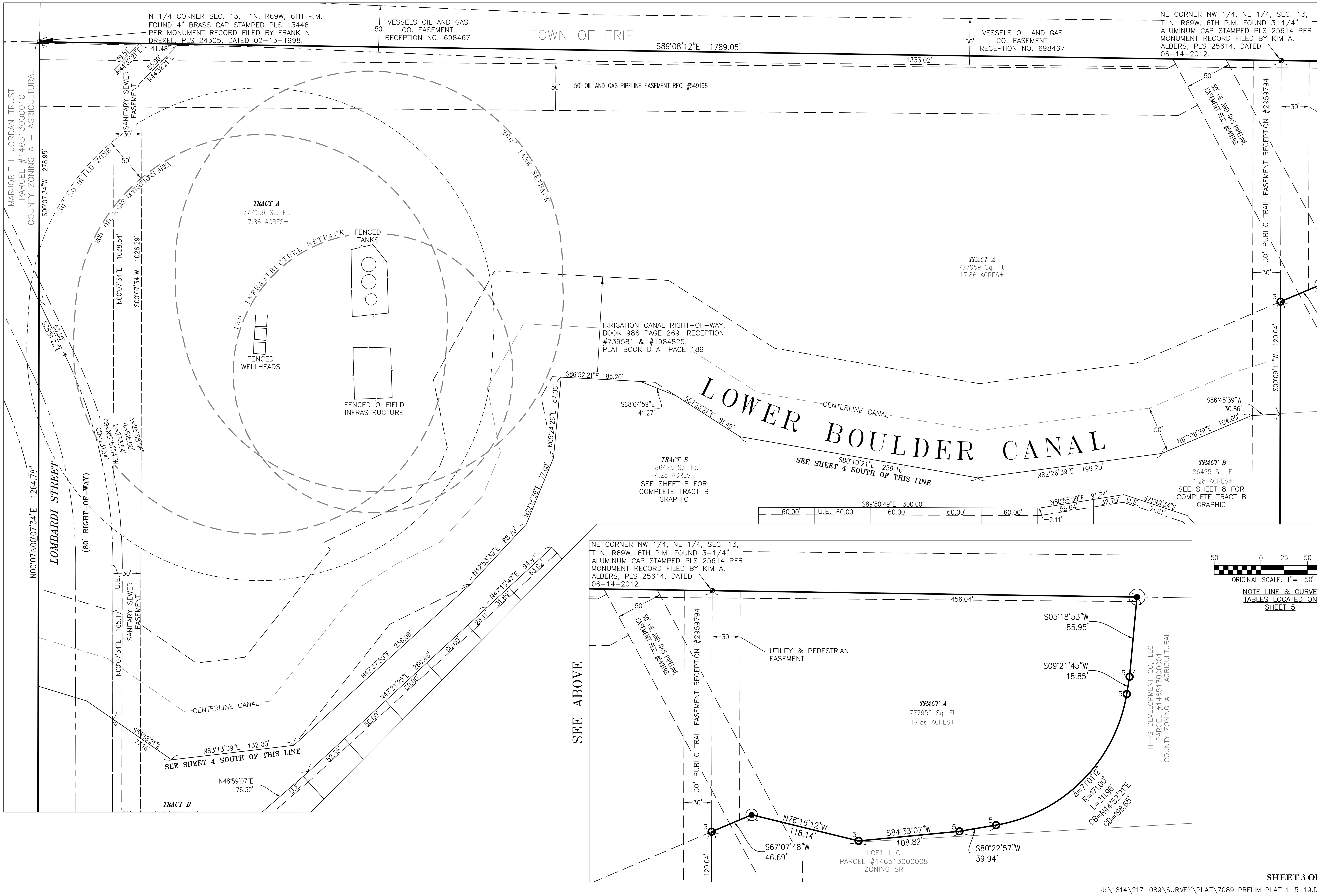

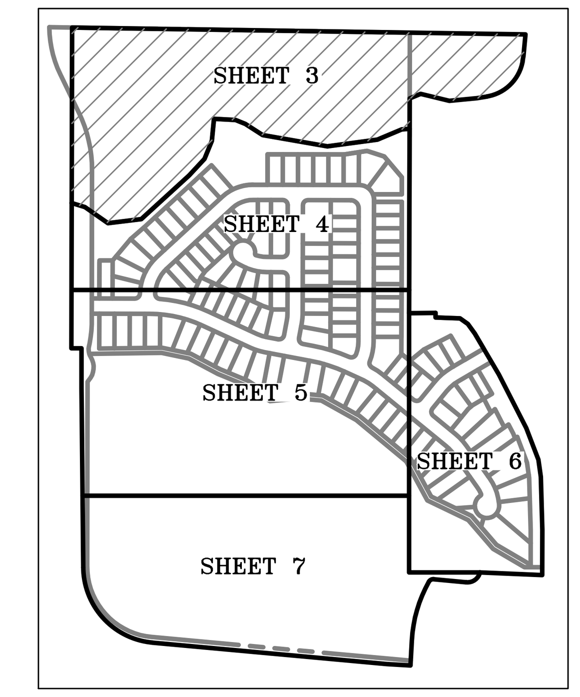

SHEET INDEX
1"=600'

NOTE:
LINE & CURVE TABLES ARE ON SHEET 6

ORIGINAL SCALE: 1"= 50' HORIZ.

NOTE LINE & CURVE TABLES LOCATED ON SHEET 5

LEGEND

- FOUND #5X24" REBAR AND 1" RED PLASTIC CAP PLS 36062
- FOUND AS DESCRIBED
- 1 FOUND #5 REBAR AND 1.25" PLASTIC CAP ILLEGIBLE
- 2 FOUND #5 REBAR AND 1.25" RED PLASTIC CAP PLS 17477
- 3 FOUND #5 REBAR AND 1.25" ORANGE PLASTIC CAP PLS 36580
- 4 FOUND #5 REBAR AND 1.25" ORANGE PLASTIC CAP ILLEGIBLE
- 5 FOUND #5 REBAR AND 1.25" YELLOW PLASTIC CAP PLS 17477
- FOUND SECTION CORNER AS DESCRIBED HEREON

LOT LINE
EASEMENT LINE
SECTION LINE
BOUNDARY LINE
RIGHT-OF-WAY LINE
ROAD CENTERLINE

BLOCK NUMBER DESIGNATION

U.E.=UTILITY EASEMENT
NOTE: FRONT UTILITY EASEMENTS ARE 6' AND REAR ARE 8' UNLESS OTHERWISE NOTED.

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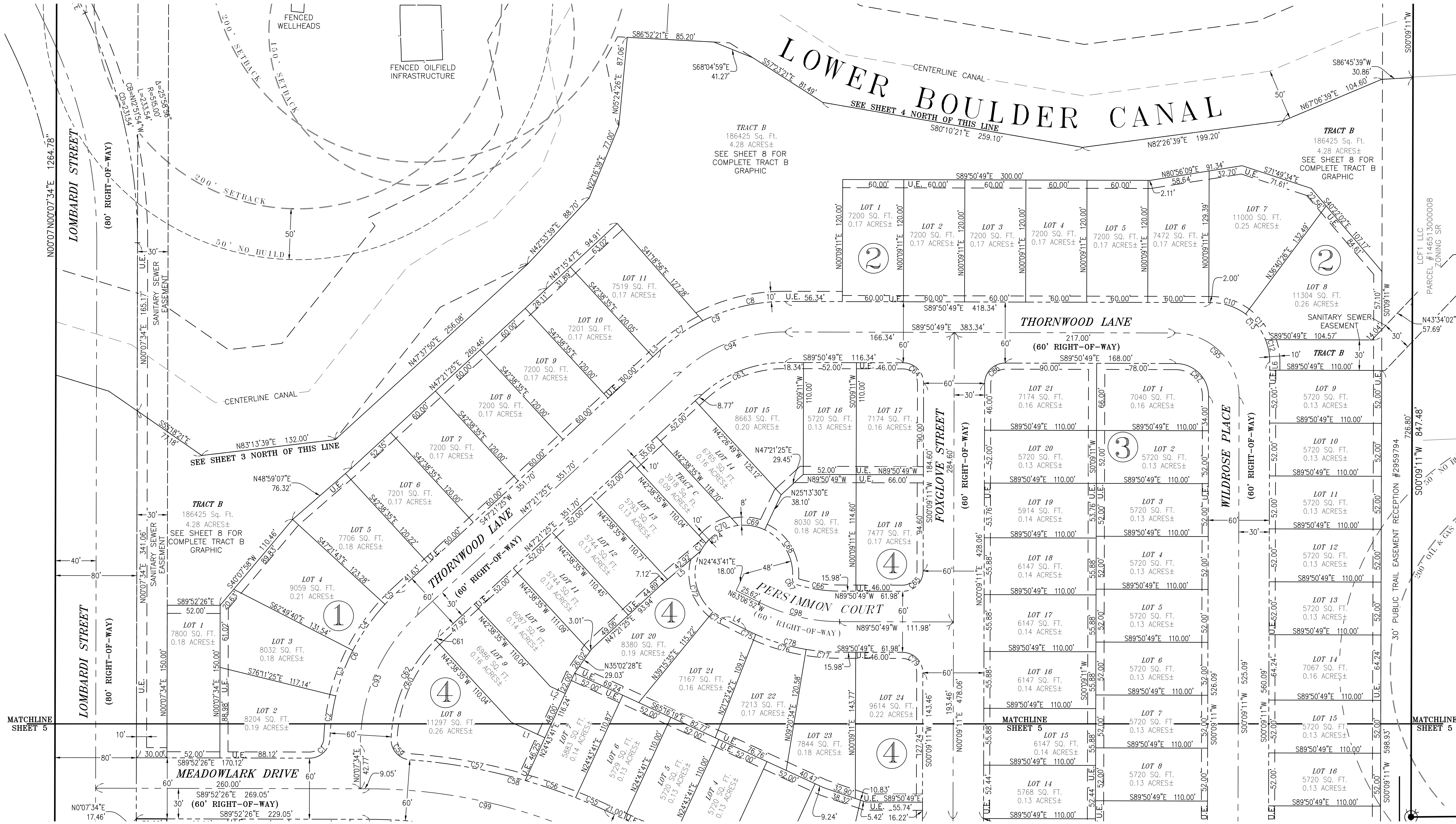
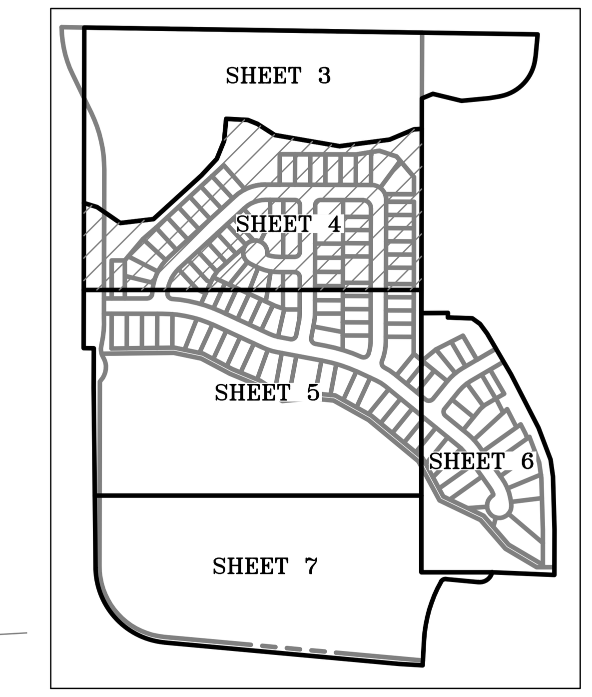
J:\1814\217-089\SURVEY\PLAT\7089 PRELIM PLAT 1-5-19.DWG

MEADOWLARK–PRELIMINARY PLAT

LOCATED IN NORTHEAST QUARTER OF SECTION 13,
TOWNSHIP 1 NORTH, RANGE 69 WEST 6TH P.M.
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO
118 LOTS, 5 TRACTS CONTAINING 86.495 ACRES±
PROJECT #PP-000946-2017





SHEET INDEX
1"=600'

NOTE:
LINE & CURVE TABLES ARE ON SHEET 6

LEGEND

- FOUND #5 REBAR AND 1" RED PLASTIC CAP PLS 36062
- FOUND AS DESCRIBED
- 1 FOUND #5 REBAR AND 1.25" PLASTIC CAP ILLEGIBLE
- 2 FOUND #5 REBAR AND 1.25" RED PLASTIC CAP PLS 17477
- 3 FOUND #5 REBAR AND 1.25" ORANGE PLASTIC CAP PLS 36580
- 4 FOUND #5 REBAR AND 1.25" ORANGE PLASTIC CAP ILLEGIBLE
- 5 FOUND #5 REBAR AND 1.25" YELLOW PLASTIC CAP PLS 17477
- FOUND SECTION CORNER AS DESCRIBED HEREON
- LOT LINE
- EASEMENT LINE
- SECTION LINE
- BOUNDARY LINE
- RIGHT-OF-WAY LINE
- ROAD CENTERLINE
- # BLOCK NUMBER DESIGNATION

U.E.=UTILITY EASEMENT
NOTE: FRONT UTILITY EASEMENTS ARE 6' AND REAR ARE 8' UNLESS OTHERWISE NOTED.

NOTE LINE & CURVE TABLES LOCATED ON SHEET 6

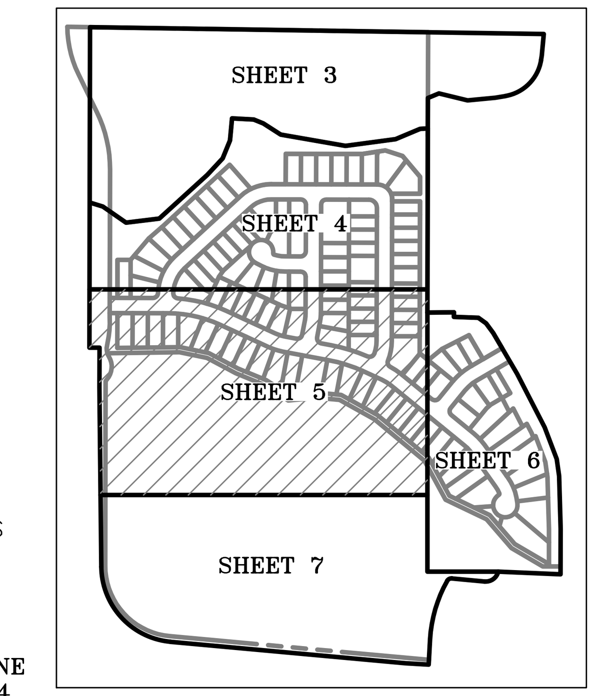
50 0 25 50 100
ORIGINAL SCALE: 1"= 50' HORIZ.

JēHN ENGINEERING
5690 WEBSTER STREET
ARVADA, CO 80002
PH. (303) 423-6036 FAX (303) 467-9438

J:\1814\217-089\SURVEY\PLAT\7089 PRELIM PLAT 1-5-19.DWG

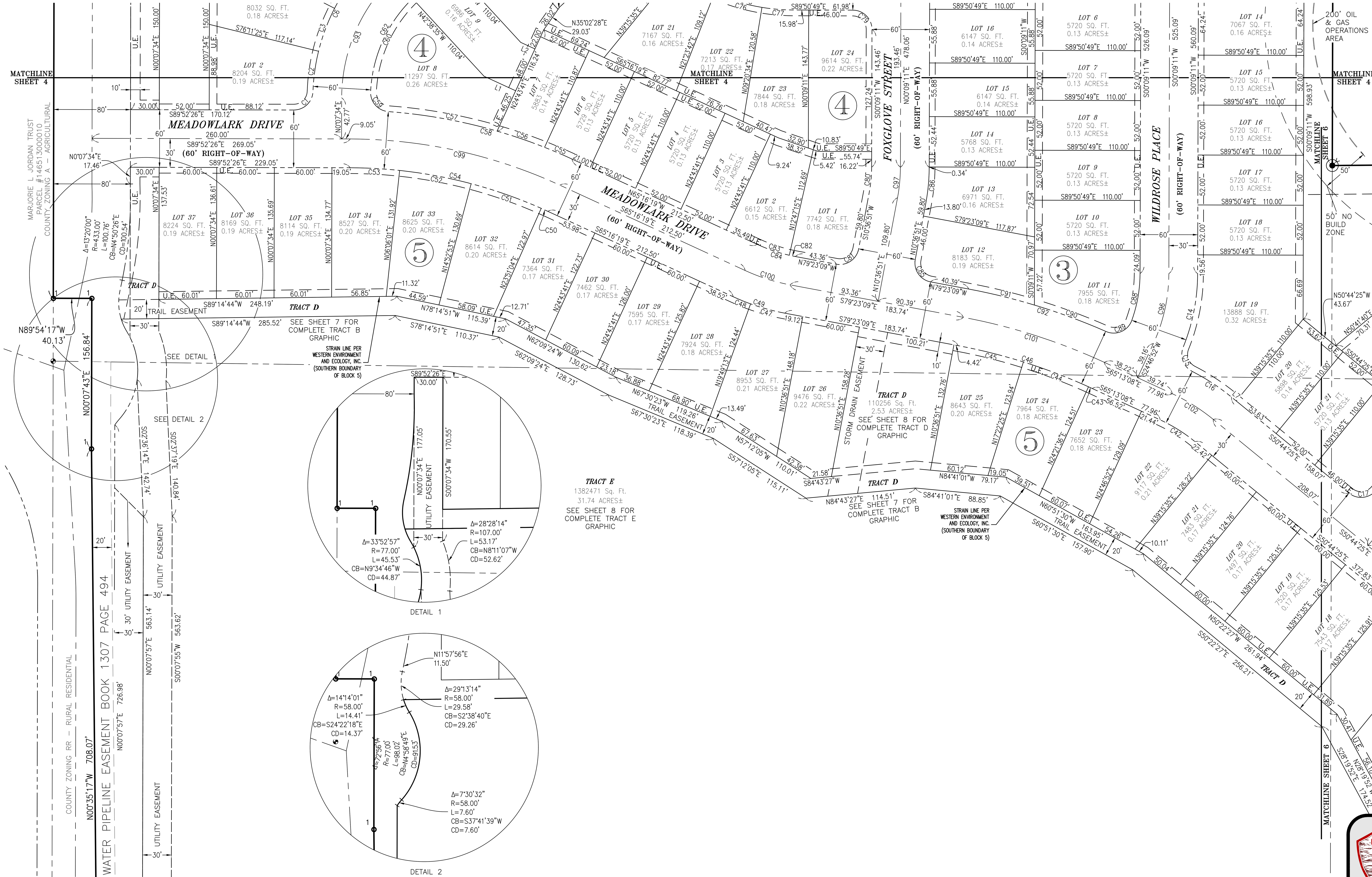
MEADOWLARK–PRELIMINARY PLAT

LOCATED IN NORTHEAST QUARTER OF SECTION 13,
TOWNSHIP 1 NORTH, RANGE 69 WEST 6TH P.M.
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO
118 LOTS, 5 TRACTS CONTAINING 86.495 ACRES±
PROJECT #PP-000946-2017



SHEET INDEX
1"=600'

NOTE:
LINE & CURVE TABLES ARE ON SHEET 6



LEGEND

- FOUND #5 REBAR AND 1" RED PLASTIC CAP PLS 36062
- FOUND AS DESCRIBED
- 1 FOUND #5 REBAR AND 1.25" PLASTIC CAP ILLEGIBLE
- 2 FOUND #5 REBAR AND 1.25" RED PLASTIC CAP PLS 17477
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- 5 FOUND #5 REBAR AND 1.25" YELLOW PLASTIC CAP PLS 17477
- FOUND SECTION CORNER AS DESCRIBED HEREON

LOT LINE
EASEMENT LINE
SECTION LINE
BOUNDARY LINE
RIGHT-OF-WAY LINE
ROAD CENTERLINE

BLOCK NUMBER DESIGNATION

U.E.=UTILITY EASEMENT
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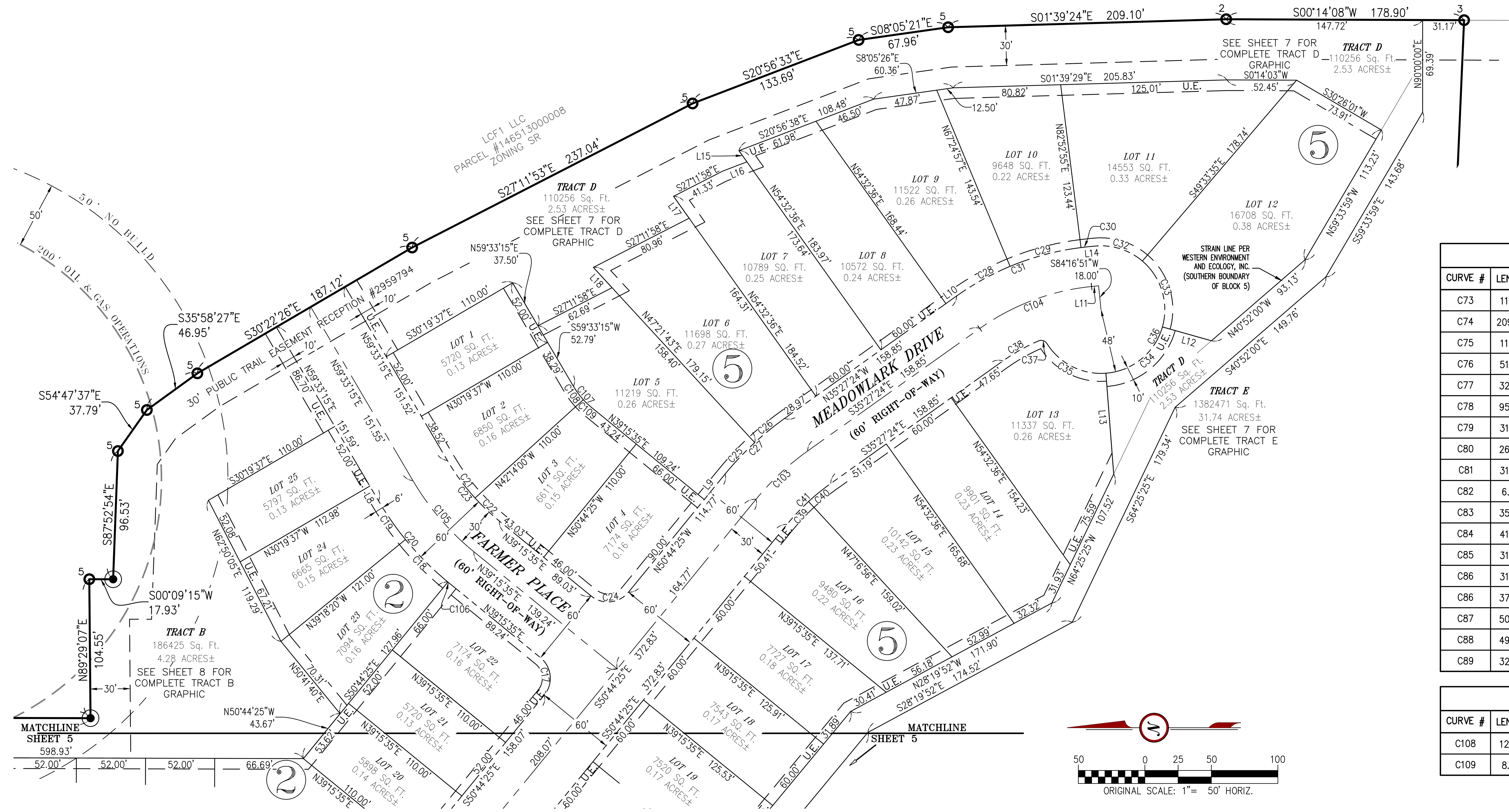

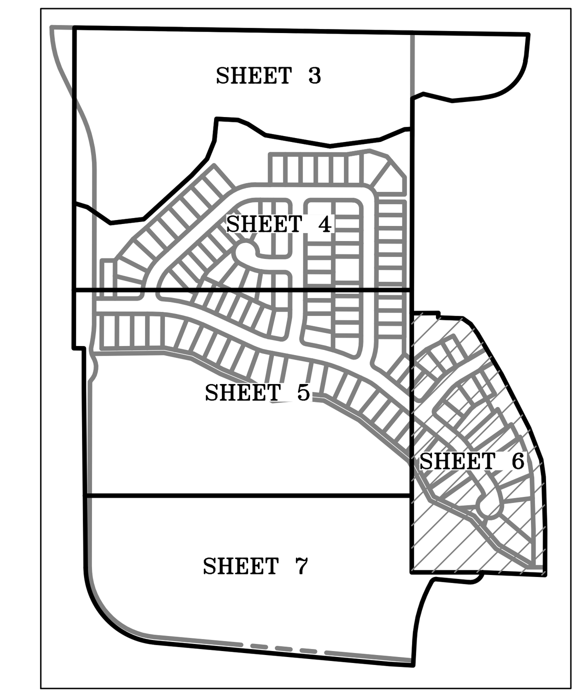

SHEET INDEX
1"=600'

CURVE TABLE					
CURVE #	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD LENGTH
C1	30.77'	20.00'	088°09'35"	N46°02'47"E	27.83'
C2	42.37'	205.00'	011°50'35"	S7°53'17"W	42.30'
C3	47.81'	205.00'	013°21'45"	S20°29'27"W	47.70'
C4	55.34'	205.00'	015°27'58"	S34°54'19"W	55.17'
C5	16.88'	205.00'	004°43'07"	S44°59'51"W	16.88'
C6	162.40'	205.00'	045°23'25"	S24°39'42"W	158.19'
C7	50.67'	180.00'	016°07'48"	S55°25'18"W	50.51'
C8	83.78'	180.00'	026°39'59"	S76°49'11"W	83.02'
C9	134.45'	180.00'	042°47'47"	S68°45'18"W	131.35'
C10	36.55'	58.00'	036°06'31"	N71°47'33"W	35.95'
C11	32.29'	58.00'	031°54'07"	N37°47'14"W	31.88'
C12	22.26'	58.00'	021°59'22"	N10°50'30"W	22.12'
C13	91.11'	58.00'	090°00'00"	N44°50'49"W	82.02'
C14	78.42'	205.00'	021°55'08"	N11°06'45"E	77.95'
C15	29.67'	20.00'	084°59'47"	S20°25'34"E	27.02'
C16	48.91'	230.00'	012°11'03"	N56°49'56"W	48.82'
C17	31.42'	20.00'	090°00'00"	N84°15'35"E	28.28'
C18	45.23'	230.00'	011°16'00"	S45°04'57"W	45.15'

CURVE TABLE					
CURVE #	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD LENGTH
C19	35.48'	230.00'	008°50'19"	S55°08'06"W	35.44'
C20	81.47'	230.00'	020°17'40"	S49°24'25"W	81.04'
C21	35.19'	170.00'	011°51'32"	S53°37'29"W	35.12'
C22	25.24'	170.00'	008°30'28"	S43°26'30"W	25.22'
C23	60.43'	170.00'	020°21'58"	S49°22'16"W	60.11'
C24	31.42'	20.00'	090°00'00"	S5°44'25"E	28.28'
C25	32.52'	230.00'	008°06'08"	N46°41'21"W	32.50'
C26	28.83'	230.00'	007°10'53"	N39°02'51"W	28.81'
C27	61.35'	230.00'	015°17'01"	N43°05'55"W	61.17'
C28	46.06'	205.00'	012°52'22"	N29°01'13"W	45.96'
C29	55.34'	205.00'	015°27'58"	N14°51'04"W	55.17'
C30	5.01'	205.00'	001°23'56"	N6°25'07"W	5.01'
C31	106.40'	205.00'	029°44'16"	N20°35'17"W	105.21'
C32	38.67'	48.00'	046°09'34"	N17°21'38"E	37.63'
C33	54.72'	48.00'	065°19'21"	N73°06'06"E	51.81'
C34	58.50'	48.00'	069°49'37"	S39°19'25"E	54.94'
C35	52.24'	48.00'	062°21'24"	S26°46'06"W	49.70'
C36	204.13'	48.00'	243°39'57"	S63°53'11"E	81.56'

CURVE TABLE					
CURVE #	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD LENGTH
C37	7.09'	5.00'	081°12'31"	N17°20'32"E	6.51'
C38	30.86'	145.00'	012°11'41"	N29°21'34"W	30.80'
C39	23.80'	170.00'	008°01'21"	N46°43'45"W	23.78'
C40	21.54'	170.00'	007°15'40"	N39°05'14"W	21.53'
C41	45.35'	170.00'	015°17'01"	N43°05'55"W	45.21'
C42	42.96'	170.00'	014°28'43"	N57°58'46"W	42.84'
C43	4.29'	595.00'	000°24'47"	N65°25'31"W	4.29'
C44	72.64'	595.00'	006°59'41"	N69°07'45"W	72.59'
C45	70.19'	595.00'	006°45'33"	N76°00'22"W	70.15'
C46	147.12'	595.00'	014°10'01"	N72°18'08"W	146.75'
C47	36.96'	230.00'	009°12'21"	S74°46'58"E	36.92'
C48	19.70'	230.00'	004°54'28"	S67°43'33"E	19.69'
C49	56.66'	230.00'	014°06'49"	S72°19'44"E	56.51'
C50	7.58'	495.00'	000°52'37"	N65°42'38"W	7.58'
C51	77.49'	495.00'	008°58'10"	N70°38'02"W	77.41'
C52	75.86'	495.00'	008°46'53"	N79°30'33"W	75.79'
C53	51.61'	495.00'	005°58'26"	N86°53'13"W	51.59'
C54	212.54'	495.00'	024°36'06"	N77°34'23"W	210.91'

CURVE TABLE					
CURVE #	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD LENGTH
C55	31.01'	555.00'	003°12'05"	N66°52'22"W	31.01'
C56	52.30'	555.00'	005°23'56"	N71°10'23"W	52.28'
C57	115.31'	555.00'	011°54'16"	N79°49'29"W	115.11'
C58	198.62'	555.00'	020°30'17"	N75°31'28"W	197.56'
C59	30.91'	20.00'	088°32'33"	S41°30'20"E	27.92'
C60	108.78'	145.43'	042°51'22"	S24°13'37"W	106.26'
C61	4.08'	120.97'	001°55'53"	N47°21'25"E	4.08'
C62	112.86'	144.77'	044°39'57"	S25°03'40"W	110.02'
C63	89.63'	120.00'	042°47'46"	S68°45'18"W	87.56'
C64	31.42'	20.00'	090°00'00"	N44°50'49"W	28.28'
C65	31.42'	20.00'	090°00'00"	N45°09'11"E	28.28'
C66	43.52'	145.00'	017°11'41"	S81°14'58"E	43.35'
C67	6.86'	5.00'	078°35'25"	S33°21'25"E	6.33'
C68	59.24'	48.00'	070°42'48"	N29°25'06"W	55.55'
C69	26.74'	48.00'	031°54'47"	N80°43'53"W	26.39'
C70	36.96'	48.00'	044°07'11"	S61°15'08"W	36.06'
C71	9.40'	48.00'	011°13'04"	S33°35'01"W	9.38'
C72	65.94'	48.00'	078°42'53"	S11°22'58"E	60.88'

CURVE TABLE					
CURVE #	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD LENGTH
C73	11.47'	48.00'	013°41'44"	S57°35'16"E	11.45'
C74	209.75'	48.00'	250°22'26"	S60°45'05"W	78.46'
C75	11.00'	205.00'	003°04'26"	S64°39'05"E	11.00'
C76	51.77'	205.00'	014°28'09"	S73°25'22"E	51.63'
C77	32.88'	205.00'	009°11'23"	S85°15'08"E	32.84'
C78	95.65'	205.00'	026°43'57"	S76°28'50"E	94.78'
C79	31.42'	20.00'	090°00'00"	N44°50'49"W	28.28'
C80	26.47'	145.00'	010°27'40"	N5°23'01"E	26.44'
C81	31.42'	20.00'	090°00'00"	N55°36'51"E	28.28'
C82	6.45'	170.00'	002°10'23"	S78°17'57"E	6.45'
C83	35.43'	170.00'	011°56'26"	S71°14'32"E	35.36'
C84	41.88'	170.00'	014°06'49"	S72°19'44"E	41.77'
C85	31.42'	20.00'	090°00'00"	S34°23'09"E	28.28'
C86	31.42'	20.00'	090°00'00"	S45°09'11"W	28.28'
C86	37.43'	205.00'	010°27'40"	N5°23'01"E	37.38'
C87	50.27'	32.00'	090°00'00"	N44°50'49"W	45.25'
C88	49.87'	145.00'	019°42'23"	N10°00'23"E	49.63'
C89	32.77'	20.00'	093°52'59"	N66°48'04"E	29.23'

CURVE TABLE					
CURVE #	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD LENGTH
C90	79.57'	655.00'	006°57'38"	N69°44'16"W	79.52'
C91	70.51'	655.00'	006°10'04"	N76°18'07"W	70.47'
C92	150.08'	655.00'	013°07'41"	N72°49'18"W	149.75'
C93	144.26'	175.00'	047°13'50"	S23°44'30"W	140.21'
C94	112.04'	150.00'	042°47'46"	S68°45'18"W	109.45'
C95	98.96'	63.00'	090°00'00"	N44°50'49"W	89.10'
C96	75.22'	175.00'	024°37'41"	N12°28'02"E	74.64'
C97	31.95'	175.00'	010°27'40"	N5°23'01"E	31.91'
C98	81.65'	175.00'	026°43'57"	S76°28'50"E	80.91'
C99	225.42'	525.00'	024°36'06"	N77°34'23"W	223.70'
C100	49.27'	200.00'	014°06'49"	S72°19'44"E	49.14'
C101	154.54'	625.00'	014°10'01"	N72°18'08"W	154.14'
C102	50.54'	200.00'	014°28'43"	N57°58'46"W	50.41'
C103	53.35'	200.00'	015°17'01"	N43°05'55"W	53.19'
C104	90.83'	175.00'	029°44'16"	N20°35'17"W	89.81'
C105	70.84'	200.00'	020°17'40"	S49°24'25"W	70.47'
C106	0.76'	230.00'	000°11'22"	S39°21'16"W	0.76'
C107	21.25'	60.00'	020°17'40"	S49°24'25"W	21.14'

CURVE TABLE					
CURVE #	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD LENGTH
C108	12.56'	60.00'	011°59'23"	S53°33'34"W	12.53'
C109	8.70'	60.00'	008°18'17"	S43°24'43"W	8.69'

LINE TABLE		
LINE #	LENGTH	BEARING
L1	36.32'	N65°16'19"W
L2	16.32'	N65°16'19"W
L3	10.06'	N47°21'25"E
L4	25.19'	S63°06'52"E
L5	50.03'	N49°27'04"E
L6	8.28'	S00°09'11"W
L7	6.44'	S50°44'25"E
L8	12.89'	N59°33'15"E
L9	24.77'	N50°44'25"W
L10	9.87'	N35°27'24"W
L11	5.30'	N05°43'09"W
L12	38.26'	N15°45'47"E
L13	76.09'	N85°35'23"E
L14	5.30'	N05°43'09"W
L15	10.33'	N54°32'36"E
L16	19.73'	S20°56'38"E
L17	20.21'	N54°32'36"E
L18	20.75'	N47°21'43"E

LEGEND

FOUND #5 REBAR AND 1" RED PLASTIC CAP PLS 36062

FOUND AS DESCRIBED

1 FOUND #5 REBAR AND 1.25" PLASTIC CAP ILLEGIBLE

2 FOUND #5 REBAR AND 1.25" RED PLASTIC CAP PLS 17477

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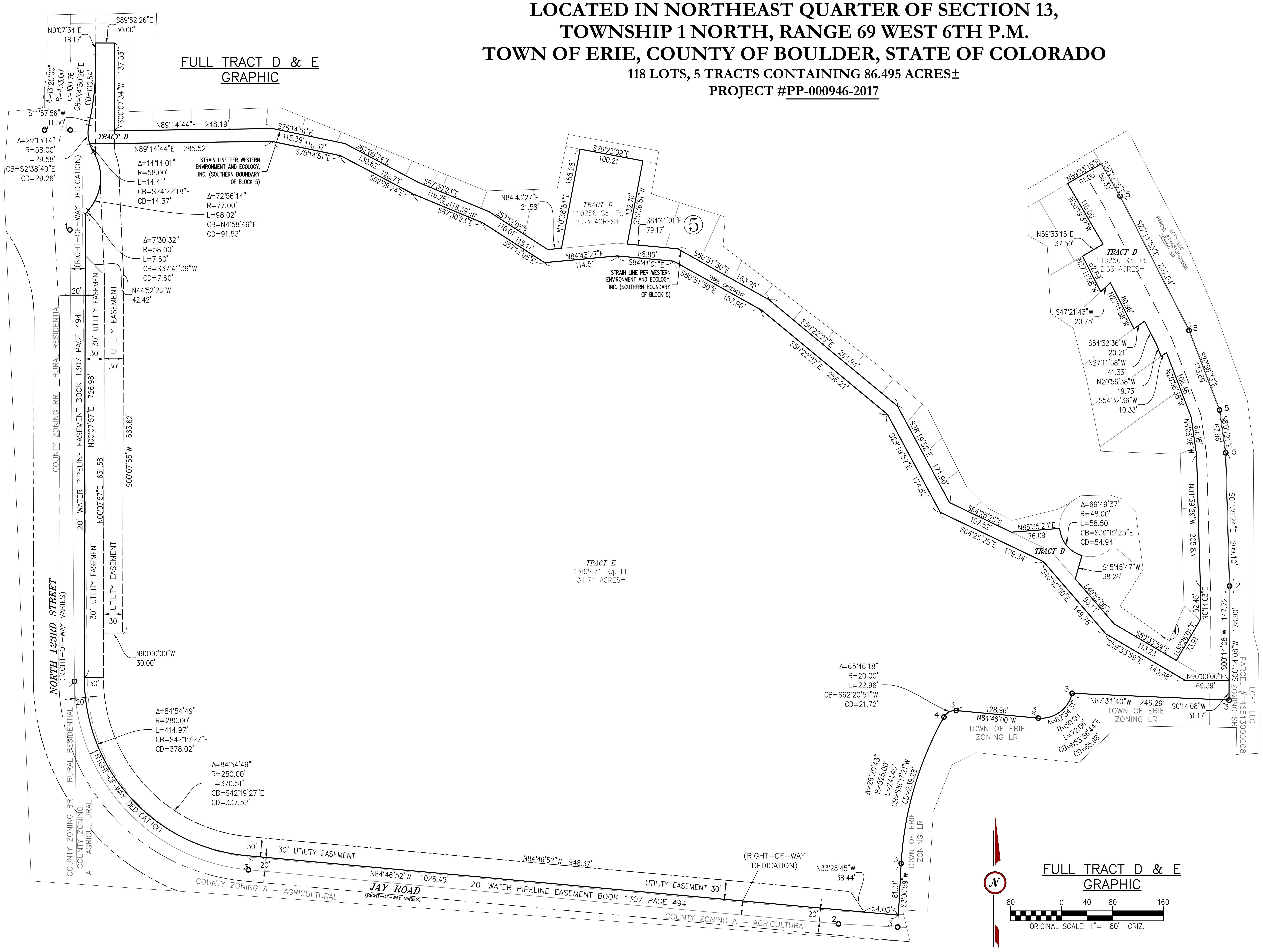
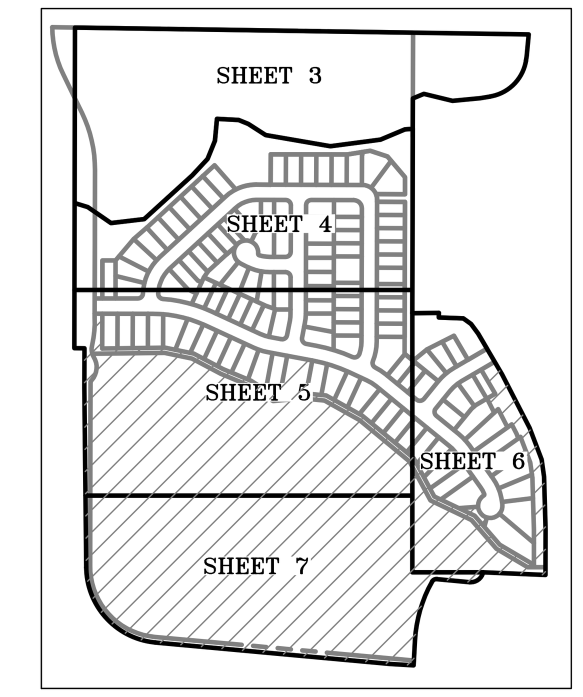
PROJECT #PP-000946-2017

FULL TRACT D & E GRAPHIC





SHEET INDEX
1"=600'

FULL TRACT D & E GRAPHIC

ORIGINAL SCALE: 1"= 80' HORIZ.

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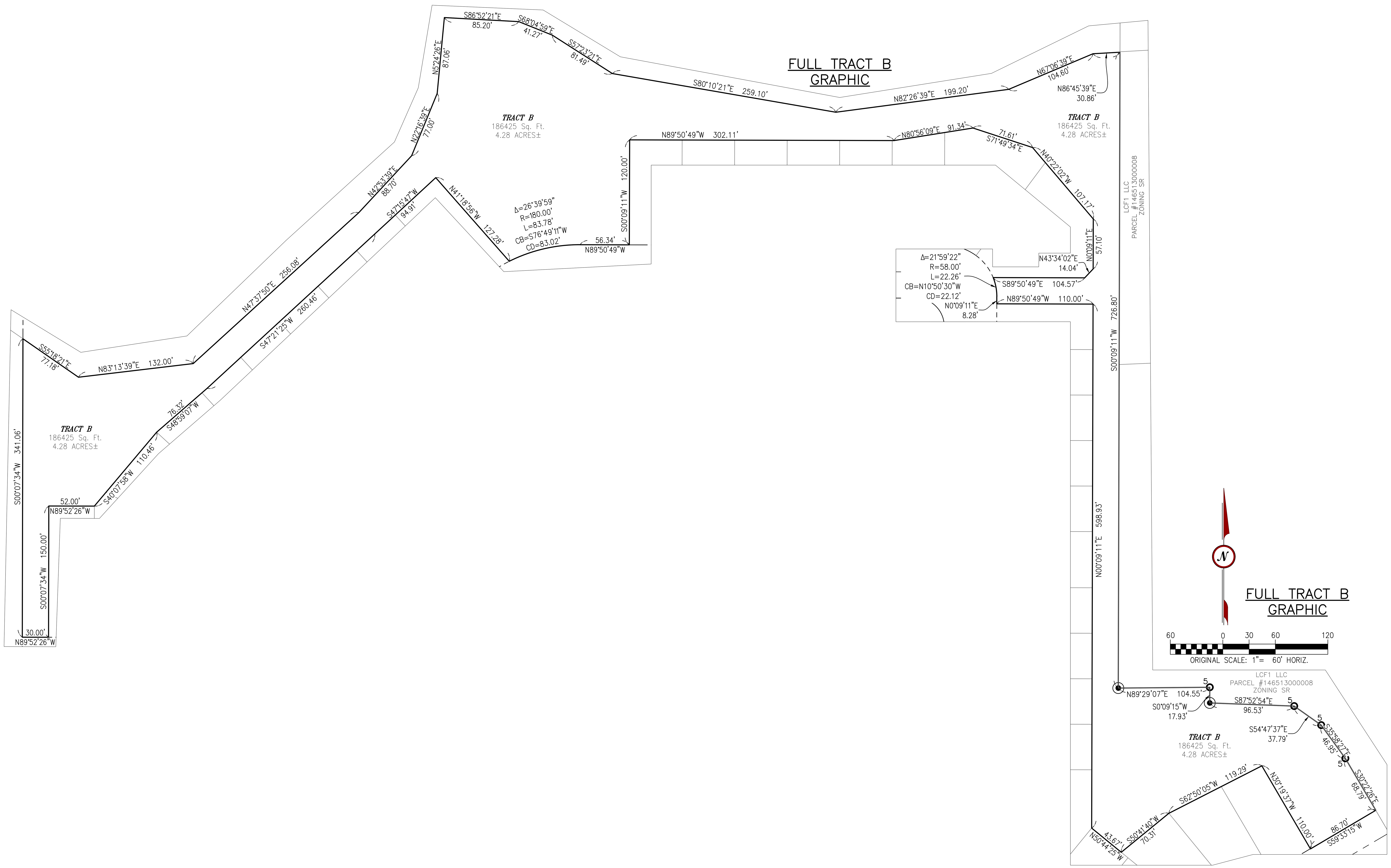

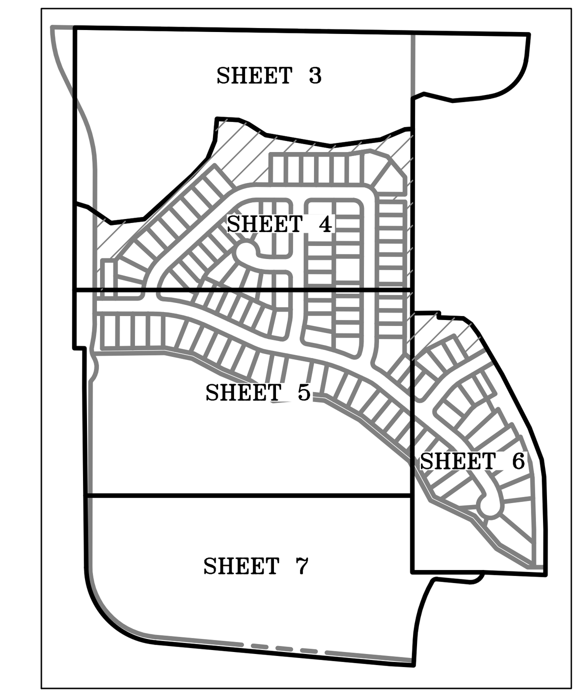

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PHASE II DRAINAGE REPORT
FOR
MEADOWLARK

Job Number 18144

November 20, 2017
Revised: March 16, 2018
Revised: September 24, 2018
Revised: December 14, 2018

PHASE II DRAINAGE REPORT
FOR
MEADOWLARK

Town of Erie
Colorado

Job Number 18184

Owner/Developer:
TI Residential
9801 E. Easter Avenue
Centennial, Colorado 80112
(303) 346-7006

Engineer:
Rick Engineering Company
9801 East Easter Avenue
Centennial, Colorado 80112
(303) 537-8020

November 20, 2017
Revised: March 16, 2018
Revised: September 24, 2018
Revised: December 14, 2018

Certification

Engineer's Certification

"I hereby certify that Phase II Drainage Report for the design of Meadowlark 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."

____

Troy Bales
Registered Professional Engineer
State of Colorado No. 50961
Exp. 10/19

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: ____________________________________ Date: ____________________
Town Engineer

TABLE OF CONTENTS

APPENDICES

PHASE II
DRAINAGE REPORT
FOR
SCHMIDT PROPERTY

REVISION PAGE

December 14, 2018

This drainage report presents a revision to the September 24, 2018 report pursuant to the third review comments from the Town of Erie, Engineering Division dated November 7, 2018. The following text is the Town of Erie's plan check comments (in italicized lettering), immediately followed by Rick Engineering Company's (Rick) responses (in bold lettering).

1. *Revise the grading of Swales A, B, E, and F to maintain 1 foot of minimum freeboard for the 100-year flows per Town Criteria. Note that all of Basin HOS-1 flows are included in Swale B calculations, however a portion of HOS-1 will likely flow to Swale F.*

   Comment noted. Swales A, B, and F have been revised to provide 1-foot of minimum freeboard. Please note that Swale D and E have been replaced with storm drain pipes.

2. *A Town variance is required to allow a retaining wall for conveying Swale D. If allowed, the wall must be installed deeper to have a footing and frost protection.*

   Swale D has been replaced with storm drain pipes.

3. *The following comments refer to the proposed box culvert conveying the Lower Boulder Canal.*

   a. *Include references and/or calculations that show how the 230 cfs design flow was obtained for sizing the culvert capacity.*

      Comment noted. Design flow was obtained from the Northern Water memorandum dated August 22, 2018. Rick Engineering received the review comments from Northern Water in the form of a memo for the Meadowlark Preliminary Plat Construction Documents dated May 16, 2018. The memo included the cross section, plan and profile details of the existing lower boulder irrigation canal including the design flow and has been included as a reference in Appendix D.

   b. *Verify that the proposed 4' x 16' box culvert does not create a rise in water surface elevation compared to existing conditions for the design flow. If there is a rise, verify the irrigation canal owners will approve a rise in water surface elevation due to backwater at the proposed culvert or increase the culvert size to lower the water surface to existing conditions.*

      Comment number 3 on the Northern Water memo (Appendix D) calls for a 1.5 ft freeboard and the proposed 4'x16' box culvert has been designed to provide the required freeboard.

4. *On the post-project drainage map sheet 1, correct the EURV and 100-year volumes to match the detention calculations in Appendix B. The EURV volume should include the WQCV, not just the volume for Zone 2. The 100-year detention volume should be the calculated 100-year volume shown in the routed hydrograph results, not the approximate volume.*

   Comment noted and addressed

5. *The design concept for the detention pond outlet structure is acceptable, but the calculation for the pond release rates and storage volumes need to be corrected to account for the proposed syphon condition. The UDFCD Detention spreadsheet only analyzes inlet control based on the orifice equation to determine the release rate for the pond outlet pipe. Since the outlet pipe has a syphon condition, outlet control must also be analyzed since this will likely control the release rate since the downstream invert of the outlet pipe is higher than the invert at the outlet structure. The following adjustments must be made to analyze the outlet pipe.*

   a. *In the Detention Basin Outlet Structure Design spreadsheet, it might be possible to adjust the "Depth to Invert of Outlet Pipe" to analyze the correct "head differential" for the syphon condition of the outlet pipe based on outlet control. Instead of using the outlet pipe invert at the outlet structure, the tailwater elevation at the downstream manhole must be used. Based on the profile schematic provided in the report appendix, this will result in a negative value (about 5012.0 - (5010.5 + 3') = -1.5'). This value should also be adjusted for the pipe friction and manhole losses. Note that the Detention spreadsheet may not allow a negative number to be entered for this value or have a reasonable result.*

      The UD-Detention spreadsheet cannot consider a negative value as suggested. Hence, CUHP and SWMM Detention Analysis with a normal tailwater elevation have been performed to account for the tailwater condition, friction and manhole losses.

   b. *If the Detention Basin Outlet Structure Design spreadsheet does not allow the adjustment described in "5a" above, we recommend analyzing the pond using SWMM with a calculated pond release rate curve based on outlet control with a varying tailwater elevation that is dependent on the pond depth and release rates.*

      Please see response to comment 5a.

   In addition, the following should be considered for the design of the outlet pipe.

   a. *Per the design, the 100-year release rate (about 112 cfs) is proposed to drain through a 36" RCP. The velocity will be about 16 ft/s. The pipe size should be increased to reduce the velocity and associated losses (friction and manhole losses) to improve the efficiency of the outlet pipe, lower the hydraulic grade line (HGL), and potentially increase the pond release rate.*

      The single 36" RCP has been replaced with three (3) parallel 36" RCPs. Per the UDFCD USDCM Volume 1 Chapter 7 the recommended maximum velocity of storm drain pipes is 20 ft/sec. The proposed 36" RCPs would have a velocity less than 20ft/sec.

b. *Consider increasing the size of the downstream outlet pipe (to the channel) to reduce the pipe slope and lower the HGL.*

Comment noted.

c. *As shown on Sheet 54 in the construction plans, the rim elevation at the downstream manhole is at elevation 5013.0. Per the profile schematic of the outlet pipe provided in the report appendix, the invert is shown to be 5010.5, making the manhole only 2.5' deep. The proposed 36" RCP pipe will not fit at this manhole. Adjust as needed.*

The construction plan has been revised to show the proposed grading at the downstream manhole to accommodate the proposed 36"RCPs with 1.5 ft of required cover.

d. *The pumped flows will be routed to the downstream manhole. To prevent flow from draining back to the pump sump manhole, the invert of the outpipe at this manhole must be lower than the invert of the inlet pipe.*

Comment noted and addressed. The invert of the outlet pipe is now lower than the invert of the inlet pipe at this manhole.

e. *At the pump sump manhole, we recommend installing the pump in a recessed wet well to reduce the losses at this manhole.*

The project proposes a submersible pump that will be recessed in a wet well to reduce the losses.

PHASE II
DRAINAGE REPORT
FOR
SCHMIDT PROPERTY

REVISION PAGE

September 24, 2018

This drainage report presents a revision to the March 16, 2018 report pursuant to the second review comments from the Town of Erie, Engineering Division dated July 13, 2018. The following text is the Town of Erie's plan check comments (in italicized lettering), immediately followed by Rick Engineering Company's (Rick) responses (in bold lettering).

1. *Please correct the typo "STAMPO" in the Town Acceptance statement.*

   The Town Acceptance statement has been updated to fix the typo.

2. *Correct the last sentence in the second paragraph of page 14 to refer to Table 10.*

   Comment noted and addressed.

3. *Add the hydrologic soil type of the site in the property description.*

   Comment noted and addressed.

4. *Per Section 100 of the Town Standards and Specifications Manual, the Phase II Drainage Report hydraulic computations shall include existing and proposed culvert capacities.*

   a. Include sizing calculations for the proposed box culvert conveying the Lower Boulder Canal.

   b. Verify that the proposed culvert under E Street in Basin 4 has capacity for runoff from Basins 2 and 4. Provide all calculations for culvert sizing.

   Comment noted. Culvert sizing calculations have been included as requested. Culvert under E street has been sized to include Q from Basin 2 and 4.

5. *The detention pond and swale calculations assume offsite flows from HOS1 will not overtop Lombardi Street, 123rd Street, or Jay Road in the minor and major storm events. Provide calculations to verify the roadside ditches or conveyance channels have capacity to redirect these offsite flows.*

   The report herein assumes the offsite flows from HOS1 will overtop Lombardi Street, 123rd Street and Jay Road. Hence, roadside ditches or conveyance channels capacity have not been verified. However, detention pond and swale calculations have been updated to include offsite flows from HOS1.

6. *Per the OSP, the runoff south of Jay Road from Basin HOS2 is planned to be conveyed north through the site. The site swales, storm sewer, and detention pond shall be sized to receive and convey this offsite undeveloped flow to follow the OSP.*

The report herein assumes the offsite flows from HOS2 will overtop Jay Road and flow north through the site per the OSP. Hence, storm sewer, detention pond and swale calculations have been updated to include offsite flows from HOS2.

7. *The residential lot at the southeast corner of the site appears to drain runoff directly north to the site. Include this area as an offsite basin and update site conveyance and detention sizing calculations accordingly.*

Comment noted and addressed. Area has been included as part of Basin 1. Relevant sizing calculations have been updated.

8. *All developed site flows are proposed to outfall into the existing Kenosha Farms channel parallel and east of the proposed Lombardi Street. Verify the channel and existing culverts at Allen Avenue have capacity for the detention pond discharge flow, Lombardi Street runoff, and the tributary basins located north of the Lower Boulder Canal.*

Comment noted. Please refer Appendix B for the open channel capacity calculation. Flow rate (436cfs) for SWMM Node 541 from the Outfall Systems Plan (Appendix D) has been used to conservatively check the capacity of the existing channel. Node 541 is the ultimate sump located further downstream from the existing channel. The peak flow at Node 541 is considerably higher than the proposed peak flow at project outfall. The provided open channel calculations show that the existing channel has capacity to convey peak flow of Node 541.

9. *It appears that Basins 19 and 20 currently are routed to the existing channel located east of proposed Lombardi Street via an existing swale along the property boundary. The runoff from these basins should be included in the analysis for the existing channel capacity.*

Comment noted. Please refer to response for comment 8.

10. *Below are several comments related to the detention basin:*

a. The detention basin volume and outlet structure shall be designed to detain and release all contributing flows, including the entirety of Basin 1, Basin HOS2 and any additional offsite flows conveyed through the detention pond. The offsite basin runoff cannot be released "separately" through the emergency overflow.

b. Provide forebays at the two swale outfalls.

c. The proposed volumes for water quality, EURV, and 100-year shall be documented on Sheet DR01.

d. The proposed pond must be designed and graded according to the Urban Storm Drainage Criteria Manual (USDCM). Update the detention pond plans to provide a micropool at the outlet structure, emergency spillway, initial surcharge volume control, and maintenance access.

Detention basin volume and outlet structure has been designed to detain and release all contributing flows, including Basin 1, Basin HOS-1 and Basin HOS-2. The outlet structure will release the detained 100-year Q (within allowable release rate) through a 36-inch RCP under the irrigation canal and outlet into the existing channel at Kenosha Farms. Emergency spillway has been designed to convey the Un-detained Q100 into the Lower Boulder Irrigation Canal in cases of emergencies only. A foot of freeboard has been provided above the spillway embankment. Please refer Appendix B for revised calculations and design.

Forebays have been provided as requested at the two swale outfalls.

Proposed WQCV, EURV and 100-year detention volumes have been included in the post-project drainage map sheet 1.

11. *A Town variance is required to allow Swale D to be a rectangular-shaped concrete channel.*

Swale D is no longer a rectangular-shaped concrete channel. Swale D has been redesigned to be a natural swale with 3:1 side slope on the eastern bank. Please refer to Appendix B for the revised hydraulic calculation of the swale. Please refer to post-project drainage map for the swale cross-section details.

12. *Proposed grading west of the Lombardi Street appears to be shown outside the property site boundary. Provide verification that this has been approved by the offsite property owner.*

It's understood that the development is obligated to obtain approval from the existing property owner grade and construct a road on their property. We have been working with the Town on this issue and will be submitting for annexation of the area in question during the final plat process.

13. *Provide design points on the Historic Drainage Map.*

Please note that the Historic Drainage Map has been provided for reference purposes only. It was approved by the Town of Erie under the Phase I drainage report.

14. *Please note the inlet calculations provided will be reviewed as part of the Phase III Drainage Report.*

Comment noted.

15. *A portion of the site is located within unincorporated Boulder County. Unless this area will be annexed into the Town, these plans should be submitted for review by Boulder County. Be aware that the Boulder County GESC requirements will need to be adhered to. It is our understanding that REC is currently in the process of working out this issue with Boulder County. Provide documentation of the final resolution in the report text.*

    We have had preliminary discussions with the Town on this issue. The town has asked us to pursue annexation at final plat.

16. *Our responses to the two alternatives proposed for discharging the site detention pond flows are the following:*

    a. In the Alternative 1 scenario, the non-draining ponded water will not be allowed to count towards the required pond storage volume. The detention pond area will need to be increased to provide the required storage volume above the outfall ditch. This is the Town's preferred alternative.

    b. In the Alternative 2 scenario, a pump is proposed to raise discharges to a manhole and outfall swale. Depending on pumping rates, additional storage volume will likely be required to accommodate the potential for the pump to fail, such as sizing the volume based on retention.

    If this alternative is pursued, provide pumping rates, calculations, sizing, and maintenance information for the pump. Verify that the pumping rate will be greater than the 100-year discharge from the detention pond. A dual pump system must be provided in case one of the pumps fails to work during a storm event. The wet well shall also include insulation on the walls, lid, and inlets and outlets to protect from freezing. Provide the size of solids that can be carried in this pump. Identify who will pay for the electricity needed to operate the pump.

    Please refer to Appendix B for the revised detention design. The bottom of the detention basin is higher than the project outfall. Hence the flow from the detention basin will drain naturally under the irrigation canal and to the outfall during a storm event. However, after the storm event the water in the storm drains under the irrigation canal will be pumped through a force main into the cleanout immediately upstream of the outfall. This sump volume will be pumped in a drawdown time of approximately 12hrs. The pumping rate and sizing calculations have also been included in Appendix B. The project will incorporate a dual pump system as requested. Specific maintenance information will be included in final engineering as part of Phase III drainage report.

PHASE II
DRAINAGE REPORT
FOR
SCHMIDT PROPERTY

REVISION PAGE

March 16, 2018

This drainage report presents a revision to the November 20, 2017 report pursuant to the first review comments from the Town of Erie, Engineering Division dated January 12, 2018. The following text is the Town of Erie's plan check comments (in italicized lettering), immediately followed by Rick Engineering Company's (REC) responses (in bold lettering).

1. *There are several typos, grammar, and spelling errors within the report that make it confusing. Please correct these.*

   The drainage report narrative has been updated to fix these issues.

2. *Use the most recent version of the including the Urban Storm Drainage Criteria Manual (USDCM) and the Town of Erie Standards and Specifications. Update all calculations, report, and plans as necessary.*

   The drainage report has been updated to adopt the Town of Erie's 2018 Standards and Specifications and UDFCD's 2017 Urban Storm Drainage Criteria Manual.

3. *A portion of the site is located within unincorporated Boulder County. Unless this area will be annexed into the Town, these plans should be submitted for review by Boulder County. Be aware that the Boulder County GESC requirements will need to be adhered to.*

   REC is currently in the process of working out this issue with Boulder County.

4. *Verify that the Lost Creek Development to the northeast of the site has been sized to accommodate the runoff generated from the Schmidt property developed condition.*

   Runoff generated from developed portions of the Schmidt property does not drain to the Lost Creek Development. The proposed swale along the east and north side of the project boundary drains the collected runoff to the proposed detention basin.

5. *Although mentioned in Section II.B, the Historic Drainage Map does not appear to be included in the appendices. Please provide.*

   Historic drainage map has been included in Appendix E per request.

6. *It appears that a portion of Basin 1 north of the proposed swales consists of the back portions of single family residential lots. Verify that the runoff does not increase beyond the historic rates and that the swales are designed to accommodate this runoff.*

   Basin 1 runoff is calculated using composite impervious percent which includes the back portions of the single family residential lots. This runoff is then used to size the swale in Basin 1 per Table 7: Flows in Swale and Appendix B of this report. The developed portion of Basin 1 (2.8 acres) has also been included in the detention calculations. The detained 10-year and 100-year flows for the developed portions of the project from detention pond would outlet at the allowable release rates per Town of Erie criteria into the existing drainage ditch located west of Erie Village Subdivision.

7. *Verify that the culvert under E Street in Basin 4 has capacity for runoff from Basins 2 and 4. Provide all calculations for culvert sizing.*

   Culvert sizing calculations will be included as part of the Phase III drainage report.

8. *Based on the proposed contours, it appears that the southern boundary between Basins 16 and 17 needs to be revised. Update all calculations and plans accordingly.*

   The lots in Basin 16 and 17 are lots with walk out backyards in the basement sloping towards the swale F-F and the delineation represents this design feature. The contours will be updated as part of the precise grading plans/final plat.

9. *In Section III.B of the report, the one-hour rainfall depth for the 2-year design storm should be corrected to be 1.01 inches, not 1.1 inches per Town criteria. The correct value was used for the calculations.*

   The report has been updated as requested.

10. *From the runoff coefficient calculations for the post-development condition, the incorrect runoff coefficient values were used. Update calculations using the values in the current version of the Urban Storm and Drainage Criteria Manual (USDCM).*

    Runoff coefficients for each sub-basin has been updated based on "Table 800-3: Percent Impervious for Rational Method" from Section-800 - Storm Drainage Facilities and "Table 6-5: Runoff Coefficients, c" from USDCM Volume 1 (March 2017).

11. *The runoff coefficient calculations do not show a composite of the different imperviousness categories within each basin. For example, Basin 3 has single family residential lots, streets, and sidewalk yet the only land use category used in the runoff coefficient calculation is residential. Update calculations for all basins to include composite percent imperviousness and corresponding runoff coefficients.*

Runoff coefficients have been updated based on the composite percent impervious for each sub-basin as requested.

12. *In the time of concentration calculations, the initial overland flow time results do not seem to be correct. Update using the correct equation from the USDCM.*

    The error in the initial overland flow time results has been rectified.

13. *In the time of concentration calculations, the ending elevation for Basin 1 (1253 ft) does not seem to be correct. This elevation gives a very steep slope and thus the time of concentration for Basin 1 is incorrect. Update all calculations that are influenced by this error including runoff calculations, swale sizing, pond sizing, etc.*

    Time of concentration calculation for Basin 1 has been updated with the right ending elevation and all relevant calculations have been updated to reflect the change.

14. *For the Rational Method calculations, runoff calculations are only provided for individual basins. Accumulated runoff at design points should also be provided that includes the runoff from all tributary basins.*

    Detailed confluence and storm sewer analyses will be included as part of the Phase III Drainage Report per Section 100: Title, Scope and General Requirements. Phase II drainage report includes preliminary storm sewer layout and inlet sizes in addition to the rational method calculations for each sub-basin.

15. *The runoff used for the 100-year analysis of swale D (12.7 cfs) only accounts for the flow from basins 5 and 8. The channel should be sized to accommodate the runoff from the full tributary area including Basins 2 and 4 upstream of the channel. Update analyses of all swales to include runoff from all tributary basins.*

    Swale D has been sized to account for flows from all tributary areas which includes, Basin 2, 4, 5, and 8.

16. *Swale D is proposed to be a rectangular-shaped concrete channel. Per criteria, channels shall be natural where possible so this channel shall be redesigned. Provide justifications if it cannot be graded as a natural channel.*

    REC ran into both horizontal and vertical constraints while designing swale D and had to design a rectangular-shaped concrete channel to accommodate flows from the entire tributary area. After initial talks with the town, REC received an ok from the town engineer to move forward with the rectangular channel for the preliminary plat.

17. *Below are several comments related to the detention basin:*

   a. *Clarify if the volume and release rates that are in the text or the spreadsheet in the appendix was used to size the detention pond. There is conflicting information. The proposed volumes for water quality, 10-year, and 100-year shall be documented on Sheet DR01.*

   Please refer to the UD-Detention spreadsheet in Appendix B for the WQCV, EURV, 10-Year and 100-Year volume calculations.

   b. *The design of the pond used 43% as the tributary area percent imperviousness based on single family residences 0.25 acres or less. However, the imperviousness for this land use is 45% per the current version of the USDCM. However, the site includes paved roads and sidewalks that would increase the imperviousness. Update pond sizing calculations using a composite percent imperviousness for the entire tributary area.*

   Composite impervious percent (including roads and sidewalks) for the site has been calculated as shown in Table 10 of this report as requested per the latest USDCM criteria. It is important to note that detention has only been provided for the developed portions of the site (34.7 acres). This includes Basins 2-18, OS-1, OS-2 and the back of residential lots in Basin 1 (2.8 acres). The undeveloped portions of the Basin 1 (37.2 acres) will not be detained and the flows from this portion will flow over emergency spillway during 100-year storm.

   c. *Provide forebays at all storm sewer outfalls, a micropool at the outlet structure, emergency spillways, initial surcharge volume control, trickle channel for the pond, and maintenance access.*

   Please refer Appendix B of this report.

18. *A pump is proposed to raise discharges to a manhole and outfall swale. Provide pumping rates, calculations, sizing, and maintenance information for the pump. Verify that the pumping rate will be greater than the 100-year discharge from the detention pond. Depending on pumping rates, additional storage volume will likely be required to accommodate the potential for the pump to fail.*

   Two alternatives are currently being proposed for discharging the flows underneath the irrigation canal to the outfall swale. Please refer to the detention calculations included in Appendix B for the schematic of both alternatives. Detailed pump sizing will be done as part of the Phase III drainage report.

19. *On DR01, there appears to be several cross sections called out on the plans (D-D, E-E, and F-F) that do not have a correlating section on any of the drainage maps. Please include cross sections and verify the swale capacities.*

    The cross-sections for Swales A-A through F-F have been included in the updated post-development drainage map. The swale sizing calculations are included in Appendix B of this report.

20. *On DR02, it is unclear where the sump Type R inlet would be located for Basin 13. Clarify on the drawings and verify inlet capacity.*

    Please refer Phase II Post-Project Drainage Map dated, March 16, 2018 in Appendix E for the design point location numbered 13. Please refer Appendix B of this report for all inlet sizing calculations.

21. *On DR02, there seems to be an extra basin label for Basin 1 located on the border with Basin 7. Remove or clarify why this redundant label is on the map.*

    The extra basin label has been removed.

22. *The summary runoff and inlet table on DR02 specifies the 100-year runoff peak of 87.2 cfs at design point 1 while the calculations in the appendix shows 91.6 cfs. Clarify which is the correct value and update all resulting calculations as necessary.*

    The summary runoff table in the drainage map has been updated to match the latest calculations in the Appendix A of this report and all relevant calculations have also been updated.

Preliminary Construction Plans

23. *The construction plans shall include details for the detention pond, channels, plan and profiles for the storm sewer systems, and any other details needed to construct the drainage system.*

    Per Section 100: Title, Scope and General Requirements, the profiles of the storm sewer systems will be included as part of the final plat. Preliminary construction plans include details for detention pond, swales and plan details of the storm sewer system.

I. GENERAL LOCATION AND DESCRIPTION

A. Location

The project site is located in the Northeast Quarter of Section 13, Township 1 North, Range 69 West, of the 6^{th} Principal Meridian, County of Boulder, State of Colorado. The property is bounded by the Erie Village Subdivision to the north, the future Lost Creek Development to the east, Jay Road to the South, and Jay Road and agricultural land to the west. Jay Road is proposed to be widened with new Right of Way width to be 80 feet. There are no other streets within 150-ft of the project boundary. A Street shall be constructed as part of the project joining Jay Road to Lombardi Street in Erie Village Subdivision.

B. Description of Property

Meadowlark has an approximate total area of 90 acres (on-site). The proposed development consists of 118 single family residential lots constructed within the portion of the property north of the zero subsidence line; the south half of the site, with a history of mining, will remain undeveloped at this time. The existing site vegetation is undeveloped farmland. The Lower Boulder Irrigation Ditch transverses the northern portion of the site flowing west to east. There are two parallel drainage swales flowing south to north in portion of the property south of zero subsidence line. There are no areas of wetlands in the property boundary.

There is an existing sewer easement in the north east corner of the project site, another easement is located at northeastern corner of the project site spanning future Lost Creek Subdivision. A storm drain easement is proposed in north central portion of project site to lay storm drain draining detention pond and connecting detention pond to outfall in drainage swale located along western boundary of Erie Village Subdivision. The hydrologic soil group of the project area is 60% Type B and 40% Type C.

This phase II drainage study for project site is based on approved Phase I drainage study for the Schmidt Property prepared by Innovative Land Consultants, Inc. dated March 9, 2015 (herein referred to as Phase I drainage report). The Phase I drainage report establishes historic drainage basin boundaries, drainage patterns and runoff calculations for pre-development condition.

II. DRAINAGE BASINS

A. Major Basin Description

Meadowlark falls within the Coal Creek Watershed Area. In particular, the property is located within four Major Basins as defined by the Town of Erie Outfall Systems Plan (West Coal Creek) (henceforth referred to as the OSP), dated January 2014, prepared by RESPEC Consulting and Services. The western portion of the project site falls within Basin 490, the northeastern portion falls within Basin 492, the southeast portion falls within Basin 498, and a portion near the northeast corner falls within Basin 487. For reference, excerpts from the OSP have been included in Appendix D.

Runoff from Basin 490 sheet flows to the north and west through natural channels, eventually passing through the Kenosha Farms and Erie Village Subdivisions. Basin 498, sheet flows north onto Basin 492. From there, Basin 492 sheet flows to the northeast before leaving the site and entering the Erie Village Subdivision. Basin 487 sheets flows to the northeast and exits the site into the future proposed Lost Creek Development. For information on runoff from these basins, see Appendix D.

The site is located within Zone X (Other Areas) as shown on FEMA FIRM panels 08013C0441J and 08013C0437J, dated December 18, 2012. No Flood Area Delineation Reports (FHADs) are available for project site. The FEMA FIRM panels have been provided in Appendix D.

The existing land use designation for the property is Agriculture/ Open Space (AG/ OS) and the proposed land use designation for the property is Low Density Residential (LR) and Agriculture/ Open Space (AG/ OS). Per Town of Erie, for a subdivision to be classified as Low Density Residential, gross density should not exceed 5 dwelling units per acre (See Appendix D). See table below showing residential density in project site.

Table 1: Residential Density of Project Site

	# of Dwelling Units (DU)	Area (acres)	Dwelling Unit Density (DU/acre)
Project Site	118	90.0	1.3

Since the dwelling unit density is less than 5 DU per acre, the project site qualifies as Low Density Residential site.

The only irrigation facility within 150’ of the property boundary is the Lower Boulder Ditch which flows west to east through northern portion of the site. This canal is assumed to be flowing full and is not assumed to take on any flows from the project site.

There are no lakes or ponds within or nearby project site that may be affected by drainage from the project.

There are no jurisdictional dams in or immediate vicinity of the project site that may be affected by drainage from the project.

B. Sub-basin Description

Meadowlark has four historic sub-basins located within the property boundaries, labeled as H1, H2, H3, and H4 and two contributory offsite sub-basins HOS1 and HOS2, per the Phase I report. The assumed percent impervious of the offsite sub-basins is 2% (historical flow analysis). Future developments in these offsite sub-basins would have to provide their own on-site detention. However, undeveloped historical flows from the offsite sub-basins have been assumed to sheet flow over Jay road and enter the proposed swales (Swale A and B) south of the proposed developments. The storm drains and detention basins have also been sized adequately to convey this undeveloped flow. The southern boundary of the offsite sub-basins is the Union Pacific Railroad track. Runoff from sub-basins H1 and H2 sheet flows north over the Lower Boulder Ditch and onto sub-basin H3. Sub-basin H3 runoff generally flows north and east into the Erie Village Subdivision. Runoff from sub-basin H4 flows to the north until reaching the property boundary, where it is diverted by an existing drainage ditch to the west. The Historic Drainage Map for the project can be referenced in Appendix E of this report.

Developed Basins: The following drainage basins are proposed with the project and are depicted on the Phase II Post-Development Drainage Map in Appendix E. Drainage Basins 1-20 represent new minor drainage basins that together make up historical drainage basin H1, H2, H3 and H4.

Basin 1: This basin lies south of zero subsidence line. The area of this basin is approximately 41.4 acres. This basin is to remain undeveloped; therefore, the 2-year and 100-year runoff coefficients for this basin are 0.11 and 0.54 respectively. The 2-year and 100-year runoff from this basin is 5.8 cfs and 79.0 cfs respectively. Runoff from this basin will flow north and will be directed via a proposed swale with a concrete trickle channel to a proposed flared end section where it will enter the proposed storm drain system and eventually outfall into the proposed detention basin. Two swales are proposed in this basin flowing west to east and east to west along the northern boundary of the basin.

Basin 2: This basin lies in the eastern portion of the project site and is proposed to have single family residential lots and a drainage swale located on the eastern portion of the project site. The area of this basin is approximately 2.6 acres. The 2-year and 100-year runoff coefficients for this basin are 0.42 and 0.71, respectively. The 2-year and 100-year runoff from this basin is 1.9 cfs and 8.4 cfs, respectively. Runoff from this basin drains into the proposed drainage swale along the eastern boundary of the project site from where it flows along eastern boundary of the project site eventually entering the proposed detention basin.

Basin 3: This basin lies in the south east portion of the project site and is proposed to have single family residential lots, streets, and sidewalk. The area of this basin is approximately 1.6 acres. The 2-year and 100-year runoff coefficients for this basin are 0.45 and 0.72, respectively. The 2-year and 100-year runoff from this basin is 1.5 and 6.3 cfs respectively. Runoff from this basin drains into chase drain located in southern portion of this basin from where it joins swale flowing east to west in Basin 1.

Basin 4: This basin lies in the eastern portion of the project site and is proposed to have single family residential lots, streets, and sidewalk. The area of this basin is approximately 0.4 acres. The 2-year and 100-year runoff coefficients for this basin are 0.50 and 0.74 respectively. The 2-year and 100-year runoff from this basin is 0.6 cfs and 2.3 cfs, respectively. Runoff from this basin drains into a proposed Colorado Department of Transportation (CDOT) Type R inlet from where it drains into drainage swale located in the eastern portion of the basin eventually entering the proposed detention basin located in northern portion of the project.

Basin 5: This basin lies in the eastern portion of the project site and is proposed to have single family residential lots, streets and sidewalk. The area of this basin is 0.5 acres. The 2-year and 100-year runoff coefficients for this basin are 0.47 and 0.73 respectively. The 2-year and 100-year runoff from this basin is 0.6 cfs and 2.4 cfs, respectively. Runoff from this basin drains into CDOT Type R inlet located along the street before draining into swale located north of street and eventually entering the proposed detention basin.

Basin 6: This basin lies in the central portion of the project site and is proposed to have single family residential lots, streets and sidewalk. The area of this basin is approximately 3.0 acres. The 2-year and 100-year runoff coefficients for this basin are 0.48 and 0.73 respectively. 2-year and 100-year runoff from this basin is 2.4 cfs and 9.9 cfs respectively. Runoff from this basin flows on street, curb and gutter before being intercepted by CDOT Type R inlet located in the sump. After being intercepted in the sump, runoff enters storm drain pipeline and eventually entering the proposed detention basin.

Basin 7: This basin lies in the eastern portion of the project site and contains area of single family residential lots, streets and sidewalk. The area of this basin is approximately 1.3 acres. 2-year and 100-year runoff coefficients for this basin are 0.47 and 0.73 respectively. 2-year and 100-year runoff from this basin is 1.3 and 5.5 cfs respectively. Runoff from this basin flows on street, curb and gutter before being intercepted by CDOT Type R inlet located in the sump and eventually entering the proposed detention basin.

Basin 8: This basin is located at the eastern boundary of the project site. The area of this basin is approximately 2.6 acres. 2-year and 100-year runoff coefficients for this basin are 0.34 and 0.67 respectively. 2-year and 100-year runoff from this basin is 1.6 and 8.3 cfs respectively. Runoff from this basin flows east and gets intercepted by a series of catch basins into the proposed storm drain and eventually outlets to the proposed detention basin.

Basin 9: This basin lies in the northern portion of the project site, south of Lower Boulder Irrigation Canal; this basin encompasses areas of single family residential lots, street and sidewalk. The area of this basin is approximately 1.7 acres. 2-year and 100-year runoff coefficients for this basin are 0.34 and 0.67 respectively. 2-year and 100-year runoff from this basin is 0.9 and 4.9 cfs respectively. Runoff from this basin drains north and gets intercepted by a series of catch basins into the proposed storm drain and eventually outlets to the proposed detention basin.

Basin 10: This basin lies in the eastern portion of the project site and contains area of single family residential, streets and sidewalks. The area of this basin is approximately 2.2 acres. 2-year and 100-year runoff coefficients for this basin are 0.45 and 0.72 respectively. 2-year and 100-year runoff from this basin is 2.1 and 9.2 cfs respectively. Runoff from this basin drains into CDOT Type R inlet located in sump where it enters storm drain pipeline before eventually entering the proposed detention basin.

Basin 11: This basin lies in the central portion of the project site and contains area of single family residential lots, street and sidewalk. The area of this basin is approximately 2.0 acres. 2-year and 100-year runoff coefficients for this basin are 0.45 and 0.72 respectively. 2-year and 100-year runoff from this basin is 1.9 and 8.1 cfs respectively. Runoff from this basin drains into CDOT Type R inlet located in sump where it enters storm drain pipeline before eventually entering the proposed detention basin.

Basin 12: This basin lies in the central portion of the project site and contains area of single family residential, areas of street and sidewalk. The area of this basin is approximately 2.9 acres. 2-year and 100-year runoff coefficients for this basin are 0.47 and 0.73 respectively. 2-year and 100-year runoff from this basin is 2.9 and 12.0 cfs respectively. Runoff from this basin drains into CDOT Type R inlet located in sump where it enters storm drain pipeline before eventually entering the proposed detention basin.

Basin 13: This basin lies in the central portion of the project site and contains area of single family residential, areas of street and sidewalk. The area of this basin is 1.0 acres. 2-year and 100-year runoff coefficients for this basin are 0.46 and 0.72 respectively. 2-year and 100-year runoff from this basin is 1.1 and 4.7 cfs respectively. Runoff from this basin drains into CDOT Type R inlet located in sump where it enters storm drain pipeline before eventually entering the proposed detention basin.

Basin 14: This basin lies in the western portion of the project site and contains area of single family residential, areas of street and sidewalk. The area of this basin is approximately 1.3 acres. 2-year and 100-year runoff coefficients for this basin are 0.50 and 0.74 respectively. 2-year and 100-year runoff from this basin is 1.9 and 7.5 cfs respectively. Runoff from this basin drains into CDOT Type R inlet located in sump where it enters storm drain pipeline before eventually entering the proposed detention basin.

Basin 15: This basin lies in the western portion of the project site and contains area of single family residential, areas of street and sidewalk. The area of this basin is approximately 2.7 acres. 2-year and 100-year runoff coefficients for this basin are 0.44 and 0.71 respectively. 2-year and 100-year runoff from this basin is 2.5 and 10.7 cfs respectively. Runoff from this basin drains into CDOT Type R inlet located in sump along the street where it enters storm drain pipeline before eventually entering the proposed detention basin.

Basin 16: This basin lies in the northcentral portion of the project site and contains area of single family residential, areas of street and sidewalk. The area of this basin is approximately 2.0 acres. 2-year and 100-year runoff coefficients for this basin are 0.49 and 0.74 respectively. 2-year and 100-year runoff from this basin is 2.3 and 9.4 cfs respectively. Runoff from this basin drains into CDOT Type R inlet located in sump along the street where it enters storm drain pipeline before eventually entering the proposed detention basin.

Basin 17: This basin lies in the western portion of the project site and contains area of single family residential and drainage swale. The area of this basin is 1.9 acres. 2-year and 100-year runoff coefficients for this basin are 0.16 and 0.57 respectively. 2-year and 100-year runoff from this basin is 0.8 and 7.4 cfs respectively. Runoff from this basin drains into drainage swale located between Lower Boulder Irrigation ditch and single family residential area before eventually entering the proposed detention basin.

Basin 18: This basin lies in the northern portion of the project site and contains area of detention basin. The area of this basin is 1.5 acres. 2-year and 100-year runoff coefficients for this basin are 0.06 and 0.52 respectively. 2-year and 100-year runoff from this basin is 0.3 and 7.2 cfs respectively. Runoff from this basin forms part of the proposed detention basin.

Basin 19: This basin forms northwest corner of the project site. The area of the basin is approximately 6.4 acres. This basin is to remain undeveloped and 2-year and 100-year runoff coefficients from this basin are 0.01 and 0.49 respectively. 2-year and 100-year runoff from this basin is approximately 0.1 cfs and 11.3 cfs respectively. Runoff from this basin flows uncontrolled towards north and into drainage swale located along the western edge of Erie Village Subdivision.

Basin 20: This basin lies at the northern portion of the project site. The area of this basin is approximately 11.5 acres. This basin is to remain undeveloped and 2-year and 100-year runoff coefficients from this basin are approximately 0.01 and 0.49 respectively. 2-year and 100-year runoff from this basin is approximately 0.1 cfs and 17.6 cfs respectively. This basin flows north uncontrolled into drainage swale from where it drains east ultimately joining swale flowing west of the County Line Road

Basin OS-1: This is an offsite basin that lies along the western boundary of the project site. The project proposes a collector street to connect existing Jay Road and Lombardi Street. The area of the basin is approximately 0.5 acres. 2-year and 100-year runoff coefficients for this basin are 0.63 and 0.80 respectively. 2-year and 100-year runoff from this basin is 1.0 and 3.4 cfs respectively. The runoff flows north along the curb and gutters and gets intercepted by a CDOT Type R inlet that outlets to the swale flowing west to east in basin 17.

Basin OS-2: This is an offsite basin that lies along the western boundary of the project site. The project proposes a collector street to connect existing Jay Road and Lombardi Street. The area of the basin is approximately 0.3 acres. 2-year and 100-year runoff coefficients for this basin are 0.64 and 0.80 respectively. 2-year and 100-year runoff from this basin is 0.6 and 1.9 cfs respectively. The runoff flows north along the curb and gutters and gets intercepted by a CDOT Type R inlet that outlets to the swale flowing west to east in basin 17.

Basin OS-3: This is an offsite basin that lies along the western boundary of the project site. The project proposes a collector street to connect existing Jay Road and Lombardi Street. The area of the basin is approximately 1.4 acres. 2-year and 100-year runoff coefficients for this basin are 0.62 and 0.80 respectively. 2-year and 100-year runoff from this basin is 1.9 and 6.5 cfs respectively. The runoff flows north along the curb and gutters and gets intercepted by a CDOT Type R inlet that outlets to the drainage swale located along western boundary of Erie Village Subdivision.

Basin OS-4: This is an offsite basin that lies along the western boundary of the project site. The project proposes a collector street to connect existing Jay Road and Lombardi Street. The area of the basin is approximately 1.4 acres. 2-year and 100-year runoff coefficients for this basin are 0.63 and 0.80 respectively. 2-year and 100-year runoff from this basin is 1.9 and 6.6 cfs respectively. The runoff flows north along the curb and gutters and gets intercepted by a CDOT Type R inlet that outlets to the drainage swale located along western boundary of Erie Village Subdivision.

Basin HOS-1: This is an offsite sub-basin and lies southwest of Jay Road. The southern boundary of this offsite sub-basin is the Union Pacific Railroad track. The area of the basin is approximately 22.4 acres. The assumed percent impervious of the offsite sub-basin is 2% (historical flow analysis). Future developments in this sub-basin would have to provide their own on-site detention. 2-year and 100-year runoff coefficients for this basin are 0.01 and 0.49. 2-year and 100-year runoff from this basin is 0.3 and 43.9 cfs respectively. Runoff from this basin will sheet flow northeast over Jay Road and will enter the proposed swale flowing west to east along the northern boundary of Basin 1. The flow will then enter the proposed storm drain system through a flared end section and eventually outfall into the proposed detention basin.

Basin HOS-2: This is an offsite sub-basin and lies south of Jay Road. The southern boundary of this offsite sub-basin is the Union Pacific Railroad track. The area of the basin is approximately 22.8 acres. The assumed percent impervious of the offsite sub-basin is 2% (historical flow analysis). Future developments in this sub-basin would have to provide their own on-site detention. 2-year and 100-year runoff coefficients for this basin are 0.01 and 0.49. 2-year and 100-year runoff from this basin is 0.3 and 41.5 cfs respectively. Runoff from this basin will sheet flow north over Jay Road and will enter the proposed swales flowing east to west along the northern boundary of Basin 1. The flow will then enter the proposed storm drain system through a flared end section and eventually outfall into the proposed detention basin.

III. DRAINAGE DESIGN CRITERIA

A. Development Criteria Reference and Constraints

This phase II drainage study for project site is based on approved Phase I drainage study for the Schmidt Property prepared by Innovative Land Consultants, Inc. dated March 9, 2015. In addition to the Phase-I drainage report , this Phase II drainage report also refers to the Town of Erie Outfall Systems Plan dated January 2014, prepared by Respec Consulting and Services, Town of Erie Standards and Specifications for Storm Drainage Facilities and Urban Storm Drainage Criteria Manual (USDCM). Where criteria are not explicitly stated by Town of Erie Standards and Specifications, USDCM is used.

Streets within the residential area of the project shall be local streets with detached sidewalk. The right-of-way encompassing Jay Street and Jasper Street shall be increased from 48’ to 80’, these streets are designated to be Rural Arterial streets. Street connecting Jay Road to Lombardi Street shall be designed as a collector street without parking or median section.

B. Hydrological Criteria

Proposed construction on the site shall be residential and landscape. For residential areas, the minor and major storms are the 2-year and 100-year storms, respectively as shown below in Table 2.

Table 2: Design Storm Return Period

Land Use or Zoning	Design Storm Return Period	
	Initial Storm	Major Storm
Residential	2-Year	100-Year
Business	5-Year	100-Year
Public Building Areas	5-Year	100-Year
Parks, Greenbelts, etc.	2-Year	100-Year
Open Channels and Drainage Ways	10-Year	100-Year
Detention Facilities	Water Quality and 10-Year	100-Year

Per Section 800 - Storm Drainage Facilities design storm shall be following:

Table 3: Town of Erie One Hour Rainfall Depth

Town of Erie One Hour Rainfall Depth	
Design Storm	Rainfall Depth (in.)
2-Year	1.01
10-Year	1.73
100-year	2.70

Since all basin areas are less than 160 acres, the Rational Method has been used for calculating runoff generated from the site. Detailed runoff coefficient, time of concentration and peak runoff calculations for each sub-basin per Phase-II post developed condition can be found in Appendix A. Similar calculations for historic and Phase-I post developed conditions from the approved Phase I drainage report have also been included in Appendix A for reference purposes.

C. Hydraulic Criteria

Runoff released from the proposed detention pond shall be released into the existing drainage swale in Kenosha Farms Subdivision north of project which follows the western boundary of Erie Village Subdivision. The swale is designed to carry detained flows from the project site. Detained runoff from the detention pond shall be carried via storm drain pipelines underneath Lower Boulder Irrigation Canal. The flow from the detention pond will drain naturally under the irrigation canal and to the outfall during a storm event. However, after the storm event the water in the storm drains under the irrigation canal will be pumped through a force main into the cleanout immediately upstream of the outfall location. This sump volume will be pumped in a drawdown time of approximately 24 hrs.

Inlets are provided at all the locations where runoff exceeds street capacity. Inlet facilities were sized using the UD-Inlet program available from UDFCD. Hydraulic criteria specific to the Town of Erie, as stipulated in Table 4 and 5 shown below from the Section 800-Storm Drainage Facilities, was used in this program to obtain peak discharge results. Please refer to Appendix B of this report for UD-Inlet results to each design points.

Table 4: Allowable Pavement Encroachment and Depth of Flow for Initial Storm Runoff

Street Classification	Maximum Encroachment
Local	No curb overtopping, flow may spread to crown of street
Collector	No curb overtopping, flow must leave the equivalent of one 10-foot driving lane clear of water

Table 5: Allowable Depth of Flow and Inundated Area for Major Storm Runoff

Street Classification	Maximum Encroachment
Local and Collector	Residential dwellings and public, commercial, and industrial buildings should be no less than 12 inches above the 100-year flood at the ground line or lowest water entry of the building. The depth of water over the gutter flow line will not exceed 18 inches and 12 inches for collector streets.

Design of swales is done per Town of Erie criteria; with minimum 1 foot of freeboard and side slopes for grassed swales are designed at 4:1 slope. Trickle channel in grass swales are designed to carry approximately 2% of the major design flow. Following values of Manning's roughness coefficient were used to design swales, trickle channel and concrete ditch.

Table 6: Minimum Values of Roughness Coefficient

Type of Channel and Description	Minimum
Earthen channels, grassed with depth of flow < 2'	0.035
Concrete trickle channels, smooth finish	0.015

Runoff draining to swales is based on basins draining to those swales, Basin 1 has two swales draining east to west and west to east hence runoff from basin 1 is split equally into two parts to determine swale sizing. See table below showing runoff draining to swales and values used to determine flows in trickle channel:

Table 7: Flow in Swale

Swale	Basin	Flow in Swale (Q_{100})	Flow in Trickle Channel ($0.02*Q_{100}$)
		cfs	cfs
A-A	(0.5*Basin 1) + 3 + HOS-2 (From Phase I Drainage Report)	102.5	2.1
B-B	(0.5*Basin 1) + HOS-1 (From Phase I Drainage Report)	96.3	1.9
C-C	2	8.4	0.2
F-F	17 + OS-1 + OS-2	12.7	0.3

Please refer to Appendix B for the swale sizing calculations. In addition to the proposed swale sizing, the capacity of the previously discussed existing swale in Kenosha Farms Subdivision has also been verified. The existing swale cross-section was referenced from sheet number 38 and 39 of Kenosha Farm Public Improvement Plans Phases 1 – 6 (Appendix D). Flow rate (436cfs) for SWMM Node 541 from the Outfall Systems Plan (Appendix D) has been used to conservatively check the capacity of the existing channel. Node 541 is the ultimate sump located further downstream from the existing channel. The peak flow at Node 541 is considerably higher than the proposed peak flow at project outfall. The provided open channel calculations show that the existing swale has capacity to convey Node 541 peak flow.

Detailed storm sewer sizing, confluence and hydraulic grade line analyses will be conducted as part of the Phase III drainage study.

D. Adaptations from Criteria:

No adaptation is requested from established criteria for Town of Erie Section 100, Section 800 and Urban Storm Drainage Criteria Manual.

IV. DRAINAGE FACILITY DESIGN

A. General Concept

Runoff from project site flows north. For calculating runoff from the project site, hydrologic soil group C/D is used for entire site (per Phase I drainage report). The historic and proposed land use designations were identified for each of the outlined drainage basins and used to determine the correlating percent impervious and composite runoff coefficient. Time of concentration was based on the 5-year storm event runoff coefficient for the basin in question, and was calculated by combining the initial/ overland flow time and the travel time in channel. Please refer Appendix A of this report for hydrologic calculations. Rational Method Formula is used to determine runoff from any sub-basin.

$$Q = CIA$$

C- Composite runoff coefficient
I - Intensity of rainfall in inches per hour
A- Area in acres

Water quality is provided in the proposed detention pond. An extended detention basin has been used to provide required detention volume.

This report references data and information from Town of Erie Outfall Systems Plan (OSP), Phase I drainage report, Town of Erie Storm Drainage Criteria Manual and Urban Storm Drainage Criteria Manual. Please refer to Appendix D for excerpts from the OSP relevant to this project.

B. Specific Details

The project site has been divided into 20 basins, 4 offsite basins and 2 historic offsite basins. Runoff from all the basins with the exception of Basin 19, 20, OS-3 and OS-4 ultimately reaches the proposed detention pond located in the northern portion of the project site. Runoff from basin 1, HOS-1 and HOS-2 located south of Zero Strain Line, enters storm drain pipe via a Flared End Section (FES) in a swale which collects all the runoff from these basins and drains into the detention pond. Basins 1, 2, 3, 4, 5, 8, 9, 17, OS-1 and OS-2 discharge into swales located along project boundary and reach detention pond whereas runoff from remaining basins enter street inlets and join storm drain system which drains into detention pond located in northern portion of the project site. It is important to note that HOS-1 and HOS-2 has been assumed to be undeveloped and future developments in these basins would have to provide their own on-site detention.

The time of concentration is calculated using both equations 6-2 and 6-5 per USDCM, Volume 1, March 2017 edition and the lesser of two is used to calculate peak runoff. For estimated time of concentration values less than 5 minutes, the time of concentration has been assumed to be 5 minutes.

Equation 6-2 per USDCM, Volume 1, March 2017 edition:

$$t_c = t_i + t_t$$

t_c – Computed time of concentration (minutes)
t_i – Overland (initial) flow time (minutes)
t_t – Channelized flow time (minutes)

Initial or Overland Flow time is calculated by following equation (equation 6-3 per USDCM, Volume 1, March 2017 edition):

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S_0^{0.33}}$$

t_i – Overland (initial) flow time (minutes)
C_5 – Runoff coefficient for 5-year frequency
L - Length of overland flow
S_0 - Average slope along the overland path (ft/ft)

Channelized Flow time is calculated by following equation (equation 6-4 per USDCM, Volume 1, March 2017 edition):

$$t_t = \frac{L_t}{60K\sqrt{S_0}}$$

t_t– Channelized flow time (travel time, min.)
L_t – Waterway length (ft)
S_0 – Waterway slope (ft/ft)
V_i – Travel time velocity (ft/s) = $K\sqrt{S_0}$
K – NRCS Conveyance factor

Table 8: NRCS Conveyance Factors

NRCS Conveyance Factors, K	
Type of Land Surface	Conveyance Factor, K
Heavy Meadow	2.5
Tillage/ Field	5
Short Pasture and Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas and Shallow Paved Swales	20

Equation 6-5 per USDCM, Volume 1, March 2017 edition:

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_0}}$$

t_c – Minimum time of concentration for first design point when less than t_c from equation 6-2
L_t – Length of channelized flow path
i – Imperviousness (expressed as decimal)
S_0 – Slope of channelized flow path

Below is the table showing runoff proposed by Phase II drainage report.

Table 9: Runoff Per Phase II Drainage Report

Runoff Per Phase II Drainage Report			
Basin	Contributing Area (Acres)	Runoff Peak 2-Year Event (Cfs)	Runoff Peak 100-Year Event (Cfs)
1	41.4	5.8	79.0
2	2.6	1.9	8.4
3	1.6	1.5	6.3
4	0.4	0.6	2.3
5	0.5	0.6	2.4
6	3.0	2.4	9.9
7	1.3	1.3	5.5
8	2.6	1.6	8.3
9	1.7	0.9	4.9
10	2.2	2.1	9.2
11	2.0	1.9	8.1
12	2.9	2.9	12.0
13	1.0	1.1	4.7
14	1.3	1.9	7.5
15	2.7	2.5	10.7
16	2.0	2.3	9.4
17	1.9	0.8	7.4
18	1.5	0.3	7.2
19	6.4	0.1	11.3
20	11.5	0.1	17.6
OS-1	0.5	1.0	3.4
OS-2	0.3	0.6	1.9
OS-3	1.4	1.9	6.5
OS-4	1.4	1.9	6.6
HOS-1	22.4	0.3	43.9
HOS-2	22.8	0.3	41.5

Basin OS-1, OS-2, OS-3 and OS-4 are offsite basins and include the collector street proposed to be constructed along the western boundary of the project site connecting Jay Road to Lombardi Street. Basin OS-1 and OS-2 will be treated for water quality by the proposed detention basin. Basin OS-3 and OS-4 will drain to water quality swales proposed on both sides of the proposed street to improve water quality of resulting runoff.

Preliminary detention and water quality volume were calculated using Urban Storm Drainage Criteria Manual. Design storm for design of detention facilities are 10-year and 100-year storm events per Town of Erie Storm Drainage Criteria Manual. Volume calculations are done using residential area with lot size ‘0.25 acres or less’ and resulting composite impervious percent as shown in Table 10. Detention basin has been designed to detain and release all contributing flows, including Basin 1, Basin HOS-1 and Basin HOS-2. Composite impervious percent calculations are shown below in Table 10.

Table 10: Composite Impervious Percent

Basin	Area, A (acres)	Imperviousness, I	AxI
1	41.4	0.14	5.74
2	2.6	0.54	1.41
3	1.6	0.57	0.91
4	0.4	0.63	0.24
5	0.5	0.60	0.29
6	3.0	0.61	1.79
7	1.3	0.60	0.76
8	2.6	0.45	1.17
9	1.7	0.45	0.75
10	2.2	0.57	1.24
11	2.0	0.57	1.17
12	2.9	0.59	1.74
13	1.0	0.58	0.59
14	1.3	0.63	0.85
15	2.7	0.56	1.52
16	2.0	0.62	1.22
17	1.9	0.22	0.42
18	1.5	0.09	0.13
OS-1	0.5	0.77	0.39
OS-2	0.3	0.78	0.20
HOS-1	22.4	0.02	0.45
HOS-2	22.8	0.02	0.46
Total	118.5	Composite	**0.19**

Minimum detention pond volume for 10-year and 100-year is calculated per Section 814.09:

$$V=KA \text{ (Eq. 801)}$$

For the 100-year,
K100 = (1.78I-0.002I-3.56)/1000 (Eq. 802)

For the 10-year,
K10 = (0.95I-1.90)/1000 (Eq. 803)

Where,
V = required volume for the 100 or 10-year storm (ac-ft)
I = Developed basin impervious (%)
A = Tributary area (ac)

In accordance with the Detention Criteria for Town of Erie, the detention basin will provide detention of the Water Quality Capture Volume (WQCV), Excess Urban Runoff Volume (EURV), 10-Year and the 100-Year storm event.

The Colorado Urban Hydrograph Procedure (CUHP) and Storm Water Management Model (SWMM) were used to analyze the detention basin. Release rates for detention basins per Town of Erie criteria:

Table 11: Release Rates per Soil Group

Control Frequency	SCS Soil Group		
	A	B	C/D
2-Year	0.02	0.03	0.04
5-Year	0.07	0.13	0.17
10-Year	0.13	0.23	0.30
25-Year	0.24	0.41	0.52
100-Year	0.5	0.85	1.0

Therefore allowable peak flows:
Q_{10} = 0.30*118.5 = 35.6 cfs
Q_{100} = 1.00*118.5 = 118.5 cfs

After extensive talks to the third party reviewer (Merrick & Company) hired by the Town of Erie, in order to determine a more realistic allowable peak flow, a pre-project peak flow was determined using the CUHP Excel Workbook and was found to be 143.6 cfs. It is important to note that this pre-project peak flow is much higher than the allowable peak flow of 118.5 cfs. Providing detention volume to comply with the allowable peak flow of 118.5 cfs was determined to be infeasible after numerous design iterations especially, since the tributary area to the detention basin consists of 83.8 acres of offsite areas as compared to the 34.7 acres of onsite areas. Hence, the post-project flow rates for the 10-year and 100-year storm event will be detained back to less than the pre-project flow rates.

The inflow hydrograph generated by the CUHP Excel Workbook was used to calculate the runoff volumes, peak flow rates, and generate the SWMM interface file for detention analysis. Stage-Storage curves, based on the grading configuration of the ponds, were utilized in SWMM to represent the amount of available volume within the detention ponds. SWMM orifice and weir links were used to represent the WQCV and EURV orifice configuration, and catch basin for the outlet works. The following table presents a summary of the SWMM detention analysis.

Table 12: Summary of Detention Results

Detention Basin	Allowable Peak Flow (cfs)	Pre-Project Peak Flow (cfs)	Post-Project Un-detained Peak Flow (cfs)	Post-Project Detained Peak Flow (cfs)
EDB-1	118.5	143.6	185.7	126.2

The detained flow from the detention basin would drain and outlet at less than the pre-project peak flow rate naturally under the irrigation canal and into the existing drainage swale in Kenosha Farms Subdivision during storm events. Please refer to Appendix-B for detention basin sizing calculations, cross-section schematic, outlet works detail, micropool and forebay details. An emergency spillway has been designed to convey the emergency undetained Q100 into the Lower Boulder Irrigation Canal during emergencies.

After the storm event, the water in the storm drains under the irrigation canal will be pumped through a force main into the cleanout immediately upstream of the outfall. This sump volume will be pumped in a drawdown time of approximately 24 hrs. The pumping rate and sizing calculations have also been included in Appendix B. The project will incorporate a dual pump system in case one of the pumps fails. Specific maintenance information will be included in final engineering as part of Phase III drainage report. A 30 feet storm drain easement is proposed to route water from detention pond to existing drainage swale in Kenosha Farms Subdivision.

The project proposes a box culvert in the Lower Boulder Irrigation Canal under the proposed Lombardi Street and a pipe culvert under Farmers place to convey flows from Swale C to Swale D. Relevant culvert sizing calculations have been included in Appendix B.

The capacity of the existing culvert under Allen Avenue downstream of the existing drainage swale in Kenosha Farms Subdivision has also been verified and included in Appendix B. The cross-section details of the culvert were referenced from sheet number 10 and 36 of Kenosha Farm Public Improvement Plans Phases 1 – 6 (Appendix D).

No existing 100-year floodplain shall be altered and there shall be no increase in flood level in any major drainageway.

V. SUMMARY

A. The phase II drainage report is in compliance with section 800 - Storm Drain Facilities of the Town of Erie's Standards and Specifications and the Urban Storm Drainage Criteria Manual March 2017 edition.

B. This report complies with design proposed in Phase I drainage report and Town of Erie Outfall System Plan, January 2014.

C. Runoff from the project shall be detained in detention pond and flows shall be released at the pre-project 10-year and 100-year release rates. Detained flows will reduce velocity of water and hence erosion potential downstream.

VI. REFERENCES

A. Town of Erie, Standards and Specifications for Design and Construction of Public Improvements, Section 800, Storm Drainage Facilities (2018 Edition)

B. Urban Storm Drainage Criteria Manual, Volume 1, 2 and 3 (January 2016)

C. Town of Erie, Outfall Systems Plan (West of Coal Creek), January 2014

D. Federal Emergency Management Agency, Flood Insurance Rate Map

E. Kenosha Farm Public Improvement Plans Phases 1 – 6

The Schmidt Property

Basin Weighted Runoff Coefficient Calculations - Historic

Land Use Is Comprised of 3 Surface Characteristics:					
NRCS Soil Group C	Imperviousness	C_2	C_5	C_{10}	C_{100}
Single Family Residential (S.F.R)	38%	0.27	0.34	0.41	0.58
Historic/Undeveloped	2%	0.06	0.16	0.26	0.51
Street	100%	0.89	0.90	0.92	0.96
Walks	90%	0.73	0.75	0.77	0.83

Project No.

21-Nov-14

Basin ID	Total Area (Ac.)	S.F.R. Area (Ac.)	Historic/Undev. Area (Ac.)	Street Area (Ac.)	Walks Area (Ac.)	Weighted Runoff Coefficients C_2	C_5	C_{10}	C_{100}
H1	32.37	0.00	32.37	0.00	0.00	0.06	0.16	0.26	0.51
H2	39.95	0.00	39.95	0.00	0.00	0.06	0.16	0.26	0.51
H3	11.29	0.00	11.29	0.00	0.00	0.06	0.16	0.26	0.51
H4	6.42	0.00	6.42	0.00	0.00	0.06	0.16	0.26	0.51
HOS1	22.43	from OSP				0.18	0.27	0.35	0.56
HOS2	22.80					0.29	0.36	0.43	0.59

From Phase I Approved Drainage Study Report. For reference only.

The Schmidt Property
Time of Concentration - Historic

Project No.

Sh. 1 of 1

11/21/14

Basin ID	C_5	Initial/Overland Flow Time T_i			Travel Time T_t							Tc Check		Final
		Length (ft)	Slope (%)	T_i (min)	Length (ft)	Slope (%)	Conveyance Element	Conveyance Coefficient	Velocity (fps)	T_t (min)	Total T_c (min)	Total Length (ft)	$T_c=(L/180)+10$ (min)	T_c (min)
H1	0.16	500	2.08	29.8	570	1.49	Grass	7	0.9	11.1				
					835	0.79	Grass	7	0.6	22.3	63.2	1905	Not Urban	63.2
H2	0.16	500	1.69	31.9	330	1.16	Grass	7	0.8	7.3				
					845	0.25	Grass	7	0.3	40.5				
					285	0.85	Grass	7	0.6	7.4	87.0	1960	Not Urban	87.0
H3	0.16	300	1.00	29.4	200	1.00	Grass	7	0.7	4.8				
					960	0.21	Grass	7	0.3	49.6	83.7	1460	Not Urban	83.7
H4	0.16	390	0.82	35.8	280	0.15	Grass	7	0.3	17.2	53.0	670	Not Urban	53.0
HOS1	0.27	500	2.94	23.5	235	3.23	Grass	7	1.3	3.1	26.6	735	Not Urban	26.6
HOS2	0.36	500	2.63	21.7	450	1.67	Grass	7	0.9	8.3	30.0	950	Not Urban	30.0

From Phase I Approved Drainage Study Report. For reference only.

The Schmidt Property
Basin Peak Runoff Calculations - Direct Runoff - Historic

Job No. 1008-10

21-Nov-14

Basin	Total Area	Tc	Runoff Coefficients				Intensity (in/hr)				Peak Flow (cfs)			
ID	(Ac.)	(min)	C_2	C_5	C_{10}	C_{100}	I_2	I_5	I_{10}	I_{100}	Q_2	Q_5	Q_{10}	Q_{100}
H1	32.37	63.2	0.06	0.16	0.26	0.51	0.99	1.40	1.69	2.63	1.91	7.22	14.20	43.48
H2	39.95	87.0	0.06	0.16	0.26	0.51	0.79	1.12	1.35	2.11	1.89	7.15	14.05	43.01
H3	11.29	83.7	0.06	0.16	0.26	0.51	0.81	1.15	1.39	2.17	0.55	2.08	4.08	12.49
H4	6.42	53.0	0.06	0.16	0.26	0.51	1.11	1.57	1.90	2.96	0.43	1.61	3.17	9.71
HOS1	22.43	26.6	0.18	0.27	0.35	0.56	1.70	2.41	2.91	4.54	6.86	14.58	22.86	57.08
HOS2	22.80	30.0	0.29	0.36	0.43	0.59	1.58	2.24	2.71	4.24	10.48	18.41	26.61	56.98

$$\text{Intensity} = \frac{28.5 * P_1}{(10 + T_c)^{0.786}}$$

From Table 800-2: 2 Year P_1 =	1.01	Inches
From Table 800-2: 5 Year P_1 =	1.43	Inches
From Table 800-2: 10 Year P_1 =	1.73	Inches
From Table 800-2: 100 Year P_1 =	2.70	Inches

The Schmidt Property
S.F.R. Percent Impervious Calculations

Project No.

1-Dec-14

Dwelling Units:	139
Area (Ac.):	36.25
Density (D.U./Ac.):	3.8
Avg. Home Size (sf):	2000

Home Type	Percent Used (%)	Impervious (%)
Ranch	10	44
Split Level	40	39
Two Story	50	36
	Composit % Impervious:	38.0
	% Impervious Used:	38

The Schmidt Property
Site Percent Impervious Calculation (C)

Project No.

1-Dec-14

Surface Type	Area (ac)	Impervious (%)
S.F.R.	36.25	38%
Historic/Undeveloped	0.00	2%
Street	0.00	100%
Walks	0.00	90%
Total	36.25	
Area Weighted Avg.		38%

The Schmidt Property
Site Percent Impervious Calculation (C + D)

Project No.

1-Dec-14

Surface Type	Area (ac)	Impervious (%)
S.F.R.	36.25	38%
Historic/Undeveloped	28.09	2%
Street	0.27	100%
Walks	0.00	90%
Total	64.61	
Area Weighted Avg.		23%

From Phase I Approved Drainage Study Report. For reference only.

From Phase I Approved Drainage Study Report. For reference only.

The Schmidt Property
Basin Weighted Runoff Coefficient Calculations - Proposed

Land Use Is Comprised of 3 Surface Characteristics:					
NRCS Soil Group C	Imperviousness	C_2	C_5	C_{10}	C_{100}
Single Family Residential (S.F.R)	38%	0.27	0.34	0.41	0.58
Historic/Undeveloped	2%	0.06	0.16	0.26	0.51
Street	100%	0.89	0.90	0.92	0.96
Walks	90%	0.73	0.75	0.77	0.83

Project No. 1028-01

1-Dec-14

Basin ID	Total Area (Ac.)	S.F.R. Area (Ac.)	Historic/Undev. Area (Ac.)	Street Area (Ac.)	Walks Area (Ac.)	Weighted Runoff Coefficients C_2	C_5	C_{10}	C_{100}
A	7.39	0.00	7.39	0.00	0.00	0.06	0.16	0.26	0.51
B	12.10	0.00	12.10	0.00	0.00	0.06	0.16	0.26	0.51
C	36.25	36.25	0.00	0.00	0.00	0.27	0.34	0.41	0.58
D	28.36	0.00	28.09	0.27	0.00	0.07	0.17	0.27	0.51
OS1	25.06	from OSP				0.18	0.27	0.35	0.56
OS2	22.80					0.29	0.36	0.43	0.59

From Phase I Approved Drainage Study Report. For reference only.

The Schmidt Property
Time of Concentration - Proposed

Project No. 1028-01

12/1/14

Basin ID	C_5	Initial/Overland Flow Time T_i			Travel Time T_t							Tc Check		Final
		Length (ft)	Slope (%)	T_i (min)	Length (ft)	Slope (%)	Conveyance Element	Conveyance Coefficient	Velocity (fps)	T_t (min)	Total T_c (min)	Total Length (ft)	$T_c=(L/180)+10$ (min)	T_c (min)
A	0.16	390	0.82	35.8	280	0.15	Grass	7	0.3	17.2	53.0	670	Not Urban	53.0
B	0.16	300	1.00	29.4	200	1.00	Grass	7	0.7	4.8				
					960	0.21	Grass	7	0.3	49.6	83.7	960	Not Urban	83.7
C	0.34	300	0.75	26.2	2410	0.75	Street	20	1.7	23.2	49.4	2710	25.1	25.1
D	0.16	500	2.17	29.4	465	1.61	Grass	7	0.9	8.7				
					290	0.34	Grass	7	0.4	11.9	49.9	1255	Not Urban	49.9
OS1	0.27	500	2.94	23.5	500	3.23	Grass	7	1.3	6.6	30.1	1000	Not Urban	30.1
OS2	0.36	500	2.63	21.7	450	1.67	Grass	7	0.9	8.3	30.0	950	Not Urban	30.0

From Phase I Approved Drainage Study Report. For reference only.

The Schmidt Property

Basin Peak Runoff Calculations - Direct Runoff - Proposed

Job No. 1028-01

1-Dec-14

Basin	Total Area	Tc	Runoff Coefficients				Intensity (in/hr)				Peak Flow (cfs)			
ID	(Ac.)	(min)	C_2	C_5	C_{10}	C_{100}	I_2	I_5	I_{10}	I_{100}	Q_2	Q_5	Q_{10}	Q_{100}
A	7.39	53.0	0.06	0.16	0.26	0.51	1.11	1.57	1.90	2.96	0.49	1.86	3.65	11.17
B	12.10	83.7	0.06	0.16	0.26	0.51	0.81	1.15	1.39	2.17	0.59	2.22	4.37	13.39
C	36.25	25.1	0.27	0.34	0.41	0.58	1.76	2.49	3.01	4.70	17.21	30.68	44.75	98.80
D	28.36	49.9	0.07	0.17	0.27	0.51	1.15	1.63	1.97	3.08	2.22	7.73	14.91	44.96
OS1	25.06	30.1	0.18	0.27	0.35	0.56	1.58	2.24	2.71	4.23	7.13	15.15	23.76	59.33
OS2	22.80	30.0	0.29	0.36	0.43	0.59	1.58	2.24	2.71	4.24	10.48	18.41	26.61	56.98

$$\text{Intensity} = \frac{28.5 * P_1}{(10 + T_c)^{0.786}}$$

From Table 800-2: 2 Year P_1 = 1.01 Inches

From Table 800-2: 5 Year P_1 = 1.43 Inches

From Table 800-2: 10 Year P_1 = 1.73 Inches

From Table 800-2: 100 Year P_1 = 2.70 Inches

RUNOFF COEFFICIENT FOR PROJECT

POST-DEVELOPMENT CONDITION

DESIGNED BY: ASH
CHECKED BY:

JOB NO. D01048-A
DATE: 9/11/2018

BASIN 1		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 41.4 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	183756.9	4.2	10.20	0.05	0.03	0.04	0.05	0.07
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49	1480788.8	34.0	82.17	0.02	0.01	0.04	0.12	0.40
Streets (Paved)	1	0.83	0.85	0.87	0.89	137567.0	3.2	7.63	0.08	0.06	0.06	0.07	0.07
					TOTAL	**1802112.6**	**41.4**	**100.00**	**0.14**	**0.11**	**0.15**	**0.24**	**0.54**

BASIN 2		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 2.6 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	94963.2	2.2	83.59	0.38	0.28	0.33	0.38	0.56
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	18644.2	0.4	16.41	0.16	0.14	0.14	0.14	0.15
					TOTAL	**113607.4**	**2.6**	**100.00**	**0.54**	**0.42**	**0.47**	**0.53**	**0.71**

BASIN 3		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 1.6 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	53900.5	1.2	77.73	0.35	0.26	0.31	0.36	0.52
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	15441.1	0.4	22.27	0.22	0.18	0.19	0.19	0.20
					TOTAL	**69341.6**	**1.6**	**100.00**	**0.57**	**0.45**	**0.50**	**0.55**	**0.72**

BASIN 4		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 0.4 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	11094.9	0.3	67.18	0.30	0.23	0.27	0.31	0.45
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	5419.1	0.1	32.82	0.33	0.27	0.28	0.29	0.29
					TOTAL	**16514.0**	**0.4**	**100.00**	**0.63**	**0.50**	**0.55**	**0.59**	**0.74**

BASIN 5		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 0.5 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	15190.7	0.3	72.90	0.33	0.25	0.29	0.34	0.49
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	5647.9	0.1	27.10	0.27	0.22	0.23	0.24	0.24
					TOTAL	**20838.6**	**0.5**	**100.00**	**0.60**	**0.47**	**0.52**	**0.57**	**0.73**

BASIN 6		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 3.0 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	91848.3	2.1	71.43	0.32	0.24	0.29	0.33	0.48
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	36730.9	0.8	28.57	0.29	0.24	0.24	0.25	0.25
					TOTAL	**128579.1**	**3.0**	**100.00**	**0.61**	**0.48**	**0.53**	**0.58**	**0.73**

BASIN 7		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 1.3 Acres													
Residential Area, 0.25 acres or lesss	0.45	0.34	0.40	0.46	0.67	40853.6	0.9	73.29	0.33	0.25	0.29	0.34	0.49
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	14886.1	0.3	26.71	0.27	0.22	0.23	0.23	0.24
					TOTAL	**55739.8**	**1.3**	**100.00**	**0.60**	**0.47**	**0.52**	**0.57**	**0.73**

BASIN 8		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 2.6 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	113437.9	2.6	100.00	0.45	0.34	0.40	0.46	0.67
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89		0.0	0.00	0.00	0.00	0.00	0.00	0.00
					TOTAL	**113437.9**	**2.6**	**100.00**	**0.45**	**0.34**	**0.40**	**0.46**	**0.67**

BASIN 9		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 1.7 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	72973.2	1.7	100.00	0.45	0.34	0.40	0.46	0.67
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89		0.0	0.00	0.00	0.00	0.00	0.00	0.00
					TOTAL	**72973.2**	**1.7**	**100.00**	**0.45**	**0.34**	**0.40**	**0.46**	**0.67**

BASIN 10		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 2.2 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	73075.8	1.7	77.65	0.35	0.26	0.31	0.36	0.52
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	21033.2	0.5	22.35	0.22	0.19	0.19	0.19	0.20
					TOTAL	**94109.0**	**2.2**	**100.00**	**0.57**	**0.45**	**0.50**	**0.55**	**0.72**

BASIN 11		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 2.0 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	69605.6	1.60	78.11	0.35	0.27	0.31	0.36	0.52
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	19501.7	0.4	21.89	0.22	0.18	0.19	0.19	0.19
					TOTAL	**89107.3**	**2.0**	**100.00**	**0.57**	**0.45**	**0.50**	**0.55**	**0.72**

BASIN 12		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 2..9 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	94088.0	2.2	73.65	0.33	0.25	0.29	0.34	0.49
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	33659.4	0.8	26.35	0.26	0.22	0.22	0.23	0.23
					TOTAL	**127747.4**	**2.9**	**100.00**	**0.59**	**0.47**	**0.52**	**0.57**	**0.73**

BASIN 13		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 1.0 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	33323.9	0.8	75.83	0.34	0.26	0.30	0.35	0.51
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	10623.7	0.2	24.17	0.24	0.20	0.21	0.21	0.22
					TOTAL	**43947.6**	**1.0**	**100.00**	**0.58**	**0.46**	**0.51**	**0.56**	**0.72**

BASIN 14		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 1.3 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	39261.2	0.9	66.88	0.30	0.23	0.27	0.31	0.45
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	19442.2	0.4	33.12	0.33	0.27	0.28	0.29	0.29
					TOTAL	**58703.4**	**1.3**	**100.00**	**0.63**	**0.50**	**0.55**	**0.60**	**0.74**

BASIN 15		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 2.7 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	95101.9	2.2	80.30	0.36	0.27	0.32	0.37	0.54
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	23337.3	0.5	19.70	0.20	0.16	0.17	0.17	0.18
					TOTAL	**118439.2**	**2.7**	**100.00**	**0.56**	**0.44**	**0.49**	**0.54**	**0.71**

BASIN 16		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 2.0 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	59458.1	1.4	69.09	0.31	0.23	0.28	0.32	0.46
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	26599.5	0.6	30.91	0.31	0.26	0.26	0.27	0.28
					TOTAL	**86057.5**	**2.0**	**100.00**	**0.62**	**0.49**	**0.54**	**0.59**	**0.74**

BASIN 17		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 1.9 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	38575.8	0.9	46.70	0.21	0.16	0.19	0.21	0.31
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49	44033.2	1.0	53.30	0.01	0.01	0.03	0.08	0.26
Streets (Paved)	1	0.83	0.85	0.87	0.89		0.0	0.00	0.00	0.00	0.00	0.00	0.00
					TOTAL	**82609.0**	**1.9**	**100.00**	**0.22**	**0.16**	**0.21**	**0.29**	**0.57**

BASIN 18		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 1.5 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	10022.3	0.2	15.15	0.07	0.05	0.06	0.07	0.10
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49	56135.4	1.3	84.85	0.02	0.01	0.04	0.13	0.42
Streets (Paved)	1	0.83	0.85	0.87	0.89		0.0	0.00	0.00	0.00	0.00	0.00	0.00
					TOTAL	**66157.6**	**1.5**	**100.00**	**0.09**	**0.06**	**0.10**	**0.20**	**0.52**

BASIN 19		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 6.4 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49	280019.3	6.4	100.00	0.02	0.01	0.05	0.15	0.49
Streets (Paved)	1	0.83	0.85	0.87	0.89		0.0	0.00	0.00	0.00	0.00	0.00	0.00
					TOTAL	**280019.3**	**6.4**	**100.00**	**0.02**	**0.01**	**0.05**	**0.15**	**0.49**

BASIN 20		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 11.5 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49	499844.2	11.5	100.00	0.02	0.01	0.05	0.15	0.49
Streets (Paved)	1	0.83	0.85	0.87	0.89		0.0	0.00	0.00	0.00	0.00	0.00	0.00
					TOTAL	**499844.2**	**11.5**	**100.00**	**0.02**	**0.01**	**0.05**	**0.15**	**0.49**

BASIN OS-1		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 0.5 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	9011.6	0.2	41.12	0.19	0.14	0.16	0.19	0.28
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	12904.6	0.3	58.88	0.59	0.49	0.50	0.51	0.52
					TOTAL	**21916.2**	**0.5**	**100.00**	**0.77**	**0.63**	**0.66**	**0.70**	**0.80**

BASIN OS-2		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 0.3 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	4471.0	0.1	39.37	0.18	0.13	0.16	0.18	0.26
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	6885.3	0.2	60.63	0.61	0.50	0.52	0.53	0.54
					TOTAL	**11356.3**	**0.3**	**100.00**	**0.78**	**0.64**	**0.67**	**0.71**	**0.80**

BASIN OS-3		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 1.4 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	25361.6	0.6	41.85	0.19	0.14	0.17	0.19	0.28
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	35246.8	0.8	58.15	0.58	0.48	0.49	0.51	0.52
					TOTAL	**60608.4**	**1.4**	**100.00**	**0.77**	**0.62**	**0.66**	**0.70**	**0.80**

BASIN OS-4		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 1.4 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67	25258.3	0.6	41.08	0.18	0.14	0.16	0.19	0.28
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Streets (Paved)	1	0.83	0.85	0.87	0.89	36224.4	0.8	58.92	0.59	0.49	0.50	0.51	0.52
					TOTAL	**61482.8**	**1.4**	**100.00**	**0.77**	**0.63**	**0.67**	**0.70**	**0.80**

BASIN HOS-1		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 22.4 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49	977050.8	22.4	100.00	0.02	0.01	0.05	0.15	0.49
Streets (Paved)	1	0.83	0.85	0.87	0.89		0.0	0.00	0.00	0.00	0.00	0.00	0.00
School	0.5	0.38	0.44	0.50	0.69		0.00	0.00	0.00	0.00	0.00	0.00	0.00
					TOTAL	**977050.8**	**22.4**	**100.00**	**0.02**	**0.01**	**0.05**	**0.15**	**0.49**

BASIN HOS-2		RUNOFF COEFFICIENTS					AREA	% OF TOTAL AREA	% IMP	COMPOSITE C FACTORS			
LAND USE	IMPERVIOUSNESS	C_2	C_5	C_{10}	C_{100}	AREA (SF)	(AC)			C_2	C_5	C_{10}	C_{100}
Total Area 22.8 Acres													
Residential Area, 0.25 acres or less	0.45	0.34	0.40	0.46	0.67		0.0	0.00	0.00	0.00	0.00	0.00	0.00
Undeveloped Areas, Historical Flow Analysis	0.02	0.01	0.05	0.15	0.49	993168.0	22.8	100.00	0.02	0.01	0.05	0.15	0.49
Streets (Paved)	1	0.83	0.85	0.87	0.89		0.0	0.00	0.00	0.00	0.00	0.00	0.00
School	0.5	0.38	0.44	0.50	0.69		0.00	0.00	0.00	0.00	0.00	0.00	0.00
					TOTAL	**993168.0**	**22.8**	**100.00**	**0.02**	**0.01**	**0.05**	**0.15**	**0.49**

TIME OF CONCENTRATION
POST-DEVELOPMENT CONDITION

DESIGNED BY: ASH
CHECKED BY:

JOB NO. D01048-A
DATE: 9/11/2018

						Initial Overland Flow Time (t_i)					Travel/Channelized Time of Flow (t_t)						Time of Concentration (t_c)	t_c check	Final Time of Concentration (t_c)	Comments
Design Point	Basin	Total Area	Imperviousness	C_5 [1]	C_{100} [1]	Starting Elevation	Ending Elevation	Length	Slope	t_i [2]	Starting Elevation	Ending Elevation	Length	Slope	Channel velocity [3]	t_t [4]	t_c [5] $=t_i+t_t$	t_c [6]	Final t_c [7] (If <5 min., use 5 min.)	
		acres				*ft*	*ft*	*ft*	*ft/ft*	*min*	*ft*	*ft*	*ft*		*ft/s*	*min*	*min*	min	*min*	
1	1	41.4	0.14	0.15	0.54	5053	5041	300	0.04	19.0	5041	5024	1210	0.01	0.83	24.3	43.4	40.2	40.2	
2	2	2.6	0.54	0.47	0.71	5029.7	5029	120.5	0.01	15.1	5029	5025	752.81	0.01	1.09	11.5	26.6	28.8	26.6	Grass Swale
3	3	1.6	0.57	0.50	0.72	5032	5031.5	111	0.00	15.1	5031.5	5030	288.35	0.01	1.44	3.3	18.4	21.8	18.4	
4	4	0.4	0.63	0.55	0.74	5031	5030	56.85	0.02	6.3	5030	5026	147.26	0.03	3.30	0.7	7.1	16.5	7.1	
5	5	0.5	0.60	0.52	0.73	5031	5030	106.24	0.01	11.1	5030	5025	168.47	0.03	3.45	0.8	11.9	17.6	11.9	
6	6	3.0	0.61	0.53	0.73	5032	5031.5	130.45	0.00	16.4	5031.5	5024	1009	0.01	1.72	9.8	26.2	28.6	26.2	
7	7	1.3	0.60	0.52	0.73	5032	5031.5	80.71	0.01	11.2	5031.5	5029	460	0.01	1.47	5.2	16.4	22.8	16.4	
8	8	2.6	0.45	0.40	0.67	5028.5	5025	131.11	0.03	10.6	5025	5023	828.54	0.00	0.98	14.1	24.6	32.2	24.6	Concrete Ditch
9	9	1.7	0.45	0.40	0.67	5024	5022	162.53	0.01	15.2	5022	5021	529	0.00	0.65	13.5	28.8	29.8	28.8	Grass Swale
10	10	2.2	0.57	0.50	0.72	5029	5027.5	122.64	0.01	11.4	5027.5	5024	489	0.01	1.69	4.8	16.2	22.9	16.2	
11	11	2.0	0.57	0.50	0.72	5029	5028	130	0.01	13.7	5028	5024	505.8	0.01	1.78	4.7	18.4	23.3	18.4	
12	12	2.9	0.59	0.52	0.73	5030	5027	197.15	0.02	13.0	5027	5025	405	0.00	1.41	4.8	17.8	22.2	17.8	
13	13	1.0	0.58	0.51	0.72	5032	5031	107.66	0.01	11.5	5031	5029	223	0.01	1.89	2.0	13.5	19.5	13.5	
14	14	1.3	0.63	0.55	0.74	5044	5043	75	0.01	7.9	5043	5030	350	0.04	3.85	1.5	9.5	17.4	9.5	
15	15	2.7	0.56	0.49	0.71	5032.5	5032	67.94	0.01	10.2	5032	5025	882	0.01	1.78	8.3	18.5	27.1	18.5	
16	16	2.0	0.62	0.54	0.74	5038	5030	160	0.05	7.6	5030	5025	630	0.01	1.78	5.9	13.5	21.3	13.5	
17	17	1.9	0.22	0.21	0.57	5038	5032	90	0.07	8.2	5032	5021	515	0.02	2.19	3.9	12.1	27.2	12.1	Grass Swale
18	18	1.5	0.09	0.10	0.52														5.0	Min T_c assumed
19	19	6.4	0.02	0.05	0.49	5023	5020	300	0.01	33.3	5020	5019.6	280	0.00	0.26	17.6	50.9	39.3	39.3	
20	20	11.5	0.02	0.05	0.49	5022	5019	300	0.01	33.3	5019	5010	960	0.01	0.68	23.6	56.9	48.8	48.8	
OS-1	OS-1	0.5	0.77	0.66	0.80	5045	5044	60	0.02	5.2	5044	5029	370	0.04	4.03	1.5	6.7	14.7	6.7	
OS-2	OS-2	0.3	0.78	0.67	0.80	5039	5036	68	0.04	3.9	5036	5029	185	0.04	3.89	0.8	4.7	13.7	5.0	
OS-3	OS-3	1.4	0.77	0.66	0.80	5029	5024	114	0.04	5.2	5024	5011	1340	0.01	1.97	11.3	16.6	23.9	16.6	
OS-4	OS-4	1.4	0.77	0.67	0.80	5029	5024	114	0.04	5.2	5024	5011	1340	0.01	1.97	11.3	16.5	23.8	16.5	
HOS-1	HOS-1	22.4	0.02	0.05	0.49	5060	5045	500	0.03	30.0	5045	5038	235	0.03	1.26	3.1	33.1	33.2	33.1	
HOS-2	HOS-2	22.8	0.02	0.05	0.49	5070	5057	500	0.03	31.1	5057	5049	450	0.02	0.90	8.3	39.4	37.2	37.2	

[1] Refer to C spreadsheet
[2] Refer to equation 6-3 USDCM Volume 1 (March 2017)
[3] Refer to equation 6-4 USDCM Volume 1 (March 2017)

$V = K\sqrt{S_0}$

K = NRCS Conveyance Factor = 20 (Paved areas) or 15 (Grassed waterway) or 7 (Short Pastures & Lawns)

S_0 - Waterway Slope

[4] Refer to equation 6-4 USDCM Volume 1 (March 2017)
[5] Refer to equation 6-2 USDCM Volume 1 (March 2017)
[6] Refer to equation 6-5 USDCM Volume 1 (March 2017)
[7] Smaller of the two t_c values

POST-DEVELOPMENT RUNOFF

2-YR

$P_{2\ Year}$ = 1.01 inch

DESIGNED BY: ASH
CHECKED BY:

JOB NO. D01048-A
DATE: 9/11/2018

Design Point	Basin	Area	C_2	t_c	CA	I	Q_2
		ACRES		MIN		IN/HR	CFS
1	1	41.4	0.11	40.24	4.40	1.32	5.8
2	2	2.6	0.42	26.55	1.10	1.70	1.9
3	3	1.6	0.45	18.42	0.71	2.07	1.5
4	4	0.4	0.50	7.06	0.19	3.10	0.6
5	5	0.5	0.47	11.94	0.23	2.54	0.6
6	6	3.0	0.48	26.20	1.42	1.71	2.4
7	7	1.3	0.47	16.38	0.60	2.20	1.3
8	8	2.6	0.34	24.63	0.89	1.77	1.6
9	9	1.7	0.34	28.77	0.57	1.62	0.9
10	10	2.2	0.45	16.18	0.97	2.21	2.1
11	11	2.0	0.45	18.44	0.91	2.07	1.9
12	12	2.9	0.47	17.80	1.38	2.11	2.9
13	13	1.0	0.46	13.47	0.46	2.41	1.1
14	14	1.3	0.50	9.45	0.68	2.79	1.9
15	15	2.7	0.44	18.47	1.19	2.07	2.5
16	16	2.0	0.49	13.49	0.97	2.41	2.3
17	17	1.9	0.16	12.10	0.31	2.53	0.8
18	18	1.5	0.06	5.00	0.09	3.43	0.3
19	19	6.4	0.01	39.27	0.06	1.35	0.1
20	20	11.5	0.01	48.85	0.11	1.17	0.1
OS-1	OS-1	0.5	0.63	6.74	0.32	3.14	1.0
OS-2	OS-2	0.3	0.64	5.00	0.17	3.43	0.6
OS-3	OS-3	1.4	0.62	16.57	0.87	2.19	1.9
OS-4	OS-4	1.4	0.63	16.53	0.89	2.19	1.9
HOS-1	HOS-1	22.4	0.01	33.13	0.22	1.49	0.3
HOS-2	HOS-2	22.8	0.01	37.23	0.23	1.39	0.3

POST-DEVELOPMENT RUNOFF

10-YR

$P_{10\ Year}$ = 1.73 inch

DESIGNED BY: ASH JOB NO. D01048-A

CHECKED BY: DATE: 9/11/2018

Design Point	Basin	Area	C_{10}	t_c	CA	I	Q_{10}
		ACRES		MIN		IN/HR	CFS
1	1	41.4	0.24	40.24	9.79	2.27	22.2
2	2	2.6	0.53	26.55	1.38	2.91	4.0
3	3	1.6	0.55	18.42	0.88	3.55	3.1
4	4	0.4	0.59	7.06	0.23	5.30	1.2
5	5	0.5	0.57	11.94	0.27	4.35	1.2
6	6	3.0	0.58	26.20	1.70	2.94	5.0
7	7	1.3	0.57	16.38	0.73	3.76	2.7
8	8	2.6	0.46	24.63	1.20	3.04	3.6
9	9	1.7	0.46	28.77	0.77	2.78	2.1
10	10	2.2	0.55	16.18	1.19	3.79	4.5
11	11	2.0	0.55	18.44	1.12	3.55	4.0
12	12	2.9	0.57	17.80	1.67	3.61	6.0
13	13	1.0	0.56	13.47	0.56	4.13	2.3
14	14	1.3	0.60	9.45	0.80	4.78	3.8
15	15	2.7	0.54	18.47	1.47	3.55	5.2
16	16	2.0	0.59	13.49	1.16	4.12	4.8
17	17	1.9	0.29	12.10	0.56	4.33	2.4
18	18	1.5	0.20	5.00	0.30	5.87	1.8
19	19	6.4	0.15	39.27	0.96	2.30	2.2
20	20	11.5	0.15	48.85	1.72	2.00	3.4
OS-1	OS-1	0.5	0.70	6.74	0.35	5.38	1.9
OS-2	OS-2	0.3	0.71	5.00	0.18	5.87	1.1
OS-3	OS-3	1.4	0.70	16.57	0.97	3.74	3.6
OS-4	OS-4	1.4	0.70	16.53	0.99	3.75	3.7
HOS-1	HOS-1	22.4	0.15	33.13	3.36	2.56	8.6
HOS-2	HOS-2	22.8	0.15	37.23	3.42	2.38	8.1

POST-DEVELOPMENT RUNOFF

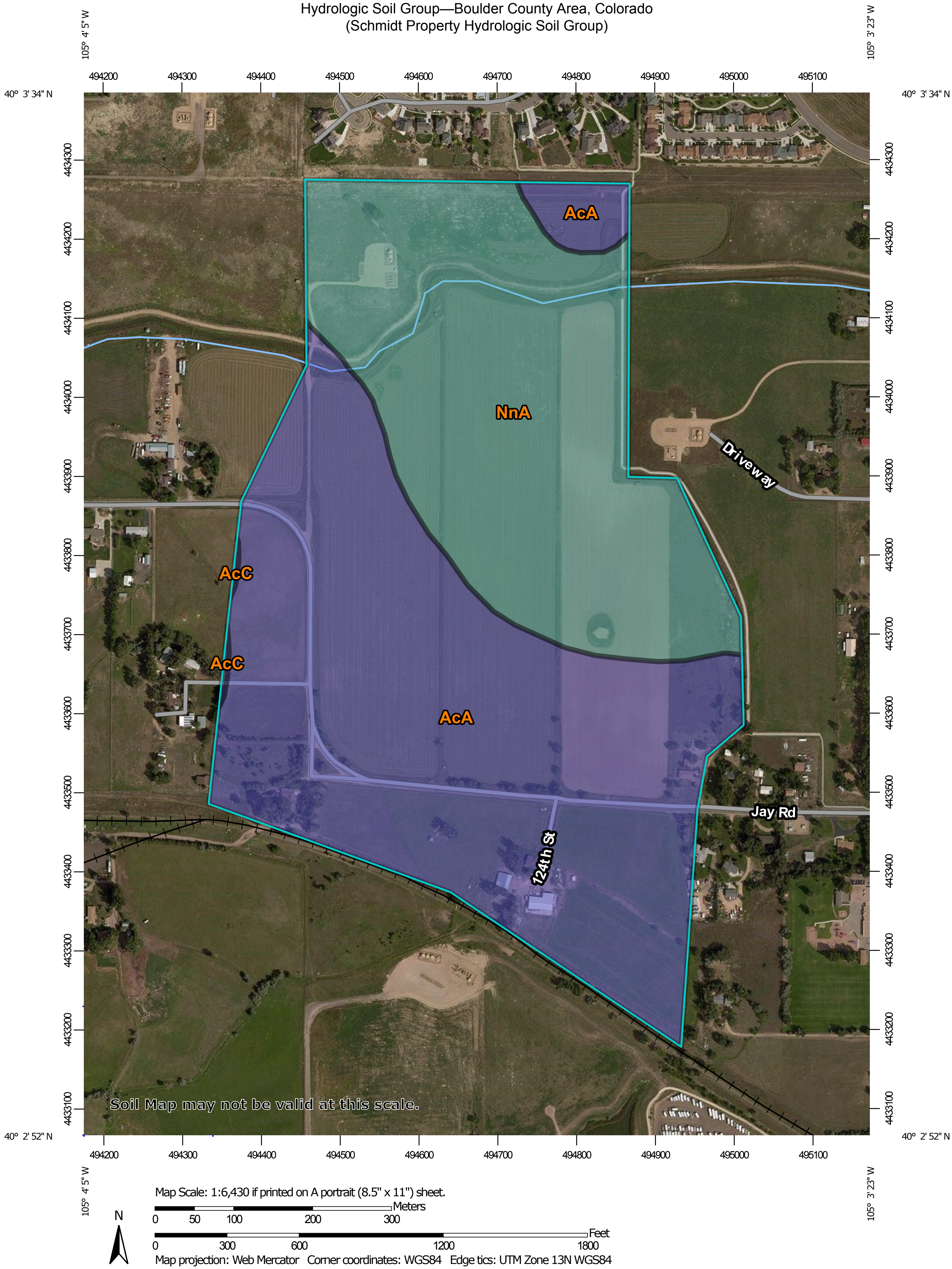
100-YR

$P_{100\ Year}$ = 2.70 inch

DESIGNED BY:	ASH	JOB NO.	D01048-A
CHECKED BY:		DATE:	9/11/2018

Design Point	Basin	Area	C_{100}	t_c	CA	I	Q_{100}
		ACRES		MIN		IN/HR	CFS
1	1	41.4	0.54	40.2	22.29	3.54	79.0
2	2	2.6	0.71	26.6	1.84	4.55	8.4
3	3	1.6	0.72	18.4	1.14	5.54	6.3
4	4	0.4	0.74	7.1	0.28	8.28	2.3
5	5	0.5	0.73	11.9	0.35	6.79	2.4
6	6	3.0	0.73	26.2	2.16	4.58	9.9
7	7	1.3	0.73	16.4	0.93	5.88	5.5
8	8	2.6	0.67	24.6	1.74	4.74	8.3
9	9	1.7	0.67	28.8	1.12	4.34	4.9
10	10	2.2	0.72	16.2	1.55	5.91	9.2
11	11	2.0	0.72	18.4	1.47	5.54	8.1
12	12	2.9	0.73	17.8	2.13	5.64	12.0
13	13	1.0	0.72	13.5	0.73	6.44	4.7
14	14	1.3	0.74	9.5	1.00	7.47	7.5
15	15	2.7	0.71	18.5	1.94	5.53	10.7
16	16	2.0	0.74	13.5	1.46	6.44	9.4
17	17	1.9	0.57	12.1	1.09	6.75	7.4
18	18	1.5	0.52	5.0	0.79	9.16	7.2
19	19	6.4	0.49	39.3	3.15	3.60	11.3
20	20	11.5	0.49	48.8	5.62	3.13	17.6
OS-1	OS-1	0.5	0.80	6.7	0.40	8.40	3.4
OS-2	OS-2	0.3	0.80	5.0	0.21	9.16	1.9
OS-3	OS-3	1.4	0.80	16.6	1.11	5.84	6.5
OS-4	OS-4	1.4	0.80	16.5	1.13	5.85	6.6
HOS-1	HOS-1	22.4	0.49	33.1	10.99	3.99	43.9
HOS-2	HOS-2	22.8	0.49	37.2	11.17	3.72	41.5

Hydrologic Soil Group—Boulder County Area, Colorado
(Schmidt Property Hydrologic Soil Group)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Boulder County Area, Colorado
Survey Area Data: Version 14, 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: Aug 30, 2014—Sep 18, 2014

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AcA	Ascalon sandy loam, 0 to 3 percent slopes	B	73.5	59.4%
AcC	Ascalon sandy loam, 3 to 5 percent slopes	B	0.2	0.2%
NnA	Nunn sandy clay loam, 0 to 1 percent slopes	C	50.1	40.5%
Totals for Area of Interest			**123.8**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix B

Hydraulic Computations

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INLET MANAGEMENT

Worksheet Protected

INLET NAME	3	4	5	6	7	10
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	On Grade	On Grade	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.5	0.6	0.6	2.4	1.3	2.1
Major Q_{Known} (cfs)	6.3	2.3	2.4	9.9	5.5	9.2

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)		0.0	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)		0.0	0.0	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)						
Percent Impervious						
NRCS Soil Type						

Watershed Profile

Overland Slope (ft/ft)						
Overland Length (ft)						
Channel Slope (ft/ft)						
Channel Length (ft)						

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)						
One-Hour Precipitation, P_1 (inches)						

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)						
One-Hour Precipitation, P_1 (inches)						

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.5**	**0.6**	**0.6**	**2.4**	**1.3**	**2.1**
Major Total Design Peak Flow, Q (cfs)	**6.3**	**2.3**	**2.4**	**9.9**	**5.5**	**9.2**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	0.0	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	0.0	N/A	N/A	N/A

Minor Storm (Calculated) Analysis of Flow Time

C	N/A	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A	N/A

Major Storm (Calculated) Analysis of Flow Time

C	N/A	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A	N/A

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INLET MANAGEMENT

Worksheet Protected

INLET NAME	11	12	13	14	15	16
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.9	2.9	1.1	1.9	2.5	2.3
Major Q_{Known} (cfs)	8.1	12.0	4.7	7.5	10.7	9.4

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)						
Percent Impervious						
NRCS Soil Type						

Watershed Profile

Overland Slope (ft/ft)						
Overland Length (ft)						
Channel Slope (ft/ft)						
Channel Length (ft)						

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)						
One-Hour Precipitation, P_1 (inches)						

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)						
One-Hour Precipitation, P_1 (inches)						

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.9**	**2.9**	**1.1**	**1.9**	**2.5**	**2.3**
Major Total Design Peak Flow, Q (cfs)	**8.1**	**12.0**	**4.7**	**7.5**	**10.7**	**9.4**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A	N/A	N/A	N/A

Minor Storm (Calculated) Analysis of Flow T

C	N/A	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A	N/A

Major Storm (Calculated) Analysis of Flow T

C	N/A	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A	N/A

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INLET MANAGEMENT

Worksheet Protected

INLET NAME	OS-1	OS-2	OS-3	OS-4
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.0	0.6	1.9	1.9
Major Q_{Known} (cfs)	3.4	1.9	6.5	6.6

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	OS-1	OS-2
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	1.0	0.2

Watershed Characteristics

Subcatchment Area (acres)				
Percent Impervious				
NRCS Soil Type				

Watershed Profile

Overland Slope (ft/ft)				
Overland Length (ft)				
Channel Slope (ft/ft)				
Channel Length (ft)				

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.0**	**0.6**	**1.9**	**1.9**
Major Total Design Peak Flow, Q (cfs)	**3.4**	**1.9**	**7.5**	**6.8**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	1.0	0.2	0.1	0.0

Minor Storm (Calculated) Analysis of Flow T

C	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A

Major Storm (Calculated) Analysis of Flow Ti

C	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A

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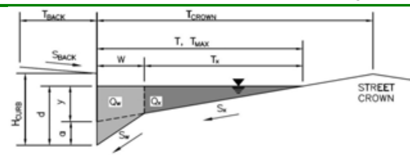
ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: 3



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

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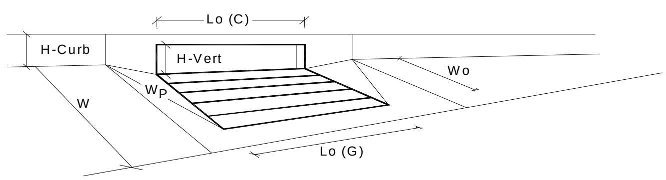


Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	7.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.17	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.51	0.90	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.9**	**7.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.5	6.3	cfs

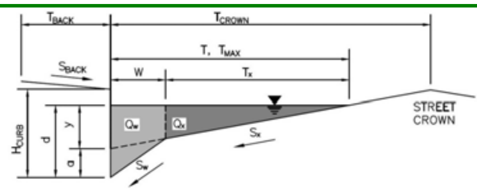
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: 4

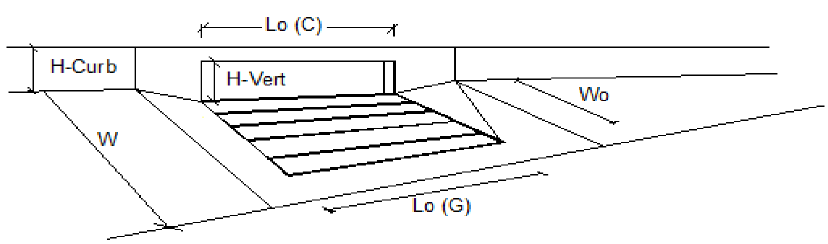


Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.025		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.4**	**29.8**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.6**	**2.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

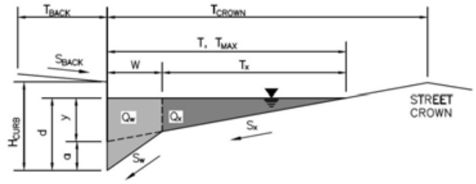
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: 5



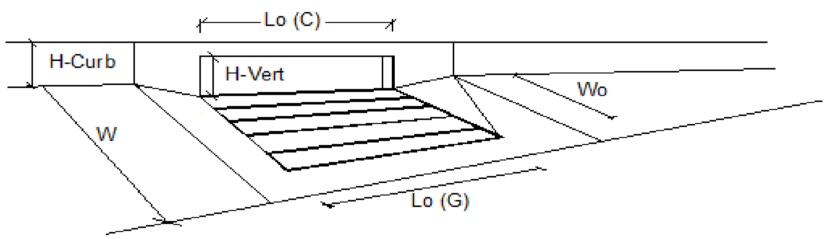
Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.025		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.4**	**29.8**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



		MINOR	MAJOR	
Design Information (Input) — CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.6**	**2.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

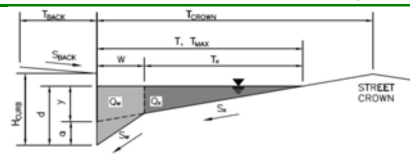
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: 6



Gutter Geometry (Enter data in the blue cells)

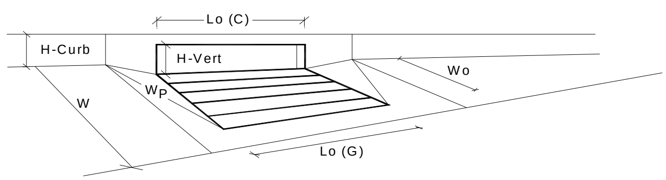
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	7.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.17	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.38	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.99	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**2.5**	**12.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.4	9.9	cfs

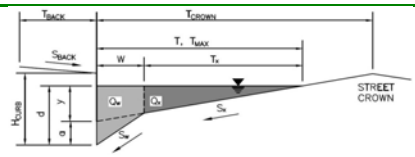
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: 7



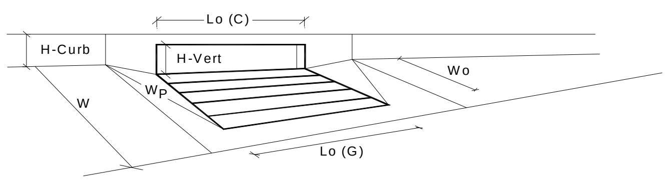
Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	7.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.17	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.51	0.90	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**1.9**	**7.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.3	5.5	cfs

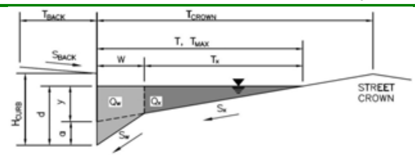
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

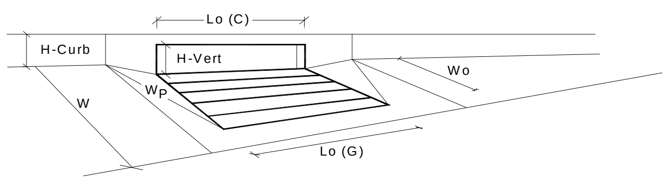
Inlet ID: 10



Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	7.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.17	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.38	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.99	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**2.5**	**12.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.1	9.2	cfs

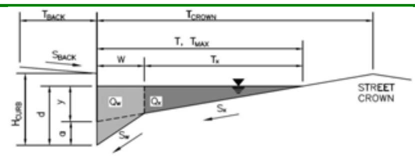
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: 11



Gutter Geometry (Enter data in the blue cells)

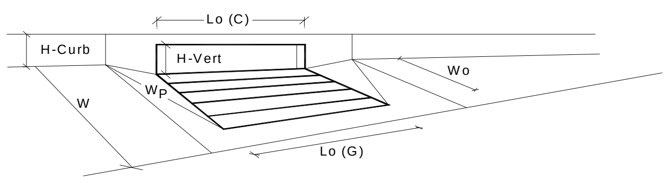
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	7.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.17	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.38	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.99	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

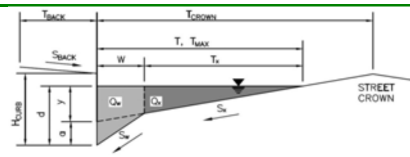
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**2.5**	**12.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.9	8.1	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

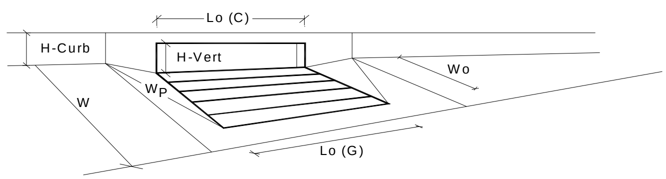
Inlet ID: 12



Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input) CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4	7.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.18	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.40	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.81	0.99	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.9**	**12.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.9	12.0	cfs

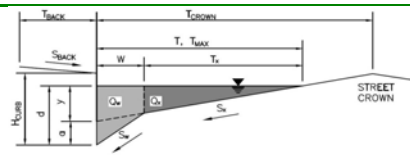
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: 13

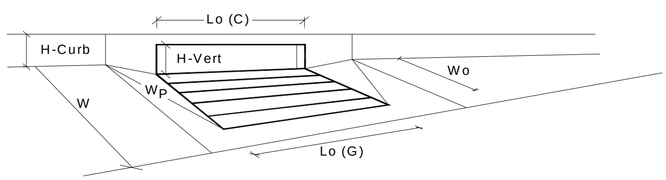


Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	7.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.17	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.51	0.90	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.9**	**7.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.1	4.7	cfs

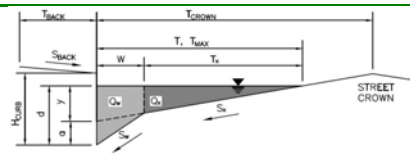
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

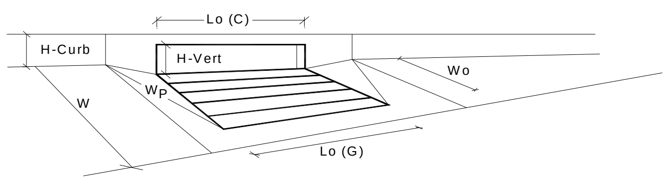
Inlet ID: 14



Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	7.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.17	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.51	0.90	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.9**	**7.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.9	7.5	cfs

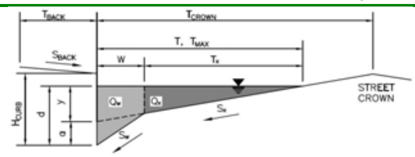
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: 15



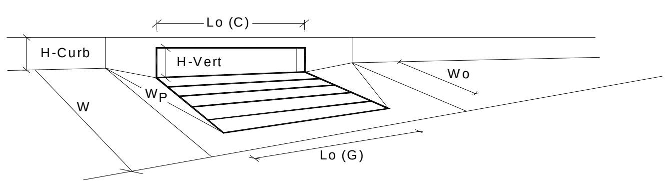
Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input) CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4	7.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.18	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.40	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.81	0.99	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**2.9**	**12.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.5	10.7	cfs

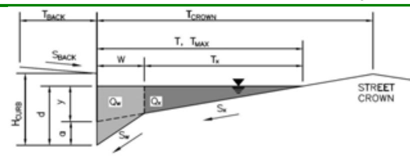
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

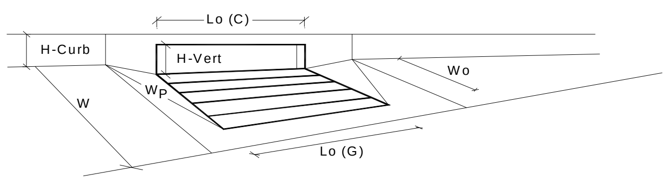
Inlet ID: 16



Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	7.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.17	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.38	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.99	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.5**	**12.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.3	9.4	cfs

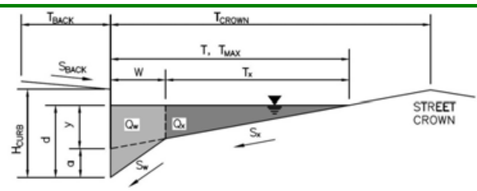
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: OS-1

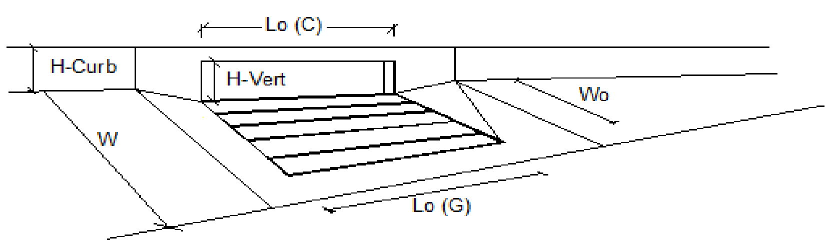


Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	22.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.040		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	8.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	11.2	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**3.9**	**25.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.0**	**2.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**70**	**%**

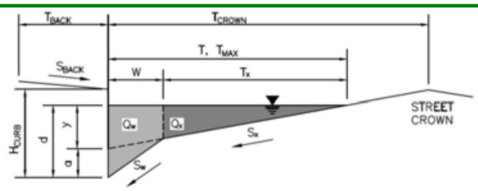
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: OS-2



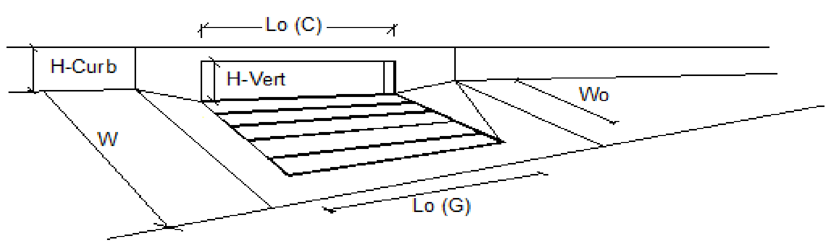
Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	22.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.040		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	8.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	11.2	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**3.9**	**96.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.6**	**1.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**89**	**%**

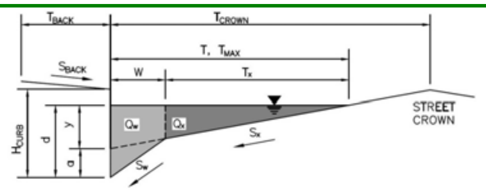
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: OS-3

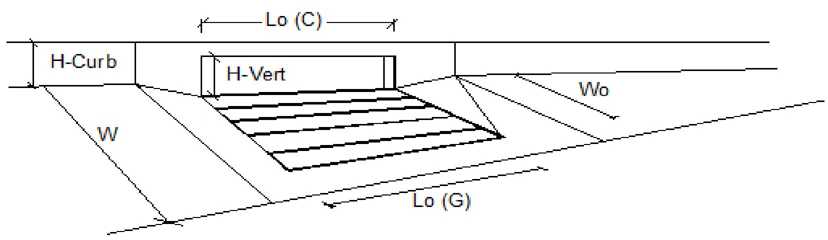


Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	22.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	8.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	11.2	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**2.0**	**100.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.9**	**7.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**99**	**%**

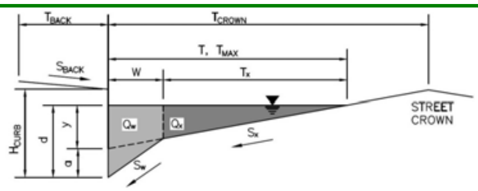
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: OS-4



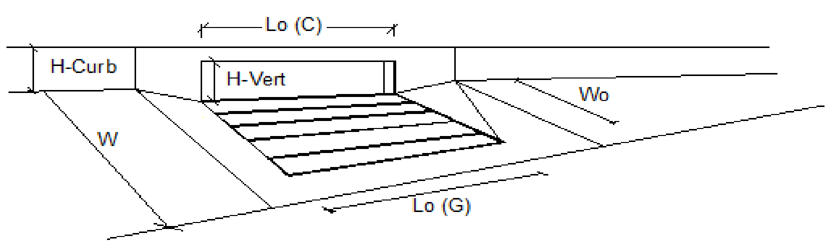
Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	22.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	8.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	11.2	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**2.0**	**100.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input) CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.9**	**6.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

Channel Analysis: A-Trickle Channel

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
-2.00	100.50	0.0350
0.00	100.00	0.0350
8.00	98.00	0.0150
11.00	97.50	0.0150
14.00	98.00	0.0350
22.00	100.00	0.0350
24.00	100.50	-----

Longitudinal Slope: 0.0020 ft/ft

Flow: 2.0500 cfs

Result Parameters

Depth: 0.4565 ft

Area of Flow: 1.2503 ft^2

Wetted Perimeter: 5.5534 ft

Hydraulic Radius: 0.2251 ft

Average Velocity: 1.6396 ft/s

Top Width: 5.4779 ft

Froude Number: 0.6048

Critical Depth: 0.3733 ft

Critical Velocity: 2.4517 ft/s

Critical Slope: 0.0058 ft/ft

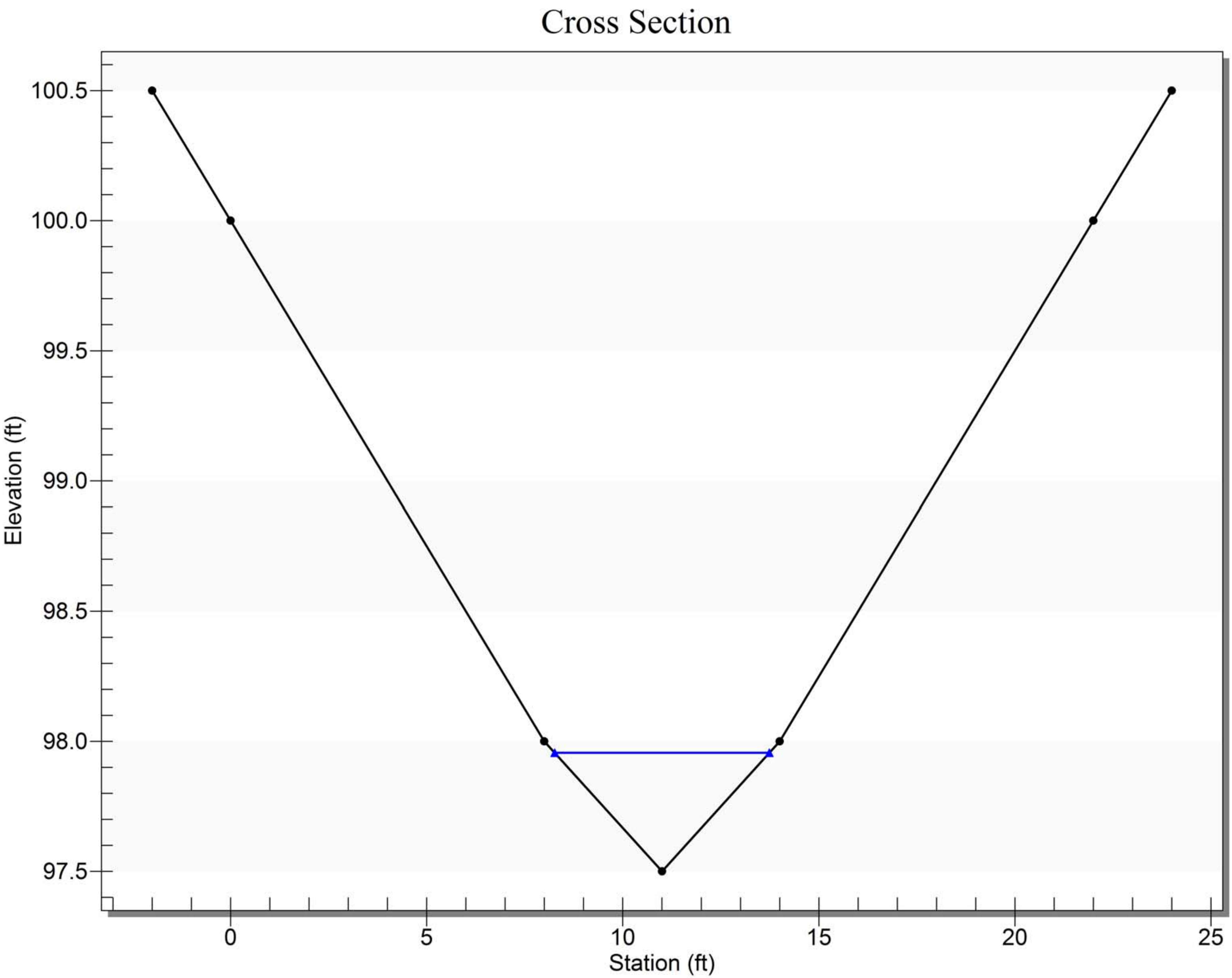
Critical Top Width: 4.48 ft

Calculated Max Shear Stress: 0.0570 lb/ft^2

Calculated Avg Shear Stress: 0.0281 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0150



Cross Section
Elevation (ft)
100.5
100.0
99.5
99.0
98.5
98.0
97.5
Station (ft)
0
5
10
15
20
25

Channel Analysis: A-100 Year

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
-2.00	100.50	0.0350
0.00	100.00	0.0350
8.00	98.00	0.0150
11.00	97.50	0.0150
14.00	98.00	0.0350
22.00	100.00	0.0350
24.00	100.50	-----

Longitudinal Slope: 0.0020 ft/ft

Flow: 102.5000 cfs

Result Parameters

Depth: 2.2304 ft

Area of Flow: 23.8594 ft^2

Wetted Perimeter: 20.3519 ft

Hydraulic Radius: 1.1723 ft

Average Velocity: 4.2960 ft/s

Top Width: 19.8431 ft

Froude Number: 0.6904

Critical Depth: 1.9018 ft

Critical Velocity: 5.7681 ft/s

Critical Slope: 0.0040 ft/ft

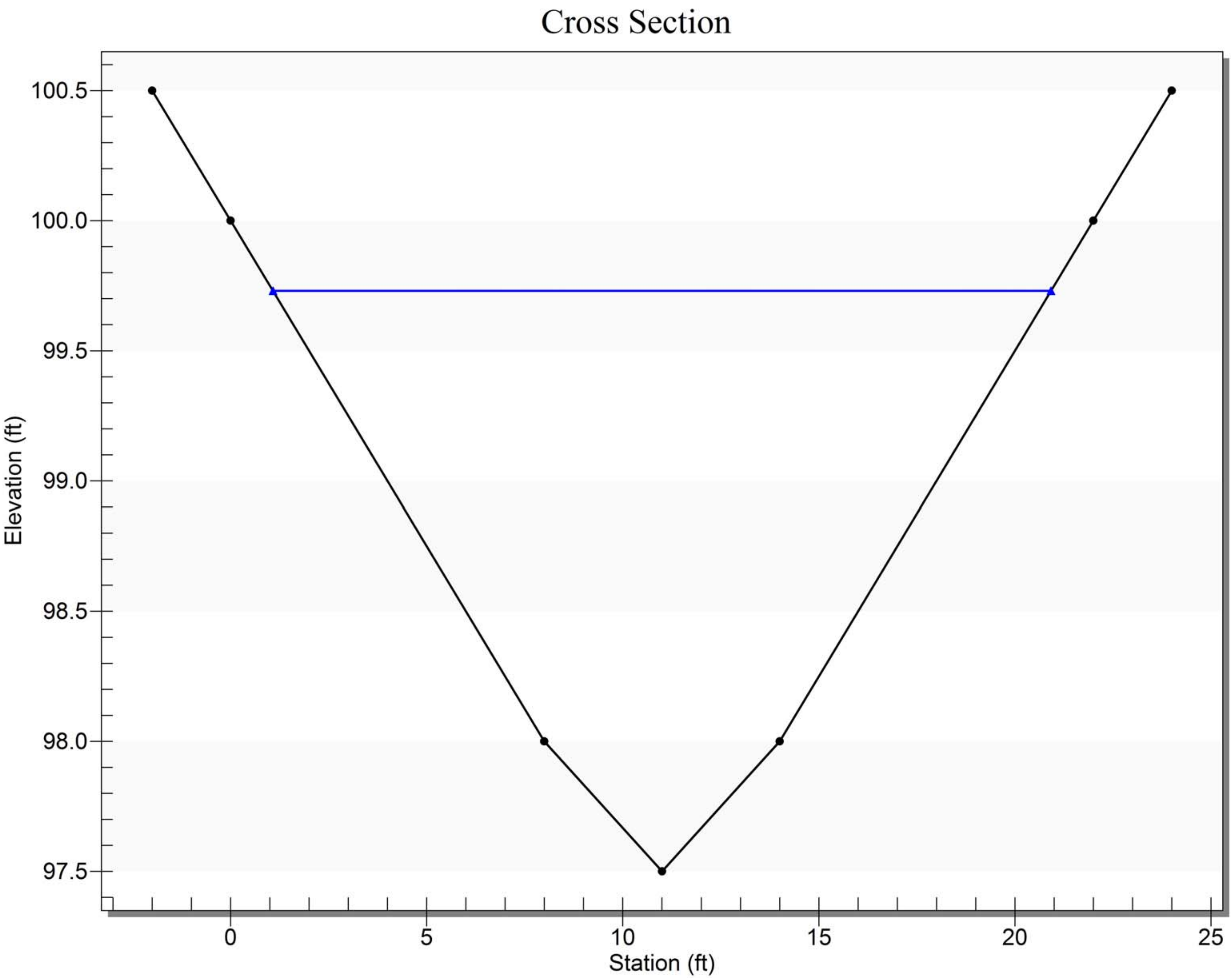
Critical Top Width: 17.21 ft

Calculated Max Shear Stress: 0.2784 lb/ft^2

Calculated Avg Shear Stress: 0.1463 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0172


Cross Section
Elevation (ft)
Station (ft)
100.5
100.0
99.5
99.0
98.5
98.0
97.5
0
5
10
15
20
25

Channel Analysis: B-Trickle Channel

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
-2.00	100.50	0.0350
0.00	100.00	0.0350
8.00	98.00	0.0150
11.00	97.50	0.0150
14.00	98.00	0.0350
22.00	100.00	0.0350
24.00	100.50	-----

Longitudinal Slope: 0.0020 ft/ft

Flow: 1.9260 cfs

Result Parameters

Depth: 0.4459 ft

Area of Flow: 1.1931 ft^2

Wetted Perimeter: 5.4250 ft

Hydraulic Radius: 0.2199 ft

Average Velocity: 1.6142 ft/s

Top Width: 5.3512 ft

Froude Number: 0.6025

Critical Depth: 0.3641 ft

Critical Velocity: 2.4215 ft/s

Critical Slope: 0.0059 ft/ft

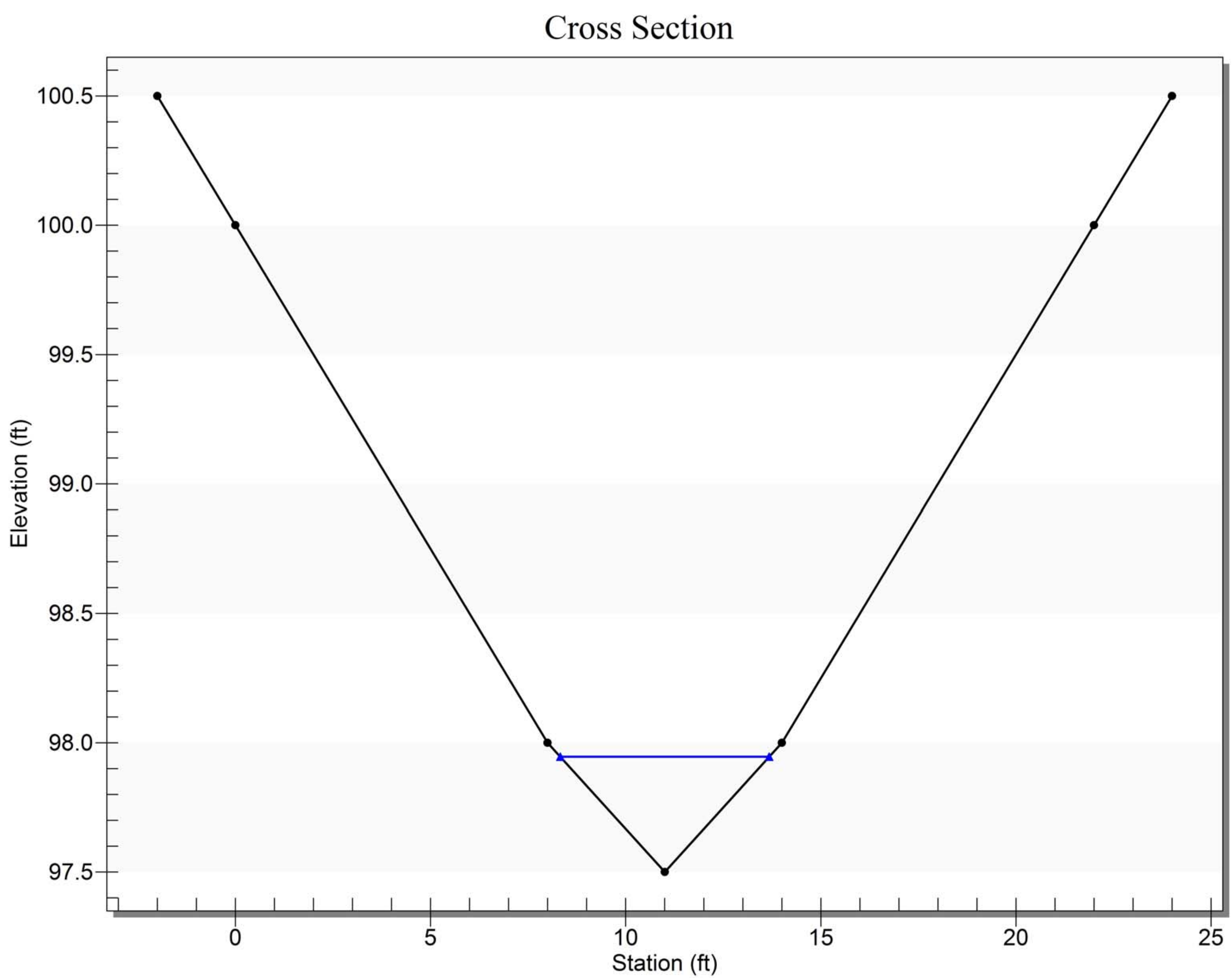
Critical Top Width: 4.37 ft

Calculated Max Shear Stress: 0.0557 lb/ft^2

Calculated Avg Shear Stress: 0.0274 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0150


Cross Section
Elevation (ft)
100.5
100.0
99.5
99.0
98.5
98.0
97.5
Station (ft)
0
5
10
15
20
25

Channel Analysis: B-100 Year

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
-2.00	100.50	0.0350
0.00	100.00	0.0350
8.00	98.00	0.0150
11.00	97.50	0.0150
14.00	98.00	0.0350
22.00	100.00	0.0350
24.00	100.50	-----

Longitudinal Slope: 0.0020 ft/ft

Flow: 96.3000 cfs

Result Parameters

Depth: 2.1676 ft

Area of Flow: 22.6293 ft^2

Wetted Perimeter: 19.8342 ft

Hydraulic Radius: 1.1409 ft

Average Velocity: 4.2556 ft/s

Top Width: 19.3408 ft

Froude Number: 0.6933

Critical Depth: 1.8517 ft

Critical Velocity: 5.6922 ft/s

Critical Slope: 0.0040 ft/ft

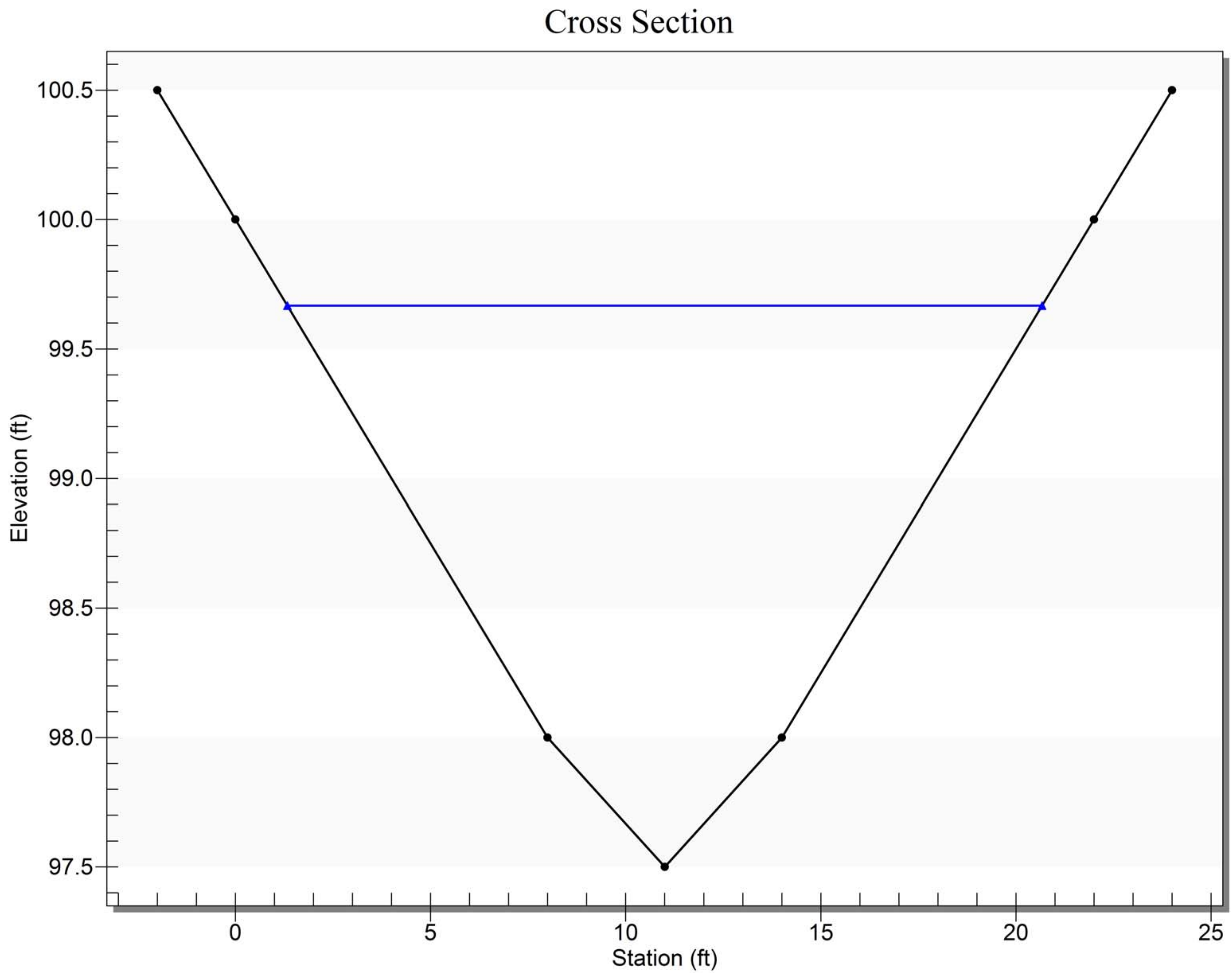
Critical Top Width: 16.81 ft

Calculated Max Shear Stress: 0.2705 lb/ft^2

Calculated Avg Shear Stress: 0.1424 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0171



Cross Section
Elevation (ft)
Station (ft)
100.5
100.0
99.5
99.0
98.5
98.0
97.5
0
5
10
15
20
25

Channel Analysis: C-Trickle Channel

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	100.00	0.0350
6.52	98.37	0.0350
7.52	98.35	0.0150
9.02	98.15	0.0150
10.52	98.35	0.0350
11.52	98.37	0.0350
18.04	100.00	-----

Longitudinal Slope: 0.0020 ft/ft

Flow: 0.1680 cfs

Result Parameters

Depth: 0.1641 ft

Area of Flow: 0.2020 ft^2

Wetted Perimeter: 2.4835 ft

Hydraulic Radius: 0.0813 ft

Average Velocity: 0.8317 ft/s

Top Width: 2.4617 ft

Froude Number: 0.5117

Critical Depth: 0.1255 ft

Critical Velocity: 1.4225 ft/s

Critical Slope: 0.0084 ft/ft

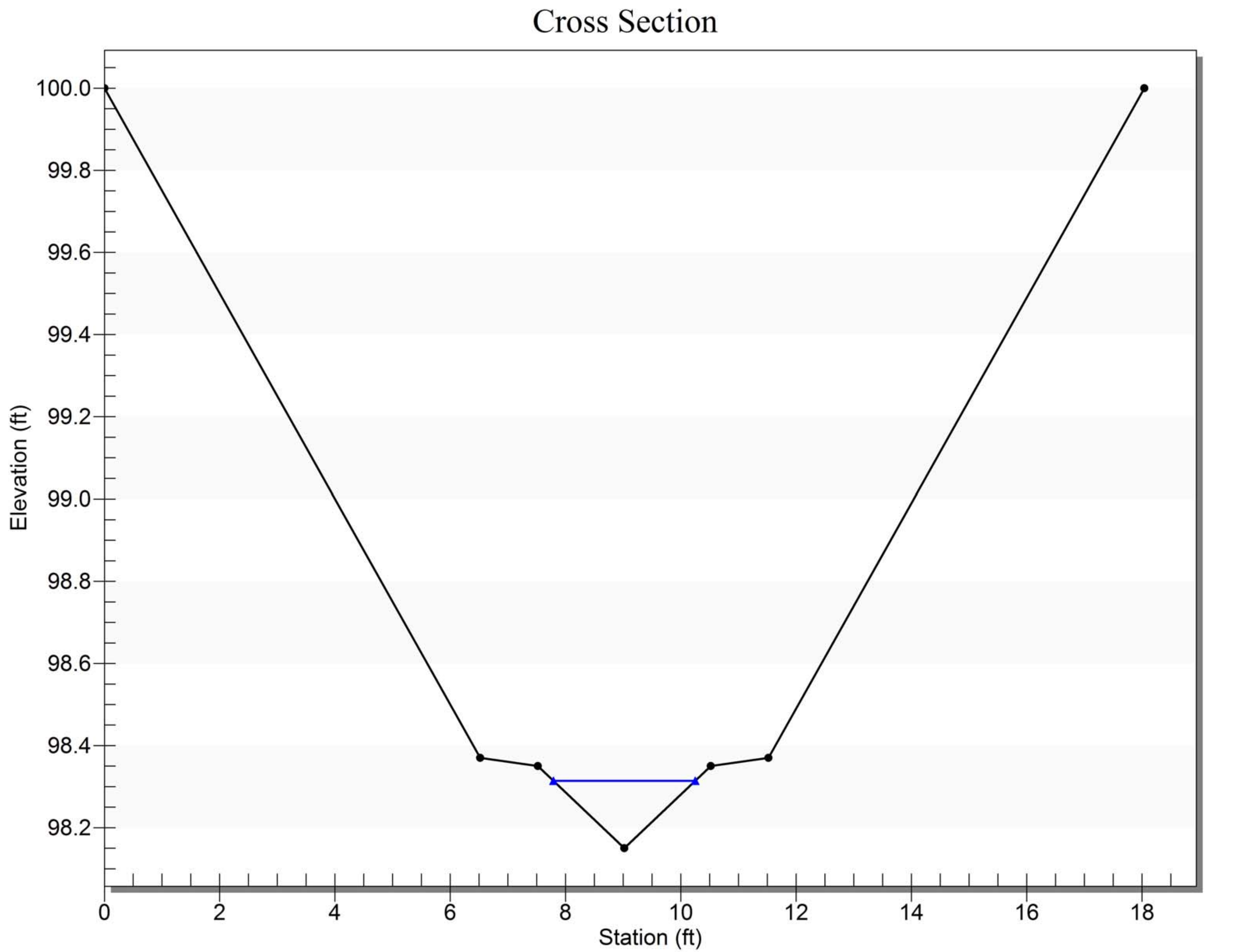
Critical Top Width: 1.88 ft

Calculated Max Shear Stress: 0.0205 lb/ft^2

Calculated Avg Shear Stress: 0.0102 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0150



Cross Section
Elevation (ft)
100.0
99.8
99.6
99.4
99.2
99.0
98.8
98.6
98.4
98.2
Station (ft)
0
2
4
6
8
10
12
14
16
18

Channel Analysis: C-100 Year

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	100.00	0.0350
6.52	98.37	0.0350
7.52	98.35	0.0150
9.02	98.15	0.0150
10.52	98.35	0.0350
11.52	98.37	0.0350
18.04	100.00	-----

Longitudinal Slope: 0.0020 ft/ft

Flow: 8.4000 cfs

Result Parameters

Depth: 0.7456 ft

Area of Flow: 4.1134 ft^2

Wetted Perimeter: 9.3615 ft

Hydraulic Radius: 0.4394 ft

Average Velocity: 2.0421 ft/s

Top Width: 9.2051 ft

Froude Number: 0.5384

Critical Depth: 0.5636 ft

Critical Velocity: 3.2681 ft/s

Critical Slope: 0.0068 ft/ft

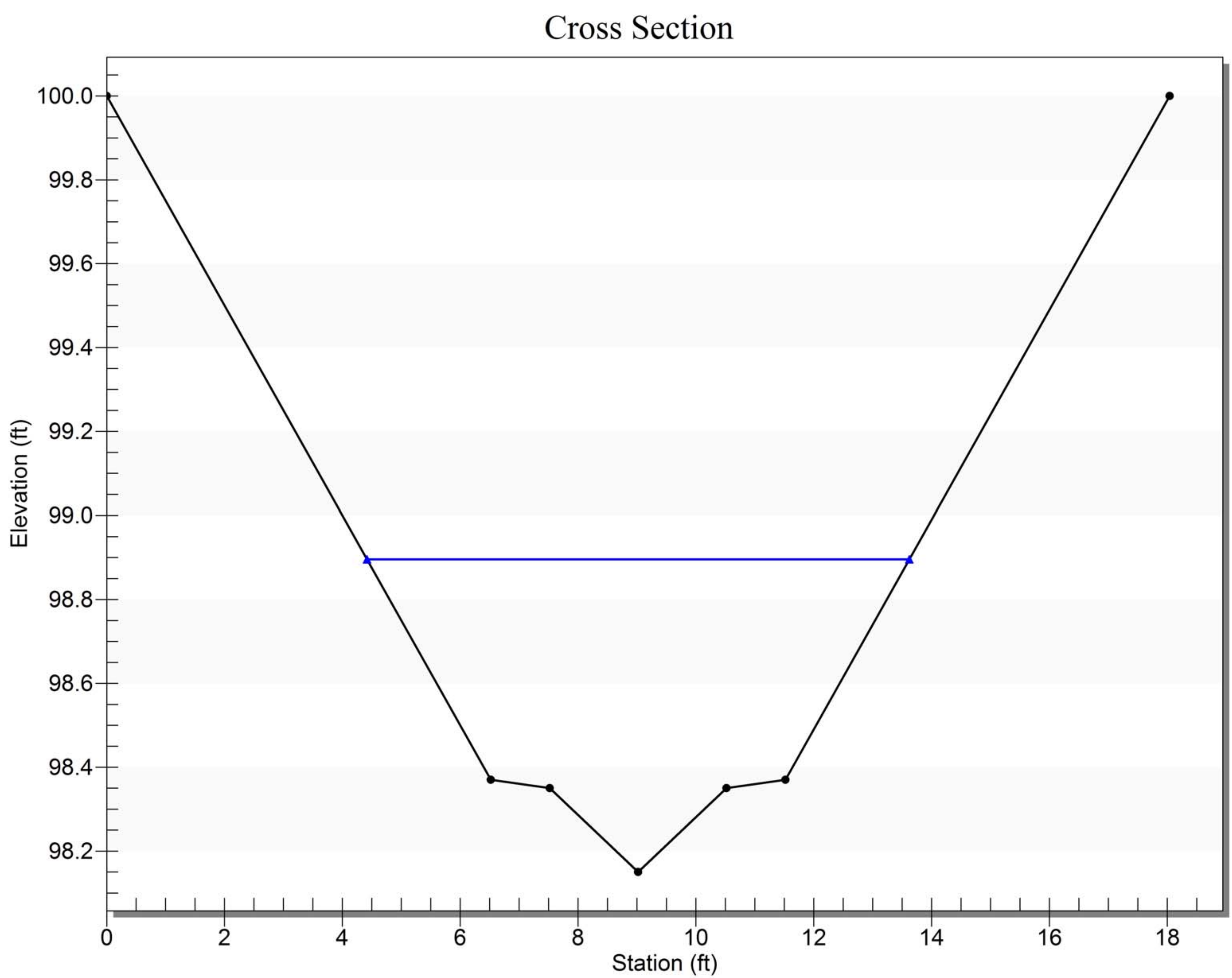
Critical Top Width: 7.75 ft

Calculated Max Shear Stress: 0.0931 lb/ft^2

Calculated Avg Shear Stress: 0.0548 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0188


Cross Section
Elevation (ft)
100.0
99.8
99.6
99.4
99.2
99.0
98.8
98.6
98.4
98.2
Station (ft)
0
2
4
6
8
10
12
14
16
18

Hydraulic Analysis Report

Project Data

Project Title: Schmidt Property

Designer: Ash

Project Date: Thursday, March 01, 2018

Project Units: U.S. Customary Units

Notes:

Channel Analysis: F-Trickle Channel

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	100.00	0.0350
6.00	98.50	0.0350
7.00	98.48	0.0150
8.50	98.28	0.0150
10.00	98.48	0.0350
11.00	98.50	0.0350
17.00	100.00	-----

Longitudinal Slope: 0.0020 ft/ft

Flow: 0.2540 cfs

Result Parameters

Depth: 0.1916 ft

Area of Flow: 0.2754 ft^2

Wetted Perimeter: 2.8999 ft

Hydraulic Radius: 0.0950 ft

Average Velocity: 0.9222 ft/s

Top Width: 2.8744 ft

Froude Number: 0.5251

Critical Depth: 0.1481 ft

Critical Velocity: 1.5443 ft/s

Critical Slope: 0.0079 ft/ft

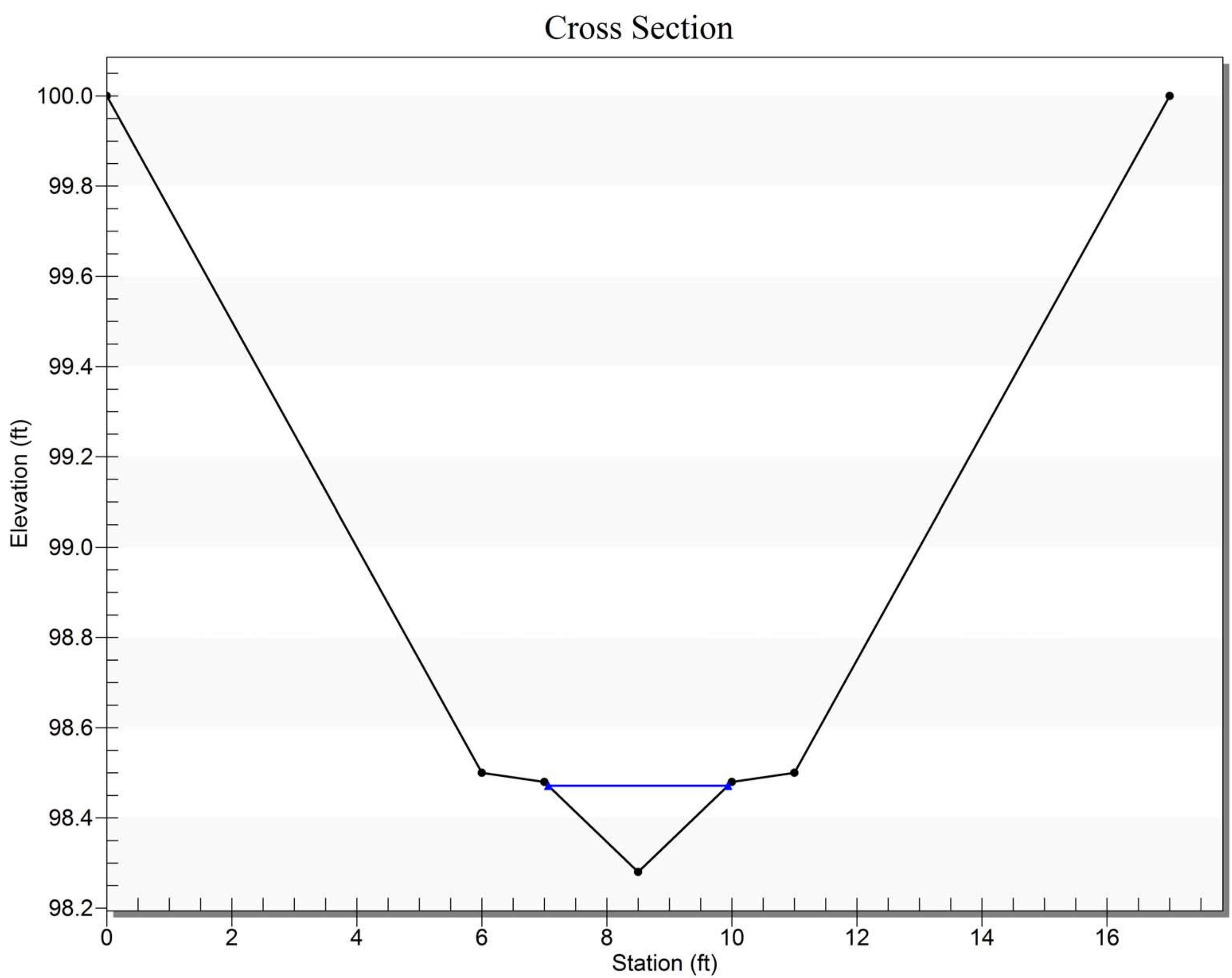
Critical Top Width: 2.22 ft

Calculated Max Shear Stress: 0.0239 lb/ft^2

Calculated Avg Shear Stress: 0.0119 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0150



Cross Section
Elevation (ft)
Station (ft)
100.0
99.8
99.6
99.4
99.2
99.0
98.8
98.6
98.4
98.2
0
2
4
6
8
10
12
14
16

Channel Analysis: F-100 Year

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	100.00	0.0350
6.00	98.50	0.0350
7.00	98.48	0.0150
8.50	98.28	0.0150
10.00	98.48	0.0350
11.00	98.50	0.0350
17.00	100.00	-----

Longitudinal Slope: 0.0020 ft/ft

Flow: 12.7000 cfs

Result Parameters

Depth: 0.9042 ft

Area of Flow: 5.6740 ft^2

Wetted Perimeter: 10.6694 ft

Hydraulic Radius: 0.5318 ft

Average Velocity: 2.2383 ft/s

Top Width: 10.4740 ft

Froude Number: 0.5359

Critical Depth: 0.6787 ft

Critical Velocity: 3.6132 ft/s

Critical Slope: 0.0069 ft/ft

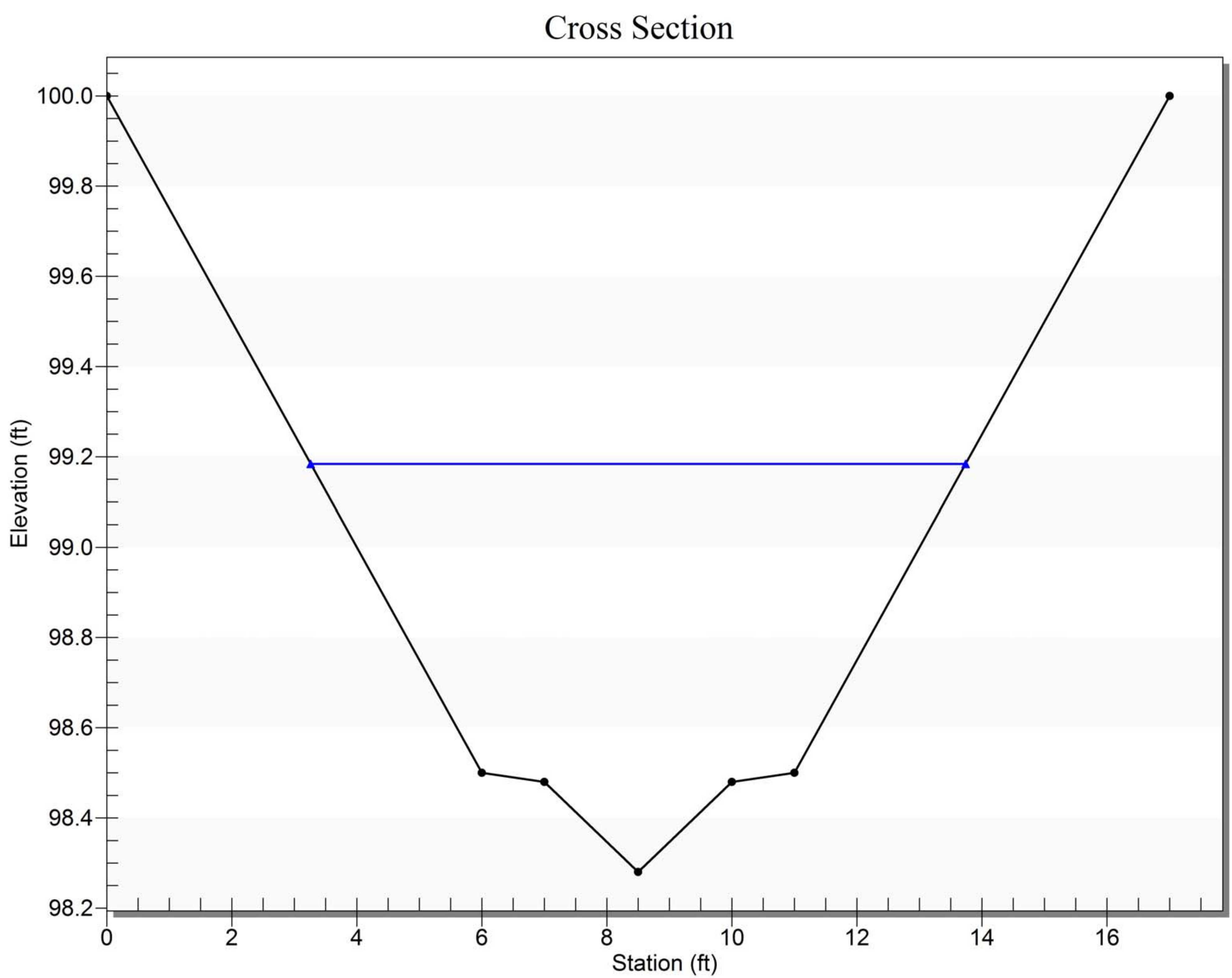
Critical Top Width: 8.67 ft

Calculated Max Shear Stress: 0.1129 lb/ft^2

Calculated Avg Shear Stress: 0.0664 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0195



Cross Section
Elevation (ft)
Station (ft)
100.0
99.8
99.6
99.4
99.2
99.0
98.8
98.6
98.4
98.2
0
2
4
6
8
10
12
14
16

Hydraulic Analysis Report

Project Data

Project Title: Schmidt Property

Designer:

Project Date: Wednesday, August 22, 2018

Project Units: U.S. Customary Units

Notes:

Channel Analysis: Existing Swale @ Kenosha Farms - 0.85%

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	100.00	0.0350
22.00	94.50	0.0350
47.50	93.99	0.0350
54.90	92.14	0.0350
60.50	91.99	0.0150
60.50	91.49	0.0150
64.50	91.49	0.0150
64.50	91.99	0.0350
70.10	92.14	0.0350
77.50	93.99	0.0350
103.00	94.50	0.0350
125.00	100.00	-----

Longitudinal Slope: 0.0085 ft/ft

Flow: 436.0000 cfs

Result Parameters

Depth: 3.0696 ft

Area of Flow: 78.3950 ft^2

Wetted Perimeter: 82.9610 ft

Hydraulic Radius: 0.9450 ft

Average Velocity: 5.5616 ft/s

Top Width: 81.4766 ft

Froude Number: 0.9992

Critical Depth: 3.0690 ft

Critical Velocity: 5.5649 ft/s

Critical Slope: 0.0085 ft/ft

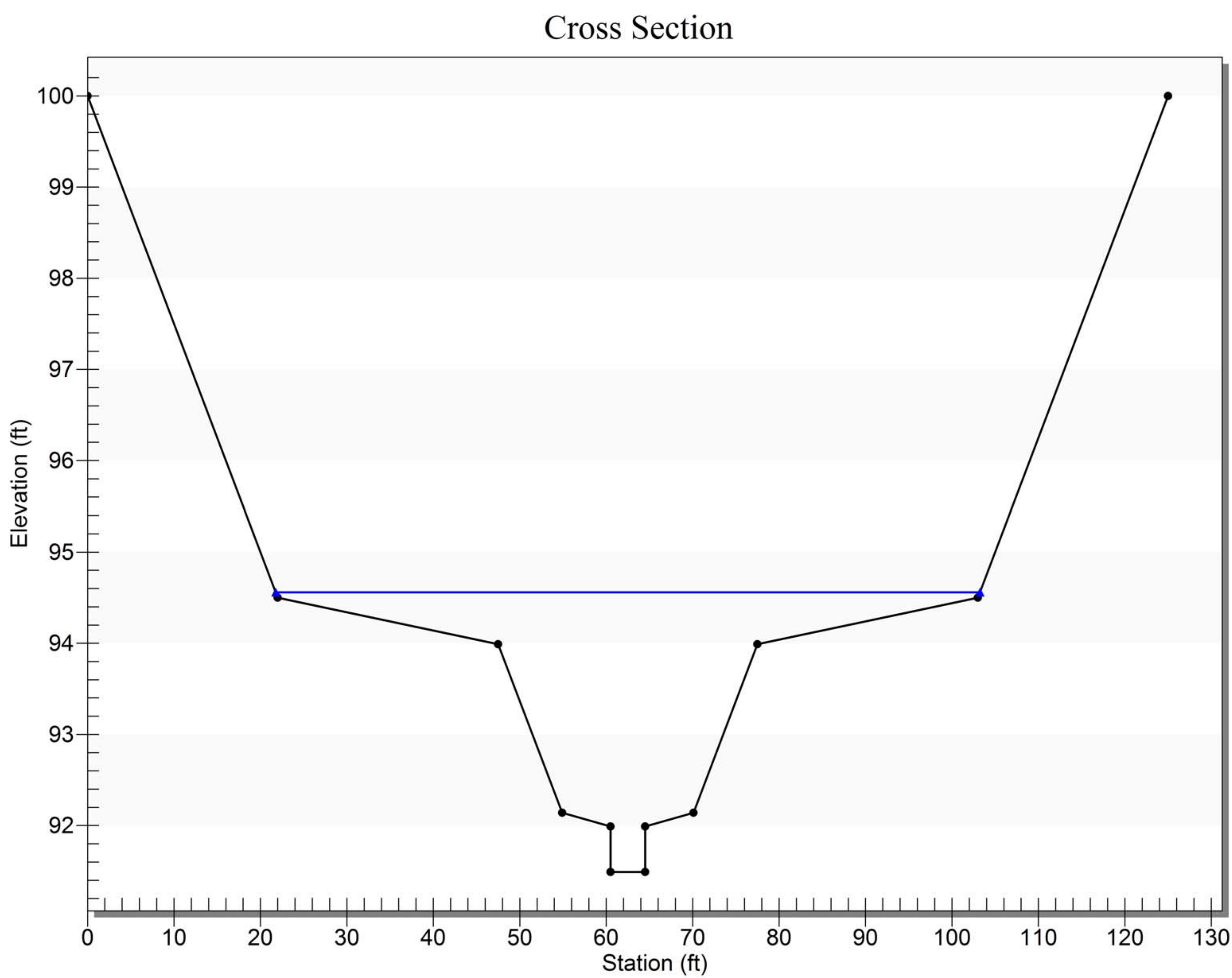
Critical Top Width: 81.47 ft

Calculated Max Shear Stress: 1.6281 lb/ft^2

Calculated Avg Shear Stress: 0.5012 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0237


Cross Section
Elevation (ft)
100
99
98
97
96
95
94
93
92
Station (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 195 cfs

Maximum Flow: 195 cfs

Table 1 - Summary of Culvert Flows at Crossing: Allen Avenue

Headwater Elevation (ft)	Total Discharge (cfs)	Allen Avenue Culvert 1 Discharge (cfs)	Allen Avenue Culvert 2 Discharge (cfs)	Allen Avenue Culvert 3 Discharge (cfs)	Allen Avenue Culvert 4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5001.47	0.00	0.00	0.00	0.00	0.00	0.00	0
5002.65	19.50	2.90	3.38	6.07	7.11	0.00	6
5003.08	39.00	7.13	8.00	10.96	12.89	0.00	4
5003.44	58.50	11.93	12.83	15.87	17.87	0.00	4
5003.78	78.00	16.41	17.44	20.96	23.18	0.00	4
5004.09	97.50	21.02	22.18	25.90	28.37	0.00	3
5004.38	117.00	25.83	27.05	30.76	33.36	0.00	3
5004.67	136.50	30.77	32.00	35.61	38.14	0.00	3
5004.96	156.00	35.79	36.97	40.55	42.73	0.00	3
5005.27	175.50	40.81	41.90	45.57	47.22	0.00	4
5005.62	195.00	45.85	46.85	50.60	51.71	0.00	4
5008.56	313.62	76.49	77.07	80.08	79.98	0.00	Overtopping

Rating Curve Plot for Crossing: Allen Avenue

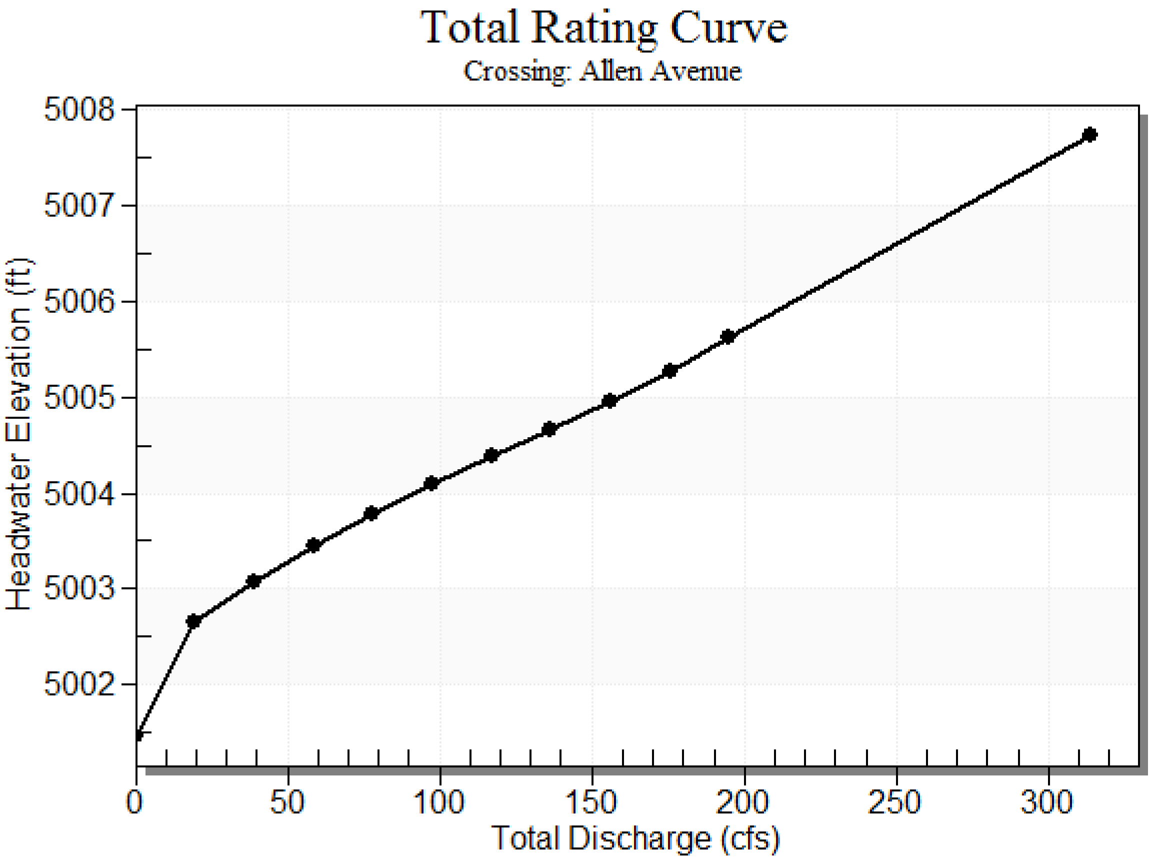


Table 2 - Culvert Summary Table: Allen Avenue Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	5001.47	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
19.50	2.90	5002.65	0.716	0.033	1-S2n	0.454	0.527	0.454	0.713	4.188	4.421
39.00	7.13	5003.08	1.150	0.371	1-S2n	0.727	0.838	0.727	0.967	5.351	4.506
58.50	11.93	5003.44	1.513	0.682	1-S2n	0.952	1.091	0.963	1.157	6.067	4.806
78.00	16.41	5003.78	1.852	0.964	1-S2n	1.133	1.292	1.143	1.317	6.629	5.081
97.50	21.02	5004.09	2.158	1.255	1-S2n	1.299	1.473	1.310	1.457	7.083	5.322
117.00	25.83	5004.38	2.449	1.562	1-S2n	1.462	1.636	1.473	1.584	7.476	5.535
136.50	30.77	5004.67	2.736	1.896	1-S2n	1.624	1.792	1.635	1.701	7.812	5.726
156.00	35.79	5004.96	3.032	2.258	5-S2n	1.788	1.941	1.796	1.810	8.110	5.898
175.50	40.81	5005.27	3.344	2.641	5-S2n	1.954	2.078	1.958	1.911	8.344	6.056
195.00	45.85	5005.62	3.685	3.045	5-S2n	2.129	2.203	2.129	2.008	8.552	6.201

****

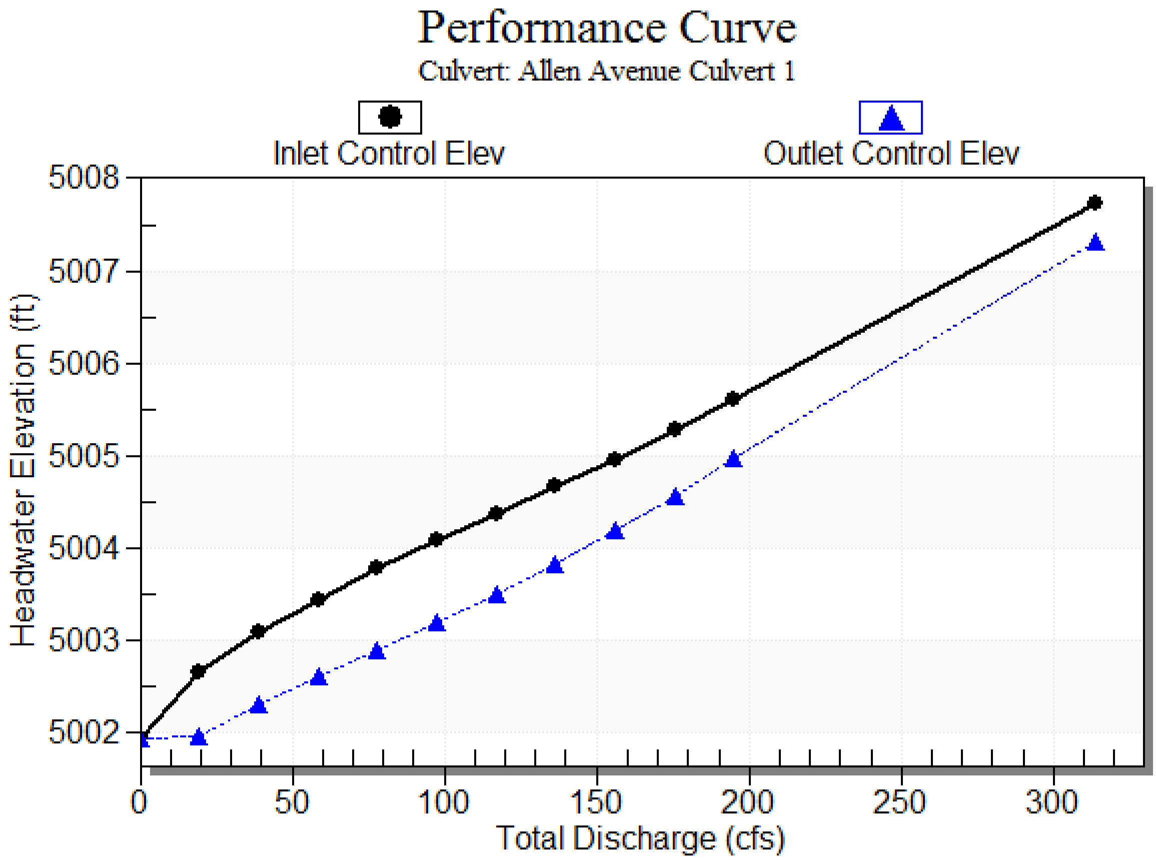
Straight Culvert

Inlet Elevation (invert): 5001.93 ft,   Outlet Elevation (invert): 5001.43 ft

Culvert Length: 76.94 ft,   Culvert Slope: 0.0065

****

Culvert Performance Curve Plot: Allen Avenue Culvert 1



Water Surface Profile Plot for Culvert: Allen Avenue Culvert 1

Site Data - Allen Avenue Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 5001.93 ft

Outlet Station: 76.94 ft

Outlet Elevation: 5001.43 ft

Number of Barrels: 1

Culvert Data Summary - Allen Avenue Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 3 - Culvert Summary Table: Allen Avenue Culvert 2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	5001.47	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
19.50	3.38	5002.65	0.776	0.0*	1-S2n	0.398	0.568	0.424	0.713	5.379	4.421
39.00	8.00	5003.08	1.210	0.0*	1-S2n	0.630	0.886	0.648	0.967	7.044	4.506
58.50	12.83	5003.44	1.573	0.140	1-S2n	0.812	1.135	0.831	1.157	8.045	4.806
78.00	17.44	5003.78	1.912	0.429	1-S2n	0.945	1.335	0.981	1.317	8.651	5.081
97.50	22.18	5004.09	2.218	0.728	1-S2n	1.080	1.514	1.122	1.457	9.208	5.322
117.00	27.05	5004.38	2.509	1.045	1-S2n	1.199	1.678	1.261	1.584	9.586	5.535
136.50	32.00	5004.67	2.796	1.386	1-S2n	1.318	1.832	1.383	1.701	10.049	5.726
156.00	36.97	5004.96	3.092	1.745	5-S2n	1.432	1.973	1.512	1.810	10.358	5.898
175.50	41.90	5005.27	3.404	2.127	5-S2n	1.542	2.106	1.631	1.911	10.674	6.056
195.00	46.85	5005.62	3.745	2.528	5-S2n	1.651	2.227	1.746	2.008	10.982	6.201

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

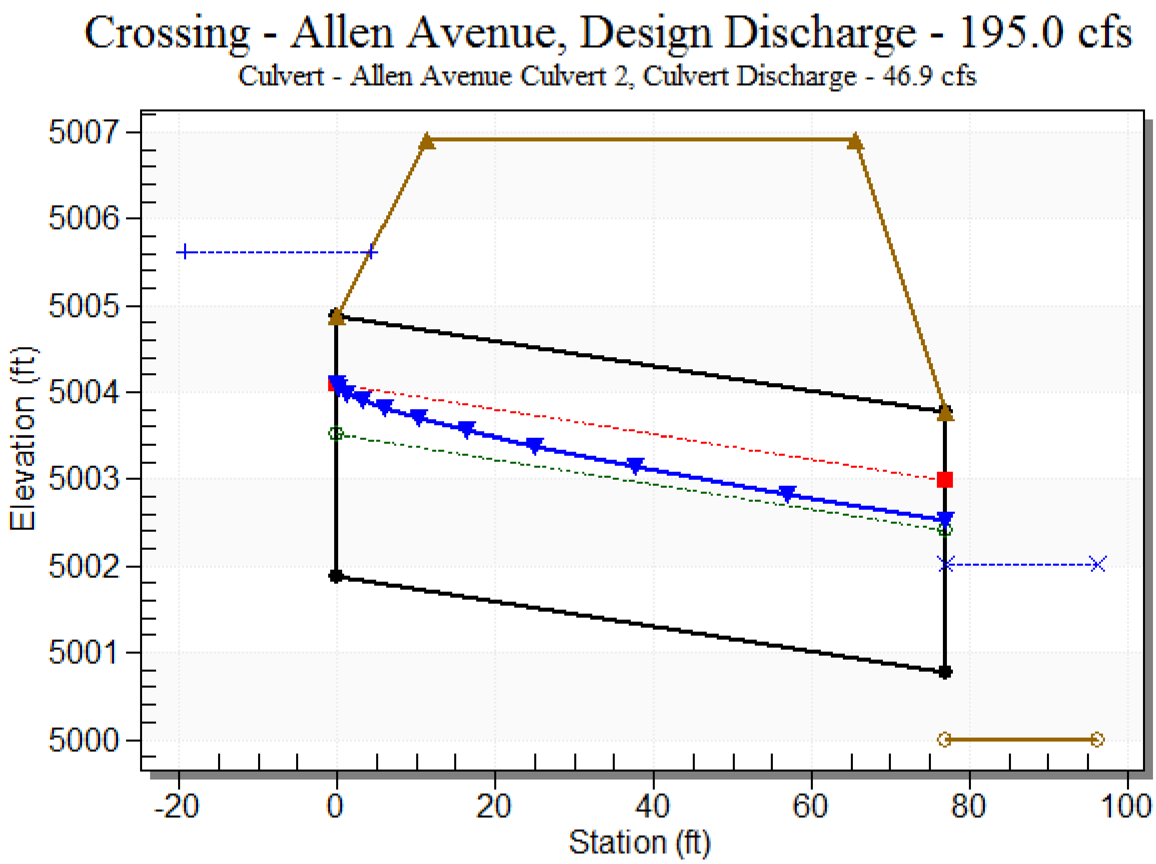
Inlet Elevation (invert): 5001.87 ft,   Outlet Elevation (invert): 5000.77 ft

Culvert Length: 76.95 ft,   Culvert Slope: 0.0143

****

Culvert Performance Curve Plot: Allen Avenue Culvert 2

Water Surface Profile Plot for Culvert: Allen Avenue Culvert 2



Site Data - Allen Avenue Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 5001.87 ft

Outlet Station: 76.94 ft

Outlet Elevation: 5000.77 ft

Number of Barrels: 1

Culvert Data Summary - Allen Avenue Culvert 2

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 4 - Culvert Summary Table: Allen Avenue Culvert 3

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	5001.47	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
19.50	6.07	5002.65	1.057	1.176	2-M2c	0.951	0.771	0.771	0.713	4.228	4.421
39.00	10.96	5003.08	1.448	1.611	2-M2c	1.316	1.047	1.047	0.967	4.993	4.506
58.50	15.87	5003.44	1.821	1.973	2-M2c	1.636	1.269	1.269	1.157	5.579	4.806
78.00	20.96	5003.78	2.161	2.311	2-M2c	1.964	1.471	1.471	1.317	6.081	5.081
97.50	25.90	5004.09	2.460	2.618	2-M2c	2.328	1.638	1.638	1.457	6.560	5.322
117.00	30.76	5004.38	2.743	2.909	2-M2c	3.000	1.792	1.792	1.584	6.983	5.535
136.50	35.61	5004.67	3.029	3.196	7-M2c	3.000	1.936	1.936	1.701	7.384	5.726
156.00	40.55	5004.96	3.335	3.492	7-M2c	3.000	2.071	2.071	1.810	7.789	5.898
175.50	45.57	5005.27	3.673	3.805	7-M2c	3.000	2.196	2.196	1.911	8.217	6.056
195.00	50.60	5005.62	4.045	4.146	7-M2c	3.000	2.312	2.312	2.008	8.657	6.201

****

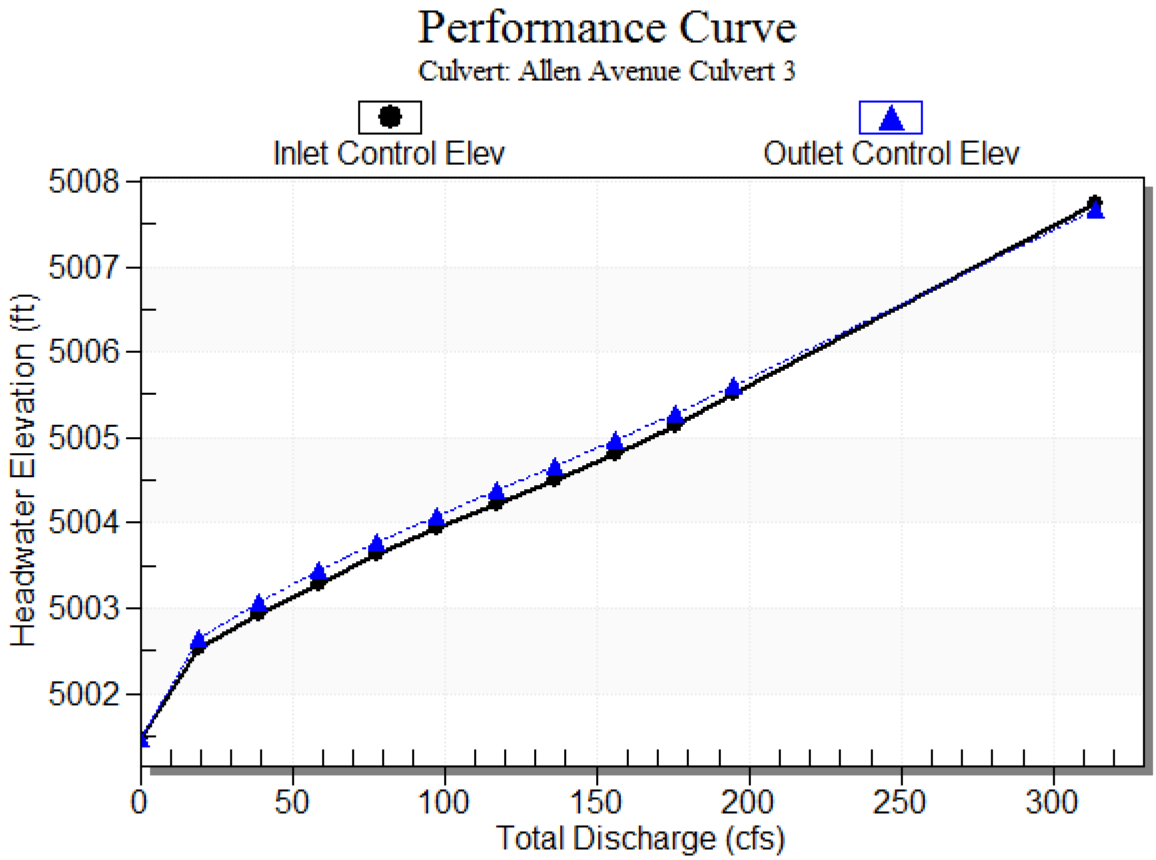
Straight Culvert

Inlet Elevation (invert): 5001.47 ft,   Outlet Elevation (invert): 5001.34 ft

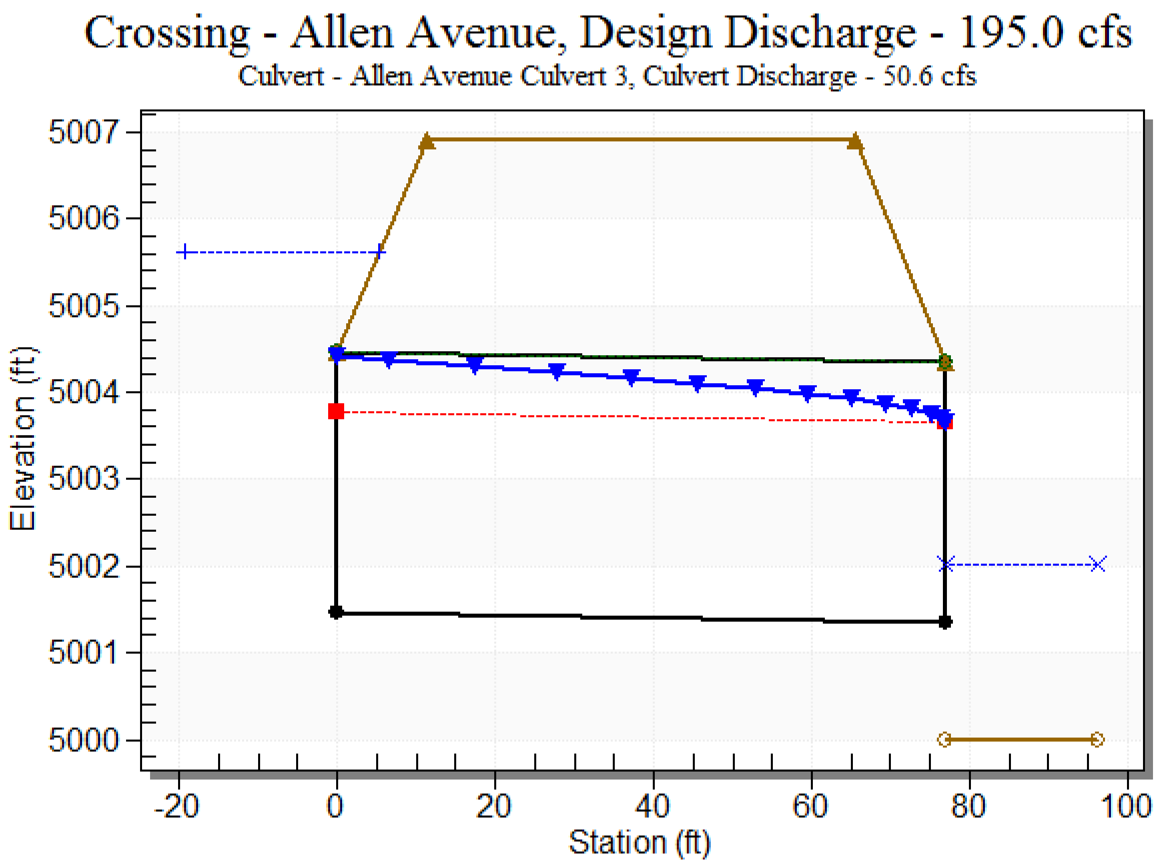
Culvert Length: 76.94 ft,   Culvert Slope: 0.0017

****

Culvert Performance Curve Plot: Allen Avenue Culvert 3



Water Surface Profile Plot for Culvert: Allen Avenue Culvert 3



Site Data - Allen Avenue Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 5001.47 ft

Outlet Station: 76.94 ft

Outlet Elevation: 5001.34 ft

Number of Barrels: 1

Culvert Data Summary - Allen Avenue Culvert 3

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 5 - Culvert Summary Table: Allen Avenue Culvert 4

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	5001.47	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
19.50	7.11	5002.65	1.136	0.0*	1-S2n	0.559	0.837	0.568	0.713	7.708	4.421
39.00	12.89	5003.08	1.570	0.0*	1-S2n	0.746	1.137	0.775	0.967	8.873	4.506
58.50	17.87	5003.44	1.933	0.066	1-S2n	0.885	1.353	0.932	1.157	9.508	4.806
78.00	23.18	5003.78	2.272	0.402	1-S2n	1.015	1.549	1.076	1.317	10.169	5.081
97.50	28.37	5004.09	2.578	0.744	1-S2n	1.134	1.720	1.206	1.457	10.657	5.322
117.00	33.36	5004.38	2.868	1.092	1-S2n	1.238	1.872	1.321	1.584	11.115	5.535
136.50	38.14	5004.67	3.156	1.443	5-S2n	1.337	2.004	1.435	1.701	11.422	5.726
156.00	42.73	5004.96	3.451	1.802	5-S2n	1.426	2.127	1.534	1.810	11.749	5.898
175.50	47.22	5005.27	3.764	2.168	5-S2n	1.512	2.235	1.631	1.911	12.024	6.056
195.00	51.71	5005.62	4.106	2.884	5-S2n	1.598	2.336	1.727	2.008	12.286	6.201

* Full Flow Headwater elevation is below inlet invert.

****

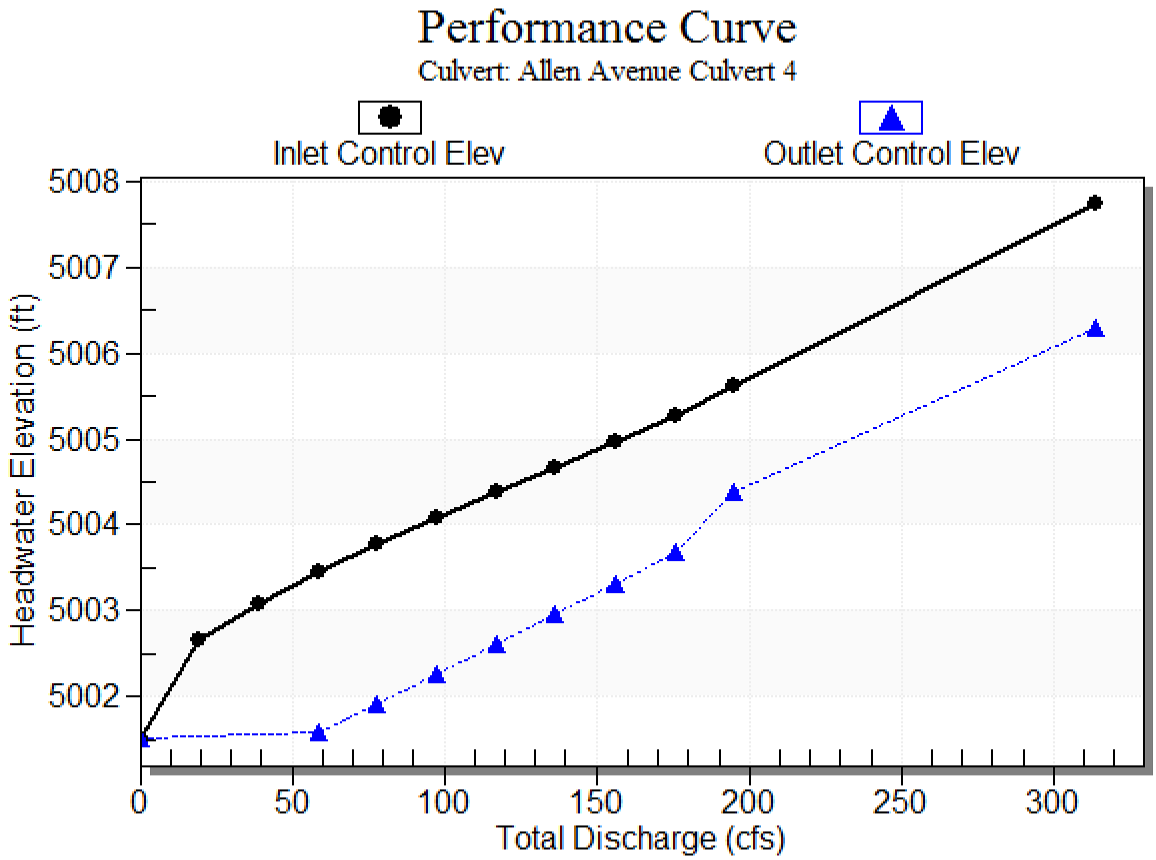
Straight Culvert

Inlet Elevation (invert): 5001.51 ft,   Outlet Elevation (invert): 5000.02 ft

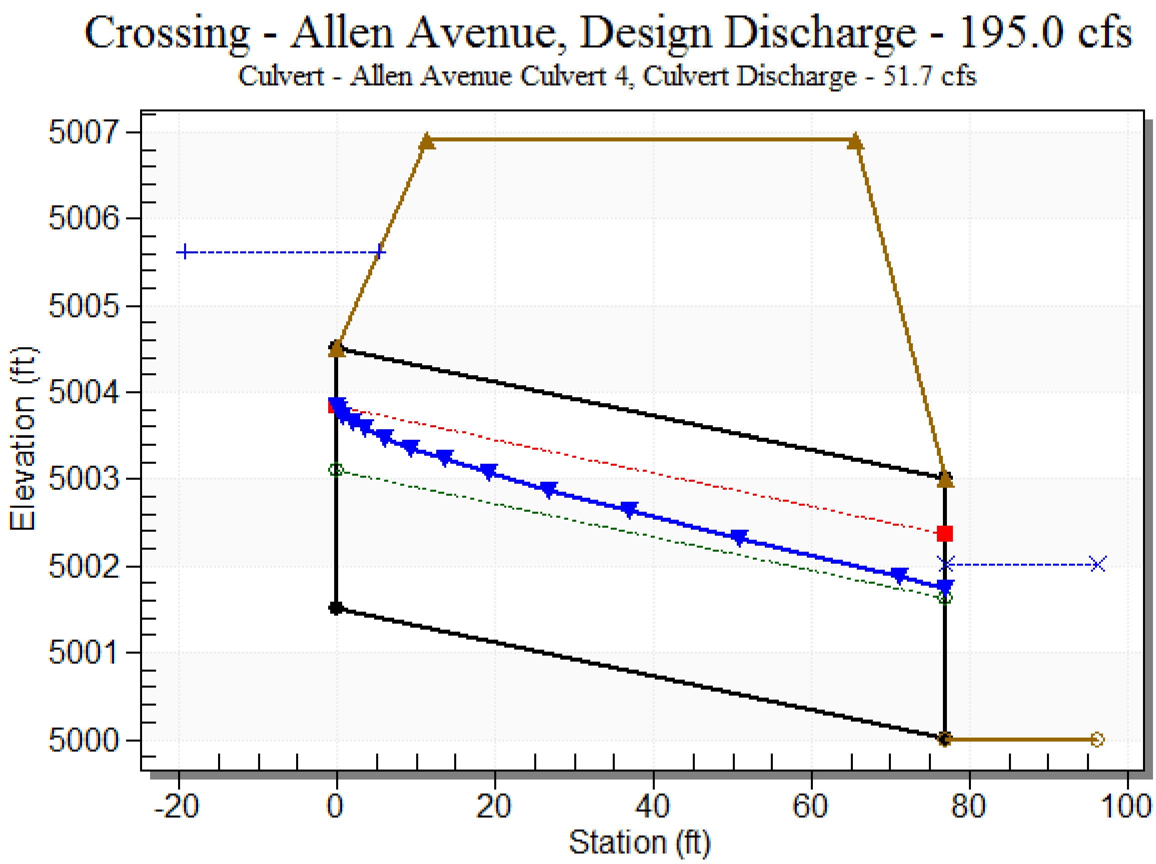
Culvert Length: 76.95 ft,   Culvert Slope: 0.0194

****

Culvert Performance Curve Plot: Allen Avenue Culvert 4



Water Surface Profile Plot for Culvert: Allen Avenue Culvert 4



Site Data - Allen Avenue Culvert 4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 5001.51 ft

Outlet Station: 76.94 ft

Outlet Elevation: 5000.02 ft

Number of Barrels: 1

Culvert Data Summary - Allen Avenue Culvert 4

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 6 - Downstream Channel Rating Curve (Crossing: Allen Avenue)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	5000.00	0.00	0.00	0.00	0.00
19.50	5000.71	0.71	4.42	0.38	1.47
39.00	5000.97	0.97	4.51	0.51	1.14
58.50	5001.16	1.16	4.81	0.61	1.07
78.00	5001.32	1.32	5.08	0.70	1.04
97.50	5001.46	1.46	5.32	0.77	1.02
117.00	5001.58	1.58	5.54	0.84	1.01
136.50	5001.70	1.70	5.73	0.90	1.00
156.00	5001.81	1.81	5.90	0.96	1.00
175.50	5001.91	1.91	6.06	1.01	1.00
195.00	5002.01	2.01	6.20	1.06	0.99

Tailwater Channel Data - Allen Avenue

Tailwater Channel Option: Irregular Channel

Roadway Data for Crossing: Allen Avenue

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Roadway Surface: Paved

Roadway Top Width: 54.00 ft

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 13.1 cfs

Maximum Flow: 15 cfs

Table 1 - Summary of Culvert Flows at Crossing: Farmers Place

Headwater Elevation (ft)	Total Discharge (cfs)	Farmers Place Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5023.00	0.00	0.00	0.00	1
5023.62	1.50	1.50	0.00	1
5023.92	3.00	3.00	0.00	1
5024.16	4.50	4.50	0.00	1
5024.37	6.00	5.97	0.01	16
5024.51	7.50	6.90	0.57	10
5024.59	9.00	7.44	1.53	7
5024.65	10.50	7.82	2.65	6
5024.70	12.00	8.13	3.85	5
5024.73	13.10	8.32	4.75	4
5024.78	15.00	8.60	6.36	4
5024.34	5.74	5.74	0.00	Overtopping

Rating Curve Plot for Crossing: Farmers Place

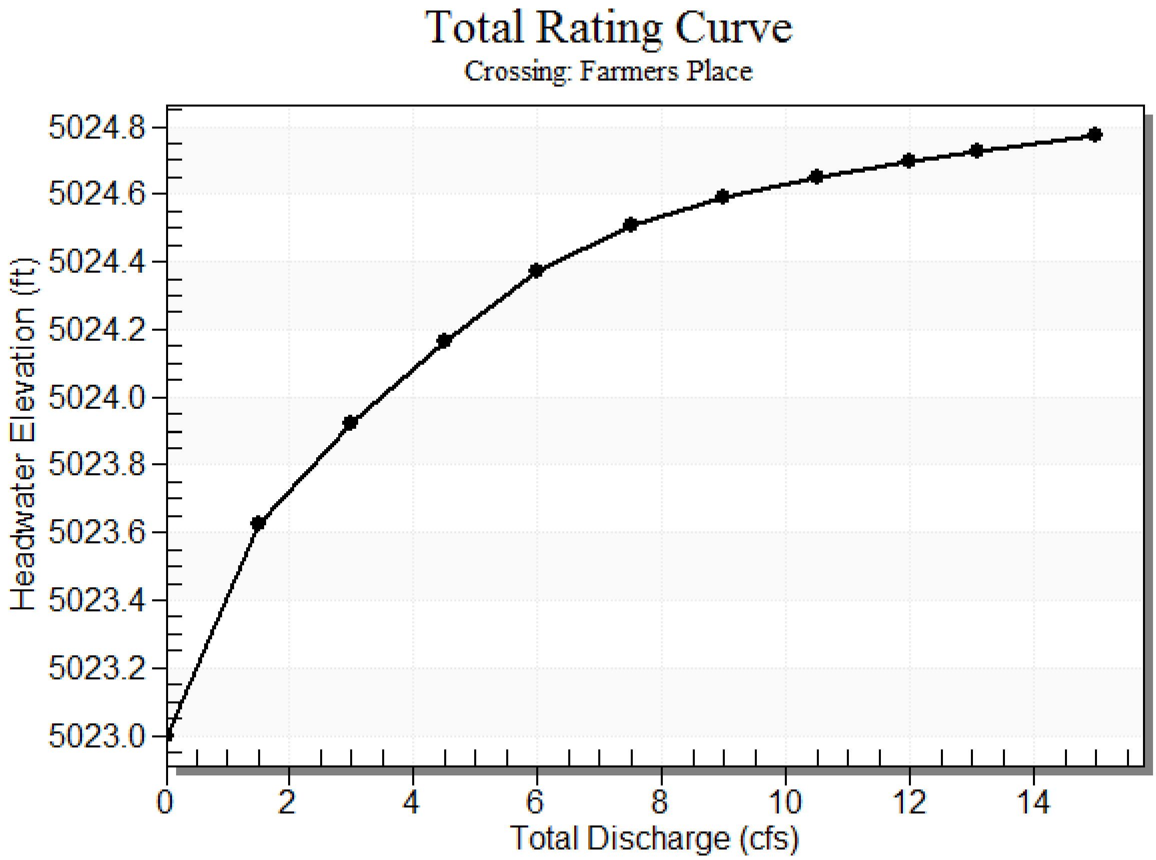


Table 2 - Culvert Summary Table: Farmers Place Culvert

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	5023.00	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
1.50	1.50	5023.62	0.623	0.0*	1-S2n	0.338	0.454	0.338	0.353	4.969	1.893
3.00	3.00	5023.92	0.919	0.0*	1-S2n	0.487	0.658	0.492	0.486	5.924	2.342
4.50	4.50	5024.16	1.162	0.053	1-S2n	0.608	0.812	0.614	0.595	6.598	2.617
6.00	5.97	5024.37	1.372	0.363	1-S2n	0.714	0.939	0.722	0.691	7.092	2.811
7.50	6.90	5024.51	1.507	0.582	5-S2n	0.778	1.014	0.787	0.778	7.345	2.959
9.00	7.44	5024.59	1.588	0.712	5-S2n	0.815	1.053	0.825	0.858	7.469	3.077
10.50	7.82	5024.65	1.648	0.809	5-S2n	0.841	1.080	0.851	0.934	7.554	3.174
12.00	8.13	5024.70	1.697	0.887	5-S2n	0.861	1.100	0.872	1.005	7.628	3.254
13.10	8.32	5024.73	1.728	0.937	5-S2n	0.874	1.113	0.885	1.056	7.669	3.302
15.00	8.60	5024.78	1.777	1.020	5-S2n	0.893	1.131	0.904	1.139	7.729	3.371

* Full Flow Headwater elevation is below inlet invert.

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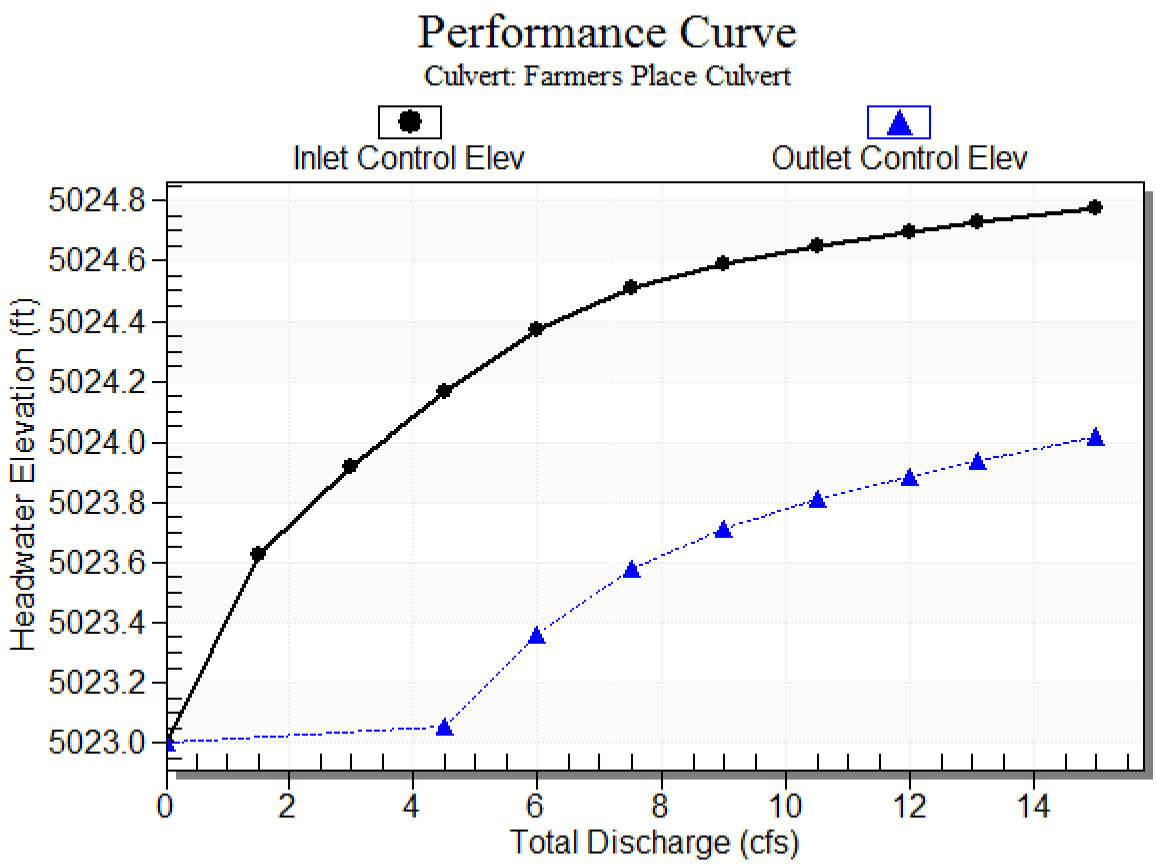
Straight Culvert

Inlet Elevation (invert): 5023.00 ft,   Outlet Elevation (invert): 5022.00 ft

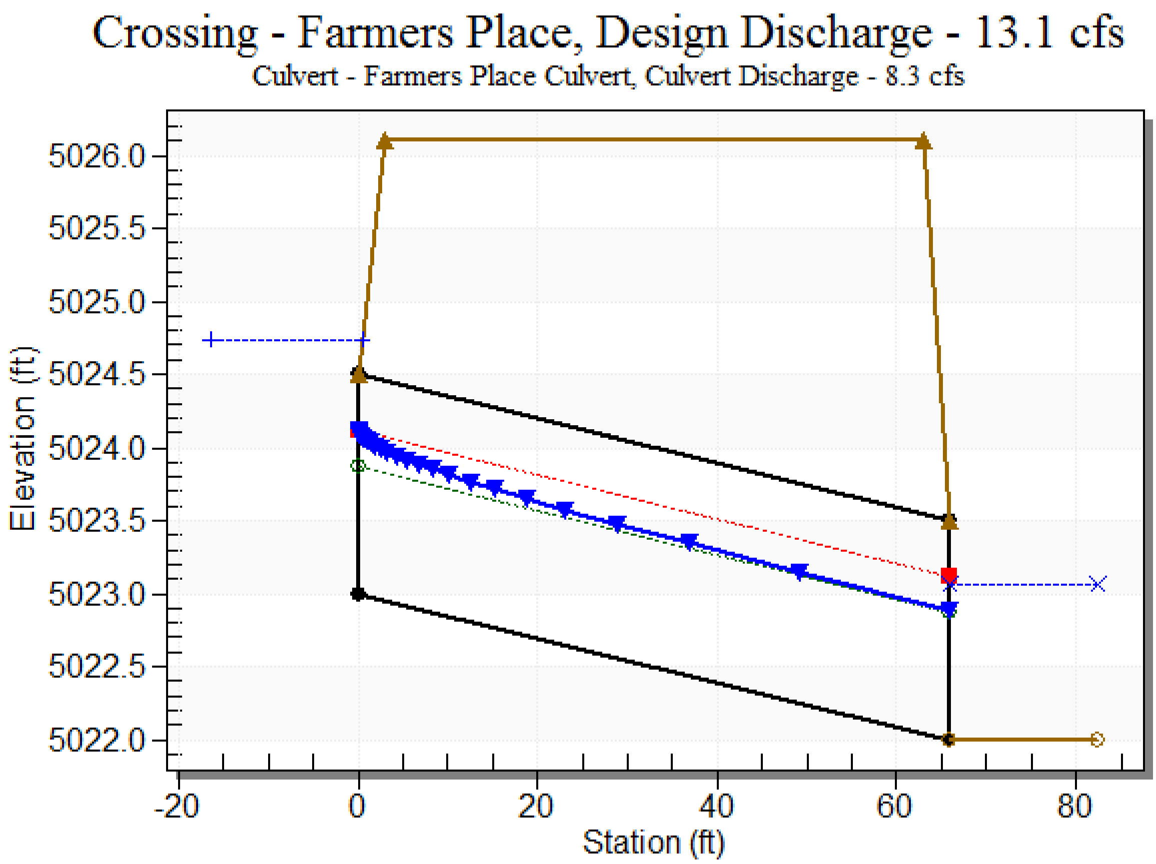
Culvert Length: 66.01 ft,   Culvert Slope: 0.0152

****

Culvert Performance Curve Plot: Farmers Place Culvert



Water Surface Profile Plot for Culvert: Farmers Place Culvert



Site Data - Farmers Place Culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 5023.00 ft

Outlet Station: 66.00 ft

Outlet Elevation: 5022.00 ft

Number of Barrels: 1

Culvert Data Summary - Farmers Place Culvert

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: Farmers Place)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	5022.00	0.00	0.00	0.00	0.00
1.50	5022.35	0.35	1.89	0.04	0.70
3.00	5022.49	0.49	2.34	0.06	0.72
4.50	5022.60	0.60	2.62	0.07	0.72
6.00	5022.69	0.69	2.81	0.09	0.72
7.50	5022.78	0.78	2.96	0.10	0.71
9.00	5022.86	0.86	3.08	0.11	0.71
10.50	5022.93	0.93	3.17	0.12	0.70
12.00	5023.01	1.01	3.25	0.13	0.70
13.10	5023.06	1.06	3.30	0.13	0.69
15.00	5023.14	1.14	3.37	0.14	0.69

Tailwater Channel Data - Farmers Place

Tailwater Channel Option: Irregular Channel

Roadway Data for Crossing: Farmers Place

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Roadway Surface: Paved

Roadway Top Width: 60.00 ft

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 230 cfs

Maximum Flow: 230 cfs

Table 1 - Summary of Culvert Flows at Crossing: Lomabrdi Street Irrigation Canal

Headwater Elevation (ft)	Total Discharge (cfs)	Lomabrdi Street Irrigation Single Box Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5017.00	0.00	0.00	0.00	1
5017.61	23.00	23.00	0.00	1
5017.96	46.00	46.00	0.00	1
5018.26	69.00	69.00	0.00	1
5018.53	92.00	92.00	0.00	1
5018.77	115.00	115.00	0.00	1
5019.00	138.00	138.00	0.00	1
5019.23	161.00	161.00	0.00	1
5019.44	184.00	184.00	0.00	1
5019.64	207.00	207.00	0.00	1
5019.84	230.00	230.00	0.00	1
5024.00	682.90	682.90	0.00	Overtopping

Rating Curve Plot for Crossing: Lomabrdi Street Irrigation Canal

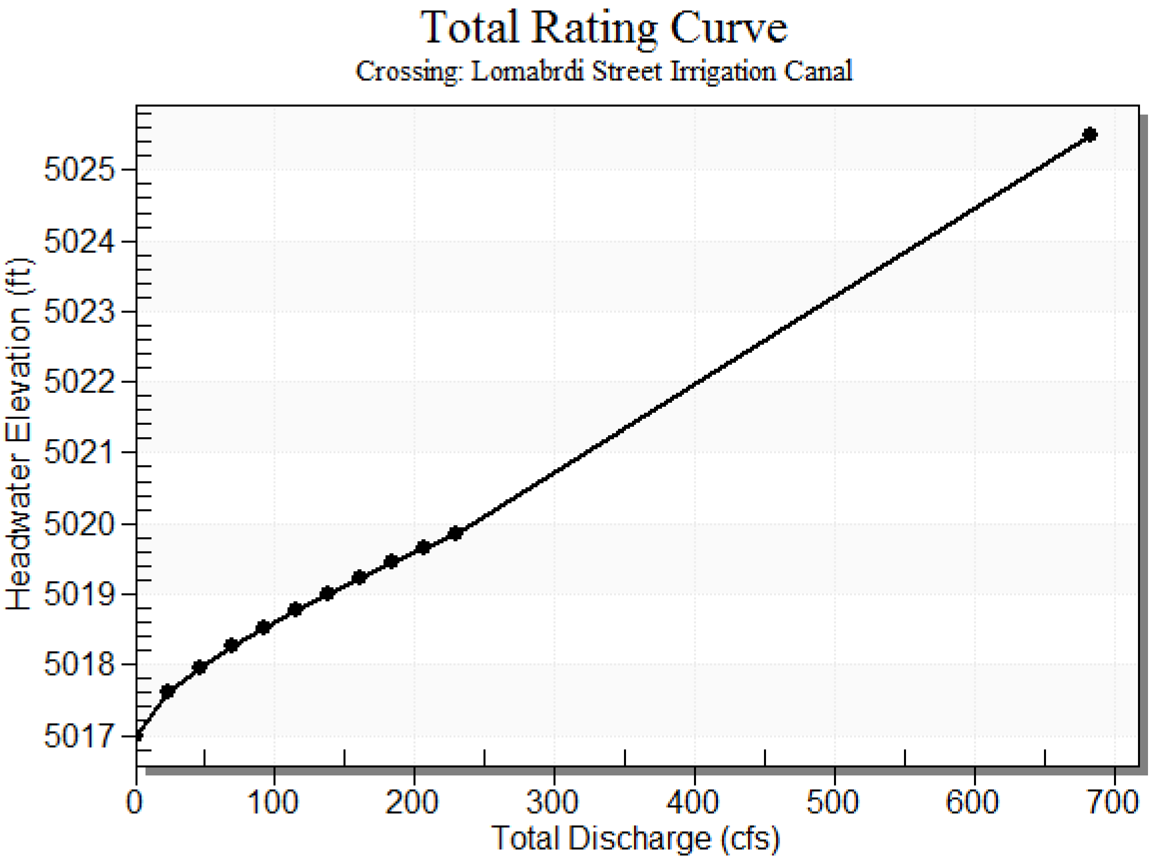


Table 2 - Culvert Summary Table: Lomabrdi Street Irrigation Single Box Culvert

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	5017.00	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
23.00	23.00	5017.61	0.606	0.0*	1-S2n	0.197	0.400	0.197	0.348	7.313	2.302
46.00	46.00	5017.96	0.961	0.0*	1-S2n	0.378	0.636	0.392	0.527	7.341	3.006
69.00	69.00	5018.26	1.260	0.0*	1-S2n	0.472	0.833	0.514	0.671	8.397	3.506
92.00	92.00	5018.53	1.526	0.059	1-S2n	0.566	1.009	0.628	0.796	9.163	3.906
115.00	115.00	5018.77	1.771	0.249	1-S2n	0.660	1.171	0.739	0.909	9.725	4.243
138.00	138.00	5019.00	2.000	0.434	1-S2n	0.748	1.322	0.843	1.013	10.235	4.538
161.00	161.00	5019.23	2.227	0.618	1-S2n	0.817	1.465	0.943	1.110	10.672	4.801
184.00	184.00	5019.44	2.440	0.801	1-S2n	0.887	1.601	1.039	1.201	11.065	5.040
207.00	207.00	5019.64	2.644	0.985	1-S2n	0.957	1.732	1.132	1.287	11.430	5.259
230.00	230.00	5019.84	2.839	1.171	1-S2n	1.027	1.858	1.226	1.370	11.722	5.461

* Full Flow Headwater elevation is below inlet invert.

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Straight Culvert

Inlet Elevation (invert): 5017.00 ft,   Outlet Elevation (invert): 5016.00 ft

Culvert Length: 60.01 ft,   Culvert Slope: 0.0167

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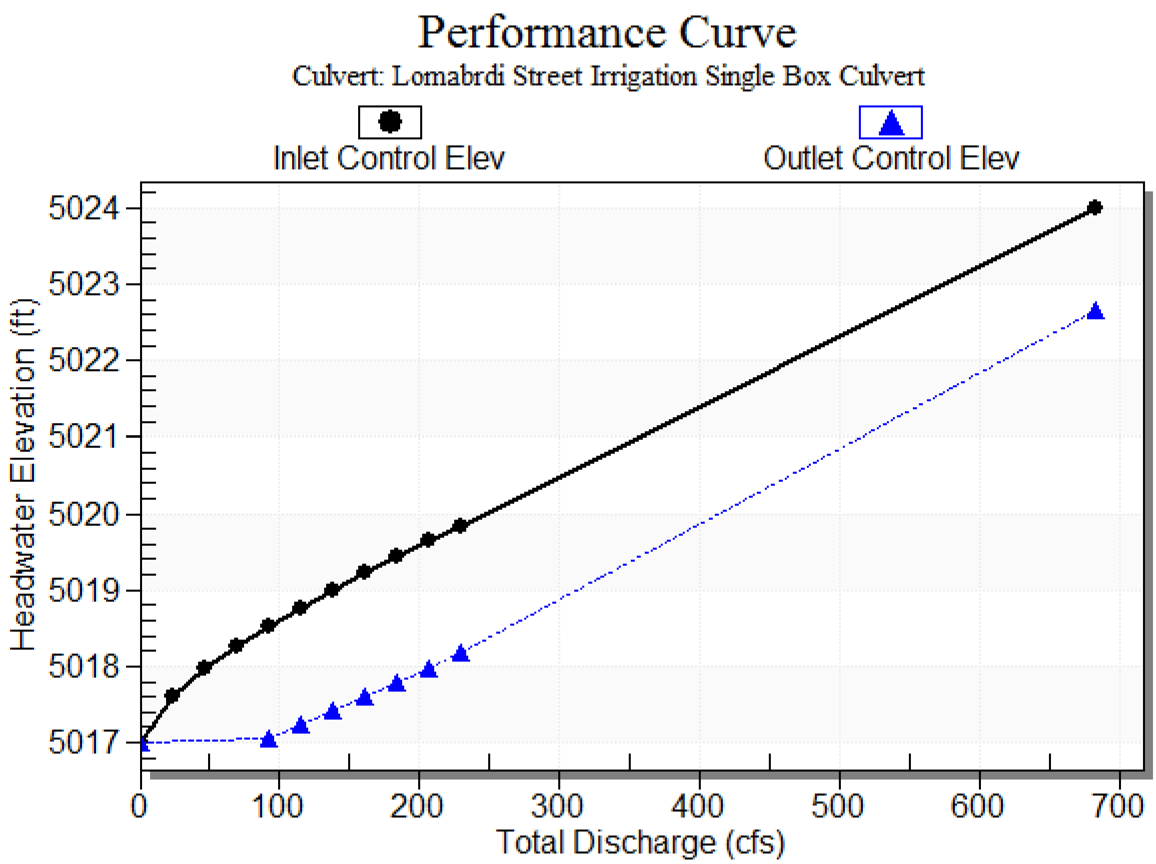
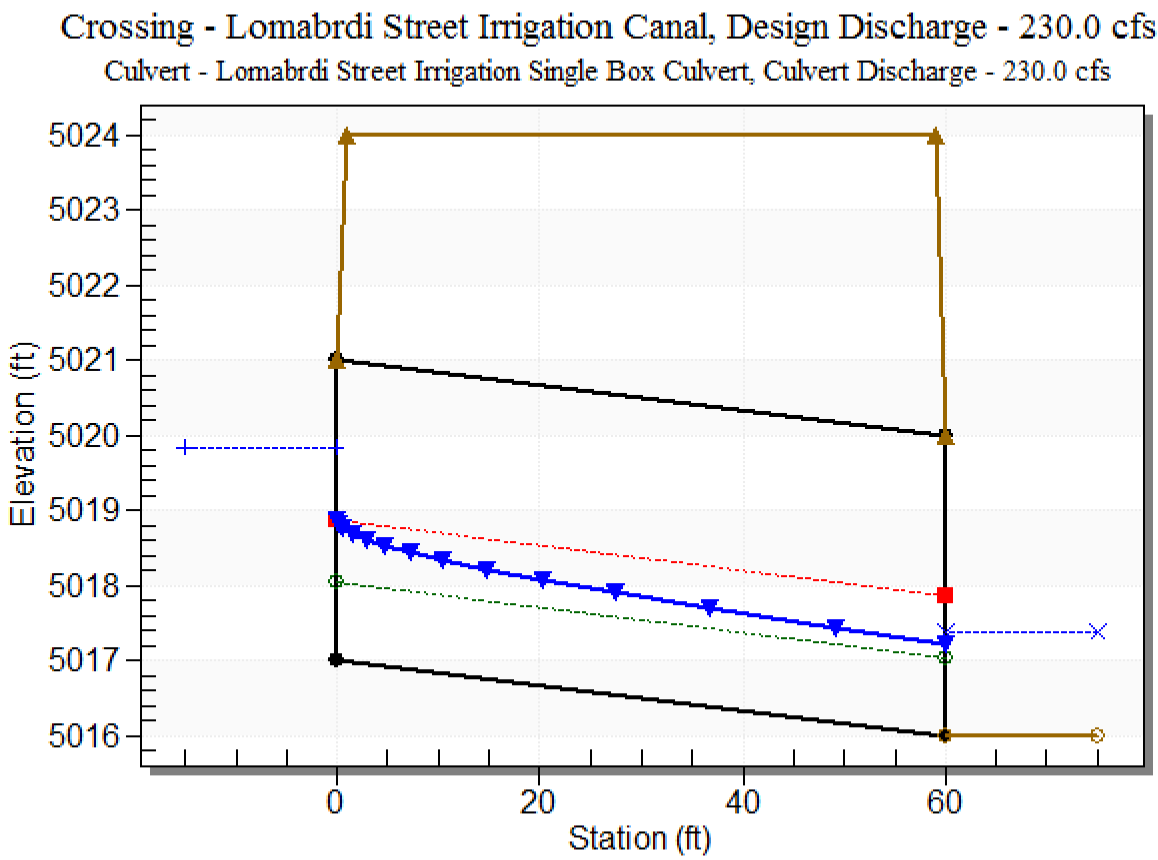
Culvert Performance Curve Plot: Lomabrdi Street Irrigation Single Box Culvert



Water Surface Profile Plot for Culvert: Lomabrdi Street Irrigation Single Box Culvert



Site Data - Lomabrdi Street Irrigation Single Box Culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 5017.00 ft

Outlet Station: 60.00 ft

Outlet Elevation: 5016.00 ft

Number of Barrels: 1

Culvert Data Summary - Lomabrdi Street Irrigation Single Box Culvert

Barrel Shape: Concrete Box

Barrel Span: 16.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: Lomabrdi Street Irrigation

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	5016.00	0.00	0.00	0.00	0.00
23.00	5016.35	0.35	2.30	1.09	0.70
46.00	5016.53	0.53	3.01	1.64	0.74
69.00	5016.67	0.67	3.51	2.09	0.77
92.00	5016.80	0.80	3.91	2.48	0.79
115.00	5016.91	0.91	4.24	2.84	0.81
138.00	5017.01	1.01	4.54	3.16	0.82
161.00	5017.11	1.11	4.80	3.46	0.83
184.00	5017.20	1.20	5.04	3.75	0.84
207.00	5017.29	1.29	5.26	4.02	0.85
230.00	5017.37	1.37	5.46	4.27	0.86

Tailwater Channel Data - Lomabrdi Street Irrigation Canal

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 28.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0500

Channel Manning's n: 0.0700

Channel Invert Elevation: 5016.00 ft

Roadway Data for Crossing: Lomabrdi Street Irrigation Canal

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 5024.00 ft

Roadway Surface: Paved

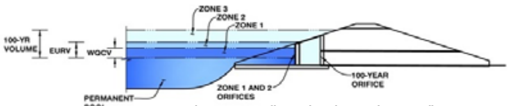
Roadway Top Width: 58.00 ft

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: 18144 Schmidt Property

Basin ID: EDB 1



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	**EDB**			
Watershed Area =	118.50	acres		
Watershed Length =	2,500	ft		
Watershed Slope =	0.008	ft/ft		
Watershed Imperviousness =	19.00%	percent		
Percentage Hydrologic Soil Group A =	0.0%	percent		
Percentage Hydrologic Soil Group B =	60.0%	percent		
Percentage Hydrologic Soil Groups C/D =	40.0%	percent		
Desired WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	Erie			
Water Quality Capture Volume (WQCV) =	1.101	acre-feet	Optional User Override 1-hr Precipitation	
Excess Urban Runoff Volume (EURV) =	2.125	acre-feet		
2-yr Runoff Volume (P1 = 1.01 in.) =	1.430	acre-feet	1.01	inches
5-yr Runoff Volume (P1 = 1.43 in.) =	2.638	acre-feet	1.43	inches
10-yr Runoff Volume (P1 = 1.73 in.) =	4.629	acre-feet	1.73	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	8.250	acre-feet	1.84	inches
50-yr Runoff Volume (P1 = 2.4 in.) =	12.572	acre-feet	2.40	inches
100-yr Runoff Volume (P1 = 2.7 in.) =	16.536	acre-feet	2.70	inches
500-yr Runoff Volume (P1 = 3.89 in.) =	27.870	acre-feet		inches
Approximate 2-yr Detention Volume =	1.335	acre-feet		
Approximate 5-yr Detention Volume =	2.486	acre-feet		
Approximate 10-yr Detention Volume =	3.698	acre-feet		
Approximate 25-yr Detention Volume =	4.181	acre-feet		
Approximate 50-yr Detention Volume =	5.103	acre-feet		
Approximate 100-yr Detention Volume =	6.454	acre-feet		

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	1.101	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.024	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	4.329	acre-feet
Total Detention Basin Volume =	6.454	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 = 1 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		
	--	1.00	--	--	--	17,890	0.411	8,766	0.201
	--	2.00	--	--	--	20,085	0.461	27,731	0.637
	--	3.00	--	--	--	22,441	0.515	49,195	1.129
	--	4.00	--	--	--	25,141	0.577	72,986	1.676
	--	5.00	--	--	--	28,045	0.644	99,579	2.286
	--	6.00	--	--	--	31,014	0.712	129,108	2.964
	--	7.00	--	--	--	34,252	0.786	161,741	3.713
	--	8.00	--	--	--	38,094	0.875	197,914	4.543
	--	9.00	--	--	--	43,263	0.993	238,593	5.477
	--	10.00	--	--	--	52,445	1.204	286,447	6.576
	--	11.00	--	--	--	65,128	1.495	345,233	7.925
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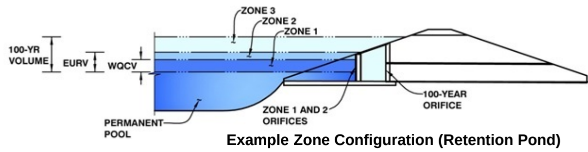
Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: 18144 Schmidt Property

Basin ID: EDB 1



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.95	1.101	Orifice Plate
Zone 2 (EURV)	4.75	1.024	Orifice Plate
Zone 3 (100-year)	9.90	4.329	Weir&Pipe (Restrict)
		6.454	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 =	4.75	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	19.00	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	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	1.58	3.17					
Orifice Area (sq. inches)	7.00	7.00	7.00					

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

Calculated Parameters for Vertical Orifice

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

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.51	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	6.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.01	N/A	feet
Over Flow Weir Slope Length =	6.18	N/A	feet
Grate Open Area / 100-yr Orifice Area =	1.32	N/A	should be $\geq$ 4
Overflow Grate Open Area w/o Debris =	25.98	N/A	ft^2
Overflow Grate Open Area w/ Debris =	12.99	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	60.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	60.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	19.63	N/A	ft^2
Outlet Orifice Centroid =	2.50	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	11.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	88.00	feet
Spillway End Slopes =	0.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.99	feet
Stage at Top of Freeboard =	12.99	feet
Basin Area at Top of Freeboard =	1.50	acres

Routed Hydrograph Results

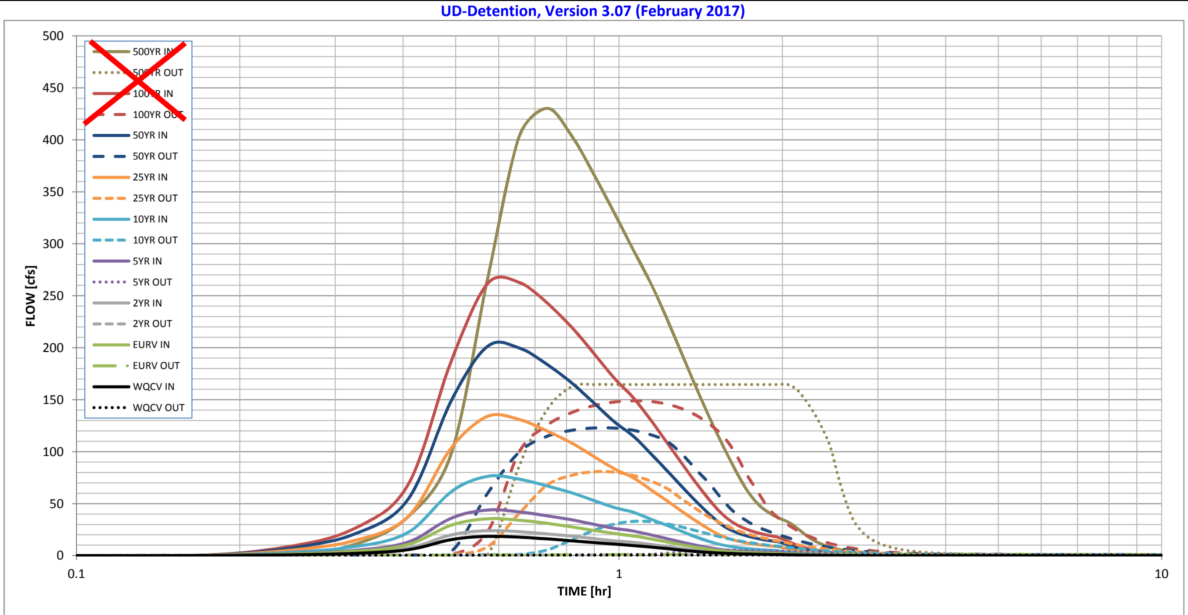
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.01	1.43	1.73	1.84	2.40	2.70	3.89
Calculated Runoff Volume (acre-ft) =	1.101	2.125	1.430	2.638	4.629	8.250	12.572	16.536	27.870
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.101	2.127	1.431	2.640	4.633	8.256	12.583	16.546	27.889
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.06	0.27	0.70	1.10	1.46	2.47
Predevelopment Peak Q (cfs) =	0.0	0.0	1.4	7.5	32.3	82.9	130.3	173.2	293.2
Peak Inflow Q (cfs) =	18.5	35.5	24.0	43.9	76.3	134.0	201.4	262.8	430.3
Peak Outflow Q (cfs) =	0.6	1.2	0.8	5.4	33.0	80.7	122.8	149.0	164.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	1.0	1.0	0.9	0.9	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	1.2	3.0	4.7	5.7	6.3
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) =	38	48	42	49	45	40	34	30	31
Time to Drain 99% of Inflow Volume (hours) =	40	52	45	53	51	49	47	44	39
Maximum Ponding Depth (ft) =	2.77	4.50	3.37	4.99	5.98	7.05	8.45	9.96	11.00
Area at Maximum Ponding Depth (acres) =	0.50	0.61	0.54	0.64	0.71	0.79	0.93	1.19	1.50
Maximum Volume Stored (acre-ft) =	1.012	1.972	1.319	2.273	2.943	3.745	4.949	6.516	7.925

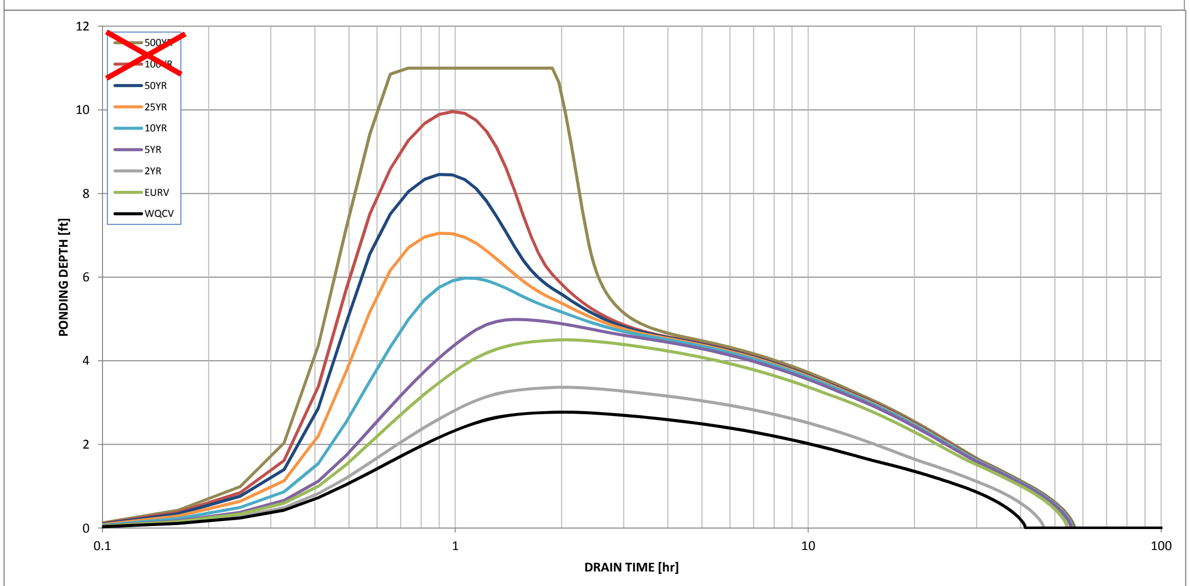
Please refer to CUHP SWMM Detention Analysis in the following pages for Major Storm.

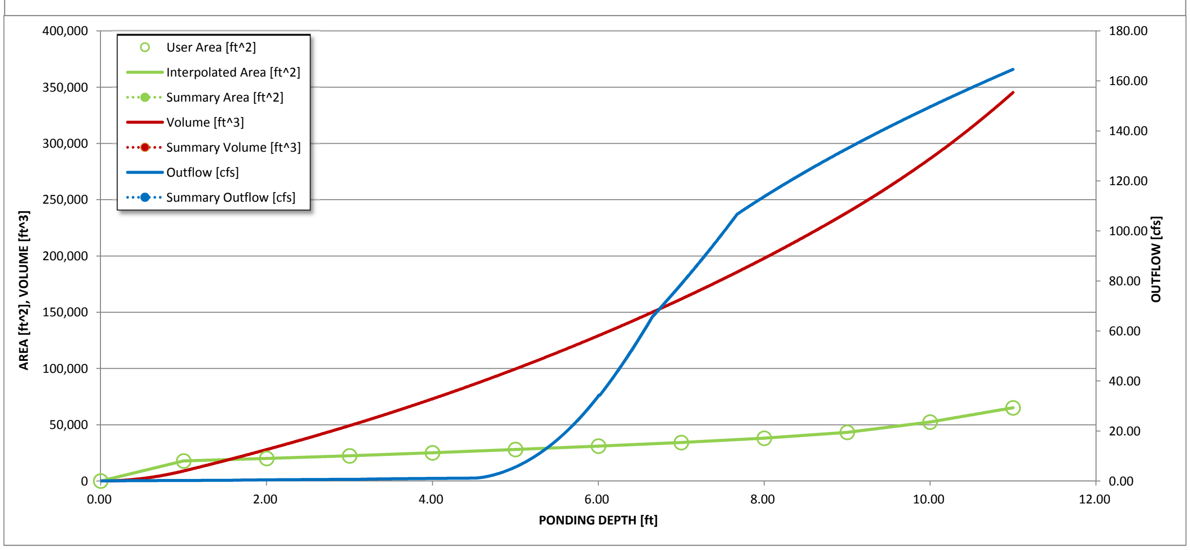
Please refer to CUHP SWMM Detention Analysis in the following pages for Major Storm.

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







Please refer to CUHP SWMM Detention Analysis in the following pages for Major Storm.

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]
4.91 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:04:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph Constant	0:09:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:14:44	0.81	1.52	1.04	1.87	3.14	5.10	7.05	8.56	11.12
1.019	0:19:38	2.19	4.16	2.83	5.13	8.75	14.77	21.29	26.76	37.63
	0:24:33	5.63	10.68	7.27	13.16	22.47	37.94	54.72	68.89	98.58
	0:29:28	15.47	29.32	19.96	36.12	61.60	103.79	149.34	187.65	267.01
	0:34:22	18.50	35.46	23.97	43.87	76.28	133.97	201.42	261.86	403.25
	0:39:17	17.69	33.96	22.93	42.06	73.52	130.89	199.72	262.84	430.35
	0:44:11	16.10	30.91	20.87	38.28	67.01	119.94	183.96	243.07	403.65
	0:49:06	14.42	27.76	18.71	34.42	60.38	108.20	166.09	219.56	365.95
	0:54:01	12.49	24.15	16.24	29.99	52.86	95.14	146.52	194.12	328.95
	0:58:55	10.86	21.00	14.11	26.11	46.17	83.27	128.38	170.17	293.28
	1:03:50	9.85	19.03	12.80	23.64	41.64	74.74	114.75	151.63	261.75
	1:08:44	8.17	15.87	10.64	19.74	34.94	63.23	97.81	129.93	226.67
	1:13:39	6.70	13.10	8.75	16.31	28.97	52.57	81.45	108.33	191.51
	1:18:34	5.21	10.28	6.83	12.84	23.00	42.10	65.67	87.75	160.36
	1:23:28	3.92	7.84	5.17	9.84	17.79	32.81	51.41	68.90	131.03
	1:28:23	2.84	5.78	3.77	7.28	13.31	24.79	39.08	52.67	105.53
	1:33:17	2.18	4.38	2.88	5.50	9.97	18.38	28.83	39.04	82.85
	1:38:12	1.79	3.56	2.35	4.46	8.00	14.62	22.76	30.56	63.44
	1:43:07	1.52	3.00	1.99	3.76	6.73	12.26	19.02	25.42	49.99
	1:48:01	1.33	2.62	1.74	3.28	5.85	10.62	16.42	21.88	41.83
	1:52:56	1.19	2.35	1.57	2.94	5.23	9.46	14.60	19.41	36.39
	1:57:50	1.10	2.16	1.44	2.69	4.79	8.64	13.30	17.65	32.54
	2:02:45	0.81	1.59	1.06	1.99	3.58	6.59	10.34	13.92	26.55
	2:07:40	0.59	1.16	0.77	1.45	2.59	4.75	7.44	10.04	19.70
	2:12:34	0.43	0.86	0.57	1.07	1.92	3.52	5.53	7.43	14.32
	2:17:29	0.32	0.63	0.42	0.79	1.43	2.62	4.10	5.51	10.63
	2:22:23	0.23	0.46	0.30	0.58	1.04	1.93	3.04	4.09	8.03
	2:27:18	0.16	0.33	0.22	0.41	0.75	1.40	2.20	2.97	6.00
	2:32:13	0.12	0.24	0.16	0.30	0.54	1.01	1.59	2.15	4.45
	2:37:07	0.08	0.16	0.11	0.21	0.38	0.72	1.14	1.55	3.32
	2:42:02	0.05	0.10	0.07	0.13	0.25	0.47	0.76	1.04	2.43
	2:46:56	0.02	0.06	0.03	0.07	0.14	0.28	0.46	0.64	1.67
	2:51:51	0.01	0.02	0.01	0.03	0.07	0.14	0.23	0.33	1.06
	2:56:46	0.00	0.00	0.00	0.01	0.02	0.04	0.08	0.12	0.59
	3:01:40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.25
	3:06:35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
	3:11:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:16:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:21:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:26:13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:31:08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:36:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:34:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:39:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:44:47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:49:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:54:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:59:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:04:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:09:20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:14:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:19:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:24:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:28:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:33:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:38:47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:43:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:48:37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:53:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Pre-Project CUHP

Summary of CUHP Input Parameters (Version 2.0.0)

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
ONSITE	J1	ERIE	0.054	0.227	0.341	0.008	2.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.81
OFFSITE	J1	ERIE	0.131	0.341	0.568	0.025	2.0	0.40	0.10	4.50	0.60	0.0018	0.00	0.04	0.02	1.75

Pre-Project CUHP

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.0)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
ONSITE		0.156	0.126	54.3	5.55	28.2	3.92	9.3	30	125,961	1.66	209,276	54.0	39	209,277	1.13
OFFSITE		0.157	0.188	43.1	6.51	22.4	4.60	10.9	91	304,194	1.49	454,514	51.0	105	454,512	1.25

Post-Project CUHP

Summary of CUHP Input Parameters (Version 2.0.0)

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
ONSITE	EDB1	ERIE	0.054	0.168	0.341	0.008	52.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.86	0.24	51.14
OFFSITE	EDB1	ERIE	0.131	0.341	0.568	0.025	2.0	0.40	0.10	4.50	0.60	0.0018	0.00	0.04	0.02	1.75

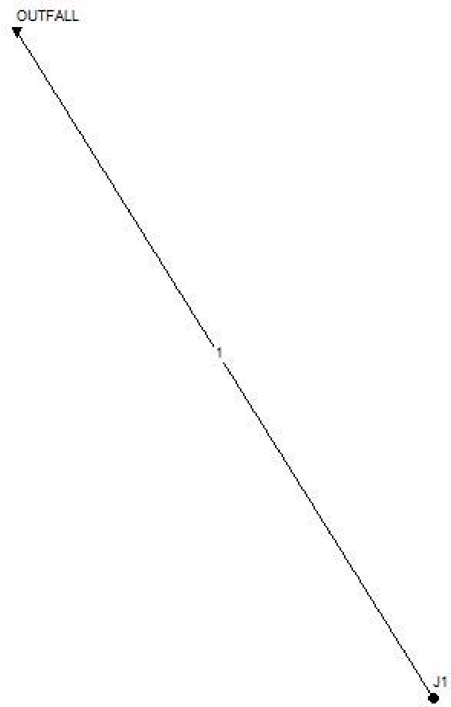
Post-Project CUHP

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.0)

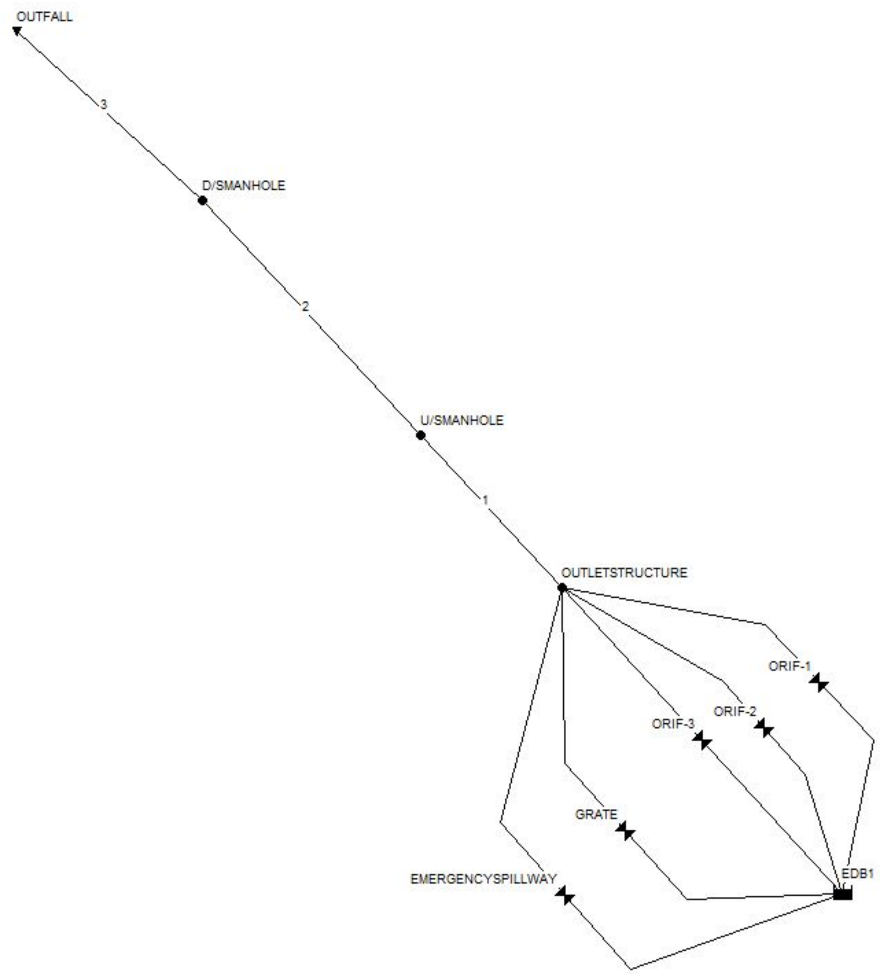
		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
ONSITE		0.088	0.148	22.4	2.85	11.6	2.01	4.7	73	125,961	2.26	285,076	39.0	89	285,050	2.55
OFFSITE		0.157	0.188	43.1	6.51	22.4	4.60	10.9	91	304,194	1.49	454,514	51.0	105	454,512	1.25

SWMM Detention Model Schematic

Pre-Project Model



Post-Project Model



```
[TITLE]
;;Project Title/Notes
18144 Meadowlark aka Schmidt
Pre-Project Routing

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2005
START_TIME           00:00:00
REPORT_START_DATE    01/01/2005
REPORT_START_TIME    00:00:00
END_DATE             01/05/2005
END_TIME             06:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         0:00:01

INERTIAL_DAMPING     FULL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              4

[FILES]
;;Interfacing Files
USE INFLOWS "W:\18144_SchmidtProperties\WaterResources\Hydraulics\DetentionBasins\CUHP_Final\18144_CUHP_PRE_MAJORSTORM.txt"

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
J1               0          0          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OUTFALL          0          FREE                        NO

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
1                J1               OUTFALL          400        0.01       0          0          0          0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
1                DUMMY        0                0          0          0          1

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
EDB1             Storage    0          0
EDB1                        1          17890
EDB1                        2          20085
EDB1                        3          22441
EDB1                        4          25141
EDB1                        5          28045
EDB1                        6          31014
EDB1                        7          34252
EDB1                        8          38094
EDB1                        9          43263
EDB1                        10         52445
EDB1                        11         65128
EDB1                        12         78000

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
```

```
[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
J1               2298.578           7744.076
OUTFALL          1976.321           8260.474

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)
--------------------------------------------------------------

18144 Meadowlark aka Schmidt
Pre-Project Routing
WARNING 04: minimum elevation drop used for Conduit 1

*************
Element Count
*************
Number of rain gages ...... 0
Number of subcatchments ... 0
Number of nodes ........... 2
Number of links ........... 1
Number of pollutants ...... 0
Number of land uses ....... 0


************
Node Summary
************
                                         Invert      Max.    Ponded    External
Name                 Type                 Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
J1                   JUNCTION              0.00      0.00       0.0
OUTFALL              OUTFALL               0.00      0.00       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
1                J1               OUTFALL          CONDUIT          400.0    0.0003    0.0100


*********************
Cross Section Summary
*********************
                                      Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape               Depth     Area     Rad.    Width  Barrels     Flow
---------------------------------------------------------------------------------------
1                DUMMY                0.00     0.00     0.00     0.00        1     0.00


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Starting Date ............ JAN-01-2005 00:00:00
Ending Date .............. JAN-05-2005 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.005000 ft


**************************        Volume         Volume
Flow Routing Continuity        acre-feet       10^6 gal
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
```

```
External Inflow ..........        15.238          4.966
External Outflow .........        15.238          4.966
Flooding Loss ............         0.000          0.000
Evaporation Loss .........         0.000          0.000
Exfiltration Loss ........         0.000          0.000
Initial Stored Volume ....         0.000          0.000
Final Stored Volume ......         0.000          0.000
Continuity Error (%) .....         0.000


***************************
Time-Step Critical Elements
***************************
None


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00


******************
Node Depth Summary
******************

---------------------------------------------------------------------------------
                               Average  Maximum  Maximum  Time of Max    Reported
                                 Depth    Depth      HGL   Occurrence   Max Depth
Node                 Type         Feet     Feet     Feet  days hr:min        Feet
---------------------------------------------------------------------------------
J1                   JUNCTION     0.00     0.00     0.00     0  00:00        0.00
OUTFALL              OUTFALL      0.00     0.00     0.00     0  00:00        0.00


*******************
Node Inflow Summary
*******************

-------------------------------------------------------------------------------------------------
                                Maximum  Maximum                  Lateral       Total        Flow
                                Lateral    Total  Time of Max      Inflow      Inflow     Balance
                                 Inflow   Inflow   Occurrence      Volume      Volume       Error
Node                 Type           CFS      CFS  days hr:min    10^6 gal    10^6 gal     Percent
-------------------------------------------------------------------------------------------------
J1                   JUNCTION    143.57   143.57     0  00:51        4.97        4.97       0.000
OUTFALL              OUTFALL       0.00   143.57     0  00:51           0        4.97       0.000


**********************
Node Surcharge Summary
**********************

Surcharging occurs when water rises above the top of the highest conduit.
---------------------------------------------------------------------
                                           Max. Height   Min. Depth
                                 Hours     Above Crown    Below Rim
Node                 Type     Surcharged          Feet         Feet
---------------------------------------------------------------------
J1                   JUNCTION     102.00         0.000        0.000


*********************
Node Flooding Summary
*********************

No nodes were flooded.


***********************
Outfall Loading Summary
***********************
```

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUTFALL	4.80	37.68	143.57	4.965
System	4.80	37.68	143.57	4.965

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
1	DUMMY	143.57	0 00:51			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	---------- Fraction of Time in Flow Class ---------- Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Wed Dec 19 15:33:35 2018
Analysis ended on: Wed Dec 19 15:33:36 2018
Total elapsed time: 00:00:01

```
[TITLE]
;;Project Title/Notes
18144 Meadowlark aka Schmidt
Post-Project Detention

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2005
START_TIME           00:00:00
REPORT_START_DATE    01/01/2005
REPORT_START_TIME    00:00:00
END_DATE             01/05/2005
END_TIME             06:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         0:00:01

INERTIAL_DAMPING     FULL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              4

[FILES]
;;Interfacing Files
USE INFLOWS "W:\18144_SchmidtProperties\WaterResources\Hydraulics\DetentionBasins\CUHP_Final\18144_CUHP_POST_MAJORSTORM.txt"

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
U/SMANHOLE       5010.75    10         0          0          0
D/SMANHOLE       5010.55    5          0          0          0
OUTLETSTRUCTURE  5011       15         0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OUTFALL          5010       NORMAL                      NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat     IMD

;;-------------- -------- ---------- ----------- ---------- ---------------------------- -------- --------          --------
--------
;Extended Detention Basin 1
EDB1             5011     12         0          TABULAR    EDB1                         0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
;3 x 36" RCP
3                D/SMANHOLE       OUTFALL          50.8       0.013      0          0          0          0
;3 x 36" RCP
2                U/SMANHOLE       D/SMANHOLE       341.2      0.013      0          0          0          0
;3 x 36" RCP
1                OUTLETSTRUCTURE  U/SMANHOLE       434        0.013      0          0          0          0

[ORIFICES]
;;Name           From Node        To Node          Type         Offset     Qcoeff     Gated    CloseTime
;;-------------- ---------------- ---------------- ------------ ---------- ---------- -------- ----------
;7 SQ.IN
ORIF-1           EDB1             OUTLETSTRUCTURE  SIDE         0          0.6        NO       0
;7 SQ.IN
ORIF-2           EDB1             OUTLETSTRUCTURE  SIDE         1.58       0.6        NO       0
;7 SQ.IN
ORIF-3           EDB1             OUTLETSTRUCTURE  SIDE         3.17       0.6        NO       0
;6' x 6' Overflow Grate with 50% Clogging and 70% Open Grate Area (3.55' x 3.55' Effective Weir)
GRATE            EDB1             OUTLETSTRUCTURE  BOTTOM       4.51       0.6        NO       0

[WEIRS]
;;Name           From Node        To Node          Type         CrestHt    Qcoeff     Gated    EndCon   EndCoeff   Surcharge
RoadWidth  RoadSurf
;;-------------- ---------------- ---------------- ------------ ---------- ---------- -------- -------- ---------- ----------
```

```
---------- ----------
EMERGENCYSPILLWAY EDB1             OUTLETSTRUCTURE  TRAPEZOIDAL  11         3          NO       0        0          YES

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
3                CIRCULAR     3                0          0          0          3
2                CIRCULAR     3                0          0          0          3
1                CIRCULAR     3                0          0          0          3
ORIF-1           RECT_CLOSED  2.646            2.646      0          0
ORIF-2           RECT_CLOSED  2.646            2.646      0          0
ORIF-3           RECT_CLOSED  2.646            2.646      0          0
GRATE            RECT_CLOSED  3.55             3.55       0          0
EMERGENCYSPILLWAY TRAPEZOIDAL  1                90         0          0

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------
3                0          1          0          NO         0
2                0.5        1          0          NO         0
1                0.5        1          0          NO         0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
EDB1             Storage    0          0
EDB1                        1          17890
EDB1                        2          20085
EDB1                        3          22441
EDB1                        4          25141
EDB1                        5          28045
EDB1                        6          31014
EDB1                        7          34252
EDB1                        8          38094
EDB1                        9          43263
EDB1                        10         52445
EDB1                        11         65128
EDB1                        12         78000

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
U/SMANHOLE       3369.763           6867.031
D/SMANHOLE       2613.843           7677.596
OUTLETSTRUCTURE  3858.537           6341.463
OUTFALL          1976.321           8260.474
EDB1             4824.390           5287.805

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
ORIF-1           4931.707           5814.634
ORIF-1           4560.976           6214.634
ORIF-2           4697.561           5697.561
ORIF-2           4414.634           6019.512
GRATE            4287.805           5268.293
GRATE            3868.293           5736.585
EMERGENCYSPILLWAY 4092.683           5024.390
EMERGENCYSPILLWAY 3643.902           5531.707
```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

18144 Meadowlark aka Schmidt
Post-Project Detention

****
Element Count
****
```
Number of rain gages ...... 0
Number of subcatchments ... 0
Number of nodes ........... 5
Number of links ........... 8
Number of pollutants ...... 0
Number of land uses ....... 0
```

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
U/SMANHOLE	JUNCTION	5010.75	10.00	0.0	
D/SMANHOLE	JUNCTION	5010.55	5.00	0.0	
OUTLETSTRUCTURE	JUNCTION	5011.00	15.00	0.0	
OUTFALL	OUTFALL	5010.00	3.00	0.0	
EDB1	STORAGE	5011.00	12.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
3	D/SMANHOLE	OUTFALL	CONDUIT	50.8	1.0827	0.0130
2	U/SMANHOLE	D/SMANHOLE	CONDUIT	341.2	0.0586	0.0130
1	OUTLETSTRUCTURE	U/SMANHOLE	CONDUIT	434.0	0.0576	0.0130
ORIF-1	EDB1	OUTLETSTRUCTURE	ORIFICE			
ORIF-2	EDB1	OUTLETSTRUCTURE	ORIFICE			
ORIF-3	EDB1	OUTLETSTRUCTURE	ORIFICE			
GRATE	EDB1	OUTLETSTRUCTURE	ORIFICE			
EMERGENCYSPILLWAY	EDB1	OUTLETSTRUCTURE	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
3	CIRCULAR	3.00	7.07	0.75	3.00	3	69.40
2	CIRCULAR	3.00	7.07	0.75	3.00	3	16.15
1	CIRCULAR	3.00	7.07	0.75	3.00	3	16.01

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
```
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Starting Date ............ JAN-01-2005 00:00:00
Ending Date .............. JAN-05-2005 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
```

```
Number of Threads ........ 1
Head Tolerance ........... 0.005000 ft


**************************        Volume        Volume
Flow Routing Continuity         acre-feet      10^6 gal
**************************      ---------     ---------
Dry Weather Inflow .......          0.000         0.000
Wet Weather Inflow .......          0.000         0.000
Groundwater Inflow .......          0.000         0.000
RDII Inflow ..............          0.000         0.000
External Inflow ..........         16.977         5.532
External Outflow .........         16.977         5.532
Flooding Loss ............          0.000         0.000
Evaporation Loss .........          0.000         0.000
Exfiltration Loss ........          0.000         0.000
Initial Stored Volume ....          0.000         0.000
Final Stored Volume ......          0.000         0.000
Continuity Error (%) .....          0.005


***************************
Time-Step Critical Elements
***************************
None


********************************
Highest Flow Instability Indexes
********************************
Link ORIF-1 (3)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00


******************
Node Depth Summary
******************

---------------------------------------------------------------------------------
                                 Average  Maximum  Maximum  Time of Max    Reported
                                   Depth    Depth      HGL   Occurrence   Max Depth
Node                 Type           Feet     Feet     Feet  days hr:min        Feet
---------------------------------------------------------------------------------
U/SMANHOLE           JUNCTION       0.09     4.41  5015.16     0  01:15        4.41
D/SMANHOLE           JUNCTION       0.05     2.46  5013.01     0  01:16        2.46
OUTLETSTRUCTURE      JUNCTION       0.11     6.71  5017.71     0  01:15        6.71
OUTFALL              OUTFALL        0.04     1.69  5011.69     0  01:16        1.69
EDB1                 STORAGE        0.13     7.63  5018.63     0  01:15        7.63


*******************
Node Inflow Summary
*******************

-------------------------------------------------------------------------------------------------
                                  Maximum  Maximum                  Lateral       Total        Flow
                                  Lateral    Total  Time of Max      Inflow      Inflow     Balance
                                   Inflow   Inflow   Occurrence      Volume      Volume       Error
Node                 Type             CFS      CFS  days hr:min    10^6 gal    10^6 gal     Percent
-------------------------------------------------------------------------------------------------
U/SMANHOLE           JUNCTION        0.00   126.24     0  01:16           0        5.53       0.006
D/SMANHOLE           JUNCTION        0.00   126.24     0  01:16           0        5.53       0.003
OUTLETSTRUCTURE      JUNCTION        0.00   126.33     0  01:13           0        5.53      -0.005
OUTFALL              OUTFALL         0.00   126.24     0  01:16           0        5.53       0.000
EDB1                 STORAGE       185.73   185.73     0  00:47        5.53        5.53       0.000


**********************
Node Surcharge Summary
**********************

Surcharging occurs when water rises above the top of the highest conduit.
---------------------------------------------------------------------
                                                Max. Height   Min. Depth
```

Node	Type	Hours Surcharged	Above Crown Feet	Below Rim Feet
U/SMANHOLE	JUNCTION	1.24	1.407	5.593

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
EDB1	2.574	1	0	0	184.020	44	0 01:15	126.33

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUTFALL	8.48	23.75	126.24	5.532
System	8.48	23.75	126.24	5.532

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
3	CONDUIT	126.24	0 01:16	8.08	0.61	0.69
2	CONDUIT	126.24	0 01:16	6.23	2.61	0.91
1	CONDUIT	126.24	0 01:16	5.95	2.63	1.00
ORIF-1	ORIFICE	36.64	0 00:39			1.00
ORIF-2	ORIFICE	36.47	0 00:40			1.00
ORIF-3	ORIFICE	32.31	0 01:14			1.00
GRATE	ORIFICE	29.42	0 01:13			
EMERGENCYSPILLWAY	WEIR	0.00	0 00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	---------- Fraction of Time in Flow Class ---------- Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
3	1.00	0.89	0.00	0.00	0.05	0.05	0.00	0.00	0.95	0.00
2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00

****
Conduit Surcharge Summary
****

Conduit	--------- Hours Full -------- Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
3	0.01	0.01	0.01	1.45	0.01
2	0.01	1.24	0.01	2.43	0.01
1	1.24	1.46	1.24	2.43	1.24

Analysis begun on: Wed Dec 19 16:57:25 2018
Analysis ended on: Wed Dec 19 16:57:27 2018
Total elapsed time: 00:00:02

RICK™
ENGINEERING COMPANY

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San Diego, CA 92110-2596

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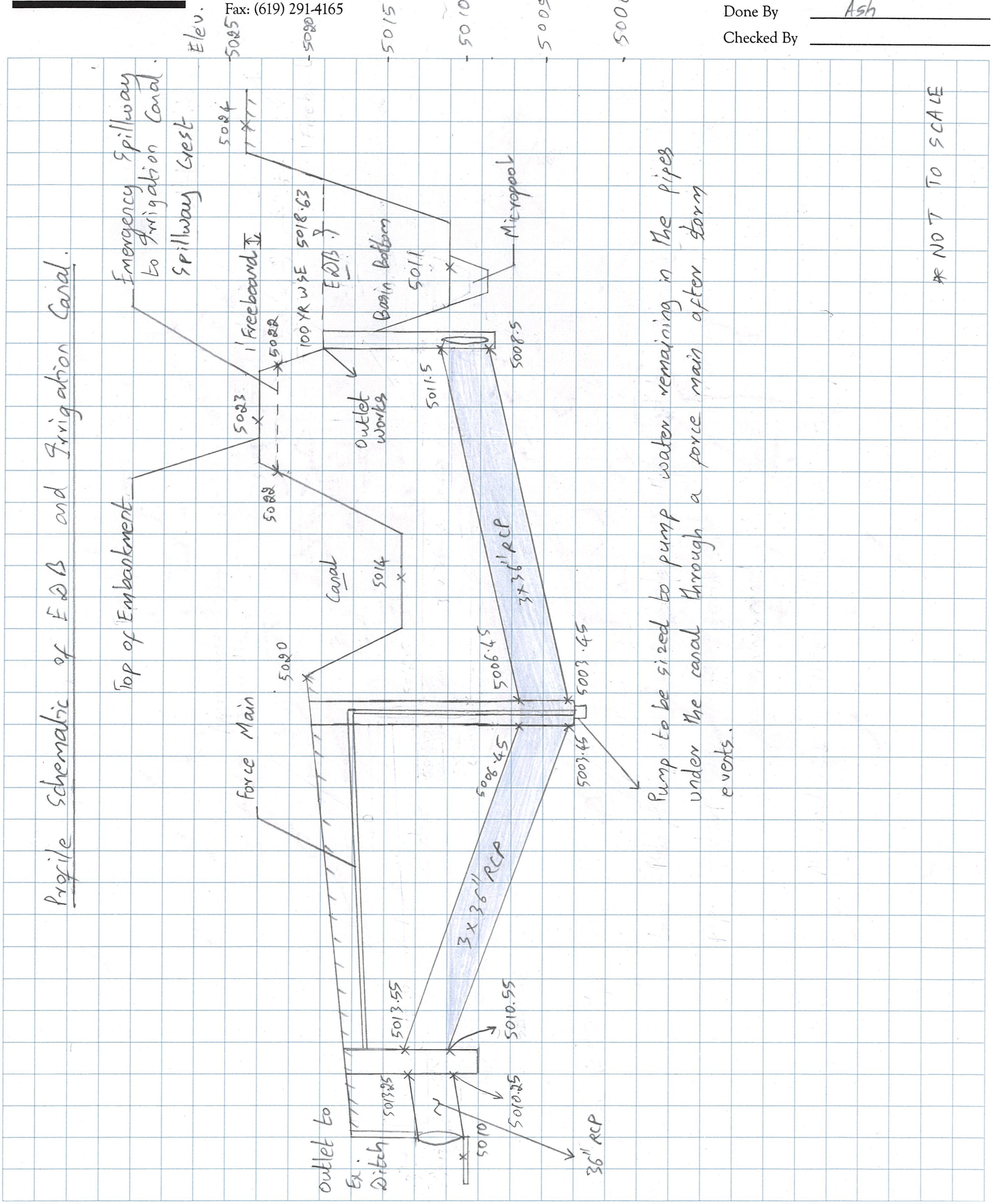
Fax: (619) 291-4165

Date: December 13, 2018
Job No.: 18144
Page: 1
Done By: Ash
Checked By:



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Date: December 13, 2018
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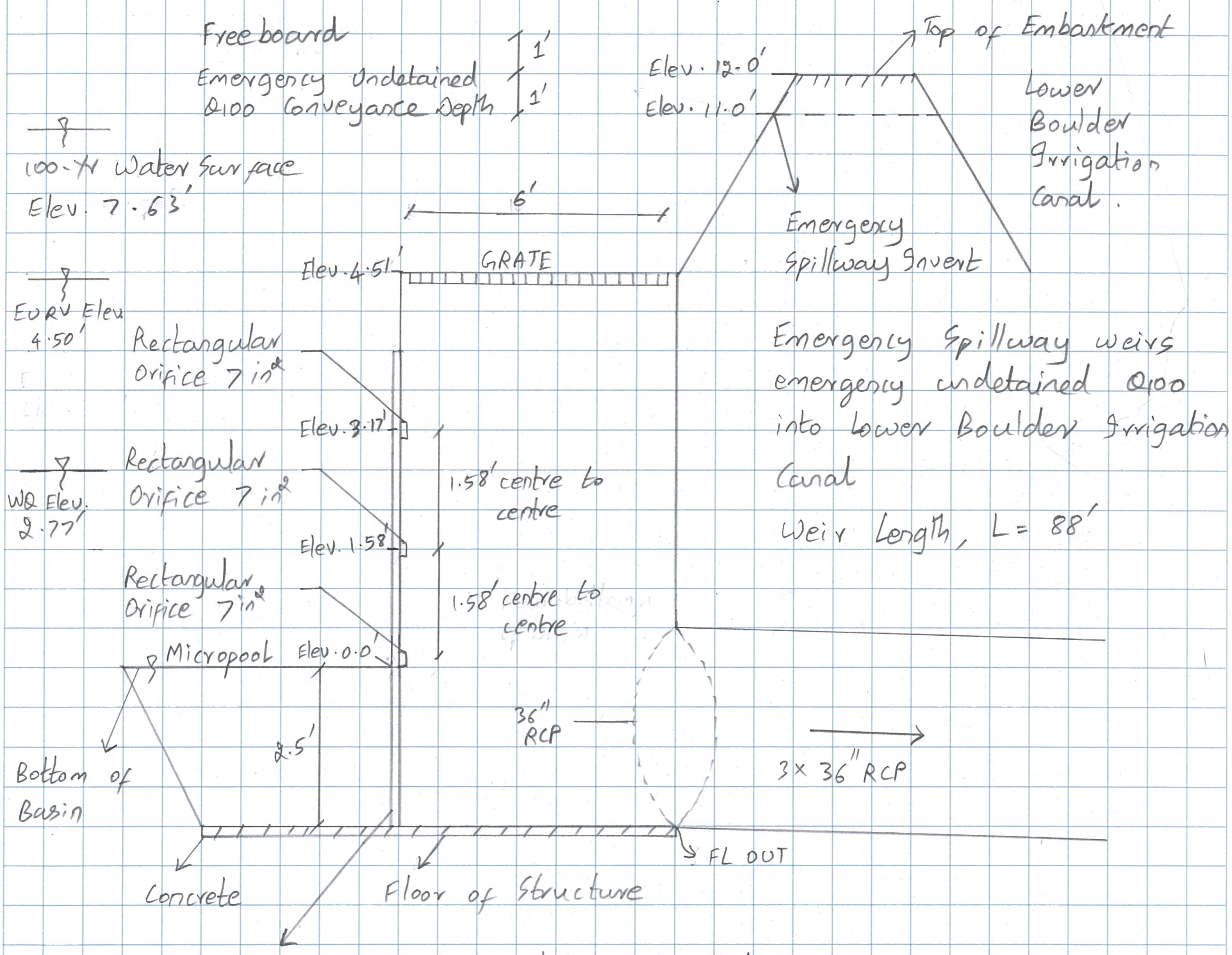
Page: 2
Done By: Ash
Checked By:

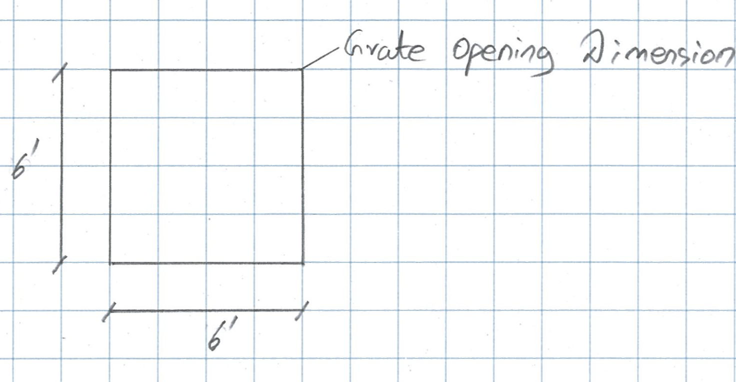
Extended Detention Basin Outlet Structure

* NOT TO SCALE



Micropool Dimension :-

L - 21 ft
W - 21 ft
H - 2.5 ft
Area - 441 ft²
Depth of trickle channel - 0.33'
Slope of trickle channel - 0.005 ft/ft



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Date September 20, 2018
Job No. 18144
Page 3
Done By Ash
Checked By

Concrete Micropool :-

Length = 21 ft

width = 21 ft

Height = 2.5 ft (below Basin Bottom)

Area = 441 ft^2

Depth of trickle channel = 0.33'

slope of trickle channel = 0.005 ft/ft

Volume of Micropool = 1102.5 ft^3

Concrete Forebays :-

No. of forebays = 3 (East, west & South)

Depth of forebays = 2.5 ft

Volume of forebays = 1439 ft^3

Release rate of forebays to trickle channel = 2% of Undetained Q_{100}

$= 0.02 \times 245.6$

Release rate Q = 4.9 cfs

Provide 2.5 ft tall 22.5° V-notch at forebay concrete wall to drain at release rate Q into trickle channel for each forebay.

Hydraulic Analysis Report

Project Data

Project Title: 18144 Schmidt

Designer:

Project Date: Thursday, September 20, 2018

Project Units: U.S. Customary Units

Notes:

Weir Analysis: Emergency Spillway Weir Analysis - Undetained Q100

Notes:

Input Parameters

Weir Type: Rectangular

Coefficient: 3.0000

Length: 88.0000 ft

Head: 1.0000 ft

Result Parameters

Flow: 264.0000 cfs

Undetained Q100 = 184 cfs
Spillway Capacity = 264 cfs
Hence Ok

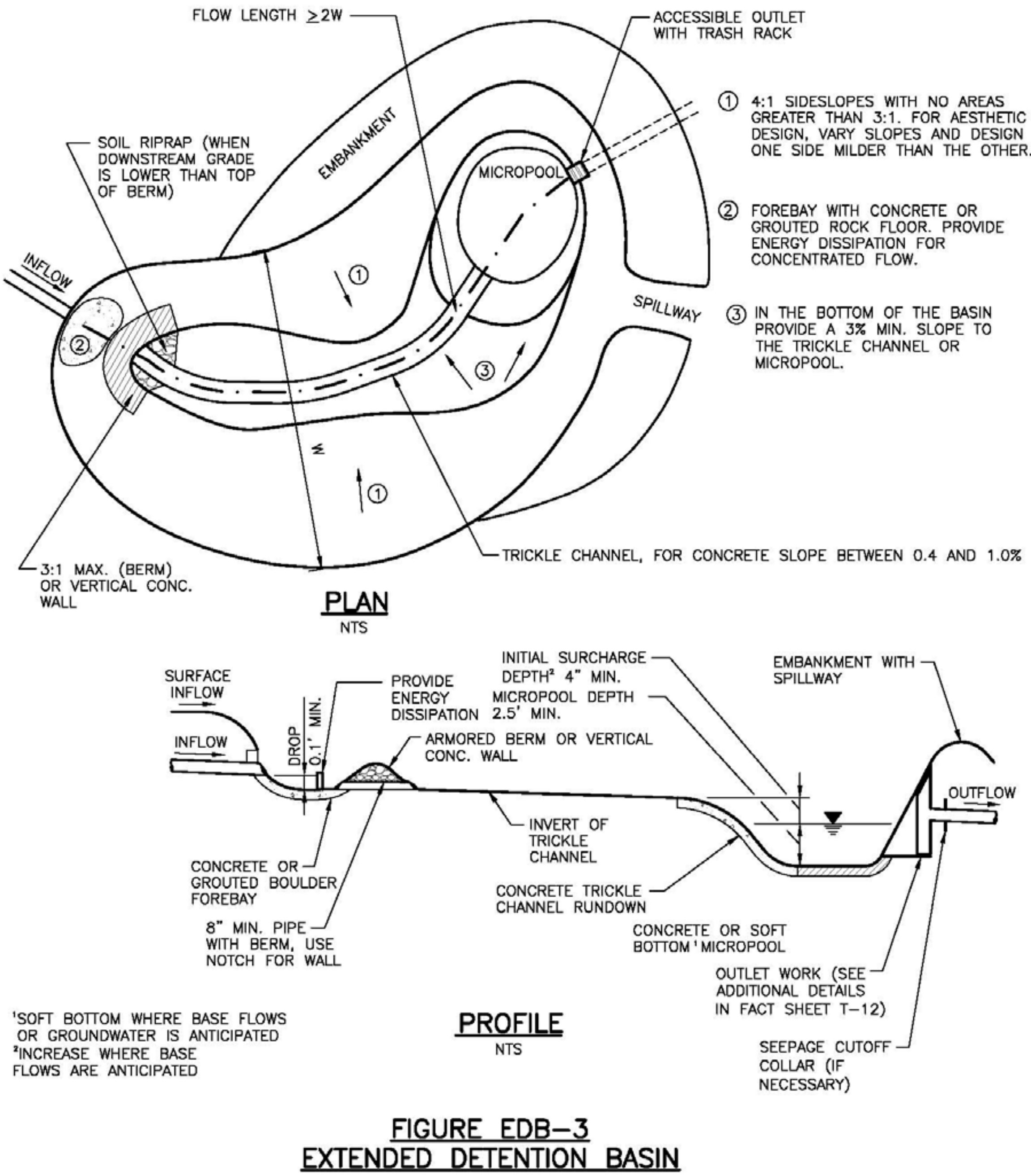

Figure EDB-3. Extended Detention Basin (EDB) Plan and Profile

Additional Details are provided in BMP Fact Sheet T-12. This includes outlet structure details including orifice plates and trash racks.

RICK™
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San Diego, CA 92110-2596

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Date September 20, 2018
Job No. 18144
Page 4
Done By Ash
Checked By

Pump Flowrate Calculation.

Volume of water in the pipes under the canal to be pumped.

Total length of pipe $\simeq 810$ ft
Number of pipes $= 3$
Pipe size $= 36$ in $= 3$ ft

Cross-Sectional Area of Pipes $= 3 \times \pi r^2 = 3 \times \pi \times 1.5^2 = 21.21\ ft^2$

$\therefore$ Volume of pipe $= 21.21 \times 810 = 17{,}180\ ft^3$

Desired Drawdown Time $= 24$ hr $= 24 \times 3600$ sec

Pump Flowrate Required $= \dfrac{\text{Vol. of pipe}}{\text{Drawdown Time}} = \dfrac{17{,}180\ ft^3}{86{,}400\ sec}$

$\boxed{\text{Pump Flowrate, } Q = 0.2\ cfs} = 89.77$ gpm

$\simeq 90$ gpm

Required head $\simeq 15$ ft

GSP05/10/20 Sub-Prime®
Electric Submersible Pumps

The GSP Sub-Prime line is a selection of portable, electric submersible dewatering pumps available for a wide range of pumping applications on construction, industrial, mining, utility, and municipal job sites. Available in 0.5 hp / 0.4 kW (GSP05), 1 hp / 0.75 kW (GSP10), and 2 hp / 1.5 kW (GSP20) models, the GSP Sub-Prime offers flow rates from 70 to 110 gpm (4.4 to 6.9 l/sec) and maximum heads from 39 to 70 feet (11.9 to 21.3 meters). Compact design allows these versatile units to go where other pumps simply do not fit. An optional piggy back single float switch can be supplied as a cost effective choice for applications requiring automatic operation.

Features and Benefits

- UL and CSA listed and approved *
- Dry-running capability without damage
- No control panel required for starting. (Control panel is needed for motor protection.)
- Portable, lightweight, durable
- Slim line top discharge design, only 7.2 in. (183mm) diameter for GSP05 and GSP10 models, 9.25 in. (235mm) diameter for the GSP20 model.
- Non-wicking cable with strain relief
- High-torque, capacitor-start motor
- Motor thermal overload protection
- Outer jacket for continuous cooling of motor
- Silicon Carbide upper and lower mechanical seals
- Triple sealed – internal upper and lower mechanical seals and external lip seal
- Torque flow impeller

Specification

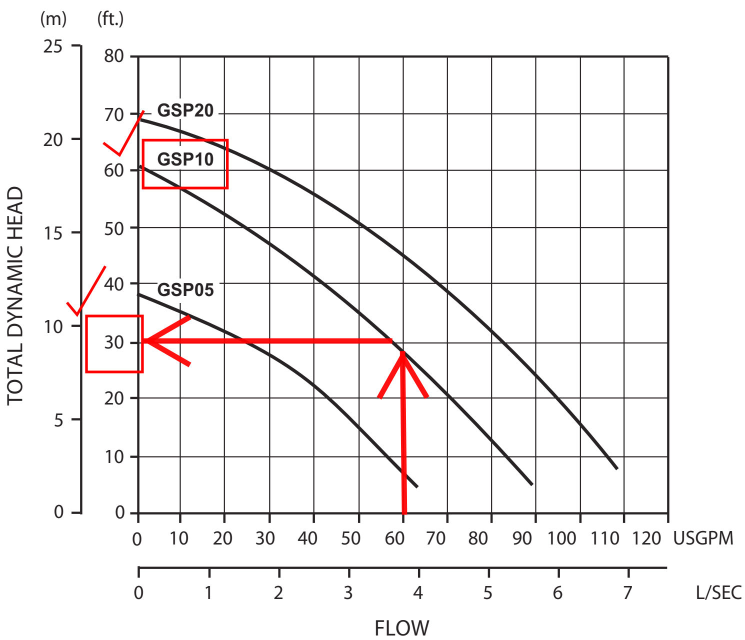
	GSP05	GSP10	GSP20
HP (kW)	0.5 (0.4)	1.0 (.75)	2.0 (1.5)
Max. Flow - gpm (l/sec)	70 (4.4)	90 (5.7)	110 (6.9)
Max. Head - ft (m)	39 (11.9)	60 (18.3)	70 (21.3)
Max. Solids - in. (mm)	1/3 (9)	1/3 (9)	1/3 (9)
Cable Length - ft (m)	30 (9)	50 (15)	50 (15)
Discharge - in. (mm)	2 (50)	2 (50)	3 (75)
RPM	3600	3600	3600
Max. Fluid Temp.	90° F (32° C)	90° F (32° C)	104° F (40° C)
PH Range	6.5-8.0	6.5-8.0	6.5-8.0
Voltage	115, 230	115, 230	115/230
Amps	5.8, 3.2	10.3, 5.11	25.9/13.0
Phase	Single	Single	Single
Height - in. (mm)	12.8 (325)	14.1 (358)	24.5 (622)
Width - in. (mm)	7.2 (183)	7.2 (183)	9.25 (235)
Weight - lbs. (kg)	20 (9)	29 lbs. (13)	61 (28)
Max. Sub. - ft (m)	16.5 (5)	16.5 (5)	16.5 (5)

C US

* n.a. for GSP20

godwin
a xylem brand

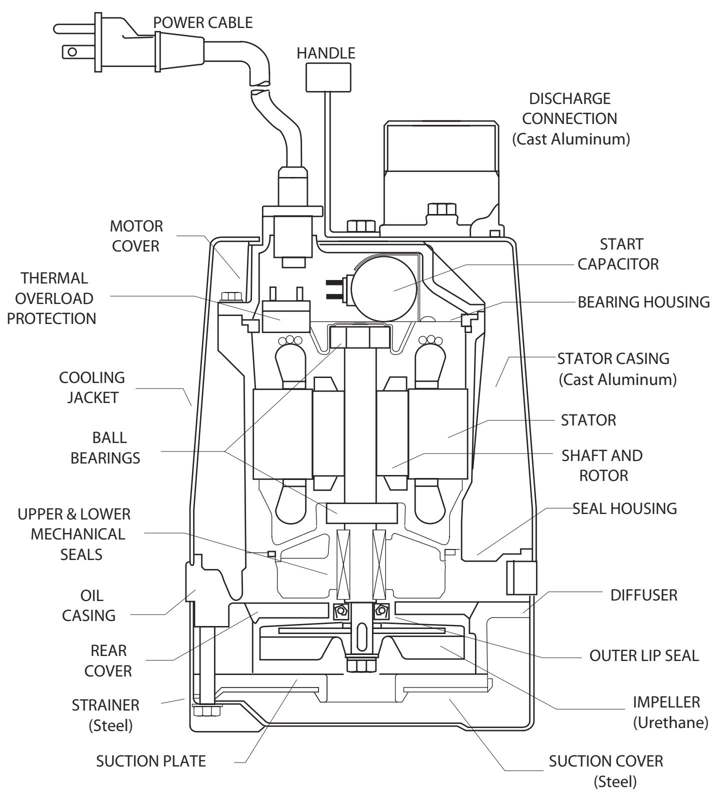
GSP Sub-Prime® Performance Curves



WARNING: Pumps are not designed for use in explosive atmosphere, flammable environments or for pumping volatile liquids.

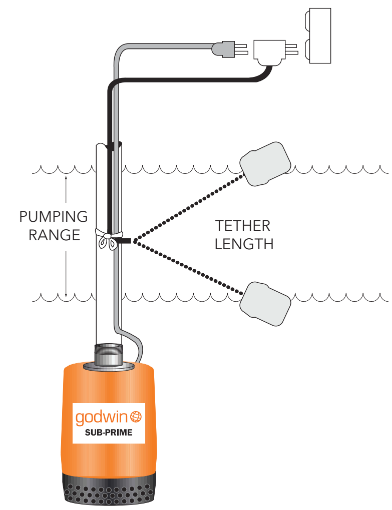
Required head <15ft.
Hence ok.

Design & Construction



Float Switch

Optional Float Switches available for automatic, remote activation of Sub-Prime pumps. Package consists of 30 ft/50ft (9m/15m) power cord with piggy-back power plug, variable length float tether, and sealed float. Typical configuration shown below.

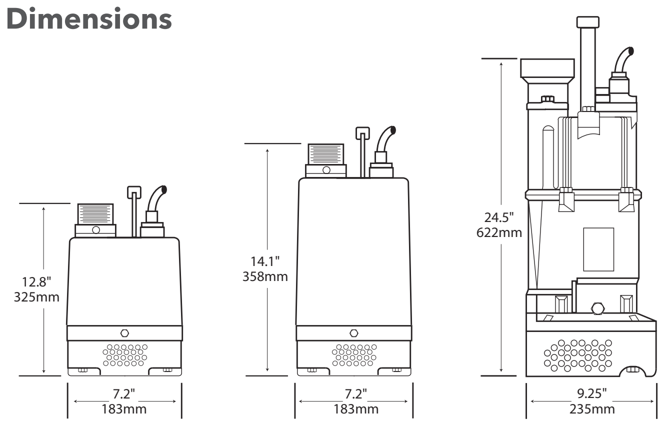


Pumping range determined by tether length according to the following guide.

Tether	3.5	5	7	9	11	13	15	in.
Length	89	127	178	229	279	330	381	mm.
Pumping	6.5	7.5	8.5	10	11	12.5	13.5	in.
Range	165	1914	216	254	279	318	343	mm.

Pumping range based on operation in non-turbulent conditions. Actual range may vary due to temperature conditions and cord shape. Tether length increases variance of pumping range.

Dimensions



GSP05 **GSP10** **GSP20**

xylem
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Tel +1.856.467.3636

GODWIN_GSP_05/10/20_07.11.14
www.godwinpumps.com

Description

Photograph EDB-1: This EDB includes a concrete trickle channel and a micropool with a concrete bottom and grouted boulder sideslopes. The vegetation growing in the sediment of the micropool adds to the natural look of this facility and ties into the surrounding landscape.

An extended detention basin (EDB) is a sedimentation basin designed to detain stormwater for many hours after storm runoff ends. This BMP is similar to a detention basin used for flood control, however; the EDB uses a much smaller outlet that extends the emptying time of the more frequently occurring runoff events to facilitate pollutant removal. The EDB's 40-hour drain time for the water quality capture volume (WQCV) is recommended to remove a significant portion of total suspended solids (TSS). Soluble pollutant removal is enhanced by providing a small wetland marsh or "micropool" at the outlet to promote biological uptake. The basins are sometimes called "dry ponds" because they are designed not to have a significant permanent pool of water remaining between storm runoff events.

Site Selection

EDBs are well suited for watersheds with at least five impervious acres up to approximately one square mile of watershed. Smaller watersheds can result in an orifice size prone to clogging. Larger watersheds and watersheds with baseflows can complicate the design and reduce the level of treatment provided. EDBs are also well suited where flood detention is incorporated into the same basin. The depth of groundwater should be investigated. Groundwater depth should be 2 or more feet below the bottom of the basin in order to keep this area dry and maintainable.

Extended Detention Basin	
Functions	
LID/Volume Red.	Somewhat
WQCV Capture	Yes
WQCV+Flood Control	Yes
Fact Sheet Includes EURV Guidance	Yes
Typical Effectiveness for Targeted Pollutants[3]	
Sediment/Solids	Good
Nutrients	Moderate
Total Metals	Moderate
Bacteria	Poor
Other Considerations	
Life-cycle Costs[4]	Moderate

[3] Based primarily on data from the International Stormwater BMP Database (www.bmpdatabase.org).

[4] Based primarily on BMP-REALCOST available at www.udfcd.org. Analysis based on a single installation (not based on the maximum recommended watershed tributary to each BMP).

Designing for Maintenance

Recommended maintenance practices for all BMPs are provided in the BMP Maintenance chapter of this manual. During design, the following should be considered to ensure ease of maintenance over the long-term:

- Always provide a micropool (see step 7).
- Provide a design slope of at least 3% in the vegetated bottom of the basin (either toward the trickle channel or toward the micropool). This will help maintain the appearance of the turf grass in the bottom of the basin and reduce the possibility of saturated areas that may produce unwanted species of vegetation and mosquito breeding conditions. Verify slopes during construction, prior to vegetation.
- Follow trash rack sizing recommendations to determine the minimum area for the trash rack (see design step 9).
- Provide adequate initial surcharge volume for frequent inundation (see design step 3).
- Provide stabilized access to the forebay, outlet, spillway, and micropool for maintenance purposes.
- Provide access to the well screen. The well screen requires maintenance more often than any other EDB component. Ensure that the screen can be reached from a point outside of the micropool. When the well screen is located inside the outlet structure, provide an access port within the trash rack or use a sloped trash rack that consists of bearing bars (not horizontal) that create openings no more than five inches clear.
- Provide a hard-bottom forebay that allows for removal of sediment.
- Where baseflows are anticipated, consider providing a flow-measuring device (e.g. weir or flume with staff gage and rating curve) at the forebay to assist with future modifications of the water quality plate. Typically, the baseflow will increase as the watershed develops. It is important that the water quality plate continue to function, passing the baseflow while draining the WQCV over approximately 40 hours. Measuring the actual baseflow can be helpful in determining if and when the orifice place should be replaced.

Benefits

- The relatively simple design can make EDBs less expensive to construct than other BMPs, especially for larger basins.
- Maintenance requirements are straightforward.
- The facility can be designed for multiple uses.

Limitations

- Ponding time and depths may generate safety concerns.
- Best suited for tributary areas of 5 impervious acres or more. EDBs are not recommended for sites less than 2 impervious acres.
- Although ponds do not require more total area compared to other BMPs, they typically require a relatively large continuous area.

EDBs providing combined water quality and flood control functions can serve multiple uses such as playing fields or picnic areas. These uses are best located at higher elevation within the basin, above the WQCV pool level.

Design Procedure and Criteria

The following steps outline the design procedure and criteria for an EDB and Figure EDB-3 shows a typical configuration. UD-BMP, available at www.udfcd.org, is an Excel based workbook that can be used to perform some of the below calculations and ensure conformance to these criteria. UD-Detention, another workbook developed by UDFCD can be used to develop and route a storm hydrograph through an EDB and design the outlet structure.

1. **Basin Storage Volume**: Provide a design volume equal to the WQCV or the EURV. This volume begins at the lowest orifice in the outlet structure.

    - Determine the imperviousness of the watershed (or effective imperviousness where LID elements are used upstream).

    - Find the required storage volume. Determine the required WQCV or EURV (watershed inches of runoff) using Figure 3-2 located in Chapter 3 of this manual (for WQCV) or equations provided in the *Storage* chapter of Volume 2 (for EURV).

    - Calculate the design volume as follows:

    For WQCV:

    $$V = \left[\frac{\text{WQCV}}{12}\right] A \qquad \text{Equation EDB-1}$$

    For EURV:

    $$V = \left[\frac{\text{EURV}}{12}\right] A \qquad \text{Equation EDB-2}$$

    Where:

    V = design volume (acre ft)

    A = watershed area tributary to the extended detention basin (acres)

2. **Basin Shape**: Always maximize the distance between the inlet and the outlet. It is best to have a basin length (measured along the flow path from inlet to outlet) to width ratio of at least 2:1. A longer flow path from inlet to outlet will minimize short circuiting and improve reduction of TSS. To achieve this ratio, it may be necessary to modify the inlet and outlet points through the use of pipes or swales.

3. **Basin Side Slopes**: Basin side slopes should be stable and gentle to facilitate maintenance and access. Slopes that are 4:1or flatter should be used to allow for conventional maintenance equipment and for improved safety, maintenance, and aesthetics. Side slopes should be no steeper than 3:1. The use of walls is highly discouraged due to maintenance constraints.

4. **Inlet**: Dissipate flow energy at concentrated points of inflow. This will limit erosion and promote particle sedimentation. Inlets should be designed in accordance with UDFCD drop structure criteria for inlets above the invert of the forebay, impact basin outlet details for at grade inlets, or other types of energy dissipating structures.

5. **Forebay Design**: The forebay provides an opportunity for larger particles to settle out in an area that can be easily maintained. The length of the flow path through the forebay should be maximized, and the slope minimized to encourage settling. The appropriate size of the forebay may be as much a function of the level of development in the tributary area as it is a percentage of the WQCV. When portions of the watershed may remain disturbed for an extended period of time, the forebay size will need to be increased due to the potentially high sediment load. Refer to Table EDB-4 for a design criteria summary. When using this table, the designer should consider increasing the size of the forebay if the watershed is not fully developed.

   The forebay outlet should be sized to release 2% of the undetained peak 100-year discharge. A soil riprap berm with 3:1 sideslopes (or flatter) and a pipe outlet or a concrete wall with a notch outlet should be constructed between the forebay and the main EDB. It is recommended that the berm/pipe configuration be reserved for watersheds in excess of 20 impervious acres to accommodate the minimum recommended pipe diameter of 8 inches. When using the berm/pipe configuration, round up to the nearest standard pipe size and use a minimum diameter of 8 inches. The floor of the forebay should be concrete or lined with grouted boulders to define sediment removal limits. With either configuration, soil riprap should also be provided on the downstream side of the forebay berm or wall if the downstream grade is lower than the top of the berm or wall. The forebay will overtop frequently so this protection is necessary for erosion control. All soil riprap in the area of the forebay should be seeded and erosion control fabric should be placed to retain the seed in this high flow area.

6. **Trickle Channel:** Convey low flows from the forebay to the micropool with a trickle channel. The trickle channel should have a minimum flow capacity equal to the maximum release from the forebay outlet.

   - **Concrete Trickle Channels:** A concrete trickle channel will help to establish the bottom of the basin long-term and may also facilitate regular sediment removal. It can be a "V" shaped concrete drain pan or a concrete channel with curbs. A flat-bottom channel facilitates maintenance. A slope between 0.4% - 1% is recommended to encourage settling while reducing the potential for low points within the pan.

   - **Soft-bottom Trickle Channels**: When designed and maintained properly, soft-bottom trickle channels can allow for an attractive alternative to concrete. They can also improve water quality. However, they are not appropriate for all sites. Be aware, maintenance of soft bottom trickle channels requires mechanical removal of sediment and vegetation. Additionally, this option provides mosquito habitat. For this reason, UDFCD recommends that they be considered on a case-by-case basis and with the approval of the local jurisdiction. It is recommended that soft bottom trickle channels be designed with a consistent longitudinal slope from forebay to micropool and that they not meander. This geometry will allow for reconstruction of the original design when sediment removal in the trickle channel is necessary. The trickle channel may also be located along the toe of the slope if a straight channel is not desired. The recommended minimum depth of a soft bottom trickle channel is 1.5 feet. This depth will help limit potential wetland growth to the trickle channel, preserving the bottom of the basin.

     Riprap and soil riprap lined trickle channels are not recommended due to past maintenance experiences, where the riprap was inadvertently removed along with the sediment during maintenance.

7. **Micropool and Outlet Structure**: Locate the outlet structure in the embankment of the EDB and provide a permanent micropool directly in front of the structure. Submerge the well screen to the bottom of the micropool. This will reduce clogging of the well screen because it allows water to flow though the well screen below the elevation of the lowest orifice even when the screen above the water surface is plugged. This will prevent shallow ponding in front of the structure, which provides a breeding ground for mosquitoes (large shallow puddles tend to produce more mosquitoes than a smaller, deeper permanent pond).

   Basins with micropools have fewer mosquitoes. Micropools reduce shallow wet areas where breeding is most favorable.

   Micropool side slopes may be vertical walls or stabilized slopes of 3:1 (horizontal:vertical). For watersheds with less than 5 impervious acres, the micropool can be located inside the outlet structure (refer to Figures OS-7 and OS-8 provided in Fact Sheet T-12). The micropool should be at least 2.5 feet in depth with a minimum surface area of 10 square feet. The bottom should be concrete unless a baseflow is present or anticipated or if groundwater is anticipated. Riprap is not recommended because it complicates maintenance operations.

   Where possible, place the outlet in an inconspicuous location as shown in Photo EDB-3. This urban EDB utilizes landscaped parking lot islands connected by a series of culverts (shown in Photo EDB-4) to provide the required water quality and flood control volumes.

   The outlet should be designed to release the WQCV over a 40-hour period. Draining a volume of water over a specified time can be done through an orifice plate as detailed in Fact Sheet T-12. Use reservoir routing calculations as discussed in the *Storage* Chapter of Volume 2 to assist in the design. Two workbooks tools have been developed by UDFCD for this purpose, UD-FSD and UD-Detention. Both are available at www.udfcd.org. UD-FSD is recommended for a typical EDB full spectrum detention design. UD-Detention uses the same methodology and can be used for a full spectrum detention basin or a WQCV only design. It also allows for a wider range of outlet controls should the user want to specify something beyond what is shown in Fact Sheet T-12.

   Refer to BMP Fact Sheet T-12 for schematics pertaining to structure geometry, grates, trash racks, orifice plate, and all other necessary components.

   The outlet may have flared or parallel wing walls as shown in Figures EDB-1 and EDB-2, respectively. Either configuration should be recessed into the embankment to minimize its profile. Additionally, the trash rack should be sloped with the basin side-slopes.

8. **Initial Surcharge Volume**: Providing a surcharge volume above the micropool for frequently occurring runoff minimizes standing water and sediment deposition in the remainder of the basin. This is critical to turf maintenance and mosquito abatement in the basin bottom. The initial surcharge volume is not provided in the micropool nor does it include the micropool volume. It is the available storage volume that begins at the water surface elevation of the micropool and extends upward to a grade break within the basin (typically the invert of the trickle channel).

Photograph EDB-2. The initial surcharge volume of this EDB is contained within the boulders that surround the micropool.

Photograph EDB-3. Although walls may complicate maintenance access, this outlet structure is relatively hidden from public view. This photo was taken shortly following a storm event.

The area of the initial surcharge volume, when full, is typically the same or slightly larger than that of the micropool. The initial surcharge volume should have a depth of at least 4 inches. For watersheds of at least 5 impervious acres, the initial surcharge volume should also be at least 0.3% of the WQCV. The initial surcharge volume is considered a part of the WQCV and does not need to be provided in addition to the WQCV. It is recommended that this area be shown on the grading plan or in a profile for the EDB. When baseflows are anticipated, it is recommended that the initial surcharge volume be increased. See the inset on page EDB-9 for additional guidelines for designing for baseflows.

Photograph EDB-4. A series of landscape islands connected by culverts provide water quality and flood control for this site.

9. **Trash Rack**: Provide a trash rack (or screen) of sufficient size at the outlet to provide hydraulic capacity while the rack is partially clogged. Openings should be small enough to limit clogging of the individual orifices. Size any overflow safety grate so it does not interfere with the hydraulic capacity of the outlet pipe. See BMP Fact Sheet T-12 for detailed trash rack and safety grate design guidance.

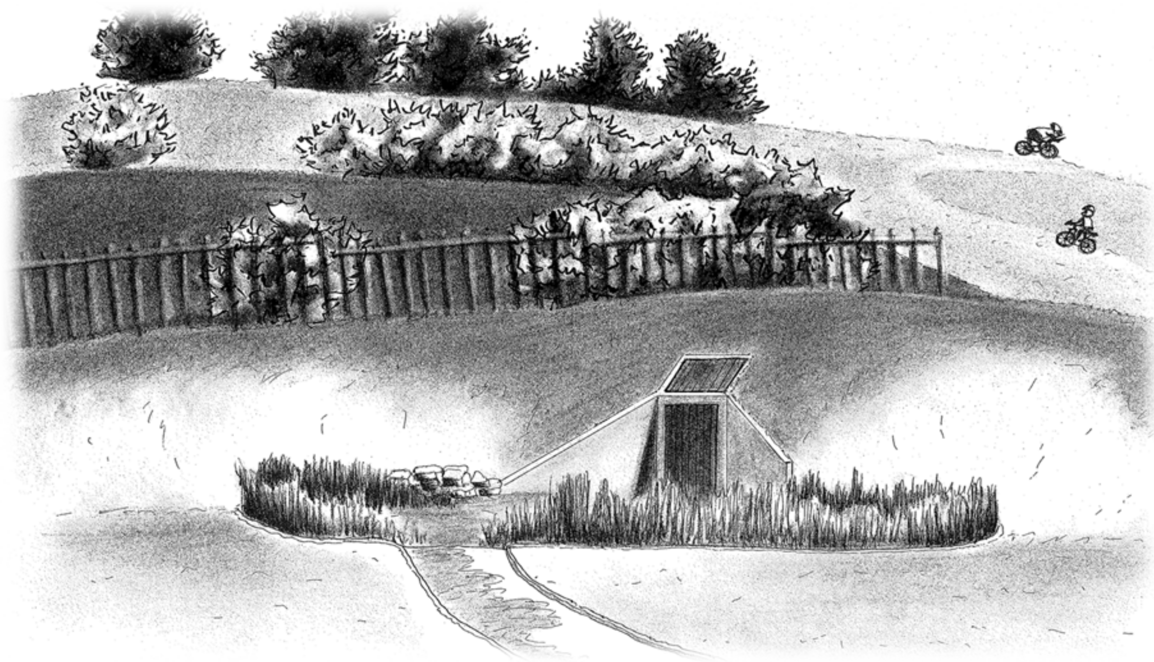


Figure EDB-1. Flared wall outlet structure configuration. Graphic by Adia Davis.

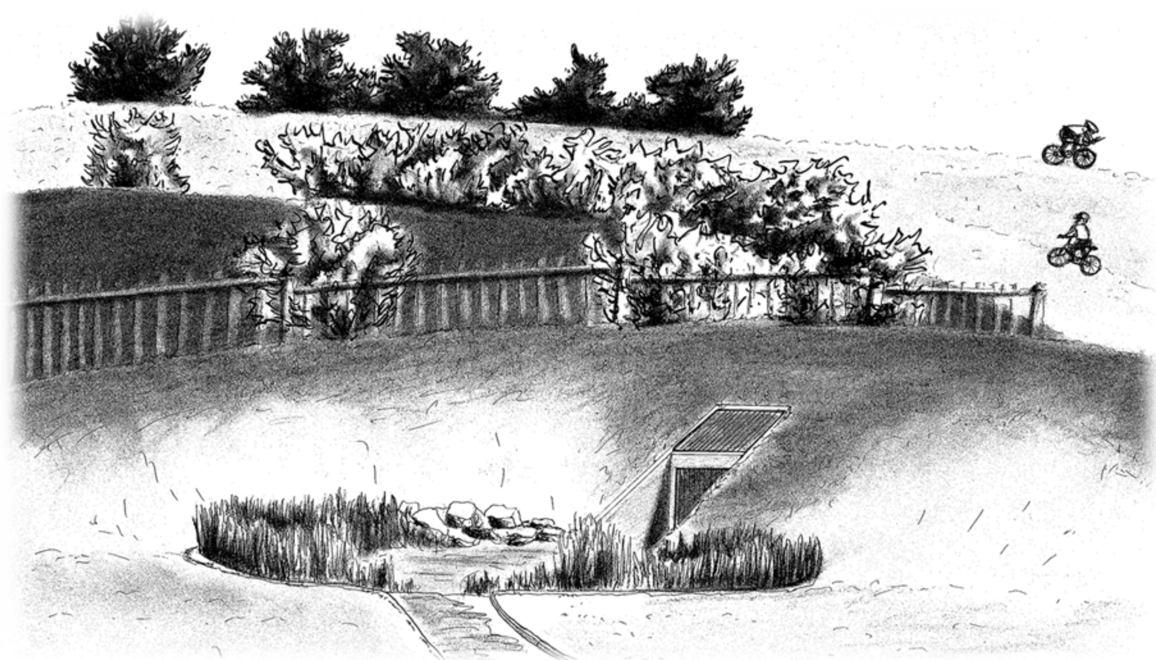


Figure EDB-2. Parallel wall outlet structure configuration. Graphic by Adia Davis.

10. **Overflow Embankment:** Design the embankment to withstand the 100-year storm at a minimum. If the embankment falls under the jurisdiction of the State Engineer's Office, it must be designed to meet the requirements of the State Engineer's Office. The overflow should be located at a point where waters can best be conveyed downstream. Slopes that are 4:1 or flatter should be used to allow for conventional maintenance equipment and for improved safety, maintenance, and aesthetics. Side slopes should be no steeper than 3:1 and should be planted with turf forming grasses. Poorly compacted native soils should be excavated and replaced. Embankment soils should be compacted to 95% of maximum dry density for ASTM D698 (Standard Proctor) or 90% for ASTM D1557 (Modified Proctor). Spillway structures and overflows should be designed in accordance with the *Storage* Chapter of Volume 2 as well as any local drainage criteria. Buried soil riprap or reinforced turf mats installed per manufacturer's recommendations can provide an attractive and less expensive alternative to concrete.

11. **Vegetation:** Vegetation provides erosion control and sediment entrapment. Basin bottom, berms, and side slopes should be planted with turf grass, which is a general term for any grasses that will form a turf or mat, as opposed to bunch grass which will grow in clumplike fashion. Xeric grasses with temporary irrigation are recommended to reduce maintenance requirements, including maintenance of the irrigation system as well as frequency of mowing. Where possible, place irrigation heads outside the basin bottom because irrigation heads in an EDB can become buried with sediment over time.

12. **Access:** Provide appropriate maintenance access to the forebay and outlet works. For larger basins, this means stabilized access for maintenance vehicles. If stabilized access is not provided, the maintenance plan should provide detail, including recommended equipment, on how sediment and trash will be removed from the outlet structure and micropool. Some communities may require

Designing for Baseflows

Baseflows should be anticipated for large tributary areas and can be accommodated in a variety of ways. Consider the following:

- If water rights are available, consider alternate BMPs such as a constructed wetland pond or retention pond.
- Anticipate future modifications to the outlet structure. Following construction, baseflows should be monitored periodically. Intermittent flows can become perennial and perennial flows can increase over time. It may be determined that outlet modifications are necessary long after construction of the BMP is complete.
- Design foundation drains and other groundwater drains to bypass the water quality plate directing these drains to a conveyance element downstream of the EDB. This will reduce baseflows and help preserve storage for the WQCV.
- When the basin is fully developed and an existing baseflow can be approximated prior to design, the water quality orifices should be increased to drain the WQCV in 40 hours while also draining the baseflow. This requires reservoir routing using an inflow hydrograph that includes the baseflow. The *UD-Detention* workbook available at www.udfcd.org may be used for this purpose.
- Increase the initial surcharge volume of the pond to provide some flexibility when baseflows are known or anticipated. Baseflows are difficult to approximate and will continue to increase as the watershed develops. Increasing the initial surcharge volume will accommodate a broader range of flows.

vehicle access to the bottom of the basin regardless of the size of the watershed. Grades should not exceed 10% for haul road surfaces and 20% for skid-loader and backhoe access. Stabilized access includes concrete, articulated concrete block, concrete grid pavement, or reinforced grass pavement. The recommended cross slope is 2%.

Aesthetic Design

Since all land owners and managers wish to use land in the most efficient manner possible, it is important that EDBs become part of a multi-use system. This encourages the design of EDBs as an aesthetic part of a naturalized environment or to include passive and/or active open space. Within each scenario, the EDB can begin to define itself as more than just a drainage facility. When this happens, the basin becomes a public amenity. This combination of public amenity and drainage facility is of much greater value to a landowner. Softened and varied slopes, interspersed irrigated fields, planting areas and wetlands can all be part of an EDB.

The design should be aesthetic whether it is considered to be an architectural or naturalized basin. Architectural basins incorporate design borrowed or reflective of the surrounding architecture or urban forms. An architectural basin is intended to appear as part of the built environment, rather than hiding the cues that identify it as a stormwater structure. A naturalized basin is designed to appear as though it is a natural part of the landscape. This section provides suggestions for designing a naturalized basin. The built environment, in contrast to the natural environment, does not typically contain the randomness of form inherent in nature. Constructed slopes typically remain consistent, as do slope transitions. Even dissipation structures are usually a hard form and have edges seldom seen in nature. If the EDB is to appear as though it is a natural part of the landscape, it is important to minimize shapes that provide visual cues indicating the presence of a drainage structure. For example, the side sides should be shaped more naturally and with varying slopes for a naturalized basin.

Suggested Methods for a Naturalized Basin

- Create a flowing form that looks like it was shaped by water.
- Extend one side of the basin higher than the other. This may require a berm.
- Shape the bottom of the basin differently than the top.
- Slope of one side of the basin more mildly than the opposing side.
- Vary slope transitions both at the top of the bank and at the toe.
- Use a soft-surface trickle channel if appropriate and approved.
- When using rock for energy dissipation, the rock should graduate away from the area of hard edge into the surrounding landscape. Other non-functional matching rock should occur in other areas of the basin to prevent the actual energy dissipation from appearing out of context.
- Design ground cover to reflect the type of water regime expected for their location within the basin.

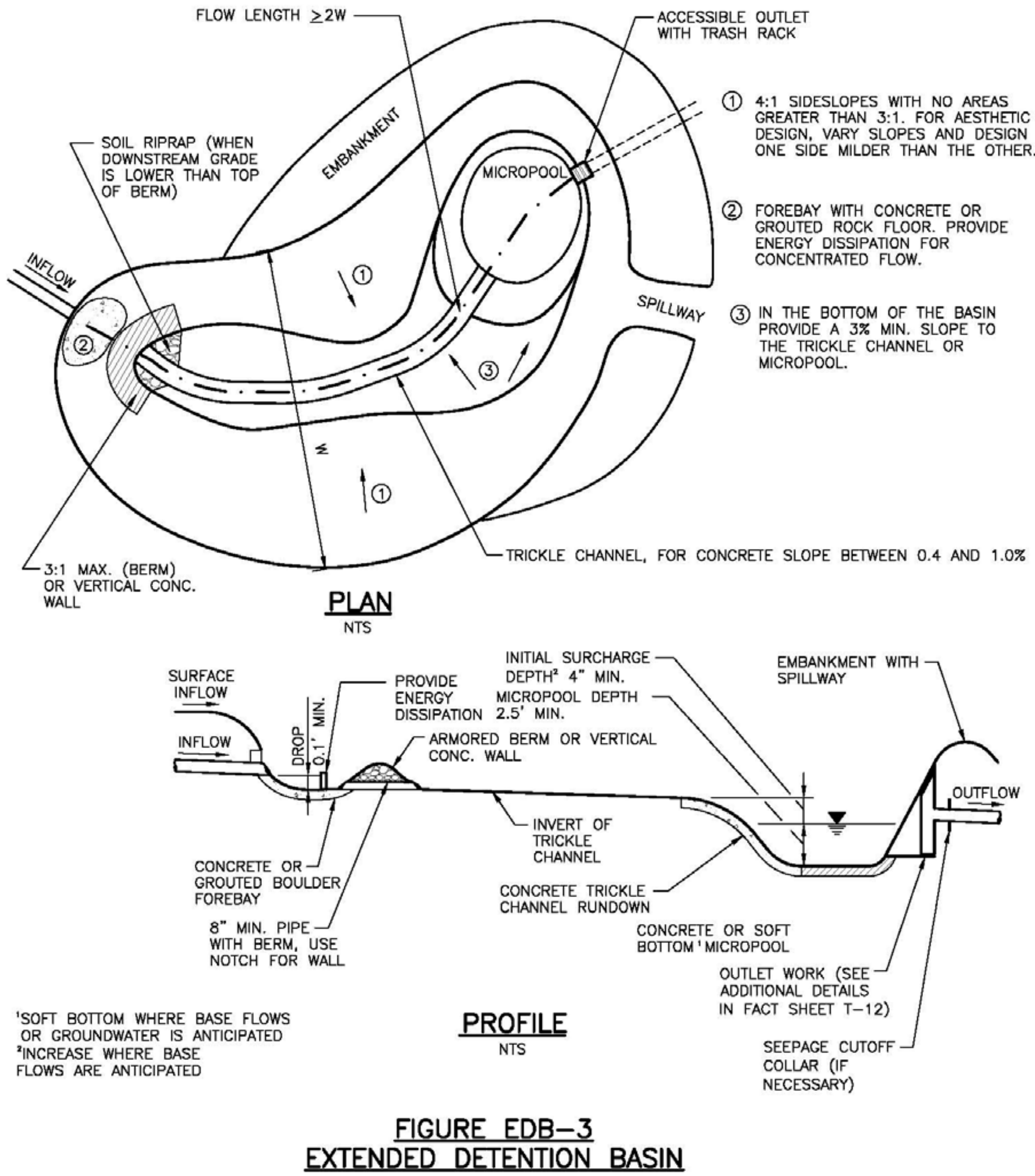


Figure EDB-3. Extended Detention Basin (EDB) Plan and Profile

Additional Details are provided in BMP Fact Sheet T-12. This includes outlet structure details including orifice plates and trash racks.

Table EDB-4. EDB component criteria

	On-Site EDBs for Watersheds up to 1 Impervious Acre[1]	**EDBs with Watersheds between 1 and 2 Impervious Acres[1]**	**EDBs with Watersheds up to 5 Impervious Acres**	**EDBs with Watersheds over 5 Impervious Acres**	**EDBs with Watersheds over 20 Impervious Acres**
Forebay Release and Configuration	EDBs should not be used for watersheds with less than 1 impervious acre.	Release 2% of the undetained 100-year peak discharge by way of a wall/notch configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch or berm/pipe[2] configuration
Minimum Forebay Volume		1% of the WQCV	2% of the WQCV	3% of the WQCV	3% of the WQCV
Maximum Forebay Depth		12 inches	18 inches	18 inches	30 inches
Trickle Channel Capacity		≥ the maximum possible forebay outlet capacity	≥ the maximum possible forebay outlet capacity	≥ the maximum possible forebay outlet capacity	≥ the maximum possible forebay outlet capacity
Micropool		Area ≥ 10 ft^2	Area ≥ 10 ft^2	Area ≥ 10 ft^2	Area ≥ 10 ft^2
Initial Surcharge Volume		Depth ≥ 4 inches	Depth ≥ 4 inches	Depth ≥ 4 in. Volume ≥ 0.3% WQCV	Depth ≥ 4 in. Volume ≥ 0.3% WQCV

[1] EDBs are not recommended for sites with less than 2 impervious acres. Consider a sand filter or rain garden.

[2] Round up to the first standard pipe size (minimum 8 inches).

~~root systems are recommended. Plant selection is crucial on roofs with intense wind and light such as roofs of skyscrapers or roofs that receive reflected solar radiation from other structures. Additionally, certain portions of the roof may experience more intense sunlight and or reflected heat, requiring additional care or irrigation system adjustments.~~

~~Care of the plants on a green roof will require the most attention during the critical establishment phase. A horticultural professional should work with individuals caring for the new roof to organize schedules and routines for hand weeding, thinning, pruning, fertilizing, irrigation system scheduling and adjustments, and plant replacement. Watering and weeding are particularly important for the first two years of the green roof. For overall health of the green roof, weeds should be identified and removed early and often.~~

~~If the growing medium needs to be replaced, it should be replaced in accordance with the original design specifications, unless these specifications have been identified as a cause of poor plant growth or green roof performance. Any substitutions or adjustments to the original green roof media must be balanced carefully to meet loading limits, drainage requirements, and characteristics conducive to healthy plant growth.~~

~~When caring for plants or adjusting growing media, care should be taken to avoid use of materials likely to result in nutrient export from the green roof. For example, growing media and compost should have a low phosphorus index (P index). Appropriate plants with low fertilization requirements should be chosen. If used, fertilizer application should be minimized to levels necessary only for plant health.~~

~~6.3 Irrigation Scheduling and Maintenance~~

~~Green roofs in Colorado should be equipped with irrigation systems, even if the ultimate goal is for the plants to rely primarily on natural precipitation. Irrigation schedules should be based on the evapotranspiration (ET) requirements of the plants, the type of irrigation system used (e.g., drip or spray), and changing ET over the growing season. Irrigation systems equipped with advanced irrigation controllers based on soil moisture can help facilitate watering according to the changing water needs of the plants. If advanced systems are not used, irrigation should be manually adjusted during the growing season to replace water lost through ET. During the first two years of plant establishment, regular irrigation will likely be needed. After plant establishment, it may be possible to reduce supplemental irrigation during non-drought conditions.~~

~~Completely drain the irrigation system before the first winter freeze each year. Upon reactivation of the irrigation system in the spring, inspect all components and replace damaged parts, as needed.~~

7.0 Extended Detention Basins (EDBs)

EDBs have low to moderate maintenance requirements on a routine basis, but may require significant maintenance once every 15 to 25 years. Maintenance frequency depends on the amount of construction activity within the tributary watershed, the erosion control measures implemented, the size of the watershed, and the design of the facility.

7.1 Inspection

Inspect the EDB at least twice annually, observing the amount of sediment in the forebay and checking for debris at the outlet structure.

7.2 Debris and Litter Removal

Remove debris and litter from the detention area as required to minimize clogging of the outlet.

7.3 Mowing and Plant Care

When starting from seed, mow native/drought tolerant grasses only when required to deter weeds during the first three years. Following this period, mowing of native/drought tolerant grass may stop or be reduced to maintain a height of no less than 6 inches (higher mowing heights are associated with deeper roots and greater drought tolerance). In general, mowing should be done as needed to maintain appropriate height and control weeds. Mowing of manicured grasses may vary from as frequently as weekly during the summer, to no mowing during the winter. See Section 4 of this chapter for additional recommendations from the CSU Extension.

7.4 Aeration

For EDBs with manicured grass, aeration will supply the soil and roots with air and increase infiltration. It reduces soil compaction and helps control thatch while helping water move into the root zone. Aeration is done by punching holes in the ground using an aerator with hollow punches that pull the soil cores or "plugs" from the ground. Holes should be at least 2 inches deep and no more than 4 inches apart.

Aeration should be performed at least once per year when the ground is not frozen. Water the turf thoroughly prior to aeration. Mark sprinkler heads and shallow utilities such as irrigation lines and cable TV lines to ensure those lines will not be damaged. Avoid aerating in extremely hot and dry conditions. Heavy traffic areas may require aeration more frequently.

7.5 Mosquito Control

Although the design provided in this manual implements practices specifically developed to deter mosquito breeding, some level of mosquito control may be necessary if the BMP is located in close proximity to outdoor amenities. The most effective mosquito control programs include weekly inspection for signs of mosquito breeding with treatment provided when breeding is found. These inspections can be performed by a mosquito control service and typically start in mid-May and extend to mid-September. Treatment should be targeted toward mosquito larvae. Mosquitoes are more difficult to control when they are adults. This typically requires neighborhood fogging with an insecticide.

The use of larvicidal briquettes or "dunks" may be appropriate. These are typically effective for about one month and perform best when the basin has a hard bottom (e.g., concrete lined micropool).

Facts on Mosquito Breeding

Although mosquitoes prefer shallow, stagnant water, they can breed within the top 6 to 8 inches of deeper pools.

Mosquitoes need nutrients and prefer shelter from direct sunlight.

Mosquitoes can go from egg to adult within 72 hours.

The most common mosquitoes in Colorado include the *Aedes Vexans* and the *Culex Tarsalis*. Both have similar needs for breeding and development.

7.6 Irrigation Scheduling and Maintenance

Adjust irrigation throughout the growing season to provide the proper irrigation application rate to maintain healthy vegetation. Less irrigation is typically needed in early summer and fall, with more irrigation needed during July and August. Native grass and other drought tolerant plantings should not require irrigation after establishment.

Check for broken sprinkler heads and repair them, as needed. Completely drain the irrigation system before the first winter freeze each year. Upon reactivation of the irrigation system in the spring, inspect all components and replace damaged parts, as needed.

7.7 Sediment Removal from the Forebay, Trickle Channel, and Micropool

Remove sediment from the forebay and trickle channel annually. If portions of the watershed are not developed or if roadway or landscaping projects are taking place in the watershed, the required frequency of sediment removal in the forebay may be as often as after each storm event. The forebay should be maintained in such a way that it does not provide a significant source of resuspended sediment in the stormwater runoff.

Sediment removal from the micropool is required about once every one to four years, and should occur when the depth of the pool has been reduced to approximately 18 inches. Small micropools may be vacuumed and larger pools may need to be pumped in order to remove all sediment from the micropool bottom. Removing sediment from the micropool will benefit mosquito control. Ensure that the sediment is disposed of properly and not placed elsewhere in the basin.

7.8 Sediment Removal from the Basin Bottom

Remove sediment from the bottom of the basin when accumulated sediment occupies about 20% of the water quality design volume or when sediment accumulation results in poor drainage within the basin. The required frequency may be every 15 to 25 years or more frequently in basins where construction activities are occurring.

7.9 Erosion and Structural Repairs

Repair basin inlets, outlets, trickle channels, and all other structural components required for the basin to operate as intended. Repair and vegetate eroded areas as needed following inspection.

8.0 Sand Filters

Sand filters have relatively low routine maintenance requirements. Maintenance frequency depends on pollutant loads in runoff, the amount of construction activity within the tributary watershed, the erosion control measures implemented, the size of the watershed, and the design of the facility.

8.1 Inspection

Inspect the detention area once or twice annually following precipitation events to determine if the sand filter is providing acceptable infiltration. Also check for erosion and repair as necessary.

Appendix C

Approval and/or Agreement Letters

Appendix D

References

TOWN OF ERIE

OUTFALL SYSTEMS PLAN (WEST OF COAL CREEK)

JANUARY 2014

PREPARED FOR: URBAN DRAINAGE & FLOOD CONTROL DISTRICT
TOWN OF ERIE
BOULDER COUNTY
CITY OF LAFAYETTE

PREPARED BY: RESPEC CONSULTING AND SERVICES
720 SOUTH COLORADO BLVD, SUITE 410S
DENVER, CO 80246

Portions of three watersheds are located within the study area: Coal Creek, Boulder Creek, and Prince Tributary. Coal Creek flows north through the study area, defining the eastern study limits, and joins Boulder Creek in the northeastern corner of the study area. Boulder Creek flows in the northeast direction through the study area and eventually joins St. Vrain Creek downstream of the study area. Prince Tributary flows north through the study area and is a right bank tributary to Boulder Creek. A fourth watershed, Bullhead Gulch, is an offsite watershed that enters the west side of the study area and eventually is joined by Prince Tributary before entering Boulder Creek.

Existing land use within the study area is a combination of agricultural, open space, large lot rural residential, low and medium density residential, historic old town Erie, commercial, and light industrial. Future land use will generally be an expansion of the existing land uses.

A detailed hydrologic analysis was performed for the study area to determine peak discharges for existing and future development conditions. Previous hydrologic studies have been conducted for the study area including the following:

- *Erie Outfall Systems Planning, Preliminary Design, Erie and Adjacent Boulder and Weld County Areas*, prepared by Love and Associates, Inc., dated May 2001.

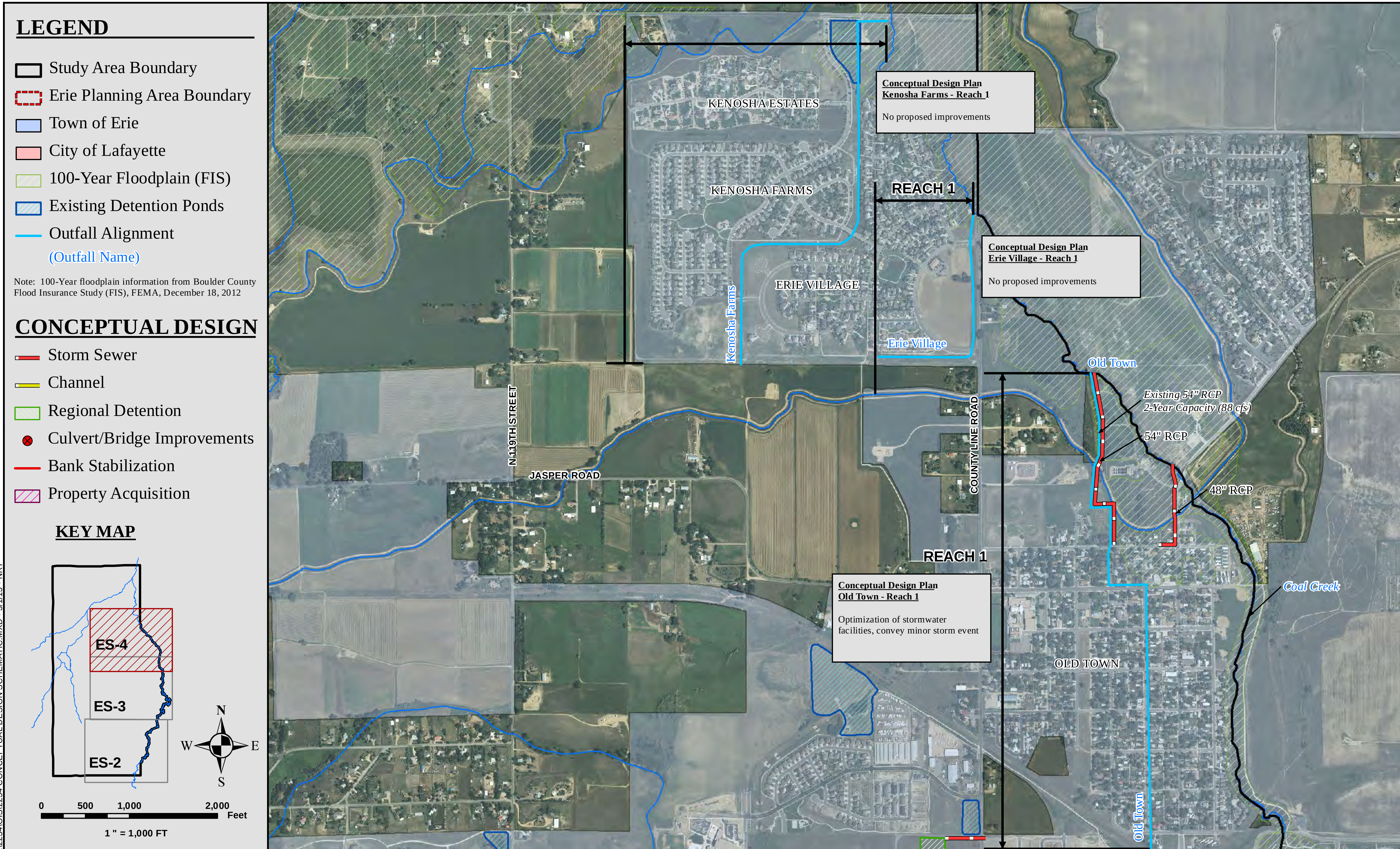
- *Major Basinwide Planning, City of Lafayette/Boulder County, Phase B Development of Preliminary Plan*, prepared by Camp, Dresser, and McKee, Inc., dated December 1980.

Table ES-2 presents a comparison of 100-year peak discharges from previous studies to the current results at key locations within the study area.

Table ES-2
100-Year Peak Flow Comparison to Previous Studies and Conceptual Design Plan

Outfall Description at Location	100-Year Peak Discharge - Future Land Use (cfs)				
	2001 OSP	1980 Lafayette Phase B Study	2014 Baseline	2014 Conceptual Design Plan	2012 Boulder County FEMA FIS
Coal Creek Tributaries					
Drainageway 2 South at N. 119th Street	1,713	1,520	1,523	921	-
Drainageway 2 North at County Line Road	721	-	406	426 [1]	-
Drainageway 1 at County Line Road	431	470	377	375	-
Arapahoe Road at County Line Road	290	-	191	163	-
Erie Farms 1 at County Line Road	482	-	372	480	-
Erie Farms 2 at County Line Road	491	-	261	N/A	-
Gold Run at Coal Creek	826	-	758	368	-
Erie Commons 1 at Coal Creek	792	-	785	501	-
Erie Commons 2 at Coal Creek	N/A	-	704	343	-
Briggs Street at Coal Creek	156	-	584	491	-
Old Town at Evans Street	N/A [2]	-	559	559	-
Prince Tributary					
Arapahoe Road	745	-	744	744	-
Erie Parkway	1,971	-	1,792	954	1,804
Flatiron Drive	2,379	-	2,106	1,168	2,130
Boulder Creek Tributaries					
N. 109th Street at Boulder Creek	113	-	108	108	-
Dawson 1 at Boulder Creek	182	-	237	427 [3]	-
Dawson 2 at Boulder Creek	210	-	197	197	-
N. 115th Street at Boulder Creek	224	-	129	129	-
Doniphan at Jasper Road	1,276	-	836	477 [3]	-
Crystal Views at N. 115th Street	1,736	-	1,831	1,831	-
Baily Kenosha Ponds at Boulder Creek	379	-	334	334	-
Wittemyer Ponds 1 at Boulder Creek	302	-	279	279	-
Wittemyer Ponds 2 at Boulder Creek	327	-	344	344	-
Mineral Road at Boulder Creek	220	-	173	173	-

[1] Peak flow revised to account for 644 cfs diverted to Drainageway 2 South alignment
[2] 2001 OSP SWMM routing different than 2014 study
[3] Results subject to change with the design of the Wise Farms development detention ponds



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TOWN OF ERIE - CITY OF LAFAYETTE - BOULDER COUNTY
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

TOWN OF ERIE OUTFALL SYSTEMS PLAN
(WEST OF COAL CREEK)

CONCEPTUAL DESIGN PLAN
COAL CREEK TRIBUTARIES

FIGURE
ES-4

2.0 STUDY AREA DESCRIPTION

2.1 PROJECT AREA

The study area is located in eastern Boulder County and southwestern Weld County and includes portions of the Town of Erie and the City of Lafayette. A vicinity map is provided in Figure 2-1 following this section. The study area boundaries are Mineral Road to the north, Baseline Road to the south, U.S. Highway 287 to the west, and Coal Creek to the east. The study area is approximately 6 miles from north to south and ranges from 2-½ to 3-½ miles from east to west. The study area encompasses approximately 17 square miles in total.

Portions of three watersheds are located within the study area: Coal Creek, Boulder Creek, and Prince Tributary. Coal Creek flows north through the study area, defining the eastern study limits, and joins Boulder Creek in the northeastern corner of the study area. Boulder Creek flows in the northeast direction through the study area and eventually joins St. Vrain Creek downstream of the study area. Prince Tributary flows north through the study area and is a right bank tributary to Boulder Creek. A fourth watershed, Bullhead Gulch, is an offsite watershed that enters the west side of the study area and eventually is joined by Prince Tributary before entering Boulder Creek.

Topography within the study area is generally flat. Elevations within the study area range from approximately 4,950 feet to 5,300 feet. Subbasin slopes within the study area generally range from approximately 0.5% to 3%. Approximately 50+% of the study area is developed within the Town of Erie, excluding unincorporated areas of Boulder County and the City of Lafayette. The portion within the unincorporated areas of Boulder County is almost fully undeveloped. The portion within the City of Lafayette is close to fully developed with the exception of zoned open spaces. Soils within the study area are primarily National Resources Conservation Service (NRCS) hydrologic soil group B. Soils along Boulder Creek are mainly hydrologic soil group C. Hydrologic soils groups are based on estimates of runoff potential. Soils are assigned to one of four groups (A, B, C, and D) according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. Group A soils have a high infiltration rate, Group B soils have a moderate rate, Group C soils have a slow rate, and Group D soils have a very slow infiltration rate. Soils classification maps are included in Appendix B.

2.2 LAND USE

Existing land use within the study area is a combination of agricultural, open space, large lot rural residential, low and medium density residential, historic old town Erie, commercial, and light industrial. Future land use will generally be an expansion of the existing land uses. Existing and future land use maps are provided in Appendix B of this report. Land use information was provided by the Town of Erie, including the 2005 Comprehensive Plan land use map (revision date July 20, 2011) and zoning map (revision date November 16, 2012). GIS shapefiles of the land use and zoning maps were also provided by the Town of Erie. The Town of Erie Unified Development Code provides definition of the different zoning districts, including maximum gross density and minimum landscaping requirements, and was used to assist in development of imperviousness estimates. Other documents used in development of the impervious area estimate include the City of Lafayette 2003 Comprehensive Plan Update land use plan and zoning map and the Boulder County Comprehensive Plan map and zoning map.

An estimate of watershed imperviousness is required in development of the baseline hydrologic analysis. The hydrologic analysis is summarized in Section 3 of this report. Imperviousness values were developed for each land use type, as shown in Table 2-1. The overall imperviousness for the study area is approximately 13% for existing land use conditions and 24% for future land use conditions. Site-specific calculations were performed on existing residential developments with a known land use to obtain typical percent impervious values for each land use type. For nonresidential developments, the Unified Development Code requires that a minimum of 15% of the gross site area shall be landscaped. Recent nonresidential developments in the study area have often included more landscaped area than required. The Urban Storm Drainage Criteria Manual (USDCM) was also referenced, particularly Volume 1, Chapter 5 Runoff. Figures RO-3 through RO-5 of Chapter 5 Runoff provide total percent impervious values for different size developments and are based on typical developments in the Urban Drainage and Flood Control District.

Table 2-1
Land Use and Impervious Area Estimates

Land Use	Land Use ID	Percent Imperviousness
Agricultural/Open Space	AG/OS	2%
Large Lot Rural Residential	LRR	8%
Rural Residential	RR	18%
Estate Residential	ER	25%
Suburban Residential	SR	35%
Low Density Residential	LR	40%
Medium Density Residential	MR	50%
High Density Residential	HR	60%
Old Town Residential	OTR	30%
Commercial/Business	C/B	80%
Mixed Use	MU	80%
Light Industrial	LI	80%

2.3 OUTFALL DESCRIPTION

Outfalls within the study area are shown in Figure B-1, Outfall Systems Map, located in Appendix B. The outfalls have been given unique names based on a geographical reference (road crossing, development, ownership, etc.). The longer outfalls are divided into separate unique reaches for analysis. An inventory of existing major roadway crossings is presented Table 4-1 located in Section 4 of this report.

<u>Coal Creek Tributaries</u>

There are thirteen identified outfalls to Coal Creek within the study area. Outfall locations with only one contributing subbasin were not included in the analysis because they discharge directly to the drainageway. A summary of the outfalls is provided in Table 2-2:

Table 2-2
Coal Creek Outfalls

SWMM Outfall ID	Outfall Name
900	Drainageway 2 South
903	Drainageway 2 North
905	Drainageway 1
906	Arapahoe Road
907	Erie Farms 1
908	Erie Farms 2
910	Gold Run
913	Erie Commons 1
925	Erie Commons 2
915	Briggs Street
917	Old Town
919	Erie Village
921	Kenosha Farms

In the southern part of the Coal Creek tributaries study area, south of the Canyon Creek development (Outfalls 900 – 911), the watershed is largely undeveloped, with the exception of the City of Lafayette. West of County Line Road, the study area is mainly unincorporated Boulder County and the City of Lafayette. A proposed development, Erie Farms, is located within the Town of Erie in the northwest corner of the intersection of County Line Road and Arapahoe Road. Future land use within this southern part of the study area consists of light industrial to the east of County Line Road and a combination of agricultural and open space and light, medium, and high density residential to the west of County Line Road.

In the middle part of the Coal Creek tributaries study area, from Erie Parkway to Kenosha Road (Outfalls 912 – 922, 925), the watershed is partially developed with a combination of residential and commercial developments and includes the area of Old Town. For areas not yet developed, the future land use is primarily low density residential and mixed use.

The very northern portion of the study area tributary to Coal Creek (Outfalls 923 and 924) is mainly located in unincorporated Boulder County, a portion of which is zoned as open space. It is anticipated that this portion of the study area will remain as agricultural and open space for the foreseeable future.

Starting at the south end of Coal Creek and moving north, the individual outfalls are described below.

<u>Drainageway 2 South</u>

Reach 1 – Coal Creek to 1,100' upstream of N. 119th Street

Reach 1 of the Drainageway 2 South outfall is primarily located in unincorporated Boulder County. The upstream boundary of Reach 1 is the City of Lafayette city limit. The portion of Reach 1 east of County Line Road, approximately 500 feet in length, is located within the City of Lafayette. Baseline Road and its right-of-way are also located within the City of Lafayette. The upper portion of the reach, both east and west of N. 119th Street, is zoned as mixed use. Periodic localized flooding has occurred at properties located along the north side of Baseline Road just east of N. 119th Street. The most recent flooding event occurred in July 2011.

Channel Upstream of County Line Road

N. 119th Street Crossing

Reach 2 has been improved over its entire length. This reach includes regional detention pond 1045, located north of the Creekside subdivision and adjacent to the Union Pacific Railroad embankment. There is one roadway crossing in this reach at Telleen Avenue.

Detention Pond 1045

Telleen Avenue Crossing

Reach 3 – 150' south of Telleen Avenue to Meller Street

Reach 3 has recently been improved as part of the Sunwest North development. A 4' x 10' RCBC was constructed beneath Meller Street and channel improvement were constructed downstream of the culvert.

Meller Street 4' x 10' RCBC

Reach 4 – Meller Street to the intersection of N. 119th Street and Erie Parkway

Reach 4 has been improved over its entire length. This reach runs through the Country Fields and Country Meadows subdivisions.

Reach 5 – Intersection of N. 119th Street and Erie Parkway to 1,600' south of Austin Avenue

Reach 5 has been improved over its entire length. This reach runs through the Orchard Glen subdivision.

<u>Old Town</u>

54" RCP Outfall at Coal Creek

The Old Town outfall is primarily located in the Town of Erie. A small area of unincorporated Weld County is located near the outfall at Coal Creek. The outfall is comprised of a series of storm sewer pipes that convey stormwater runoff to Coal Creek.

<u>Erie Village</u>

The Erie Village outfall is a single reach extending from Coal Creek to the Lower Boulder Ditch. The outfall is located entirely within the Town of Erie, primarily in the Erie Village subdivision. The outfall is comprised of a series of storm sewer pipes that convey stormwater runoff to Coal Creek.

<u>Kenosha Farms</u>

The Kenosha Farms outfall is a single reach extending from Coal Creek at Kenosha Road to the southwest corner of the Kenosha Farms subdivision. The outfall is located entirely within the Town of Erie and the Kenosha Farms subdivision. The outfall was improved as part of the development and is a grass-lined open channel ending at a detention pond near Coal Creek.

3.0 HYDROLOGIC ANALYSIS

3.1 OVERVIEW

A detailed hydrologic analysis was performed for the study area to determine peak discharges for the 2-, 5-, 10-, 25-, 50- and 100-year storm frequencies for existing and future development conditions. The latest version of the CUHP computer program, CUHP 2005, Version 1.3.3, was used to estimate storm runoff hydrographs for the individual subbasins. EPA SWMM, Version 5.0.022, was used to route the hydrographs through the watershed. The UDFCD computer program CUHP/SWMM Converter, Version 1.3.2.36493, was used to convert previous versions of UDSWM to the current versions. This baseline hydrologic analysis updates the hydrologic analysis from the 2001 OSP.

3.2 UDSWM CONVERSION

RESPEC, in conjunction with the project sponsors, recommended that the effort used to develop the 2001 OSP hydrology be utilized, after review and QA/QC check. In order to utilize the 2001 OSP analysis, it was first necessary to convert the model files to the current versions of CUHP and SWMM. This was done with CUHP/SWMM Converter, Version 1.3.2.36493. RESPEC performed a thorough check of the converted input files to verify validity of the data.

The 2001 OSP hydrologic analysis utilized UDSWM to develop subbasin hydrographs and route them through the watershed to their outfall locations. CUHP was not used to develop the subbasin hydrographs in the 2001 OSP. CUHP was used to calibrate the UDSWM model based on five subbasins within the study area. Therefore, a new CUHP model was developed to generate the subbasin hydrographs based on the UDSWM model input. New CUHP input variables, not required by UDSWM, were also developed, including subbasin length and distance to subbasin centroid. All other UDSWM input was left unchanged for the conversion process.

EPA SWMM requires invert elevations for each node. UDSWM only requires a starting elevation and channel slopes from one node the next. In order to convert UDSWM to EPA SWMM, a starting outfall elevation must be assigned during the conversion process. The remaining upstream node elevations are assigned automatically by the converter program based on this outfall elevation and the conduit slopes of the UDSWM model (EPA SWMM terminology includes pipes and open channels as conduits). However, this method can result in erroneous node elevations, especially in the upper portions of the watershed. It was found that the 2001 OSP node elevations, once converted to EPA SWMM, were generally higher than actual elevations. Therefore, node elevations were revised for each node in the EPA SWMM model based on the 2-foot topographic mapping.

Once the 2001 OSP models were converted, differences were observed in the results. A detailed review was conducted to determine the source of differences between the 2001 OSP results produced using the older software versions and the results from the converted models. The 2001 OSP did not include a separate CUHP model; therefore it was not possible to compare the results for each individual subbasin. Peak flows were compared at all design points along the outfalls.

The updated CUHP/SWMM results were mixed, with some design points having lower peak flows than the 2001 OSP, and some higher. A complete summary of the conversion results is included in Table 3-2 at the end of this section.

It was found that several irregularly shaped, single basin outfalls, produced results significantly different than the 2001 OSP. These subbasins were compared to other subbasins with similar imperviousness by plotting the subbasin peak runoff versus subbasin area. However, no pattern emerged from this comparison. The discrepancies were attributed to the effects of model calculation changes between the software versions, UDSWM and CUHP.

3.3 CALIBRATION

Some of the improvements recommended in the 2001 OSP have been implemented throughout the study area, including regional detention ponds and channel improvements. These improvements were designed based upon the 2001 hydrologic analysis. Therefore, to avoid discrepancies in the study area hydrology due solely to revisions in software, an effort was made to calibrate the updated hydrologic models. Following the calibration process, the hydrologic model would be updated with physical changes in the watershed, including additional regional detention ponds built since the 2001 OSP, revised land use assumptions, and corresponding subbasin impervious values to create the baseline hydrologic analysis.

The calibration process was aimed at adjusting the revised 100-year peak discharges to within 10% of the effective peak discharges from the 2001 OSP. This was done by adjusting the Cp coefficient in CUHP. Through discussions with the project sponsors, it was determined that only three subbasins required calibration, Subbasins 212, 440, and 487. Calibration of these subbasins was required to reduce 100-year peak flows at design points 310, 511, and 539, respectively.

Peak flows at design points that were significantly less than the 2001 results were analyzed for errors, but were not calibrated up to meet the 2001 peak flows. Several smaller outfalls with peak flow differences greater than ±10% were left uncalibrated based on several factors including: the subbasins are located entirely in planned open space, single subbasin outfalls with no proposed improvements, and peak flow discrepancies due to an irregular basin shape.

The calibrated hydrologic model was then updated with additional regional detention ponds built since the 2001 OSP, revised land use assumptions, and corresponding subbasin impervious values to create the baseline hydrologic analysis. This is summarized in the flowing sections.

3.4 DESIGN RAINFALL

The design rainfall for the study area was obtained using the UDFCD design spreadsheet UD-Rain, version 1.0. The UD-Rain software requires the user to select a predetermined location that best represents the project location. The Broomfield location was chosen for this study area. Table 3-1 provides a summary of the point rainfall depths used in the analysis:

Table 3-1
One-Hour Design Rainfall Depths (Inches)

Storm Duration	2-Year	5-Year	10-Year	25-Year	50-year	100-Year
One Hour	0.98	1.48	1.71	2.06	2.40	2.68
Six Hour	1.51	2.00	2.44	2.87	3.30	3.74

The UD-Rain software distributed the point rainfall depths using a 5-minute time interval for each storm frequency. All tributary watersheds within the study area are significantly less than ten square miles so area adjustment factors were not required. The rainfall distributions produced by UD-Rain are included in Appendix B.

3.5 SUBBASIN CHARACTERISTICS

The subbasin input parameters required for CUHP are subbasin identification number, drainage area, subbasin length, distance to subbasin centroid, subbasin slope, percent impervious area, depression losses, and infiltration rates. Subbasin parameters were computed using ArcGIS. A summary of the CUHP input parameters are included in Appendix B.

As a general rule, UDFCD requires that individual subbasins shall average no more than 100 acres in size and no single subbasin shall exceed 130 acres. 158 subbasins were delineated for the study area with an average size of 70 acres. All subbasin slopes were less than 4%, so a slope correction per Figure RO-10 of the USDCM was not required.

Impervious area estimates for areas within the study area were developed for existing and future development conditions based on land use. Land use information was provided by the Town of Erie, including the 2005 Comprehensive Plan land use map and zoning map. GIS shapefiles of the land use and zoning maps were also provided by the Town of Erie. The Town of Erie Unified Development Code provides definition of the different zoning districts, including maximum gross density and minimum landscaping requirements, and was used to assist in development of imperviousness estimates. Other documents used in development of the impervious area estimates include the City of Lafayette 2003 Comprehensive Plan Update land use plan and zoning map and the Boulder County Comprehensive Plan Map and zoning map. Site-specific calculations were performed on existing residential developments, with a known land use, to obtain typical percent impervious values for each land use type. For nonresidential developments, the Unified Development Code requires that a minimum of 15% of the gross site shall be landscaped area. The Urban Storm Drainage Criteria Manual (USDCM) was also referenced, particularly Volume 1, Chapter 5 Runoff. Figures RO-3 through RO-5 of Chapter 5 Runoff provide total percent impervious values for different size developments and are based on typical developments in the Urban Drainage and Flood Control District.

Soils information was obtained from the National Resources Conservation Service (NRCS) Web Soil Survey. Infiltration parameters were assigned to each hydrologic soil group as recommended in Tables RO-6 of the USDCM. Composite infiltration parameters weighted by area were then determined for each subbasin. Depression losses were estimated as recommended in Table RO-7 of the USDCM. The optional parameters for pervious/impervious area connections were not used for this study area and the program defaulted to the analysis method used for traditional drainage practices.

3.6 HYDROGRAPH ROUTING

Hydrograph routing was performed in EPA SWMM, Version 5.0.022. Required input includes nodes (junctions and dividers), conduits, storage units and outlets, and outfalls. The model input parameters for junctions include node identifier, invert elevation, and maximum depth. Dividers also require overflow and diverted link identifier. Input required for conduits include conduit identifier, upstream and downstream node identifiers, shape, maximum depth, length, and roughness. Input required for storage units include storage unit identifier, invert elevation, maximum depth, and a stage-area relationship. Input required for storage outlets include outlet identifier, upstream and downstream node identifiers, and a stage-discharge relationship. Input required for outfalls include the outfall identifier and invert elevation.

The routing network from the 2001 OSP UDSWM model was converted to EPA SWMM and was used in this hydrologic analysis. The 2001 OSP numbering system for nodes, conduits, and storage units was not revised from the original model. Node invert elevations were not used in UDSWM. Alternatively, conduits were modeled with a length and slope. The CUHP/SWMM Converter program converted the UDSWM input to EPA SWMM, which requires an invert elevation at each node. The CUHP/SWMM Converter program requires a starting invert elevation at the downstream end of the study area and the remaining node invert elevations are computed based on the length and slope values of the UDSWM conveyance elements. This resulted in node invert elevations that did not represent actual elevations based on the topographic mapping. Therefore, RESPEC developed node invert elevations for each node based on the topographic mapping. EPA SWMM input parameters are provided in the input/output files, a copy of which are provided in Appendix B.

The 2001 OSP included five regional detention ponds in the baseline analysis, one of which was inadvertent detention behind a railroad embankment. Since 2001, five additional regional detention ponds have been built within the study area. The updated baseline hydrology includes the recently constructed detention ponds. The inadvertent railroad detention was removed from the modeling. RESPEC requested that the project sponsors obtain stage-storage-volume-discharge information for each of the detention ponds in order to accurately include them in the model. Where stage-storage-volume-discharge information was not available, it was developed based on the pond grading and outlet structure configuration. A summary of detention pond rating curves is included in Appendix B.

When routing elements in EPA SWMM become flooded, the water is either lost from the system or allowed to pond at that location until conveyance capacity becomes available downstream. This is not representative of actual conditions. When detention ponds flood or overtop, the flow will continue downstream. To account for this, the maximum depth of the pond was increased vertically by one foot above the known stage-area relationship. The stage-discharge relationship was also extended one foot with a discharge rate greater than the peak inflow. This is a conservative method of modeling the pond overtopping and assumes there is no freeboard in the pond.

Regional Detention Pond 1045 was designed with twin storage areas, Pond A and Pond B, each with their own rating curve. Stormwater runoff enters Pond A directly, which is designed to store approximately the 10-year event. When discharge to Pond A exceeds approximately the 10-year event, the pond will overtop a spillway into the adjacent Pond B. Ponds A and B have separate outlet structures and corresponding rating curves. This pond routing is represented in the SWMM model.

<u>Offsite Flows</u>

Offsite stormwater flows enter the study area at several locations. The offsite hydrology was analyzed in the 2001 OSP, and was not restudied for this report. The 2001 OSP utilized the results of a previous study, *Outfall Systems Planning Bullhead Gulch Watershed*, dated 1992, to account for stormwater flows from Bullhead Gulch. Bullhead Gulch enters the study area from the west, overtops U.S. Highway 287, and eventually joins Prince Tributary. The inflow hydrograph from the 2001 OSP for Bullhead Gulch was used in this baseline analysis. The Bullhead Gulch inflow hydrograph is located at JUNCT_1020, and enters Prince Tributary at JUNCT_322.

Offsite subbasin 400 enters the study area from the south and is tributary to Coal Creek. Offsite subbasin 1060 enters the study area from the west, north of Boulder Creek. The inflow hydrographs from the 2001 OSP were used for both of these offsite subbasins. Offsite subbasins 200 and 410 (tributary to Prince Tributary and Coal Creek, respectively) were included in the updated CUHP/SWMM model.

<u>Irrigation Facilities</u>

Several irrigation reservoirs and ditches are located within the study area. Interception of stormwater flows by an irrigation ditch can result in flooding at unpredictable locations along the path of the ditch. The hydrologic analysis assumes irrigation ditches are flowing full during all events and the ditches neither capture nor transport stormwater.

3.7 RESULTS OF ANALYSIS

Tables 3-2 through 3-4 summarize the UDSWM conversion results as well as provide a comparison between the updated baseline hydrologic analysis and the 2001 OSP results. Appendix B also contains several tables and figures summarizing the study results, including peak flow and runoff volume tables, hydrographs and peak flow profiles at major design points, and sample SWMM model input and output.

In general, the peak flows in the baseline hydrologic analysis are less than in the 2001 OSP and calibrated model. This is mainly due to the updated land use assumptions and corresponding subbasin impervious values as well as the addition of new regional detention facilities. There are a few instances where the peak flows from the baseline hydrologic analysis are greater than the calibrated model, most notably Design Points 904, 909, 914, and 918 along Coal Creek and Design Point 302 along Prince Tributary. All of these increases are a result of an increase in subbasin imperviousness.

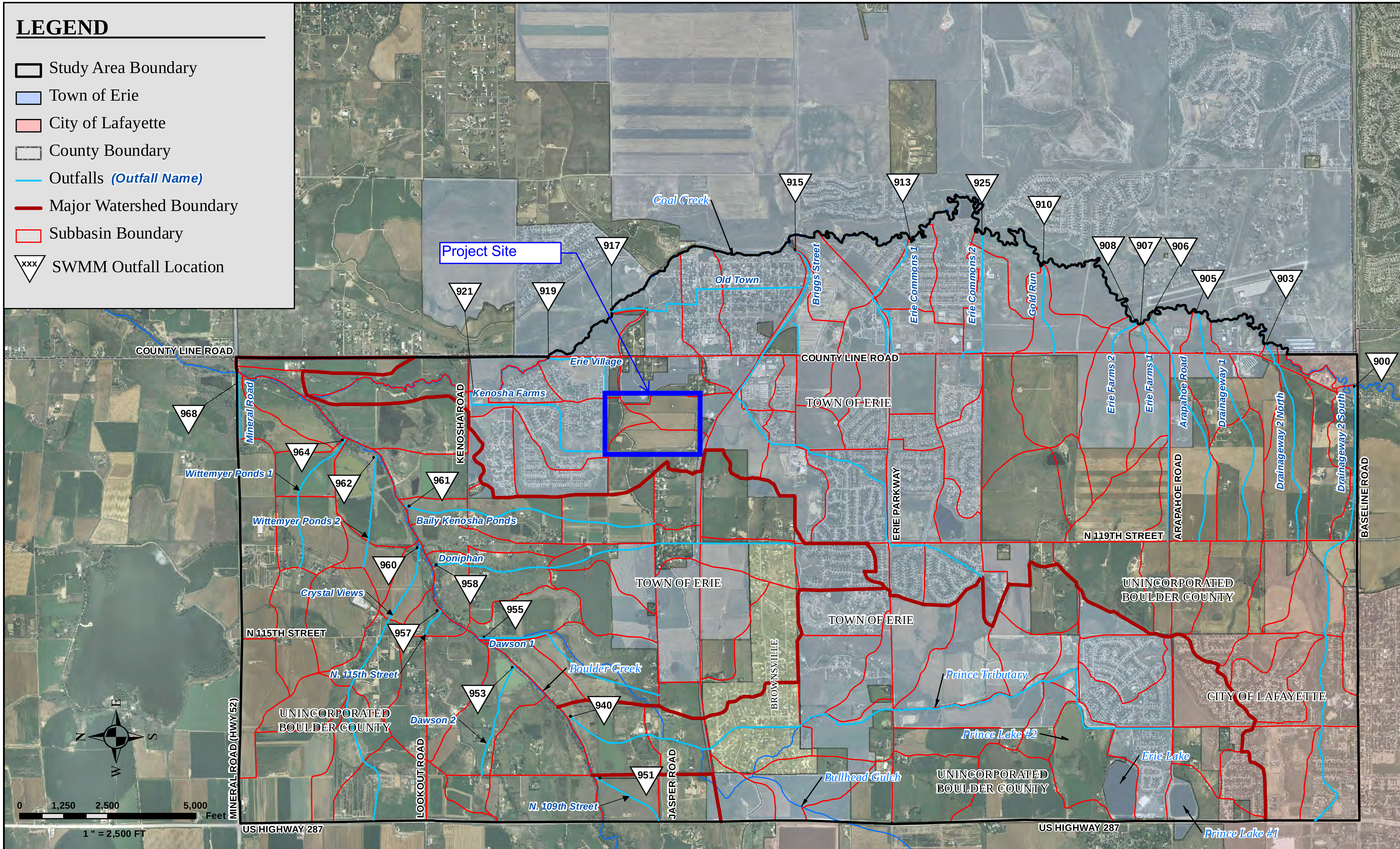
The results were checked for reasonableness by first examining the peak flow rates for the 2-year through 100-year and to ensure that the peak flow rates increased appropriately. RESPEC also plotted the peak flow rates/acre versus subbasin imperviousness to determine if any subbasins were not consistent with the others. Subbasin outliers were looked at in detail to determine what caused the abnormal result. Continuity errors were computed by EPA SWMM for flow routing to account for the conservation of runoff volume. Continuity errors were found to be within a reasonable range.

We believe this baseline hydrologic analysis is an accurate representation of the study area and the results should be used as the basis of the subsequent phases of this study, including the Alternative Analysis and Conceptual Design analysis and reports.

Due to changes in the SWMM routing from the 2001 OSP to the baseline hydrologic analysis, comparison of peak flows between the two studies is not possible in certain locations. At locations where this occurs, a N/A (not applicable) designation is shown in Tables 3-2 through 3-4. It should also be noted that the ordering of the SWMM nodes in the tables represents the 2001 OSP SWMM routing in order to easily summarize the model conversion results. Table B-2 in Appendix B provides a complete summary of the baseline hydrology results organized using the updated SWMM routing.

Table 3-2 (continued)
Model Conversion and Baseline Hydrology Results
Coal Creek Tributaries

Coal Creek Tributaries			100-year Peak Discharge (cfs) - Future Development						
SWMM Node	Location Description	Drainage Area (acres)	2001 OSP	Updated to CUHP/SWMM	Difference (Updated - 2001 OSP)	% Difference (Updated - 2001 OSP)	Baseline Hydrology	Difference (Baseline - 2001 OSP)	% Difference (Baseline - 2001 OSP)
519	E. County Line Road	148	883	935	52	6%	40	N/A	N/A
520		N/A	1,061	1,062	1	0%	N/A	N/A	N/A
912	Coal Creek	85	1,120	1,242	122	11%	183	N/A	N/A
521	E. County Line Road	79	590	551	-39	-7%	391	-199	-34%
522		174	752	600	-152	-20%	705	-47	-6%
913	Coal Creek	234	792	829	37	5%	785	-7	-1%
914	Coal Creek	51	107	119	12	11%	186	79	74%
915	Coal Creek	877	156	137	-19	-12%	584	N/A	N/A
916	Coal Creek	N/A	281	408	127	45%	N/A	N/A	N/A
523		41	172	170	-2	-1%	93	-79	-46%
525		N/A	398	414	16	4%	N/A	N/A	N/A
526		168	355	425	70	20%	106	-249	-70%
528		35	57	62	5	9%	55	-2	-3%
529		298	442	516	74	17%	212	-230	-52%
530	Meller Street	489	717	892	175	24%	515	-202	-28%
531		572	843	1,080	237	28%	624	-219	-26%
532		636	924	1,191	267	29%	262	-662	-72%
534	E. County Line Road	61	423	413	-10	-2%	250	-173	-41%
536	E. County Line Road	686	543	530	-13	-2%	276	-267	-49%
538	E. County Line Road	27	1,295	1,537	242	19%	126	N/A	N/A
917	Coal Creek	323	1,310	1,603	293	22%	741	N/A	N/A
918	Coal Creek	N/A	206	191	-15	-7%	N/A	N/A	N/A
539		69	290	402	112	39%	184	-106	-37%
919	Coal Creek	159	454	554	100	22%	431	-23	-5%
920	Coal Creek	34	85	65	-20	-23%	69	-16	-19%
540		88	223	217	-6	-3%	116	-107	-48%
541		319	494	535	41	8%	436	-58	-12%
921	Coal Creek	387	598	650	52	9%	520	-78	-13%
922	Coal Creek	29	15	29	14	97%	28	13	88%
923	Coal Creek	48	15	32	17	117%	34	19	125%
924	Coal Creek	59	18	45	27	151%	44	26	142%
925	Coal Creek	438	N/A	N/A	N/A	N/A	704	N/A	N/A



WRC ENGINEERING, INC.
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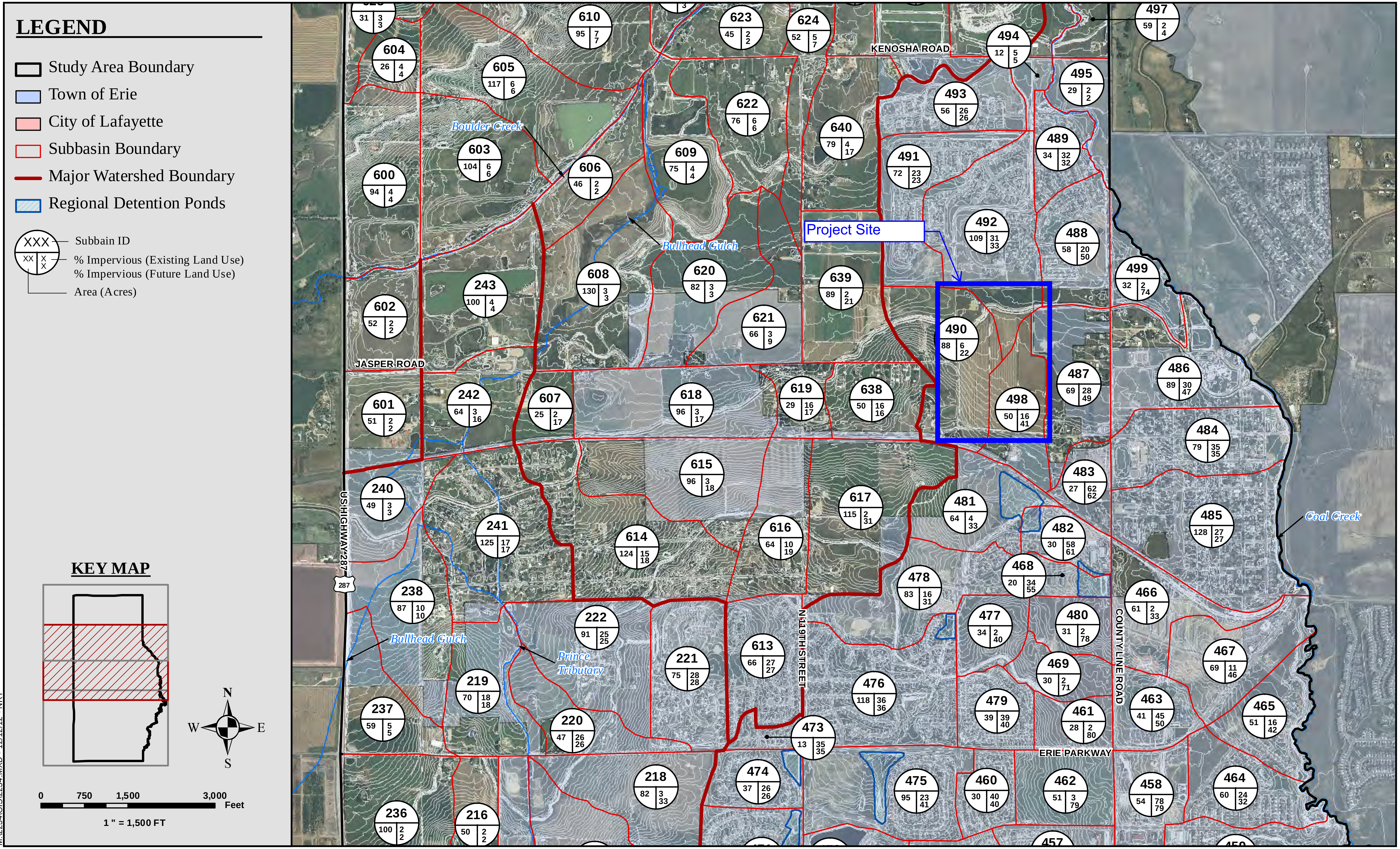
TOWN OF ERIE
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

TOWN OF ERIE OUTFALL SYSTEMS PLAN
(WEST OF COAL CREEK)

OUTFALL SYSTEMS MAP

FIGURE
B-1



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TOWN OF ERIE
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

TOWN OF ERIE OUTFALL SYSTEMS PLAN
(WEST OF COAL CREEK)

SUBBASIN MAP

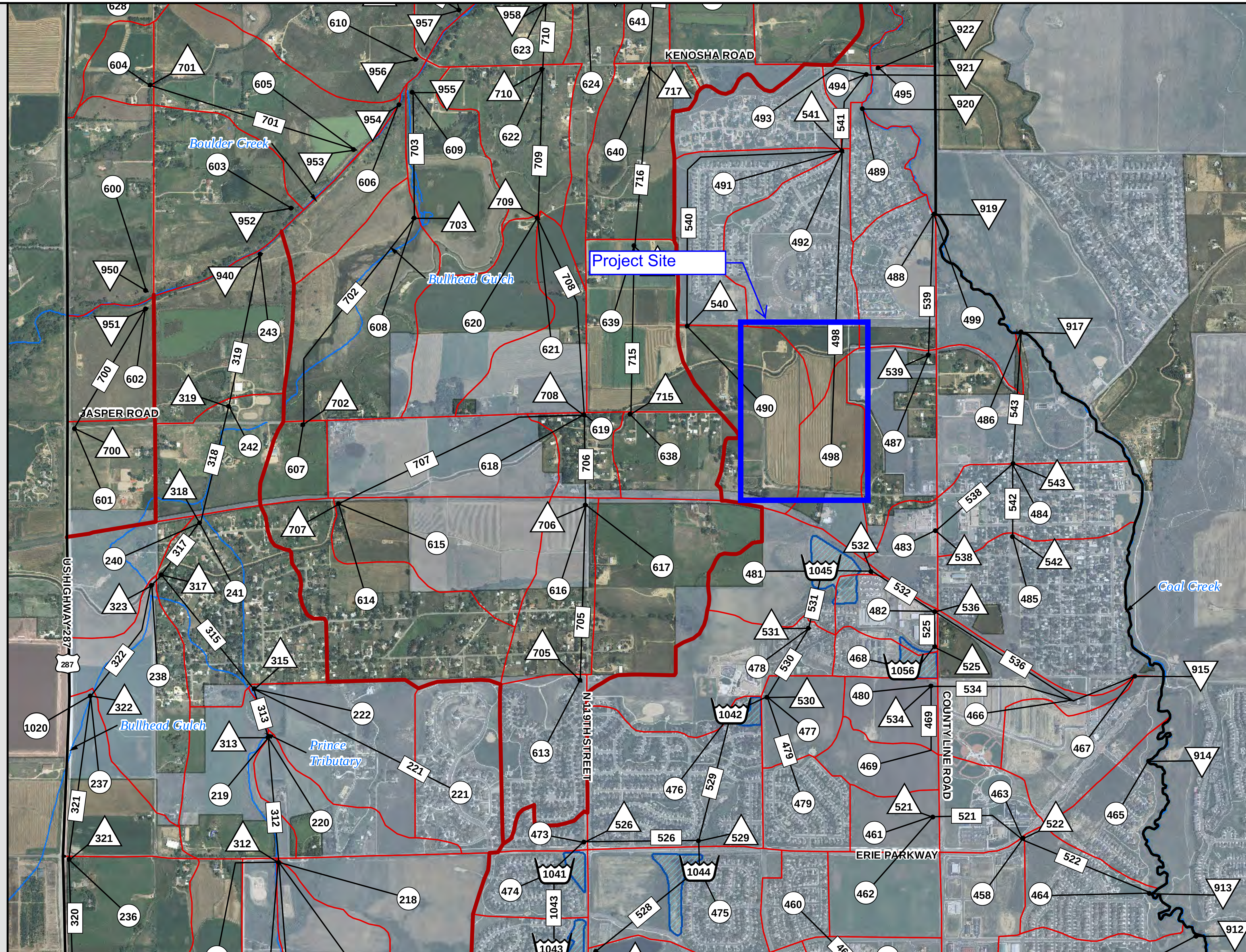
FIGURE
B-3

LEGEND

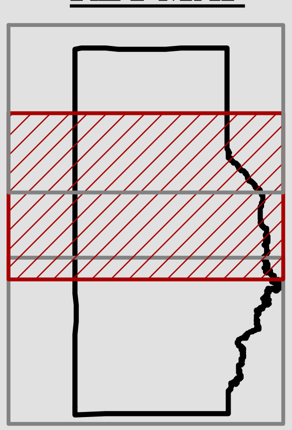
- Study Area Boundary
- Town of Erie
- City of Lafayette
- Subbasin Boundary
- Major Watershed Boundary
- Regional Detention Ponds

SWMM Elements

- Subbasin
- Design Point
- Conveyance Element
- Detention Facility
- Outfall



KEY MAP



0 750 1,500 3,000 Feet

1 " = 1,500 FT

M:\2234\GIS\2234.MXD - 12/12/12 - NRT

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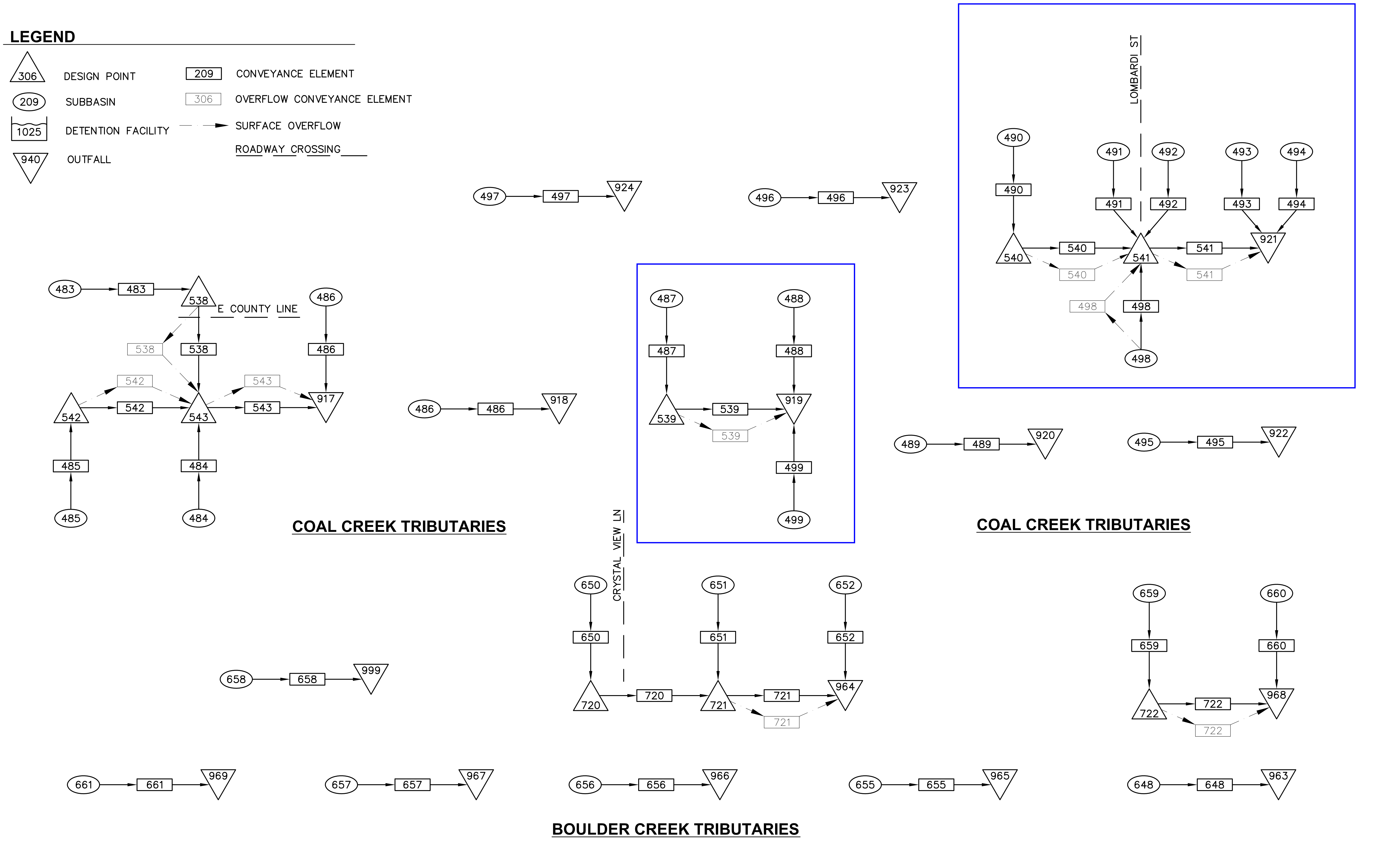
TOWN OF ERIE
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

TOWN OF ERIE OUTFALL SYSTEMS PLAN (WEST OF COAL CREEK)

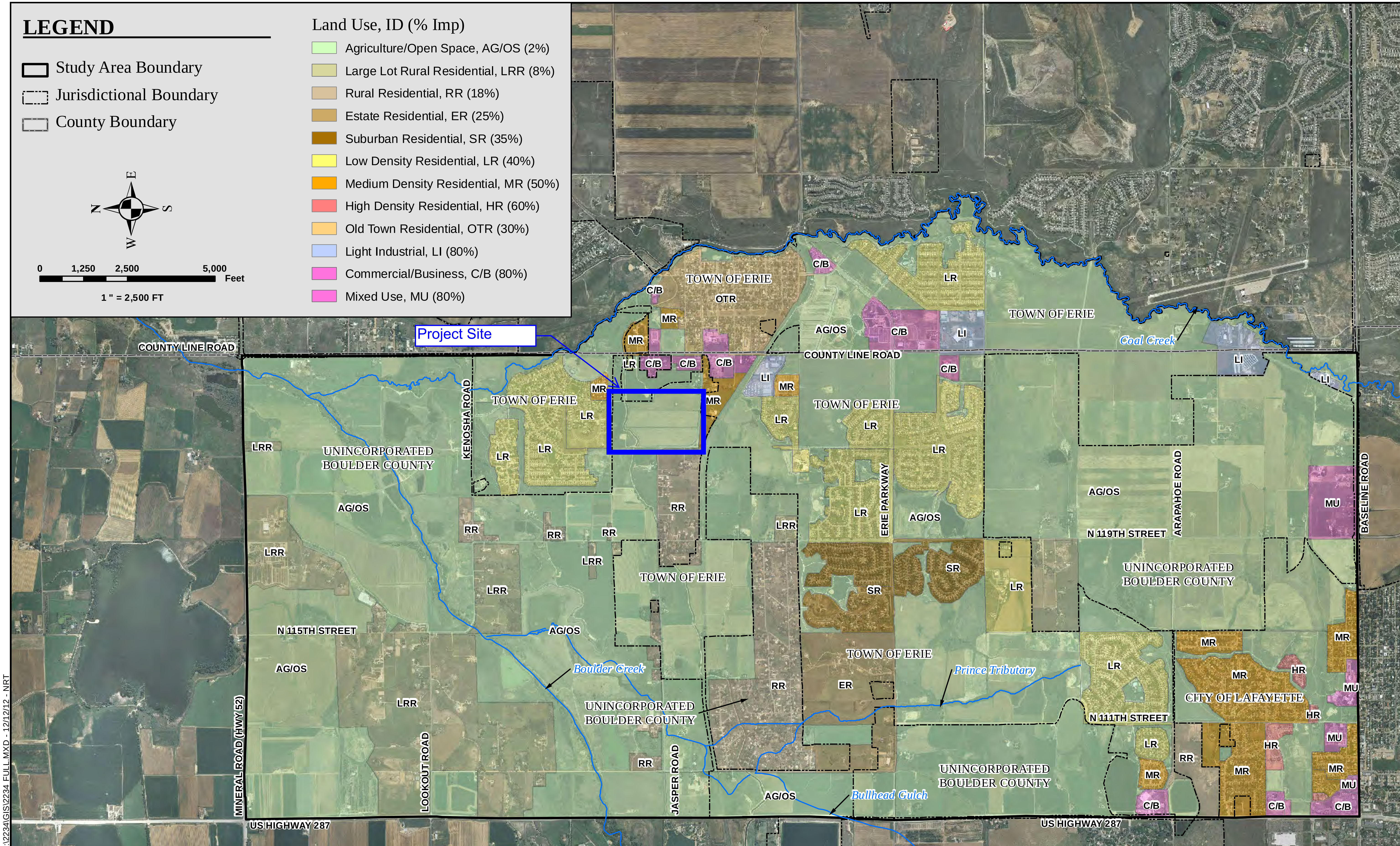
SWMM ROUTING MAP

FIGURE B-7



2234\DWG\SWMM SCHEMATIC.DWG, COAL CREEK 3 - 1/29/13 - JHN

WRC ENGINEERING, INC. 950 SOUTH CHERRY STREET SUITE 404 DENVER, COLORADO 80246 PHONE NO: (303) 757-8513 FAX NO: (303) 758-3208	DESIGNED NRT DRAWN JHN CHECKED NRT DATE 1/29/13 AS-BUILT	NO. BY DATE REVISION DESCRIPTION	TOWN OF ERIE URBAN DRAINAGE AND FLOOD CONTROL DISTRICT	TOWN OF ERIE OUTFALL SYSTEMS PLAN (WEST OF COAL CREEK)	SWMM SCHEMATIC COAL CREEK/BOULDER CREEK TRIBUTARIES	PROJECT NUMBER 2234 FIGURE B-11



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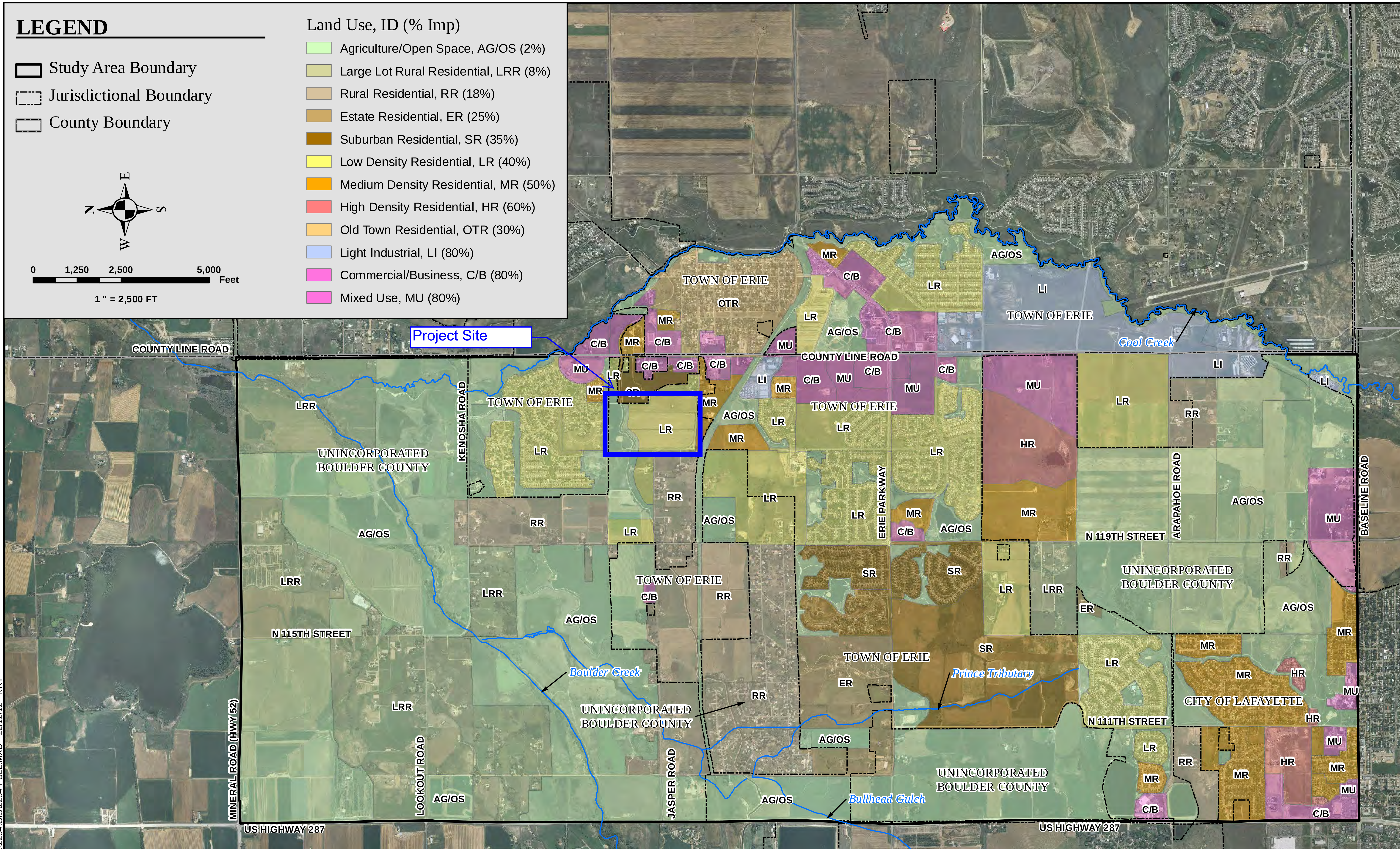
TOWN OF ERIE
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

TOWN OF ERIE OUTFALL SYSTEMS PLAN
(WEST OF COAL CREEK)

EXISTING LAND USE/
IMPERVIOUSNESS MAP

FIGURE
B-14



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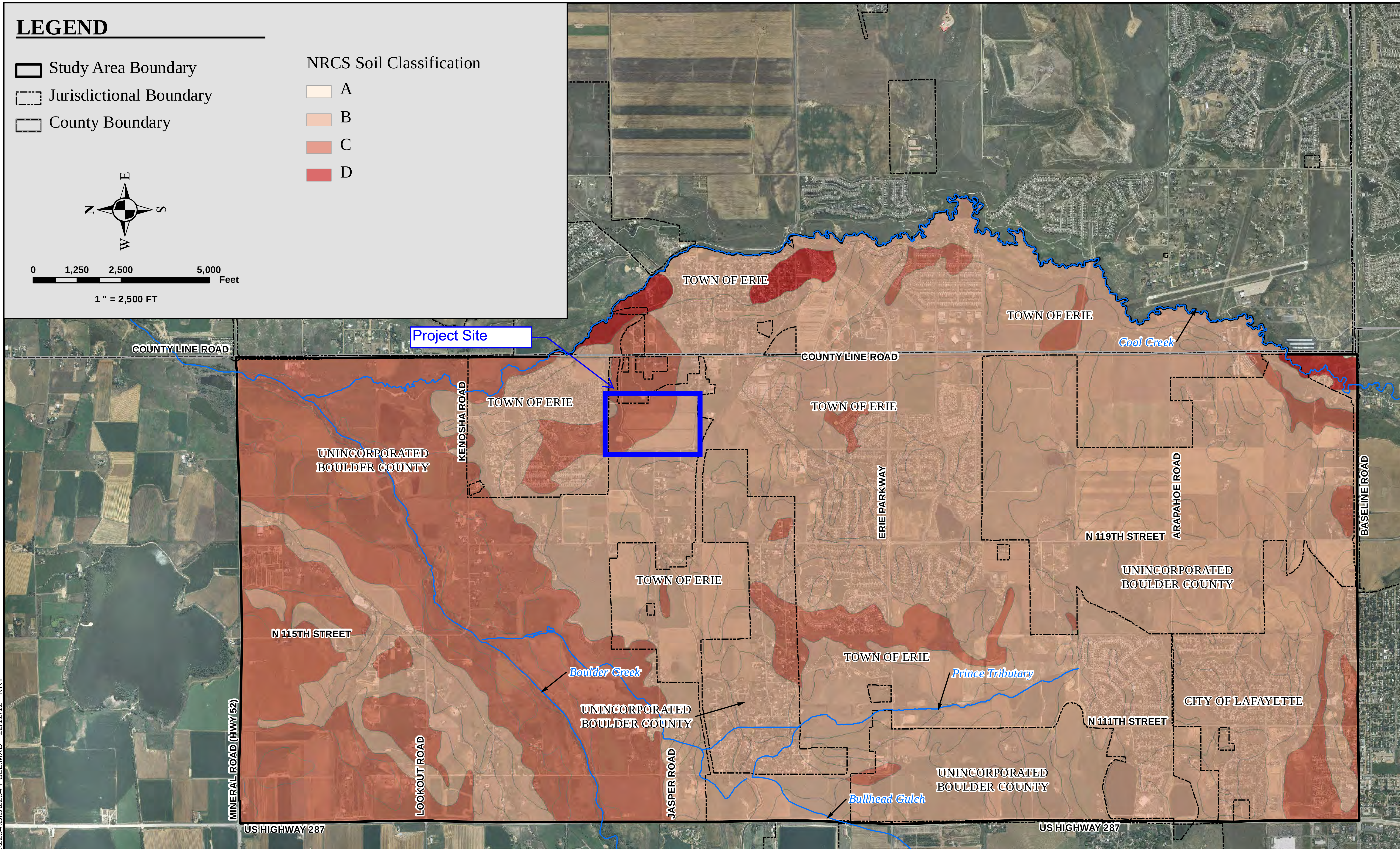
TOWN OF ERIE
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

TOWN OF ERIE OUTFALL SYSTEMS PLAN
(WEST OF COAL CREEK)

FUTURE LAND USE/
IMPERVIOUSNESS MAP

FIGURE
B-15



M:\2234\GIS\2234 FULL.MXD - 12/12/12 - NRT

WRC ENGINEERING, INC. WRC ENGINEERING, INC. 950 SOUTH CHERRY STREET, SUITE 404 DENVER, COLORADO 80246 PHONE: 303-757-8513 FAX: 303-758-3208	TOWN OF ERIE URBAN DRAINAGE AND FLOOD CONTROL DISTRICT	TOWN OF ERIE OUTFALL SYSTEMS PLAN (WEST OF COAL CREEK)	SOILS CONDITIONS MAP	FIGURE B-16

Depth-Duration-Frequency and Intensity-Duration-Frequency Tables for Colorado Hydrologic Zones 1 through 4

Depth-Duration-Frequency and Intensity-Duration-Frequency Tables for Colorado Hydrologic Zones 1 through 4

Project: Town of Erie OSP Update

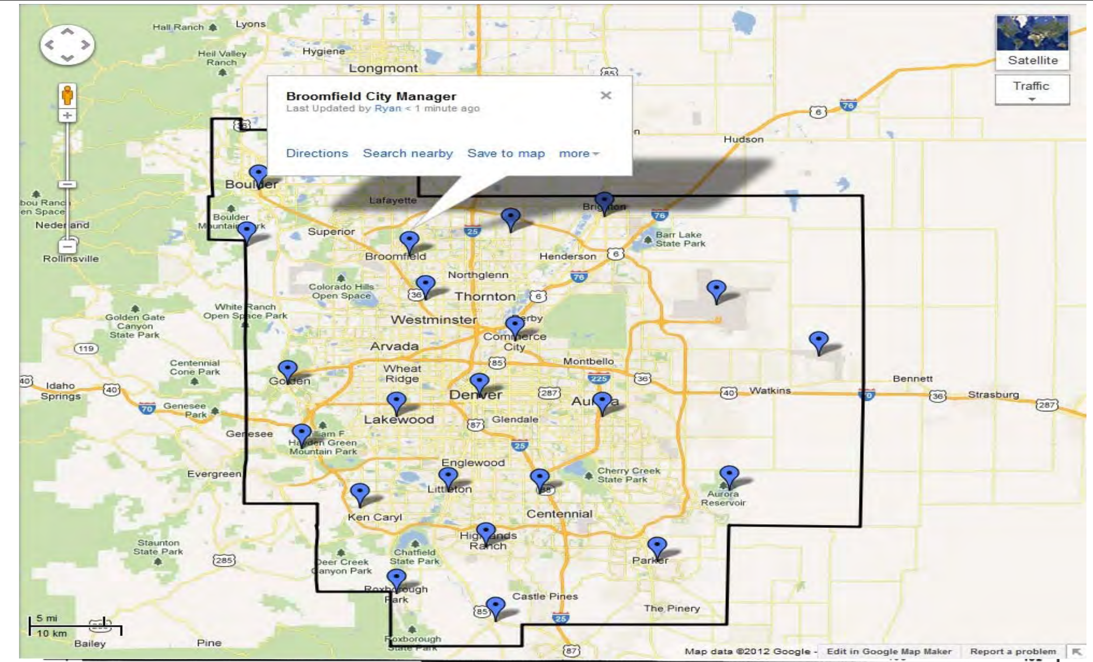
Where is the Watershed Located?

- (●) Located within UDFCD Boundary
- ( ) Located outside of UDFCD Boundary

Hydrologic Zone (1, 2, 3, or 4) = 1 (see map)
Elevation at Center of Watershed = N/A ft
Watershed Area (Optional) = sq. mi.

Select a location within the UDFCD boundary: Broomfield - Broomfield City Manager

Longitude: 39° 55' 12" Latitude: 105° 04' 09" W



1. Rainfall Depth-Duration-Frequency Table

If within the UDFCD Boundary, Enter the 1-hour and 6-hour rainfall depths from the USDCM Volume 1.
Otherwise, Enter the 6-hour and 24-hour rainfall depths from the NOAA Atlas 2 Volume III.

Return	Rainfall Depth in Inches at Time Duration								
Period	*5-min*	*10-min*	*15-min*	*30-min*	*1-hr*	*2-hr*	*3-hr*	*6-hr*	*24-hr*
2-yr	0.28	0.44	0.56	0.64	0.98	1.16	1.30	1.51	N/A
5-yr	0.42	0.67	0.84	0.97	1.48	1.66	1.79	2.00	N/A
10-yr	0.48	0.77	0.97	1.12	1.71	1.96	2.15	2.44	N/A
25-yr	0.58	0.93	1.17	1.35	2.06	2.34	2.54	2.87	N/A
50-yr	0.68	1.08	1.36	1.57	2.40	2.71	2.94	3.30	N/A
100-yr	0.76	1.21	1.52	1.76	2.68	3.04	3.31	3.74	N/A
500-yr	0.95	1.52	1.91	2.21	3.37	3.79	4.11	4.61	N/A

Note: Refer to Figures 4-1 through 4-12 of USDCM Volume 1 for 1-hr and 6-hr rainfall depths.
Refer to NOAA Atlas 2 Volume III isopluvial maps for 6-hr and 24-hr rainfall depths.
Rainfall depths for durations less than 1-hr are calculated using Equation 4-4 in USDCM Volume 1.

2. Rainfall Intensity-Duration-Frequency Table

Return	Rainfall Intensity in Inches Per Hour at Time Duration								
Period	*5-min*	*10-min*	*15-min*	*30-min*	*1-hr*	*2-hr*	*3-hr*	*6-hr*	*24-hr*
2-yr	3.32	2.65	2.22	1.54	0.98	0.61	0.45	0.27	0.09
5-yr	5.02	4.00	3.36	2.32	1.48	0.92	0.68	0.40	0.14
10-yr	5.80	4.63	3.88	2.68	1.71	1.06	0.79	0.47	0.16
25-yr	6.99	5.57	4.68	3.23	2.06	1.28	0.95	0.56	0.19
50-yr	8.14	6.49	5.45	3.77	2.40	1.49	1.11	0.66	0.22
100-yr	9.09	7.25	6.08	4.20	2.68	1.67	1.24	0.73	0.25
500-yr	11.42	9.11	7.64	5.28	3.37	2.09	1.55	0.92	0.31

Note: Intensity approximated using 1-hr rainfall depths and Equation 4-3 in USDCM Volume 1.

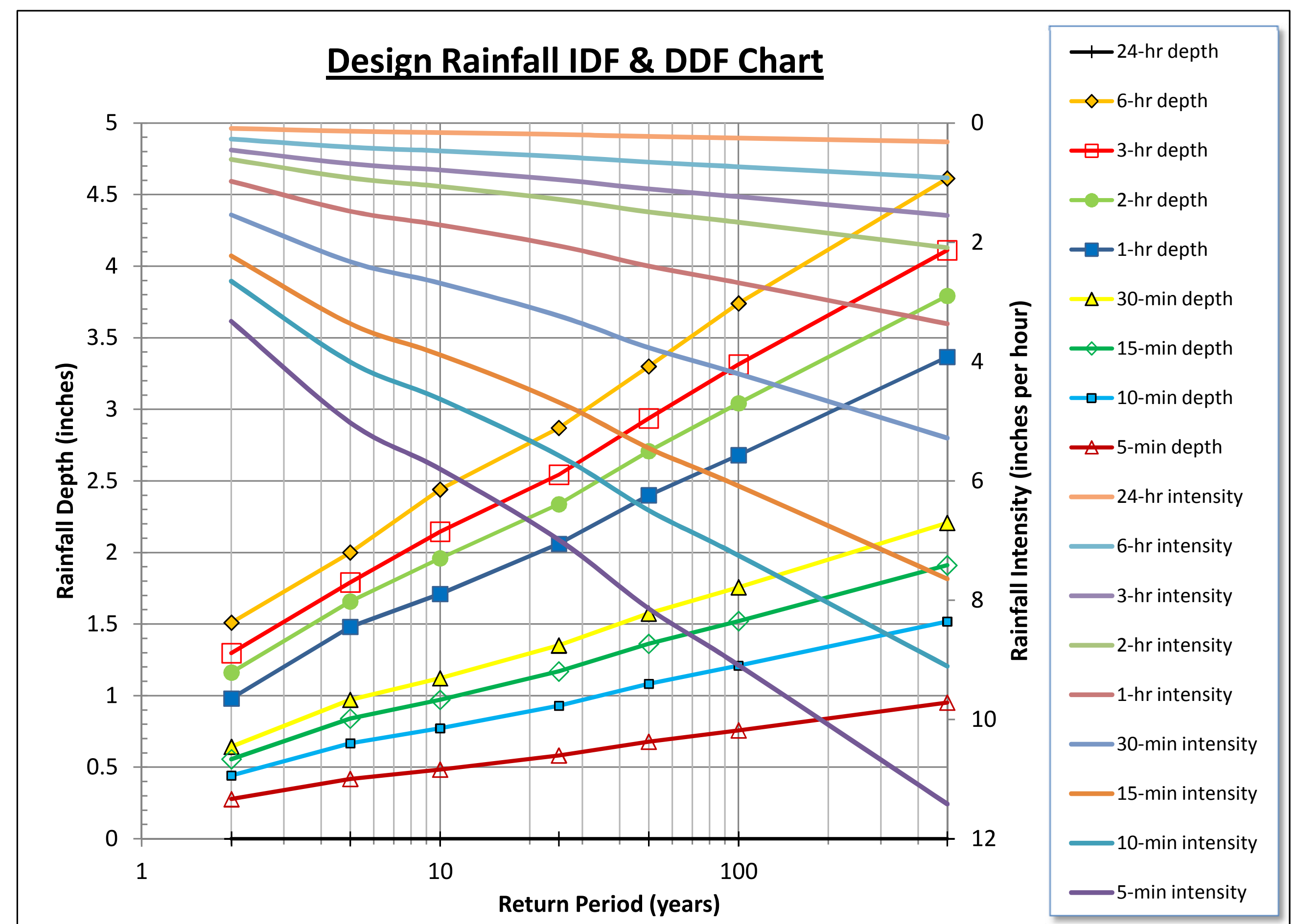


Table B-1
CUHP Input

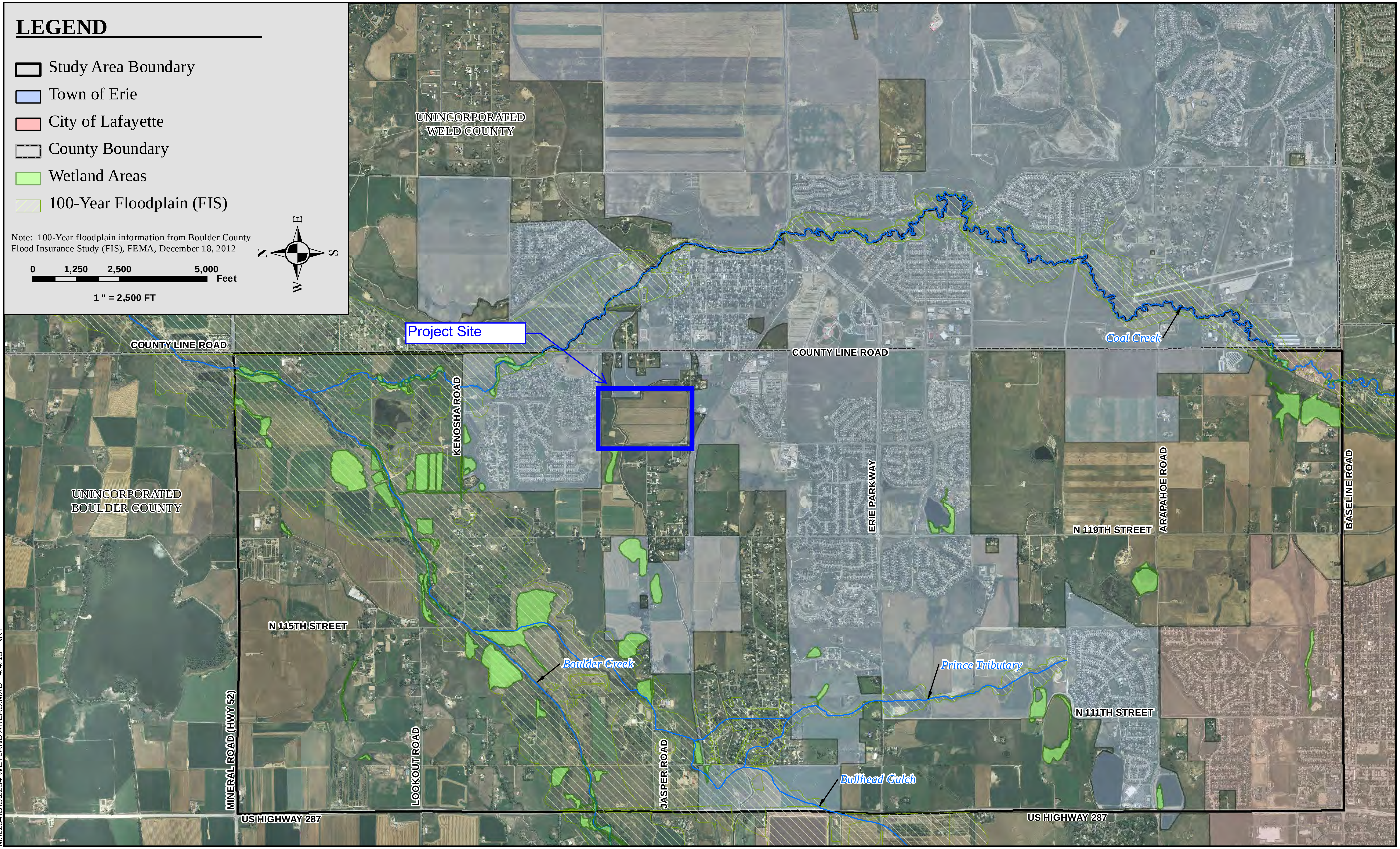
Subbasin	Area (mi^2)	Distance to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness		Depression Storage		Horton's Infiltration Parameters		
					Existing Land Use	Future Land Use	Pervious	Impervious	Initial Rate (in/hr)	Decay Coefficient (1/sec)	Final Rate (in/hr)
468	0.031	0.170	0.315	0.024	33.9	55.1	0.38	0.10	4.50	0.0018	0.60
469	0.047	0.185	0.341	0.012	2.0	71.3	0.38	0.10	4.41	0.0018	0.59
470	0.064	0.233	0.452	0.018	31.8	31.8	0.38	0.10	4.50	0.0018	0.60
471	0.121	0.258	0.542	0.020	33.6	33.6	0.38	0.10	4.50	0.0018	0.60
472	0.054	0.160	0.365	0.015	13.5	13.5	0.38	0.10	4.50	0.0018	0.60
473	0.021	0.132	0.273	0.016	35.2	35.2	0.38	0.10	4.50	0.0018	0.60
474	0.058	0.183	0.422	0.015	26.3	26.3	0.38	0.10	4.50	0.0018	0.60
475	0.149	0.162	0.473	0.015	22.8	40.8	0.38	0.10	4.50	0.0018	0.60
476	0.185	0.375	0.785	0.015	35.6	35.8	0.38	0.10	4.50	0.0018	0.60
477	0.054	0.150	0.305	0.017	2.4	40.0	0.38	0.10	4.35	0.0018	0.59
478	0.130	0.364	0.842	0.016	15.7	31.2	0.38	0.10	4.50	0.0018	0.60
479	0.061	0.187	0.404	0.017	38.9	40.0	0.38	0.10	4.05	0.0018	0.57
480	0.049	0.152	0.326	0.023	2.1	78.3	0.38	0.10	4.50	0.0018	0.60
481	0.100	0.297	0.544	0.017	4.4	33.4	0.38	0.10	4.50	0.0018	0.60
482	0.047	0.137	0.321	0.008	58.2	61.4	0.38	0.10	4.50	0.0018	0.60
483	0.043	0.098	0.259	0.010	61.5	61.5	0.38	0.10	4.50	0.0018	0.60
484	0.123	0.094	0.460	0.009	35.2	35.2	0.38	0.10	4.50	0.0018	0.60
485	0.200	0.232	0.581	0.008	27.4	27.4	0.38	0.10	4.16	0.0018	0.58
486	0.138	0.274	0.601	0.011	30.0	46.8	0.38	0.10	3.50	0.0018	0.53
487	0.108	0.235	0.676	0.011	28.3	49.2	0.38	0.10	3.50	0.0018	0.53
488	0.090	0.187	0.539	0.011	19.9	49.7	0.38	0.10	4.26	0.0018	0.58
489	0.052	0.221	0.426	0.012	32.2	32.2	0.38	0.10	4.17	0.0018	0.58
490	0.138	0.463	0.827	0.012	6.2	21.5	0.38	0.10	4.24	0.0018	0.58
491	0.112	0.624	0.934	0.004	22.9	23.0	0.38	0.10	4.13	0.0018	0.58
492	0.171	0.347	0.768	0.009	31.1	32.7	0.38	0.10	3.63	0.0018	0.54
493	0.088	0.207	0.543	0.004	25.5	25.5	0.38	0.10	4.50	0.0018	0.60
494	0.018	0.113	0.279	0.005	5.1	5.1	0.38	0.10	3.99	0.0018	0.57
495	0.046	0.216	0.515	0.006	2.0	2.0	0.38	0.10	3.00	0.0018	0.50
496	0.075	0.472	0.924	0.007	2.0	4.4	0.38	0.10	3.16	0.0018	0.51
497	0.093	0.505	0.926	0.006	2.0	4.1	0.38	0.10	3.00	0.0018	0.50
498	0.078	0.332	0.617	0.008	15.6	40.6	0.38	0.10	3.98	0.0018	0.57
499	0.049	0.327	0.593	0.008	2.2	73.6	0.38	0.10	3.45	0.0018	0.53
600	0.147	0.294	0.585	0.030	4.3	4.3	0.38	0.10	3.73	0.0018	0.55
601	0.080	0.237	0.479	0.003	2.0	2.3	0.38	0.10	4.30	0.0018	0.59
602	0.081	0.228	0.449	0.008	2.0	2.0	0.38	0.10	3.00	0.0018	0.50
603	0.162	0.238	0.538	0.028	5.8	5.8	0.38	0.10	3.35	0.0018	0.52
604	0.040	0.097	0.263	0.020	4.5	4.5	0.38	0.10	4.00	0.0018	0.57
605	0.183	0.415	0.799	0.025	5.6	5.6	0.38	0.10	3.81	0.0018	0.55
606	0.071	0.402	0.694	0.006	2.0	2.0	0.38	0.10	3.00	0.0018	0.50
607	0.040	0.121	0.282	0.010	2.0	16.8	0.38	0.10	4.37	0.0018	0.59
608	0.203	0.377	0.733	0.007	2.8	3.0	0.38	0.10	3.14	0.0018	0.51

Table B-2
Peak Flow Summary

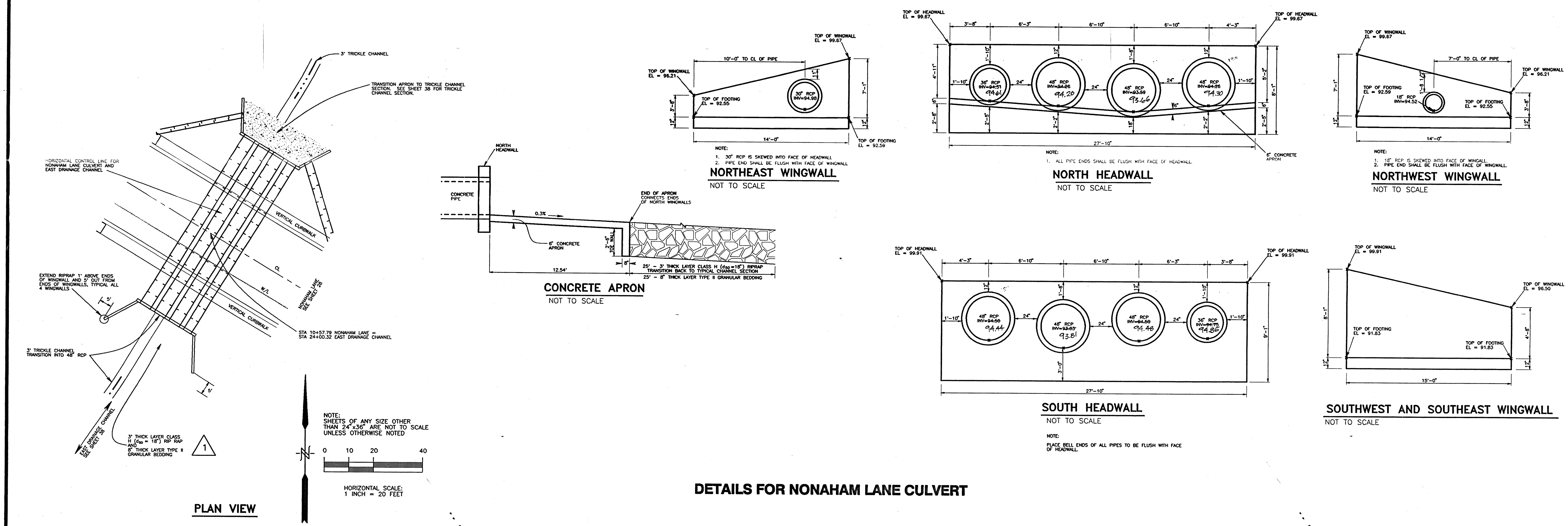
Coal Creek Tributaries			Peak Discharge (cfs) - Existing Development						Peak Discharge (cfs) - Future Development					
SWMM Node	Location Description	Drainage Area (acres)	2-Year	5-Year	10-Year	25-Year	50-year	100-Year	2-Year	5-Year	10-Year	25-Year	50-year	100-Year
912		85	22	56	74	120	153	183	22	56	74	120	153	183
521	E. County Line Road	79	1	23	34	72	97	122	117	190	221	283	337	391
522		174	88	159	194	288	360	431	200	339	400	535	625	705
913		234	92	182	227	349	438	513	202	369	440	569	676	785
914		51	6	24	33	60	78	95	31	66	84	125	157	186
523		41	12	29	37	61	77	93	12	29	37	61	77	93
526		168	10	20	27	68	95	106	10	20	27	68	95	106
528		35	3	13	18	34	45	55	3	13	18	34	45	55
529		298	11	46	66	136	183	210	19	63	84	137	188	212
530	Meller Street	489	32	77	130	263	362	470	49	99	162	295	410	515
531		572	38	91	152	317	419	551	66	142	198	367	487	624
532		636	25	81	117	187	223	258	46	111	148	196	248	262
534	E. County Line Road	61	0	13	21	46	63	80	65	112	132	179	216	250
536	E. County Line Road	686	27	86	125	193	225	267	51	119	159	207	252	276
915		877	25	96	143	248	307	380	118	225	275	399	493	584
538	E. County Line Road	27	30	54	65	88	107	126	30	54	65	88	107	126
542		128	33	91	119	195	249	300	33	91	119	195	249	300
543		234	77	170	220	361	460	559	77	170	220	361	460	559
917		323	98	228	283	449	575	706	125	260	322	471	604	741
539		69	18	50	64	101	128	152	36	73	88	128	157	184
919		159	26	72	95	164	211	259	90	165	200	294	364	431
920		34	9	22	28	45	57	69	9	22	28	45	57	69
540		88	2	17	25	51	68	87	10	30	41	73	94	116
541	Lombardi Street	319	31	86	116	209	272	347	45	121	160	274	351	436
921		387	39	111	148	263	330	427	53	145	191	321	414	520
922		29	0	6	9	17	22	28	0	6	9	17	22	28
923		48	0	7	10	19	26	33	1	7	11	20	26	34
924		59	0	9	14	25	34	43	1	10	14	26	34	44
518	E. County Line Road	202	2	50	79	172	230	292	165	313	381	544	684	763
519	E. County Line Road	148	4	15	21	32	39	40	4	15	21	32	39	40
925		438	5	52	84	185	249	315	146	286	363	509	605	704

Table B-3
Runoff Volume Summary

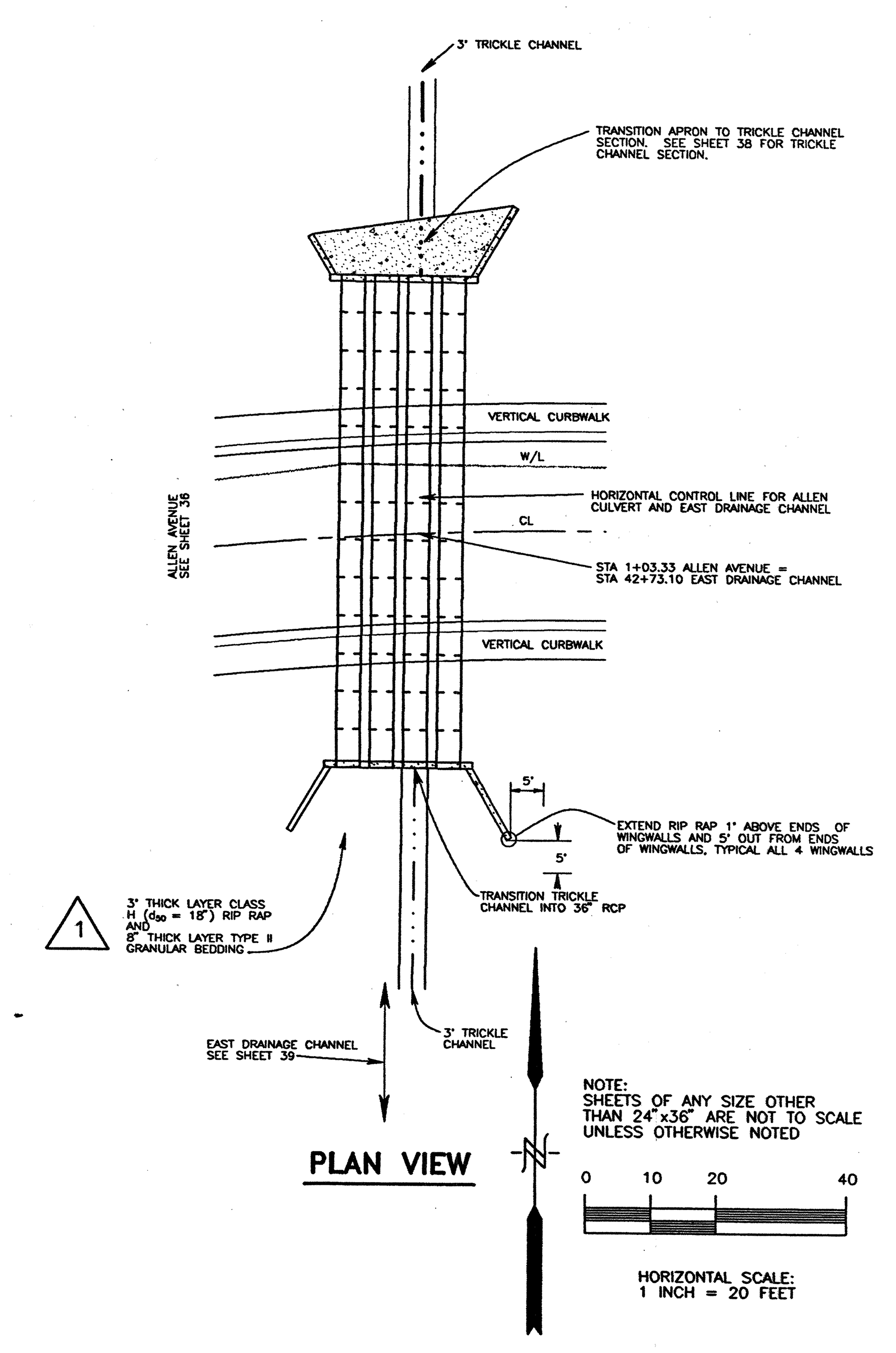
Coal Creek Tributaries			Runoff Volume (acre-ft) - Existing Development						Runoff Volume (acre-ft) - Future Development					
SWMM Node	Location Description	Drainage Area (acres)	2-Year	5-Year	10-Year	25-Year	50-year	100-Year	2-Year	5-Year	10-Year	25-Year	50-year	100-Year
912		85	1.8	4.2	5.6	8.6	11.0	13.4	1.8	4.2	5.6	8.6	11.0	13.4
521	E. County Line Road	79	0.1	1.5	2.5	5.5	7.5	9.9	4.8	7.9	9.3	11.8	14.1	16.1
522		174	4.8	9.7	12.5	18.6	23.5	28.4	9.8	16.4	19.7	25.6	31.0	35.7
913		234	5.9	12.4	16.2	24.4	31.5	38.6	11.2	20.0	24.9	33.3	40.5	47.1
914		51	0.5	1.7	2.4	4.3	5.6	7.1	1.6	3.1	4.0	5.7	7.2	8.6
523		41	0.9	2.0	2.7	4.1	5.3	6.5	0.9	2.0	2.7	4.1	5.3	6.5
526		168	3.7	8.4	11.2	17.1	21.9	26.7	3.7	8.4	11.2	17.1	21.9	26.7
528		35	0.3	1.0	1.5	2.8	3.7	4.8	0.3	1.0	1.5	2.8	3.7	4.8
529		298	4.6	12.1	16.8	27.4	35.7	44.3	5.7	14.0	18.8	29.3	37.7	46.1
530	Meller Street	489	8.7	21.4	29.2	46.6	60.3	74.3	10.8	24.8	32.8	50.0	63.8	77.6
531		572	9.5	24.1	33.1	53.5	69.8	86.3	12.5	28.8	38.2	58.5	74.9	91.1
532		636	8.1	23.7	33.6	56.1	74.0	91.3	12.4	30.4	40.9	63.2	80.9	97.4
534	E. County Line Road	61	0.1	1.2	2.0	4.3	5.9	7.7	3.6	5.9	7.1	9.1	10.9	12.5
536	E. County Line Road	686	9.3	26.5	37.3	61.6	81.0	99.8	14.0	33.8	45.1	69.5	88.6	106.5
915		877	10.0	30.9	44.4	75.7	100.1	124.3	21.4	47.6	62.3	93.0	117.5	140.3
538	E. County Line Road	27	1.3	2.2	2.7	3.6	4.4	5.2	1.3	2.2	2.7	3.6	4.4	5.2
542		128	2.4	6.0	8.1	12.6	16.2	19.9	2.4	6.0	8.1	12.6	16.2	19.9
543		234	6.1	13.2	17.3	25.6	32.3	39.0	6.1	13.2	17.3	25.6	32.3	39.0
917		323	8.0	17.9	23.9	35.4	44.7	53.9	9.2	19.5	25.5	36.9	46.2	55.3
539		69	1.4	3.6	4.8	7.2	9.1	11.1	2.6	5.1	6.4	8.7	10.8	12.7
919		159	2.1	6.8	9.5	15.0	19.5	24.1	6.8	12.5	15.5	20.8	25.5	29.9
~~920~~		~~34~~	~~0.8~~	~~1.7~~	~~2.3~~	~~3.5~~	~~4.4~~	~~5.4~~	~~0.8~~	~~1.7~~	~~2.3~~	~~3.5~~	~~4.4~~	~~5.4~~
540		88	0.3	2.1	3.4	6.6	9.0	11.6	1.2	3.5	4.9	8.0	10.5	13.0
541	Lombardi Street	319	4.3	13.0	18.3	29.7	38.6	47.9	6.6	16.1	21.6	32.8	41.9	51.1
921		387	5.3	15.7	22.1	35.9	46.8	58.3	7.6	18.8	25.4	39.3	50.4	61.7
922		29	0.0	0.9	1.4	2.4	3.2	4.1	0.0	0.9	1.4	2.4	3.2	4.1
923		48	0.1	1.4	2.2	3.8	5.1	6.6	0.1	1.5	2.3	3.9	5.3	6.7
924		59	0.1	1.8	2.8	4.8	6.5	8.2	0.1	1.9	2.9	4.9	6.6	8.3
518	E. County Line Road	202	0.3	3.9	6.6	14.2	19.5	25.6	8.9	15.7	19.3	26.0	32.9	38.6
519	E. County Line Road	148	1.9	5.7	7.9	12.7	16.7	20.6	2.0	5.7	8.0	12.8	16.8	20.6
925		438	2.2	9.6	14.6	27.1	36.4	46.3	11.0	22.1	28.9	41.4	52.8	62.7



WRC ENGINEERING, INC. 950 SOUTH CHERRY STREET, SUITE 404 DENVER, COLORADO 80246 PHONE: 303-757-8513 FAX: 303-758-3208	TOWN OF ERIE URBAN DRAINAGE AND FLOOD CONTROL DISTRICT	TOWN OF ERIE OUTFALL SYSTEMS PLAN (WEST OF COAL CREEK)	WETLAND AND RIPARIAN AREAS	FIGURE E-1

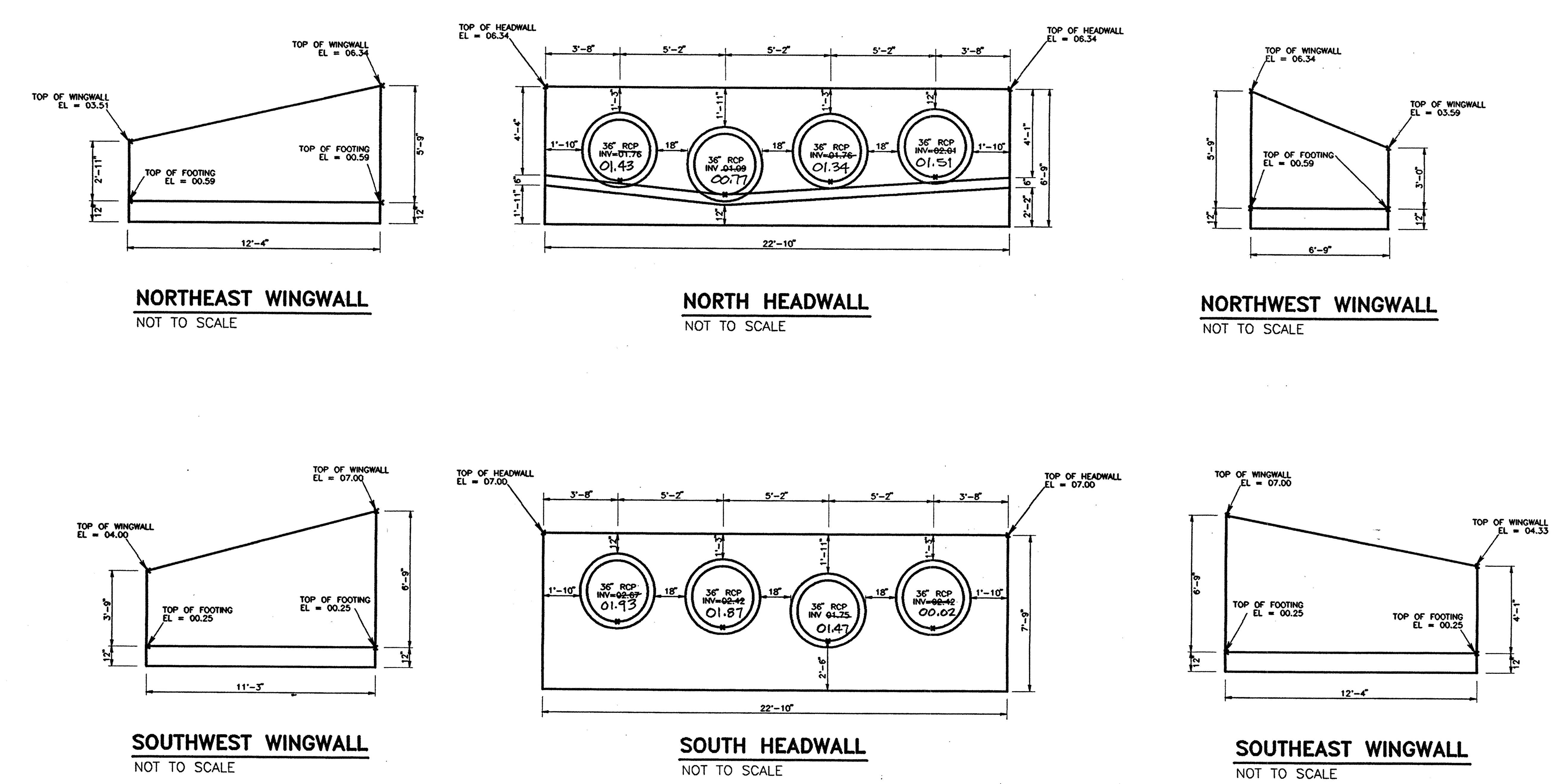


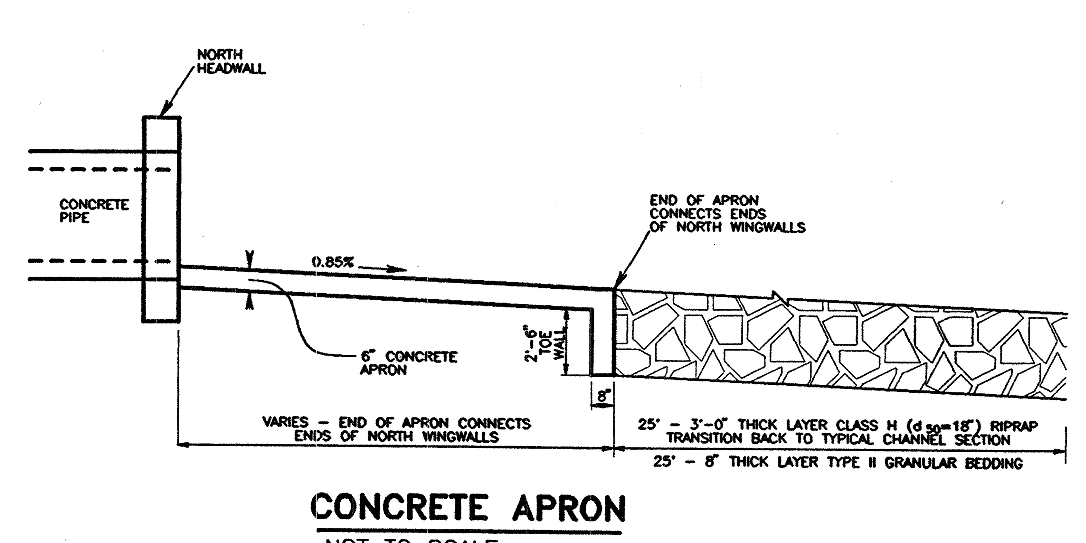
DETAILS FOR NONAHAM LANE CULVERT



NOTES FOR ALL KENOSHA FARM CULVERTS:

1. ALL HEADWALLS, WINGWALLS, APRONS AND OTHER RELATED ITEMS SHALL CONFORM TO CURRENT COLORADO DEPARTMENT OF TRANSPORTATION DESIGN STANDARDS, SPECIFICATIONS, AND STANDARD PLANS.
2. HEADWALLS SHALL FOLLOW CDOT STANDARD PLAN NO. M-601-10. WINGWALLS AND APRONS SHALL CONFORM TO CDOT STANDARD PLAN NO. M-601-20.
3. ALL PIPE JOINTS SHALL BE WATERTIGHT.
4. BEDDING TYPE AND RIP-RAP CLASS PER BOULDER COUNTY STORM DRAINAGE CRITERIA MANUAL.





DETAILS FOR ALLEN AVENUE CULVERT

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By: Todd J. Borger, P.E. No. 32993

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RMC
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(303) 772-5282 METRO:665-6283 FAX:665-6959
825 DELAWARE AVE, SUITE 500
LONGMONT, CO 80501

NONAHAM LANE AND ALLEN AVENUE CULVERT DETAILS
KENOSHA FARM
MELODY HOMES, Inc.

REVISIONS

NO.	DESCRIPTION	DATE	BY
1	RIPRAP UPSTREAM OF CULVERT	09/15/98	TJB

ONLY VALID FOR CONSTRUCTION IF ORIGINAL SEAL & SIGNATURE ARE ON EACH SHEET

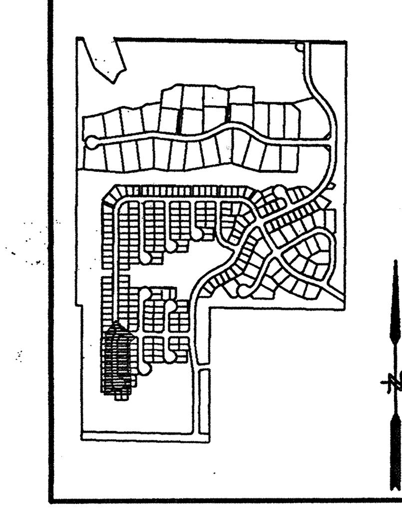
PLOTTED: Dec 2,1999
DESIGNED BY: TJB
DRAWN BY: TEAM A
CHECKED BY: KRR

JOB NUMBER:
80-0068.005.50

PLOTTED: Thu Dec 02 14:09:25 1999 D:\0068_005\Kenosha Farm Const Plans.pro

ALLEN AVENUE WATER LINE TABLE

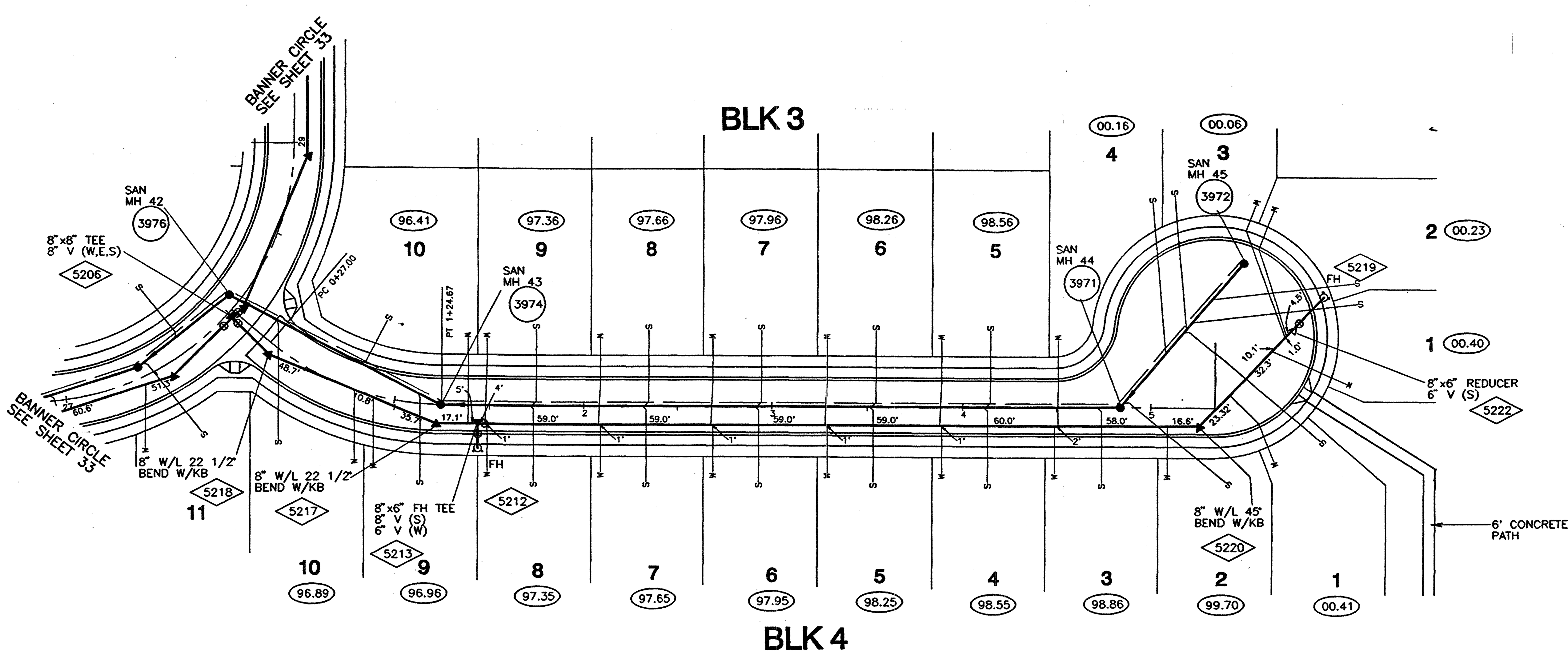
POINT	STATION	OFFSET	DESC
1029	0+10.00	10.00 LT	WLTEE
1030	0+93.31	11.46 LT	WLDEFLECT
1031	1+50.84	10.00 LT	WL STUB

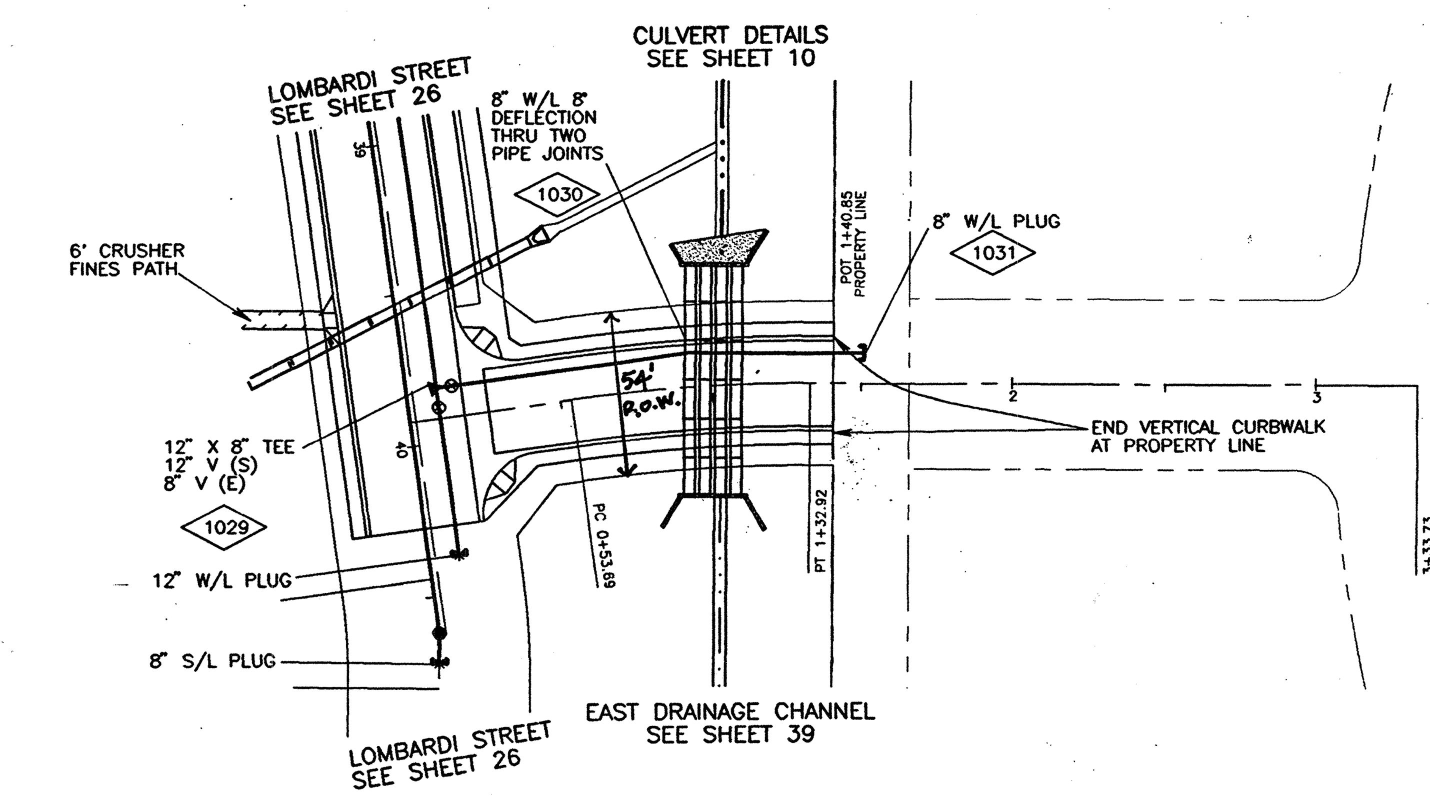


KEY MAP

0 750 1500 3000

SCALE: 1 INCH = 1500 FEET





LEGEND

331	WATER LINE POINT
547	STORM SEWER POINT
358	SANITARY SEWER POINT
87.42	SANITARY SEWER SERVICE INVERT IN LOT

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COOKE COURT SANITARY SEWER TABLE

POINT	STATION	OFFSET	DESC
3976	−0+06.10	5.25 LT	SANMH 42
3974	1+24.15	0.0	SANMH 43
3971	4+83.75	0.0	SANMH 44
3972	5+48.45	77.34 LT	SANMH 45

NOTE:
SHEETS OF ANY SIZE OTHER THAN 24"x36" ARE NOT TO SCALE UNLESS OTHERWISE NOTED

0 25 50 100

HORIZONTAL SCALE: 1 INCH = 50 FEET

VERTICAL SCALE: 1 INCH = 5 FEET

COOKE COURT WATER LINE TABLE

POINT	STATION	OFFSET	DESC
5206	0+03.13	2.95 RT	WLTEE
5218	0+30.18	5.48 RT	WLBEND
5217	1+21.90	10.03 RT	WLBEND
5213	1+43.75	10.00 RT	WLFHTEE
5212	1+43.75	23.00 RT	WLFH
5220	5+25.34	10.00 RT	WLBEND
5222	5+74.20	41.75 LT	WLREDUCER
5219	5+90.87	59.41 LT	WLFH

NOTE:
SHEETS OF ANY SIZE OTHER THAN 24"x36" ARE NOT TO SCALE UNLESS OTHERWISE NOTED

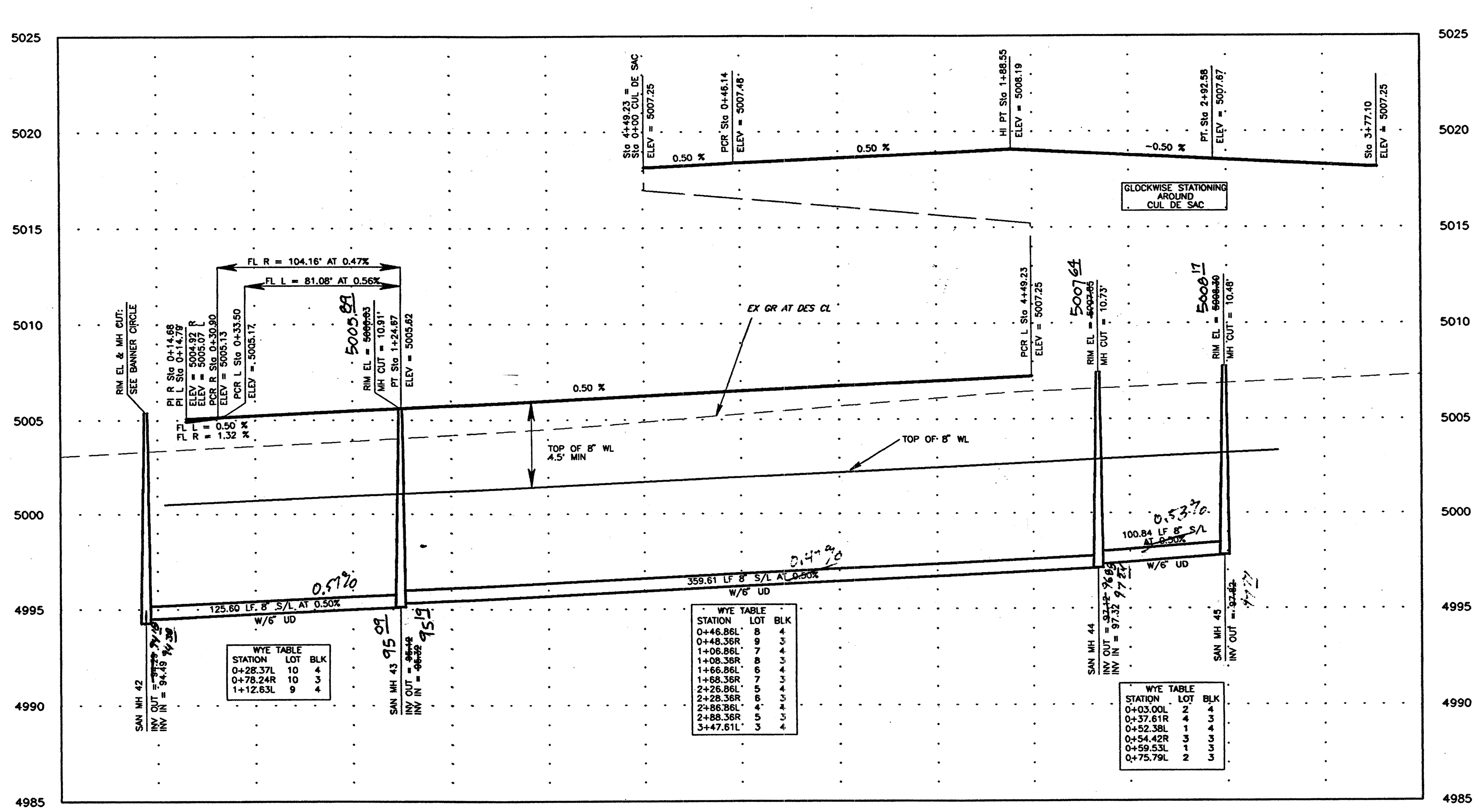
0 25 50 100

HORIZONTAL SCALE: 1 INCH = 50 FEET

VERTICAL SCALE: 1 INCH = 5 FEET

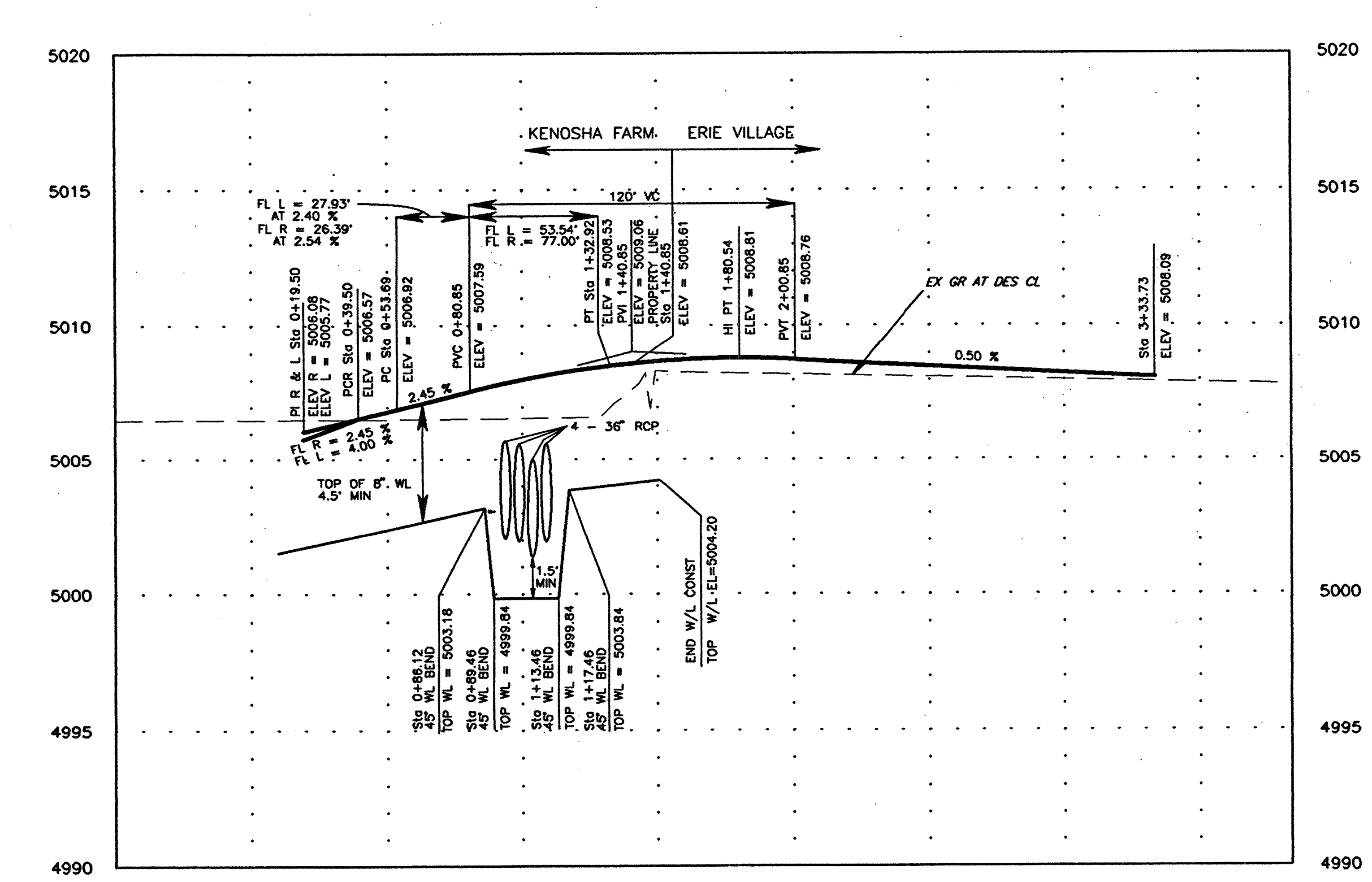
COOKE COURT

R.O.W. = 54 FT
FL TO FL = 31 FT



ALLEN AVENUE

R.O.W. = 54 FT
FL TO FL = 31 FT



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825 DELAWARE AVE, SUITE 500
LONGMONT, CO 80501

COOKE COURT and ALLEN AVENUE
KENOSHA FARM
MELODY HOMES, Inc.

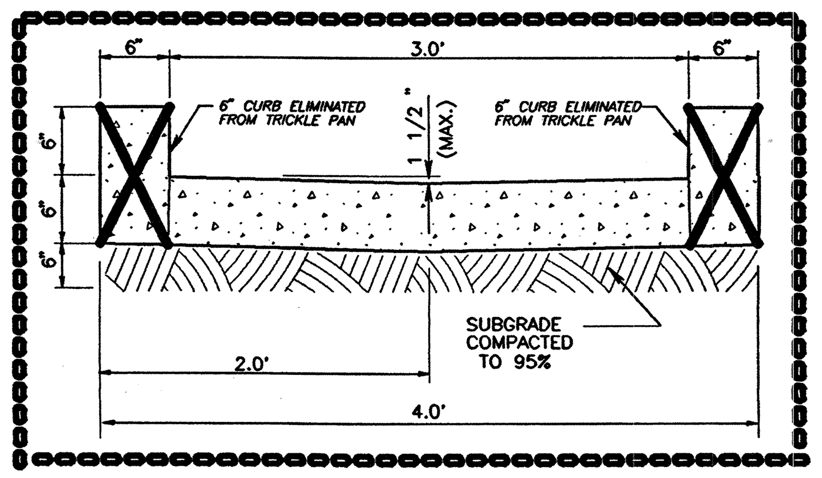
REVISIONS

NO.	DESCRIPTION	DATE	BY

ONLY VALID FOR CONSTRUCTION IF ORIGINAL SEAL & SIGNATURE ARE ON EACH SHEET

PLOTTED: Dec 2,1999
DESIGNED BY: TJB
DRAWN BY: TEAM A
CHECKED BY: KRR
JOB NUMBER: 80-0068.005.50

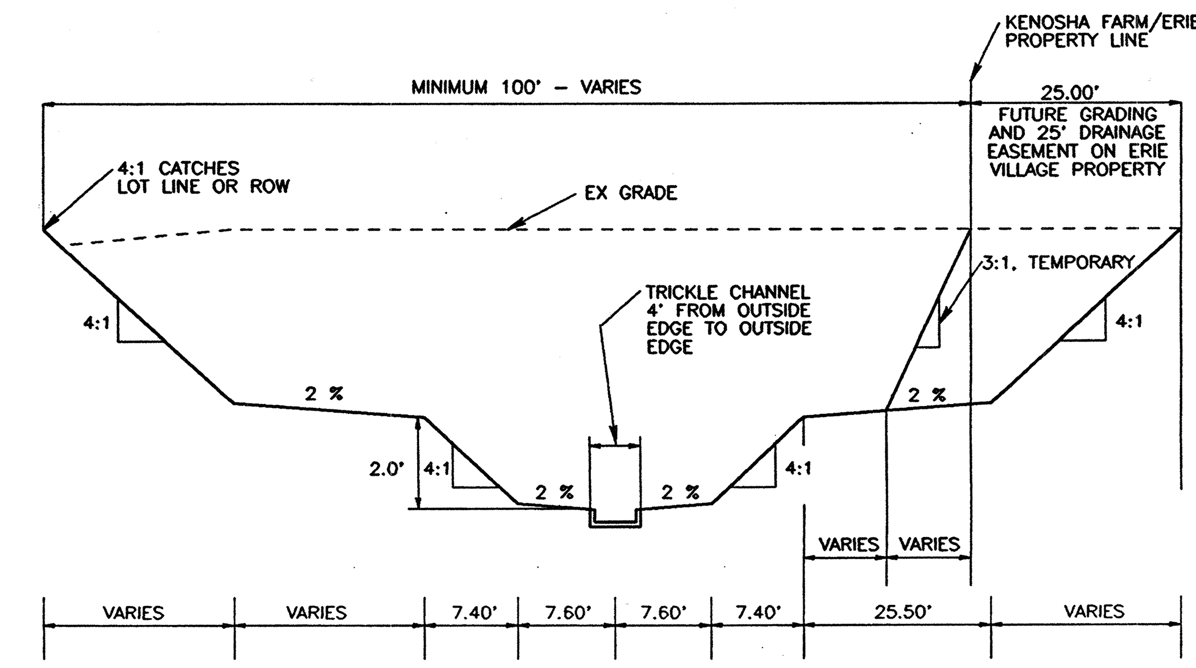
PLOTTED: Thu Dec 02 17:20:45 1999 D:\0068_005\Kenosha Farm Const Plans.pro



6" DEEP CONCRETE TRICKLE CHANNEL

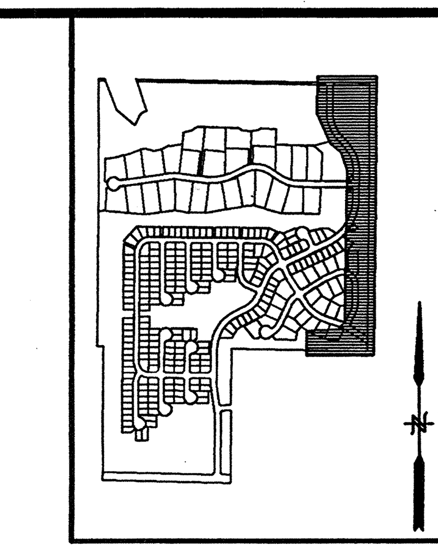
NOT TO SCALE

NOTE:
THIS SECTION TO BE USED ONLY FOR THE EAST DRAINAGE CHANNEL.

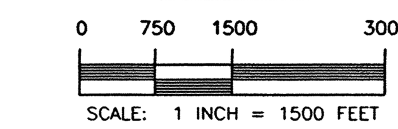


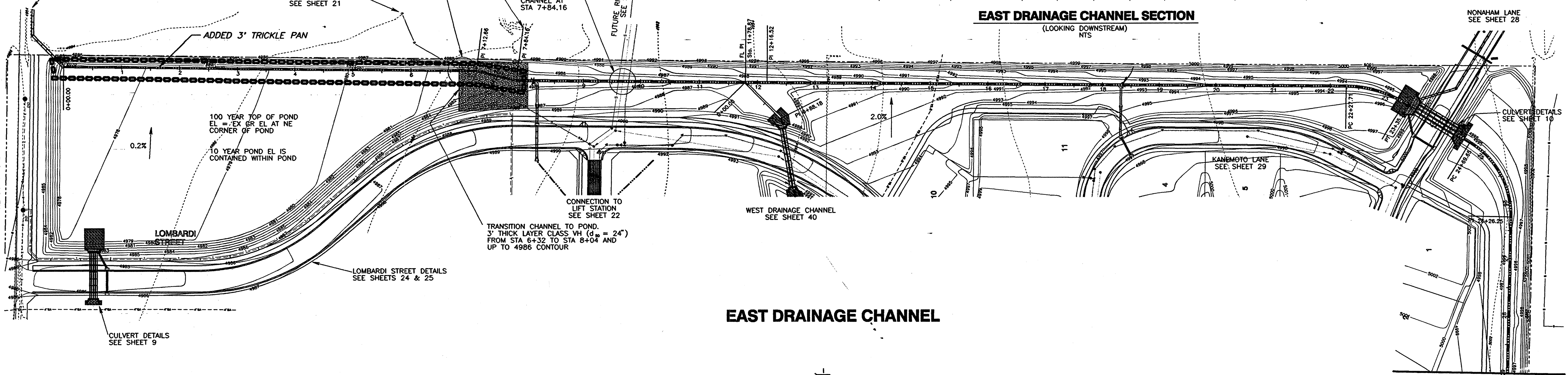
EAST DRAINAGE CHANNEL SECTION

(LOOKING DOWNSTREAM)
NTS



KEY MAP





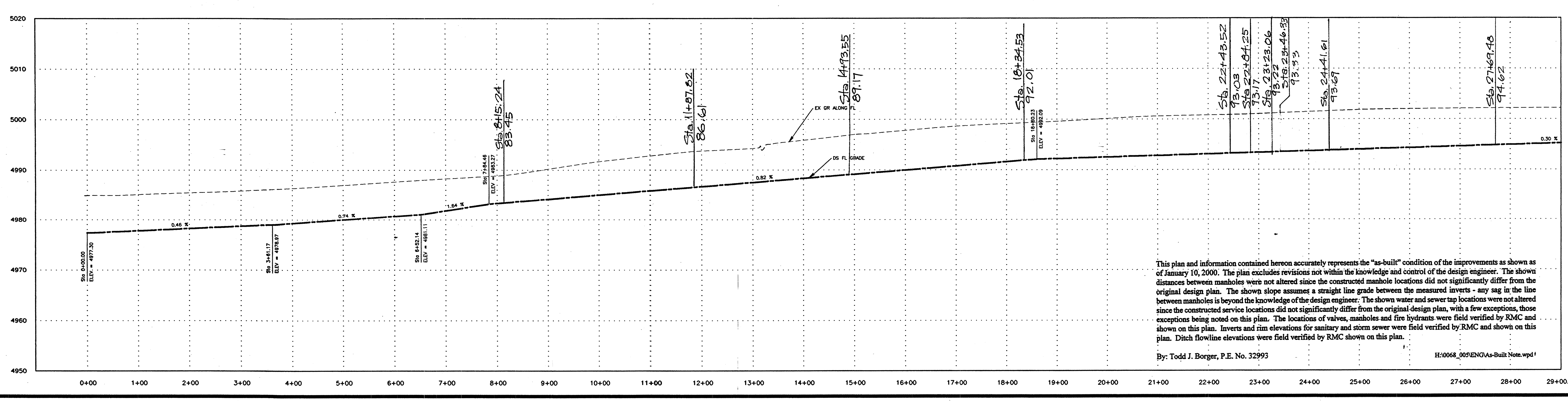
EAST DRAINAGE CHANNEL

MATCHLINE STA 29+00.00
SEE SHEET 39

NOTE:
SHEETS OF ANY SIZE OTHER THAN 24"x36" ARE NOT TO SCALE UNLESS OTHERWISE NOTED

HORIZONTAL SCALE: 1 INCH = 100 FEET
VERTICAL SCALE: 1 INCH = 10 FEET

NOTE:
PROPOSED CONTOURS ON SHEETS 38-41 WITHIN ROW AND LOTS ARE OVERLOT CONTOURS NOT FINISHED GRADE CONTOURS.



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By: Todd J. Borger, P.E. No. 32993

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PLOTTED: Thu Dec 02 18:01:35 1999 D:\0068_005\Kenosha Farm Record Dwgs Phases 1-3.pro

RMC
ROCKY MOUNTAIN CONSULTANTS INC.
(303) 772-5282 METRO:665-6283 FAX:665-6959
825 DELAWARE AVE, SUITE 500
LONGMONT, CO 80501

EAST DRAINAGE CHANNEL Sta 0+00 to 29+00
KENOSHA FARM
MELODY HOMES, Inc.

REVISIONS

NO.	DESCRIPTION	DATE	BY

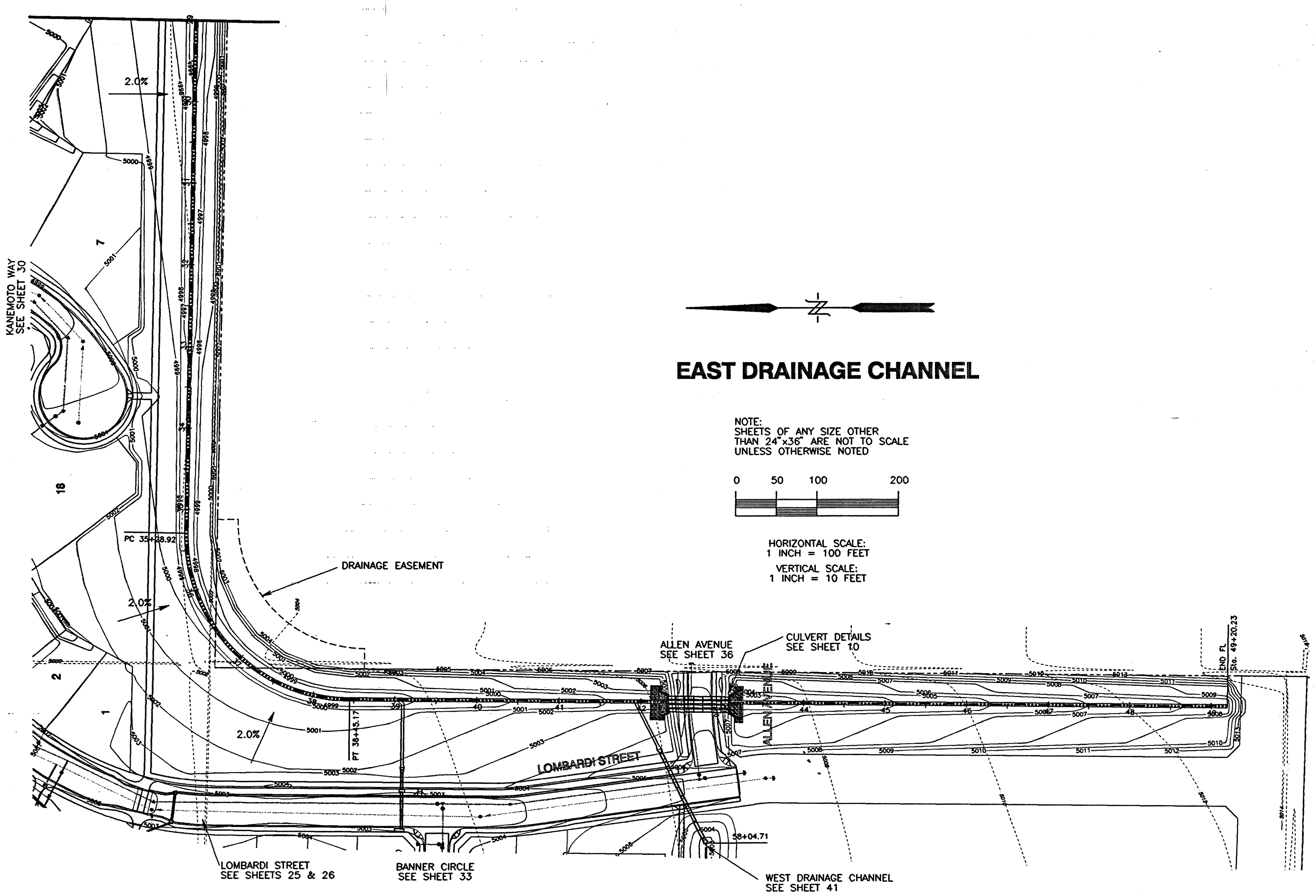
ONLY VALID FOR CONSTRUCTION IF ORIGINAL SEAL & SIGNATURE ARE ON EACH SHEET

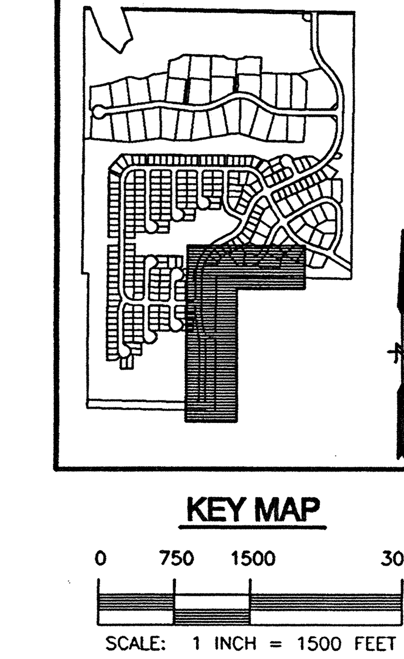
PLOTTED: Dec 2, 1999
DESIGNED BY: TJB
DRAWN BY: TEAM A
CHECKED BY: KRR

JOB NUMBER: 80-0068.005.50

SEE SHEET 38

MATCHLINE STA 29+00.00



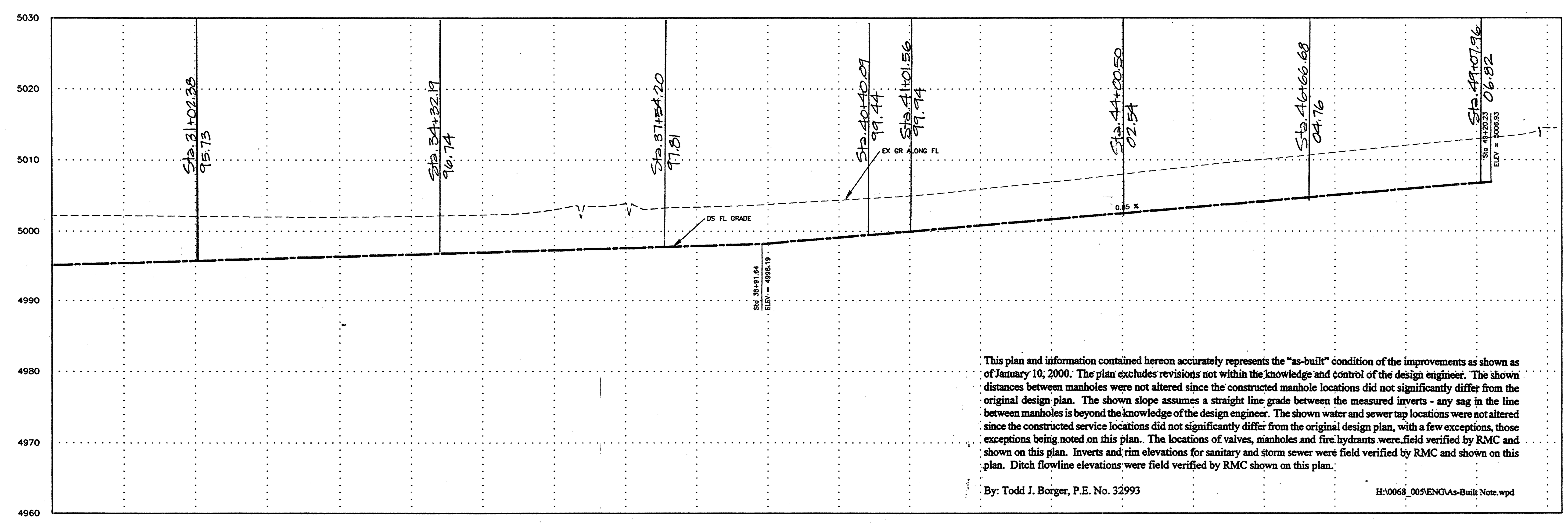


EAST DRAINAGE CHANNEL

NOTE:
SHEETS OF ANY SIZE OTHER THAN 24"x36" ARE NOT TO SCALE UNLESS OTHERWISE NOTED

0 50 100 200

HORIZONTAL SCALE:
1 INCH = 100 FEET
VERTICAL SCALE:
1 INCH = 10 FEET



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By: Todd J. Borger, P.E. No. 32993

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ROCKY MOUNTAIN CONSULTANTS INC.
(303) 772-5282 METRO:665-6283 FAX:665-6959
825 DELAWARE AVE, SUITE 500
LONGMONT, CO 80501

EAST DRAINAGE CHANNEL Sta 29+00 to END

KENOSHA FARM

MELODY HOMES, Inc.

REVISIONS

NO.	DESCRIPTION	DATE	BY

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PLOTTED: Dec 2,1999
DESIGNED BY: TJB
DRAWN BY: TEAM A
CHECKED BY: KRR

JOB NUMBER: 80-0068.005.50

PLOTTED: Thu Dec 02 18:07:33 1999 D:\0068_005\Kenosha Farm Record Dwgs Phases 1-3.pro

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by the FEMA Map Service Centerand the Boulder Area Spatial Data Cooperative (BASIC). Additional input was provided by the Town of Erie and the City of Longmont. These data are current as of 2004

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

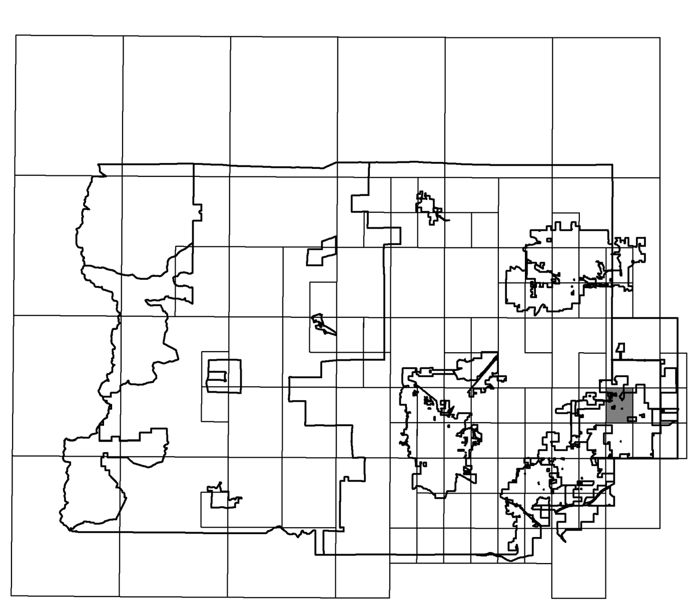
Accredited Levee Notes to Users: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at http://www.fema.gov/business/nfip.index.htm

Boulder County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)
Coal Creek (within Town of Erie)	3.0

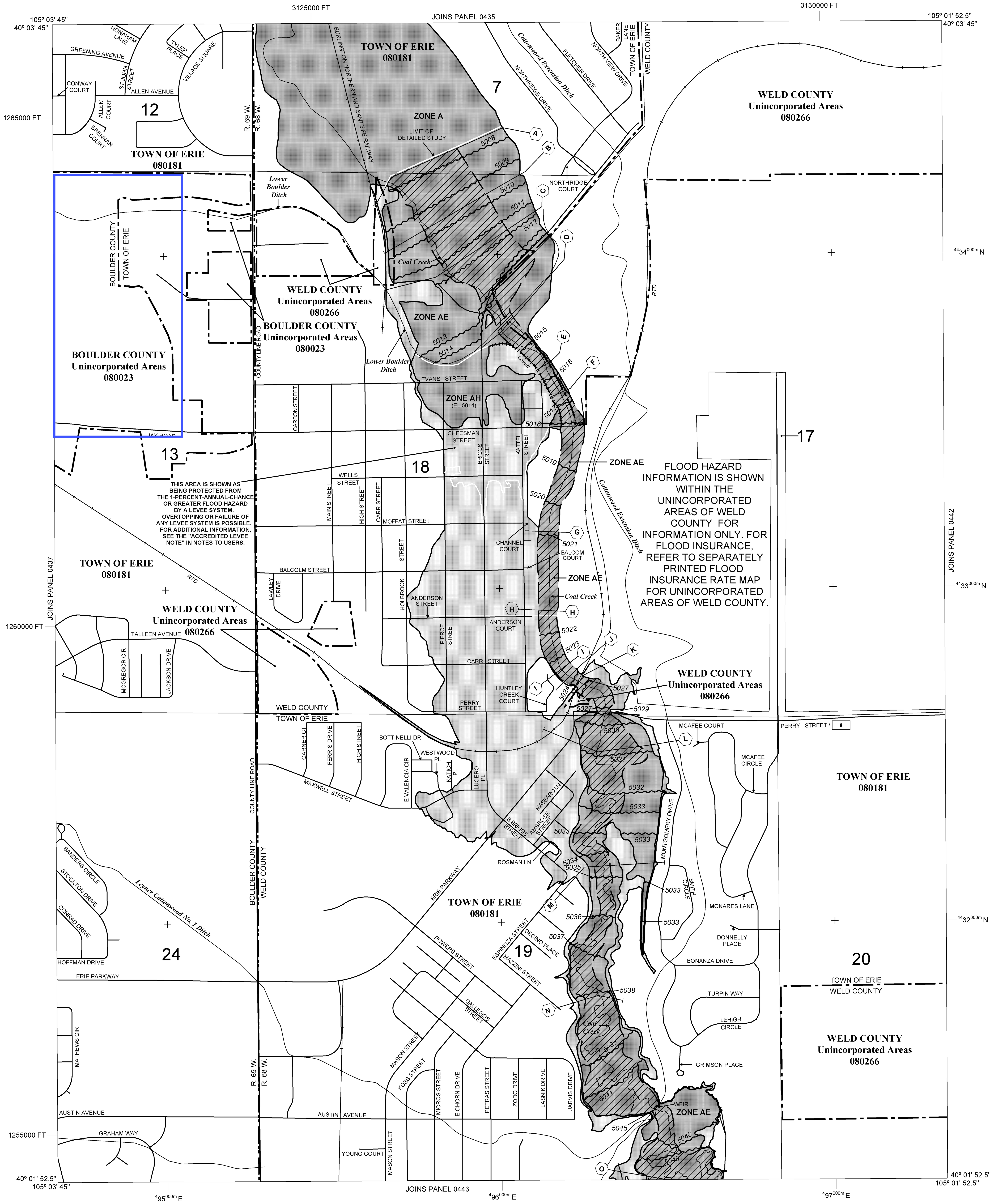
Example: To convert Coal Creek elevations to NAVD 88, 3.0 feet were added to the NGVD 29 elevations.

Panel Location Map



This digital Flood Insurance Rate map (FIRM) was produced through a cooperative partnership between the State of Colorado Water Conservation Board, the Urban Drainage and Flood Control District, and the Federal Emergency Management Agency (FEMA). The State of Colorado Water Conservation Board and the Urban Drainage and Flood Control District have implemented a long-term approach of floodplain management to reduce the costs associated with flooding. As part of this effort, both the State of Colorado and the Urban Drainage and Flood Control District have joined in Cooperating Technical Partner agreements with FEMA to produce this digital FIRM.

Additional Flood Hazard Information and resources are available from local communities, the Colorado Water Conservation Board, and the Urban Drainage and Flood Control District.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 1 NORTH, RANGE 68 WEST, AND TOWNSHIP 1 NORTH, RANGE 69 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 - - - 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
$^{49}89^{000m}$ N	1000-meter Universal Transverse Mercator grid values, zone 13
3180000 FT	5000-foot ticks: Colorado State Plane North Zone (FIPS Zone 0501), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 2, 1995

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 6, 1996 - to incorporate previously issued Letters of Map Revision; to add roads and road names; and to update corporate limits.
October 4, 2002 - to change base flood elevations; to change special flood hazard areas; to change zone designations; to update roads and road names; to reflect updated topographic information; to incorporate previously issued Letters of Map Revision; and to change floodway.
December 18, 2012 - to update corporate limits; to update roads and road names; to add Special Flood Hazard Areas previously shown on Town of Erie, Colorado Flood Insurance Rate Map dated December 2, 2004; and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0441J

FIRM

FLOOD INSURANCE RATE MAP

BOULDER COUNTY, COLORADO

AND INCORPORATED AREAS

PANEL 441 OF 615

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BOULDER COUNTY	080023	0441	J
ERIE, TOWN OF	080181	0441	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08013C0441J

MAP REVISED
DECEMBER 18, 2012

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by the FEMA Map Service Centerand the Boulder Area Spatial Data Cooperative (BASIC). Additional input was provided by the Town of Erie and the City of Longmont. These data are current as of 2004

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

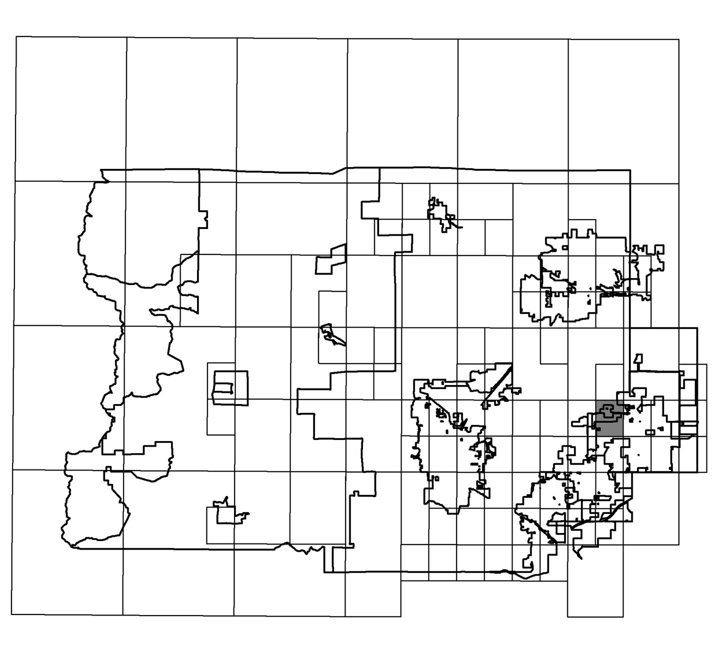
If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

Boulder County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)	Flooding Source	Vertical Datum Offset (ft)
Bullhead Gulch	3.1	Prince Tributary West Branch	3.1
Prince Tributary East Branch	3.1	Boulder Creek (Confluence of Fourmile Creek to East County Line Road)	3.3

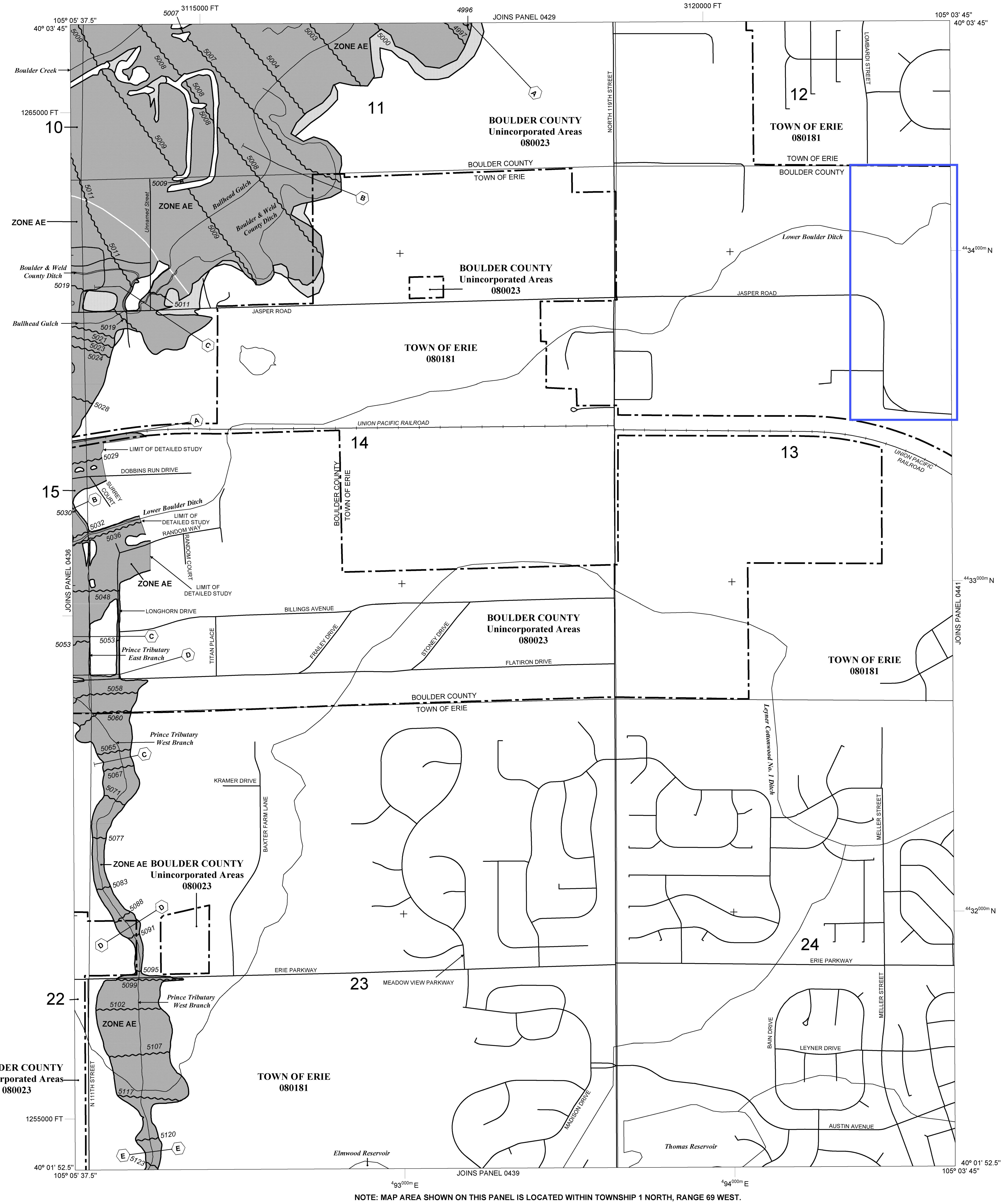
Example: To convert Bullhead Gulch elevations to NAVD 88, 3.1 feet were added to the NGVD 29 elevations.

Panel Location Map



This digital Flood Insurance Rate map (FIRM) was produced through a cooperative partnership between the State of Colorado Water Conservation Board, the Urban Drainage and Flood Control District, and the Federal Emergency Management Agency (FEMA). The State of Colorado Water Conservation Board and the Urban Drainage and Flood Control District have implemented a long-term approach of floodplain management to reduce the costs associated with flooding. As part of this effort, both the State of Colorado and the Urban Drainage and Flood Control District have joined in Cooperating Technical Partner agreements with FEMA to produce this digital FIRM.

Additional Flood Hazard Information and resources are available from local communities, the Colorado Water Conservation Board, and the Urban Drainage and Flood Control District.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 1 NORTH, RANGE 69 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
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ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
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FLOODWAY AREAS IN ZONE AE

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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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Floodplain Boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

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$^{49}89^{000m}$ N	1000-meter Universal Transverse Mercator grid values, zone 13
3180000 FT	5000-foot ticks: Colorado State Plane North Zone (FIPS Zone 0501), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 2, 1995

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

NFIP

PANEL 0437J

FIRM

FLOOD INSURANCE RATE MAP

BOULDER COUNTY, COLORADO

AND INCORPORATED AREAS

PANEL 437 OF 615

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BOULDER COUNTY	080023	0437	J
ERIE, TOWN OF	080181	0437	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08013C0437J

MAP REVISED
DECEMBER 18, 2012

Federal Emergency Management Agency

Walsh
Environmental Scientists and Engineers, LLC
an ecology and environment company

February 28, 2007

TI Residential, LLC
C/o Bryan Horan
1745 Shea Center Drive, Suite 310
Highlands Ranch, CO 80129

RE: Preliminary Habitat Assessment of Wetlands, Threatened and Endangered Species and State-Listed Species of Concern, and Migratory Bird Species on the Schmidt Property in the Town of Erie, Boulder County, Colorado

Dear Mr. Horan:

Walsh Environmental Scientists and Engineers, LLC (WALSH) performed a preliminary habitat assessment on the **Schmidt Property** (Site) on February 26, 2007. The approximate 90-acre Site is located just west of the Town of Erie and is bounded by Jay and Jasper Roads to the south, a residential community to the north, and undeveloped agricultural land to the east and west. The Lower Boulder Ditch and several concrete-lined lateral ditches cross the northern portion of the site in a general west to east direction. Geographically the property is located in the NE 1/4 of Section 13, Township 1 North, Range 69 West, in eastern Boulder County, Colorado.

The habitat assessment included investigations for the presence of jurisdictional waters of the U.S. (including wetlands); evidence of habitation by migratory bird species protected under the Migratory Bird Treaty Act; and suitable habitat for Threatened and Endangered (T&E) species listed for Boulder County and State-listed species of concern. Assessments were conducted for the following species: Preble's Meadow Jumping Mouse (Mouse) (*Zapus hudsonius preblei*); Bald eagle (*Haliaeetus leucocephalus*); Boreal toad (*Bufo boreas boreas*); Canada lynx (*Lynx canadensis*); Burrowing owl (*Athene cunicularia*); Mexican spotted owl (*Strix occidentalis lucida*); Interior least tern (*Sterna antillarum*); Piping plover (*Charadrius melodus*); Whooping crane (*Grus americana*); Greenback cutthroat trout (*Onocorhynchus clarki stomias*), Pallid sturgeon (*Scaphirhynchus albus*); Ute Ladies-tresses Orchid (Orchid) (*Spiranthes diluvialis*); and the slender moonwort (*Botrychium lineare*).

The following information summarizes the methodology employed, the results of the preliminary habitat assessments and recommendations regarding regulatory strategy.

METHODOLOGY

WALSH performed a two-phased assessment of the Site. The first phase included a desktop-level review of pertinent data including: Soil Conservation Service (SCS) *Soil Survey of Boulder County Area, Colorado*; the 2006 list of hydric soils for the Boulder Area prepared by the Natural Resource Conservation Service (NRCS); the USGS Topographic 7.5' *Erie, Colorado* Quadrangle Map; and, previous assessment reports prepared by WALSH in 2000 and 2002 documenting site conditions at those times.

4888 Pearl East Circle . Suite 108 . Boulder, Colorado . 80301-2475 . Phone (303) 443-3282 . FAX (303) 443-0367

The second task of the preliminary assessment consisted of an onsite inspection by WALSH. Guidance for the inspection was provided in the *1987 Corps of Engineers Wetlands Delineation Manual* (USACE 1987); the *Interim Survey Guidelines for Preble's Meadow Jumping Mouse* (USFWS 1999) and the *Interim Survey Requirements for Spiranthes diluvialis* (USFWS 1992). Habitat requirements for T&E species for which there are currently no specific regulatory documents were researched on ecological internet databases including *NatureServe Explorer* (2004), *Natural Diversity Information Source* (2004), USFWS and other ecological sources. During the onsite inspection the following assessment actions were conducted:

- dominant vegetation communities were identified;
- the presence and extent of waterbodies and potential jurisdictional wetlands on the property was documented;
- potential habitat and the presence/absence of T&E species occurring in Boulder County and State listed species of concern were investigated;
- potential nest sites and the presence/absence of migratory birds were investigated; and,
- representative color photographs were taken to document site conditions and pertinent landscape features.

DISCUSSION AND RESULTS

Office Assessment

A review of the USGS Topographic 7.5' *Erie, Colorado* Quadrangle Map indicates that a section of the man-made, Lower Boulder Canal (aka Lower Boulder Ditch) flows across the northern portion of the site in an eastern direction. The USGS map confirms that the closest natural water bodies to the Site are Coal Creek (approximately 1,400 feet to the northeast) and Boulder Creek (approximately 6,500 feet to the northwest). No other natural or man-made waterbodies appear on the topographic map.

The Boulder County Area Soil Survey indicates that soils at the Site consist of Ascalon sandy loam (AcA) soils with 0 to 1 percent slopes, and Nunn sandy clay loam (NnA) soils with 0 to 1 percent slopes. Ascalon sandy loams are well-drained soils occurring on nearly level terraces and uplands in loamy mixed alluvium and wind-laid materials. Historically, most of the acreage of these soils has been used for irrigated and dry cropland, but suitability is high for homesite development. Nunn sandy clay loam soils are made up of deep, well-drained soils formed on terraces and valley side slopes in loamy alluvium. Almost all of the acreage of this soil is used for irrigated crops.

As determined by the NRCS and listed on the NRCS Hydric Soils List, the mapped unit for an area must contain less than 2 percent of hydric characteristics to quality as a hydric (i.e., wetland) soil. These characteristics are only present in 1 percent of the Ascalon sandy loam soil type occurring in this area. Therefore, this soil type is not considered to be a hydric soil. Although the majority of the property is comprised of upland habitat, Nunn sandy clay loam soils in this area are recognized as wetland soils as hydric characteristics account for 6 percent of the map unit. These soils typically occur in swales. However, the presence of hydric soils on the property is confined to the lower side slopes of the Lower Boulder Ditch banks, and hydric soils were not encountered elsewhere on the property.

Onsite Assessment

During the assessment the entire property was traversed to perform a thorough visual assessment of habitat conditions. Because the property is fairly flat and almost completely devoid of tree cover, the south boundary and the southern half portion of the west boundary were assessed by driving along Jay Road and stopping at periodic intervals to view the fallow fields that comprise the majority of the site. The interior of the property as well as the ditch corridor were assessed on foot. The approximate three-acre parcel in the southeast corner was assessed from the driveway that outlets onto Jay Road.

The site is characterized by sparsely vegetated fields containing remnant pasture grasses and forbs typically occurring in Front Range agricultural areas, and the site is fairly weedy. A few unimproved farm roads lead into the interior of the site, and the main irrigation ditch is flanked by well-worn, dirt roads on both sides. Structures on the property are limited to a house and several outbuildings on the parcel that fronts Jay Road in the southeastern corner of the site. A combination of naturally establishing Siberian elm (*Ulmus pumila*) and plains cottonwood (*Populus deltoides*) trees are scattered around the homesite. Although there are a number of very small, volunteer elm saplings scattered across the fields and in the vicinity of the ditches, woody vegetation is a minor component of the vegetation communities at the site and accounts for less than 5 percent of groundcover in the open fields. The Lower Boulder Canal, which is a man-made irrigation ditch that meanders across the property in a series of wide curves, is approximately 20 feet wide. The ditch is spanned by several dilapidated wooden bridge crossings, and one concrete headgate structure. Vegetation along the toe of the banks extends only about half-way up the side of the sloped banks and is primarily comprised of reed canary grass (*Phalaris arundinacea*). Although the channel contained water that was moving sluggishly, vegetation in the channel bottom is stagnant and weedy. Several narrow, concrete irrigation channels branch off of the main ditch to disperse water farther into the fields.

Vegetation

There are no native vegetative communities on the property, and there was little sign of the remnant agricultural species previously noted (i.e., primarily alfalfa and corn). Vegetative cover across the fields is sparse and predominantly comprised of pasture grasses, forbs and weeds including smooth brome (*Bromopsis inermis*), western wheatgrass (*Pascopyron smithii*), Kentucky bluegrass (*Poa pratensis*), cheatgrass (*Agropyron cristatum*), mullein (*Verbascum thaspsus*), sweetclover (*Melilotus officinalis*), Canada thistle (*Breea arvense*), Russian thistle (*Salsola iberica*), and a large population of an immature plant that was too small to positively identify but is likely to be kochia (*Brassia sieversiana*). Vegetation at the Lower Boulder Ditch consists of a linear stand of reed canary grass that runs the length of the ditch. The canary grass is intermittently supplemented with small pockets of milkweed (*Asclepias speciosa*). Channel vegetation was partially obscured with algae, dead weeds and debris making species identification of the under-lying plant material difficult.

Soils

Soil samples were not taken as the land was tilled and turned for numerous years during farming activities resulting in the creation of an artificial soil profile with no clearly identifiable horizons. Soils were compacted and visually dry to the surface and were only supporting upland plants. With the exception of the lower side banks and invert of the Ditch, hydric soils do not occur on the property.

Hydrology

Hydrology at the site is primarily provided artificially through the surface irrigation system. Water was flowing in the Lower Boulder Ditch, but was not observed in the concrete-lined lateral ditches or elsewhere on the property. Secondary sources of hydrology appear to be limited to naturally occurring events (i.e., snowmelt, spring runoff and precipitation, as no additional natural or artificial sources of hydrology were identified on the property.

Threatened and Endangered Species

Due to the undeveloped nature and expanse of the property it is highly likely that small species of commonly occurring local wildlife such as rabbit and fox, and avian species use the site on a transient basis (i.e., hunting, resting and foraging), and/or as seasonal or full-time residents. However, given the minimal presence of surface water (i.e., shallow flows transported by the Lower Boulder Canal); absence of mature woody vegetation and lack of variance in vegetation strata, conditions across the Site are unsuitable to provide the necessary life requisites for Boulder County T&E species.

Migratory Birds

The presence of numerous burrows associated with an occupied prairie dog colony in the northwestern corner of the Site provides potential habitat for the Burrowing owl, which is a State-listed species of concern that is protected under the Migratory Bird Treaty Act. Bald eagles and other raptors may be attracted to the Site for hunting because of the presence of the prairie dogs. In addition, they are seldom found far from large rivers, lakes and reservoirs. Therefore, it is unlikely that these species would be more than transient visitors due to the absence of protected vantage points, scarcity of tree cover, and proximity to increasing area development.

CONCLUSIONS AND RECOMMENDATIONS

WALSH confirmed the absence of jurisdictional wetland habitat on the property. Therefore, TI Residential, LLC will not need a Section 404 permit from the U.S. Army Corps of Engineers for building on the property.

WALSH confirmed the absence of suitable habitat for the Preble's meadow jumping mouse on the property, and within 300 feet of the property boundaries.

The Canada lynx generally inhabits forest ecosystem areas and prefers old growth boreal forests with a dense understory of willow thickets and snowshoe hare populations.

Colonial nesting species (i.e., birds that nest in colonies) or other species of special concern that would necessitate seasonal avoidance under the Migratory Bird Treaty Act are not present at the Site as onsite resources are inadequate to support these species. No active or unoccupied ground or tree nests were observed, and no bird species were observed during the site visit. Suitable habitat to fulfill the life requisites of the Mexican spotted owl is not present on the Site as this species typically inhabits canyons and montane forests. However, potential habitat associated with the prairie dog colony in the northwest portion of the Site is present for the Burrowing owl.

The presence of fish species is precluded due to the absence of a sustainable water source.

Habitat for the Boreal toad is restricted to areas with suitable breeding attributes, which includes lakes, marshes, ponds, and bogs with sunny exposures. Suitable habitat is absent at the Site.

WALSH confirmed the absence of the Orchid within the Site. The property does not meet the criteria for "sites requiring a survey" as stipulated under the USFWS *Interim Survey Requirements for Spiranthes diluvialis.* Specifically, there are no perennial tributaries to streams with known populations on the Site, no riparian area, and no high ground water table.

Populations of the slender moonwort have been documented in pine forests and as this species typically prefers sub-alpine elevations, it is highly unlikely to occur on the eastern plains in areas completely lacking evergreen trees.

Summary

WALSH recommends the following action be completed prior to the implementation of any construction activities north of the Lower Boulder Ditch or in adjacent areas if the prairie dog population has expanded prior to the commencement of construction:

> <u>Burrowing owl:</u> A survey will need to be conducted for the Burrowing owl if development is planned in the vicinity of the prairie dog colony and construction is scheduled during the period when the owl is likely to inhabit the prairie dog burrows (March 1 – October 31). Should T.I. Residential, LLC decide to remove the prairie dogs from the property outside of the Burrowing owl protection period, WALSH can provide the names and contact information for reputable contractors who specialize in the humane eradication of prairie dogs.

This preliminary habitat assessment has been prepared for the sole use of T.I. Residential LLC, and as such it is not suitable for submission to the U.S. Fish and Wildlife Service (USFWS), Colorado Department of Wildlife (CDOW) or other local agencies to verify the presence or absence of state or federal listed threatened or endangered species. It is not prepared in the specific format, nor does it contain adequate documentation to serve this purpose. Please contact WALSH if you wish to file for verification or site disqualification for a specific species. We will discuss the specific data and reporting requirements for each species at that time.

Please contact WALSH if we can provide further clarification regarding this preliminary habitat assessment.

Regards,

Walsh Environmental Scientists and Engineers, LLC

Janetta Shepard

Janetta Shepard, P.W.S.
Restoration Ecologist

Attachment: Figure 1 - Site Location Map
Photo Pages

P:\Wetland-E&TSpecies\TerraVisions\Projects\Schmidt Property\Schmidt PHA Report.doc

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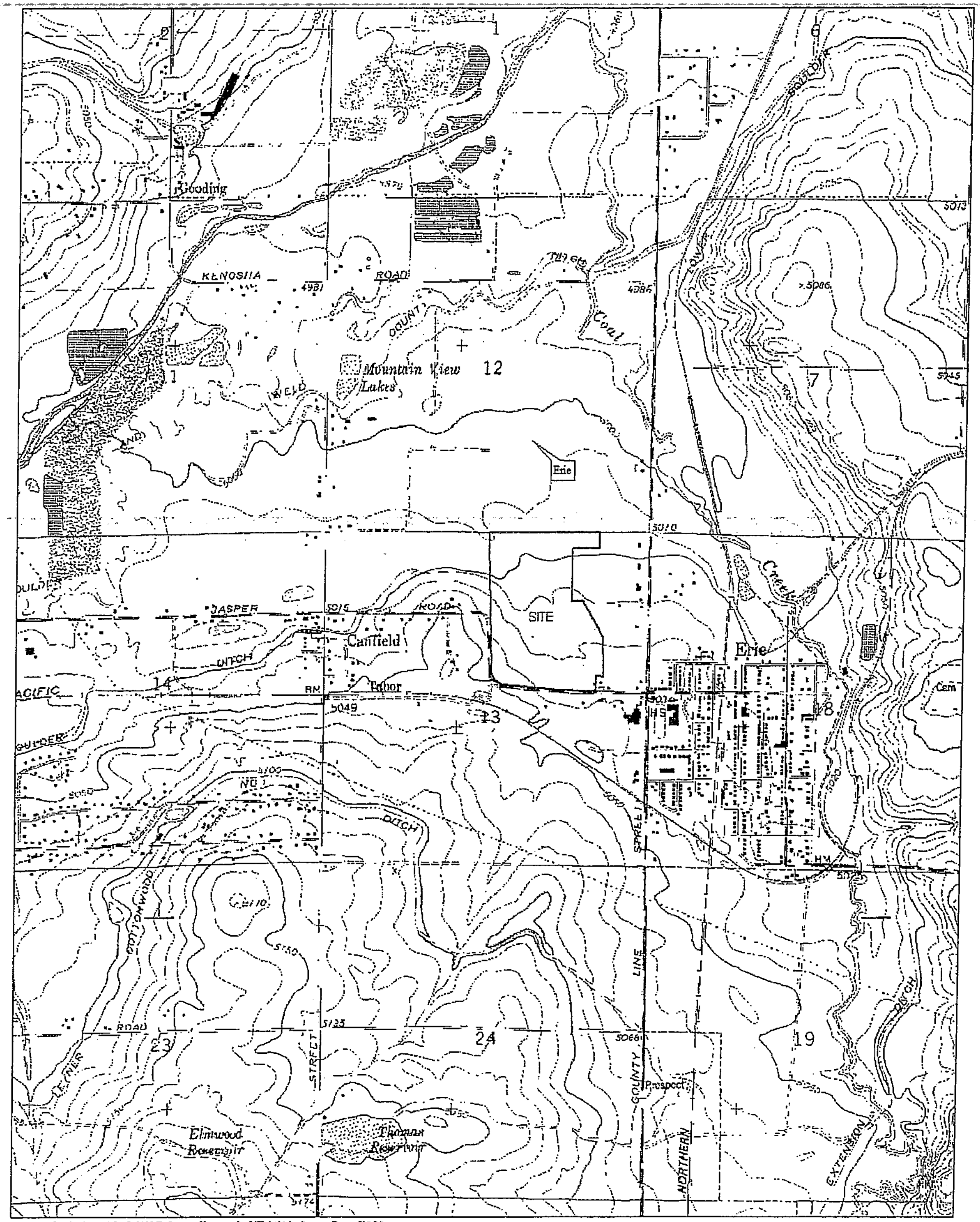


3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS 700 ft Scale: 1 : 24,000 Detail: 13-0 Datum: WGS84

Latitude: N40°3'17", Longitude: W105°3'43", Avg. Elevation: 5030'. Source: USGS 7.5 minute topographic map *Erie, Colorado*

Walsh
Environmental Scientists and Engineers, Inc.

Figure 1
Schmidt Property USGS Site Location Map

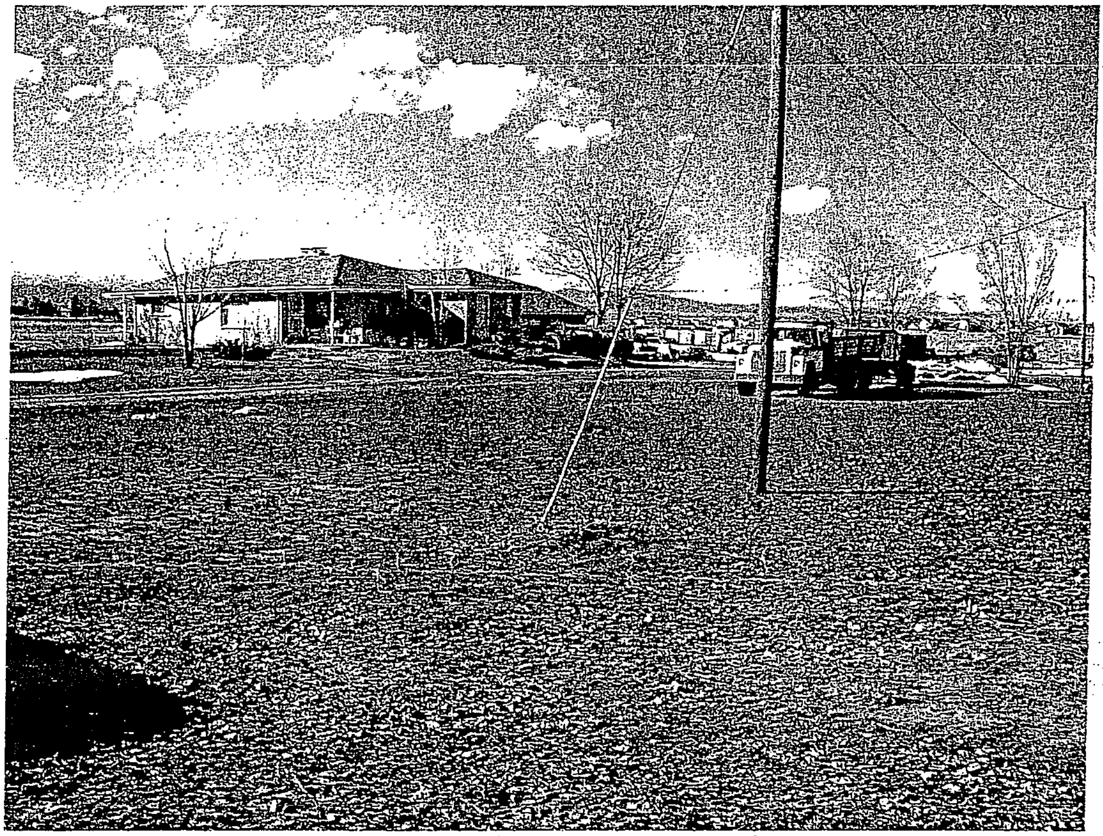


Photo 1- Overview of homesite in southeast corner of the property

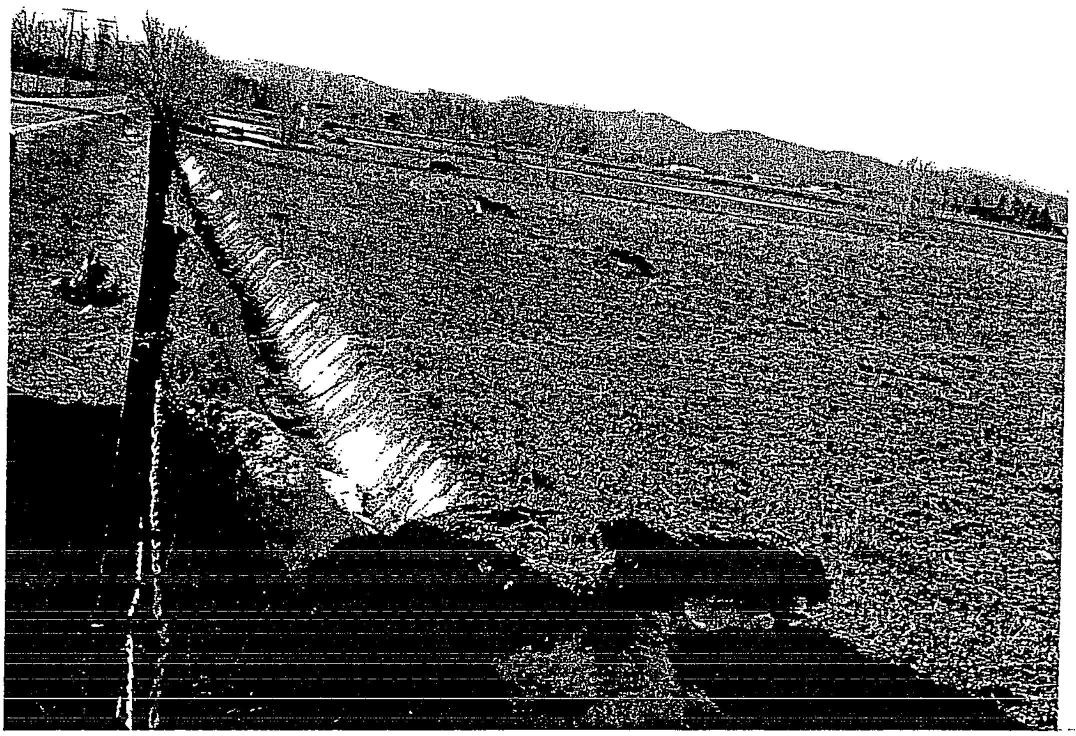


Photo 2 – From west side of homesite in Photo 1 looking west along Jay Road at open fields and concrete-lined lateral ditch that parallels the road.


Photo 3 – From Jasper Road on the west side of the property looking east across the open fields.


Photo 4 – Overview of fallow and plowed fields looking north from western-most curve in Jasper Road.

Photo 5 – Looking northeast across a segment of the Lower Boulder Ditch flanked by two dirt access roads

Photo 6 –Looking southwest at oncrete-lined lateral ditch in northwest corner of the Site. Note prairie dog burrows occurring on both sides of the ditch and across the adjacent open fields.

Northern Water

Memorandum

Date: August 20, 2018

To: Kevin San – Rick Engineering Company

From: Devin Shable, Northern Water

CC: Amy Johnson, Dennis Baker, Jim Struble, Brian Flockhart - Northern Water
Eric Doering, Famuer Rasmusson, Mark Monger, Jeff Kahn – Lower Boulder Ditch Company

Subject: Meadowlark Preliminary Construction Plans - Review Comments
Lower Boulder Ditch Crossings

We have received and reviewed the Meadowlark Preliminary Plat Construction Documents dated May 16, 2018. The proposed development is located adjacent to and within Norther Water's Permanent Easement and Lower Boulder Ditch's prescriptive easement. The following list summarizes Northern Water's review comments. Please address these comments and submit the required information for further review.

<u>Proposed Box Culvert</u>

1) Existing Bridge: The location of the proposed culvert is the same location of an existing bridge over the ditch. The record drawings of the original bridge at this location are attached to this memo (see Attachments A and B). However, Norther Water believes the original bridge was replaced with a steel bridge by an oil/gas company. Norther Water does not have records of the bridge that exists today.
2) Culvert Size, Length, and Shape: The size and length of the culvert were not shown in the plans. Please add the size and length. The culvert shall be a box without a center support.
3) Culvert Hydraulic Capacity: The culvert shall be sized to convey a design flow of 230-cfs with at least 1.5-ft of freeboard.
4) Culvert Structural Capacity: The culvert shall meet the structural design requirements of the agency with jurisdiction of the proposed road.
5) Culvert Invert: The invert of the culvert shall match the invert of the existing adjacent ditch.
6) Erosion Control: Add riprap armoring (D_{50} = 6-inch with geotextile) to the ditch for a minimum length of 5-ft upstream and downstream of the culvert. The goal is to protect the embankment from erosion and the culvert from undermining.
7) Property: The proposed culvert is located within Northern Water's Permanent Easement and within Lower Boulder's prescriptive easement. A crossing permit is required and must be obtained from Jeff Kahn.

Proposed Utility Crossings (Storm Sewer, Sanitary Sewer, and Water Main)

1) Sewer Profiles: The plans do not show the profiles of the proposed below-grade storm sewer and sanitary sewer, so it is not possible to determine the clearance between the ditch invert and the top of the sewer pipelines. Add sewer profiles for further review.
2) Sewer Crossing Detail: The sewer crossings shall be in accordance with the detail attached to this memo (see Attachment C).
3) Water Main: The plans do not include a detail of the water main crossing the ditch. The crossing shall be in accordance with the detail attached to this memo (see Attachment C).
4) Property: The utilities will cross through Northern Water's Permanent Easement and Lower Boulder's prescriptive easement. A crossing permit is required for each utility crossing shown on the plans. Obtain the crossing permits from Jeff Kahn.

Proposed Storm Sewer Pump Station

1) General: The plans show a call-out for a pump station within Northern Water's Permanent Easement and Lower Boulder's prescriptive easement. However, the plans do not show the pump station. Confirm the call-out is an error and there is not a proposed pump station. If a pump station is required, an alternate location must be identified so it is not installed within Northern Water's Permanent Easement and Lower Boulder's prescriptive easement.

Proposed Trickle Channels

1) Location: The proposed trickle channels are partially located within Northern Water's Permanent Easement and Lower Boulder's prescriptive easement. The trickle channels shall not be installed within Northern Water's Permanent Easement and Lower Boulder's prescriptive easement. Submit revised plans showing the trickle channels have been relocated.

General

1) Property Lines: The plans show the ditch Easement as the property boundary for several properties (lots) and the detention pond. Confirm the Easement is accurately represented to avoid future property boundary disputes.
2) The plans do not show fencing or any other means of identifying property lines. Provide information for identifying property lines.
3) The offside road will not be affected by the proposed work.

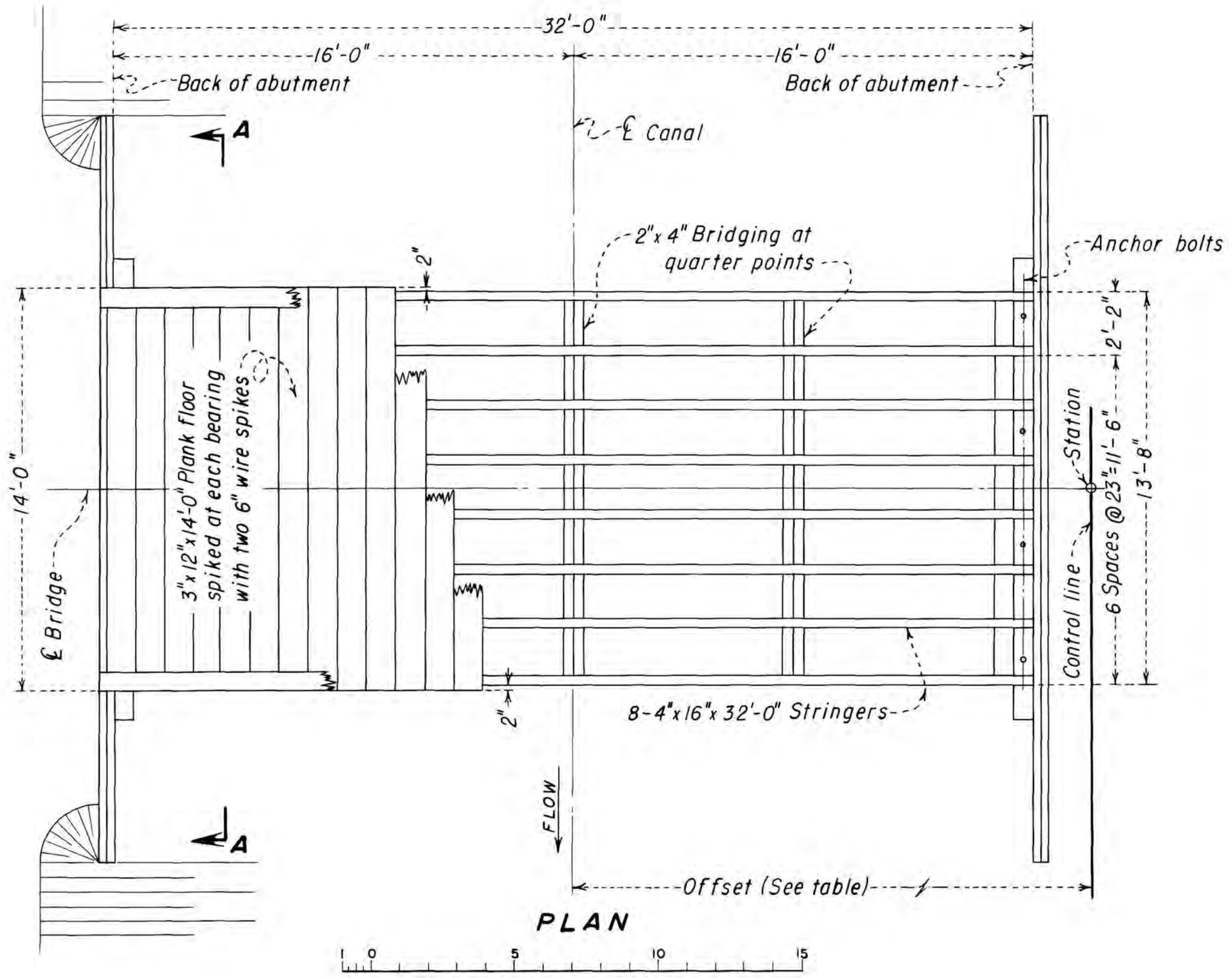
Attachments

A. Record Drawing of Existing Bridge (Drawing 245-704-8069)
B. Record Drawing of South Platte Supply Canal (Drawing 245-704-6115)
C. Storm Sewer Crossing Detail

If you have additional questions, please feel free to contact me at 970-622-2358 or dshable@northernwater.org.

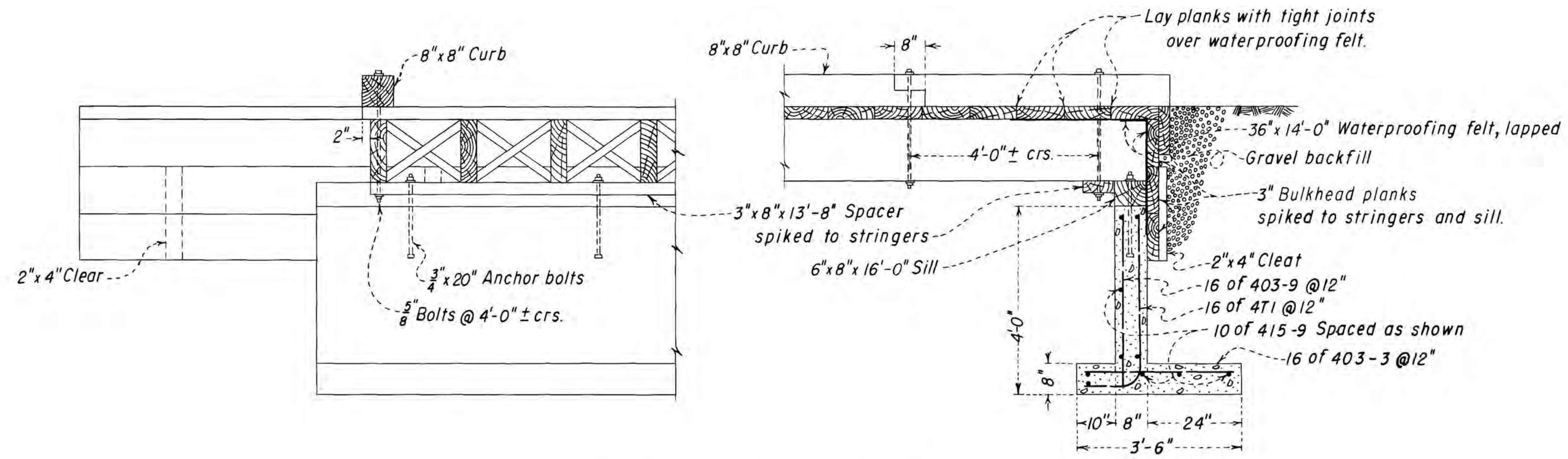
REINFORCEMENT LIST FOR TWO ABUTMENTS

MARK	BAR NO.	TOTAL L'GTH.	NO REQ'D.	DIMENSIONS a	b	c	R		SHAPE
									"T" BAR
4T1	4	4'-6"	32	6½"	9½"	3'-2"	6"		
415-9	4	15'-9"	20						
403-9	4	3'-9"	32						
403-3	4	3'-3"	32						



PLAN

SCALE OF FEET



CURB-BULKHEAD-ABUTMENT

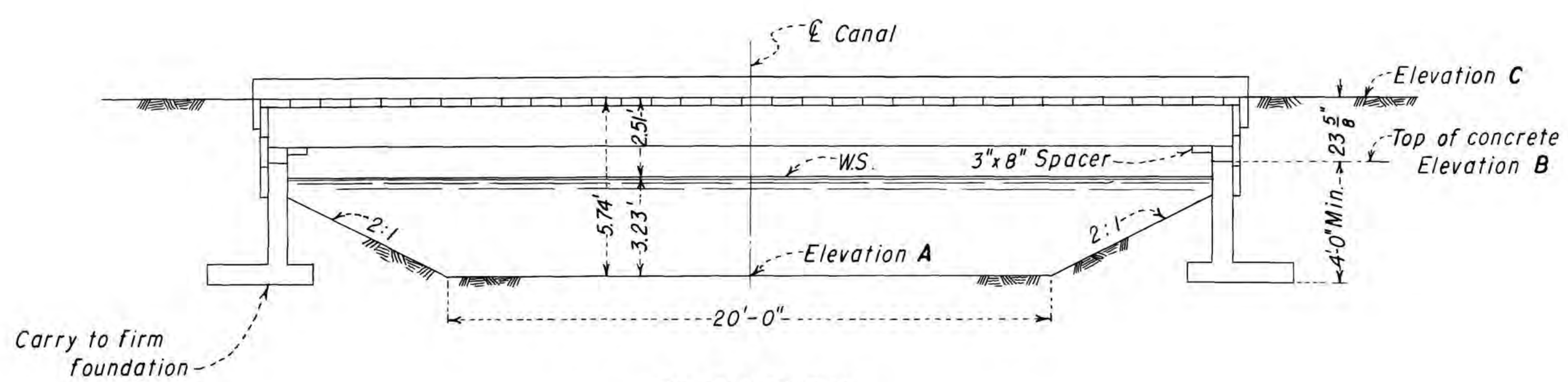
SCALE OF FEET

ESTIMATED QUANTITIES
(FOR ONE STRUCTURE)

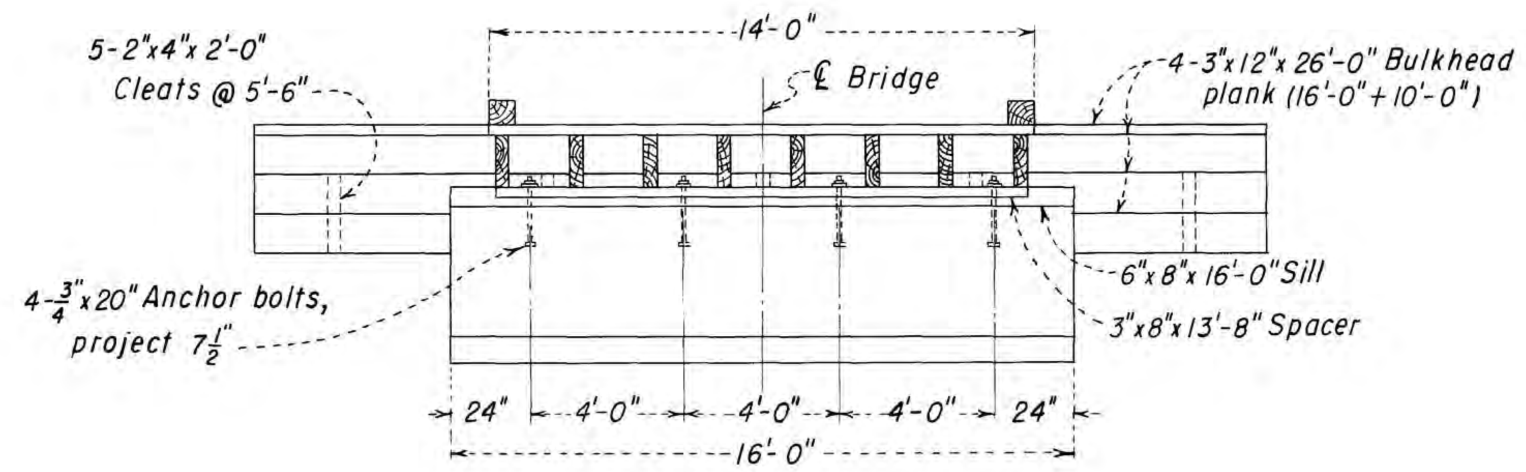
Lumber (Untreated)	3300	F.B.M.
Lumber (Treated)	765	F.B.M.
Concrete	5.5	Cu.Yds.
Reinforcement steel	456	Lbs.

NOTES

Bridge designed for one lane H-5-44 loading.
Unless otherwise shown, place reinforcement so that the clear distance between face of concrete and nearest reinforcement is 1½", except provide a clear distance from face of concrete placed against earth or rock of 2".
All dimensions to reinforcement are to ℄ of bars.
Malleable iron washers to be used.
Sills, bulkhead planks, and cleats to be treated.



ELEVATION



SECTION A-A

STATION	EL. A	EL. B	EL. C	OFFSET
31+81.9	5041.48	5045.25	5047.22	18 Ft.
132+08	5025.21	5028.98	5030.95	16 Ft.
210+64	5015.47	5019.24	5021.21	20 Ft.
221+90	5014.91	5018.68	5020.65	20 Ft.

7-27-54 704 A.C.O.	Change Br. from Sta. 31+92.3 to Sta. 31+81.9

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLORADO-BIG THOMPSON PROJECT-COLO.

SOUTH PLATTE SUPPLY CANAL
STATION 31+81.9 TO STATION 221+90
TIMBER FARM BRIDGES

DRAWN R.W.S. SUBMITTED A. D. Soderberg
TRACED A.B.B.(704) RECOMMENDED Henry L. Nevo.
CHECKED RW A.C.O. APPROVED [illegible] DISTRICT MANAGER
DENVER, COLORADO. FEB. 10, 1954 245-704-8069

SEP 25 '72

Note: All stationing, bearings and curve data are on the control line.

Centerline of South Platte Supply Canal is located by offsets from the control line.

Easement lines are located by offsets from the control line.

HYDRAULIC PROPERTIES

SECTION	Q	A	v	r	n	s
EARTH	230	90.8544	2.5342	2.6632	0.025	0.0005

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLORADO – BIG THOMPSON PROJECT – COLORADO
SOUTH PLATTE SUPPLY CANAL
PLAN PROFILE AND SECTIONS
STA. 190+00 to STA. 253+00

DRAWN E.D.P. SUBMITTED
TRACED W.L.S. & G.N. RECOMMENDED
CHECKED E.D.P. APPROVED

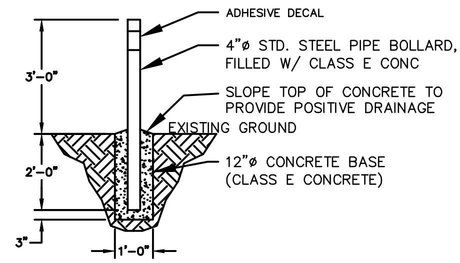
DENVER, COLORADO 245-704-6115

NOTES:

1. CLAY MATERIAL SHALL MEET THE FOLLOWING CRITERIA:

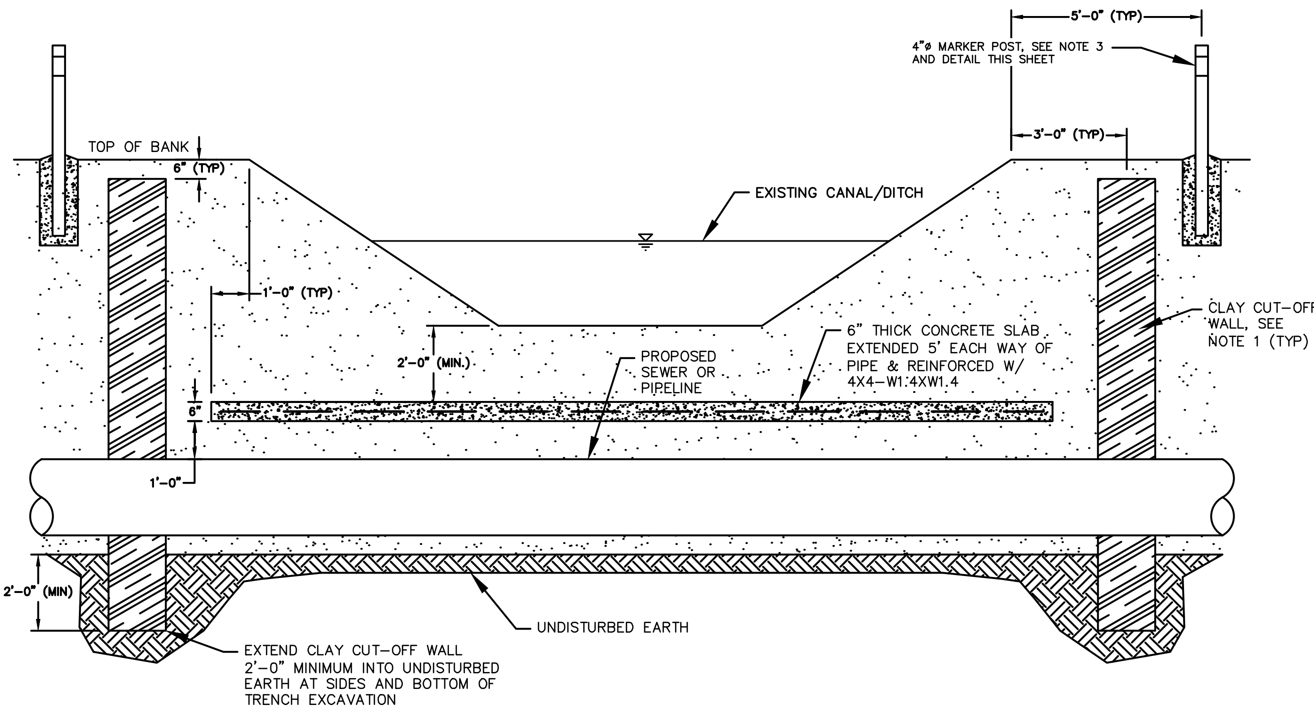
PLASTICITY INDEX:	15 TO 40
LIQUID LIMIT:	LESS THAN 40
USCS CLASSIFICATION	CL
PERCENT PASSING NO. 200 SIEVE	50–75
HYDRAULIC CONDUCTIVITY	1X10^–7 CM/SEC

2. EXCAVATION FOR DITCH CROSSING MAY REQUIRE SPECIAL TRENCH SUPPORT/SHORING TO MINIMIZE DISTURBANCE TO EXISTING FACILITIES. WHEN SPECIAL SUPPORT/SHORING IS REQUIRED, THE PROPOSED TRENCH SUPPORT/SHORING SHALL BE APPROVED BY DITCH COMPANY PRIOR TO STARTING DITCH CROSSING CONSTRUCTION
3. INSTALL STEEL PIPE MARKER POST ON BOTH SIDES OF DITCH AT CENTERLINE.



MARKER POST

NO SCALE



CANAL/DITCH CROSSING

NO SCALE

Northern Water

CANAL/DITCH CROSSING

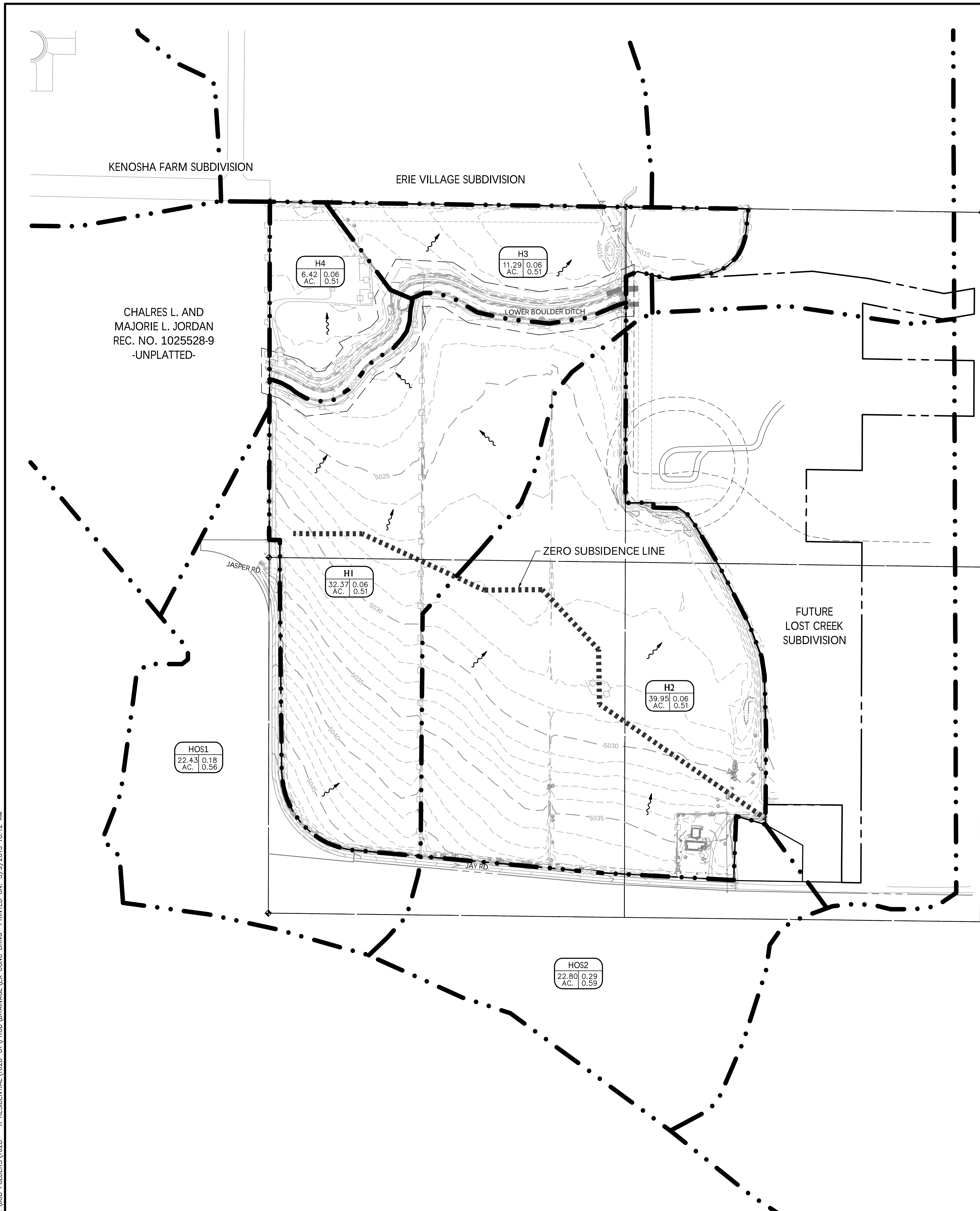
		Date
Designed	DSHABLE	8/14/18
Drawn	DSHABLE	8/14/18
Checked	AJOHNSON	8/16/18
Approved		

Sheet 1 of 1

Appendix E

Drainage Maps

HISTORIC DRAINAGE MAP



The Schmidt Property
Basin Peak Runoff Calculations - Direct Runoff - Historic

Job No. 1008-10
9-Mar-15

Basin ID	Total Area (Ac.)	Tc (min)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}	Intensity (in/hr) I_2	I_5	I_{10}	I_{100}	Peak Flow (cfs) Q_2	Q_5	Q_{10}	Q_{100}
H1	32.37	63.2	0.06	0.16	0.26	0.51	0.99	1.40	1.69	2.63	1.91	7.22	14.20	43.48
H2	39.95	87.0	0.06	0.16	0.26	0.51	0.79	1.12	1.35	2.11	1.89	7.15	14.05	43.01
H3	11.29	83.7	0.06	0.16	0.26	0.51	0.81	1.15	1.39	2.17	0.55	2.08	4.08	12.49
H4	6.42	53.0	0.06	0.16	0.26	0.51	1.11	1.57	1.90	2.96	0.43	1.61	3.17	9.71
HOS1	22.43	26.6	0.18	0.27	0.35	0.56	1.70	2.41	2.91	4.54	6.86	14.58	22.86	57.08
HOS2	22.80	30.0	0.29	0.36	0.43	0.59	1.58	2.24	2.71	4.24	10.48	18.41	26.61	56.98

$$\text{Intensity} = \frac{28.5 * P_1}{(10 + T_c)^{0.786}}$$

From Table 800-2: 2 Year P_1 = 1.01 Inches
From Table 800-2: 5 Year P_1 = 1.43 Inches
From Table 800-2: 10 Year P_1 = 1.73 Inches
From Table 800-2: 100 Year P_1 = 2.70 Inches

LEGEND
Prop. Major Contour
Prop. Minor Contour
Ex. Major Contour
Ex. Minor Contour
Basin Outline
Flow Arrow
Name / Area AC. / C2 C100 — Prop. Basin Designation

SCALE 1 inch = 200 ft.

Innovative Land Consultants, Inc.
12071 Tejon Street, Suite 470
Westminster, CO 80234
Phone 303.421.4224
www.innovativelandinc.com

Sheet: 1 of 2
Job No.: 1028-01
Date: March 9, 2015
Horiz. Scale: 1" = 200'
Vert. Scale: N/A
Designed By: XWL
Prepared By: ZAH
Approved By: TRH

Proj. Name: The Schmidt Property
Location: Boulder County, Colorado
Sheet Name: Historic Drainage Map

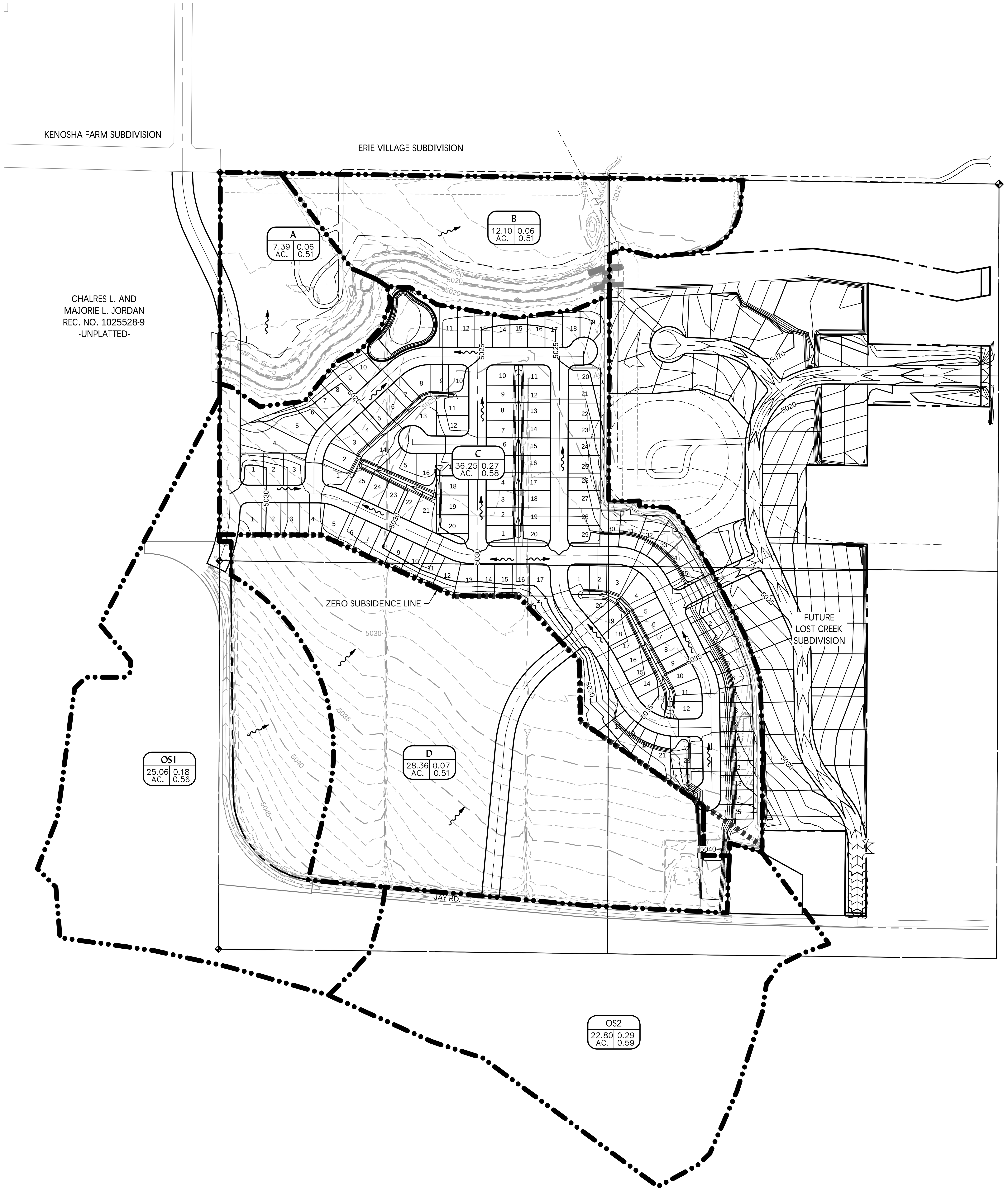
NOT FOR CONSTRUCTION

811 Know what's below. Call before you dig.

Sheet: 1

I:\JOB FOLDERS\1028 – TI RESIDENTIAL\1028–01\PROD\DRAINAGE\EX CONC DRNG PRINTED ON: 3/9/2015 10:12 AM

APPROVED PHASE 1 - PROPOSED DRAINAGE MAP



LEGEND

- Prop. Major Contour
- Prop. Minor Contour
- Ex. Major Contour
- Ex. Minor Contour
- Basin Outline
- Flow Arrow
- Right of Way Line
- Lot Line
- Name / Area AC. / C2 / C100 — Prop. Basin Designation

The Schmidt Property
Basin Peak Runoff Calculations - Direct Runoff - Proposed

Job No. 1028-01
9-Mar-15

Basin ID	Total Area (Ac.)	Tc (min)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}	Intensity (in/hr) I_2	I_5	I_{10}	I_{100}	Peak Flow (cfs) Q_2	Q_5	Q_{10}	Q_{100}
A	7.39	53.0	0.06	0.16	0.26	0.51	1.11	1.57	1.90	2.96	0.49	1.86	3.65	11.17
B	12.10	83.7	0.06	0.16	0.26	0.51	0.81	1.15	1.39	2.17	0.59	2.22	4.37	13.39
C	36.25	25.1	0.27	0.34	0.41	0.58	1.76	2.49	3.01	4.70	17.21	30.68	44.75	98.80
D	28.36	49.9	0.07	0.17	0.27	0.51	1.15	1.63	1.97	3.08	2.22	7.73	14.91	44.96
OS1	25.06	30.1	0.18	0.27	0.35	0.56	1.58	2.24	2.71	4.23	7.13	15.15	23.76	59.33
OS2	22.80	30.0	0.29	0.36	0.43	0.59	1.58	2.24	2.71	4.24	10.48	18.41	26.61	56.98

$$\text{Intensity} = \frac{28.5 * P_1}{(10 + T_c)^{0.786}}$$

From Table 800-2: 2 Year P_1 = 1.01 Inches
From Table 800-2: 5 Year P_1 = 1.43 Inches
From Table 800-2: 10 Year P_1 = 1.73 Inches
From Table 800-2: 100 Year P_1 = 2.70 Inches

The Schmidt Property
Storage Volume Calculations (Type C & D soils)

Job No. 1028-01
9-Mar-15

Contributing Basins	Total Area (Ac.)	Impervious Percent	Allowable Release Rates (cfs) Q_{10}	Q_{100}	Water Quality Capture Volume (cf) WQCV	EDB WQCV	Detenetion Volume (cf) 10-Year	100-Year	100-Year + 1/2WQCV	100-Year + WQCV
C	36.25	38%	10.88	36.25	22,962	27,554	60,004	107,361	118,842	130,323
C & D	64.61	23%	19.38	64.61	29,559	35,471	61,221	111,511	126,291	141,070

$WQCV = a\,(0.91i^3 - 1.19i^2 + .78i)$
a: (based on drain time)
i: Percent Impervious
Extended Detention Basin (EDB) requires additional 20% volume for sedimentation

10 Year Detention $V_{10} = K_{10}A$
$K_{10} = (0.951 - 1.90) / 1000$

100 Year Detention $V_{100} = K_{100}A$
$K_{100} = (1.781 - 0.002I^2 - 3.56) / 900$

SCALE
200 0 100 200
1 inch = 200 ft.

Innovative Land Consultants, Inc.
12071 Tejon Street, Suite 470
Westminster, CO 80234
Phone 303.421.4224
www.innovativelandinc.com

Revision Type:
No. | Rev. Date:
1
2
3
4
5
6

Date: March 9, 2015
Horiz. Scale: 1" = 200'
Vert. Scale: N/A
Designed By: XWL
Prepared By: ZAH
Approved By: TRH

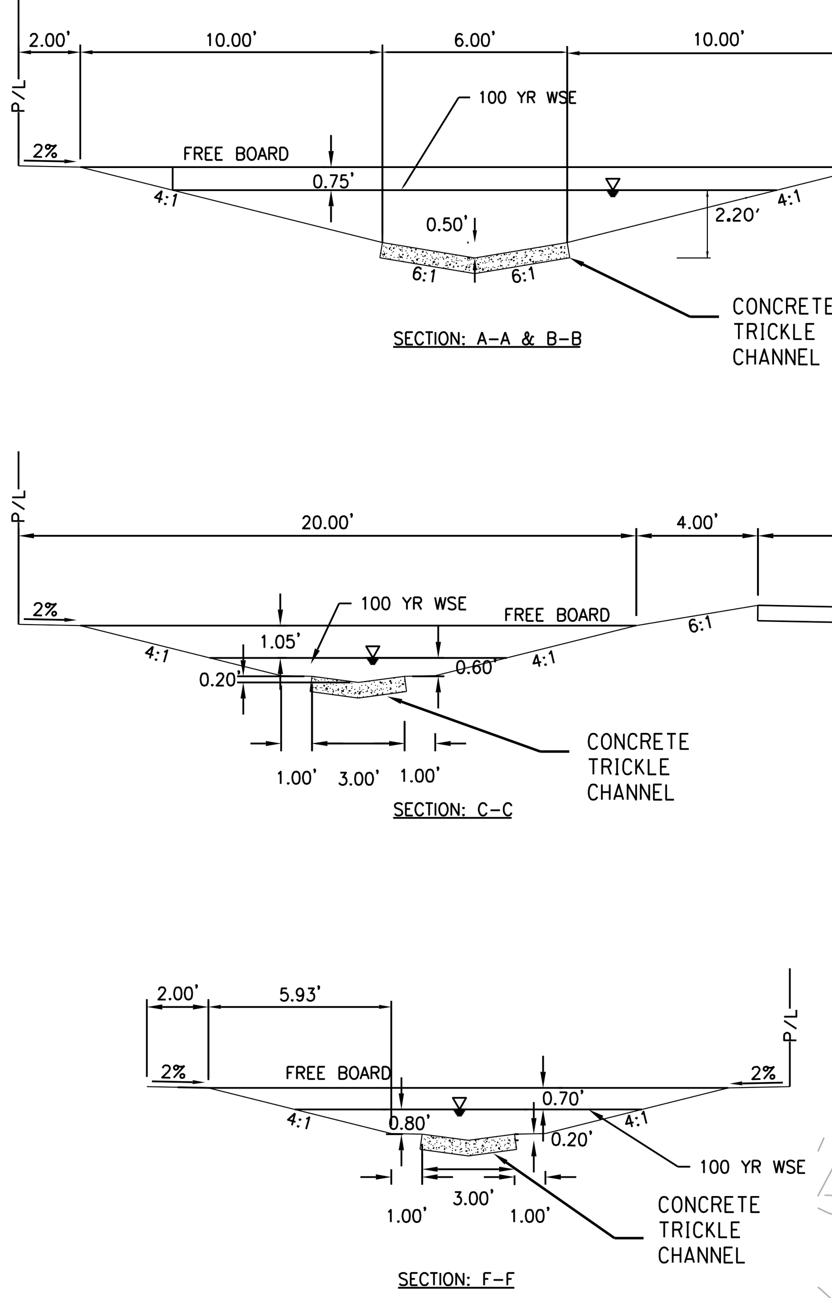
Sheet: 2 of 2
Job No.: 1028-01

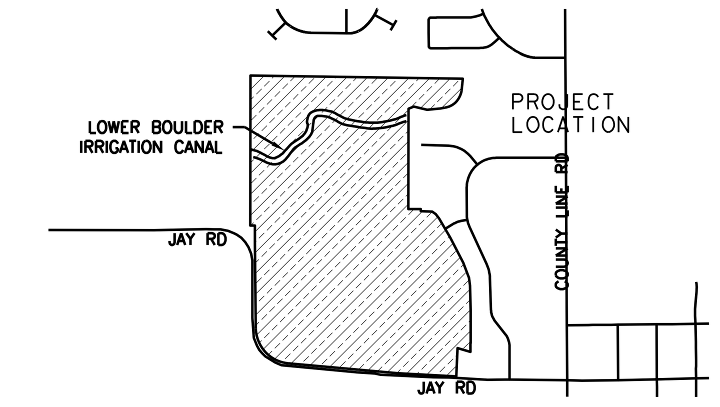
Prop. Name: The Schmidt Property
Location: Boulder County, Colorado
Plan Set:
Sheet Name: Proposed Drainage Map

NOT FOR CONSTRUCTION

811
Know what's below.
Call before you dig.

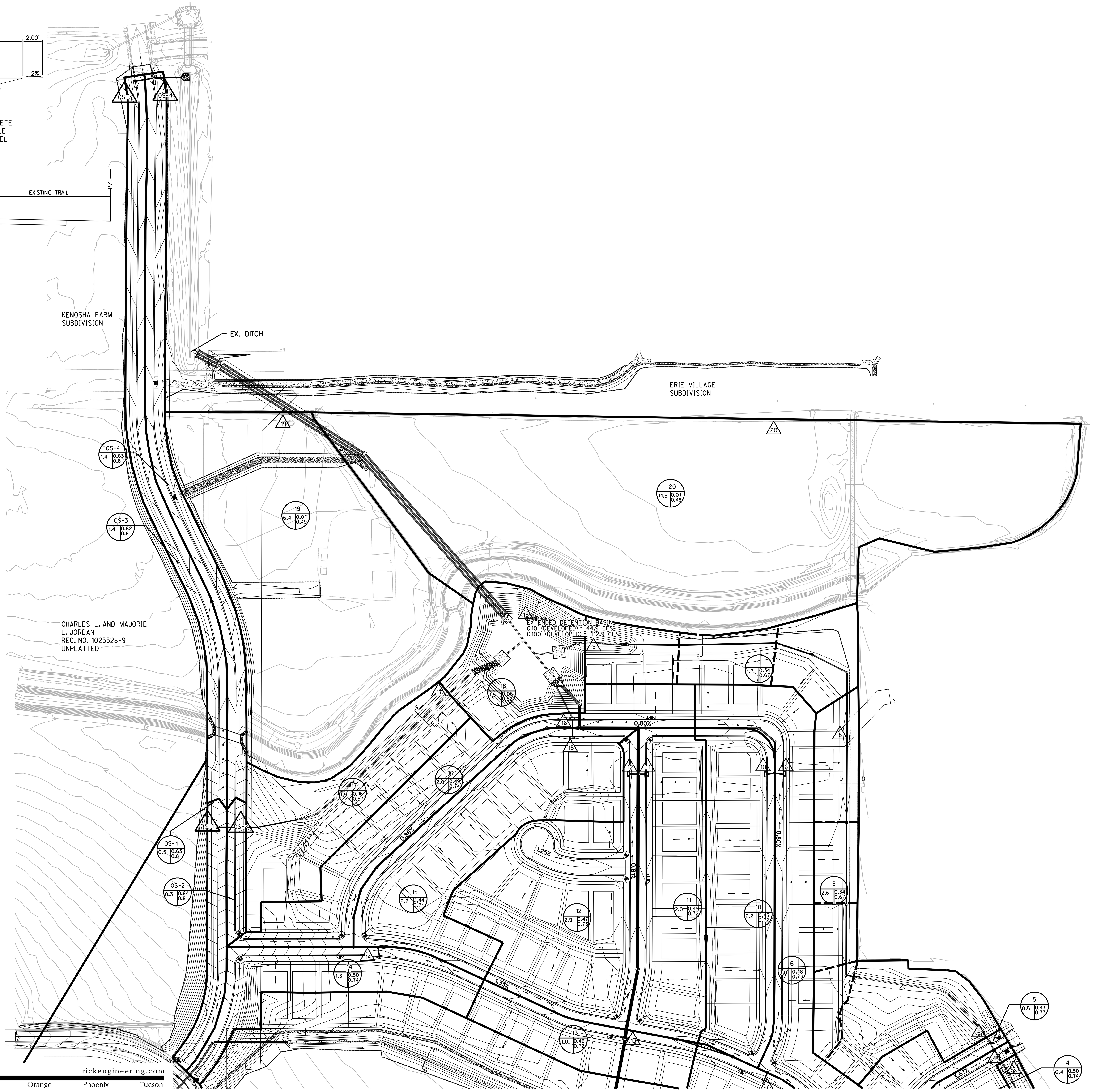
Sheet: 2





VICINITY MAP

DESIGN POINT	CONTRIBUTING AREA (ACRES)	RUNOFF PEAK 2-YEAR EVENT (CFS)	RUNOFF PEAK 100-YEAR EVENT (CFS)	INLET TYPE
1	41.4	5.8	79.0	FES
2	2.6	1.9	8.4	Swale
3	1.6	1.5	6.3	Chase Drain
4	0.4	0.6	2.3	Curb Cut
5	0.5	0.6	2.4	Curb Cut
6	3.0	2.4	9.9	R
7	1.3	1.3	5.5	R
8	2.6	1.6	8.3	Swale
9	1.7	0.9	4.9	Swale
10	2.2	2.1	9.2	R
11	2.0	1.9	8.1	R
12	2.9	2.9	12.0	R
13	1.0	1.1	4.7	R
14	1.3	1.9	7.5	R
15	2.7	2.5	10.7	R
16	2.0	2.3	9.4	R
17	1.9	0.8	7.4	Swale
18	1.5	0.3	7.2	Swale
19	6.4	0.1	11.3	Sheet Flow
20	11.5	0.1	17.6	Sheet Flow
OS-1	0.5	1.0	3.4	R
OS-2	0.3	0.6	1.9	R
OS-3	1.4	1.9	6.5	R
OS-4	1.4	1.9	6.6	R
HOS-1	22.4	0.3	43.9	Sheet Flow
HOS-2	22.8	0.3	41.5	Sheet Flow



DETENTION NOTES:

1. WATER QUALITY CONTROL VOLUME, WQCV = 1.00 AC-FT
2. EXCESS URBAN RUNOFF VOLUME, EURV = 1.93 AC-FT
3. 100-YEAR DETENTION VOLUME = 7.57 AC-FT

LEGEND:

BASIN BOUNDARY
SUB BASIN BOUNDARY
BASIN ID
C2
C100
BASIN AREA
DESIGN POINT

STREET:

ROW WIDTH: 60'
FLOW LINE WIDTH: 34'
CURB TYPE: MOUNTABLE
SIDEWALK WIDTH: 5'
LONGITUDINAL SLOPE: VARIES (SHOWN ON PLAN)

GRAPHIC SCALE 1" = 100'

100 50 0 100 200 300

RICK
ENGINEERING COMPANY
San Diego
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165
rickengineering.com
Riverside Sacramento Orange Phoenix Tucson

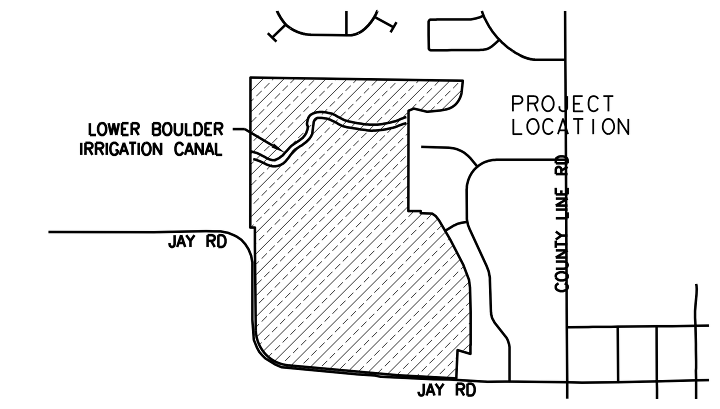
DRAINAGE STUDY MAP FOR MEADOWLARK (POST-PROJECT)

Date: November 21, 2017
Revised: March 16, 2018
Revised: September 24, 2018
Revised: December 14, 2018

J-18184

Sheet 1 of 2

NOT FOR CONSTRUCTION - EXHIBIT FOR DRAINAGE STUDY REPORT ONLY



VICINITY MAP

DESIGN POINT	CONTRIBUTING AREA (ACRES)	RUNOFF PEAK 2-YEAR EVENT (CFS)	RUNOFF PEAK 100-YEAR EVENT (CFS)	INLET TYPE
1	41.4	5.8	79.0	FES
2	2.6	1.9	8.4	Swale
3	1.6	1.5	6.3	Chase Drain
4	0.4	0.6	2.3	Curb Cut
5	0.5	0.6	2.4	Curb Cut
6	3.0	2.4	9.9	R
7	1.3	1.3	5.5	R
8	2.6	1.6	8.3	Swale
9	1.7	0.9	4.9	Swale
10	2.2	2.1	9.2	R
11	2.0	1.9	8.1	R
12	2.9	2.9	12.0	R
13	1.0	1.1	4.7	R
14	1.3	1.9	7.5	R
15	2.7	2.5	10.7	R
16	2.0	2.3	9.4	R
17	1.9	0.8	7.4	Swale
18	1.5	0.3	7.2	Swale
19	6.4	0.1	11.3	Sheet Flow
20	11.5	0.1	17.6	Sheet Flow
OS-1	0.5	1.0	3.4	R
OS-2	0.3	0.6	1.9	R
OS-3	1.4	1.9	6.5	R
OS-4	1.4	1.9	6.6	R
HOS-1	22.4	0.3	43.9	Sheet Flow
HOS-2	22.8	0.3	41.5	Sheet Flow

LEGEND:

BASIN BOUNDARY
SUB BASIN BOUNDARY
BASIN ID
C2
C100
BASIN AREA
DESIGN POINT

STREET:

ROW WIDTH: 60'
FLOW LINE WIDTH: 34'
CURB TYPE: MOUNTABLE
SIDEWALK WIDTH: 5'
LONGITUDINAL SLOPE: VARIES (SHOWN ON PLAN)

DRAINAGE STUDY MAP FOR MEADOWLARK (POST-PROJECT)

Date: November 21, 2017
Revised: March 16, 2018
Revised: September 24, 2018
Revised: December 14, 2018

J-18184

Sheet 2 of 2

GRAPHIC SCALE 1" = 100'

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San Diego Riverside Sacramento Orange Phoenix Tucson

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MEADOWLARK
TRAFFIC IMPACT STUDY
TOWN OF ERIE, COLORADO

NOVEMBER 30, 2018

JOB NUMBER [C:18144-T, D:1048]

Rick

RICK ENGINEERING COMPANY

RICK
ENGINEERING COMPANY

rickengineering.com

MEADOWLARK
TRAFFIC IMPACT STUDY
TOWN OF ERIE, COLORADO

November 30, 2018

Prepared for:

O/B/O TI Residential L.L.C
9801 E. Easter Avenue
Erie, CO 80112

COLORADO LICENSED
BRIAN R. STEPHENSON
48708
PROFESSIONAL ENGINEER

Prepared by:

RICK
ENGINEERING COMPANY
Traffic Division

Job Number [C:18144-T, D:1048]

MEADOWLARK
TRAFFIC IMPACT STUDY
November 30, 2018

INTRODUCTION

The following Traffic Impact Study (TIS) has been prepared to determine any traffic-related impacts within the project area roadways and intersections due to the proposed Meadowlark project. The project site is located northeast of the Jay Road/Jasper Road S-curve, within the Town of Erie and Boulder County, Colorado. **Exhibit 1** shows the project vicinity map.

This TIS was prepared following the guidelines presented in *Chapter 6 (Development and Design Standards) Section 10.6.5 (Transportation and Access) of Town of Erie, Colorado Unified Development Code dated October 2017*.

PROJECT DESCRIPTION

The project is proposing to construct 118 homes on approximately 90 acres of land. The project proposes to take access to Jay Road via a new roadway that will provide the third leg at the S-curve at Jay Road/Jasper Road. It is proposed that the project take access to both Jay Road to the south and to County Line Road to the east via a connection to Farmer Place and henceforth accessing Delechant Drive. Both Farmer Place and Delechant Drive are currently under construction as part of the Lost Creek Farm project.

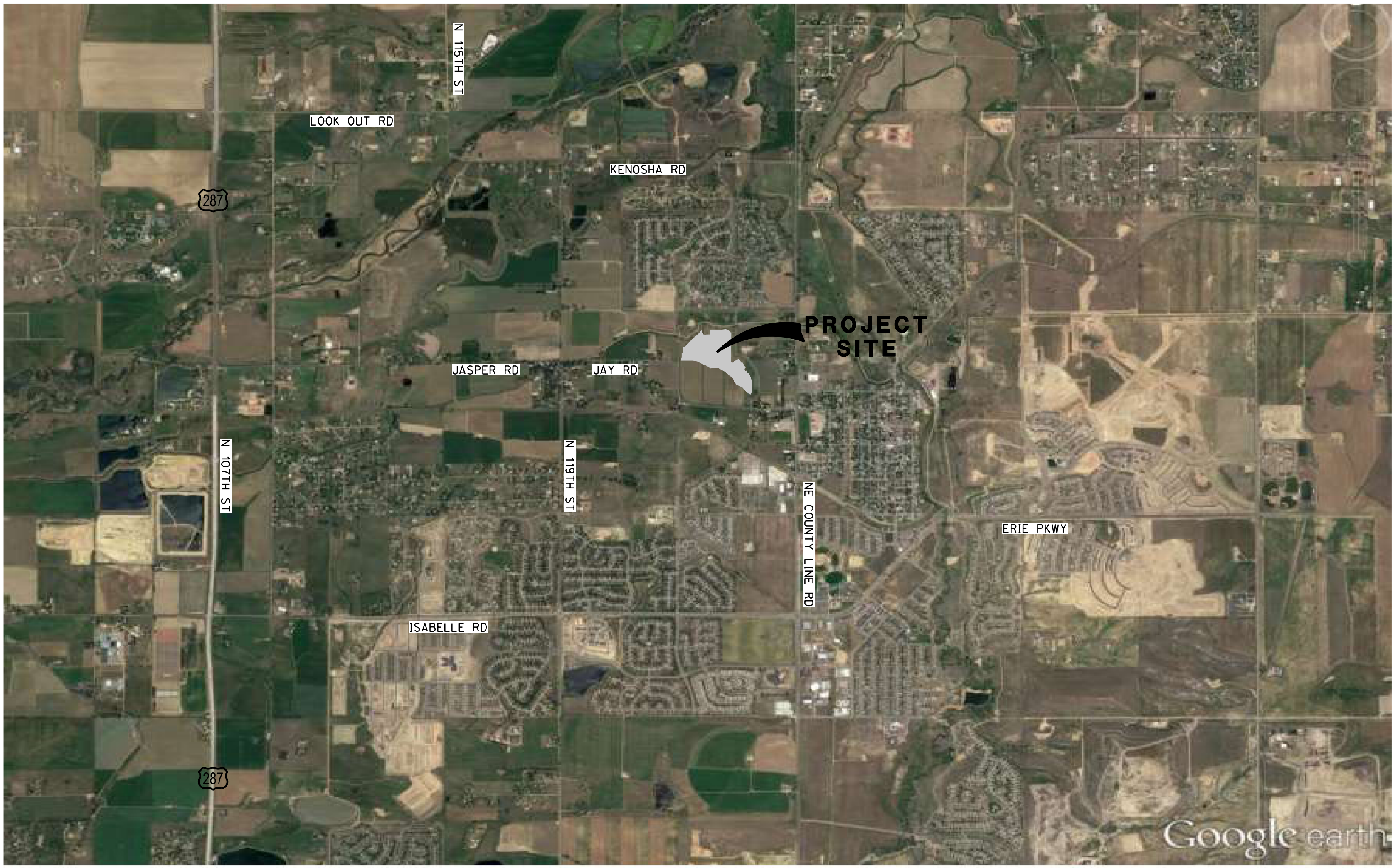
Exhibit 2 shows the existing transportation conditions and **Exhibit 3** shows the proposed site plan.

EXISTING TRANSPORTATION CONDITIONS

The following is a brief description of the roadways within the project area.

<u>Jasper Road-Jasper Road</u> runs west to east and provides access to US-287 to the west of the project site. Per the *Erie Transportation Plan* it is functionally classified as a two-lane minor collector within the study area. The roadway provides one through travel lane in each direction and the posted speed limit is 35 mph in the vicinity of N 119th Street, 30 MPH just west of County Line Road and 20 MPH east of County Line Road (school zone) . It currently provides for all way stop control at its intersection with N 119th Street in the vicinity of the study area.

<u>County Line Road</u> runs north to south and per the *Erie Transportation Plan* it is functionally classified as a two-lane minor arterial in the vicinity of the project. The roadway provides one through travel lane in each direction; the posted speed limit is 35 mph north of Jay Road-Cheesman Street and 25 MPH south of Jay Road-Cheesman Street and it is currently all way stop controlled at its intersection with Jay Road-Cheesman Street.



NOT TO SCALE

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EXHIBIT 1
PROJECT VICINITY MAP

MEADOWLARK TRAFFIC IMPACT STUDY

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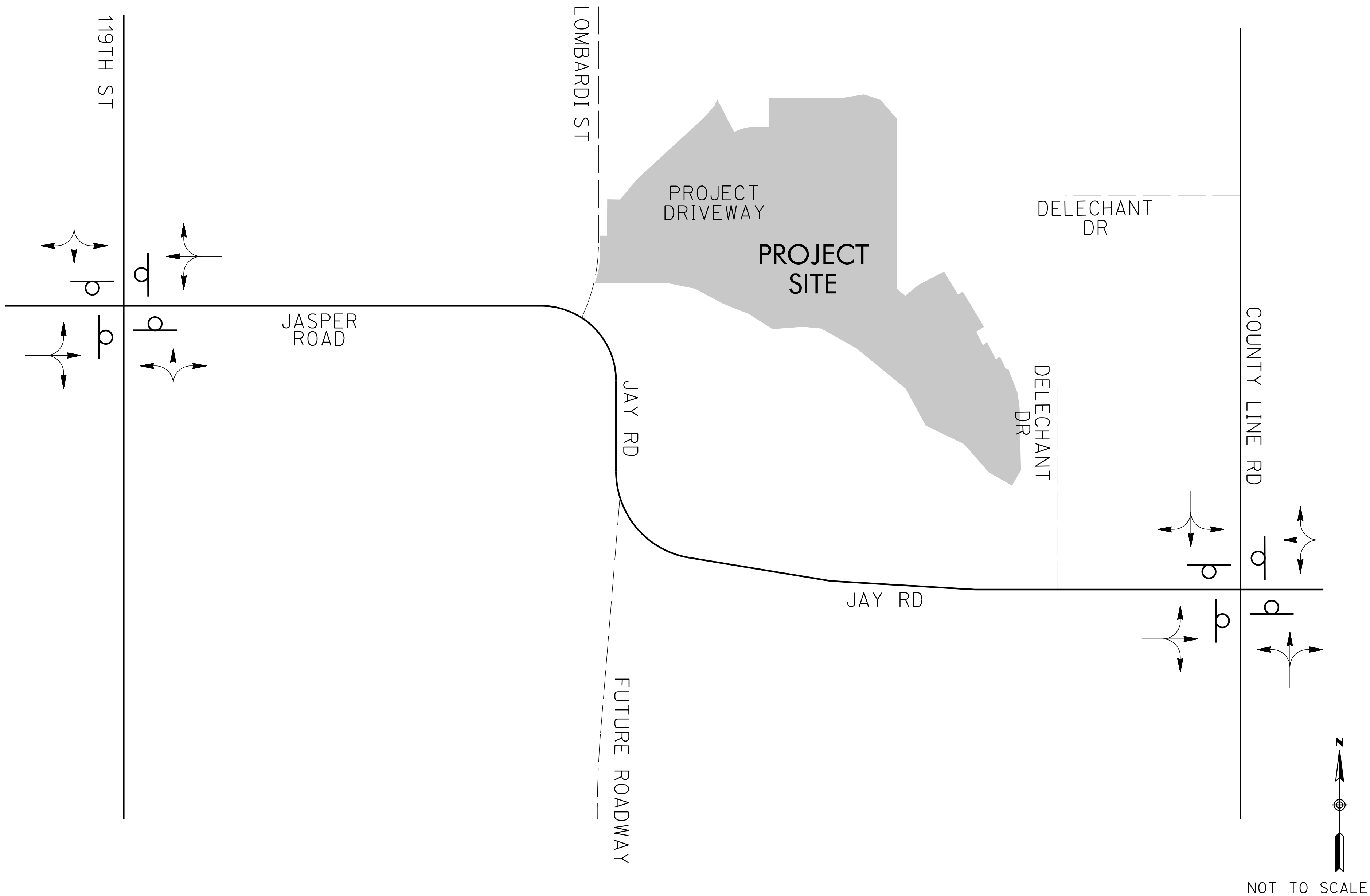

LEGEND
= STOP SIGN

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EXHIBIT 2
EXISTING GEOMETRIC CONDITIONS

MEADOWLARK TRAFFIC IMPACT STUDY

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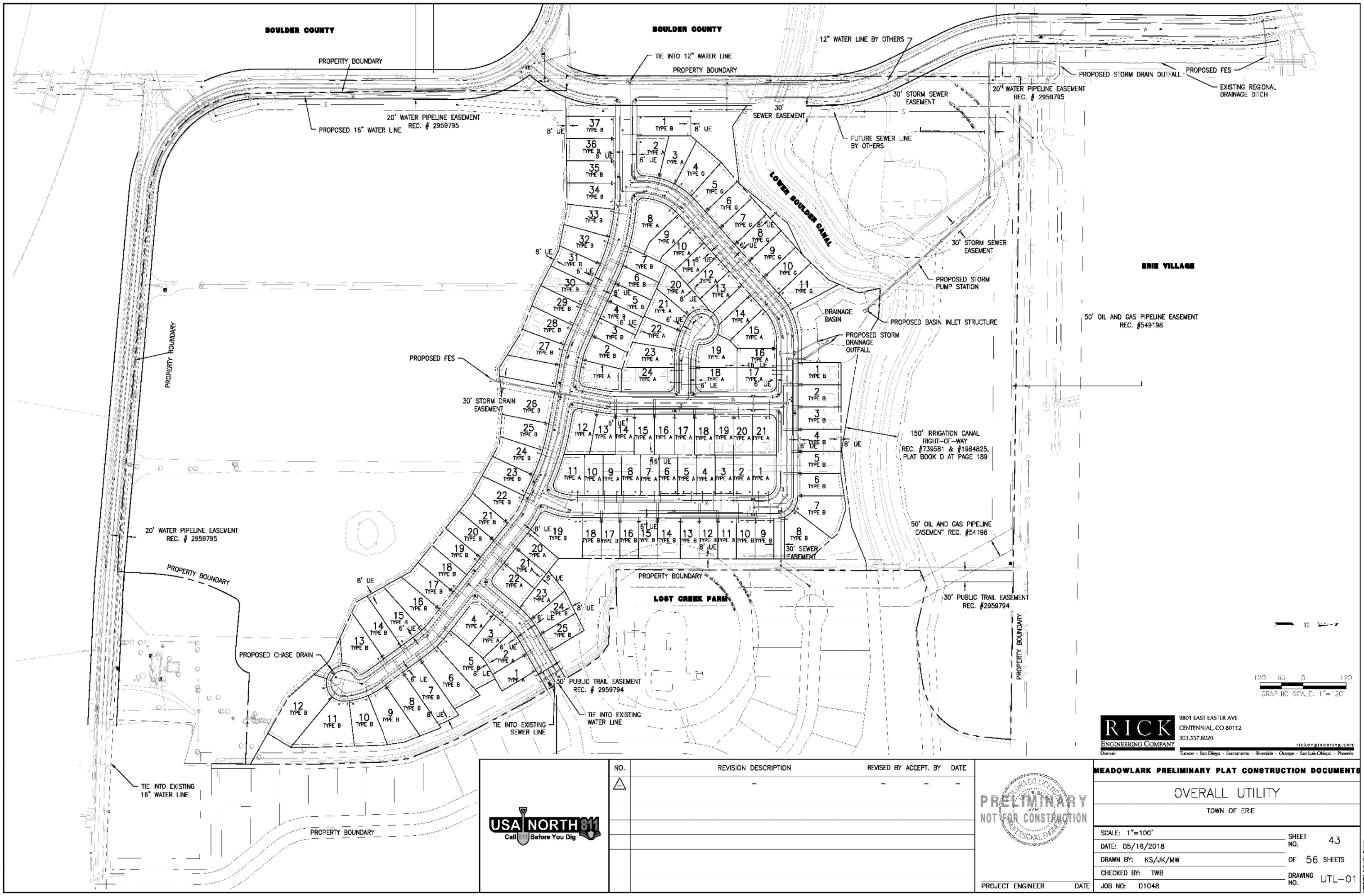

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EXHIBIT 3

SITE PLAN

MEADOWLARK TRAFFIC IMPACT STUDY

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EXISTING TRAFFIC VOLUMES

Existing traffic volumes at the project area intersections were obtained from traffic counts conducted by Counter Measures Inc. on Tuesday, May 15, 2018 and on Wednesday May 16, 2018 during the AM (7-9) and PM (4-6) periods. Additionally, 24-hour ADT counts were conducted on Tuesday May 15, 2018. **Exhibit 4** shows the existing intersection turning movement counts and ADT's within the study area. **Appendix A** contains the manual turning movement and daily traffic count sheets.

TRAFFIC ANALYSIS METHODOLOGY

The intersections and roadways within the project area were analyzed for the following scenarios:

- Existing (2018)
- Opening year (2019 Background)
- Opening year (2019 Total)
- 2040 (Build out)

The level of service for unsignalized intersections was calculated using the methodologies described in Chapters 20 and 21 of the HCM 6th Edition. The level of service for an unsignalized (two-way stop controlled) intersection is determined by the computed control delay for each minor street movement and major street left-turns, lanes, and not for the intersection as a whole. The level of service for an unsignalized (all-way stop controlled) intersection is determined by the computed control delay for the intersection as a whole.

Level of Service A through D is considered acceptable for peak hour intersection operations per Town of Erie *Unified Development Code*. The project area intersections were analyzed during the AM and PM peak hours.

The intersection calculation sheets are contained in **Appendix B**.

EXISTING (2018) TRAFFIC OPERATIONS

Table 1 shows that all the critical movements of the unsignalized intersections currently operate at LOS B or better during the AM and PM peak hours.

BACKGROUND TRAFFIC VOLUMES

In order to estimate the year 2019 background traffic volumes, the existing traffic volumes were increased 3% per year. Additionally, per direction of Town of Erie staff, traffic volumes from the following approved traffic impact studies were included as part of the background traffic:

- Wiggett Subdivision Memorandum prepared by Felsburg Holt & Ullevig dated December 15, 2000

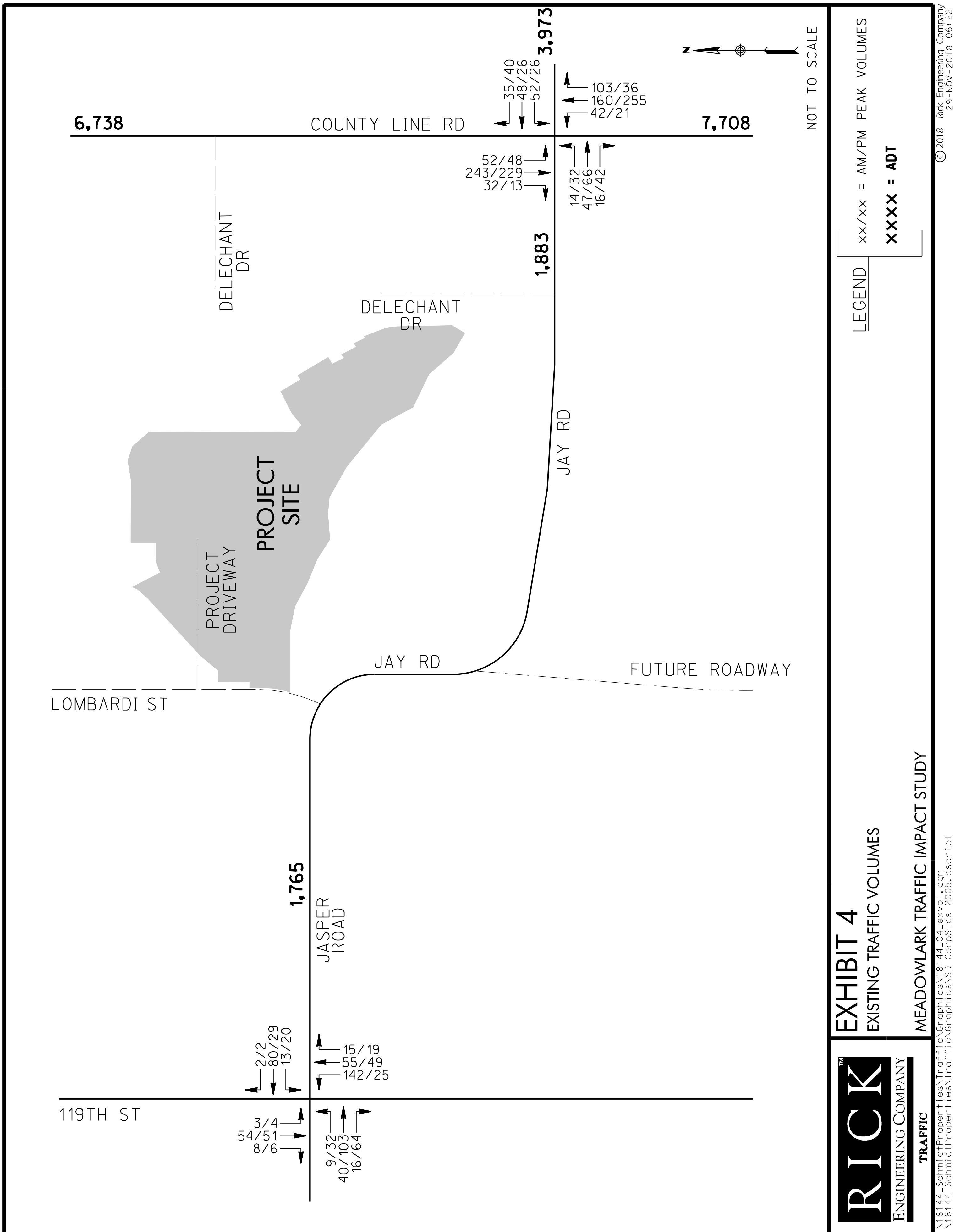
EXHIBIT 4
EXISTING TRAFFIC VOLUMES
MEADOWLARK TRAFFIC IMPACT STUDY
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TRAFFIC
LEGEND
xx/xx = AM/PM PEAK VOLUMES
XXXX = ADT
NOT TO SCALE
N
COUNTY LINE RD
6,738
7,708
3,973
35/40
48/26
52/26
103/36
160/255
42/21
52/48
243/229
32/13
14/32
47/66
16/42
1,883
DELECHANT DR
DELECHANT DR
PROJECT SITE
PROJECT DRIVEWAY
JAY RD
JAY RD
FUTURE ROADWAY
LOMBARDI ST
1,765
JASPER ROAD
2/2
80/29
13/20
15/19
55/49
142/25
119TH ST
3/4
54/51
8/6
9/32
40/103
16/64
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TABLE 1
EXISTING INTERSECTION OPERATIONS
MEADOWLARK TRAFFIC IMPACT STUDY

INTERSECTION		EXISTING (2018)	
		DELAY	LOS
1.- 119th Street/Jay Road (U)			
	AM peak		
	NB LTR	9.4	A
	SB LTR	8.0	A
	EB LTR	8.1	A
	WB LTR	8.5	A
	PM peak		
	NB LTR	8.2	A
	SB LTR	8.1	A
	EB LTR	8.7	A
	WB LTR	8.0	A
5.- Jay Road/County Line Road - Cheesman Street (U)			
	AM peak		
	NB LTR	12.0	B
	SB LTR	13.0	B
	EB LTR	9.8	A
	WB LTR	10.5	B
	PM peak		
	NB LTR	12.7	B
	SB LTR	12.4	B
	EB LTR	10.5	B
	WB LTR	9.8	A

- Delay and Level of Service calculated utilizing the methodologies described
  in Chapters 19, 20, 21 and 22 of the Highway Capacity Manual (HCM) 6th Edition.

Delay is measured in seconds per vehicle
LOS = Level of Service
NB=Northbound, SB=Southbound, etc.
T=Thru Movement, L=Left-Turn Movement, etc.
(S)=Signalized Intersection
(U)=Unsignalized Intersection
(R)=Roundabout Intersection

- Canyon Creek Filings 7 & 8 prepared by LSC Transportation Consultants, Inc. dated February 12, 2007

- Wise Farms Traffic Analysis prepared by LSC Transportation Consultants, Inc. dated July 31, 2014

Furthermore, the number of AM and PM peak hour trips anticipated to utilize the extension of Lombardi Street was estimated, as this project will connect to the existing Lombardi Street to the north. This estimate was conducted based on the existing homes north of this project (Kenosha Farms and Erie Village subdivisions) and utilizing ITE (Institute of Transportation Engineer)'s *Trip Generation* 10th *Edition* publication, for Single Family Detached Housing (ITE Code 210). It was also assumed that approximately 30% of the total trips generated by this existing residential development would be rerouted south along Lombardi Street.

Appendix C contains the trip generation calculations, an exhibit showing the existing residential development areas used for this calculation and an exhibit showing the distributed trips.

Exhibit 5 shows the 2019 background traffic volumes utilized for this analysis. Additionally, **Exhibit 6** shows the anticipated year 2019 and year 2040 geometric conditions.

BACKGROUND (2019) TRAFFIC ANALYSIS

Table 2 shows that all the critical movements of the unsignalized intersections are anticipated to operate at LOS B or better during the AM and PM peak hours.

PROJECT TRAFFIC GENERATION

The proposed project trip generation is based on ITE (Institute of Transportation Engineer)'s *Trip Generation* 10th *Edition* publication, for Single Family Detached Housing (ITE Code 210). The proposed project is estimated to generate a total of 1,114 ADT with 88 AM peak hour trips, (22 inbound and 66 outbound), and 117 PM peak hour trips, (74 inbound and 43 outbound). **Appendix D** contains the trip generation rates used in this study.

Table 3 shows the summary of the project traffic generation calculations.

TRIP DISTRIBUTION/ASSIGNMENT

The site traffic distribution was estimated based on the site's proximity to the nearby major roadways/freeway interchanges, existing local traffic patterns and existing traffic counts at the project area intersections. **Exhibit 7** and **Exhibit 8** show the project traffic distribution percentages for opening year 2019 and year 2040 (Build-Out) respectively. Additionally, **Exhibit 9** and **Exhibit 10** show the project traffic volumes for opening year 2019 and year 2040 (Build-out) respectively and **Exhibit 11** shows the total traffic volumes for opening year 2019.

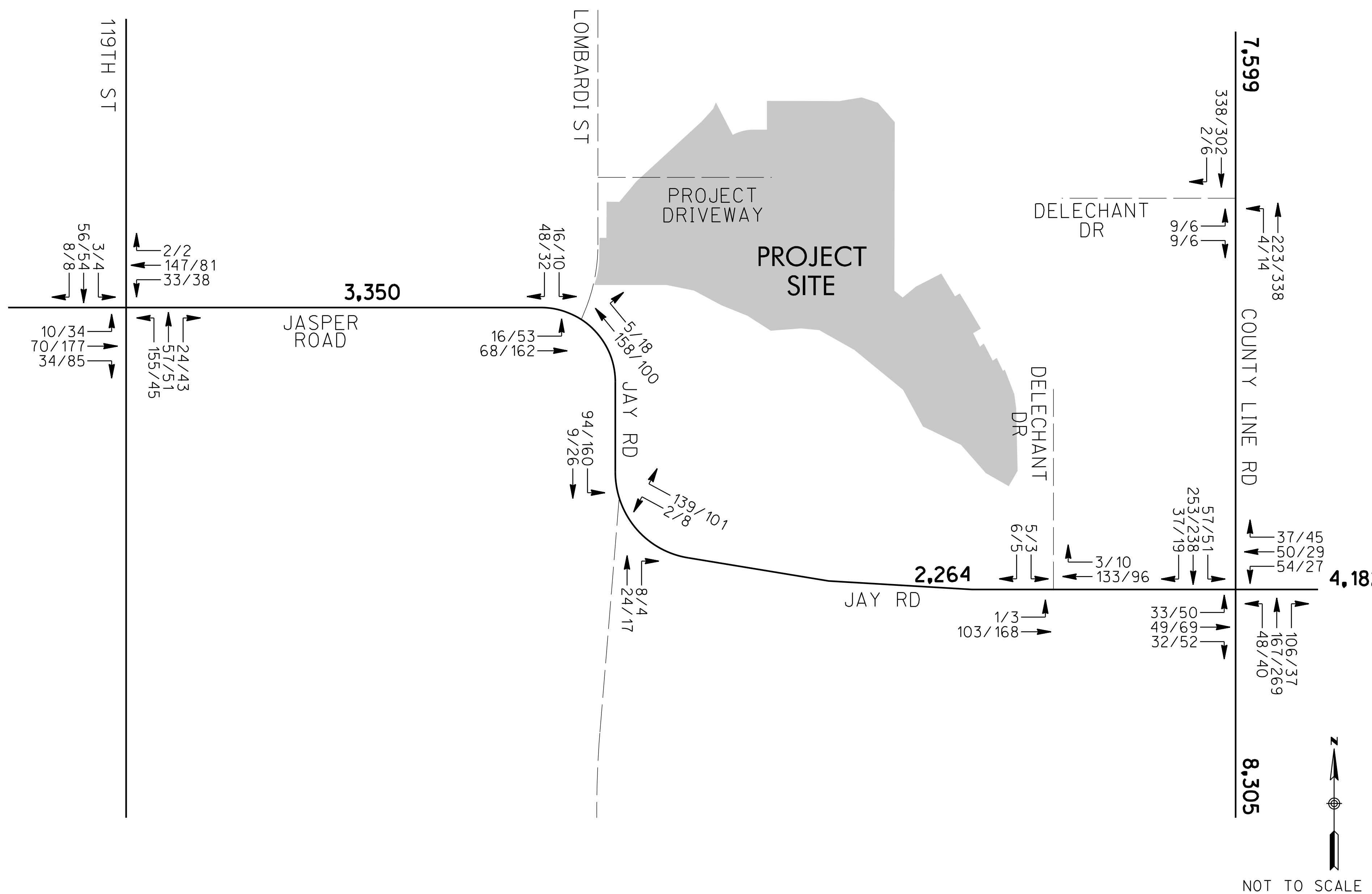

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EXHIBIT 5
2019 BACKGROUND TRAFFIC VOLUMES

MEADOWLARK TRAFFIC IMPACT STUDY

LEGEND
xx/xx = AM/PM PEAK VOLUMES
XXXX = ADT

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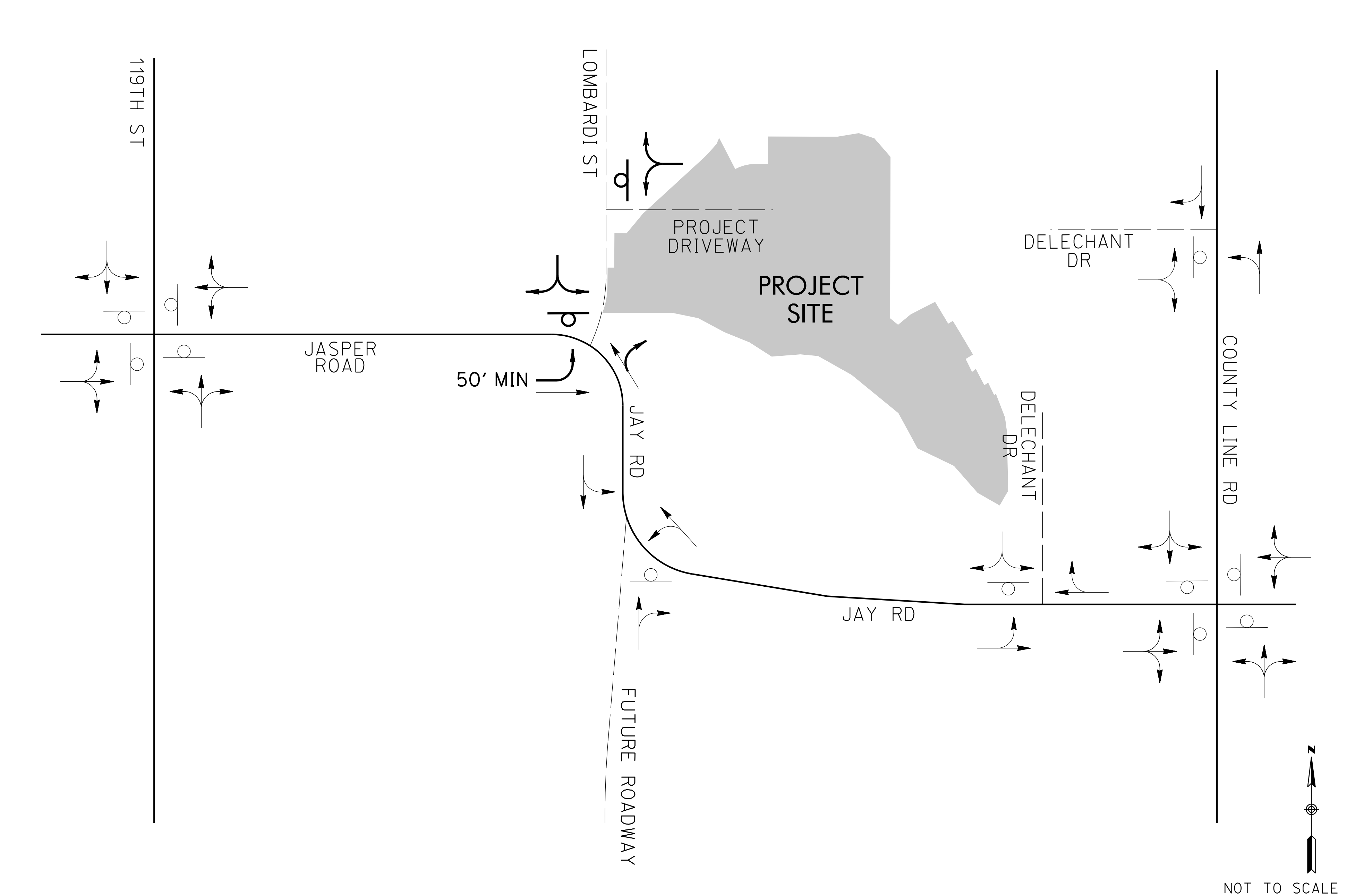

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EXHIBIT 6

2019 & 2040 GEOMETRIC CONDITIONS

MEADOWLARK TRAFFIC IMPACT STUDY

LEGEND
= STOP SIGN
= PROPOSED MOVEMENT
= EXISTING MOVEMENT

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Traffic Division

TABLE 2
2019 OPENING YEAR BACKGROUND
INTERSECTION OPERATIONS
MEADOWLARK TRAFFIC IMPACT STUDY

INTERSECTION		2019 OPENING YEAR BACKGROUND	
		DELAY	**LOS**
1.- 119th Street/Jasper Road (U)			
	AM peak		
	NB LTR	10.6	B
	SB LTR	8.6	A
	EB LTR	8.9	A
	WB LTR	9.8	A
	PM peak		
	NB LTR	9.3	A
	SB LTR	8.8	A
	EB LTR	10.6	B
	WB LTR	9.1	A
2.- Jay Road/Lombardi Street (U)			
	AM peak		
	SB LTR	7.6	A
	EB L	9.8	A
	PM peak		
	SB LTR	7.6	A
	EB L	9.7	A
3.- Jay Road/Jasper Road (U)			
	AM peak		
	NB LTR	9.9	A
	WB LTR	7.4	A
	PM peak		
	NB LTR	10.3	B
	WB LTR	7.6	A
4.- Jay Road/Delechant Drive (U)			
	AM peak		
	SB LTR	9.5	A
	EB LTR	7.5	A
	PM peak		
	SB LTR	9.4	A
	EB LTR	7.4	A

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Traffic Division

TABLE 2
2019 OPENING YEAR BACKGROUND INTERSECTION OPERATIONS
MEADOWLARK TRAFFIC IMPACT STUDY

INTERSECTION	2019 OPENING YEAR BACKGROUND	
	DELAY	**LOS**
5.- Jay Road/County Line Road - Cheesman Street (U)		
AM peak		
NB LTR	13.4	B
SB LTR	14.7	B
EB LTR	10.7	B
WB LTR	11.1	B
PM peak		
NB LTR	14.8	B
SB LTR	13.8	B
EB LTR	11.6	B
WB LTR	10.4	B
7.- County Line Road/Delechant Drive (U)		
AM peak		
NB LTR	8.0	A
EB LTR	11.9	B
PM peak		
NB LTR	8.0	A
EB LTR	12.4	B

- Delay and Level of Service calculated utilizing the methodologies described in Chapters 19, 20, 21 and 22 of the Highway Capacity Manual (HCM)

Delay is measured in seconds per vehicle
LOS = Level of Service
NB=Northbound, SB=Southbound, etc.
T=Thru Movement, L=Left-Turn Movement, etc.
(S)=Signalized Intersection
(U)=Unsignalized Intersection
(R)=Roundabout Intersection

TABLE 3
MEADOWLARK
TRIP GENERATION

USE	SIZE	RATE*	ADT	AM PEAK				PM PEAK			
				RATE		VOLUME		RATE		VOLUME	
				IN	OUT	IN	OUT	IN	OUT	IN	OUT
Single Family Detached Housing (ITE Code 210)	118 Units	9.44	1,114	0.0197	0.0592	22	66	0.0664	0.0386	74	43

ITE Trip Generation Rate from Institute of Transportation Engineer's Trip Generation Manual 10th Edition.

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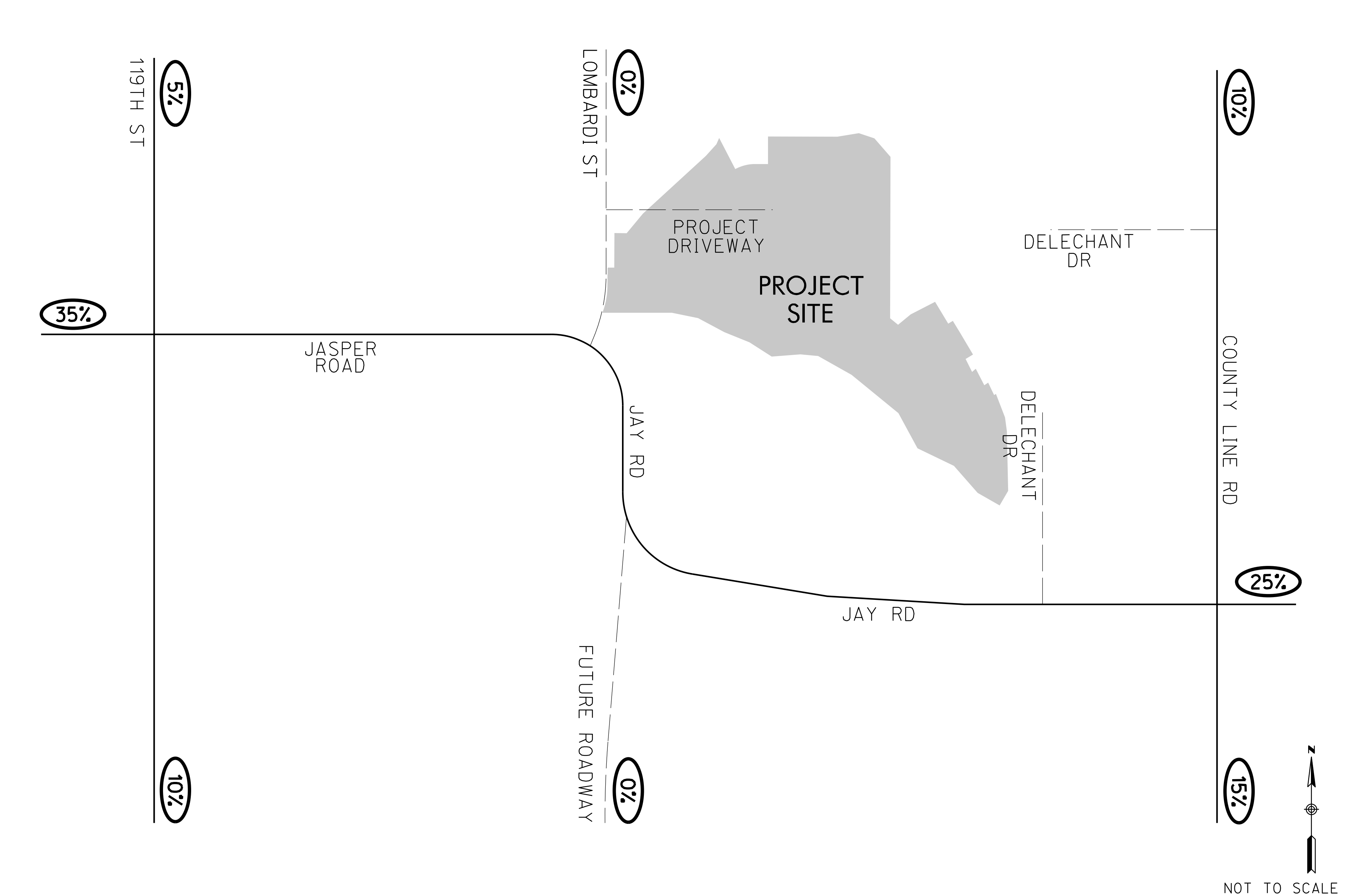

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EXHIBIT 7

TRAFFIC DISTRIBUTION PERCENTAGES (2019)

MEADOWLARK TRAFFIC IMPACT STUDY

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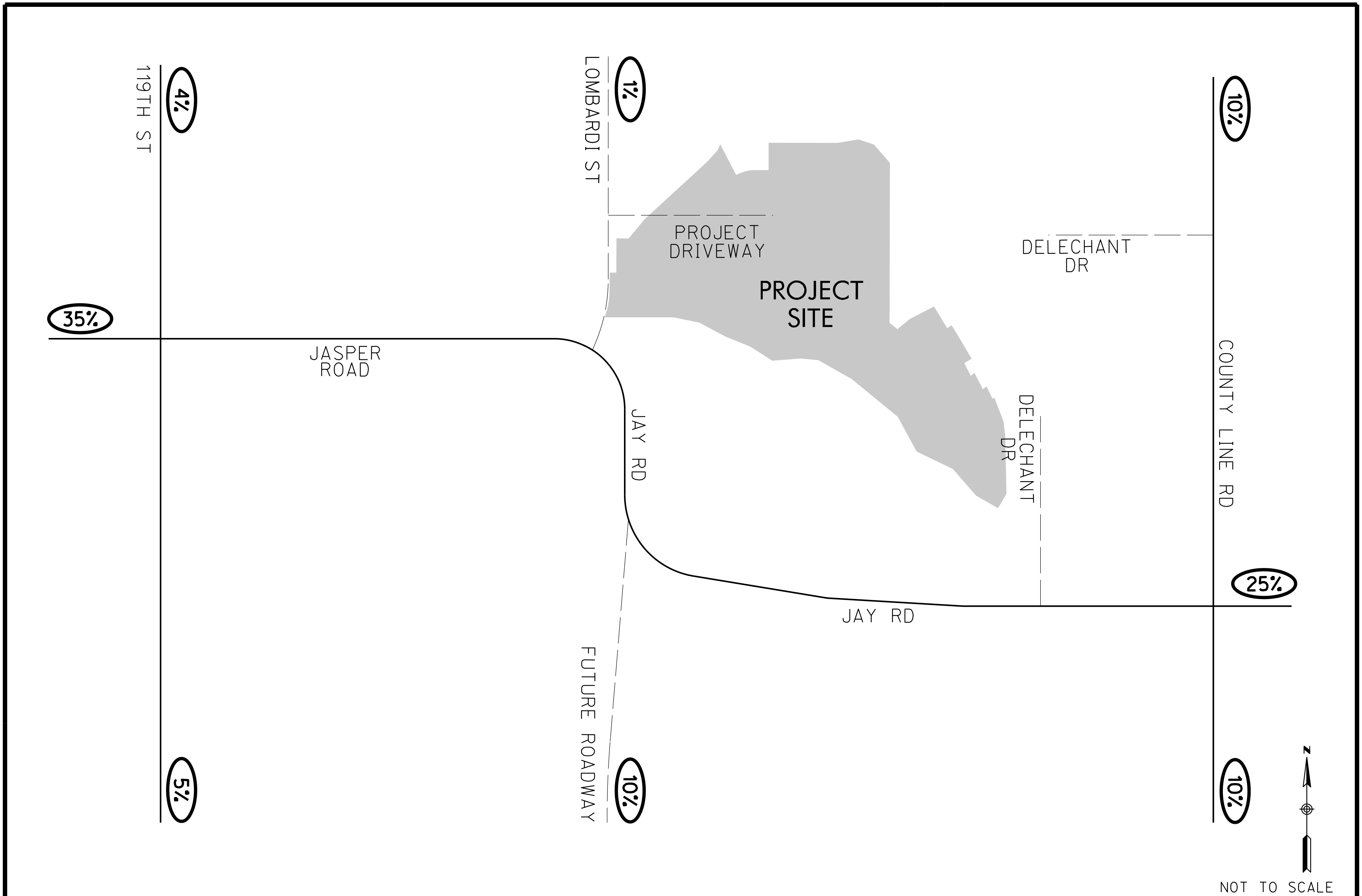

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EXHIBIT 8

TRAFFIC DISTRIBUTION PERCENTAGES (2040)

MEADOWLARK TRAFFIC IMPACT STUDY

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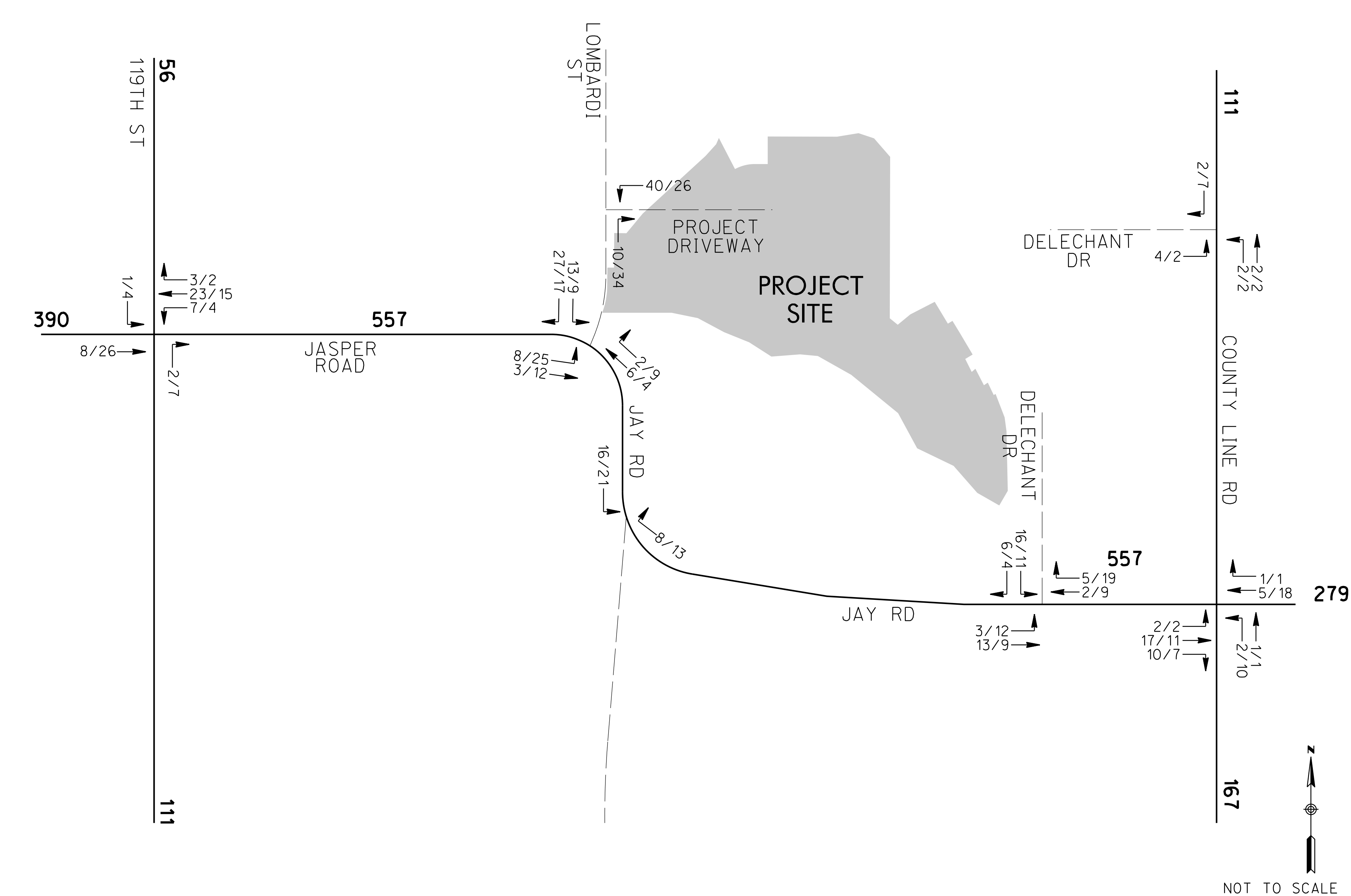

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EXHIBIT 9

PROJECT TRAFFIC VOLUMES (2019)

MEADOWLARK TRAFFIC IMPACT STUDY

LEGEND
xx/xx = AM/PM PEAK VOLUMES
XXXX = ADT

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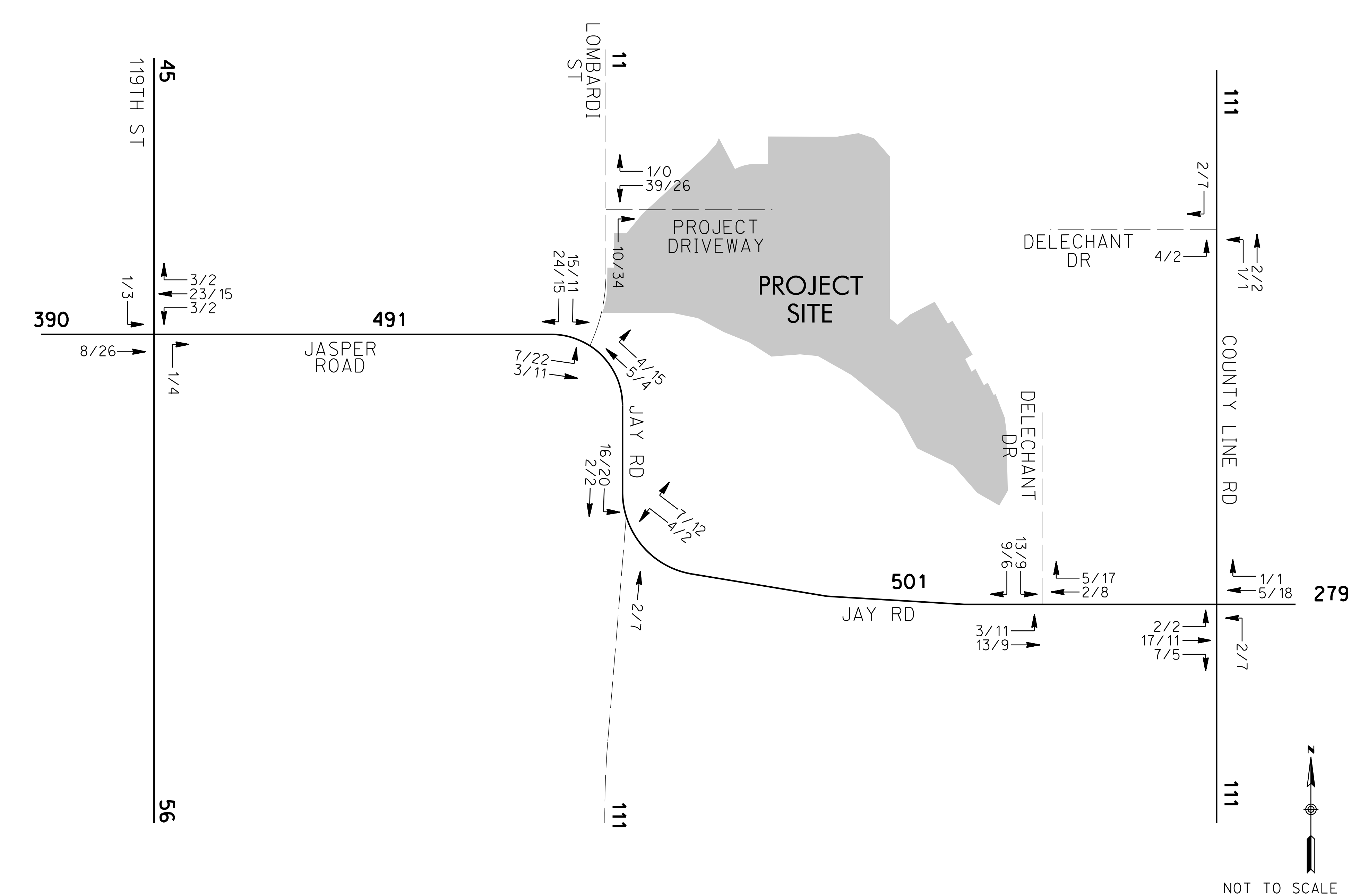

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EXHIBIT 10
PROJECT TRAFFIC VOLUMES (2040)

MEADOWLARK TRAFFIC IMPACT STUDY

LEGEND
xx/xx = AM/PM PEAK VOLUMES
XXXX = ADT

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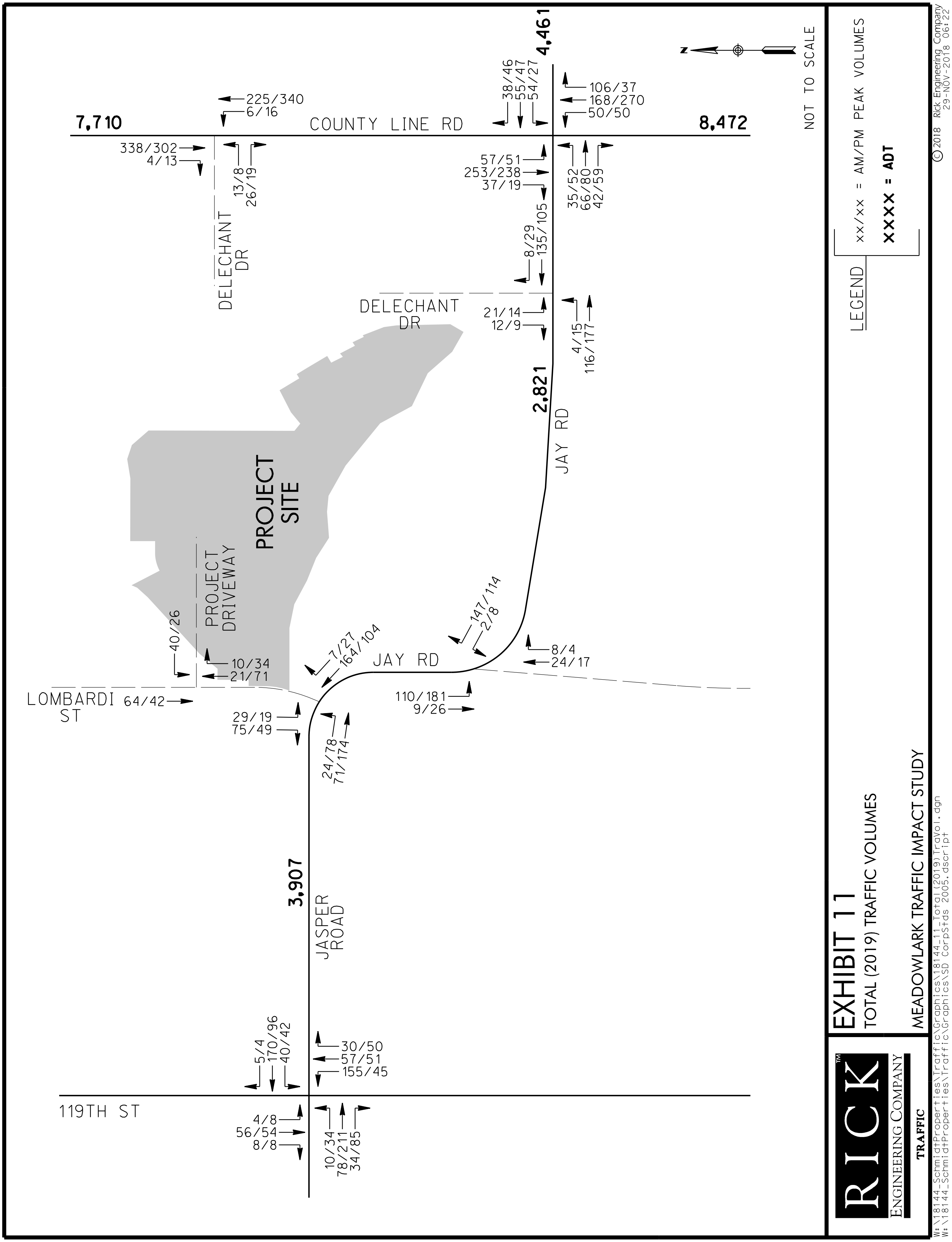
EXHIBIT 11
TOTAL (2019) TRAFFIC VOLUMES
MEADOWLARK TRAFFIC IMPACT STUDY
RICK ENGINEERING COMPANY
TRAFFIC
LEGEND
xx/xx = AM/PM PEAK VOLUMES
XXXX = ADT
NOT TO SCALE
COUNTY LINE RD
7,710
8,472
4,461
DELECHANT DR
JAY RD
2,821
PROJECT SITE
PROJECT DRIVEWAY
LOMBARDI ST
JASPER ROAD
3,907
119TH ST
225/340
6/16
338/302
4/13
13/8
26/19
38/46
55/47
54/27
106/37
168/270
50/50
57/51
253/238
37/19
35/52
66/80
42/59
8/29
135/105
21/14
12/9
4/15
116/177
147/114
2/8
8/4
24/17
7/27
164/104
40/26
10/34
21/71
64/42
110/181
9/26
29/19
75/49
24/78
71/174
5/4
170/96
40/42
30/50
57/51
155/45
4/8
56/54
8/8
10/34
78/211
34/85
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OPENING YEAR (2019) TOTAL TRAFFIC ANALYSIS

Table 4 shows that all the critical movements of the unsignalized intersections are anticipated to operate at LOS C or better during the AM and PM peak hours with the addition of project related traffic.

YEAR 2040 (BACKGROUND) TRAFFIC ANALYSIS

Background (2040) traffic volumes were calculated utilizing existing average daily traffic (ADT) and 2040 average daily traffic volumes from the *Erie Transportation Plan* prepared by Felsburg Holt & Ullevig and dated January 2018 and removing the project traffic volumes. It should be noted that per the *Town of Erie, Colorado Zoning Map* the project site is classified as LR (Low Density Residential). Based on this it is assumed that the *Erie Transportation Plan* includes the proposed 118 homes that are part of this study. **Exhibit 12** shows the background traffic volumes for year 2040. **Appendix E** contains the calculations sheets and **Appendix F** contains the *Town of Erie, Colorado Zoning Map*.

Table 5 shows that all the critical movements of the unsignalized intersections are anticipated to operate at LOS C or better during the AM and PM peak hours.

YEAR 2040 (BUILD-OUT) TRAFFIC ANALYSIS

As previously mentioned, the build out (2040) traffic volumes were calculated utilizing existing average daily traffic (ADT) and 2040 average daily traffic volumes from the *Erie Transportation Plan* prepared by Felsburg Holt & Ullevig and dated January 2018. For the purposes of this analysis, it is assumed that the *Erie Transportation Plan* includes the proposed 118 homes that are part of this study. **Exhibit 13** shows the 2040 (Build-Out) total traffic volumes.

Table 6 shows that all the critical movements of the unsignalized intersections are anticipated to operate at LOS C or better during the AM and PM peak hours.

Table 7 shows the intersection operations summary for all study scenarios.

CONCLUSIONS/RECOMMENDATIONS

Based on the analysis contained within this report, the nearby project area intersections are calculated to operate at acceptable levels of services (LOS C or better) for the study scenarios. The following are recommendations to help facilitate access and continue to operate at acceptable levels of service:

Intersection of: ***Jasper Road-Jay Road/Lombardi Street***

It is recommended that this intersection operate as an unsignalized intersection with stop control for the southbound approach. It is anticipated that in year 2040 (Build Out), 70 eastbound vehicles will turn left at this intersection. Based on these projected traffic volumes, it is recommended that Jay Road be widened to provide an eastbound left turn lane at its intersection

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Traffic Division

TABLE 4
2019 OPENING YEAR TOTAL
INTERSECTION OPERATIONS
MEADOWLARK TRAFFIC IMPACT STUDY

INTERSECTION		2019 OPENING YEAR TOTAL DELAY	2019 OPENING YEAR TOTAL LOS
1.- 119th Street/Jasper Road (U)			
	AM peak		
	NB LTR	10.9	B
	SB LTR	8.8	A
	EB LTR	9.1	A
	WB LTR	10.4	B
	PM peak		
	NB LTR	9.7	A
	SB LTR	9.1	A
	EB LTR	11.5	B
	WB LTR	9.5	A
2.- Jasper Road/Lombardi Street (U)			
	AM peak		
	SB LTR	7.6	A
	EB L	10.3	B
	PM peak		
	SB LTR	7.7	A
	EB L	10.3	B
3.- Jay Road/Jasper Road (U)			
	AM peak		
	NB LTR	10.1	B
	WB LTR	7.5	A
	PM peak		
	NB LTR	10.6	B
	WB LTR	7.7	A
4.- Jay Road/Delechant Drive (U)			
	AM peak		
	SB LTR	10.0	B
	EB LTR	7.5	A
	PM peak		
	SB LTR	10.2	B
	EB LTR	7.5	A

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Traffic Division

TABLE 4
2019 OPENING YEAR TOTAL
INTERSECTION OPERATIONS
MEADOWLARK TRAFFIC IMPACT STUDY

INTERSECTION		2019 OPENING YEAR TOTAL	
		DELAY	**LOS**
5.- Jay Road/County Line Road - Cheesman Street (U)			
AM peak			
	NB LTR	14.2	B
	SB LTR	15.5	C
	EB LTR	11.4	B
	WB LTR	11.5	B
PM peak			
	NB LTR	16.4	C
	SB LTR	14.7	B
	EB LTR	12.4	B
	WB LTR	11.1	B
6.- Lombardi Street/Proposed Project Driveway (U)			
AM peak			
	SB LTR	-	-
	WB LTR	9.2	A
PM peak			
	SB LTR	-	-
	WB LTR	9.4	A
7.- County Line Road/Delechant Drive (U)			
AM peak			
	NB LTR	8.0	A
	EB LTR	11.7	B
PM peak			
	NB LTR	8.0	A
	EB LTR	11.8	B

- Delay and Level of Service calculated utilizing the methodologies described in Chapters 19, 20, 21 and 22 of the Highway Capacity Manual (HCM)

Delay is measured in seconds per vehicle
LOS = Level of Service
NB=Northbound, SB=Southbound, etc.
T=Thru Movement, L=Left-Turn Movement, etc.
(S)=Signalized Intersection
(U)=Unsignalized Intersection
(R)=Roundabout Intersection

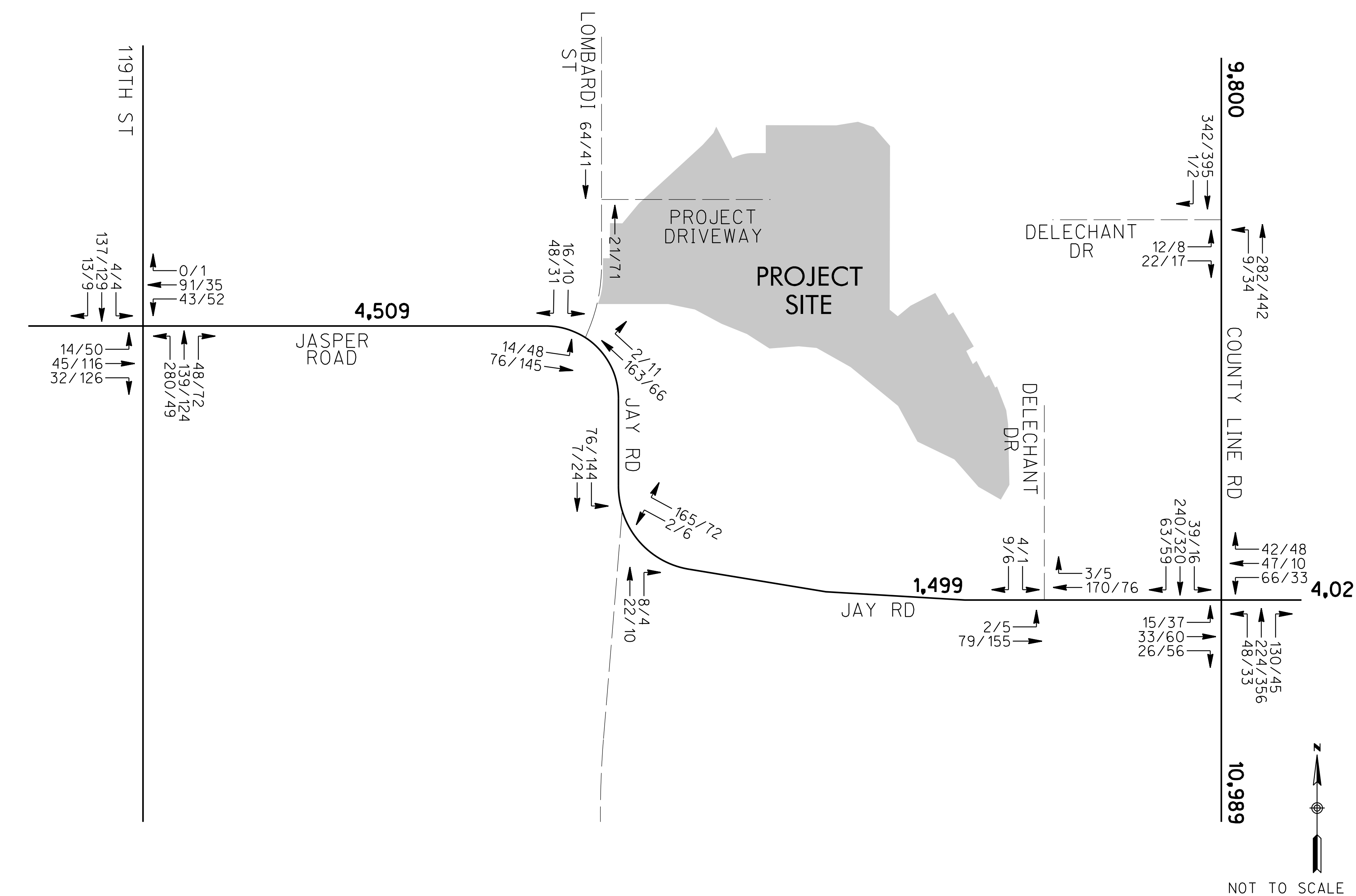

EXHIBIT 12

2040 BACKGROUND TRAFFIC VOLUMES

MEADOWLARK TRAFFIC IMPACT STUDY

RICK™ ENGINEERING COMPANY

TRAFFIC

LEGEND

xx/xx = AM/PM PEAK VOLUMES

XXXX = ADT

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W:\18144_Schmid+Properties\Traffic\Graphics\SD CorpStds 2005.dscript

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RICK ENGINEERING COMPANY
Traffic Division

TABLE 5
2040 (BACKGROUND) INTERSECTION OPERATIONS
MEADOWLARK TRAFFIC IMPACT STUDY

INTERSECTION		2040 BACKGROUND	
		DELAY	LOS
1.- 119th Street/Jasper Road (U)			
	AM peak		
	NB LTR	19.1	C
	SB LTR	10.1	B
	EB LTR	9.9	A
	WB LTR	10.9	B
	PM peak		
	NB LTR	11.3	B
	SB LTR	10.1	B
	EB LTR	11.9	B
	WB LTR	9.7	A
2.- Jasper Road/Lombardi Street (U)			
	AM peak		
	SB LTR	7.6	A
	EB L	9.8	A
	PM peak		
	SB LTR	7.5	A
	EB L	9.4	A
3.- Jay Road/Jasper Road (U)			
	AM peak		
	NB LTR	9.9	A
	WB LTR	7.4	A
	PM peak		
	NB LTR	9.8	A
	WB LTR	7.6	A
4.- Jay Road/Delechant Drive (U)			
	AM peak		
	SB LTR	9.6	A
	EB LTR	7.6	A
	PM peak		
	SB LTR	8.9	A
	EB LTR	7.4	A

TABLE 5
2040 (BACKGROUND) INTERSECTION OPERATIONS
MEADOWLARK TRAFFIC IMPACT STUDY

INTERSECTION	2040 BACKGROUND	
	DELAY	LOS
5.- Jay Road/County Line Road - Cheesman Street (U)		
AM peak		
NB LTR	16.0	C
SB LTR	14.4	B
EB LTR	10.3	B
WB LTR	11.5	B
PM peak		
NB LTR	20.7	C
SB LTR	18.1	C
EB LTR	12.1	B
WB LTR	11.0	B
7.- County Line Road/Delechant Drive (U)		
AM peak		
NB LTR	8.1	A
EB LTR	12.1	B
PM peak		
NB LTR	8.3	A
EB LTR	13.8	B

- Delay and Level of Service calculated utilizing the methodologies described in Chapters 19, 20, 21 and 22 of the Highway Capacity Manual (HCM)
Delay is measured in seconds per vehicle
LOS = Level of Service
NB=Northbound, SB=Southbound, etc.
T=Thru Movement, L=Left-Turn Movement, etc.
(S)=Signalized Intersection
(U)=Unsignalized Intersection
(R)=Roundabout Intersection

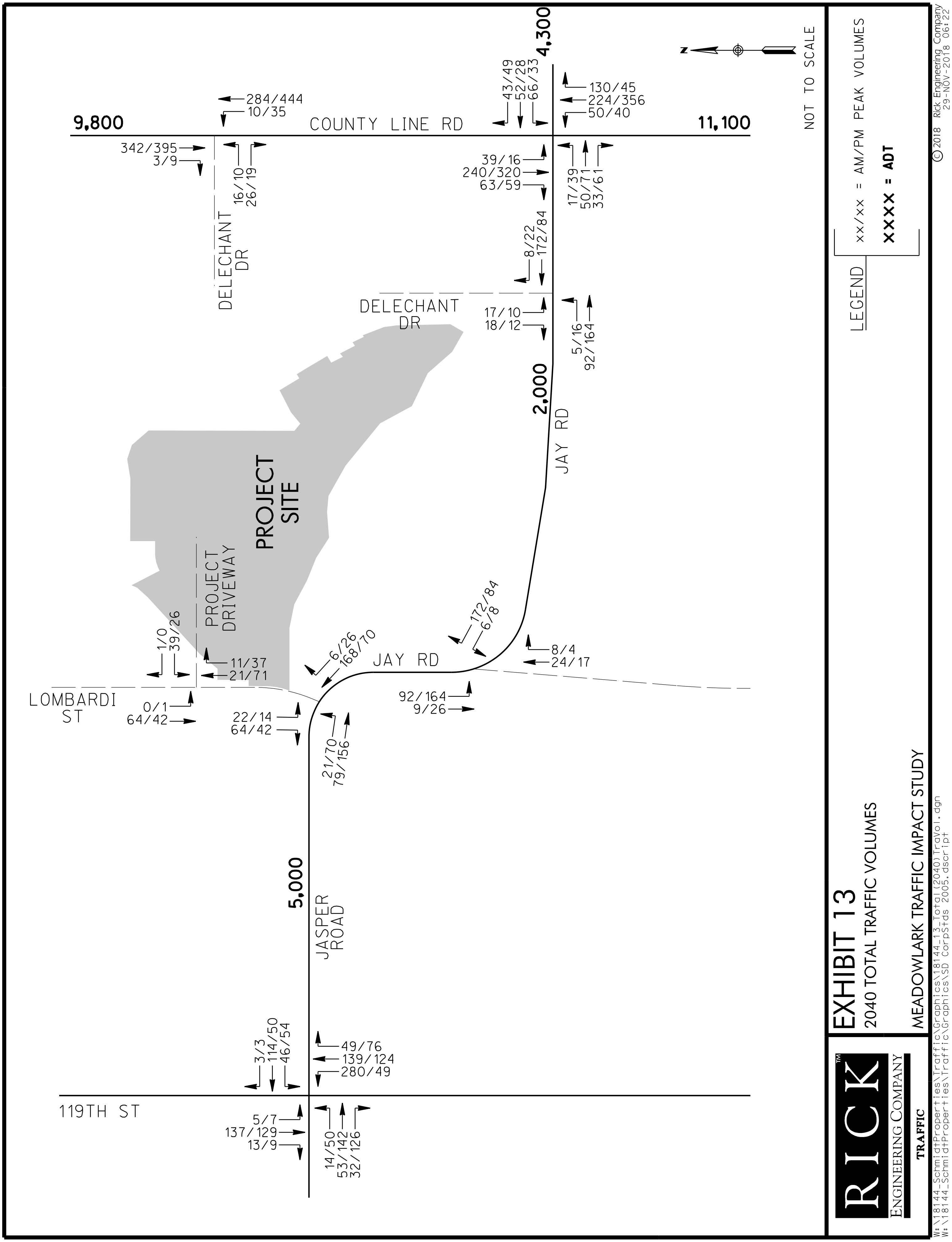
EXHIBIT 13
2040 TOTAL TRAFFIC VOLUMES
MEADOWLARK TRAFFIC IMPACT STUDY
RICK
ENGINEERING COMPANY
TRAFFIC
LEGEND
xx/xx = AM/PM PEAK VOLUMES
XXXX = ADT
NOT TO SCALE
COUNTY LINE RD
9,800
11,100
4,300
284/444
10/35
342/395
3/9
16/10
26/19
43/49
52/28
66/33
130/45
224/356
50/40
39/16
240/320
63/59
17/39
50/71
33/61
DELECHANT DR
8/22
172/84
DELECHANT DR
17/10
18/12
5/16
92/164
2,000
JAY RD
PROJECT SITE
PROJECT DRIVEWAY
172/84
6/8
8/4
24/17
JAY RD
92/164
9/26
6/26
168/70
1/0
39/26
11/37
21/71
LOMBARDI ST
0/1
64/42
22/14
64/42
21/70
79/156
5,000
JASPER ROAD
3/3
114/50
46/54
49/76
139/124
280/49
119TH ST
5/7
137/129
13/9
14/50
53/142
32/126
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29-NOV-2018 06:22

TABLE 6
2040 (BUILD OUT) INTERSECTION OPERATIONS
MEADOWLARK TRAFFIC IMPACT STUDY

INTERSECTION		2040 (BUILD OUT) DELAY	2040 (BUILD OUT) LOS
1.- 119th Street/Jasper Road (U)			
	AM peak		
	NB LTR	20.5	C
	SB LTR	10.5	B
	EB LTR	10.3	B
	WB LTR	11.5	B
	PM peak		
	NB LTR	11.9	B
	SB LTR	10.5	B
	EB LTR	13.0	B
	WB LTR	10.1	B
2.- Jasper Road/Lombardi Street (U)			
	AM peak		
	SB LTR	7.6	A
	EB L	10.1	B
	PM peak		
	SB LTR	7.5	A
	EB L	9.7	A
3.- Jay Road/Jasper Road (U)			
	AM peak		
	NB LTR	10.1	B
	WB LTR	7.4	A
	PM peak		
	NB LTR	10.2	B
	WB LTR	7.7	A
4.- Jay Road/Delechant Drive (U)			
	AM peak		
	SB LTR	10.0	B
	EB LTR	7.6	A
	PM peak		
	SB LTR	9.7	A
	EB LTR	7.5	A

RICK ENGINEERING COMPANY
Traffic Division

TABLE 6
2040 (BUILD OUT) INTERSECTION OPERATIONS
MEADOWLARK TRAFFIC IMPACT STUDY

INTERSECTION		2040 (BUILD OUT) DELAY	2040 (BUILD OUT) LOS
5.- Jay Road/County Line Road - Cheesman Street (U)			
AM peak			
	NB LTR	17.2	C
	SB LTR	15.2	C
	EB LTR	10.9	B
	WB LTR	12.0	B
PM peak			
	NB LTR	24.8	C
	SB LTR	20.6	C
	EB LTR	13.1	B
	WB LTR	11.9	B
6.- Lombardi Street/Proposed Project Driveway (U)			
AM peak			
	SB LTR	0.0	A
	WB LTR	9.2	A
PM peak			
	SB LTR	7.4	A
	WB LTR	9.4	A
7.- County Line Road/Delechant Drive (U)			
AM peak			
	NB LTR	8.1	A
	EB LTR	12.5	B
PM peak			
	NB LTR	8.3	A
	EB LTR	14.5	B

- Delay and Level of Service calculated utilizing the methodologies described in Chapters 19, 20, 21 and 22 of the Highway Capacity Manual (HCM)

Delay is measured in seconds per vehicle
LOS = Level of Service
NB=Northbound, SB=Southbound, etc.
T=Thru Movement, L=Left-Turn Movement, etc.
(S)=Signalized Intersection
(U)=Unsignalized Intersection
(R)=Roundabout Intersection

RICK ENGINEERING COMPANY Traffic Division

TABLE 7
INTERSECTION OPERATIONS SUMMARY
MEADOWLARK TRAFFIC IMPACT STUDY

INTERSECTION		EXISTING (2018)		2019 OPENING YEAR BACKGROUND		2019 OPENING YEAR TOTAL		2040 BACKGROUND		2040 (BUILD OUT)	
		DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS
1.- 119th Street/Jasper Road (U)											
AM peak											
	NB LTR	9.4	A	10.6	B	10.9	B	19.1	C	20.5	C
	SB LTR	8.0	A	8.6	A	8.8	A	10.1	B	10.5	B
	EB LTR	8.1	A	8.9	A	9.1	A	9.9	A	10.3	B
	WB LTR	8.5	A	9.8	A	10.4	B	10.9	B	11.5	B
PM peak											
	NB LTR	8.2	A	9.3	A	9.7	A	11.3	B	11.9	B
	SB LTR	8.1	A	8.8	A	9.1	A	10.1	B	10.5	B
	EB LTR	8.7	A	10.6	B	11.5	B	11.9	B	13.0	B
	WB LTR	8.0	A	9.1	A	9.5	A	9.7	A	10.1	B
2.- Jasper Road/Lombardi Street (U)											
AM peak											
	SB LTR	-	-	7.6	A	7.6	A	7.6	A	7.6	A
	EB L	-	-	9.8	A	10.3	B	9.8	A	10.1	B
PM peak											
	SB LTR	-	-	7.6	A	7.7	A	7.5	A	7.5	A
	EB L	-	-	9.7	A	10.3	B	9.4	A	9.7	A
3.- Jay Road/Jasper Road (U)											
AM peak											
	NB LTR	-	-	9.9	A	10.1	B	9.9	A	10.1	B
	WB LTR	-	-	7.4	A	7.5	A	7.4	A	7.4	A
PM peak											
	NB LTR	-	-	10.3	B	10.6	B	9.8	A	10.2	B
	WB LTR	-	-	7.6	A	7.7	A	7.6	A	7.7	A
4.- Jay Road/Delechant Drive (U)											
AM peak											
	SB LTR	-	-	9.5	A	10.0	B	9.6	A	10.0	B
	EB LTR	-	-	7.5	A	7.5	A	7.6	A	7.6	A
PM peak											
	SB LTR	-	-	9.4	A	10.2	B	8.9	A	9.7	A
	EB LTR	-	-	7.4	A	7.5	A	7.4	A	7.5	A

RICK ENGINEERING COMPANY
Traffic Division

TABLE 7
INTERSECTION OPERATIONS SUMMARY
MEADOWLARK TRAFFIC IMPACT STUDY

INTERSECTION	EXISTING (2018)		2019 OPENING YEAR BACKGROUND		2019 OPENING YEAR TOTAL		2040 BACKGROUND		2040 (BUILD OUT)	
	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS
5.- Jay Road/County Line Road - Cheesman Street (U)										
AM peak										
NB LTR	12.0	B	13.4	B	14.2	B	16.0	C	17.2	C
SB LTR	13.0	B	14.7	B	15.5	C	14.4	B	15.2	C
EB LTR	9.8	A	10.7	B	11.4	B	10.3	B	10.9	B
WB LTR	10.5	B	11.1	B	11.5	B	11.5	B	12.0	B
PM peak										
NB LTR	12.7	B	14.8	B	16.4	C	20.7	C	24.8	C
SB LTR	12.4	B	13.8	B	14.7	B	18.1	C	20.6	C
EB LTR	10.5	B	11.6	B	12.4	B	12.1	B	13.1	B
WB LTR	9.8	A	10.4	B	11.1	B	11.0	B	11.9	B
6.- Lombardi Street/Proposed Project Driveway (U)										
AM peak										
SB LTR	-		-	-	-	-	-	-	0.0	A
WB LTR	-	-	-	-	9.2	A	-	-	9.2	A
PM peak										
SB LTR	-		-	-	-	-	-	-	7.4	A
WB LTR	-	-	-	-	9.4	A	-	-	9.4	A
7.- County Line Road/Delechant Drive (U)										
AM peak										
NB LTR	-	-	8.0	A	8.0	A	8.1	A	8.1	A
EB LTR	-	-	11.9	B	11.7	B	12.1	B	12.5	B
PM peak										
NB LTR	-	-	8.0	A	8.0	A	8.3	A	8.3	A
EB LTR	-	-	12.4	B	11.8	B	13.8	B	14.5	B

- Delay and Level of Service calculated utilizing the methodologies described
  in Chapters 19, 20, 21 and 22 of the Highway Capacity Manual (HCM) 6th Edition.
Delay is measured in seconds per vehicle
LOS = Level of Service
NB=Northbound, SB=Southbound, etc.
T=Thru Movement, L=Left-Turn Movement, etc.
(S)=Signalized Intersection
(U)=Unsignalized Intersection
(R)=Roundabout Intersection

with Lombardi Street. The construction of this left turn lane should follow the standards contained in Section 500 of the Town of Erie Standards and Specifications. Additionally, a queueing analysis was conducted. This analysis shows that the 95% queue is 37 feet. Therefore, the proposed 50 foot storage length is anticipated to be more than adequate. **Appendix G** contains page 500-12 of the *Town of Erie Standards and Specifications* document and the queueing analysis results.

The intersection lane configuration should be constructed as follows:

Southbound: One shared left/right-turn lane

Eastbound: One left-turn lane (50' min storage)
One through lane

Westbound: One shared through/right-turn lane

Intersection of: ***Lombardi Street/Project Driveway***

It is recommended that this intersection operate as an unsignalized intersection with stop control for the westbound approach. The intersection lane configuration should be constructed as follows:

Northbound: One shared through/right-turn lane

Southbound: One shared left/through-turn lane

Westbound: One shared left/right-turn lane

All other intersections are anticipated to operate at acceptable levels of service. Therefore, no improvements are recommended.

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APPENDIX A

Manual Turning Movement and Daily Count Sheets

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: COUNTY LINE RD
E/W STREET: JAY RD / CHEESMAN ST
CITY: ERIE
COUNTY: WELD

File Name : COUNJAYRA
Site Code : 00000010
Start Date : 5/16/2018
Page No : 1

Groups Printed- VEHICLES

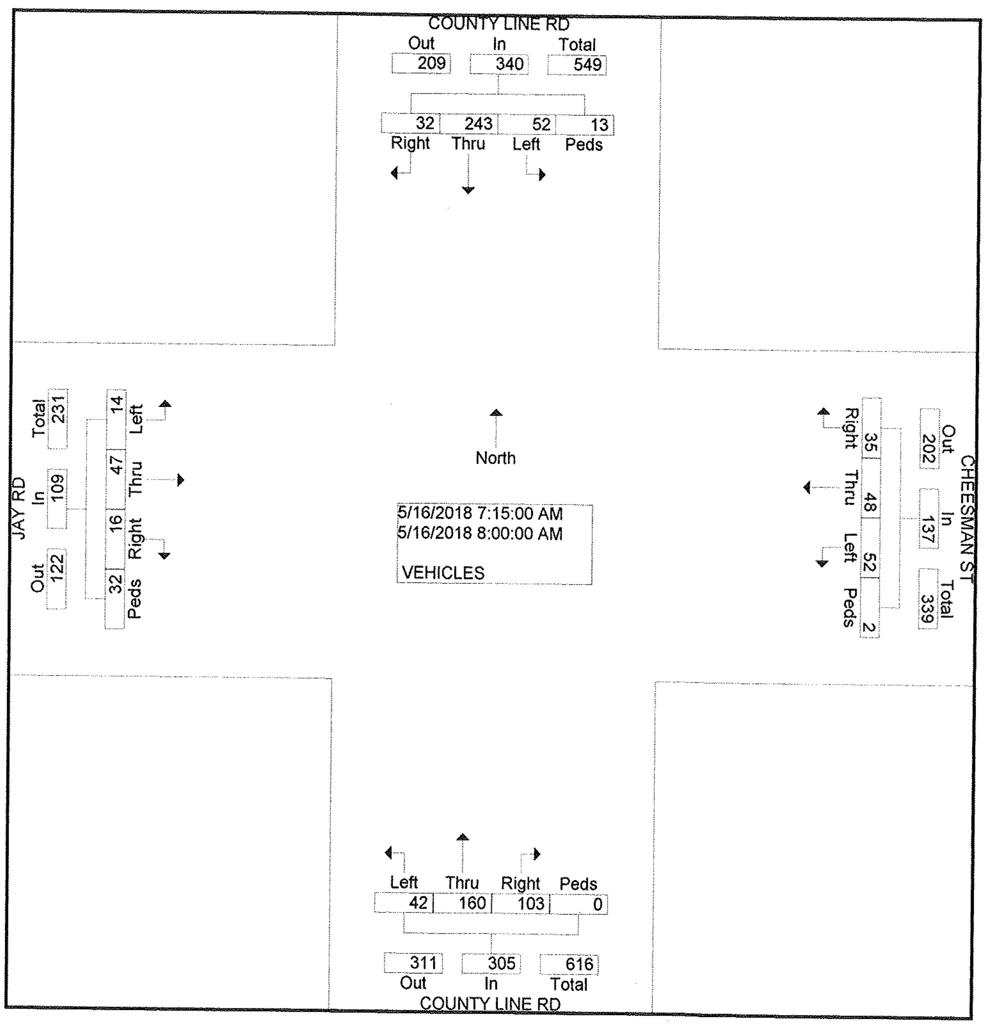
	COUNTY LINE RD Southbound				CHEESMAN ST Westbound				COUNTY LINE RD Northbound				JAY RD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	3	57	3	0	7	6	6	0	8	42	3	0	2	1	5	1	144
07:15 AM	8	57	9	0	11	10	7	0	9	32	9	0	2	9	3	3	169
07:30 AM	10	63	7	8	9	16	7	0	10	47	29	0	2	14	3	19	244
07:45 AM	27	66	10	5	26	13	12	0	8	36	60	0	4	14	4	10	295
Total	48	243	29	13	53	45	32	0	35	157	101	0	10	38	15	33	852
08:00 AM	7	57	6	0	6	9	9	2	15	45	5	0	6	10	6	0	183
08:15 AM	6	50	5	1	9	7	7	5	8	48	6	0	4	2	2	0	160
08:30 AM	10	55	2	15	28	6	5	1	9	24	5	1	2	4	8	4	179
08:45 AM	1	59	6	35	58	3	8	0	11	29	5	16	6	6	31	25	299
Total	24	221	19	51	101	25	29	8	43	146	21	17	18	22	47	29	821
04:00 PM	10	45	3	4	9	9	13	1	6	62	8	5	7	12	8	5	207
04:15 PM	9	54	2	2	6	4	9	0	2	38	8	0	4	10	8	2	158
04:30 PM	12	56	5	3	9	6	14	0	4	71	7	0	6	9	11	3	216
04:45 PM	16	43	2	2	7	5	9	0	4	59	7	0	5	22	12	1	194
Total	47	198	12	11	31	24	45	1	16	230	30	5	22	53	39	11	775
05:00 PM	12	53	1	1	6	8	10	0	7	58	11	0	10	14	7	0	198
05:15 PM	8	77	5	3	4	7	7	0	6	67	11	0	11	21	12	1	240
05:30 PM	13	50	2	5	6	7	11	2	5	63	12	3	9	14	5	0	207
05:45 PM	17	49	3	1	5	8	10	2	6	49	12	0	12	22	7	0	203
Total	50	229	11	10	21	30	38	4	24	237	46	3	42	71	31	1	848
Grand Total	169	891	71	85	206	124	144	13	118	770	198	25	92	184	132	74	3296
Apprch %	13.9	73.3	5.8	7.0	42.3	25.5	29.6	2.7	10.6	69.3	17.8	2.3	19.1	38.2	27.4	15.4	
Total %	5.1	27.0	2.2	2.6	6.3	3.8	4.4	0.4	3.6	23.4	6.0	0.8	2.8	5.6	4.0	2.2	

N/S STREET: COUNTY LINE RD
E/W STREET: JAY RD / CHEESMAN ST
CITY: ERIE
COUNTY: WELD

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

File Name : COUNJAYRA
Site Code : 00000010
Start Date : 5/16/2018
Page No : 2

	COUNTY LINE RD Southbound					CHEESMAN ST Westbound					COUNTY LINE RD Northbound					JAY RD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 07:00 AM to 09:00 AM - Peak 1 of 1																					
Intersection	07:15 AM																				
Volume	52	243	32	13	340	52	48	35	2	137	42	160	103	0	305	14	47	16	32	109	891
Percent	15.3	71.5	9.4	3.8		38.0	35.0	25.5	1.5		13.8	52.5	33.8	0.0		12.8	43.1	14.7	29.4		
07:45 Volume	27	66	10	5	108	26	13	12	0	51	8	36	60	0	104	4	14	4	10	32	295
Peak Factor																					0.755
High Int.	07:45 AM					07:45 AM					07:45 AM					07:30 AM					
Volume	27	66	10	5	108	26	13	12	0	51	8	36	60	0	104	2	14	3	19	38	
Peak Factor					0.787					0.672					0.733					0.717	

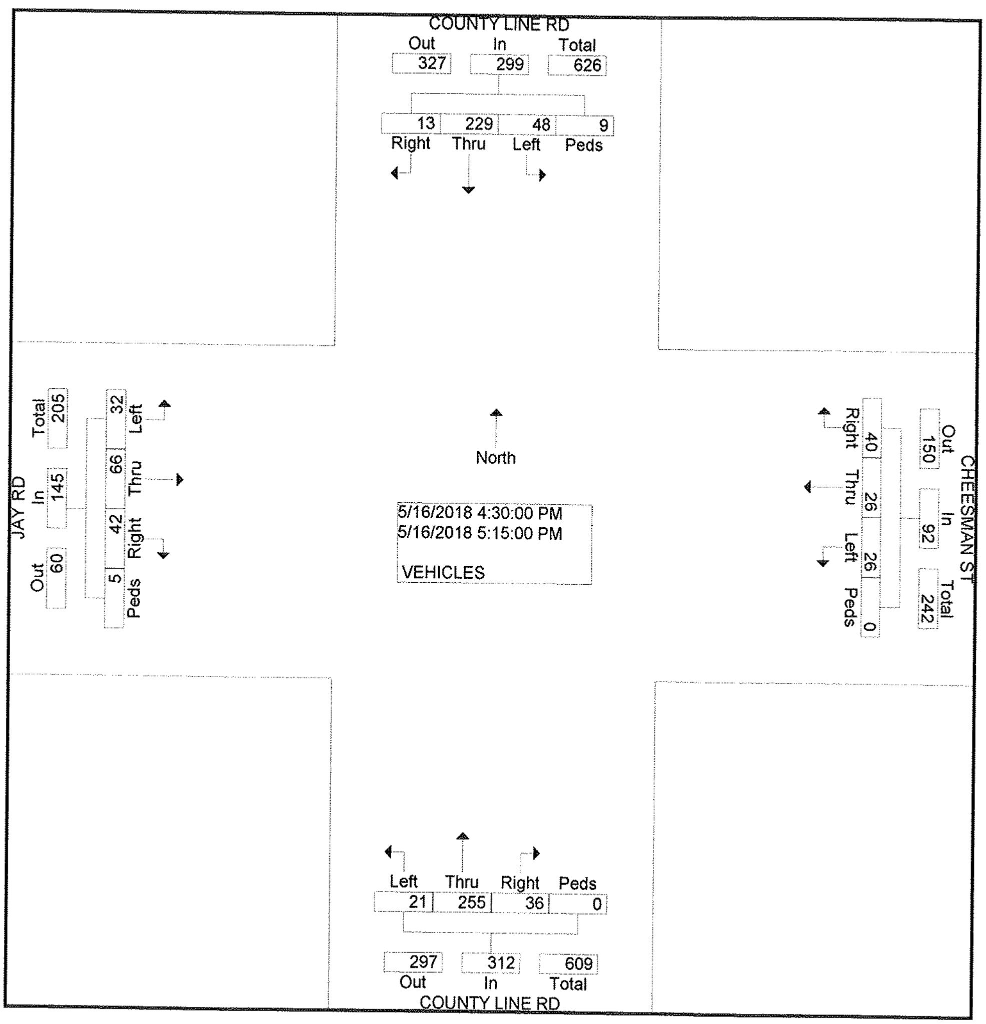


N/S STREET: COUNTY LINE RD
E/W STREET: JAY RD / CHEESMAN ST
CITY: ERIE
COUNTY: WELD

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

File Name : COUNJAYRA
Site Code : 00000010
Start Date : 5/16/2018
Page No : 2

	COUNTY LINE RD Southbound					CHEESMAN ST Westbound					COUNTY LINE RD Northbound					JAY RD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:30 PM																				
Volume	48	229	13	9	299	26	26	40	0	92	21	255	36	0	312	32	66	42	5	145	848
Percent	16.1	76.6	4.3	3.0		28.3	28.3	43.5	0.0		6.7	81.7	11.5	0.0		22.1	45.5	29.0	3.4		
05:15 Volume	8	77	5	3	93	4	7	7	0	18	6	67	11	0	84	11	21	12	1	45	240
Peak Factor																					0.883
High Int.	05:15 PM					04:30 PM					05:15 PM					05:15 PM					
Volume	8	77	5	3	93	9	6	14	0	29	6	67	11	0	84	11	21	12	1	45	
Peak Factor					0.804					0.793					0.929					0.806	



COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: 119TH ST
E/W STREET: JASPER RD / JAY RD
CITY: ERIE
COUNTY: WELD

File Name : 119TJASPA
Site Code : 00000008
Start Date : 5/15/2018
Page No : 1

Groups Printed- VEHICLES

	119TH ST Southbound				JASPER RD Westbound				119TH ST Northbound				JASPER RD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	12	3	0	3	13	0	0	25	11	2	0	0	6	2	0	77
07:15 AM	0	20	0	0	1	19	1	0	31	10	1	0	4	7	6	0	100
07:30 AM	1	11	3	1	1	30	0	0	52	11	5	0	2	5	3	0	125
07:45 AM	0	10	3	0	6	19	0	0	41	18	8	0	1	12	6	0	124
Total	1	53	9	1	11	81	1	0	149	50	16	0	7	30	17	0	426
08:00 AM	2	13	2	0	5	12	1	0	18	16	1	0	2	16	1	0	89
08:15 AM	2	8	1	0	4	18	1	0	17	12	1	0	2	8	4	0	78
08:30 AM	1	13	6	0	0	11	0	0	16	15	3	0	2	8	3	0	78
08:45 AM	0	12	2	0	6	17	2	0	9	11	7	1	2	8	6	0	83
Total	5	46	11	0	15	58	4	0	60	54	12	1	8	40	14	0	328
04:00 PM	0	15	1	2	6	10	0	0	6	14	7	0	7	20	12	1	101
04:15 PM	0	10	2	0	3	5	1	0	3	10	1	0	3	14	13	1	66
04:30 PM	0	14	1	0	6	8	0	0	10	10	4	1	7	20	14	0	95
04:45 PM	1	9	1	0	2	6	0	0	5	16	5	0	6	31	14	1	97
Total	1	48	5	2	17	29	1	0	24	50	17	1	23	85	53	3	359
05:00 PM	1	14	4	0	9	9	1	0	7	12	6	1	10	26	19	1	120
05:15 PM	2	14	0	0	3	6	1	0	3	11	4	0	9	26	17	0	96
05:30 PM	1	11	2	0	6	5	0	0	10	11	2	1	8	28	20	0	105
05:45 PM	0	9	1	1	4	5	0	2	5	17	4	1	8	39	13	1	110
Total	4	48	7	1	22	25	2	2	25	51	16	3	35	119	69	2	431
Grand Total	11	195	32	4	65	193	8	2	258	205	61	5	73	274	153	5	1544
Apprch %	4.5	80.6	13.2	1.7	24.3	72.0	3.0	0.7	48.8	38.8	11.5	0.9	14.5	54.3	30.3	1.0	
Total %	0.7	12.6	2.1	0.3	4.2	12.5	0.5	0.1	16.7	13.3	4.0	0.3	4.7	17.7	9.9	0.3	

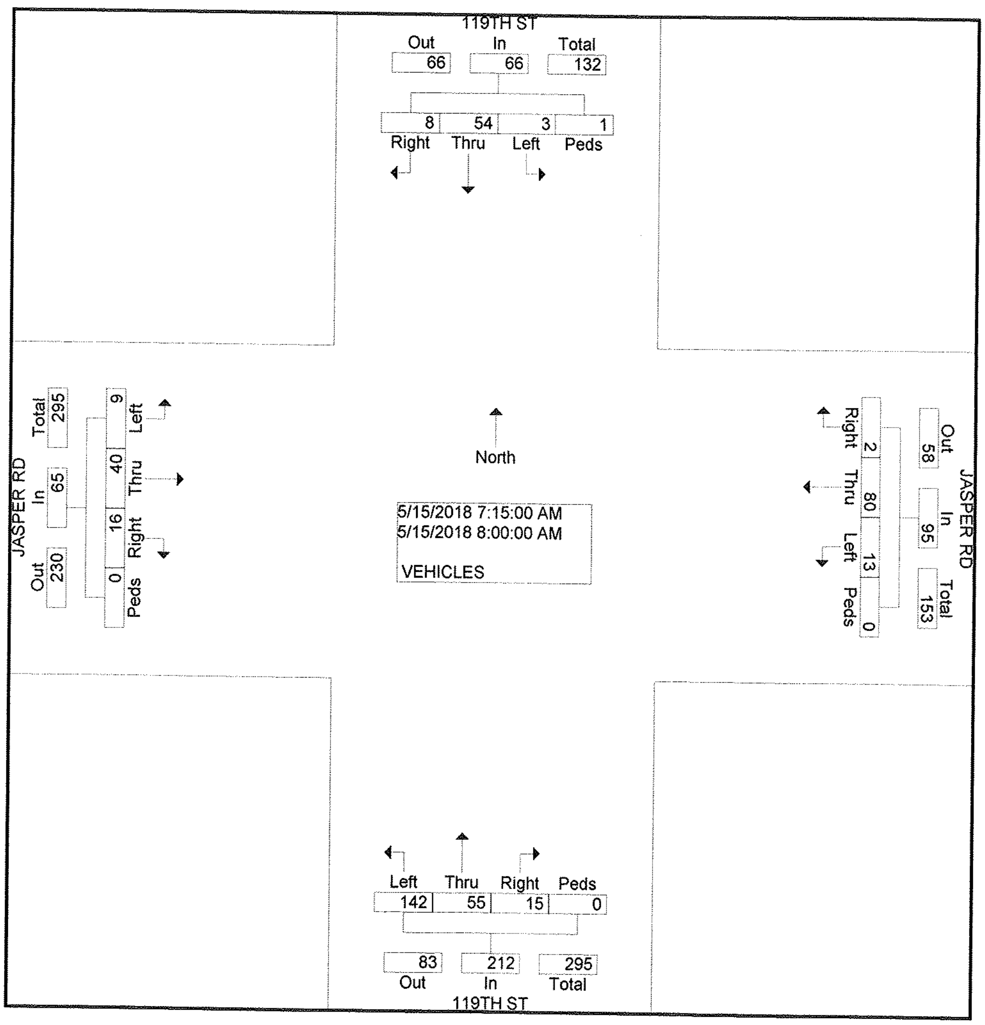
COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: 119TH ST
E/W STREET: JASPER RD / JAY RD
CITY: ERIE
COUNTY: WELD

File Name : 119TJASPA
Site Code : 00000008
Start Date : 5/15/2018
Page No : 2

	119TH ST Southbound					JASPER RD Westbound					119TH ST Northbound					JASPER RD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 07:15 AM to 08:00 AM - Peak 1 of 1																					
Intersection	07:15 AM																				
Volume	3	54	8	1	66	13	80	2	0	95	142	55	15	0	212	9	40	16	0	65	438
Percent	4.5	81.8	12.1	1.5		13.7	84.2	2.1	0.0		67.0	25.9	7.1	0.0		13.8	61.5	24.6	0.0		
07:30 Volume	1	11	3	1	16	1	30	0	0	31	52	11	5	0	68	2	5	3	0	10	125
Peak Factor																					0.876
High Int.	07:15 AM					07:30 AM					07:30 AM					07:45 AM					
Volume	0	20	0	0	20	1	30	0	0	31	52	11	5	0	68	1	12	6	0	19	
Peak Factor					0.825					0.766					0.779					0.855	

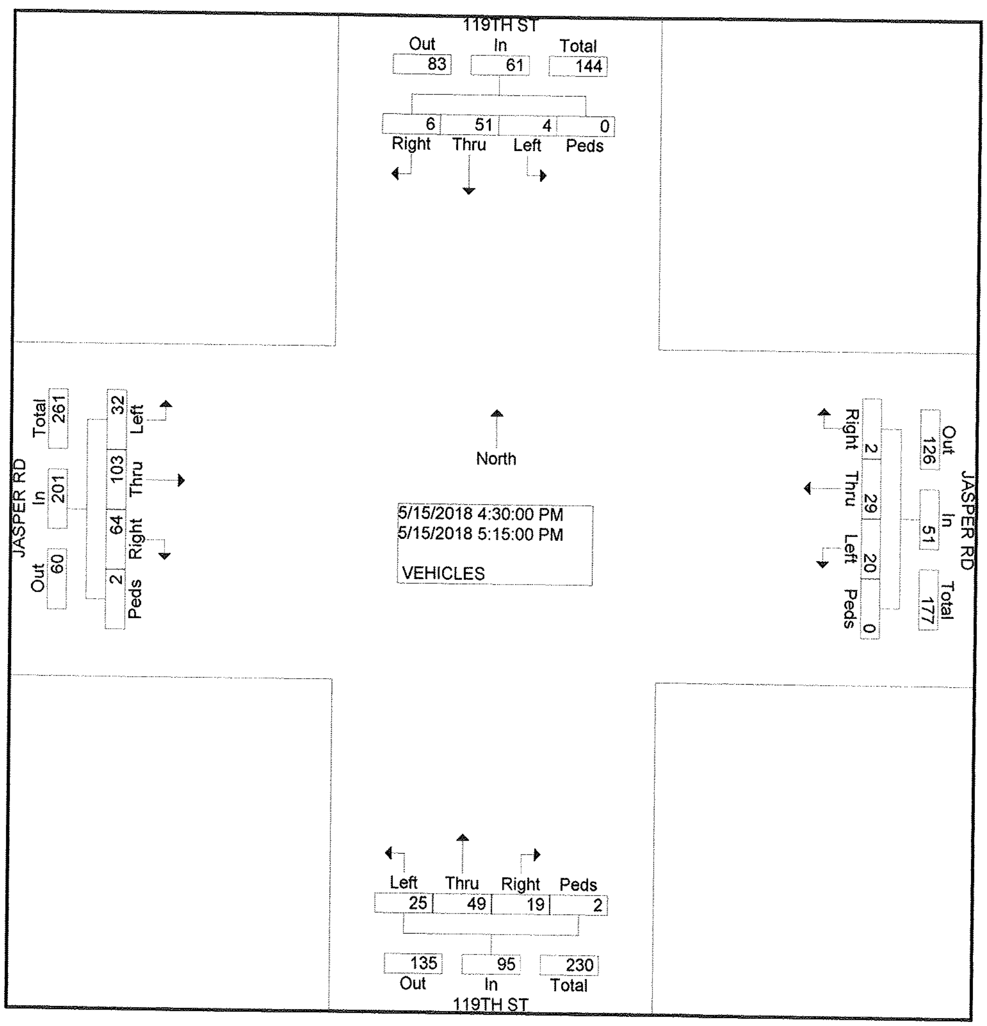


COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: 119TH ST
E/W STREET: JASPER RD / JAY RD
CITY: ERIE
COUNTY: WELD

File Name : 119TJASPA
Site Code : 00000008
Start Date : 5/15/2018
Page No : 2

	119TH ST Southbound					JASPER RD Westbound					119TH ST Northbound					JASPER RD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:30 PM to 05:15 PM - Peak 1 of 1																					
Intersection	04:30 PM																				
Volume	4	51	6	0	61	20	29	2	0	51	25	49	19	2	95	32	103	64	2	201	408
Percent	6.6	83.6	9.8	0.0		39.2	56.9	3.9	0.0		26.3	51.6	20.0	2.1		15.9	51.2	31.8	1.0		
05:00 Volume	1	14	4	0	19	9	9	1	0	19	7	12	6	1	26	10	26	19	1	56	120
Peak Factor																					0.850
High Int.	05:00 PM					05:00 PM					04:45 PM					05:00 PM					
Volume	1	14	4	0	19	9	9	1	0	19	5	16	5	0	26	10	26	19	1	56	
Peak Factor					0.803					0.671					0.913					0.897	



Location: JASPER RD E/O 119TH ST
City: ERIE
County: WELD
Direction: WESTBOUND-EASTBOUND

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 051416
Station ID: 051416

Start Time	15-May-1 Tue	WB	EB							Total
12:00 AM		1	0							1
01:00		0	2							2
02:00		2	2							4
03:00		1	1							2
04:00		8	0							8
05:00		10	4							14
06:00		43	18							61
07:00		**91**	54							**145**
08:00		81	**64**							145
09:00		44	36							80
10:00		39	44							83
11:00		46	48							94
12:00 PM		42	32							74
01:00		50	46							96
02:00		62	56							118
03:00		**74**	80							154
04:00		51	108							159
05:00		52	**140**							**192**
06:00		50	78							128
07:00		49	52							101
08:00		17	30							47
09:00		19	17							36
10:00		4	10							14
11:00		1	6							7
Total		837	928							1765
Percent		47.4%	52.6%							
AM Peak	-	07:00	08:00	-	-	-	-	-	-	07:00
Vol.	-	91	64	-	-	-	-	-	-	145
PM Peak	-	15:00	17:00	-	-	-	-	-	-	17:00
Vol.	-	74	140	-	-	-	-	-	-	192
Grand Total		837	928							1765
Percent		47.4%	52.6%							

ADT   ADT 1,765   AADT 1,765

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location: JAY RD W/O COUNTY LINE RD
City: ERIE
County: WELD
Direction: EASTBOUND-WESTBOUND

Site Code: 051420
Station ID: 051420

Start Time	15-May-1 Tue	EB	WB							Total
12:00 AM		0	1							1
01:00		2	0							2
02:00		2	2							4
03:00		1	1							2
04:00		0	7							7
05:00		4	10							14
06:00		18	50							68
07:00		54	**92**							146
08:00		**73**	88							**161**
09:00		36	52							88
10:00		48	42							90
11:00		56	44							100
12:00 PM		49	34							83
01:00		60	57							117
02:00		78	43							121
03:00		84	**82**							166
04:00		108	54							162
05:00		**154**	57							**211**
06:00		85	46							131
07:00		56	47							103
08:00		33	12							45
09:00		20	18							38
10:00		12	4							16
11:00		6	1							7
Total		1039	844							1883
Percent		55.2%	44.8%							
AM Peak	-	08:00	07:00	-	-	-	-	-	-	08:00
Vol.	-	73	92	-	-	-	-	-	-	161
PM Peak	-	17:00	15:00	-	-	-	-	-	-	17:00
Vol.	-	154	82	-	-	-	-	-	-	211
Grand Total		1039	844							1883
Percent		55.2%	44.8%							

ADT ADT 1,883 AADT 1,883

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location: CHEESMAN ST E/O COUNTY LINE RD
City: ERIE
County: WELD
Direction: EASTBOUND-WESTBOUND

Site Code: 051418
Station ID: 051418

Start Time	15-May-1 Tue	SB	NB							Total
12:00 AM		1	2							3
01:00		3	1							4
02:00		4	4							8
03:00		0	0							0
04:00		4	9							13
05:00		8	8							16
06:00		44	67							111
07:00		**233**	**287**							**520**
08:00		90	169							259
09:00		56	74							130
10:00		67	68							135
11:00		84	90							174
12:00 PM		94	76							170
01:00		70	96							166
02:00		120	128							248
03:00		**256**	154							410
04:00		218	**224**							**442**
05:00		182	212							394
06:00		178	117							295
07:00		158	82							240
08:00		64	41							105
09:00		50	20							70
10:00		24	18							42
11:00		10	8							18
Total		2018	1955							3973
Percent		50.8%	49.2%							
AM Peak	-	07:00	07:00	-	-	-	-	-	-	07:00
Vol.	-	233	287	-	-	-	-	-	-	520
PM Peak	-	15:00	16:00	-	-	-	-	-	-	16:00
Vol.	-	256	224	-	-	-	-	-	-	442
Grand Total		2018	1955							3973
Percent		50.8%	49.2%							
ADT		ADT 3,973	AADT 3,973							

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location: COUNTY LINE RD N/O JAY RD
City: ERIE
County: WELD
Direction: SOUTHBOUND-NORTHBOUND

Site Code: 051411
Station ID: 051411

Start Time	15-May-1 Tue	SB	NB							Total
12:00 AM		8	7							15
01:00		4	4							8
02:00		6	6							12
03:00		4	4							8
04:00		18	9							27
05:00		66	21							87
06:00		144	108							252
07:00		**329**	**282**							**611**
08:00		315	245							560
09:00		202	222							424
10:00		196	176							372
11:00		196	178							374
12:00 PM		212	222							434
01:00		186	194							380
02:00		222	206							428
03:00		314	**374**							**688**
04:00		297	360							657
05:00		**317**	358							675
06:00		210	236							446
07:00		136	176							312
08:00		104	118							222
09:00		51	90							141
10:00		29	40							69
11:00		13	17							30
Total		3579	3653							7232
Percent		49.5%	50.5%							
AM Peak	-	07:00	07:00	-	-	-	-	-	-	07:00
Vol.	-	329	282	-	-	-	-	-	-	611
PM Peak	-	17:00	15:00	-	-	-	-	-	-	15:00
Vol.	-	317	374	-	-	-	-	-	-	688
Grand Total		3579	3653							7232
Percent		49.5%	50.5%							

ADT ADT 7,232 AADT 7,232

COUNTER MEASURES INC.

1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location: COUNTY LINE RD S/O BIXLER BLVD
City: ERIE
County: WELD
Direction: NORTHBOUND-SOUTHBOUND

Site Code: 051415
Station ID: 051415

Start Time	15-May-1 Tue	NB	SB							Total
12:00 AM		8	7							15
01:00		2	4							6
02:00		5	3							8
03:00		3	4							7
04:00		9	17							26
05:00		24	60							84
06:00		96	148							244
07:00		**237**	**332**							**569**
08:00		217	296							513
09:00		176	190							366
10:00		159	178							337
11:00		156	170							326
12:00 PM		196	188							384
01:00		180	186							366
02:00		184	212							396
03:00		330	286							616
04:00		**350**	290							640
05:00		350	**321**							**671**
06:00		231	208							439
07:00		177	128							305
08:00		111	92							203
09:00		83	44							127
10:00		37	26							63
11:00		16	11							27
Total		3337	3401							6738
Percent		49.5%	50.5%							
AM Peak	-	07:00	07:00	-	-	-	-	-	-	07:00
Vol.	-	237	332	-	-	-	-	-	-	569
PM Peak	-	16:00	17:00	-	-	-	-	-	-	17:00
Vol.	-	350	321	-	-	-	-	-	-	671
Grand Total		3337	3401							6738
Percent		49.5%	50.5%							

ADT ADT 6,738 AADT 6,738

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Location: COUNTY LINE RD S/O JAY RD
City: ERIE
County: WELD
Direction: NORTHBOUND-SOUTHBOUND

Site Code: 051419
Station ID: 051419

Start Time	15-May-1 Tue	NB	SB							Total
12:00 AM		5	6							11
01:00		3	4							7
02:00		4	5							9
03:00		3	4							7
04:00		8	13							21
05:00		22	60							82
06:00		112	125							237
07:00		311	388							699
08:00		**340**	**452**							**792**
09:00		206	226							432
10:00		149	193							342
11:00		206	248							454
12:00 PM		200	214							414
01:00		162	184							346
02:00		200	240							440
03:00		**428**	**513**							**941**
04:00		346	361							707
05:00		299	374							673
06:00		208	230							438
07:00		146	138							284
08:00		94	95							189
09:00		61	40							101
10:00		34	26							60
11:00		12	10							22
Total		3559	4149							7708
Percent		46.2%	53.8%							
AM Peak	-	08:00	08:00	-	-	-	-	-	-	08:00
Vol.	-	340	452	-	-	-	-	-	-	792
PM Peak	-	15:00	15:00	-	-	-	-	-	-	15:00
Vol.	-	428	513	-	-	-	-	-	-	941
Grand Total		3559	4149							7708
Percent		46.2%	53.8%							

ADT ADT 7,708 AADT 7,708

APPENDIX B

Intersection Calculation Sheets

Intersection	
Intersection Delay, s/veh	8.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	40	16	13	80	2	142	55	15	3	54	8
Future Vol, veh/h	9	40	16	13	80	2	142	55	15	3	54	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	43	17	14	87	2	154	60	16	3	59	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.1	8.5	9.4	8
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	67%	14%	14%	5%
Vol Thru, %	26%	62%	84%	83%
Vol Right, %	7%	25%	2%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	212	65	95	65
LT Vol	142	9	13	3
Through Vol	55	40	80	54
RT Vol	15	16	2	8
Lane Flow Rate	230	71	103	71
Geometry Grp	1	1	1	1
Degree of Util (X)	0.29	0.091	0.136	0.089
Departure Headway (Hd)	4.523	4.646	4.738	4.55
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	795	771	757	787
Service Time	2.546	2.677	2.767	2.579
HCM Lane V/C Ratio	0.289	0.092	0.136	0.09
HCM Control Delay	9.4	8.1	8.5	8
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	1.2	0.3	0.5	0.3

Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	14	47	16	52	48	35	42	160	103	52	243	32
Future Vol, veh/h	14	47	16	52	48	35	42	160	103	52	243	32
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	51	17	57	52	38	46	174	112	57	264	35
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.8	10.5	12	13
HCM LOS	A	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	18%	39%	16%
Vol Thru, %	52%	61%	36%	74%
Vol Right, %	34%	21%	26%	10%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	305	77	135	327
LT Vol	42	14	52	52
Through Vol	160	47	48	243
RT Vol	103	16	35	32
Lane Flow Rate	332	84	147	355
Geometry Grp	1	1	1	1
Degree of Util (X)	0.455	0.136	0.233	0.498
Departure Headway (Hd)	4.936	5.85	5.723	5.043
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	729	612	627	714
Service Time	2.969	3.898	3.766	3.074
HCM Lane V/C Ratio	0.455	0.137	0.234	0.497
HCM Control Delay	12	9.8	10.5	13
HCM Lane LOS	B	A	B	B
HCM 95th-tile Q	2.4	0.5	0.9	2.8

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	32	103	64	20	29	2	25	49	19	4	51	6
Future Vol, veh/h	32	103	64	20	29	2	25	49	19	4	51	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	35	112	70	22	32	2	27	53	21	4	55	7
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.7	8	8.2	8.1
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	27%	16%	39%	7%
Vol Thru, %	53%	52%	57%	84%
Vol Right, %	20%	32%	4%	10%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	93	199	51	61
LT Vol	25	32	20	4
Through Vol	49	103	29	51
RT Vol	19	64	2	6
Lane Flow Rate	101	216	55	66
Geometry Grp	1	1	1	1
Degree of Util (X)	0.128	0.254	0.071	0.085
Departure Headway (Hd)	4.553	4.232	4.614	4.617
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	788	850	777	777
Service Time	2.574	2.249	2.637	2.639
HCM Lane V/C Ratio	0.128	0.254	0.071	0.085
HCM Control Delay	8.2	8.7	8	8.1
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.4	1	0.2	0.3

Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	32	66	42	26	26	40	21	255	36	48	229	13
Future Vol, veh/h	32	66	42	26	26	40	21	255	36	48	229	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	35	72	46	28	28	43	23	277	39	52	249	14
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.5	9.8	12.7	12.4
HCM LOS	B	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	23%	28%	17%
Vol Thru, %	82%	47%	28%	79%
Vol Right, %	12%	30%	43%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	312	140	92	290
LT Vol	21	32	26	48
Through Vol	255	66	26	229
RT Vol	36	42	40	13
Lane Flow Rate	339	152	100	315
Geometry Grp	1	1	1	1
Degree of Util (X)	0.478	0.239	0.158	0.452
Departure Headway (Hd)	5.069	5.655	5.696	5.158
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	712	635	628	700
Service Time	3.101	3.7	3.746	3.191
HCM Lane V/C Ratio	0.476	0.239	0.159	0.45
HCM Control Delay	12.7	10.5	9.8	12.4
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	2.6	0.9	0.6	2.4

Intersection	
Intersection Delay, s/veh	9.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	70	34	33	147	2	155	57	24	3	56	8
Future Vol, veh/h	10	70	34	33	147	2	155	57	24	3	56	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	76	37	36	160	2	168	62	26	3	61	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.9	9.8	10.6	8.6
HCM LOS	A	A	B	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	66%	9%	18%	4%
Vol Thru, %	24%	61%	81%	84%
Vol Right, %	10%	30%	1%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	236	114	182	67
LT Vol	155	10	33	3
Through Vol	57	70	147	56
RT Vol	24	34	2	8
Lane Flow Rate	257	124	198	73
Geometry Grp	1	1	1	1
Degree of Util (X)	0.348	0.167	0.271	0.101
Departure Headway (Hd)	4.88	4.846	4.934	4.993
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	734	735	724	712
Service Time	2.94	2.915	2.997	3.07
HCM Lane V/C Ratio	0.35	0.169	0.273	0.103
HCM Control Delay	10.6	8.9	9.8	8.6
HCM Lane LOS	B	A	A	A
HCM 95th-tile Q	1.6	0.6	1.1	0.3

Intersection	
Intersection Delay, s/veh	13.2
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	33	49	32	54	50	37	48	167	106	57	253	37
Future Vol, veh/h	33	49	32	54	50	37	48	167	106	57	253	37
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	36	53	35	59	54	40	52	182	115	62	275	40
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.7	11.1	13.4	14.7
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	15%	29%	38%	16%
Vol Thru, %	52%	43%	35%	73%
Vol Right, %	33%	28%	26%	11%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	321	114	141	347
LT Vol	48	33	54	57
Through Vol	167	49	50	253
RT Vol	106	32	37	37
Lane Flow Rate	349	124	153	377
Geometry Grp	1	1	1	1
Degree of Util (X)	0.502	0.207	0.255	0.552
Departure Headway (Hd)	5.18	6.023	5.983	5.266
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	694	592	598	683
Service Time	3.232	4.094	4.049	3.317
HCM Lane V/C Ratio	0.503	0.209	0.256	0.552
HCM Control Delay	13.4	10.7	11.1	14.7
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	2.8	0.8	1	3.4

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	103	133	3	5	6
Future Vol, veh/h	1	103	133	3	5	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	112	145	3	5	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	148	0	-	0	261	147
Stage 1	-	-	-	-	147	-
Stage 2	-	-	-	-	114	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1434	-	-	-	728	900
Stage 1	-	-	-	-	880	-
Stage 2	-	-	-	-	911	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1434	-	-	-	727	900
Mov Cap-2 Maneuver	-	-	-	-	727	-
Stage 1	-	-	-	-	879	-
Stage 2	-	-	-	-	911	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	9.5
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1434	-	-	-	812
HCM Lane V/C Ratio	0.001	-	-	-	0.015
HCM Control Delay (s)	7.5	0	-	-	9.5
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	9	4	223	338	2
Future Vol, veh/h	9	9	4	223	338	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	10	4	242	367	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	618	368	369	0	-	0
Stage 1	368	-	-	-	-	-
Stage 2	250	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	453	677	1190	-	-	-
Stage 1	700	-	-	-	-	-
Stage 2	792	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	451	677	1190	-	-	-
Mov Cap-2 Maneuver	451	-	-	-	-	-
Stage 1	697	-	-	-	-	-
Stage 2	792	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.9	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1190	-	541	-	-
HCM Lane V/C Ratio	0.004	-	0.036	-	-
HCM Control Delay (s)	8	0	11.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.2

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	94	9	2	139	24	8
Future Vol, veh/h	94	9	2	139	24	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	102	10	2	151	26	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	112	0	262	107
Stage 1	-	-	-	-	107	-
Stage 2	-	-	-	-	155	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1478	-	727	947
Stage 1	-	-	-	-	917	-
Stage 2	-	-	-	-	873	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1478	-	726	947
Mov Cap-2 Maneuver	-	-	-	-	726	-
Stage 1	-	-	-	-	917	-
Stage 2	-	-	-	-	872	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.1	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	771	1478	-	-	-
HCM Lane V/C Ratio	0.045	0.001	-	-	-
HCM Control Delay (s)	9.9	7.4	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	0	-	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	16	48	16	68	158	5
Future Vol, veh/h	16	48	16	68	158	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	52	17	74	172	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	283	175	177	0	-	0
Stage 1	175	-	-	-	-	-
Stage 2	108	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	707	868	1399	-	-	-
Stage 1	855	-	-	-	-	-
Stage 2	916	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	699	868	1399	-	-	-
Mov Cap-2 Maneuver	699	-	-	-	-	-
Stage 1	845	-	-	-	-	-
Stage 2	916	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	9.8	1.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1
Capacity (veh/h)	-	-	1399	-	819
HCM Lane V/C Ratio	-	-	0.012	-	0.085
HCM Control Delay (s)	-	-	7.6	-	9.8
HCM Lane LOS	-	-	A	-	A
HCM 95th %tile Q(veh)	-	-	0	-	0.3

Intersection	
Intersection Delay, s/veh	9.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	34	177	85	38	81	2	45	51	43	4	54	8
Future Vol, veh/h	34	177	85	38	81	2	45	51	43	4	54	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	37	192	92	41	88	2	49	55	47	4	59	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.6	9.1	9.3	8.8
HCM LOS	B	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	32%	11%	31%	6%
Vol Thru, %	37%	60%	67%	82%
Vol Right, %	31%	29%	2%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	139	296	121	66
LT Vol	45	34	38	4
Through Vol	51	177	81	54
RT Vol	43	85	2	8
Lane Flow Rate	151	322	132	72
Geometry Grp	1	1	1	1
Degree of Util (X)	0.208	0.403	0.18	0.102
Departure Headway (Hd)	4.955	4.505	4.916	5.13
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	719	795	725	692
Service Time	3.023	2.555	2.979	3.206
HCM Lane V/C Ratio	0.21	0.405	0.182	0.104
HCM Control Delay	9.3	10.6	9.1	8.8
HCM Lane LOS	A	B	A	A
HCM 95th-tile Q	0.8	2	0.7	0.3

Intersection	
Intersection Delay, s/veh	13.4
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	50	69	52	27	29	45	40	269	37	51	238	19
Future Vol, veh/h	50	69	52	27	29	45	40	269	37	51	238	19
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	75	57	29	32	49	43	292	40	55	259	21
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.6	10.4	14.8	13.8
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	29%	27%	17%
Vol Thru, %	78%	40%	29%	77%
Vol Right, %	11%	30%	45%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	346	171	101	308
LT Vol	40	50	27	51
Through Vol	269	69	29	238
RT Vol	37	52	45	19
Lane Flow Rate	376	186	110	335
Geometry Grp	1	1	1	1
Degree of Util (X)	0.555	0.305	0.183	0.502
Departure Headway (Hd)	5.31	5.906	5.996	5.403
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	677	606	595	663
Service Time	3.363	3.973	4.072	3.459
HCM Lane V/C Ratio	0.555	0.307	0.185	0.505
HCM Control Delay	14.8	11.6	10.4	13.8
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	3.4	1.3	0.7	2.8

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	168	96	10	3	5
Future Vol, veh/h	3	168	96	10	3	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	183	104	11	3	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	115	0	-	0	299	110
Stage 1	-	-	-	-	110	-
Stage 2	-	-	-	-	189	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1474	-	-	-	692	943
Stage 1	-	-	-	-	915	-
Stage 2	-	-	-	-	843	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1474	-	-	-	691	943
Mov Cap-2 Maneuver	-	-	-	-	691	-
Stage 1	-	-	-	-	913	-
Stage 2	-	-	-	-	843	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1474	-	-	-	830
HCM Lane V/C Ratio	0.002	-	-	-	0.01
HCM Control Delay (s)	7.4	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection						
Int Delay, s/veh	0.4					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	6	14	338	302	6
Future Vol, veh/h	6	6	14	338	302	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	7	15	367	328	7

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	729	332	335	0	-	0
Stage 1	332	-	-	-	-	-
Stage 2	397	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	390	710	1224	-	-	-
Stage 1	727	-	-	-	-	-
Stage 2	679	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	384	710	1224	-	-	-
Mov Cap-2 Maneuver	384	-	-	-	-	-
Stage 1	716	-	-	-	-	-
Stage 2	679	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.4	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1224	-	498	-	-
HCM Lane V/C Ratio	0.012	-	0.026	-	-
HCM Control Delay (s)	8	0	12.4	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection						
Int Delay, s/veh	0.9					

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	160	26	8	101	17	4
Future Vol, veh/h	160	26	8	101	17	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	174	28	9	110	18	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	202	0	316	188
Stage 1	-	-	-	-	188	-
Stage 2	-	-	-	-	128	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1370	-	677	854
Stage 1	-	-	-	-	844	-
Stage 2	-	-	-	-	898	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1370	-	672	854
Mov Cap-2 Maneuver	-	-	-	-	672	-
Stage 1	-	-	-	-	844	-
Stage 2	-	-	-	-	892	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.6	10.3
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	700	1370	-	-	-
HCM Lane V/C Ratio	0.033	0.006	-	-	-
HCM Control Delay (s)	10.3	7.6	0	-	-
HCM Lane LOS	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	0	-	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	10	32	53	162	100	18
Future Vol, veh/h	10	32	53	162	100	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	35	58	176	109	20

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	411	119	129	0	-	0
Stage 1	119	-	-	-	-	-
Stage 2	292	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	597	933	1457	-	-	-
Stage 1	906	-	-	-	-	-
Stage 2	758	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	573	933	1457	-	-	-
Mov Cap-2 Maneuver	573	-	-	-	-	-
Stage 1	870	-	-	-	-	-
Stage 2	758	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	9.7	1.9	0
HCM LOS	A		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1
Capacity (veh/h)	-	-	1457	-	812
HCM Lane V/C Ratio	-	-	0.04	-	0.056
HCM Control Delay (s)	-	-	7.6	-	9.7
HCM Lane LOS	-	-	A	-	A
HCM 95th %tile Q(veh)	-	-	0.1	-	0.2

Intersection	
Intersection Delay, s/veh	10.2
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	78	34	40	170	5	155	57	30	4	56	8
Future Vol, veh/h	10	78	34	40	170	5	155	57	30	4	56	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	85	37	43	185	5	168	62	33	4	61	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	9.1			10.4			10.9			8.8		
HCM LOS	A			B			B			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	64%	8%	19%	6%
Vol Thru, %	24%	64%	79%	82%
Vol Right, %	12%	28%	2%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	242	122	215	68
LT Vol	155	10	40	4
Through Vol	57	78	170	56
RT Vol	30	34	5	8
Lane Flow Rate	263	133	234	74
Geometry Grp	1	1	1	1
Degree of Util (X)	0.364	0.182	0.323	0.105
Departure Headway (Hd)	4.98	4.938	4.973	5.133
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	715	719	717	690
Service Time	3.054	3.022	3.046	3.228
HCM Lane V/C Ratio	0.368	0.185	0.326	0.107
HCM Control Delay	10.9	9.1	10.4	8.8
HCM Lane LOS	B	A	B	A
HCM 95th-tile Q	1.7	0.7	1.4	0.4

Intersection	
Intersection Delay, s/veh	13.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	35	66	42	54	55	38	50	168	106	57	253	37
Future Vol, veh/h	35	66	42	54	55	38	50	168	106	57	253	37
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	38	72	46	59	60	41	54	183	115	62	275	40
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.4	11.5	14.2	15.5
HCM LOS	B	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	15%	24%	37%	16%
Vol Thru, %	52%	46%	37%	73%
Vol Right, %	33%	29%	26%	11%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	324	143	147	347
LT Vol	50	35	54	57
Through Vol	168	66	55	253
RT Vol	106	42	38	37
Lane Flow Rate	352	155	160	377
Geometry Grp	1	1	1	1
Degree of Util (X)	0.523	0.263	0.272	0.569
Departure Headway (Hd)	5.345	6.088	6.122	5.431
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	669	586	583	660
Service Time	3.411	4.173	4.206	3.496
HCM Lane V/C Ratio	0.526	0.265	0.274	0.571
HCM Control Delay	14.2	11.4	11.5	15.5
HCM Lane LOS	B	B	B	C
HCM 95th-tile Q	3.1	1.1	1.1	3.6

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	116	135	8	21	12
Future Vol, veh/h	4	116	135	8	21	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	126	147	9	23	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	156	0	-	0	286	152
Stage 1	-	-	-	-	152	-
Stage 2	-	-	-	-	134	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1424	-	-	-	704	894
Stage 1	-	-	-	-	876	-
Stage 2	-	-	-	-	892	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1424	-	-	-	702	894
Mov Cap-2 Maneuver	-	-	-	-	702	-
Stage 1	-	-	-	-	873	-
Stage 2	-	-	-	-	892	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1424	-	-	-	761
HCM Lane V/C Ratio	0.003	-	-	-	0.047
HCM Control Delay (s)	7.5	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	13	26	6	225	338	4
Future Vol, veh/h	13	26	6	225	338	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	28	7	245	367	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	628	369	371	0	-	0
Stage 1	369	-	-	-	-	-
Stage 2	259	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	447	677	1188	-	-	-
Stage 1	699	-	-	-	-	-
Stage 2	784	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	444	677	1188	-	-	-
Mov Cap-2 Maneuver	444	-	-	-	-	-
Stage 1	694	-	-	-	-	-
Stage 2	784	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.7	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1188	-	576	-	-
HCM Lane V/C Ratio	0.005	-	0.074	-	-
HCM Control Delay (s)	8	0	11.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	110	9	2	147	24	8
Future Vol, veh/h	110	9	2	147	24	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	120	10	2	160	26	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	130	0	289	125
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	164	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1455	-	702	926
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	865	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1455	-	701	926
Mov Cap-2 Maneuver	-	-	-	-	701	-
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	863	-

Approach	SE		NW		NE	
HCM Control Delay, s	0		0.1		10.1	
HCM LOS					B	

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	746	1455	-	-	-
HCM Lane V/C Ratio	0.047	0.001	-	-	-
HCM Control Delay (s)	10.1	7.5	0	-	-
HCM Lane LOS	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	0	-	-	-

Intersection						
Int Delay, s/veh	3.4					

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	29	75	24	71	164	7
Future Vol, veh/h	29	75	24	71	164	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	82	26	77	178	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	311	182	186	0	-	0
Stage 1	182	-	-	-	-	-
Stage 2	129	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	681	861	1388	-	-	-
Stage 1	849	-	-	-	-	-
Stage 2	897	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	668	861	1388	-	-	-
Mov Cap-2 Maneuver	668	-	-	-	-	-
Stage 1	833	-	-	-	-	-
Stage 2	897	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	10.3	1.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1
Capacity (veh/h)	-	-	1388	-	797
HCM Lane V/C Ratio	-	-	0.019	-	0.142
HCM Control Delay (s)	-	-	7.6	-	10.3
HCM Lane LOS	-	-	A	-	B
HCM 95th %tile Q(veh)	-	-	0.1	-	0.5

Intersection	
Int Delay, s/veh	2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	40	0	21	10	0	64
Future Vol, veh/h	40	0	21	10	0	64
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	43	0	23	11	0	70

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	99	29	0	0	34	0
Stage 1	29	-	-	-	-	-
Stage 2	70	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	900	1046	-	-	1578	-
Stage 1	994	-	-	-	-	-
Stage 2	953	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	900	1046	-	-	1578	-
Mov Cap-2 Maneuver	900	-	-	-	-	-
Stage 1	994	-	-	-	-	-
Stage 2	953	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	9.2		0		0	
HCM LOS	A					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	900	1578	-
HCM Lane V/C Ratio	-	-	0.048	-	-
HCM Control Delay (s)	-	-	9.2	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	34	211	85	42	96	4	45	51	50	8	54	8
Future Vol, veh/h	34	211	85	42	96	4	45	51	50	8	54	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	37	229	92	46	104	4	49	55	54	9	59	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.5	9.5	9.7	9.1
HCM LOS	B	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	31%	10%	30%	11%
Vol Thru, %	35%	64%	68%	77%
Vol Right, %	34%	26%	3%	11%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	146	330	142	70
LT Vol	45	34	42	8
Through Vol	51	211	96	54
RT Vol	50	85	4	8
Lane Flow Rate	159	359	154	76
Geometry Grp	1	1	1	1
Degree of Util (X)	0.224	0.458	0.214	0.112
Departure Headway (Hd)	5.092	4.595	5	5.315
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	698	778	712	667
Service Time	3.175	2.655	3.078	3.411
HCM Lane V/C Ratio	0.228	0.461	0.216	0.114
HCM Control Delay	9.7	11.5	9.5	9.1
HCM Lane LOS	A	B	A	A
HCM 95th-tile Q	0.9	2.4	0.8	0.4

Intersection	
Intersection Delay, s/veh	14.4
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	52	80	59	27	47	46	50	270	37	51	238	19
Future Vol, veh/h	52	80	59	27	47	46	50	270	37	51	238	19
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	57	87	64	29	51	50	54	293	40	55	259	21
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.4	11.1	16.4	14.7
HCM LOS	B	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	27%	23%	17%
Vol Thru, %	76%	42%	39%	77%
Vol Right, %	10%	31%	38%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	357	191	120	308
LT Vol	50	52	27	51
Through Vol	270	80	47	238
RT Vol	37	59	46	19
Lane Flow Rate	388	208	130	335
Geometry Grp	1	1	1	1
Degree of Util (X)	0.593	0.349	0.224	0.522
Departure Headway (Hd)	5.499	6.045	6.181	5.61
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	652	590	575	639
Service Time	3.573	4.135	4.281	3.686
HCM Lane V/C Ratio	0.595	0.353	0.226	0.524
HCM Control Delay	16.4	12.4	11.1	14.7
HCM Lane LOS	C	B	B	B
HCM 95th-tile Q	3.9	1.6	0.9	3

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	177	105	29	14	9
Future Vol, veh/h	15	177	105	29	14	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	192	114	32	15	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	146	0	-	0	354	130
Stage 1	-	-	-	-	130	-
Stage 2	-	-	-	-	224	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1436	-	-	-	644	920
Stage 1	-	-	-	-	896	-
Stage 2	-	-	-	-	813	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1436	-	-	-	636	920
Mov Cap-2 Maneuver	-	-	-	-	636	-
Stage 1	-	-	-	-	885	-
Stage 2	-	-	-	-	813	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1436	-	-	-	723
HCM Lane V/C Ratio	0.011	-	-	-	0.035
HCM Control Delay (s)	7.5	0	-	-	10.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	19	16	340	302	13
Future Vol, veh/h	8	19	16	340	302	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	21	17	370	328	14

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	739	335	342	0	-	0
Stage 1	335	-	-	-	-	-
Stage 2	404	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	385	707	1217	-	-	-
Stage 1	725	-	-	-	-	-
Stage 2	674	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	378	707	1217	-	-	-
Mov Cap-2 Maneuver	378	-	-	-	-	-
Stage 1	712	-	-	-	-	-
Stage 2	674	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.8	0.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1217	-	562	-	-
HCM Lane V/C Ratio	0.014	-	0.052	-	-
HCM Control Delay (s)	8	0	11.8	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	181	26	8	114	17	4
Future Vol, veh/h	181	26	8	114	17	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	197	28	9	124	18	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	225	0	353	211
Stage 1	-	-	-	-	211	-
Stage 2	-	-	-	-	142	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1344	-	645	829
Stage 1	-	-	-	-	824	-
Stage 2	-	-	-	-	885	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1344	-	640	829
Mov Cap-2 Maneuver	-	-	-	-	640	-
Stage 1	-	-	-	-	824	-
Stage 2	-	-	-	-	879	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.5	10.6
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	669	1344	-	-	-
HCM Lane V/C Ratio	0.034	0.006	-	-	-
HCM Control Delay (s)	10.6	7.7	0	-	-
HCM Lane LOS	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	0	-	-	-

Intersection	
Int Delay, s/veh	2.9

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	19	49	78	174	104	27
Future Vol, veh/h	19	49	78	174	104	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	53	85	189	113	29

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	487	128	142	0	-	0
Stage 1	128	-	-	-	-	-
Stage 2	359	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	540	922	1441	-	-	-
Stage 1	898	-	-	-	-	-
Stage 2	707	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	508	922	1441	-	-	-
Mov Cap-2 Maneuver	508	-	-	-	-	-
Stage 1	845	-	-	-	-	-
Stage 2	707	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	10.3	2.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1
Capacity (veh/h)	-	-	1441	-	751
HCM Lane V/C Ratio	-	-	0.059	-	0.098
HCM Control Delay (s)	-	-	7.7	-	10.3
HCM Lane LOS	-	-	A	-	B
HCM 95th %tile Q(veh)	-	-	0.2	-	0.3

Intersection	
Int Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	26	0	71	34	0	42
Future Vol, veh/h	26	0	71	34	0	42
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	0	77	37	0	46

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	142	96	0	0	114	0
Stage 1	96	-	-	-	-	-
Stage 2	46	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	851	960	-	-	1475	-
Stage 1	928	-	-	-	-	-
Stage 2	976	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	851	960	-	-	1475	-
Mov Cap-2 Maneuver	851	-	-	-	-	-
Stage 1	928	-	-	-	-	-
Stage 2	976	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	851	1475	-
HCM Lane V/C Ratio	-	-	0.033	-	-
HCM Control Delay (s)	-	-	9.4	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Intersection Delay, s/veh	15.2
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	45	32	43	91	0	280	139	48	4	137	13
Future Vol, veh/h	14	45	32	43	91	0	280	139	48	4	137	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	49	35	47	99	0	304	151	52	4	149	14
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.9	10.9	19.1	10.1
HCM LOS	A	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	60%	15%	32%	3%
Vol Thru, %	30%	49%	68%	89%
Vol Right, %	10%	35%	0%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	467	91	134	154
LT Vol	280	14	43	4
Through Vol	139	45	91	137
RT Vol	48	32	0	13
Lane Flow Rate	508	99	146	167
Geometry Grp	1	1	1	1
Degree of Util (X)	0.706	0.159	0.24	0.248
Departure Headway (Hd)	5.008	5.786	5.925	5.339
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	726	618	604	671
Service Time	3.008	3.84	3.974	3.381
HCM Lane V/C Ratio	0.7	0.16	0.242	0.249
HCM Control Delay	19.1	9.9	10.9	10.1
HCM Lane LOS	C	A	B	B
HCM 95th-tile Q	5.9	0.6	0.9	1

Intersection	
Intersection Delay, s/veh	14.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	15	33	26	66	47	42	48	224	130	39	240	63
Future Vol, veh/h	15	33	26	66	47	42	48	224	130	39	240	63
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	36	28	72	51	46	52	243	141	42	261	68
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.3	11.5	16	14.4
HCM LOS	B	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	20%	43%	11%
Vol Thru, %	56%	45%	30%	70%
Vol Right, %	32%	35%	27%	18%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	402	74	155	342
LT Vol	48	15	66	39
Through Vol	224	33	47	240
RT Vol	130	26	42	63
Lane Flow Rate	437	80	168	372
Geometry Grp	1	1	1	1
Degree of Util (X)	0.617	0.138	0.284	0.542
Departure Headway (Hd)	5.084	6.195	6.061	5.245
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	708	575	590	684
Service Time	3.134	4.272	4.125	3.296
HCM Lane V/C Ratio	0.617	0.139	0.285	0.544
HCM Control Delay	16	10.3	11.5	14.4
HCM Lane LOS	C	B	B	B
HCM 95th-tile Q	4.3	0.5	1.2	3.3

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	2	79	170	3	4	9
Future Vol, veh/h	2	79	170	3	4	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	86	185	3	4	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	188	0	-	0	277	187
Stage 1	-	-	-	-	187	-
Stage 2	-	-	-	-	90	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1386	-	-	-	713	855
Stage 1	-	-	-	-	845	-
Stage 2	-	-	-	-	934	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1386	-	-	-	712	855
Mov Cap-2 Maneuver	-	-	-	-	712	-
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	934	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1386	-	-	-	805
HCM Lane V/C Ratio	0.002	-	-	-	0.018
HCM Control Delay (s)	7.6	0	-	-	9.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	12	22	9	282	342	1
Future Vol, veh/h	12	22	9	282	342	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	24	10	307	372	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	700	373	373	0	-	0
Stage 1	373	-	-	-	-	-
Stage 2	327	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	405	673	1185	-	-	-
Stage 1	696	-	-	-	-	-
Stage 2	731	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	401	673	1185	-	-	-
Mov Cap-2 Maneuver	401	-	-	-	-	-
Stage 1	689	-	-	-	-	-
Stage 2	731	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.1	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1185	-	543	-	-
HCM Lane V/C Ratio	0.008	-	0.068	-	-
HCM Control Delay (s)	8.1	0	12.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	76	7	2	165	22	8
Future Vol, veh/h	76	7	2	165	22	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	83	8	2	179	24	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	91	0	270	87
Stage 1	-	-	-	-	87	-
Stage 2	-	-	-	-	183	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1504	-	719	971
Stage 1	-	-	-	-	936	-
Stage 2	-	-	-	-	848	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1504	-	718	971
Mov Cap-2 Maneuver	-	-	-	-	718	-
Stage 1	-	-	-	-	936	-
Stage 2	-	-	-	-	847	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.1	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	772	1504	-	-	-
HCM Lane V/C Ratio	0.042	0.001	-	-	-
HCM Control Delay (s)	9.9	7.4	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	0	-	-	-

Intersection	
Int Delay, s/veh	2.3

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	16	48	14	76	163	2
Future Vol, veh/h	16	48	14	76	163	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	52	15	83	177	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	291	178	179	0	-	0
Stage 1	178	-	-	-	-	-
Stage 2	113	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	700	865	1397	-	-	-
Stage 1	853	-	-	-	-	-
Stage 2	912	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	692	865	1397	-	-	-
Mov Cap-2 Maneuver	692	-	-	-	-	-
Stage 1	844	-	-	-	-	-
Stage 2	912	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	9.8	1.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1
Capacity (veh/h)	-	-	1397	-	814
HCM Lane V/C Ratio	-	-	0.011	-	0.085
HCM Control Delay (s)	-	-	7.6	-	9.8
HCM Lane LOS	-	-	A	-	A
HCM 95th %tile Q(veh)	-	-	0	-	0.3

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	21	0	0	64
Future Vol, veh/h	0	0	21	0	0	64
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	23	0	0	70

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	93	23	0	0	23	0
Stage 1	23	-	-	-	-	-
Stage 2	70	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	907	1054	-	-	1592	-
Stage 1	1000	-	-	-	-	-
Stage 2	953	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	907	1054	-	-	1592	-
Mov Cap-2 Maneuver	907	-	-	-	-	-
Stage 1	1000	-	-	-	-	-
Stage 2	953	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1592	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Intersection Delay, s/veh	11.1
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	50	116	126	52	35	1	49	124	72	4	129	9
Future Vol, veh/h	50	116	126	52	35	1	49	124	72	4	129	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	126	137	57	38	1	53	135	78	4	140	10
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.9	9.7	11.3	10.1
HCM LOS	B	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	20%	17%	59%	3%
Vol Thru, %	51%	40%	40%	91%
Vol Right, %	29%	43%	1%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	245	292	88	142
LT Vol	49	50	52	4
Through Vol	124	116	35	129
RT Vol	72	126	1	9
Lane Flow Rate	266	317	96	154
Geometry Grp	1	1	1	1
Degree of Util (X)	0.381	0.44	0.151	0.232
Departure Headway (Hd)	5.146	4.996	5.67	5.417
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	700	720	632	662
Service Time	3.177	3.026	3.71	3.454
HCM Lane V/C Ratio	0.38	0.44	0.152	0.233
HCM Control Delay	11.3	11.9	9.7	10.1
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	1.8	2.3	0.5	0.9

Intersection	
Intersection Delay, s/veh	17.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	37	60	56	33	10	48	33	356	45	16	320	59
Future Vol, veh/h	37	60	56	33	10	48	33	356	45	16	320	59
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	40	65	61	36	11	52	36	387	49	17	348	64
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.1	11	20.7	18.1
HCM LOS	B	B	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	8%	24%	36%	4%
Vol Thru, %	82%	39%	11%	81%
Vol Right, %	10%	37%	53%	15%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	434	153	91	395
LT Vol	33	37	33	16
Through Vol	356	60	10	320
RT Vol	45	56	48	59
Lane Flow Rate	472	166	99	429
Geometry Grp	1	1	1	1
Degree of Util (X)	0.709	0.297	0.181	0.648
Departure Headway (Hd)	5.408	6.439	6.573	5.436
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	660	562	549	657
Service Time	3.495	4.439	4.581	3.526
HCM Lane V/C Ratio	0.715	0.295	0.18	0.653
HCM Control Delay	20.7	12.1	11	18.1
HCM Lane LOS	C	B	B	C
HCM 95th-tile Q	5.9	1.2	0.7	4.7

Intersection						
Int Delay, s/veh	0.4					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	155	76	5	1	6
Future Vol, veh/h	5	155	76	5	1	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	168	83	5	1	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	88	0	-	0	264	86
Stage 1	-	-	-	-	86	-
Stage 2	-	-	-	-	178	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1508	-	-	-	725	973
Stage 1	-	-	-	-	937	-
Stage 2	-	-	-	-	853	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1508	-	-	-	722	973
Mov Cap-2 Maneuver	-	-	-	-	722	-
Stage 1	-	-	-	-	933	-
Stage 2	-	-	-	-	853	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1508	-	-	-	927
HCM Lane V/C Ratio	0.004	-	-	-	0.008
HCM Control Delay (s)	7.4	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection						
Int Delay, s/veh	0.7					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	17	34	442	395	2
Future Vol, veh/h	8	17	34	442	395	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	18	37	480	429	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	984	430	431	0	-	0
Stage 1	430	-	-	-	-	-
Stage 2	554	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	275	625	1129	-	-	-
Stage 1	656	-	-	-	-	-
Stage 2	575	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	263	625	1129	-	-	-
Mov Cap-2 Maneuver	263	-	-	-	-	-
Stage 1	626	-	-	-	-	-
Stage 2	575	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.8	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1129	-	434	-	-
HCM Lane V/C Ratio	0.033	-	0.063	-	-
HCM Control Delay (s)	8.3	0	13.8	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

Intersection						
Int Delay, s/veh	0.7					

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	144	24	6	72	10	4
Future Vol, veh/h	144	24	6	72	10	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	157	26	7	78	11	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	183	0	262	170
Stage 1	-	-	-	-	170	-
Stage 2	-	-	-	-	92	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1392	-	727	874
Stage 1	-	-	-	-	860	-
Stage 2	-	-	-	-	932	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1392	-	723	874
Mov Cap-2 Maneuver	-	-	-	-	723	-
Stage 1	-	-	-	-	860	-
Stage 2	-	-	-	-	927	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.6	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	761	1392	-	-	-
HCM Lane V/C Ratio	0.02	0.005	-	-	-
HCM Control Delay (s)	9.8	7.6	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	0	-	-	-

Intersection						
Int Delay, s/veh	2.4					

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	10	31	48	145	66	11
Future Vol, veh/h	10	31	48	145	66	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	34	52	158	72	12

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	340	78	84	0	-	0
Stage 1	78	-	-	-	-	-
Stage 2	262	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	656	983	1513	-	-	-
Stage 1	945	-	-	-	-	-
Stage 2	782	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	634	983	1513	-	-	-
Mov Cap-2 Maneuver	634	-	-	-	-	-
Stage 1	913	-	-	-	-	-
Stage 2	782	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	9.4	1.9	0
HCM LOS	A		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1
Capacity (veh/h)	-	-	1513	-	867
HCM Lane V/C Ratio	-	-	0.034	-	0.051
HCM Control Delay (s)	-	-	7.5	-	9.4
HCM Lane LOS	-	-	A	-	A
HCM 95th %tile Q(veh)	-	-	0.1	-	0.2

Intersection						
Int Delay, s/veh	0.9					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	0	71	25	0	42
Future Vol, veh/h	14	0	71	25	0	42
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	0	77	27	0	46

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	137	91	0	0	104	0
Stage 1	91	-	-	-	-	-
Stage 2	46	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	856	967	-	-	1488	-
Stage 1	933	-	-	-	-	-
Stage 2	976	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	856	967	-	-	1488	-
Mov Cap-2 Maneuver	856	-	-	-	-	-
Stage 1	933	-	-	-	-	-
Stage 2	976	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	856	1488	-
HCM Lane V/C Ratio	-	-	0.018	-	-
HCM Control Delay (s)	-	-	9.3	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Intersection Delay, s/veh	15.9
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	14	53	32	46	114	3	280	139	49	5	137	13
Future Vol, veh/h	14	53	32	46	114	3	280	139	49	5	137	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	58	35	50	124	3	304	151	53	5	149	14
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.3	11.5	20.5	10.5
HCM LOS	B	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	60%	14%	28%	3%
Vol Thru, %	30%	54%	70%	88%
Vol Right, %	10%	32%	2%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	468	99	163	155
LT Vol	280	14	46	5
Through Vol	139	53	114	137
RT Vol	49	32	3	13
Lane Flow Rate	509	108	177	168
Geometry Grp	1	1	1	1
Degree of Util (X)	0.724	0.177	0.294	0.258
Departure Headway (Hd)	5.123	5.925	5.977	5.515
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	707	603	599	649
Service Time	3.16	3.985	4.032	3.565
HCM Lane V/C Ratio	0.72	0.179	0.295	0.259
HCM Control Delay	20.5	10.3	11.5	10.5
HCM Lane LOS	C	B	B	B
HCM 95th-tile Q	6.2	0.6	1.2	1

Intersection	
Intersection Delay, s/veh	15.1
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	50	33	66	52	43	50	224	130	39	240	63
Future Vol, veh/h	17	50	33	66	52	43	50	224	130	39	240	63
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	54	36	72	57	47	54	243	141	42	261	68
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.9	12	17.2	15.2
HCM LOS	B	B	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	17%	41%	11%
Vol Thru, %	55%	50%	32%	70%
Vol Right, %	32%	33%	27%	18%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	404	100	161	342
LT Vol	50	17	66	39
Through Vol	224	50	52	240
RT Vol	130	33	43	63
Lane Flow Rate	439	109	175	372
Geometry Grp	1	1	1	1
Degree of Util (X)	0.639	0.19	0.301	0.558
Departure Headway (Hd)	5.24	6.285	6.194	5.407
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	685	566	576	662
Service Time	3.301	4.378	4.277	3.472
HCM Lane V/C Ratio	0.641	0.193	0.304	0.562
HCM Control Delay	17.2	10.9	12	15.2
HCM Lane LOS	C	B	B	C
HCM 95th-tile Q	4.6	0.7	1.3	3.5

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	92	172	8	17	18
Future Vol, veh/h	5	92	172	8	17	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	100	187	9	18	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	196	0	-	0	302	192
Stage 1	-	-	-	-	192	-
Stage 2	-	-	-	-	110	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1377	-	-	-	690	850
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	915	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1377	-	-	-	687	850
Mov Cap-2 Maneuver	-	-	-	-	687	-
Stage 1	-	-	-	-	838	-
Stage 2	-	-	-	-	915	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1377	-	-	-	762
HCM Lane V/C Ratio	0.004	-	-	-	0.05
HCM Control Delay (s)	7.6	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	16	22	10	284	342	3
Future Vol, veh/h	16	22	10	284	342	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	24	11	309	372	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	705	374	375	0	-	0
Stage 1	374	-	-	-	-	-
Stage 2	331	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	403	672	1183	-	-	-
Stage 1	696	-	-	-	-	-
Stage 2	728	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	399	672	1183	-	-	-
Mov Cap-2 Maneuver	399	-	-	-	-	-
Stage 1	688	-	-	-	-	-
Stage 2	728	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.5	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1183	-	522	-	-
HCM Lane V/C Ratio	0.009	-	0.079	-	-
HCM Control Delay (s)	8.1	0	12.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Intersection	
Int Delay, s/veh	1.2

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	92	9	6	172	24	8
Future Vol, veh/h	92	9	6	172	24	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	100	10	7	187	26	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	110	0	306	105
Stage 1	-	-	-	-	105	-
Stage 2	-	-	-	-	201	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1480	-	686	949
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	833	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1480	-	683	949
Mov Cap-2 Maneuver	-	-	-	-	683	-
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	829	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.3	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	734	1480	-	-	-
HCM Lane V/C Ratio	0.047	0.004	-	-	-
HCM Control Delay (s)	10.1	7.4	0	-	-
HCM Lane LOS	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	0	-	-	-

Intersection						
Int Delay, s/veh	2.9					

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	22	64	21	79	168	6
Future Vol, veh/h	22	64	21	79	168	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	70	23	86	183	7

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	319	187	190	0	-	0
Stage 1	187	-	-	-	-	-
Stage 2	132	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	674	855	1384	-	-	-
Stage 1	845	-	-	-	-	-
Stage 2	894	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	663	855	1384	-	-	-
Mov Cap-2 Maneuver	663	-	-	-	-	-
Stage 1	831	-	-	-	-	-
Stage 2	894	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	10.1	1.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1
Capacity (veh/h)	-	-	1384	-	796
HCM Lane V/C Ratio	-	-	0.016	-	0.117
HCM Control Delay (s)	-	-	7.6	-	10.1
HCM Lane LOS	-	-	A	-	B
HCM 95th %tile Q(veh)	-	-	0.1	-	0.4

Intersection						
Int Delay, s/veh	2.7					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	39	1	21	11	0	64
Future Vol, veh/h	39	1	21	11	0	64
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	42	1	23	12	0	70

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	99	29	0	0	35	0
Stage 1	29	-	-	-	-	-
Stage 2	70	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	900	1046	-	-	1576	-
Stage 1	994	-	-	-	-	-
Stage 2	953	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	900	1046	-	-	1576	-
Mov Cap-2 Maneuver	900	-	-	-	-	-
Stage 1	994	-	-	-	-	-
Stage 2	953	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	903	1576	-
HCM Lane V/C Ratio	-	-	0.048	-	-
HCM Control Delay (s)	-	-	9.2	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Intersection Delay, s/veh	11.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	50	142	126	54	50	3	49	124	76	7	129	9
Future Vol, veh/h	50	142	126	54	50	3	49	124	76	7	129	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	154	137	59	54	3	53	135	83	8	140	10
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	13	10.1	11.9	10.5
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	20%	16%	50%	5%
Vol Thru, %	50%	45%	47%	89%
Vol Right, %	31%	40%	3%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	249	318	107	145
LT Vol	49	50	54	7
Through Vol	124	142	50	129
RT Vol	76	126	3	9
Lane Flow Rate	271	346	116	158
Geometry Grp	1	1	1	1
Degree of Util (X)	0.399	0.49	0.186	0.245
Departure Headway (Hd)	5.307	5.105	5.754	5.605
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	677	705	622	640
Service Time	3.348	3.145	3.807	3.653
HCM Lane V/C Ratio	0.4	0.491	0.186	0.247
HCM Control Delay	11.9	13	10.1	10.5
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	1.9	2.7	0.7	1

Intersection	
Intersection Delay, s/veh	20.3
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	39	71	61	33	28	49	40	356	45	16	320	59
Future Vol, veh/h	39	71	61	33	28	49	40	356	45	16	320	59
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	42	77	66	36	30	53	43	387	49	17	348	64
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	13.1	11.9	24.8	20.6
HCM LOS	B	B	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	9%	23%	30%	4%
Vol Thru, %	81%	42%	25%	81%
Vol Right, %	10%	36%	45%	15%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	441	171	110	395
LT Vol	40	39	33	16
Through Vol	356	71	28	320
RT Vol	45	61	49	59
Lane Flow Rate	479	186	120	429
Geometry Grp	1	1	1	1
Degree of Util (X)	0.763	0.342	0.226	0.689
Departure Headway (Hd)	5.729	6.627	6.81	5.774
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	633	541	525	627
Service Time	3.746	4.69	4.878	3.793
HCM Lane V/C Ratio	0.757	0.344	0.229	0.684
HCM Control Delay	24.8	13.1	11.9	20.6
HCM Lane LOS	C	B	B	C
HCM 95th-tile Q	7	1.5	0.9	5.4

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	164	84	22	10	12
Future Vol, veh/h	16	164	84	22	10	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	178	91	24	11	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	115	0	-	0	315	103
Stage 1	-	-	-	-	103	-
Stage 2	-	-	-	-	212	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1474	-	-	-	678	952
Stage 1	-	-	-	-	921	-
Stage 2	-	-	-	-	823	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1474	-	-	-	669	952
Mov Cap-2 Maneuver	-	-	-	-	669	-
Stage 1	-	-	-	-	909	-
Stage 2	-	-	-	-	823	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	9.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1474	-	-	-	798
HCM Lane V/C Ratio	0.012	-	-	-	0.03
HCM Control Delay (s)	7.5	0	-	-	9.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection						
Int Delay, s/veh	0.7					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	17	35	444	395	9
Future Vol, veh/h	10	17	35	444	395	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	18	38	483	429	10

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	993	434	439	0	-	0
Stage 1	434	-	-	-	-	-
Stage 2	559	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	272	622	1121	-	-	-
Stage 1	653	-	-	-	-	-
Stage 2	572	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	259	622	1121	-	-	-
Mov Cap-2 Maneuver	259	-	-	-	-	-
Stage 1	623	-	-	-	-	-
Stage 2	572	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.5	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1121	-	409	-	-
HCM Lane V/C Ratio	0.034	-	0.072	-	-
HCM Control Delay (s)	8.3	0	14.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

Intersection						
Int Delay, s/veh	0.9					

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	164	26	8	84	17	4
Future Vol, veh/h	164	26	8	84	17	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	178	28	9	91	18	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	206	0	301	192
Stage 1	-	-	-	-	192	-
Stage 2	-	-	-	-	109	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1365	-	691	850
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	916	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1365	-	686	850
Mov Cap-2 Maneuver	-	-	-	-	686	-
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	910	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.7	10.2
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	712	1365	-	-	-
HCM Lane V/C Ratio	0.032	0.006	-	-	-
HCM Control Delay (s)	10.2	7.7	0	-	-
HCM Lane LOS	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	0	-	-	-

Intersection						
Int Delay, s/veh	2.8					

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Vol, veh/h	14	42	70	156	70	26
Future Vol, veh/h	14	42	70	156	70	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	46	76	170	76	28

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	412	90	104	0	-	0
Stage 1	90	-	-	-	-	-
Stage 2	322	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	596	968	1488	-	-	-
Stage 1	934	-	-	-	-	-
Stage 2	735	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	566	968	1488	-	-	-
Mov Cap-2 Maneuver	566	-	-	-	-	-
Stage 1	886	-	-	-	-	-
Stage 2	735	-	-	-	-	-

Approach	SB	SE	NW
HCM Control Delay, s	9.7	2.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SBLn1
Capacity (veh/h)	-	-	1488	-	822
HCM Lane V/C Ratio	-	-	0.051	-	0.074
HCM Control Delay (s)	-	-	7.5	-	9.7
HCM Lane LOS	-	-	A	-	A
HCM 95th %tile Q(veh)	-	-	0.2	-	0.2

Intersection	
Int Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	26	0	71	37	1	41
Future Vol, veh/h	26	0	71	37	1	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	0	77	40	1	45

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	144	97	0	0	117	0
Stage 1	97	-	-	-	-	-
Stage 2	47	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	849	959	-	-	1471	-
Stage 1	927	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	848	959	-	-	1471	-
Mov Cap-2 Maneuver	848	-	-	-	-	-
Stage 1	927	-	-	-	-	-
Stage 2	974	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	848	1471	-
HCM Lane V/C Ratio	-	-	0.033	0.001	-
HCM Control Delay (s)	-	-	9.4	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

APPENDIX C

Background Traffic

RICK™
ENGINEERING COMPANY

5620 Friars Road
San Diego, CA 92110-2596

Tel: (619) 291-0707
Fax: (619) 291-4165

Date 8/24/18
Job No. 18144
Page 1
Done By Carlos Perez
Checked By

Kenosha Farms / Erie Village Subdivision Traffic Volumes

Total Homes = 27 + 251 + 101 = 379 Homes

Assume 30% to use Lombardy St towards the south

379 x 0.3 = 113.7 ≈ 114 Homes

Per ITE Trip Generation Manual 10th Edition Single Family Detached Housing (210) is assumed

ADT Rate 9.44

9.44 x 114 = 1,076.16 ≈ 1,077

AM Peak Hour Rate = 0.74   25% In   75% Out

114 x 0.74 = 84.36 ≈ 85

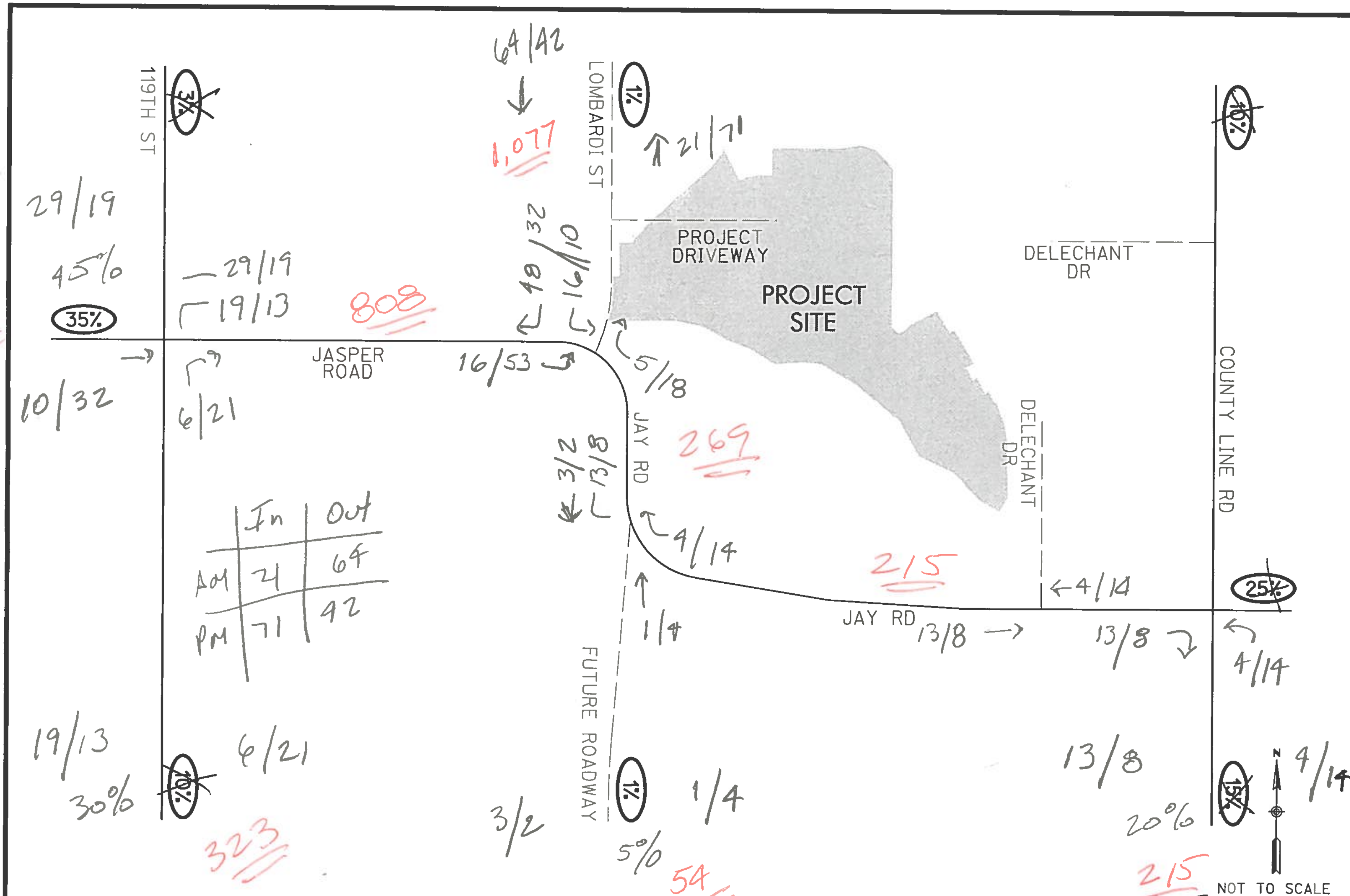
85 x 0.25 = 21   85 x 0.75 = 64

PM Peak Hour Rate = 0.99   63% In   37% Out

114 x 0.99 = 112.86 ≈ 113

113 x 0.63 = 71   113 x 0.37 = 42


27 Homes
251 Homes
101 Homes
Kenosha Rd
County Rd
E County Line Rd
NE County Line Rd
Carlson Ave
Washburn St
Flannagan Ct
German Ct
Holden Ct
James Way
Nonaham Ln
Kanemoto Ln
Banner Cir
Lombardi St
Cooke Ct
Greening Ave
Allen Ave
Conway St
St John St
C W Bixler Blvd
Village Cir
© 2018 Google



	In	Out
AM	21	64
PM	71	42

RICK
ENGINEERING COMPANY
TRAFFIC

EXHIBIT 7

TRAFFIC DISTRIBUTION PERCENTAGES

SCHMIDT PROPERTIES TRAFFIC IMPACT STUDY

CCPM
8/29/18

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14-JUN-2018 15:30

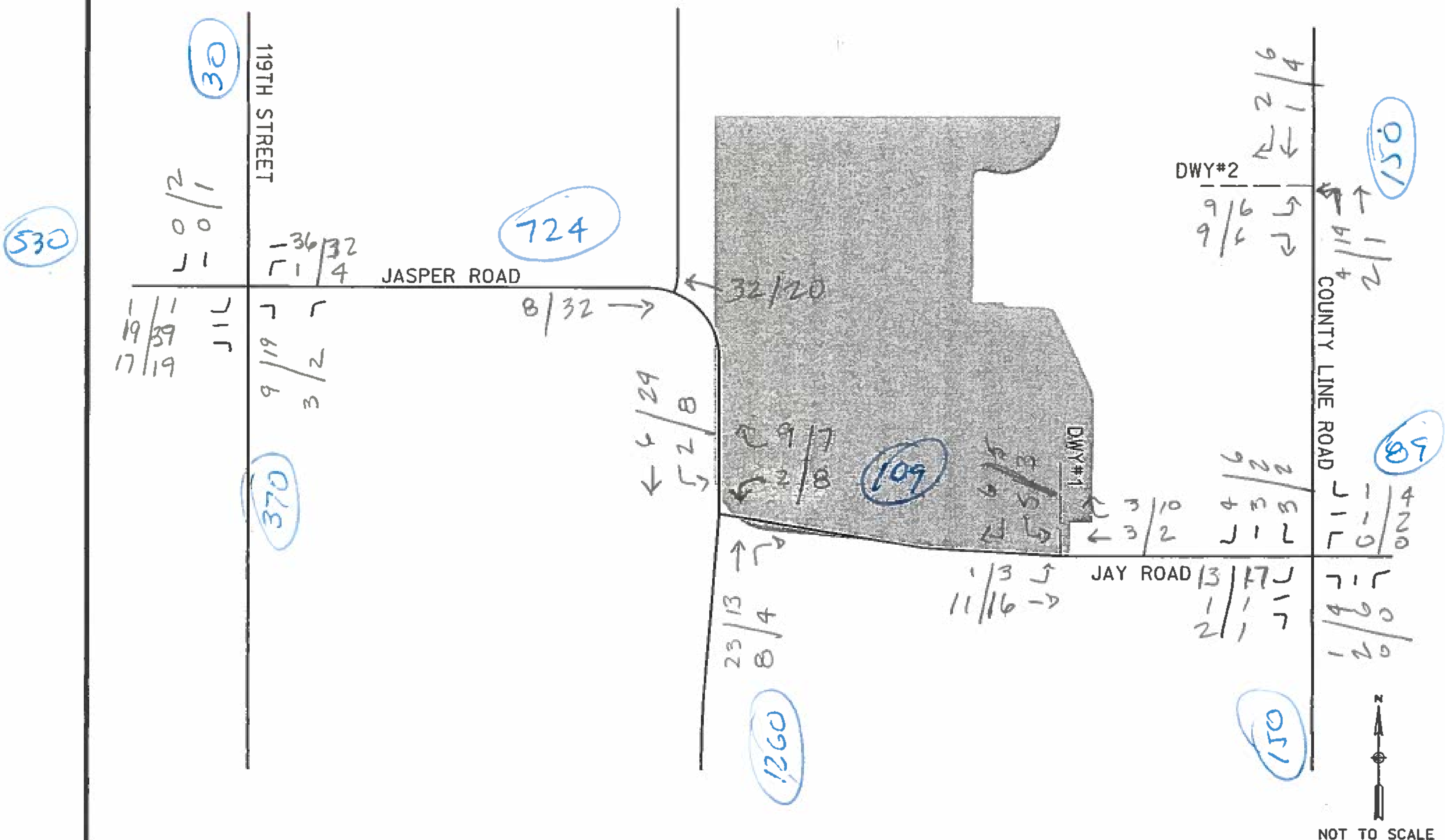

EXHIBIT XX

EXHIBIT NAME

SCHMIDT PROPERTIES TRAFFIC IMPACT ANALYSIS

Total Background Vol. (Wise, Wiggett Canyon Creek)

CCBM 6/6/18

RICK ENGINEERING COMPANY

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FELSBURG
HOLT &
ULLEVIG

engineering paths to transportation solutions

December 15, 2000

MEMORANDUM

TO: Cheryl Appell

FROM: Dave Hattan David E. Hattan

SUBJECT: Wiggett Subdivision

PROJECT: Erie Traffic Engineering
FHU Project #96-190

I have reviewed the Preliminary Plat, subdivision description, and traffic analysis letter (prepared by Eugene G. Coppola, P.E. on April 4, 2000) for the Wiggett Subdivision. The property is located west of East County Line Road and north of Jay Road and has a size of 30.8 acres. The subdivision will have a total of 46 residences. The following are general comments about the proposed project:

- I have reviewed the traffic letter, and it appears to be a complete analysis of the likely traffic impacts from this development. The 46-unit subdivision will generate relatively little traffic - approximately 440 trips per day. The traffic analysis shows that the peak hour turning movement volumes will also be small enough that no auxiliary turn lanes will be warranted on either East County Line Road or Jay Road.

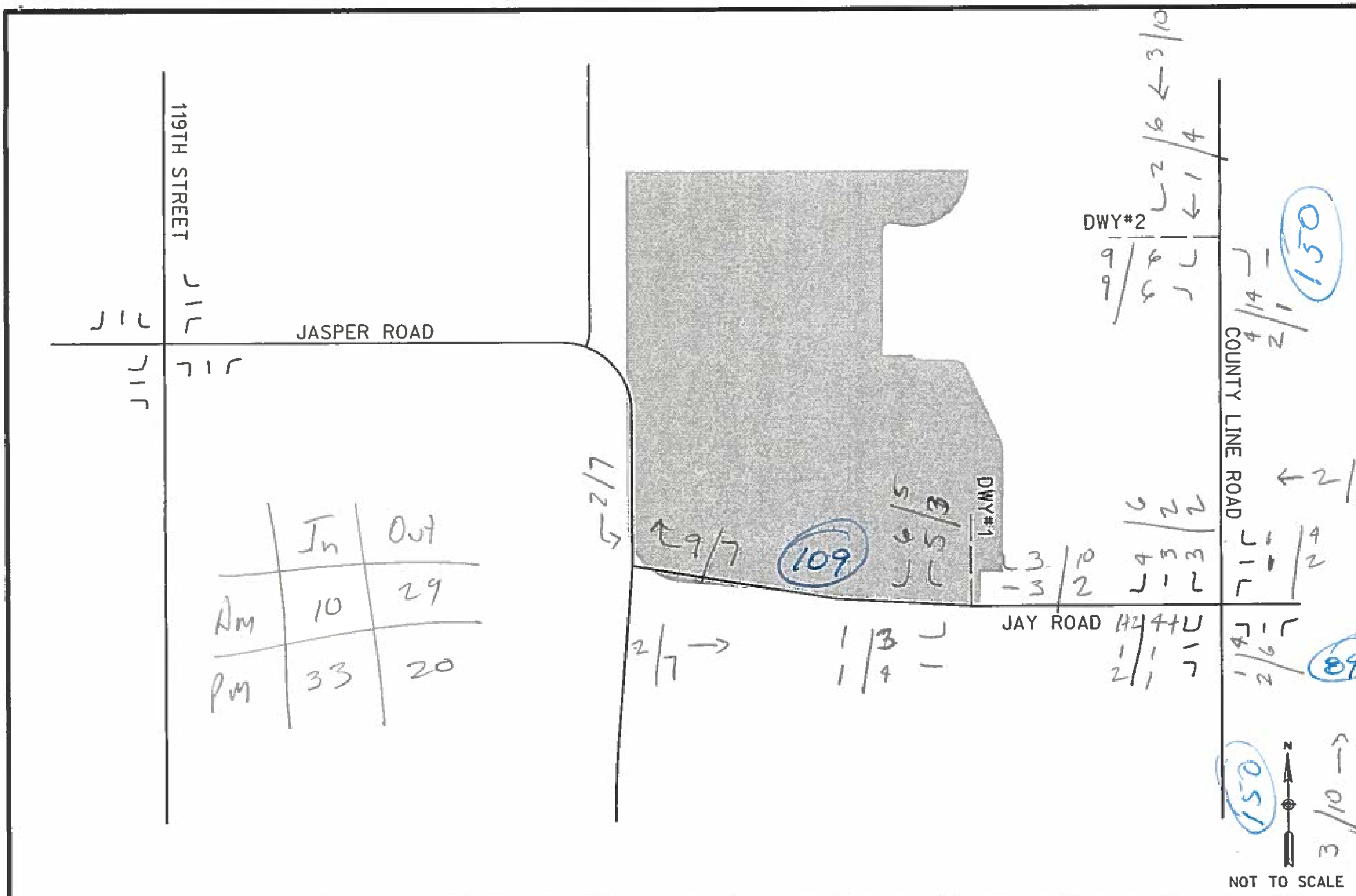
- East County Line Road is shown as a minor arterial in the Erie Transportation Plan. The recommended right-of-way (ROW) for minor arterials is 120 feet plus a 30-foot wide landscape buffer on each side. Jay Road is shown as a major collector in the plan which requires a ROW of 80 feet. 80

- It appears that both East County Line Road and Jay Road could have a series of intersections and driveways in the vicinity of this development. The Town should consider building a three lane section on these roads in the future to accommodate closely spaced left turn maneuvers.

Please call if you have any questions or need further clarification.

303.721.1440
fax 303.721.0832
fhu@fhueng.com

Greenwood Corporate Plaza
7951 E. Maplewood Ave. Ste. 200
Greenwood Village, CO 80111



	In	Out
Am	10	29
Pm	33	20

RICK ENGINEERING COMPANY

EXHIBIT XX

EXHIBIT NAME

52 Units Per Plans

Wiggett Subdivision Project

CCBM 6/6/18

SCHMIDT PROPERTIES TRAFFIC IMPACT ANALYSIS

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T:\18323\Traffic\Graphics\SD CorpStds 2005.dscript

LSC TRANSPORTATION CONSULTANTS, INC.

1889 York Street
Denver, CO 80206
(303) 333-1105
FAX (303) 333-1107
E-mail: lsc@lscdenver.com
Web Site: http://www.lscdenver.com

TRANSPORTATION
CONSULTANTS, INC.

September 20, 2004

Mr. Con Gerdes
Johnson Development Company
4380 S. Syracuse Street, Suite 510
Denver, CO 80237

Re: Canyon Creek Filings 7 & 8
Erie, Colorado
(LSC #041310)

Dear Mr. Gerdes:

We have completed a review of the traffic impacts of the proposed Canyon Creek Filings 7 & 8 residential development located near the intersection of Telleen Avenue and Jasper Road in Erie, Colorado. This site is presently within the jurisdiction of Erie, Colorado and this report has been prepared in accordance with their requirements. The presently vacant site is proposed to contain 110 single-family dwelling units (Filing 7) and 250 multi-family dwelling units (Filing 8) upon completion. Filing 7 will have two full movement accesses from proposed Jasper Road with the south access lining up with existing Telleen Avenue on the east. Filing 8 will have two full have movement accesses from proposed Jasper Road. The remainder of this report presents our findings concerning the traffic impacts of the proposed development.

Existing and Planned Roadways

Figure 1, enclosed, shows the vicinity map and the location of the site within the surrounding roadway network. As indicated, Filing 7 is located west of proposed Jasper Road and Filing 8 is located east of proposed Jasper Road in Erie, Colorado. The following is a brief discussion of existing roadway conditions and anticipated future roadway improvements:

- Leon Wurl Parkway will be a four- to six-lane east-west principal arterial facility as envisioned by the *Erie Transportation Plan*. The portion connecting Isabelle Road on the west with CR 8 on the east was recently constructed and will eventually be expanded through Erie Commons as a four-lane arterial roadway. In the vicinity of Meller Street, it has a four-lane cross-section (two in each direction) with a posted speed limit of 35 mph. The intersection of Leon Wurl Parkway/Meller Street is currently controlled by Stop signs on Meller Street with separate left-turn lanes on the eastbound and westbound approaches.

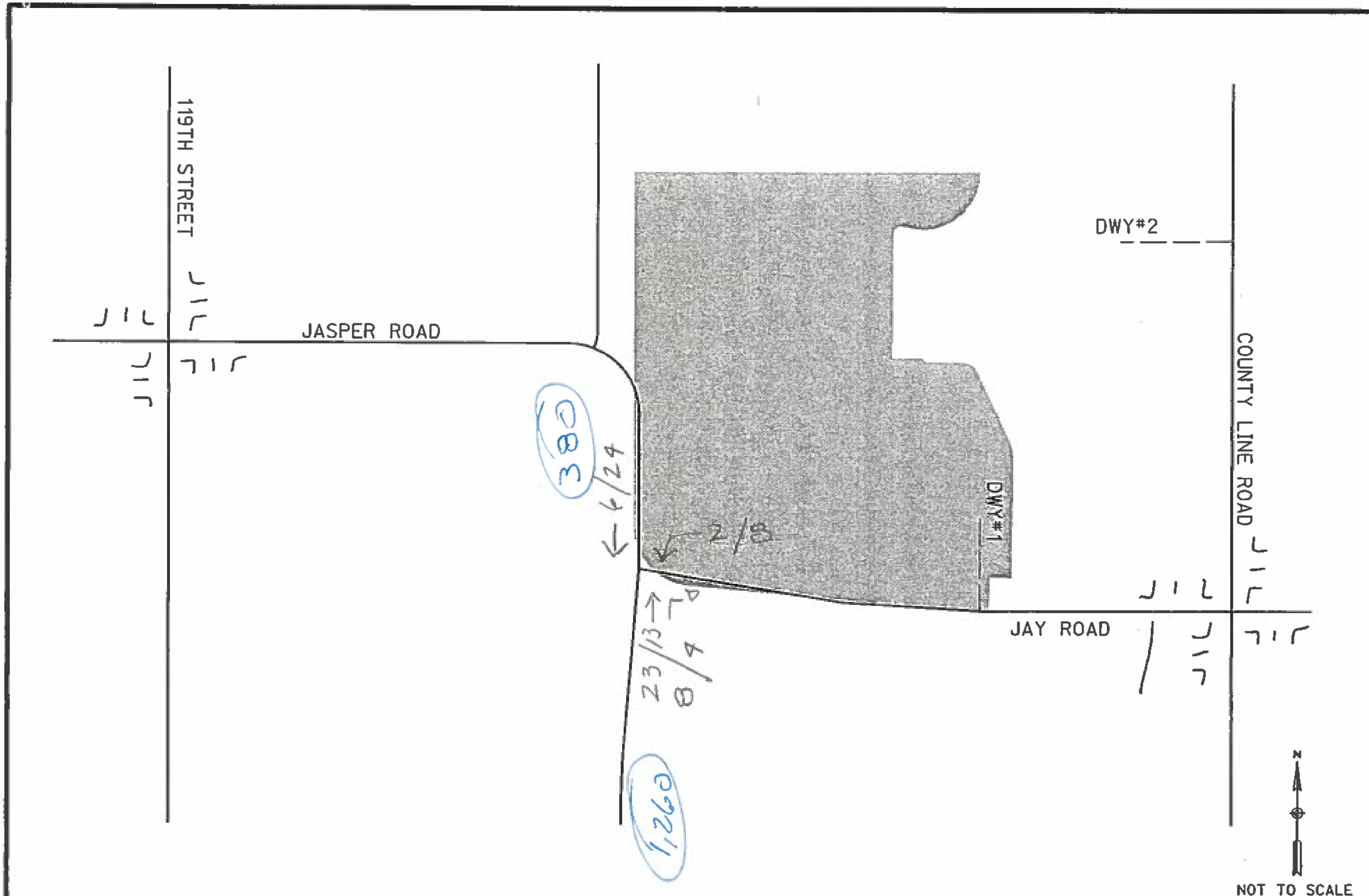

EXHIBIT XX

EXHIBIT NAME

SCHMIDT PROPERTIES TRAFFIC IMPACT ANALYSIS

Canyon Creek 7 & 8

ec PM 6/6/18

RICK ENGINEERING COMPANY

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24-MAY-2018 08:43

TRANSPORTATION
CONSULTANTS, INC.

LSC TRANSPORTATION CONSULTANTS, INC.

1889 York Street
Denver, CO 80206
(303) 333-1105
FAX (303) 333-1107
E-mail: lsc@lscdenver.com

July 31, 2014

Mr. James Dullea
Jasper Land Investments, LLC
9162 S. Kenwood Court
Highlands Ranch, CO 80126

Re: Wise Farms
Traffic Analysis
(LSC #120761)

Dear Mr. Dullea:

In response to your request, LSC Transportation Consultants, Inc. has prepared this traffic analysis for the Wise Farms development. As shown on Figure 1, the site is located south of Jasper Road and west of N. 119th Street in Erie, Colorado.

REPORT CONTENTS

The report contains the following: the existing roadway and traffic conditions in the vicinity of the site; the existing traffic volumes; the site-generated traffic volumes; the assignment of the site-generated traffic volumes; the resulting short and long-term total traffic volumes; the site's projected traffic impacts; and any recommended roadway improvements to mitigate the site's traffic impacts.

LAND USE AND ACCESS

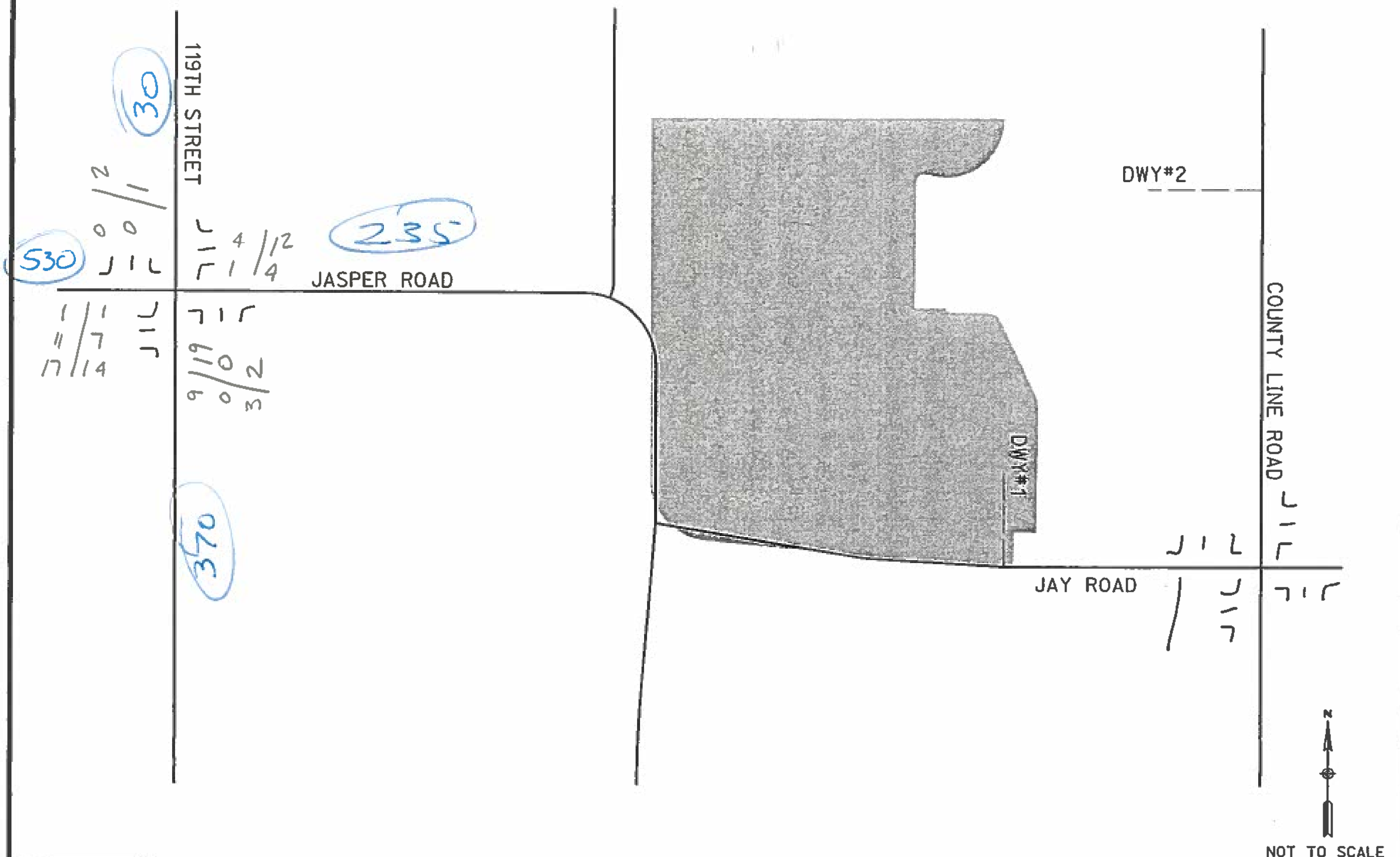
Figure 2 shows the conceptual site plan. The site is proposed as a residential development with up to 127 single-family detached dwelling units on the north half and 39 single-family detached dwelling units on the south half.

The site is proposed to have two full movement access points on Jasper Road, one full movement and one emergency access point on N. 119th Street, with a potential future connection between the north and south halves of the site across existing RTD right-of-way. The analysis and trip assignment assumes no connection across the RTD right-of-way.

ROADWAY AND TRAFFIC CONDITIONS

Area Roadways

The major roadways in the site's vicinity are shown on Figure 1 and are described below.



RICK ENGINEERING COMPANY

EXHIBIT XX

EXHIBIT NAME

SCHMIDT PROPERTIES TRAFFIC IMPACT ANALYSIS

Wise Farms

CCPM 6/6/18

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24-MAY-2018 08:43

APPENDIX D

ITE Trip Generation Rate Sheets

Land Use: 210
Single-Family Detached Housing

Description

Single-family detached housing includes all single-family detached homes on individual lots. A typical site surveyed is a suburban subdivision.

Additional Data

The number of vehicles and residents had a high correlation with average weekday vehicle trip ends. The use of these variables was limited, however, because the number of vehicles and residents was often difficult to obtain or predict. The number of dwelling units was generally used as the independent variable of choice because it was usually readily available, easy to project, and had a high correlation with average weekday vehicle trip ends.

This land use included data from a wide variety of units with different sizes, price ranges, locations, and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Single-family detached units had the highest trip generation rate per dwelling unit of all residential uses because they were the largest units in size and had more residents and more vehicles per unit than other residential land uses; they were generally located farther away from shopping centers, employment areas, and other trip attractors than other residential land uses; and they generally had fewer alternative modes of transportation available because they were typically not as concentrated as other residential land uses.

Time-of-day distribution data for this land use are presented in Appendix A. For the six general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:15 and 8:15 a.m. and 4:00 and 5:00 p.m., respectively. For the two sites with Saturday data, the overall highest vehicle volume was counted between 3:00 and 4:00 p.m. For the one site with Sunday data, the overall highest vehicle volume was counted between 10:15 and 11:15 a.m.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in California, Connecticut, Delaware, Illinois, Indiana, Maryland, Minnesota, Montana, New Jersey, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, and Virginia.

Source Numbers

100, 105, 114, 126, 157, 167; 177, 197, 207, 211, 217, 267, 275, 293, 300, 319, 320, 356, 357, 367, 384, 387, 407, 435, 522, 550, 552, 579, 598, 601, 603, 614, 637, 711, 716, 720, 728, 735, 868, 903, 925, 936

Single-Family Detached Housing
(210)

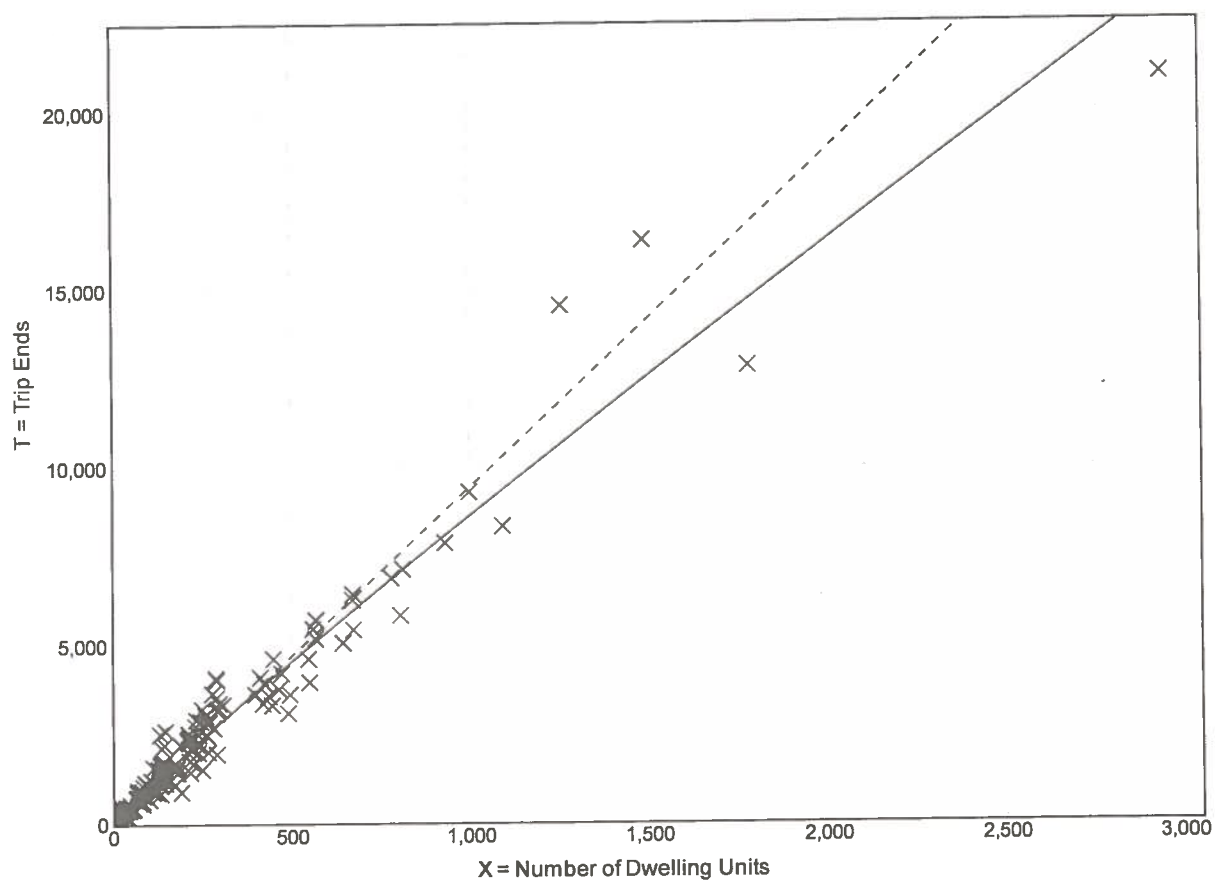
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



× **Study Site** **Fitted Curve** - - - - **Average Rate**

Fitted Curve Equation: $Ln(T) = 0.92 \, Ln(X) + 2.71$ **$R^2 = 0.95$**

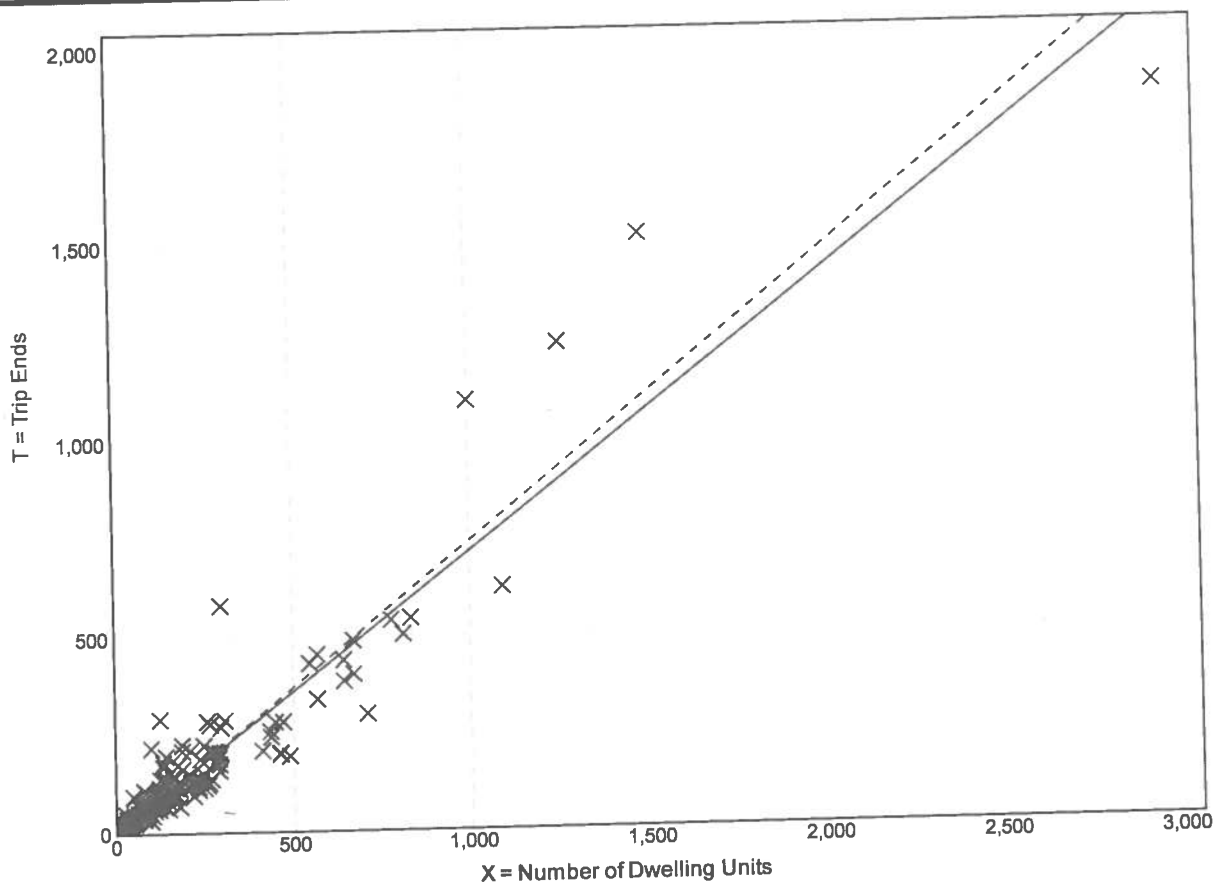
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	173
Avg. Num. of Dwelling Units:	219
Directional Distribution:	25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



× **Study Site** — **Fitted Curve** - - - - **Average Rate**

Fitted Curve Equation: $T = 0.71(X) + 4.80$ **$R^2 = 0.89$**

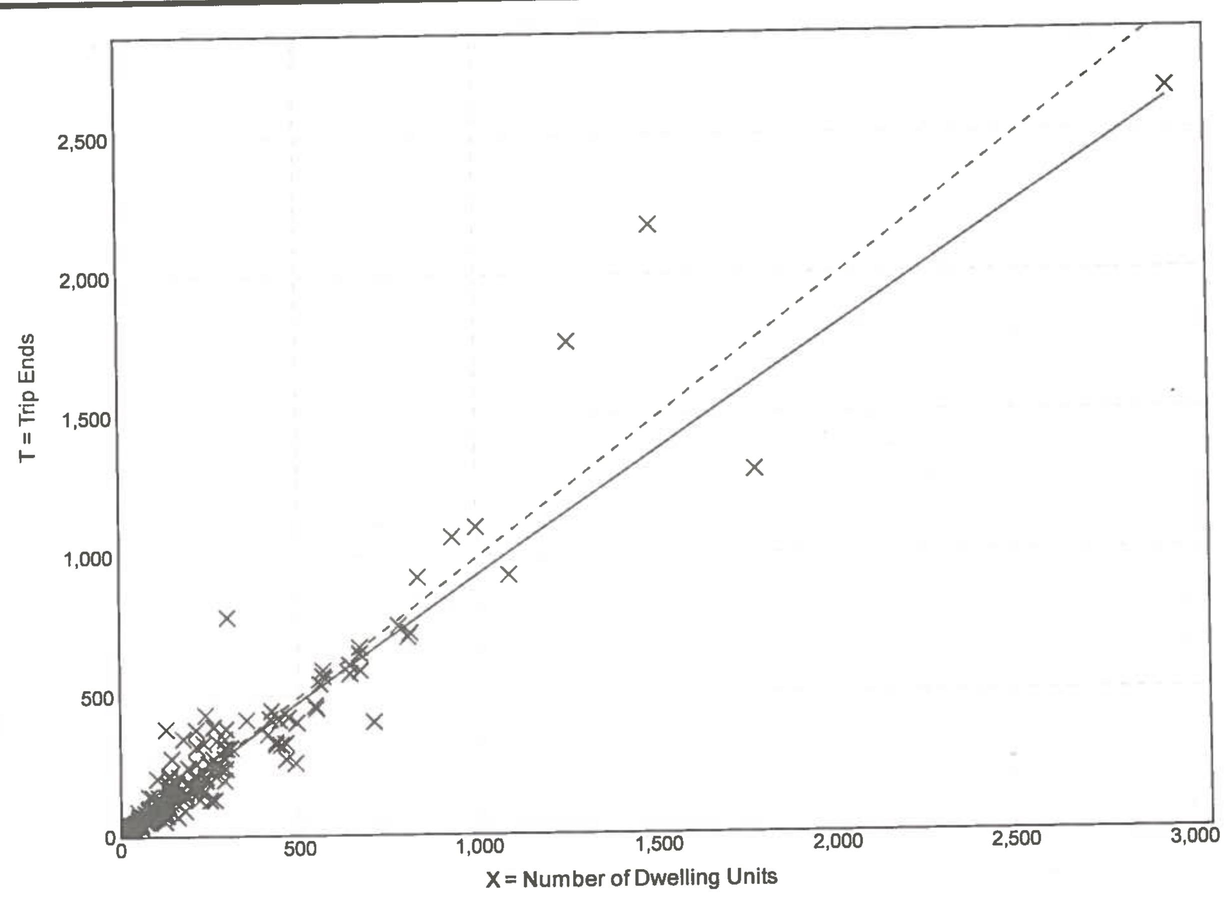
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	190
Avg. Num. of Dwelling Units:	242
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



Fitted Curve Equation: $Ln(T) = 0.96\ Ln(X) + 0.20$

$R^2 = 0.92$

APPENDIX E

2040 (Buildout) Turning Movement Calculation Sheets

18144
LF
6/13/2018

FORECAST MOVEMENT VOLUMES
AM PEAK

RICK ENGINEERING COMPANY
Traffic Division

INPUTS:
OUTPUTS:

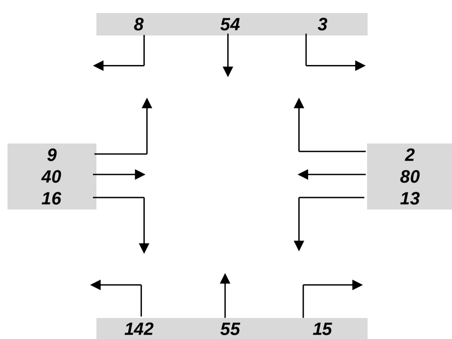
Baseline Year 1: 2018
Baseline Year 2: 2040

Forecast year: 2040
Time of Day: AM

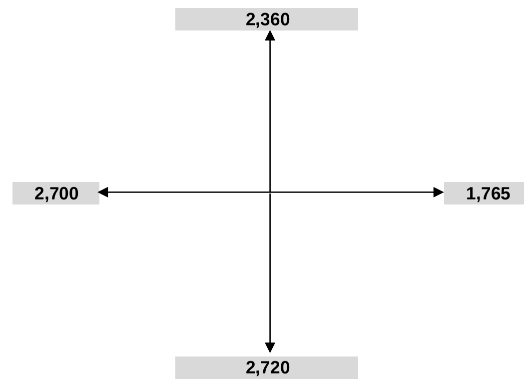
2040 **- Baseline Peak Hour Turning Movement Calculations -** **AM**

Intersection Name (Major/Minor): ***Int.1 - Jasper Rd./ 119th Street***

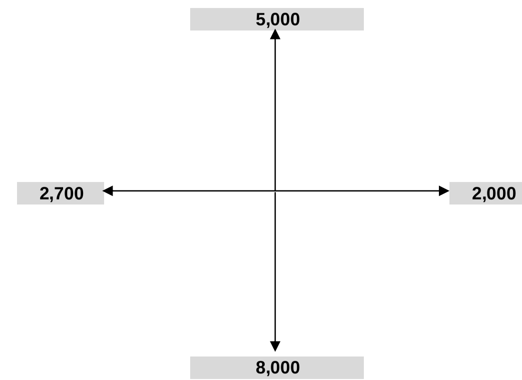
Existing Peak Hour Turning Movement Volumes
2018 **AM**



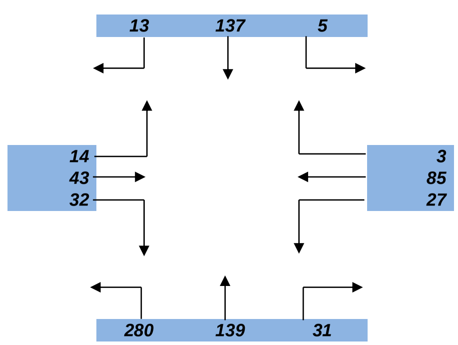
Baseline ADTs
2018



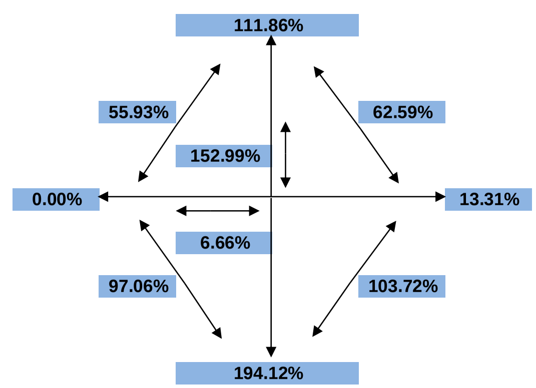
Forecast Year ADTs
2040



Forecasted Peak Hour Turning Movement Volumes
2040 **AM**



Rercent Increase/Decrease



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RICK ENGINEERING COMPANY
Traffic Division

FORECAST MOVEMENT VOLUMES
PM PEAK

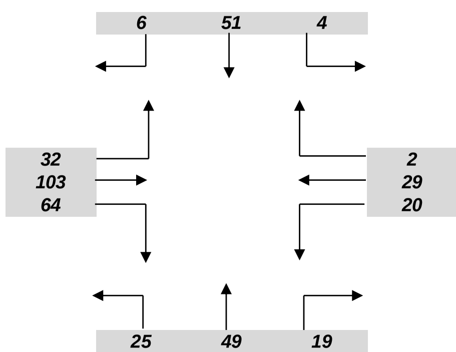
18144
LF
6/13/2018

INPUTS:		Baseline Year 1:	2018	Forecast year:	2040
OUTPUTS:		Baseline Year 2:	2040	Time of Day:	PM

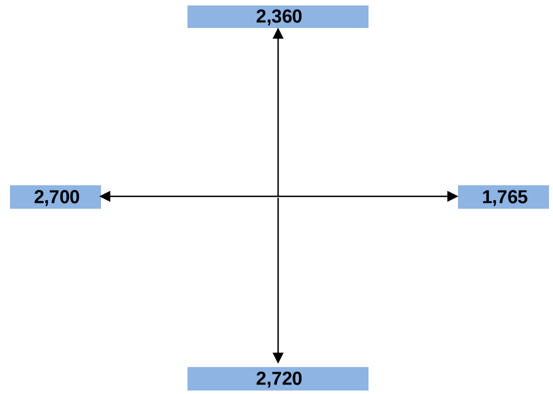
2040 - Baseline Peak Hour Turning Movement Calculations - PM

Intersection Name (Major/Minor): ***Int.1 - Jasper Rd./ 119th Street***

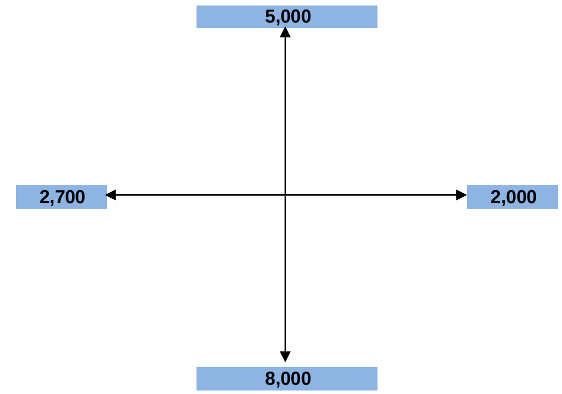
Existing Peak Hour Turning Movement Volumes
2018 PM



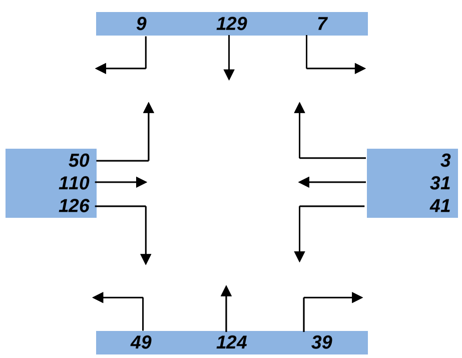
Baseline ADTs
2018



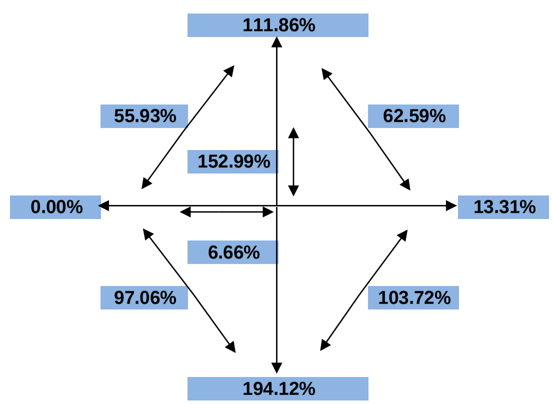
Forecast Year's ADTs
2040



Forecasted Peak Hour Turning Movement Volumes
2040 PM



Rercent Increase/Decrease



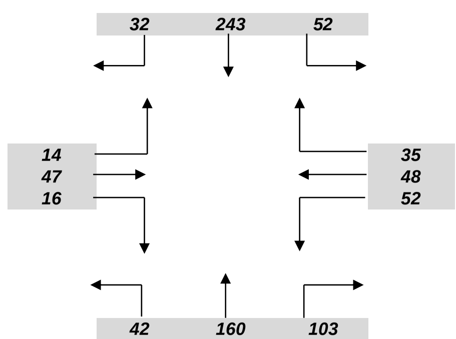
FORECAST MOVEMENT VOLUMES
AM PEAK

INPUTS:		Baseline Year 1:	2018	Forecast year:	2040
OUTPUTS:		Baseline Year 2:	2040	Time of Day:	AM

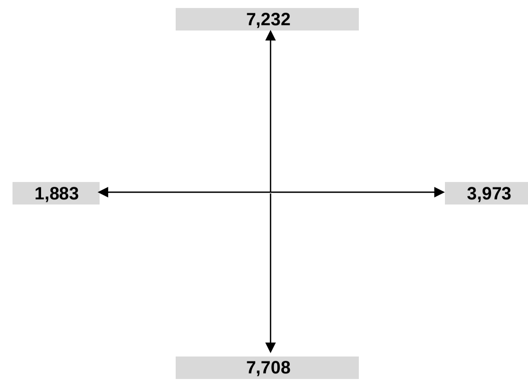
2040 **- Baseline Peak Hour Turning Movement Calculations -** **AM**

Intersection Name (Major/Minor): ***Int.5 - E. County Line Rd/ Jay Rd.***

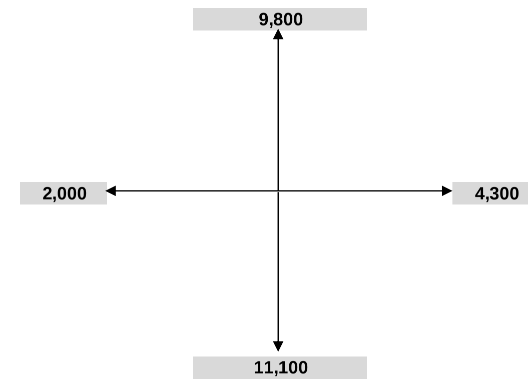
Existing Peak Hour Turning Movement Volumes
2018 **AM**



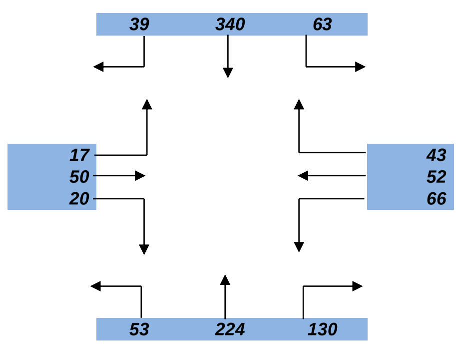
Baseline ADTs
2018



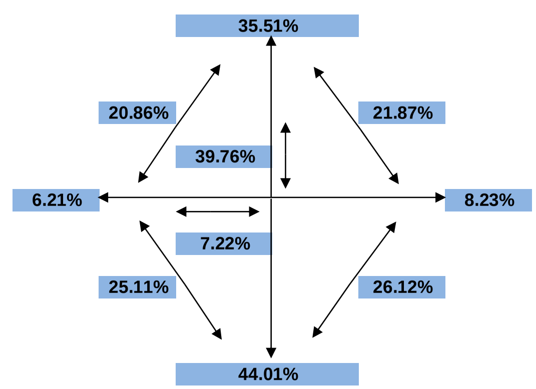
Forecast Year ADTs
2040



Forecasted Peak Hour Turning Movement Volumes
2040 **AM**



Rercent Increase/Decrease



RICK ENGINEERING COMPANY
Traffic Division

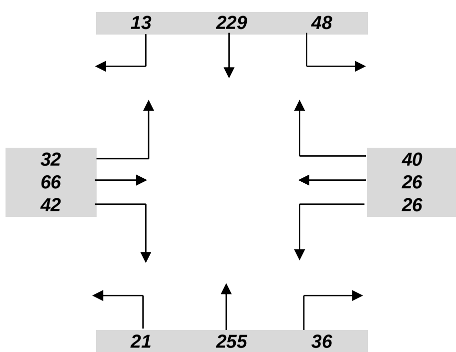
FORECAST MOVEMENT VOLUMES
PM PEAK

INPUTS:		Baseline Year 1:	2018	Forecast year:	2040
OUTPUTS:		Baseline Year 2:	2040	Time of Day:	PM

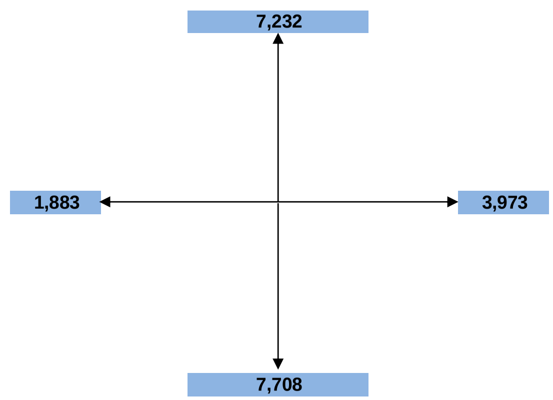
2040 - Baseline Peak Hour Turning Movement Calculations - PM

Intersection Name (Major/Minor): ***Int.5 - E. County Line Rd/ Jay Rd.***

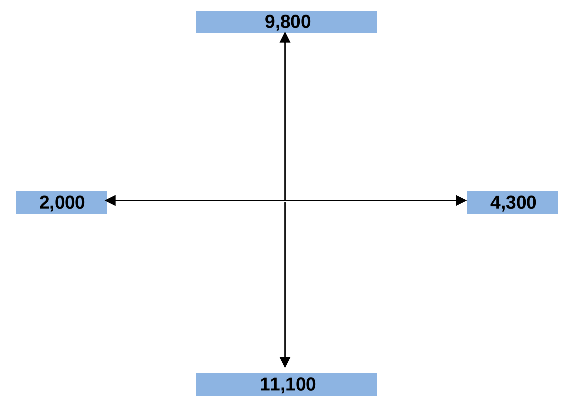
Existing Peak Hour Turning Movement Volumes
2018 **PM**



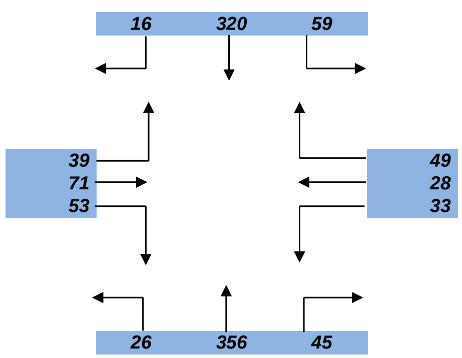
Baseline ADTs
2018



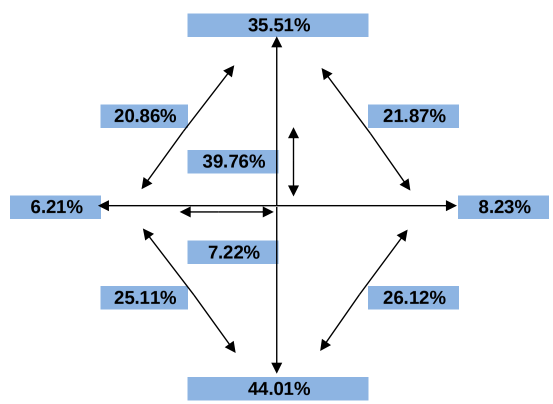
Forecast Year's ADTs
2040



Forecasted Peak Hour Turning Movement Volumes
2040 **PM**



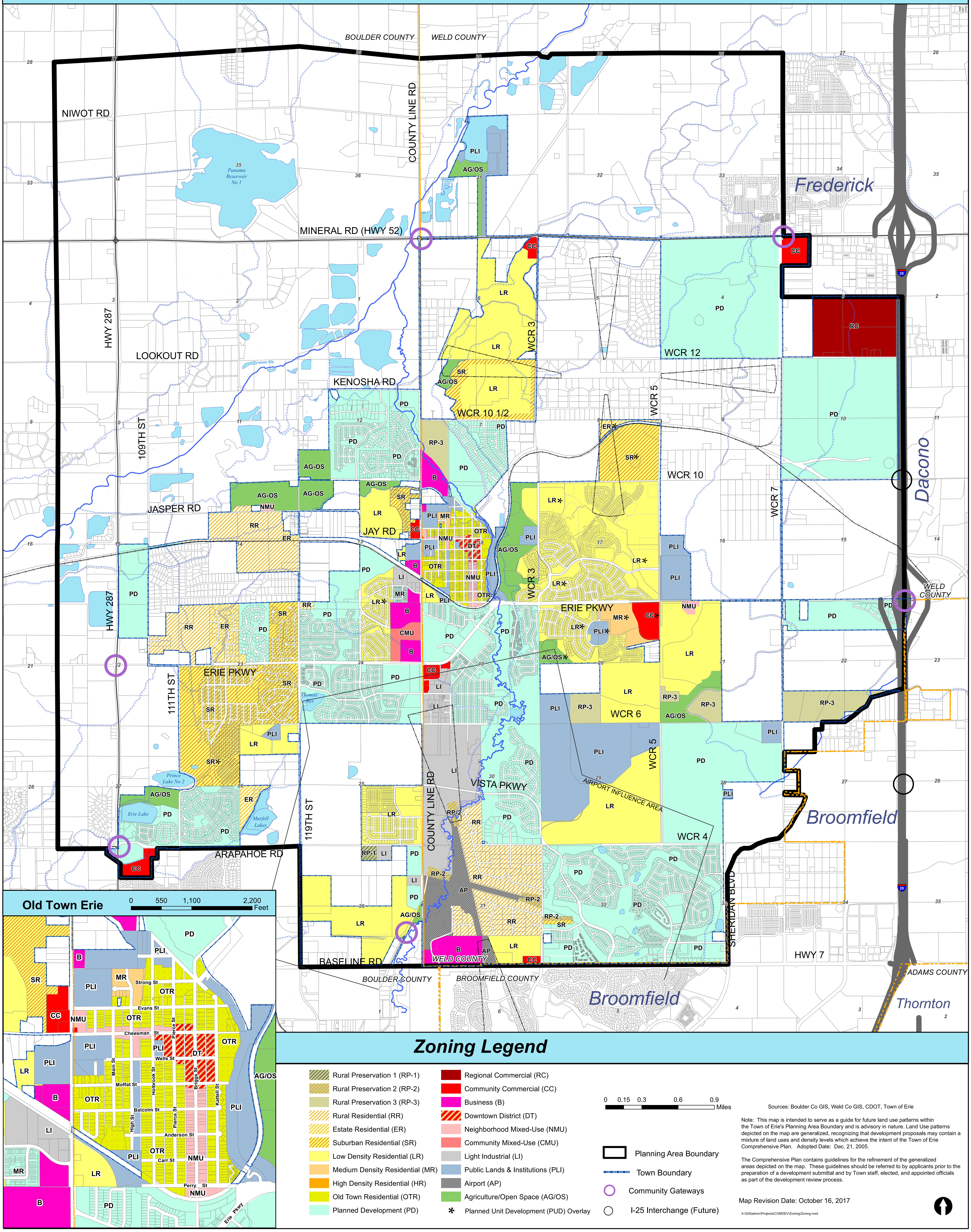
Rercent Increase/Decrease



APPENDIX F

Town of Erie, Colorado Zoning Map

Town of Erie, Colorado
Zoning Map



APPENDIX G

Page 500-12 of the Town of Erie Standards and Specifications

Left-turn Deceleration Lane

	Minimum Left-Turns to Require Deceleration Lane (vph)	Deceleration Lane Including Taper Length (ft)	Taper Rate
Principal Arterial (CDOT NR-A)	10	435 + Storage	13.5:1
Minor Arterial (CDOT NR-B)	10	Storage + Taper	12:1
Collector (CDOT NR-C)	25	Storage + Taper	10:1

Storage Lengths

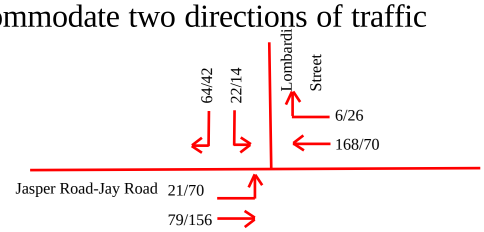
Turning Vehicles Per Hour	< 30	30-59	60-99	100-199	200-299	>300
Storage Length (ft)	25	40	50	100	200	300

Right-turn Acceleration Lane

	Minimum Right-Turns to Require Acceleration Lane (vph)	Acceleration Lane Including Taper Length (ft)	Taper Rate
Principal Arterial (CDOT NR-A)	50	550	13.5:1
Minor Arterial (CDOT NR-B)	N/A	--	--
Collector (CDOT NR-C)	N/A	--	--

522.00 Half Streets

Where half streets are allowed, sufficient additional right of way will be dedicated and additional width will be constructed to allow sufficient paved width to accommodate two directions of traffic and emergency parking by offsetting the geometric cross section.



2040 Traffic Volumes

523.00 Structural Sections

523.01 Structural Sections for Streets

Structural sections for streets shall be composite sections of base and asphalt.

Structural sections for streets shall be designed by a qualified soils engineer based on the Equivalent (18 Kip) Daily Load Applications (EDLA) for a twenty (20) year service life and the subgrade support analysis. The soils analysis shall be performed in accordance with AASHTO standard methods of surveying and sampling Soils. The field investigation shall consist of boring subgrade soils to a depth of at least four feet below proposed subgrade elevation (nine (9) feet below proposed subgrade on arterial roadways), at spacing of not more than two hundred fifty (250) feet,

Intersection: 1: 119th Street & Jasper Road/Jay Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	78	53	75	100
Average Queue (ft)	67	40	59	57
95th Queue (ft)	84	58	72	95
Link Distance (ft)	1015	2229	1298	934
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: NE County Line Road & Jay Road/Cheesman Street

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	54	55	89	137
Average Queue (ft)	40	35	62	83
95th Queue (ft)	59	52	85	144
Link Distance (ft)	441	1061	737	1813
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 13: Jay Road & Delechant Drive

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	31	30
Average Queue (ft)	6	12
95th Queue (ft)	27	37
Link Distance (ft)	1666	285
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 15: NE County Line Road & Delechant Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	30	56
Average Queue (ft)	18	11
95th Queue (ft)	42	48
Link Distance (ft)	424	1813
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 17: Jasper Road & Jay Road

Movement	NE
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	12
95th Queue (ft)	37
Link Distance (ft)	615
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 18: Jay Road & Lombardi Street

Movement	SB
Directions Served	LR
Maximum Queue (ft)	30
Average Queue (ft)	28
95th Queue (ft)	31
Link Distance (ft)	497
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 19: Lombardi Street & Proposed Project Driveway

Movement	WB
Directions Served	LR
Maximum Queue (ft)	79
Average Queue (ft)	28
95th Queue (ft)	76
Link Distance (ft)	341
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

From:	Troy Bales
To:	Chris LaRue
Subject:	FW: D1048 - Schmidt Neighborhood Meeting 6/12/18 Summary
Date:	Wednesday, November 28, 2018 8:58:22 AM
Attachments:	PDF Document.pdf 2018-0612_Neighborhood Meeting.pptx

Chris

We had our neighborhood meeting on the Meadowlark Subdivision per Town code for the Preliminary Plat Application on 6/12/2018. Attached is the sign in sheet and the PowerPoint slides that we presented at the meeting.

The sign in sheet indicated 13 people were in attendance

Most people who attended were just looking for more information. Residents with concerns were properties in Boulder County along the west side of Jay and 123rd and further west along Jasper.

People were generally supportive of the proposed site plan and most who lived in Erie Village liked the large buffer between their properties and the proposed homes in Meadowlark (aka Schmidt). Specific concerns that were brought up were safety of the current alignment of Jay and jasper road and the proposed Lombardi Street connection, and mine subsidence in the area.

Please advise if you have any questions

Thanks

Troy Bales P.E.

ASSOCIATE

RICK ENGINEERING COMPANY

9801 East Easter Ave / Centennial, CO 80112

t 303.537.8020 / **d** 303.537.8025 / **c** 619.540.6848

tbales@rickengineering.com / www.**rickengineering**.com

TOWN OF ERIE
AFFIDAVIT OF NEIGHBORHOOD MEETING NOTICE POSTING

Meadowlark Subdivision Preliminary Plat

(Taken at the intersection of Jasper Rd and 123rd Street)

(Taken on Jay Rd.)

I, (*TROY BALES*), ATTEST THAT NOTICE WAS POSTED IN ACCORDANCE WITH THE ERIE MUNICIPAL CODE, TITLE 10.7.2 D. NOTICE WAS POSTED ON MAY 25TH FOR THE NEIGHBORHOOD MEETING ON JUNE,12TH,2018 WHICH IS AT LEAST 15 DAYS BEFORE THE SCHEDULED NEIGHBORHOOD MEETING. THE PHOTOS, ABOVE, ARE A TRUE AND CORRECT REPRESENTATION OF THE NEIGHBORHOOD MEETING NOTICE SIGNS THAT HAVE BEEN POSTED.

____
(*SIGNATURE OF PERSON THAT POSTED NOTICE*)

STATE OF COLORADO)
) ss.
COUNTY OF Arapahoe)

ACKNOWLEDGED BEFORE ME THIS 29 DAY OF May, 2018
BY Troy Bales AS Project Manager.

WITNESS MY HAND AND OFFICIAL SEAL

ASHLEY WEISS
Notary Public
State of Colorado
Notary ID # 20174020366
My Commission Expires 05-12-2021

MY COMMISSION EXPIRES: 5-12-2021

____
NOTARY PUBLIC

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION PLANS

A PORTION OF THE NE $\frac{1}{4}$ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF BOULDER, COLORADO 90 ACRES – 118 LOTS/5 TRACTS

RICK ENGINEERING COMPANY SPECIAL NOTES:

1. ANY QUESTION RAISED RELATIVE TO THE ACCURACY OF IMPROVEMENT INSTALLATION SHALL NOT BE RAISED SUBSEQUENT TO COMPLETION OF THE WORK UNLESS ALL SURVEY STAKES ARE MAINTAINED INTACT. SHOULD SUCH STAKES NOT BE PRESENT AND VERIFIED AS TO THEIR ORIGIN, NO CLAIM FOR ADDITIONAL COMPENSATION FOR CORRECTION SHALL BE PRESENTED TO ANY PARTY AND SUCH WORK SHALL BE CORRECTED BY THE CONTRACTOR AT HIS EXPENSE.
2. CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOBSITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY. AND THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE OWNER AND ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.
3. NEITHER THE OWNER, NOR THE ENGINEER OF WORK WILL ENFORCE SAFETY MEASURES OR REGULATIONS. THE CONTRACTOR SHALL DESIGN, CONSTRUCT, AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE, AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.
4. THE CONTRACTOR SHALL FOLLOW THE GUIDELINES AND REGULATIONS AS SET FORTH BY OSHA.
5. THE CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THAT ALL UTILITIES ARE BUILT IN ACCORDANCE WITH THESE PLANS. IF THERE ARE ANY QUESTIONS REGARDING THESE PLANS OR FIELD STAKES, THE CONTRACTOR SHALL REQUEST AN INTERPRETATION BEFORE DOING ANY WORK BY CALLING THE ENGINEER OF WORK. THE CONTRACTOR SHALL ALSO TAKE THE NECESSARY STEPS TO PROTECT THE PROJECT AND ADJACENT PROPERTY FROM ANY EROSION AND SILTATION THAT RESULT FROM HIS OPERATIONS BY APPROPRIATE MEANS (SAND BAGS, HAY BALES, TEMPORARY DESILTING BASINS, DIKES, SHORING, ETC.) UNTIL SUCH TIME THAT THE PROJECT IS COMPLETED AND ACCEPTED FOR MAINTENANCE BY WHATEVER OWNER, AGENCY OR ASSOCIATIONS IS TO BE ULTIMATELY RESPONSIBLE FOR MAINTENANCE.
6. THE EXISTENCE AND LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED FROM A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO OTHER EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN HEREON AND ANY OTHER NOT OF RECORD OR NOT SHOWN ON THESE PLANS. ALL DAMAGES THERETO CAUSED BY THE CONTRACTOR SHALL BE REPAIRED TO THE APPROPRIATE SPECIFICATIONS AND AT THE EXPENSE OF THE CONTRACTOR.
7. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UNDERGROUND PIPELINES, TELEPHONE AND ELECTRIC CONDUITS AND STRUCTURES IN ADVANCE OF ANY CONSTRUCTION AND TO OBSERVE ALL POSSIBLE PRECAUTIONS TO AVOID ANY DAMAGE TO SUCH. THE ENGINEER AND/OR OWNER WILL NOT GUARANTEE ANY LOCATIONS AS SHOWN ON THESE PLANS OR THOSE OMITTED FROM SAME.
8. CONTRACTOR SHALL MAKE EXPLORATORY EXCAVATIONS AND LOCATE EXISTING UNDERGROUND FACILITIES SUFFICIENTLY AHEAD OF CONSTRUCTION TO PERMIT REVISIONS TO PLANS IF REVISIONS ARE NECESSARY BECAUSE OF ACTUAL LOCATIONS OF EXISTING FACILITIES.
9. BEFORE EXCAVATING FOR THIS CONTRACT, THE CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES WITH THE APPROPRIATE UTILITY COMPANY.
10. LOCATION AND ELEVATION OF IMPROVEMENTS TO BE MET BY WORK TO BE DONE SHALL BE CONFIRMED BY FIELD MEASUREMENTS PRIOR TO CONSTRUCTION OF NEW WORK.
11. CONTRACTOR SHALL TAKE THE NECESSARY PRECAUTIONS REQUIRED TO PROTECT ADJACENT PROPERTIES DURING THE GRADING OPERATIONS.
12. WHERE TRENCHES ARE WITHIN EASEMENTS OR WITHIN 10' OF ANY BUILDING, A SOILS REPORT SHALL BE SUBMITTED TO THE ENGINEER OF WORK BY A QUALIFIED SOILS ENGINEER WHICH INDICATES THAT TRENCH BACKFILL WAS COMPACTED UNDER THE OBSERVATION OF THE SOILS ENGINEER AND IN ACCORDANCE WITH THE ABOVE-NAMED SPECIFICATIONS.
13. ALL FRAMES, COVERS, VALVE BOXES AND MANHOLES SHALL BE ADJUSTED TO FINISHED GRADE UPON COMPLETION OF PAVING OR RELATED CONSTRUCTION.

RESIDENTIAL DEVELOPER:

TI RESIDENTIAL
9801 E EASTER AVE
CENTENNIAL CO, 80012

PHONE: (720) 413-3948
CONTACT: ANDREW TRIETLEY

ENGINEER:

RICK ENGINEERING COMPANY
9801 E EASTER
CENTENNIAL, CO 80112

PHONE: (303) 537-8020
CONTACT: TROY W BALES PE

WORK TO BE DONE:

THE IMPROVEMENTS CONSIST OF THE FOLLOWING WORK TO BE DONE ACCORDING TO THESE PLANS AND THE SPECIFICATIONS AND STANDARD DRAWINGS OF THE TOWN OF ERIE.

STANDARD SPECIFICATIONS:

1. TOWN OF ERIE STANDARD SPECIFICATION (JAN 2018)
2. STATE OF COLORADO, DEPARTMENT OF TRANSPORTATION, STANDARD SPECIFICATION (2017)

STANDARD DRAWINGS:

1. TOWN OF ERIE STANDARD CONSTRUCTION DRAWINGS (2018)
2. STATE OF COLORADO, DEPARTMENT OF TRANSPORTATION, STANDARD PLAN (2012)

BENCH MARK:

N 1/4 CORNER SEC. 13, T1N, R69W, 6TH P.M. FOUND 4" BRASS CAP STAMPED PLS 13446 PER MONUMENT RECORD FILED BY FRANK N. DREXEL, PLS 23405, DATED 02-13-1998
ELEV: 5018.45'

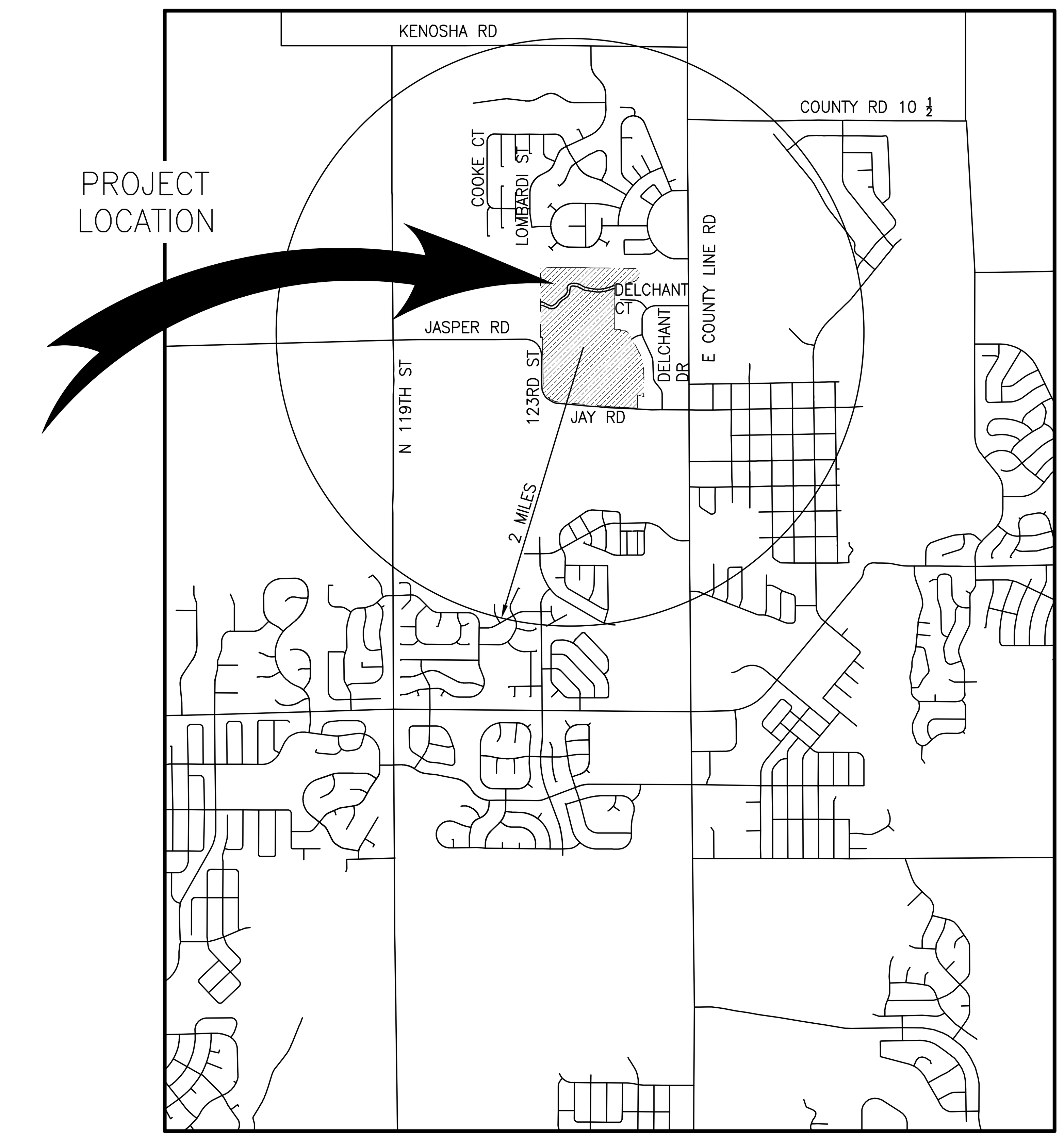
INDEX OF SHEETS

LEGEND

	EXISTING	PROPOSED
PROPERTY BOUNDARY		
PROPERTY LINE		
RIGHT-OF-WAY		
CENTERLINE		
CURB		
CURB & GUTTER		
DAYLIGHT LINE		
EASEMENT		
FLOWLINE		
SLOPE	TOP OF SLOPE	TOP OF SLOPE
CONTOURS		
WATER LINE	W	W
SANITARY SEWER LINE	S	S
STORM DRAIN LINE	SD	
GAS LINE	G	G
ELECTRIC LINE	E	E
FENCE-GENERAL USE		
OVERHEAD WIRES	OHE	
TYPICAL LATERALS		XX
SANITARY SEWER MANHOLE	SS	SS
STORM DRAIN MANHOLE		SD
STORM DRAIN INLET		
FIRE HYDRANT		
WATER VALVE		
STREET LAMP		
FLARED END SECTION		
AC PAVING		
CONCRETE		
DG TRAIL/CRUSHER FINES		

ABBREVIATION

AIR RELEASE VALVE	ARV
ASPHALT CONCRETE	AC
BEGIN CURB RETURN	BCR
BEGIN CURVE	BC
BEGIN VERTICAL CURVE	BVC
CENTERLINE	CL
END CURVE	EC
END VERTICAL CURVE	EVC
EXISTING GRADE	EG
FINISHED GRADE	FG
FINISHED SURFACE	FS
FLOW LINE	FL
GRADE BREAK	GB
HIGH POINT	HP
INVERT	INV
POINT OF CONNECTION	POC
PROPERTY LINE	PL
PUBLIC UTILITY EASEMENT	PUE
RIGHT-OF-WAY	ROW
TOP OF CURB	TC



VICINITY MAP

SCALE 1"=2000'

NO.	REVISION DESCRIPTION	REVISED BY	ACCEPT. BY	DATE
△	–	–	–	–

USA NORTH 811 Call 811 Before You Dig

PRELIMINARY NOT FOR CONSTRUCTION
COLORADO LICENSED PROFESSIONAL ENGINEER 50961

PROJECT ENGINEER DATE

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

COVER

TOWN OF ERIE

SCALE: N.T.S
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 01
OF 55 SHEETS
DRAWING NO. CV-01

RICK ENGINEERING COMPANY
Denver
9801 EAST EASTER AVE
CENTENNIAL, CO 80112
303.537.8020
rickengineering.com
Tucson · San Diego · Sacramento · Riverside · Orange · San Luis Obispo · Phoenix

GENERAL NOTES – WATER

1. AT ALL POINTS OF CONNECTION OF NEW WATER MAINS TO EXISTING MAINS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR EXCAVATING AND VERIFYING LOCATION OF THE EXISTING LINES PRIOR TO ANY CONSTRUCTION.
2. EXCEPT IN CASE OF AN EMERGENCY, VALVES ON THE TOWN OF ERIE WATER SYSTEM SHALL BE OPERATED BY OR UNDER THE DIRECTION OF THE APPROPRIATE TOWN OF ERIE PERSONNEL. THE CONTRACTOR SHALL GIVE THE TOWN OF ERIE ENGINEERING STAFF 48 HOURS NOTICE TO ARRANGE FOR OPERATING VALVES. BOTH THE CONTRACTOR AND THE APPROPRIATE TOWN OF ERIE PERSONNEL SHALL BE PRESENT WHEN THE VALVES ARE OPERATED.
3. WATER AND SANITARY SEWER LINES SHALL HAVE A MINIMUM HORIZONTAL SEPARATION OF TEN (10) FEET. WHEN A TEN (10) FOOT SEPARATION IS NOT PROVIDED OR WHEN SEWER LINES CROSS WATER LINES WITH LESS THAN ONE AND ONE–HALF (1½) FEET OF VERTICAL SEPARATION, SEWER LINE JOINTS SHALL BE CONCRETE ENCASED. FOR PERPENDICULAR CROSSINGS, ENCASED JOINTS SHALL EXTEND TEN (10) FEET, PERPENDICULAR TO THE WATER LINE IN BOTH DIRECTIONS.
4. ALL WATER LINES SHALL HAVE A MINIMUM OF FOUR AND ONE–HALF (4½) FEET OF COVER AND BE LOCATED A MINIMUM OF TEN (10) FEET FROM THE SANITARY SEWER AND THREE (3) FEET FROM THE EDGE OF CONCRETE CURB AND GUTTER PAN.
5. CHANGES IN DIRECTION OF WATERLINE PIPE SHALL REQUIRE BENDS IN ALL INSTANCES. AXIAL DEFLECTION AT THE JOINTS SHALL NOT BE ALLOWED.
6. WHEN IT IS NECESSARY TO DEPRESS WATER LINES AT UTILITY CROSSINGS, A MINIMUM CLEARANCE OF ONE AND ONE–HALF (1–1/2) FEET SHALL BE MAINTAINED BETWEEN OUTSIDES OF PIPE.
7. DISTANCES FOR WATER LINES ARE THE HORIZONTAL DISTANCE BETWEEN THE CENTERS OF THE FITTINGS. THEREFORE, DISTANCES SHOWN ON THE PLANS ARE APPROXIMATE AND COULD VARY DUE TO VERTICAL ALIGNMENT AND FITTING DIMENSIONS.
8. ALL WATER LINE VALVES SHALL BE SET ADJACENT TO THE TEE, EXCEPT FOR POINTS THAT FALL IN THE FLOW LINE OF A CONCRETE CROSS PAN. IN WHICH CASE, THE VALVE SHALL BE LOCATED SO THAT SURFACE DRAINAGE DOES NOT INFILTRATE THE VALVE BOX. VALVE BOXES SHALL BE SET AT AN ELEVATION IN ACCORDANCE WITH TOWN PAVING REQUIREMENTS.
9. ALL WATER MAINS SHALL BE POLYVINYL CHLORIDE (PVC) PRESSURE PIPE UNLESS SPECIFIED OTHERWISE. NOMINAL PVC PIPE SIZES 6–INCH THROUGH 12–INCH SHALL CONFORM TO ALL REQUIREMENTS OF AWWA STANDARD C–900, PRESSURE CLASS 150 (DR18). NOMINAL PVC PIPE SIZES 16–INCH THROUGH 24–INCH SHALL CONFORM TO ALL REQUIREMENTS OF AWWA STANDARD C–905, PRESSURE CLASS 165 (DR25). ALL PVC PIPES SHALL HAVE OUTSIDE DIAMETERS EQUIVALENT TO CAST IRON PIPE.
10. FIRE HYDRANT ASSEMBLY INCLUDES THE FIRE HYDRANT, SIX (6) INCH VALVE, AND SIX (6) INCH PIPE. INSTALLATION SHALL BE IN ACCORDANCE WITH THE TOWN OF ERIE STANDARDS AND SPECIFICATIONS.
11. ALL FITTINGS SHALL BE MADE FROM DUCTILE IRON, FURNISHED WITH MECHANICAL JOINT ENDS OR INTEGRAL RESTRAINED JOINTS, AND SHALL HAVE A PRESSURE RATING OF 350 PSI.
12. POLYETHYLENE WRAPPING SHALL BE INSTALLED AROUND ALL DUCTILE IRON PIPES, FITTINGS, VALVES, FIRE HYDRANT BARRELS AND ROD AND CLAMPS. THE POLYETHYLENE SHALL HAVE A MINIMUM THICKNESS OF EIGHT (8) MILS, IN ACCORDANCE WITH AWWA STANDARD C–105.
13. ALL WATER LINE PIPE SHALL BE PROVIDED WITH A MINIMUM GAGE SIZE OF 12 SINGLE STRAND INSULATED COPPER WIRE. SPLICES IN TRACER WIRE SHALL BE CAPPED IN WATER PROOF GEL CAP TYPE CONNECTORS SUITED FOR DIRECT BURY APPLICATION (3M TYPE DBY–6 LOW VOLTAGE OR EQUAL). WIRE SHALL BE ATTACHED TO TOP OF WATER LINE WITH 2–INCH WIDE PVC TAPE @ 5–FT INTERVALS ALONG PIPE. TRACER WIRE SHALL EXTEND TO THE SURFACE AND BE COILED IN A LOCATE BOX AT THE BACKSIDE OF EITHER EACH FIRE HYDRANT OR VALVE. UNDER THE SUPERVISION OF TOWN OF ERIE ENGINEERING STAFF, TEST SHALL BE MADE BY THE CONTRACTOR @ THE COMPLETION OF CONSTRUCTION TO INSURE THAT THE TRACER WIRES CARRY A CONTINUOUS CURRENT BETWEEN ALL ACCESS POINTS.
14. WARNING TAPE SHALL BE INSTALLED 12" MINIMUM AND 18" MAXIMUM ABOVE WATER PIPE.
15. BEDDING MATERIAL SHALL CONFORM TO TOWN OF ERIE STANDARDS AND SPECIFICATIONS.
16. VALVES SHALL OPEN COUNTER CLOCKWISE. VALVES 12–INCH AND SMALLER SHALL BE RESILIENT SEAT GATE VALVES. LARGER VALVES SHALL BE BUTTERFLY VALVES.
17. VALVE BOXES SHALL BE RAISED TO ONE–FOURTH (1/4) INCH BELOW GRADE AFTER COMPLETION OF SURFACE PAVING OR FINAL GRADING. VALVE BOXES IN NON–PAVED AREAS SHALL HAVE A CONCRETE COLLAR AROUND THE VALVE LID IN ACCORDANCE WITH THE DETAIL.
18. ALL SERVICE LINE TAPS SHALL HAVE DOUBLE STRAP BRASS TAPPING SADDLES. (ROMAC 202B OR APPROVED EQUAL).
19. ALL RESIDENTIAL WATER TAPS SHALL BE THREE–QUARTER (3/4) INCH OR AS REQUIRED BY THE CURRENT BUILDING CODE.
20. ALL WATER SERVICE LATERALS SHALL EXTEND FIVE (5) FEET BEYOND RIGHT OF WAY OR UTILITY EASEMENTS, WHICHEVER IS GREATER. THE ENDS SHALL BE MARKED BY A BLUE PAINTED WOOD POST UNTIL CURB AND GUTTER IS IN PLACE. WHEN CURB AND GUTTER IS IN PLACE THE LATERALS SHALL BE MARKED ON THE CONCRETE CURB FACE WITH A "V" or "W".
21. CONCRETE THRUST BLOCKS AND/OR "MEGA–LUG" MECHANICAL RESTRAINTS ARE REQUIRED AT ALL MECHANICAL FITTINGS. THRUST BLOCKS MAY NOT BE REQUIRED IF PIPE RESTRAINT IS PROVIDED IN ACCORDANCE WITH RESTRAINED PIPE DETAIL.
22. NO WORK SHALL BE BACKFILLED (INCLUDING BEDDING MATERIAL ABOVE THE SPRING LINE OF THE PIPE) UNTIL THE CONSTRUCTION HAS BEEN INSPECTED AND APPROVED FOR BACKFILLING BY THE TOWN OF ERIE ENGINEERING STAFF.
23. ONLY ONE CONNECTION TO THE EXISTING WATER DISTRIBUTION SYSTEM SHALL BE MADE UNTIL ALL HYDROSTATIC TESTING, CHLORINATION AND FLUSHING HAS BEEN COMPLETED.
24. DISINFECTION AND HYDROSTATIC TESTING SHALL BE DONE IN THE PRESENCE OF A TOWN OF ERIE ENGINEERING STAFF. CONTACT THE TOWN OF ERIE DEPARTMENT OF PUBLIC WORKS, FORTY–EIGHT (48) HOURS PRIOR TO DISINFECTING AND/OR TESTING.
25. DISINFECTION AND FLUSHING SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF THE COLORADO DEPARTMENT OF HEALTH AND THE PROCEDURE SET FORTH IN AWWA C651, "STANDARD FOR DISINFECTING WATER MAINS". THE CHLORINATION OF THE WATER LINE SHALL BE PERFORMED PRIOR TO THE HYDROSTATIC TESTING. ALL VALVES, FIRE HYDRANTS AND OTHER APPURTANCES SHALL BE OPERATED WHILE PIPELINE IS FILLED WITH THE CHLORINATING AGENT TO INSURE THAT HIGH CHLORINE CONTACT IS MADE WITH ALL INTERNAL SURFACES.
26. ALL WATER LINES SHALL BE HYDROSTATIC TESTED. PRESSURE AND LEAKAGE TESTS SHALL BE CONDUCTED ACCORDING TO THE APPLICABLE SECTIONS OF AWWA C600/605 TO A MINIMUM PRESSURE OF ONE HUNDRED AND FIFTY (150) POUNDS PER SQUARE (PSI) INCH AT THE LOW POINT OF THE SECTION BEING TESTED FOR THE DURATION OF TWO (2) HOURS. THE MAXIMUM LENGTH OF LINE TO BE TESTED SHALL BE ONE THOUSAND (1,000) FEET. ALL JOINTS IN CONNECTIONS ARE TO BE WATERTIGHT WITHIN TOLERANCES ALLOWED BY THE SPECIFICATIONS IN AWWA C600/605. ANY LEAKAGE THAT IS DISCOVERED BY OBSERVATION OR TESTS SHALL BE LOCATED AND MADE WATERTIGHT BY THE CONTRACTOR. PRESSURE AND LEAKAGE TESTS SHALL NOT BE CONDUCTED UNTIL THE LINE HAS PASSED ALL REQUIRED DISINFECTION TESTS.
27. SUBSTANTIAL COMPLETION/CONSTRUCTION ACCEPTANCE OF THE NEW WATER LINES ARE CONTINGENT UPON RECEIVING COPIES OF:
   A. WATER TRENCH COMPACTION TEST RESULTS
   B. HYDRO STATIC TESTING OF 100% OF THE SYSTEM
   C. HEALTH DEPARTMENT TESTS. (CHLORINE AND/OR CLEAR WATER AS REQUIRED)
28. ALL METER PITS AND CURB STOPS SHALL BE PROTECTED AT THE TIME OF INSTALLATION WITH A MINIMUM OF THREE (3) T–POSTS AND ORANGE SAFETY FENCE. THE T–POST AND SAFETY FENCE SHALL REMAIN IN PLACE AND IN GOOD CONDITION UNTIL THE LANDSCAPING IS INSTALLED.
29. ALL WATER VAULTS SHALL BE WATER TIGHT. CONTRACTOR SHALL SEAL VAULTS TO ENSURE SURFACE WATER DOES NOT INFILTRATE INTO THE VAULTS. VAULT LIDS SHALL BE PLACED TO ENSURE THAT SURFACE WATER DOES NOT FLOW INTO THE VAULTS.

GENERAL NOTES – ROADWAY

1. ALL STATIONING IS BASED ON CENTERLINE OF ROADWAYS UNLESS OTHERWISE NOTED.
2. THE CONTRACTOR SHALL PREPARE THE SUBGRADE BY SCARIFYING THE UPPER ONE (1) FOOT OF THE SUBGRADE IN CUT AREAS OR AREAS WITH LITTLE OR NO FILL, UNLESS SPECIFIED IN THE SOILS REPORT. THE WORK SHALL CONFORM TO THE COLORADO DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS.
3. PAVEMENT SHALL NOT BE CONSTRUCTED UNTIL ALL UNDERGROUND UTILITIES HAVE BEEN INSTALLED, TESTED AND ACCEPTED BY THE TOWN OF ERIE ENGINEERING STAFF.
4. IT SHALL BE THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO SUPERVISE AND CERTIFY THAT PROPER COMPACTION HAS BEEN OBTAINED BY SUBCONTRACTORS AND AGENCIES CONCERNING UTILITY LINE BACKFILL INCLUDING, BUT NOT LIMITED TO, SEWER, WATER, ELECTRICAL, GAS AND LANDSCAPE IRRIGATION LINES AND ACCEPTED BY THE TOWN OF ERIE ENGINEERING STAFF AND THE SOILS ENGINEER.
5. STREET PAVING SHALL NOT START UNTIL:
   A. A SOILS REPORT AND PAVEMENT DESIGN IS ACCEPTED BY THE TOWN OF ERIE ENGINEERING STAFF.
   B. ALL STREETS ARE COMPACTED IN ACCORDANCE WITH THE SOILS REPORT AND THE TOWN OF ERIE SPECIFICATIONS.
   C. ALL COMPACTION TEST REPORTS HAVE BEEN SUBMITTED TO THE TOWN ENGINEERING STAFF PRIOR TO PROOF ROLLS.
   D. PROOF ROLLS ARE PERFORMED USING A LOADED SINGLE AXLE 2000 GALLON WATER TRUCK AND MONITORED BY THE TOWN OF ERIE ENGINEERING STAFF.
6. THE OWNER/CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING ALL UTILITY MANHOLE COVERS AND ACCESS LIDS TO GRADE.
7. ALL CONCRETE SHALL BE A MINIMUM OF CLASS B, IN CONFORMANCE WITH CDOT STANDARDS.
8. ALL CONCRETE EDGES MUST BE ROUNDED TO A FOURTH (1/4) INCH RADIUS, EXCEPT WHERE SHOWN OTHERWISE ON DRAWINGS.
9. ONE HALF (1/2) INCH EXPANSION JOINTS SHALL BE INSTALLED AT ALL CURB RETURNS, CURB CUTS AND EXISTING STRUCTURES. CONTROL JOINTS SHALL BE INSTALLED PER THE TOWNS STANDARDS AND SPECIFICATIONS.
10. BEFORE PLACING OF ASPHALT THE SUBGRADE SHALL RECEIVE A GROUND STERILANT APPLIED AT A RATE IN ACCORDANCE TO MANUFACTURERS RECOMMENDATIONS.
11. TACK COAT SHALL BE USED PRIOR TO OVERLAY, (CSS–1H), 50:50 DILUTION, 0.10 GAL/SY. ALL EDGES ABUTTING NEW PAVEMENT SHALL BE TACKED.
12. WHEN IT IS REQUIRED TO MATCH EXISTING PAVEMENT, EXISTING PAVEMENT SHALL BE SAW CUT IN A MANNER TO AFFECT A SMOOTH, VERTICAL STRAIGHT CUT EDGE. T PATCH MILLING MUST BE DONE PER STANDARD DETAILS.
13. ALL SAWCUT EDGES OF EXISTING PAVEMENT SHALL BE CLEAN AND COATED WITH TACK COAT PRIOR TO PLACING NEW PAVEMENT ADJACENT TO THE EXISTING PAVEMENT.
14. ALL ASPHALT SHALL BE ONE FOURTH (1/4) INCH ABOVE CONCRETE EDGES, MANHOLE COVERS AND ACCESS LIDS.
15. SIGNAGE AND STRIPING SHALL CONFORM TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, THE COLORADO DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, THE COLORADO DEPARTMENT OF TRANSPORTATION M&S STANDARDS, AND THE TOWN OF ERIE STANDARD DESIGN CRITERIA AND STANDARD CONSTRUCTION REQUIREMENTS.
16. THE PURCHASE AND INSTALLATION OF STREET NAME SIGNS SHALL BE THE RESPONSIBILITY OF THE OWNER/CONTRACTOR. THE OWNER/CONTRACTOR SHALL SECURE THE APPROVAL OF THE TOWN OF ERIE ENGINEERING STAFF FOR TYPE AND LOCATION OF THE STREET NAME SIGNS PRIOR TO INSTALLATION.
17. ALL NEW ROADWAY SECTIONS SHALL HAVE SUBGRADE PREPARATION AND INITIAL ASPHALT PAVEMENT PLACED WITH A 1% CROWN. FINAL OVERLAY IS TO BE PLACED WITH A 2% CROWN. SEE DETAIL ST7 IN THE "STANDARD DETAILS–STREET" FOR MORE INFORMATION.
18. DETERMINATION OF CROWN FOR CUL DE SAC PAVING SHALL BE EVALUATED ON A CASE BY CASE BASIS.

TRACT SUMMARY CHART

TRACT	AREA (SQFT)	AREA (ACRES)	PURPOSE	OWNED BY/MAINTAINED BY
TRACT A	778,417	17.87	PUBLIC ACCESS, OPEN SPACE, DRAINAGE	TOWN OF ERIE/TOWN OF ERIE
TRACT B	186,008	4.27	DRAINAGE,PUBLIC ACCESS, OPEN SPACE	DISTRICT/DISTRICT
TRACT C	3,921	0.09	PUBLIC ACCESS, OPEN SPACE, DRAINAGE	DISTRICT/DISTRICT
TRACT D	110,962	2.55	PUBLIC ACCESS, OPEN SPACE, STRAIN ISOLATION TRENCH, PARK, DRAINAGE	DISTRICT/DISTRICT
TRACT E	1,388,918	31.89	VACANT, DRAINAGE, PUBLIC ACCESS	DISTRICT/DISTRICT

PARKS & OPEN SPACE SUMMARY CHART

	REQUIRED	PROVIDED
POCKET PARK	0.17 AC	3.57 AC
NEIGHBORHOOD PARKS	1.02 AC	0.00 AC
COMMUNITY PARKS	1.70 AC	0.00 AC
PARK SUBTOTAL	2.89 AC	3.57 AC
OPEN SPACE	5.77 AC	13.23 AC
TOTAL	8.66 AC	16.80 AC

POCKET PARK

TRACT	TOTAL
SPINE TRAIL	1.02 AC (PARTS OF TRACT A & B)
D	2.55 AC
TOTAL	3.57 AC

TRACT A = 17.87 AC
LESS 2.75 AC (DITCH)
LESS 5.23 AC (O&G)
LESS 0.26 AC (SPINE TRAIL)
9.63 AC APPLICABLE

OPEN SPACE

TRACT	TOTAL
A	9.63 AC (NET APPLICABLE)
B	3.51 AC (NET APPLICABLE)
C	0.09 AC
TOTAL	13.23 AC

LAND SUMMARY CHART

TYPE	AREA (SQFT)	AREA (ACRES)	% OF TOTAL AREA
RESIDENTIAL LOTS	894,722	20.54 AC	23.75%
TRACTS	2,468,545	56.67 AC	65.51%
PUBLIC ROW	404,673	9.29 AC	10.74%
TOTAL	3,767,940	86.50 AC	100.00%

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△	–	–	–	–

COLORADO LICENSED PROFESSIONAL ENGINEER 50961
PRELIMINARY NOT FOR CONSTRUCTION

PROJECT ENGINEER DATE

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS
NOTES
TOWN OF ERIE

SCALE: N.T.S
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048
SHEET NO. 02
OF 55 SHEETS
DRAWING NO. NT–01

GENERAL NOTES – CONSTRUCTION

1. ALL CONSTRUCTION SHALL CONFORM TO THE LATEST "STANDARDS AND SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS" BY THE TOWN OF ERIE. COPIES OF THE TOWN OF ERIE STANDARDS AND SPECIFICATIONS MAY BE OBTAINED FROM THE TOWN OF ERIE WEB SITE. CONTRACTOR SHALL HAVE A SET ON SITE AT ALL TIMES.
2. THE OWNER SHALL SCHEDULE A PRE–CONSTRUCTION MEETING WITH THE TOWN OF ERIE ENGINEERING STAFF PRIOR TO THE START OF CONSTRUCTION. THOSE IN ATTENDANCE SHALL INCLUDE THE OWNER, HIS ENGINEER, THE TOWN OF ERIE ENGINEERING STAFF, REPRESENTATIVES OF THE CONTRACTORS AND OTHER AFFECTED AGENCIES. PLANS SIGNED AND ACCEPTED BY THE TOWN OF ERIE WILL BE DISTRIBUTED AT THE PRECONSTRUCTION MEETING. CONTRACTOR SHALL HAVE (1) COPY OF THE SIGNED PLANS ON SITE AT ALL TIMES.
3. THE TOWN OF ERIE, THROUGH ACCEPTANCE OF THIS DOCUMENT, ASSUMES NO RESPONSIBILITY FOR THE COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT. THE OWNER AND DESIGN ENGINEER UNDERSTAND THAT THE RESPONSIBILITY FOR THE ENGINEERING ADEQUACY OF THE FACILITIES DEPICTED IN THIS DOCUMENT LIES SOLELY WITH THE REGISTERED PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE ARE AFFIXED TO THIS DOCUMENT. REPORT ALL DISCREPANCIES TO THE DESIGN ENGINEER IMMEDIATELY.
4. PRIOR TO BEGINNING THE WORK, THE CONTRACTOR SHALL OBTAIN ANY/ALL WRITTEN AGREEMENTS FOR INGRESS AND EGRESS TO THE WORK SITE FROM ADJACENT PRIVATE PROPERTY OWNERS. A COPY OF ALL AGREEMENTS SHALL BE PROVIDED TO THE TOWN. ACCESS TO ANY ADJACENT PRIVATE PROPERTY SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.
5. ALL MATERIALS AND WORKMANSHIP SHALL BE SUBJECT TO INSPECTION BY THE TOWN OF ERIE ENGINEERING STAFF. THE TOWN RESERVES THE RIGHT TO ACCEPT OR REJECT ANY SUCH MATERIALS AND WORKMANSHIP THAT DOES NOT CONFORM TO TOWN STANDARDS AND SPECIFICATIONS. INSPECTIONS AND ONSITE VISITS ARE NOT TO BE CONSTRUED AS A GUARANTEE BY THE TOWN ENGINEERING STAFF OF THE CONTRACTORS" CONTRACTUAL COMMITMENT. REQUESTS FOR INSPECTION BY THE TOWN OF ERIE SHALL BE MADE BY THE CONTRACTOR A MINIMUM OF TWENTY FOUR (24) HOURS IN ADVANCE.
6. CONSTRUCTION WATER IS AVAILABLE TO THE CONTRACTOR AS ESTABLISHED IN THE TOWN OF ERIE STANDARDS AND SPECIFICATIONS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT THE TOWN OF ERIE REGARDING CURRENT REGULATIONS, FEES AND REQUIRED AGREEMENTS RELATED TO THE PROVISION OF CONSTRUCTION WATER.
7. THE CONTRACTOR SHALL COORDINATE HIS ACTIVITIES WITH THE AFFECTED UTILITY COMPANIES AND SHALL NOTIFY THE UTILITY NOTIFICATION CENTER, PHONE NUMBER 811, THREE (3) BUSINESS DAYS PRIOR TO THE START OF CONSTRUCTION.
8. UTILITIES IN THE AREA OF CONSTRUCTION ARE APPROXIMATE ONLY. THEY HAVE BEEN LOCATED FROM FIELD INVESTIGATION AND THE BEST AVAILABLE UTILITY RECORDS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION, PROTECTION AND REPAIR OF ALL UTILITIES ENCOUNTERED DURING CONSTRUCTION WHETHER SHOWN ON THESE PLANS OR NOT. THE CONTRACTOR SHALL CONTACT ALL RESPECTIVE UTILITIES AND HAVE ALL UTILITIES FIELD–LOCATED PRIOR TO CONSTRUCTION. IF ANY UNKNOWN SUBSURFACE STRUCTURES ARE ENCOUNTERED DURING CONSTRUCTION, IT SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE TOWN OF ERIE ENGINEERING STAFF AND DESIGN ENGINEER PRIOR TO PROCEEDING.
9. THE CONTRACTOR SHALL NOTIFY TOWN OF ERIE ENGINEERING STAFF OF ANY PROBLEM IMPACTING WATER AND WASTE WATER FACILITIES THAT WOULD POTENTIALLY REQUIRE A VARIANCE FROM THE APPROVED PLANS AND SPECIFICATIONS. ANY VARIANCE FROM THE APPROVED DOCUMENTS SHALL BE AT THE SOLE DISCRETION OF THE TOWN OF ERIE ENGINEERING STAFF.
10. CONTRACTOR SHALL OBTAIN, AT HIS OWN EXPENSE, ALL APPLICABLE SPECIFICATIONS AND PERMITS NECESSARY TO PERFORM THE PROPOSED WORK.
11. AS–BUILT DRAWINGS AS REQUIRED IN THE SPECIFICATIONS, ARE TO BE SUBMITTED BY THE OWNER/DEVELOPER PRIOR TO SUBSTANTIAL COMPLETION/CONSTRUCTION ACCEPTANCE OF THE CONSTRUCTION.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND REPLACING ANY EXISTING SIGNS, STRUCTURES, FENCES, ETC., ENCOUNTERED ON THE JOB AND RESTORING THEM TO THEIR ORIGINAL CONDITION.
13. THE CONTRACTOR IS RESPONSIBLE FOR:
    A. NOTIFYING THE TOWN OF ERIE UTILITY CUSTOMERS OF POTENTIAL SERVICE OUTAGES, AND COORDINATE WITH THE TOWN OF ERIE FOR DETERMINATION OF MINIMUM TIME REQUIREMENT.
    B. NOTIFYING THE TOWN OF ERIE ENGINEERING STAFF IF WORK IS SUSPENDED FOR ANY PERIOD OF TIME AFTER INITIAL START–UP. THE CONTRACTOR SHALL NOTIFY THE TOWN OF ERIE FORTY–EIGHT (48) HOURS PRIOR TO RESTART.
    C. IN THE EVENT OF AN AFTER HOURS EMERGENCY, CALL 303–441–4444.
    D. NOTIFYING THE MOUNTAIN VIEW FIRE PROTECTION DISTRICT OF ALL STREET CLOSURES AND EXISTING FIRE HYDRANTS TAKEN OUT OF SERVICE A MINIMUM OF FORTY–EIGHT (48) HOURS PRIOR TO THE START OF CONSTRUCTION.
14. PRIOR TO INSTALLATION OF UTILITY MAINS, ROAD CONSTRUCTION MUST HAVE COMPLETED THE OVER LOT GRADING STAGE.
15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING ANY GROUNDWATER ENCOUNTERED DURING THE CONSTRUCTION OF ANY PORTION OF THIS PROJECT. A CONSTRUCTION DEWATERING PERMIT MUST BE OBTAINED FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT (CDPHE). GROUNDWATER SHALL BE PUMPED, PIPED, REMOVED AND DISPOSED OF IN A MANNER WHICH DOES NOT CAUSE FLOODING OF EXISTING STREETS OR EROSION OF ABUTTING PROPERTIES IN ORDER TO CONSTRUCT THE IMPROVEMENTS SHOWN ON THESE PLANS. THE USE OF ANY SANITARY SEWER TO DISPOSE OF TRENCH WATER WILL NOT BE PERMITTED. NO CONCRETE SHALL BE PLACED WHERE GROUNDWATER IS VISIBLE OR UNTIL THE GROUNDWATER TABLE HAS BEEN LOWERED BELOW THE PROPOSED IMPROVEMENTS. ANY UNSTABLE AREAS, AS A RESULT OF GROUNDWATER, ENCOUNTERED DURING THE CONSTRUCTION OF THE PROPOSED IMPROVEMENTS SHALL BE STABILIZED AS AGREED UPON BY THE CONTRACTOR, THE TOWN OF ERIE, AND THE DESIGN ENGINEER AT THE TIME OF THE OCCURRENCE
16. IT SHALL BE THE RESPONSIBILITY OF THE DESIGN ENGINEER TO RESOLVE CONSTRUCTION PROBLEMS WITH THE TOWN OF ERIE DUE TO CHANGED CONDITIONS ENCOUNTERED BY THE CONTRACTOR DURING THE PROGRESS OF ANY PORTION OF THE PROPOSED WORK. IF, IN THE OPINION OF THE TOWN OF ERIE, PROPOSED ALTERATIONS TO THE SIGNED CONSTRUCTION PLANS INVOLVES SIGNIFICANT CHANGES TO THE CHARACTER OF THE WORK, OR TO THE FUTURE CONTIGUOUS PUBLIC OR PRIVATE IMPROVEMENTS, THE DESIGN ENGINEER SHALL BE RESPONSIBLE FOR SUBMITTING REVISED PLANS TO THE TOWN OF ERIE FOR REVIEW, PRIOR TO ANY FURTHER CONSTRUCTION RELATED TO THAT PORTION OF THE WORK.
17. DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS AT AND ADJACENT TO THE JOB INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING PERFORMANCE OF THE WORK. THE CONTRACTOR SHALL PROVIDE ALL LIGHTS, SIGNS, BARRICADES, FLAGMEN, OR OTHER DEVICES NECESSARY TO PROVIDE FOR PUBLIC SAFETY. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND IS NOT LIMITED TO NORMAL WORKING HOURS. THE TOWN OF ERIE OR THE DESIGN ENGINEER EXERCISE NO CONTROLS OVER THE SAFETY OR ADEQUACY OF ANY EQUIPMENT, BUILDING COMPONENTS, SCAFFOLDING, FORMS OR OTHER WORK AIDS USED IN OR ABOUT THE PROJECT, OR IN THE SUPERINTENDING OF THE SAME. THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD HARMLESS FROM ANY AND ALL LIABILITY, REAL AND ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER, THE DESIGN ENGINEER OR THE TOWN. THE TOWN OF ERIE ENGINEERING STAFF, OR ANY CONTRACTED ENGINEER, ARE NOT RESPONSIBLE FOR SAFETY IN, ON OR ABOUT THE PROJECT SITE, NOR FOR COMPLIANCE BY THE APPROPRIATE PARTY OF ANY REGULATIONS RELATING THERETO.
18. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE PROSECUTED TO COMPLETION WITHOUT DELAY SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.
19. REGULAR WORK HOURS ARE SEVEN (7) A.M. UNTIL SEVEN (7) P.M. OR DUSK (WHICHEVER OCCURS FIRST) OF THE SAME DAY, MONDAY THROUGH FRIDAY. THE CONTRACTOR WILL NOT PERMIT OVERTIME WORK OUTSIDE OF REGULAR WORKING HOURS OR THE PERFORMANCE OF WORK ON SATURDAY, SUNDAY OR ANY LEGAL HOLIDAY WITHOUT RECEIVING WRITTEN CONSENT FROM THE PUBLIC WORKS DIRECTOR. REQUESTS FOR WEEKEND WORK APPROVAL MUST BE SUBMITTED, IN WRITING TO THE TOWN OF ERIE NO LATER THAN WEDNESDAYS AT 3:30PM FOR SUBSEQUENT WEEKEND AND REQUESTS FOR HOLIDAY WORK APPROVAL MUST BE SUBMITTED, IN WRITING TO THE TOWN OF ERIE NO LATER THAN 7:00AM–2 BUSINESS DAYS PRIOR TO THE HOLIDAY. ALL EXPENSES INCURRED BY THE TOWN SHALL BE REIMBURSED AT A RATE TO BE DETERMINED BY DIRECTOR OF FINANCE.
20. THE CONTRACTOR SHALL TAKE ALL NECESSARY AND PROPER PRECAUTIONS TO PROTECT ADJACENT PROPERTIES FROM ANY AND ALL DAMAGE THAT MAY OCCUR FROM STORM WATER RUNOFF AND/OR DEPOSITION OF DEBRIS RESULTING FROM ANY AND ALL WORK. THE OWNER/CONTRACTOR IS RESPONSIBLE FOR OBTAINING A STORMWATER DISCHARGE PERMIT FOR CONSTRUCTION ACTIVITIES FOR ANY PROJECT DISTURBING OVER ONE ACRE FROM BOTH THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND THE TOWN OF ERIE.
21. EACH TYPE OF CONSTRUCTION SHALL BE COMPLETED BY A CONTRACTOR THAT HAS DEMONSTRATED ACCEPTABLE QUALIFICATIONS TO THE TOWN AND IS A LICENSED CONTRACTOR IN THE TOWN OF ERIE.
22. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TRAFFIC CONTROL DURING CONSTRUCTION. ALL TRAFFIC CONTROLS SHALL CONFORM TO THE TOWN OF ERIE STANDARDS AND SPECIFICATIONS AND THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, (MUTCD) LATEST EDITIONS. A PLAN SHALL BE SUBMITTED TO THE TOWN FOR REVIEW AND ACCEPTANCE PRIOR TO CONSTRUCTION.
23. ALL BACKFILL SHALL CONFORM TO THE TRENCH DETAIL LOCATED IN THE TOWN OF ERIE STANDARDS & SPECIFICATIONS.
24. THE CONTRACTOR SHALL IMMEDIATELY REMOVE ANY CONSTRUCTION DEBRIS OR MUD TRACKED ONTO EXISTING ROADWAYS.
25. THE CONTRACTOR SHALL REPAIR ANY EXCAVATION OR PAVEMENT FAILURES CAUSED BY HIS CONSTRUCTION.
26. THE CONTRACTOR SHALL RENEW OR REPLACE ANY EXISTING TRAFFIC STRIPING AND/OR PAVEMENT MARKINGS, WHICH HAVE BEEN EITHER REMOVED OR THE EFFECTIVENESS OF WHICH HAS BEEN REDUCED DURING HIS OPERATION. RENEWAL OF PAVEMENT STRIPING AND MARKING SHALL BE DONE IN CONFORMANCE WITH THE TOWN OF ERIE STANDARD SPECIFICATIONS.
27. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO TAKE EVERY MEASURE NECESSARY TO COMPLY WITH ANY STATE, COUNTY OR TOWN DUST CONTROL ORDINANCE.
28. CONSTRUCTION VEHICLES SHALL USE TRUCK ROUTES DESIGNATED BY THE TOWN.
29. THE OWNER/DEVELOPER WILL BE HELD RESPONSIBLE FOR THE PROPER FUNCTIONING OF THE IMPROVEMENTS FOR A MINIMUM OF TWO (2) YEARS FROM THE DATE OF SUBSTANTIAL COMPLETION/ CONSTRUCTION ACCEPTANCE OF THE IMPROVEMENTS BY THE TOWN OF ERIE. ANY FAILURE DURING THIS PERIOD OF GUARANTEE SHALL BE REMEDIED BY THE OWNER/CONTRACTOR TO THE SATISFACTION OF THE TOWN OF ERIE AT NO EXPENSE TO THE TOWN.
30. THE SOILS ENGINEER SHALL PERFORM SUFFICIENT INSPECTIONS DURING GRADING AND CONSTRUCTION SO THAT AN OPINION CAN BE RENDERED AND VERIFIED IN WRITING AS TO COMPLIANCE WITH THE PLANS AND CODES WITHIN THE SOILS ENGINEER'S PURVIEW.

GENERAL NOTES – STORM DRAIN

1. EXCEPT WHERE NOTED, ALL STORM SEWER PIPE SHALL BE REINFORCED CONCRETE, CLASS III AND SHALL CONFORM TO REQUIREMENTS OF ASTM C76. ALL RCP SHALL HAVE RUBBER GASKETED JOINTS AND SHALL CONFORM TO REQUIREMENTS OF ASTM C443, AND SHALL PROVIDE WATERTIGHT PERFORMANCE CHARACTERISTICS.
2. TONGUE AND GROOVE JOINTS SHALL NOT BE ALLOWED.
3. THE MINIMUM COVERAGE FOR ALL STORM DRAINAGE PIPES SHALL BE 1.5 FEET FOR CLASS III PIPE AND 1 FOOT FOR CLASS IV PIPE.
4. BEDDING MATERIAL SHALL CONFORM TO TOWN OF ERIE STANDARDS AND SPECIFICATIONS.
5. ALL MANHOLES SHALL BE CONCRETE AND CONFORM TO CDOT STANDARD M–604–20.
6. THE MINIMUM MANHOLE DIAMETER SHALL BE AS SPECIFIED BELOW:
    PIPE DIAMETER MANHOLE SIZE
    15" TO 18" 4' DIAMETER
    21" TO 42" 5' DIAMETER
    48" TO 54" 6' DIAMETER
    60" AND LARGER BOX BASE MANHOLE
7. ALL STREET INLETS SHALL BE CURB OPENING TYPE R, CONFORMING TO CDOT STANDARD M–604–12, EXCEPT WHERE OTHERWISE NOTED.
8. ALL INLET ACCESS COVERS SHALL HAVE THE WORDS "NO DUMPING – DRAINS TO RIVERS" AND "STORM SEWER" CAST INTO THE COVER PER TOWN OF ERIE STANDARD DETAIL.
9. ALL END SECTIONS SHALL CONFORM TO CDOT STANDARD M–603–10.
10. WHERE RIPRAP IS CALLED FOR ON THE PLANS FOR EROSION CONTROL, IT SHALL CONFORM TO THE URBAN STORM DRAINAGE CRITERIA MANUAL SPECIFICATIONS (LATEST REVISION).

GENERAL NOTES – GRADING

1. ALL CONSTRUCTION ACTIVITIES THAT DISTURBS ONE OR MORE ACRES OF LAND, AS WELL AS ACTIVITIES THAT DISTURB LESS THAN ONE ACRE OF LAND, BUT IS PART OF A LARGER COMMON PLAN OF DEVELOPMENT, MUST COMPLY WITH BOTH LOCAL AND STATE REGULATIONS REGARDING STORMWATER DRAINAGE ON CONSTRUCTION SITES. OWNERS OR CONTRACTORS MUST OBTAIN A COLORADO STORMWATER DISCHARGE PERMIT FOR CONSTRUCTION ACTIVITIES FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT (CDPHE) AND EITHER A PUBLIC IMPROVEMENT PERMIT OR A GRADING AND STORMWATER QUALITY PERMIT FROM THE TOWN OF ERIE. CONTRACTOR SHALL:
    A. MAINTAIN A COPY OF THE STORM WATER MANAGEMENT PLAN (SWMP) ONSITE AT ALL TIMES. THE SWMP MUST BE MAINTAINED AND MADE AVAILABLE TO TOWN OF ERIE INSPECTORS UPON REQUEST.
    B. INSTALL AND MAINTAIN EROSION, SEDIMENT, AND MATERIALS MANAGEMENT CONTROL BMPS AS SPECIFIED IN THE SWMP.
    C. INSPECT ALL BEST MANAGEMENT PRACTICES (BMPS) AT LEAST EVERY FOURTEEN (14) DAYS AND WITHIN TWENTY FOUR (24) HOURS AFTER ANY PRECIPITATION OR SNOWMELT EVENT THAT CAUSES SURFACE RUNOFF.
    D. MAINTAIN INSPECTION AND MAINTENANCE RECORDS OF BMPS ONSITE WITH THE SWMP. COPIES OF THESE REPORTS SHALL BE PROVIDED TO THE TOWN OF ERIE ENGINEERING STAFF.
    E. BASED ON INSPECTIONS PERFORMED BY THE PERMIT HOLDER OR BY TOWN PERSONNEL, MODIFICATIONS TO THE SWMP WILL BENECESSARY IF AT ANY TIME THE SPECIFIED BMPS DO NOT MEET THE OBJECTIVES OF THE PERMIT. ALL MODIFICATIONS SHALL BE COMPLETED AS SOON AS PRACTICABLE AFTER THE REFERENCED INSPECTION, AND SHALL BE RECORDED ON THE OWNER'S COPY OF THE SWMP.
    F. THE OPERATOR SHALL AMEND THE SWMP WHENEVER THERE IS A SIGNIFICANT CHANGE IN DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE, WHICH HAS A SIGNIFICANT EFFECT ON THE POTENTIAL FOR DISCHARGE OF POLLUTANTS TO THE RECEIVING WATERS, OR IF THE SWMP PROVES TO BE INEFFECTIVE IN ACHIEVING THE GENERAL OBJECTIVES OF CONTROLLING POLLUTANTS IN STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES.
    G. INSTALLATION AND MAINTENANCE OF BMPS SHALL BE SUPERVISED BY PERSONNEL CERTIFIED IN EROSION AND SEDIMENT CONTROL.
2. ALL SITE GRADING (EXCAVATION, EMBANKMENT, AND COMPACTION) SHALL CONFORM TO THE RECOMMENDATIONS OF THE LATEST SOILS INVESTIGATION FOR THIS PROPERTY AND SHALL FURTHER BE IN CONFORMANCE WITH THE TOWN OF ERIE "STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS", LATEST EDITION.
3. ALL GRADING AND FILLING OPERATIONS SHALL BE OBSERVED, INSPECTED AND TESTED BY A LICENSED SOILS ENGINEER. ALL TEST RESULTS SHALL BE SUBMITTED TO THE TOWN OF ERIE ENGINEERING STAFF.
4. NATURAL VEGETATION SHALL BE RETAINED AND PROTECTED WHEREVER POSSIBLE. EXPOSURE OF SOIL TO EROSION BY REMOVAL OR DISTURBANCE OF VEGETATION SHALL BE LIMITED TO THE AREA REQUIRED FOR IMMEDIATE CONSTRUCTION OPERATION AND FOR THE SHORTEST PRACTICAL PERIOD OF TIME. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO AVOID ANY DAMAGE TO EXISTING FOLIAGE THAT LIES IN THE PROJECT AREA UNLESS DESIGNATED FOR REMOVAL AND SHALL BE LIABLE FOR SUCH DAMAGE AT HIS/HER EXPENSE.
5. TOPSOIL SHALL BE STOCKPILED TO THE EXTENT PRACTICABLE ON THE SITE FOR USE ON AREAS TO BE RE–VEGETATED. ANY AND ALL STOCKPILES SHALL BE LOCATED AND PROTECTED FROM EROSIVE ELEMENTS.
6. TEMPORARY VEGETATION SHALL BE INSTALLED ON ALL DISTURBED AREAS WHERE PERMANENT SURFACE IMPROVEMENTS ARE NOT SCHEDULED FOR IMMEDIATE INSTALLATION. SEEDING WILL BE DONE ACROSS THE SLOPE FOLLOWING THE CONTOURS. VEGETATION SHALL CONFORM TO THE TOWN OF ERIE STANDARDS AND SPECIFICATIONS. PROJECT SCHEDULING SHOULD TAKE ADVANTAGE OF SPRING OR FALL PLANTING SEASONS FOR NATURAL GERMINATION. SEEDED AREAS SHALL BE IRRIGATED IN ACCORDANCE WITH THE TOWN OF ERIE'S STANDARDS AND SPECIFICATIONS.
7. AT ALL TIMES, A WATER TRUCK SHALL BE ON–SITE AND THE PROPERTY SHALL BE MAINTAINED AND/OR WATERED TO PREVENT WIND–CAUSED EROSION. EARTHWORK OPERATIONS SHALL BE DISCONTINUED WHEN FUGITIVE DUST SIGNIFICANTLY IMPACTS ADJACENT PROPERTY. IF EARTHWORK IS COMPLETE OR DISCONTINUED AND DUST FROM THE SITE CONTINUES TO CREATE PROBLEMS, THE OWNER/DEVELOPER SHALL IMMEDIATELY INSTITUTE MITIGATIVE MEASURES AND SHALL CORRECT DAMAGE TO ADJACENT PROPERTY.
8. FILL SLOPES SHALL BE COMPACTED BY MEANS OF SHEEPSFOOT COMPACTOR OR OTHER SUITABLE EQUIPMENT. COMPACTING SHALL CONTINUE UNTIL SLOPES ARE STABLE AND THERE IS NOT AN APPRECIABLE AMOUNT OF LOOSE SOIL ON THE SLOPES.
9. TEMPORARY CUT/FILL SLOPES SHALL ABIDE BY THE SOILS REPORT. PERMANENT SLOPES SHALL BE AS SHOWN ON PLANS.
10. DEPTH OF MOISTURE–DENSITY CONTROL SHALL BE FULL DEPTH ON ALL EMBANKMENT AND SIX (6) INCHES ON THE BASE OF CUTS AND FILLS.
11. OUTLET SIDES OF ALL STORM PIPES SHALL BE GRADED TO DRAIN AND SHALL HAVE SUFFICIENT EROSION PROTECTION.
12. THE PERMITTEE OR HIS AGENT SHALL NOTIFY THE SITE GEOTECHNICAL ENGINEER WHEN THE GRADING OPERATION IS READY FOR EACH OF THE FOLLOWING INSPECTIONS:
    A. INITIAL INSPECTION WHEN THE PERMITTEE IS READY TO BEGIN WORK, BUT NOT LESS THAN TWO (2) DAYS BEFORE ANY GRADING OR GRUBBING IS STARTED.
    B. AFTER THE NATURAL GROUND OR BEDROCK IS EXPOSED AND PREPARED TO RECEIVE FILL, BUT BEFORE FILL IS PLACED.
    C. EXCAVATION INSPECTION AFTER THE EXCAVATION IS STARTED BUT BEFORE THE VERTICAL DEPTH OF THE EXCAVATION EXCEEDS TEN (10) FEET.
    D. FILL INSPECTION AFTER THE FILL PLACEMENT IS STARTED, BUT BEFORE THE FILL EXCEEDS TEN (10) FEET.

GENERAL NOTES – SEWER

1. THE CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATIONS OF ALL EXISTING SEWERS TO BE CONNECTED TO PRIOR TO CONSTRUCTION STAKING.
2. CONNECTION TO EXISTING TOWN OF ERIE LINES WILL BE PERMITTED UPON SUBSTANTIAL COMPLETION/CONSTRUCTION ACCEPTANCE OF THE NEW SANITARY SEWER SYSTEM. EXISTING PIPE AT THE POINT OF CONNECTION SHALL NOT BE "BROKEN OUT" UNTIL THE NEW SYSTEM IS ACCEPTED. IF CONNECTING TO AN EXISTING MANHOLE, THE NEW LINE SHALL BE PLUGGED UNTIL THE NEW SYSTEM IS ACCEPTED.
3. MINIMUM VERTICAL SEPARATIONS BETWEEN ALL UTILITY PIPES SHALL BE EIGHTEEN (18) INCHES. IF VERTICAL SEPARATIONS ARE LESS THAN EIGHTEEN (18) INCHES, THE UTILITY PIPES SHALL BE REINFORCED AND PROTECTED AS REQUIRED BY CURRENT TOWN STANDARD SPECIFICATIONS.
4. WATER AND SANITARY SEWER LINES SHALL HAVE A MINIMUM HORIZONTAL SEPARATION OF TEN (10) FEET. WHEN A TEN (10) FOOT SEPARATION IS NOT PROVIDED OR WHEN SEWER LINES CROSS WATER LINES WITH LESS THAN ONE AND ONE–HALF (1½) FEET OF VERTICAL SEPARATION, SEWER LINE JOINTS SHALL BE CONCRETE ENCASED. FOR PERPENDICULAR CROSSINGS, ENCASED JOINTS SHALL EXTEND TEN (10) FEET, PERPENDICULAR TO THE WATER LINE IN BOTH DIRECTIONS.
5. ALL SANITARY SEWER SERVICES AND WATER SERVICES ARE TO BE TEN (10) FEET APART.
6. SERVICE LATERALS SHALL EXTEND FIVE (5) FEET BEYOND RIGHTS OF WAY OR UTILITY EASEMENTS, WHICHEVER IS GREATER. THE ENDS SHALL BE MARKED BY A GREEN PAINTED WOOD POST UNTIL CURB AND GUTTER IS IN PLACE. WHEN CURB AND GUTTER IS IN PLACE THE LATERALS SHALL BE MARKED ON THE CONCRETE CURB FACE WITH AN "S" or "X".
7. THE LENGTH OF SANITARY SEWER LINE IS THE HORIZONTAL DISTANCE BETWEEN CENTER OF MANHOLE TO CENTER OF MANHOLE. THEREFORE, THE DISTANCES INDICATED ON THE PLANS ARE APPROXIMATE AND COULD VARY DUE TO VERTICAL ALIGNMENT AND MANHOLE DIMENSIONS.
8. SERVICE LINE CONNECTIONS TO DEAD END MANHOLES THAT HAVE NO FURTHER POSSIBILITY OF EXTENSION SHALL BE ALLOWED AND SHALL HAVE A MINIMUM DROP OF 0.75 X MAIN DIAMETER. SERVICE LINE CONNECTINGS TO IN–LINE MANHOLES ARE NOT PERMITTED. MINIMUM SERVICE LINE SLOPE; 4 INCHES=2%; 6 INCHES= 1%; 8 INCHES=0.4%.
9. ALL FOUR (4) THROUGH FIFTEEN (15) INCH SANITARY SEWER PIPE SHALL BE POLYVINYL CHLORIDE (PVC) AND SHALL BE IN ACCORDANCE WITH ASTM D–3034–SDR35, "STANDARD SPECIFICATION FOR PVC SEWER PIPE AND FITTINGS". ANY SANITARY SEWER HAVING A DEPTH IN EXCESS OF FIFTEEN (15) FEET SHALL BE COORDINATED WITH THE PUBLIC WORKS DEPARTMENT.
10. BEDDING MATERIAL SHALL CONFORM TO TOWN OF ERIE STANDARDS AND SPECIFICATIONS.
11. WARNING TAPE SHALL BE INSTALLED 12" MINIMUM AND 18" MAXIMUM ABOVE SEWER PIPE.
12. PRECAST CONCRETE MANHOLE SECTIONS SHALL BE IN ACCORDANCE WITH ASTM C–478. MANHOLE STEPS SHALL BE POLYPROPYLENE COVERED STEEL CONFORMING TO ASTM. D–4101 AND ASTMA–615. CAST IRON RING AND COVER SHALL CONFORM TO ASTM A–48.
13. MANHOLES SHALL BE A MINIMUM FOUR (4) FOOT DIAMETER AND CONSTRUCTED PER THE STANDARDS AND SPECIFICATIONS.
14. THE CONTRACTOR SHALL TAKE CARE TO PROPERLY SHAPE ALL MANHOLE INVERTS AND BENCHES IN ACCORDANCE WITH THE TOWN OF ERIE STANDARDS AND SPECIFICATIONS, TO PROMOTE SMOOTH FLOW THROUGH THE MANHOLE. INVERTS OF LINES INTERSECTING AT 90 DEGREES AND AT HIGHLY DIVERGENT OR FLAT SLOPES ARE ESPECIALLY CRITICAL. MANHOLE INVERTS SHALL BE CONSTRUCTED WITH A SMOOTH TROWEL FINISH, AND BENCH FINISHED WITH A LIGHT BROOMED, NON–SKID, FINISH.
15. SEWER TEES AND/OR WYES SHALL BE STAKED BY A SURVEY CREW. THE CONTRACTOR SHALL FURNISH TO THE ENGINEER "ASCONSTRUCTED" LOCATION OF TEES AND WYES. ALL SERVICE LINES ARE FOUR (4) INCH UNLESS OTHERWISE NOTED.
16. THE CONTRACTOR, AT THE OWNER'S EXPENSE, WILL MAKE ALL SEWER SERVICE TAPS.
17. PRIOR TO BACKFILL THE TOWN OF ERIE ENGINEERING STAFF SHALL INSPECT ALL SANITARY SEWER MAINS AND SERVICE EXTENSIONS.
18. MANHOLE RIMS SHALL BE SET AT AN ELEVATION RELATIVE TO THE PAVEMENT, IN ACCORDANCE WITH THE TOWN OF ERIE STANDARDS. WHETHER THE MANHOLE IS AT PAVED OR UNPAVED GRADE, A MINIMUM OF ONE (1) AND A MAXIMUM OF FOUR (4) CONCRETE RINGS SHALL BE USED TO ADJUST THE RIM ELEVATION TO FINAL GRADE. THE MAXIMUM ACCEPTABLE VERTICAL ADJUSTMENT UTILIZING CONCRETE RINGS IS EIGHTEEN (18) INCHES.
19. SUBSTANTIAL COMPLETION/CONSTRUCTION ACCEPTANCE OF THE NEW SANITARY SEWER MAINS IS CONTINGENT UPON COMPLETION OF ITEMS LISTED IN THE TOWNS STANDARDS AND SPECIFICATIONS.

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TROY W. BALES
50961
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PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT ENGINEER DATE

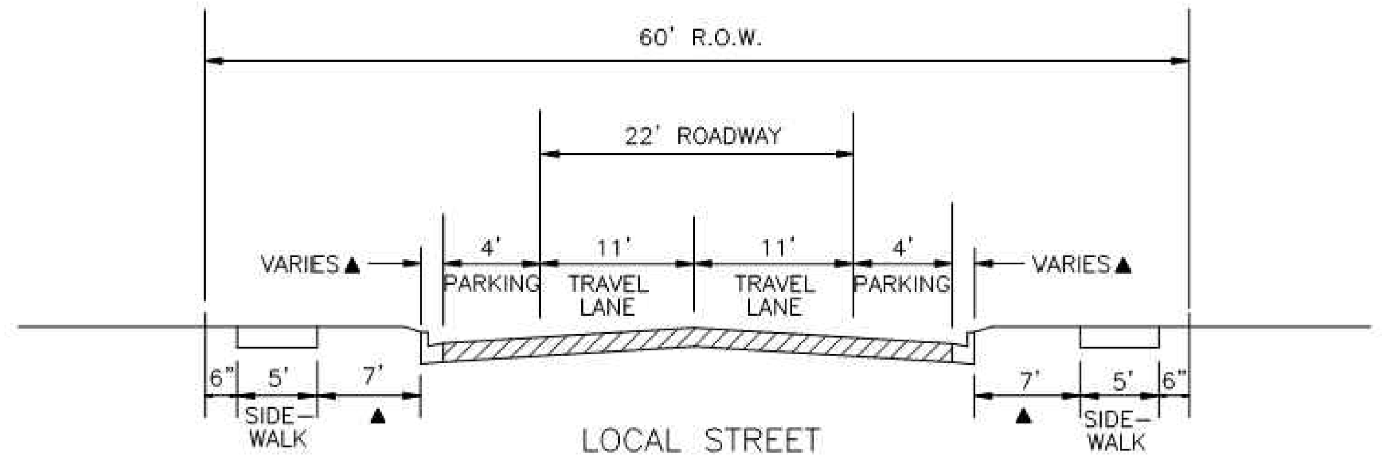
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

NOTES

TOWN OF ERIE

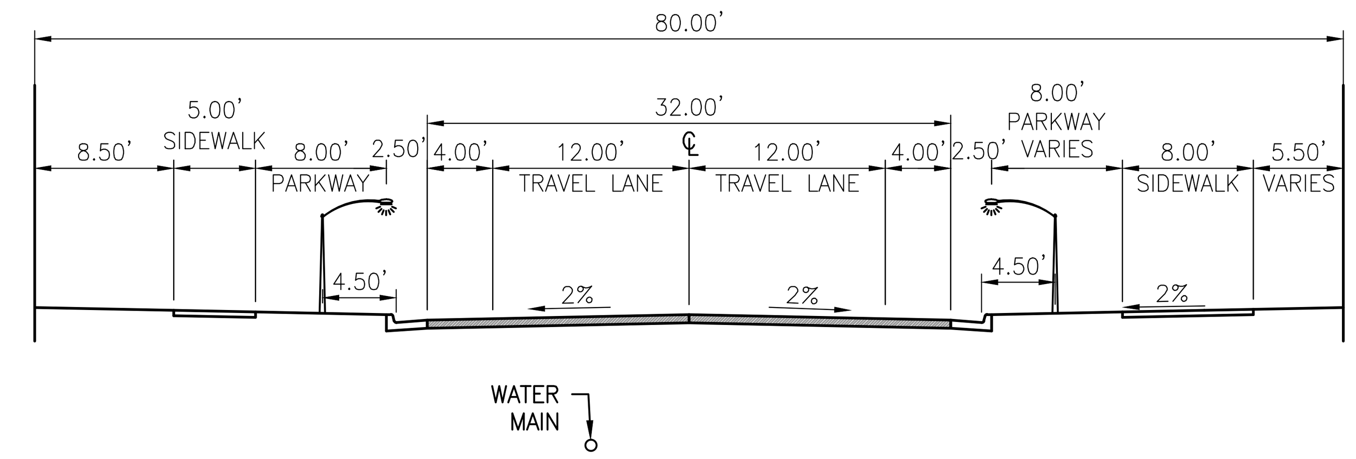
SCALE: N.T.S	SHEET NO. 03
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	DRAWING NO. NT–02
CHECKED BY: TB	
JOB NO: D1048	

preliminary plat\1048-C-NT02.dwg 2019-02-05 - 2:34PM - ksan

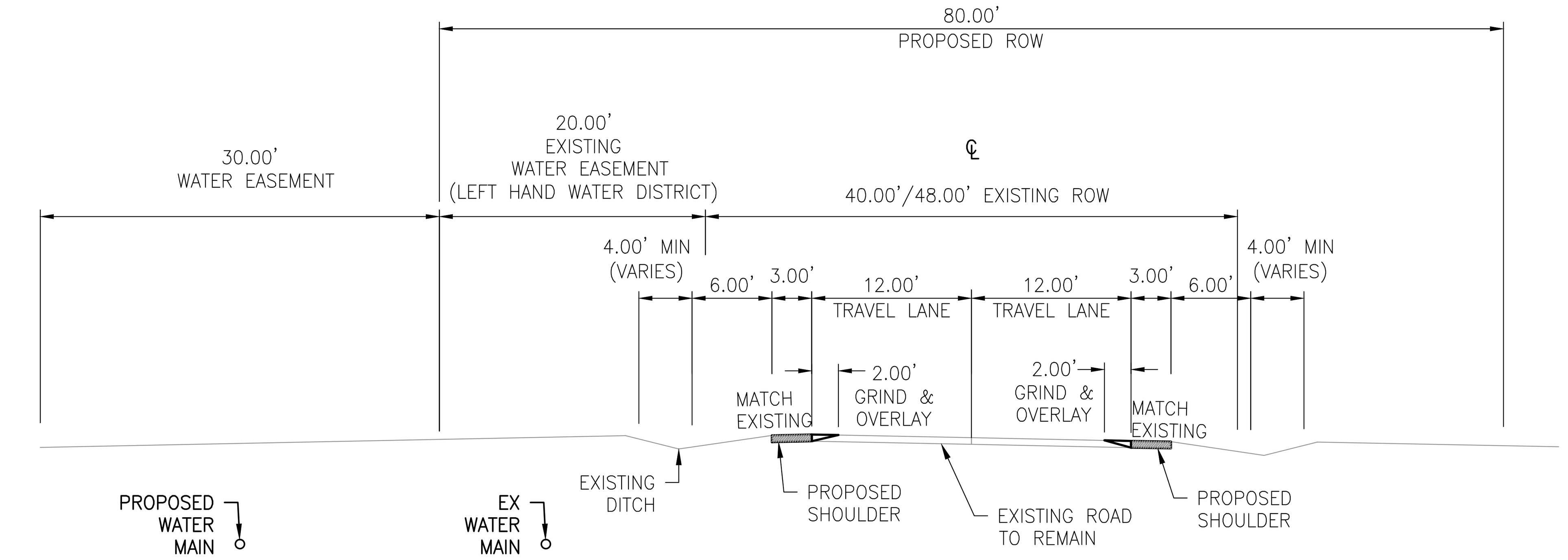


NOTE:
PRIVATE UTILITIES TO BE OUTSIDE OF THE PUBLIC RIGHT-OF-WAY
▲ WIDTH DEPENDS ON VERTICAL OR ROLLOVER CURB

1 LOCAL STREETS
MEADOWLARK DR, THORNWOOD LN, PERSIMMON CT
FOXGLOVE ST, WILDROSE PL & FARMERS PL
SCALE 1"=10'



2 COLLECTOR
LOMBARDI ST
SCALE 1"=10'



3 JAY RD AND JASPER RD
SCALE 1"=10'

NO.	REVISION DESCRIPTION	REVISED BY	ACCEPT. BY	DATE
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PROJECT ENGINEER DATE

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

CROSS SECTIONS

TOWN OF ERIE

SCALE: 1"=10'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 04 OF 55 SHEETS
DRAWING NO. CS-01

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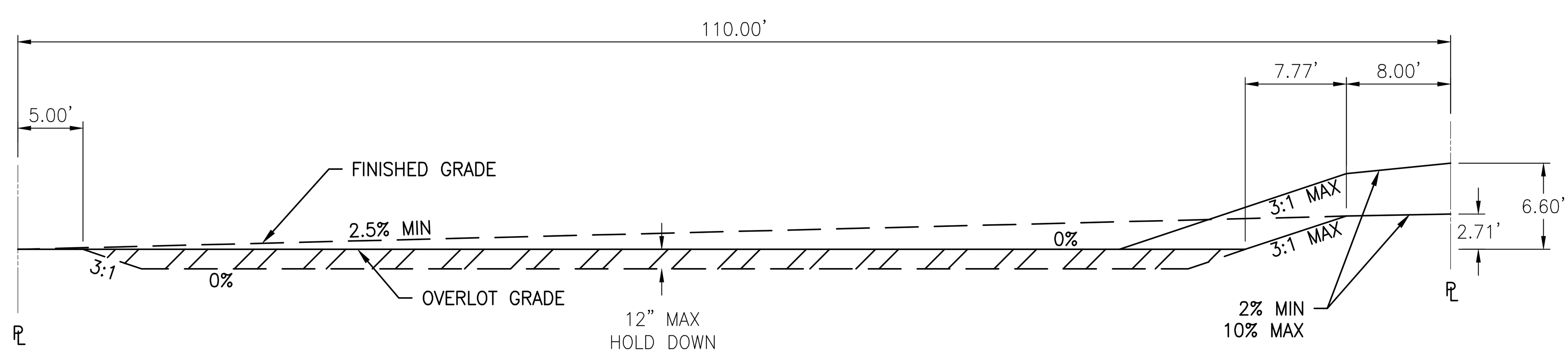
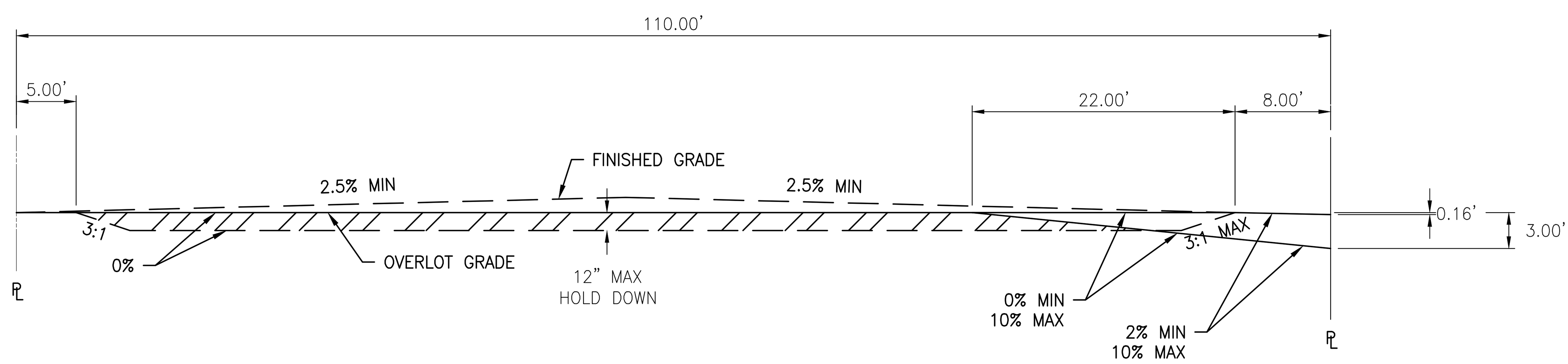
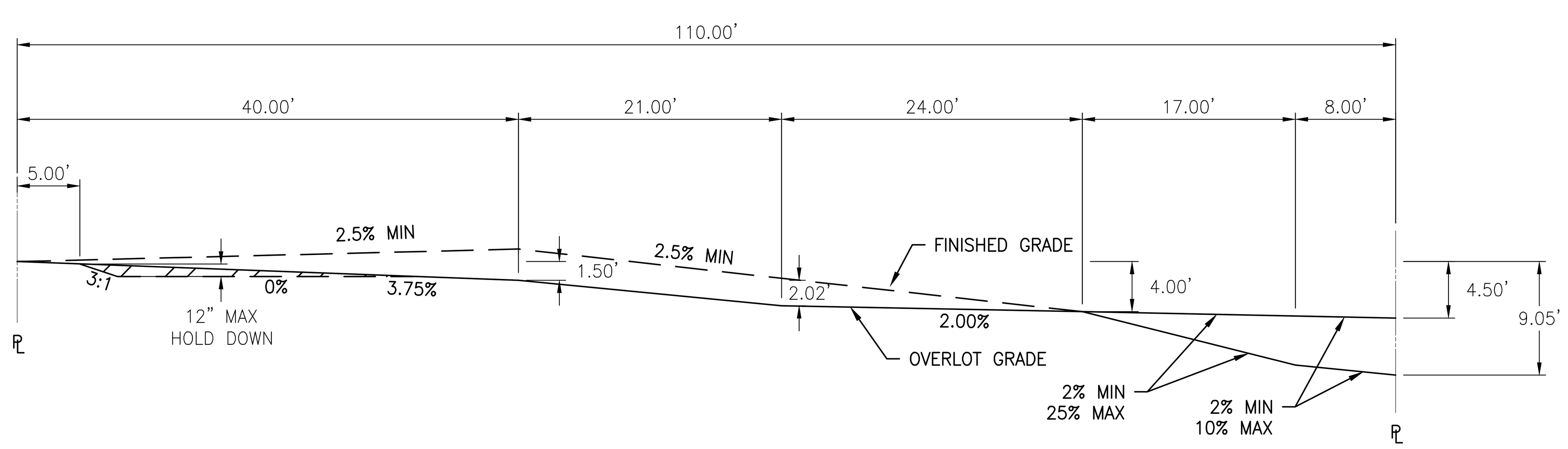
SINGLE FAMILY (50') OVERLOT GRADING TEMPLATES



1 TYPE A
SCALE 1"=10'

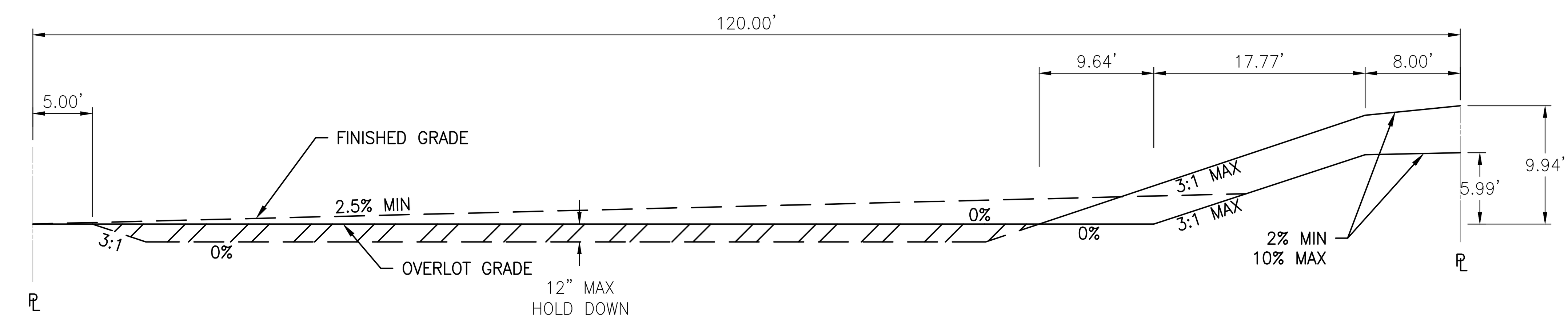


2 TYPE B
SCALE 1"=10'

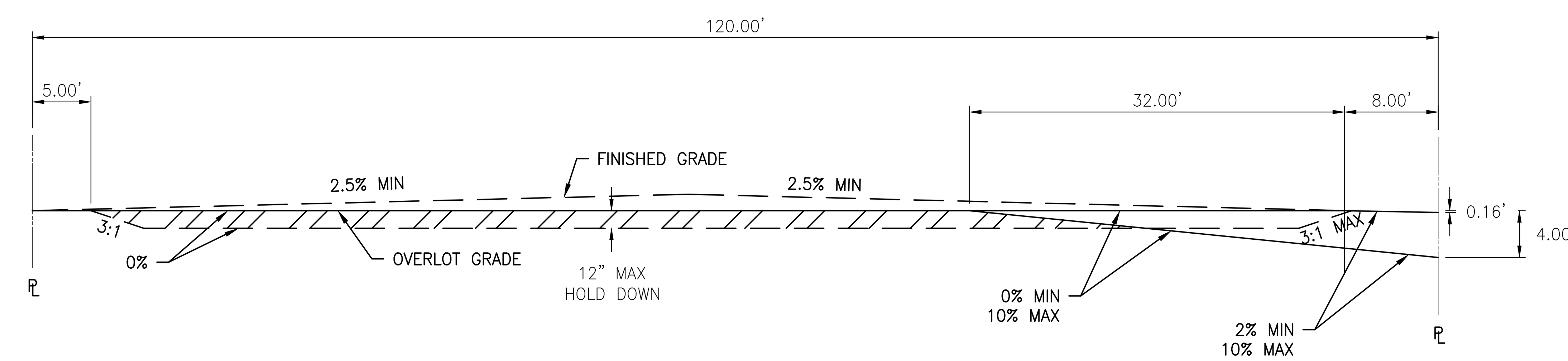


3 TYPE G
SCALE 1"=10'

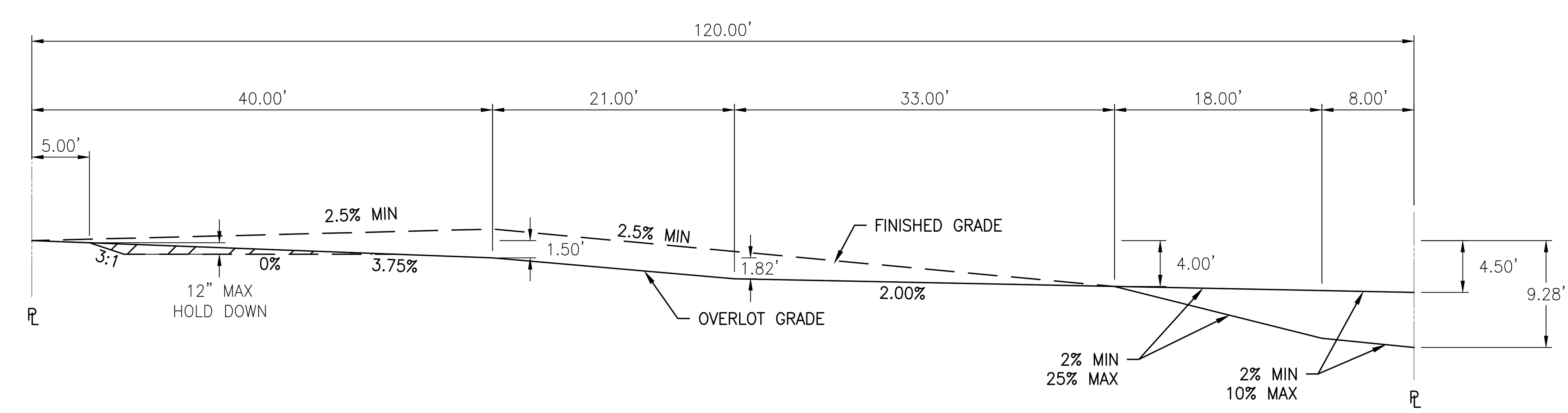
SINGLE FAMILY (60') OVERLOT GRADING TEMPLATES



4 TYPE A
SCALE 1"=10'



5 TYPE B
SCALE 1"=10'



6 TYPE G
SCALE 1"=10'

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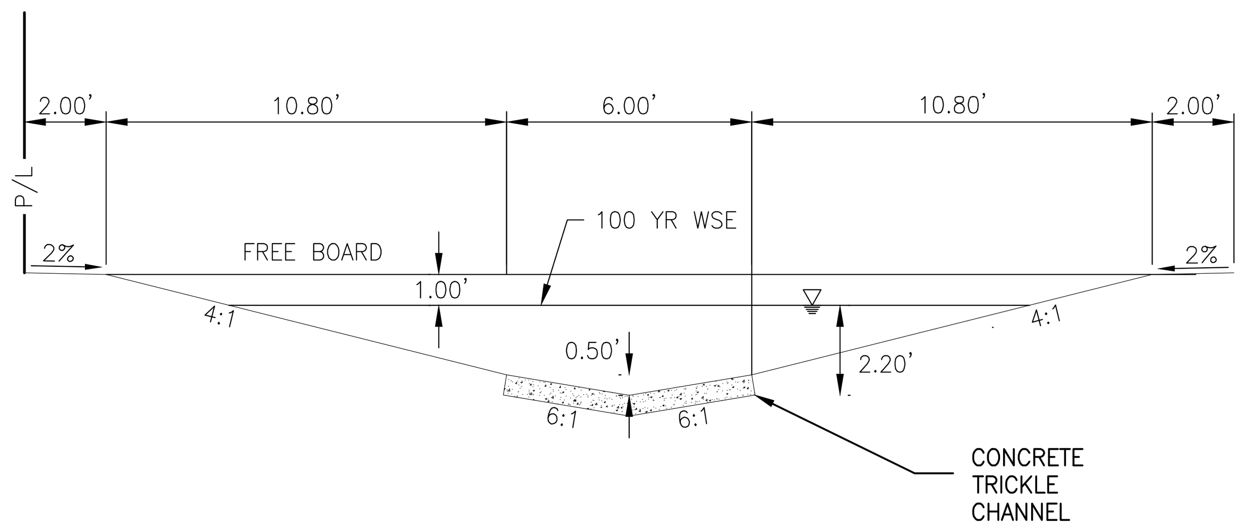
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

CROSS SECTIONS

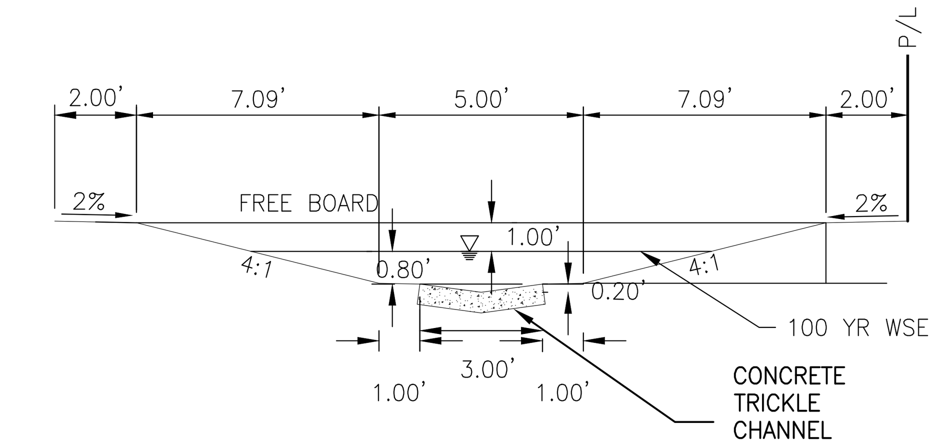
TOWN OF ERIE

SCALE: 1"=10'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

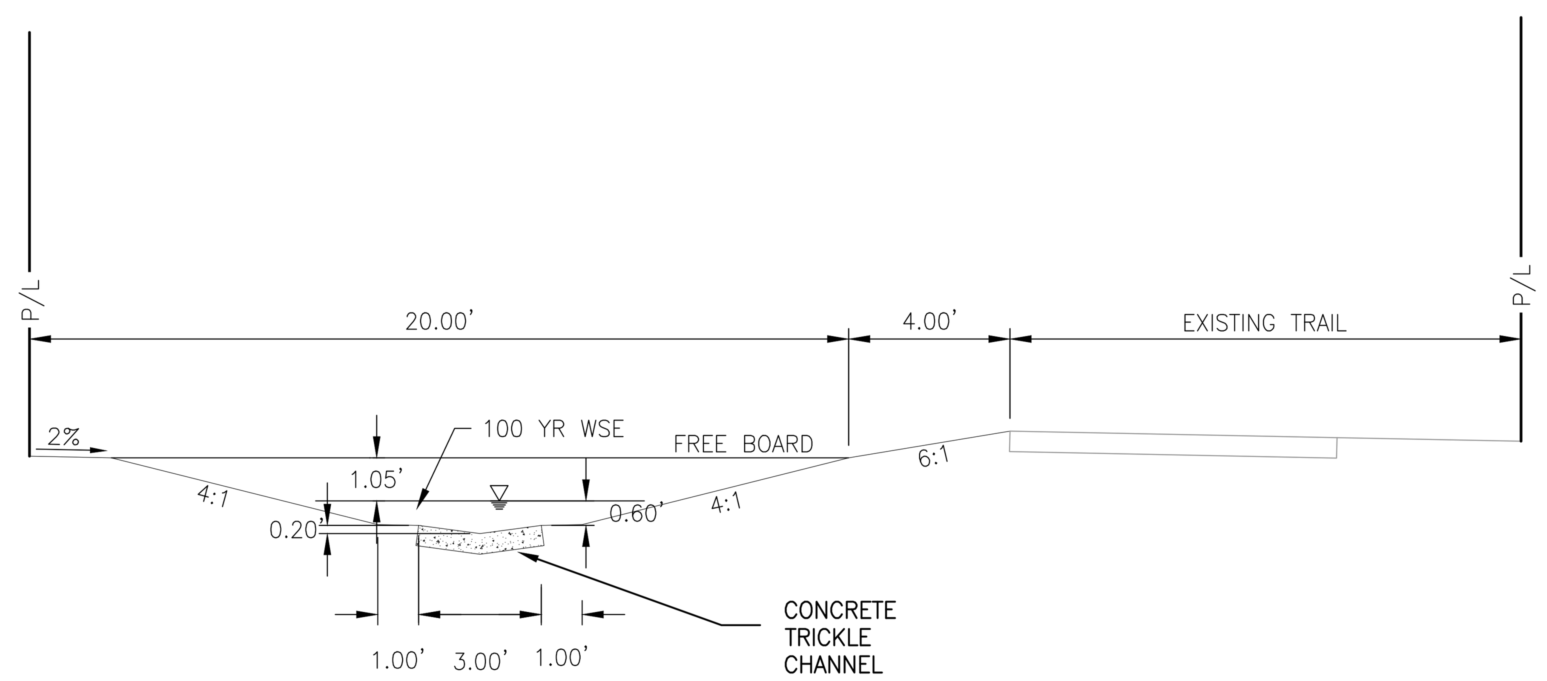
SHEET NO. 05 OF 55 SHEETS
DRAWING NO. CS-02



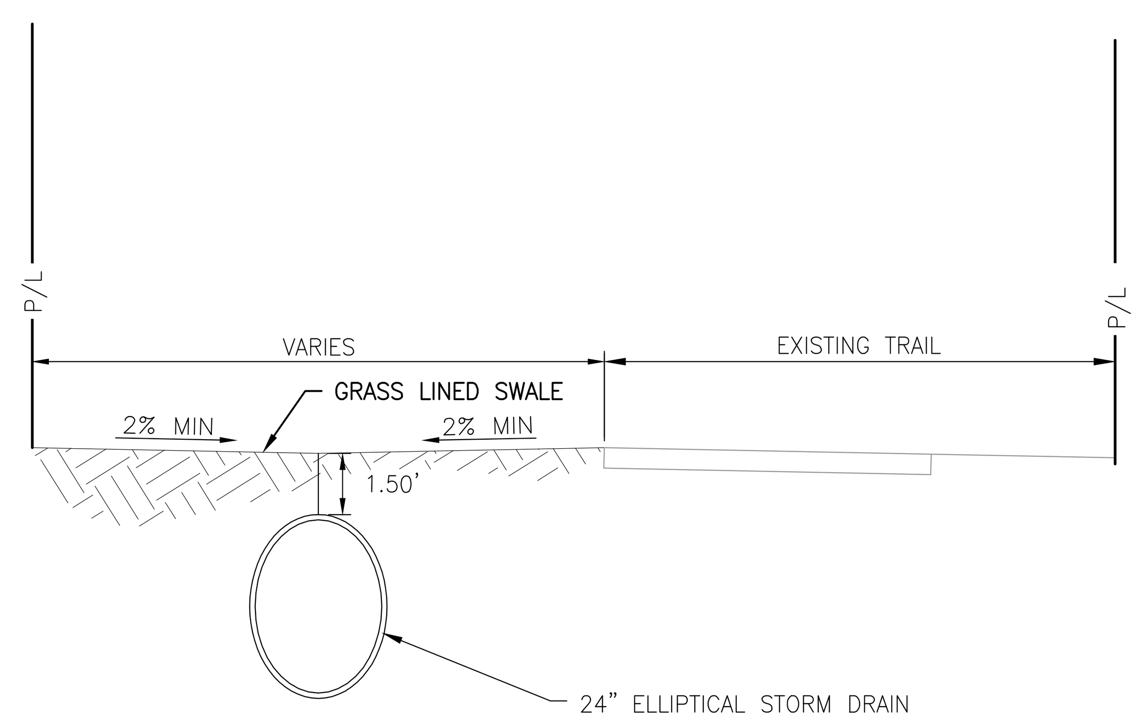
SECTION: A-A & B-B



SECTION: F-F



SECTION: C-C



SECTION: D-D

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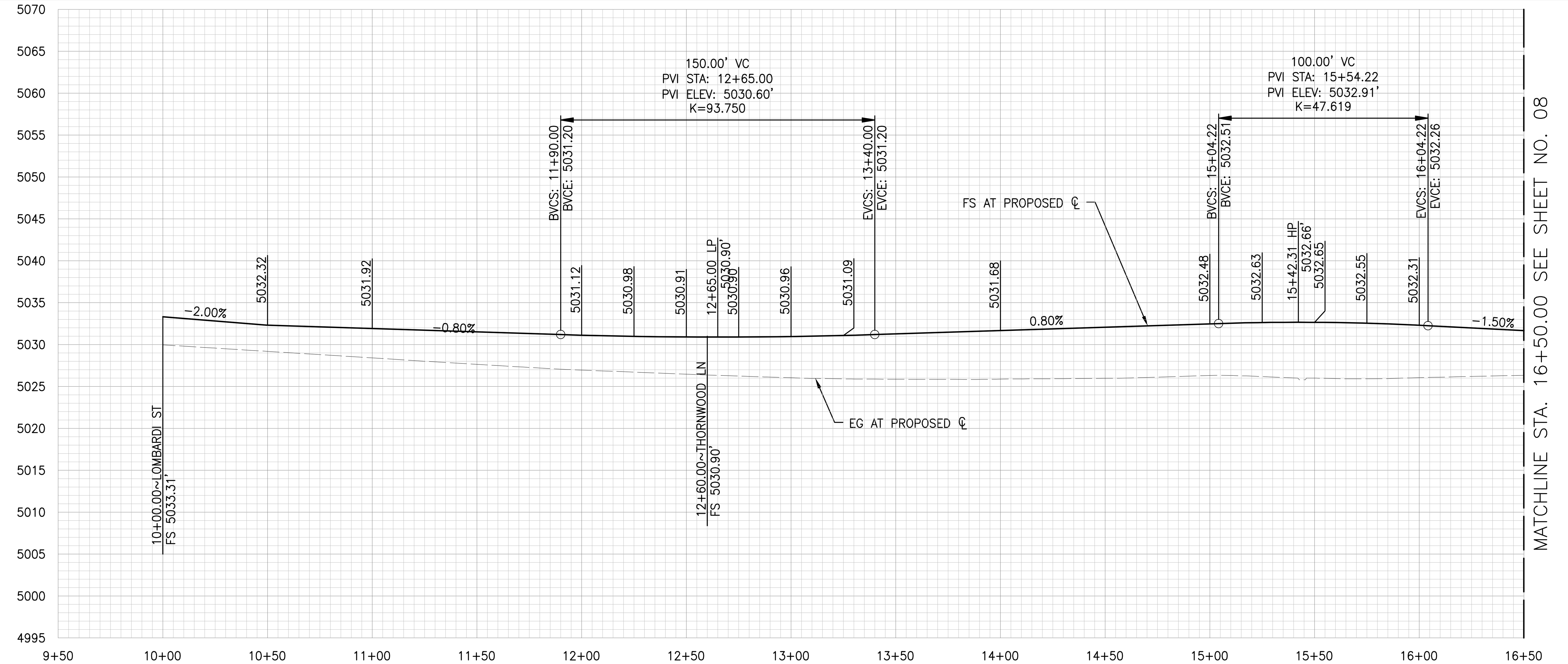
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

DRAINAGE SWALE CROSS SECTIONS

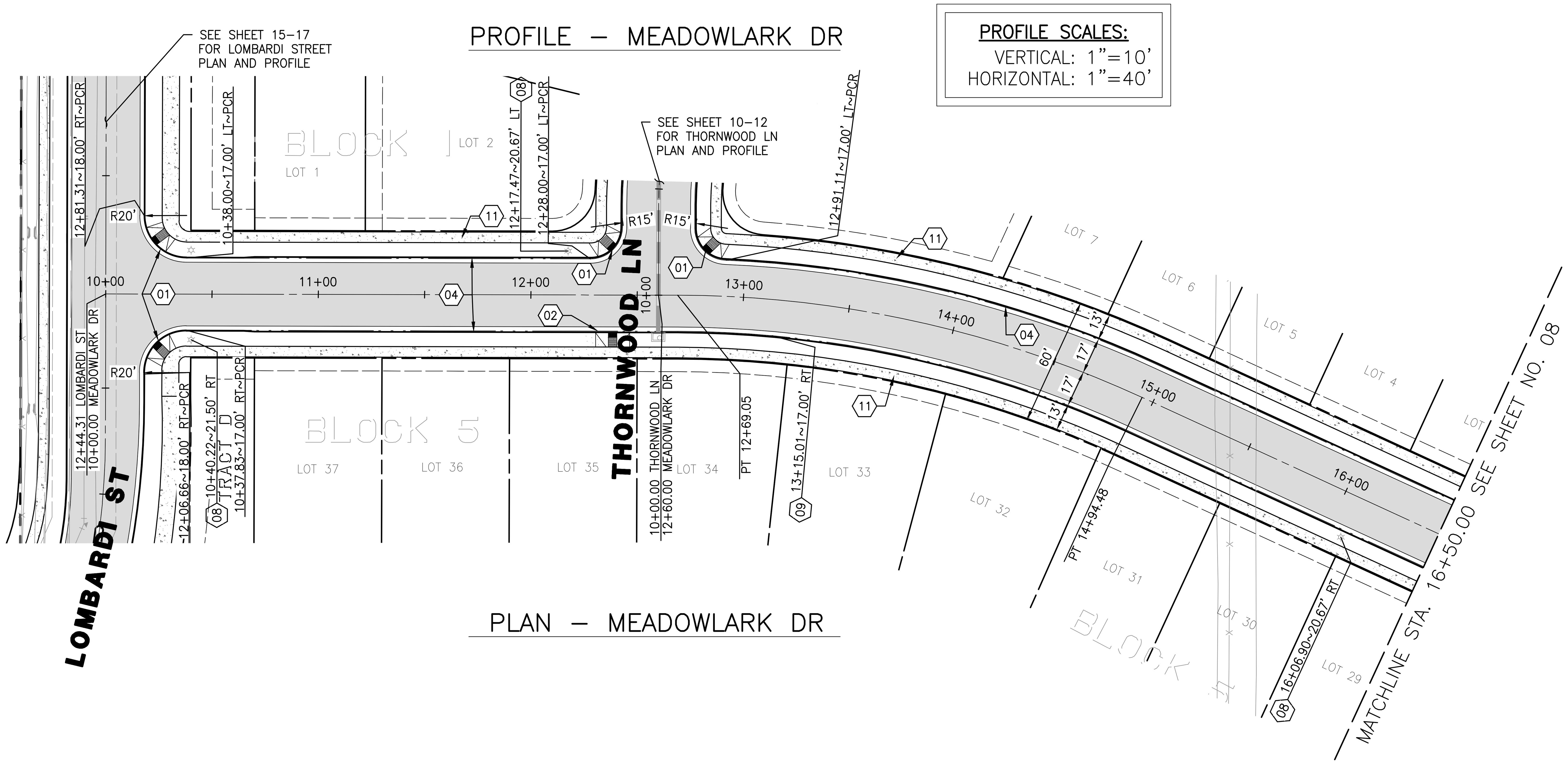
TOWN OF ERIE

SCALE: 1"=4'	SHEET NO. 06
DATE: 02/06/2018	
DRAWN BY: KS	OF 55 SHEETS
CHECKED BY: TB	DRAWING NO. CS-03
JOB NO: D1048	

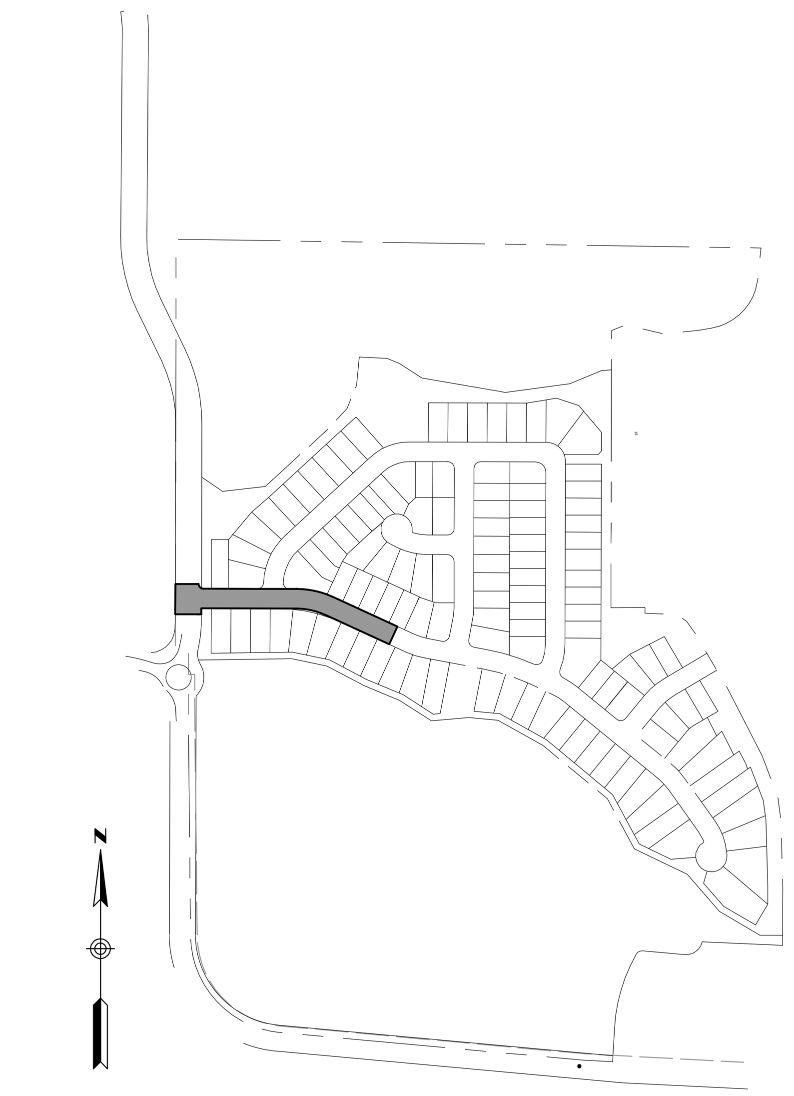


PROFILE – MEADOWLARK DR

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'



PLAN – MEADOWLARK DR



KEY MAP
SCALE 1"=500'

CL ALIGNMENT TABLE

NUMBER	LENGTH	RADIUS	DELTA (Δ)	LINE/CHORD DIRECTION
1	269.05'	N/A	N/A	S89° 52' 25.61"E
2	225.42'	525.00'	24°36'06"	S77° 34' 22.55"E
3	212.50'	N/A	N/A	S65° 16' 19.48"E

CONSTRUCTION NOTES

- 01 CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
- 02 CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
- 03 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
- 04 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
- 05 CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
- 06 SPINE TRAIL PER TOWN OF ERIE STD DTL P25
- 07 DRIVE CUT–DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
- 08 STREET LIGHT
- 09 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
- 10 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
- 11 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
- 12 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
- 13 CHASE DRAIN
- 14 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M–609–1
- 15 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
- 16 5' CURB TRANSITION

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GRAPHIC SCALE: 1"=40'

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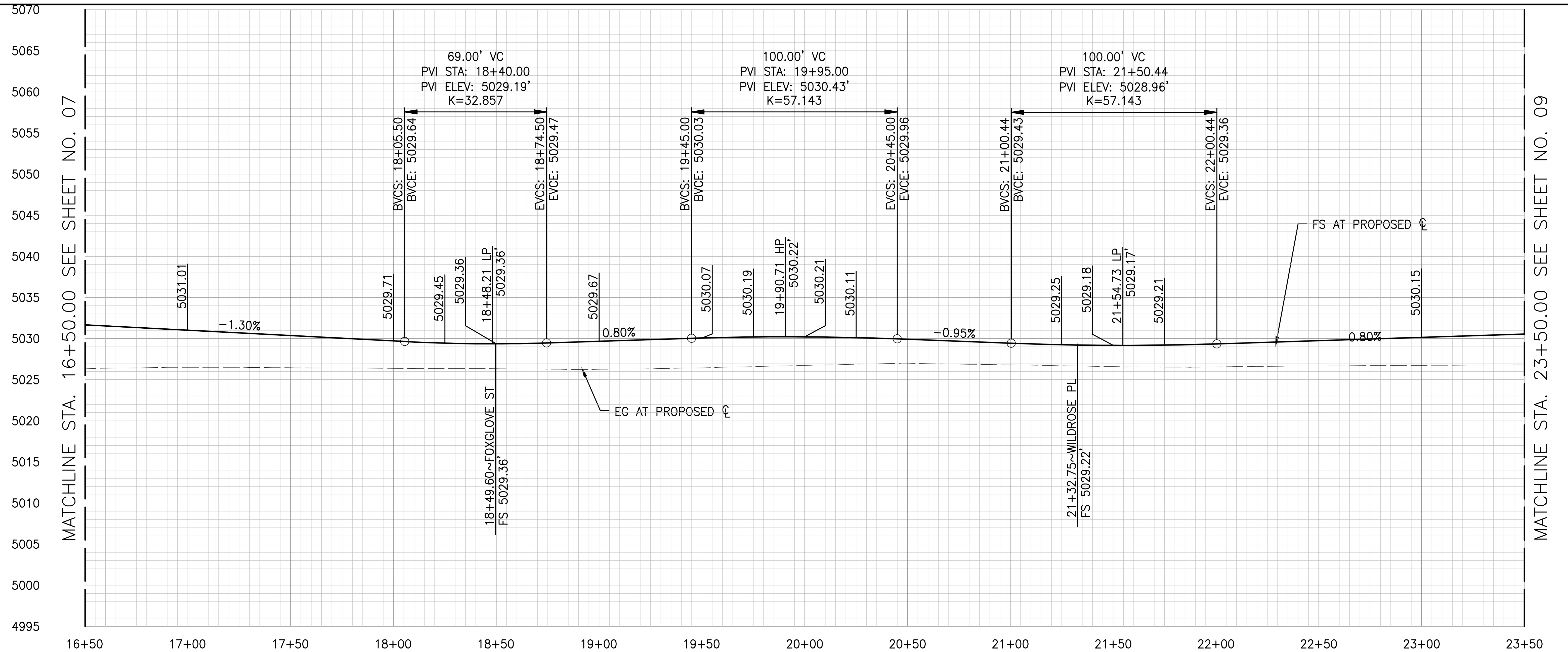
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

ROADWAY PLAN AND PROFILE

TOWN OF ERIE

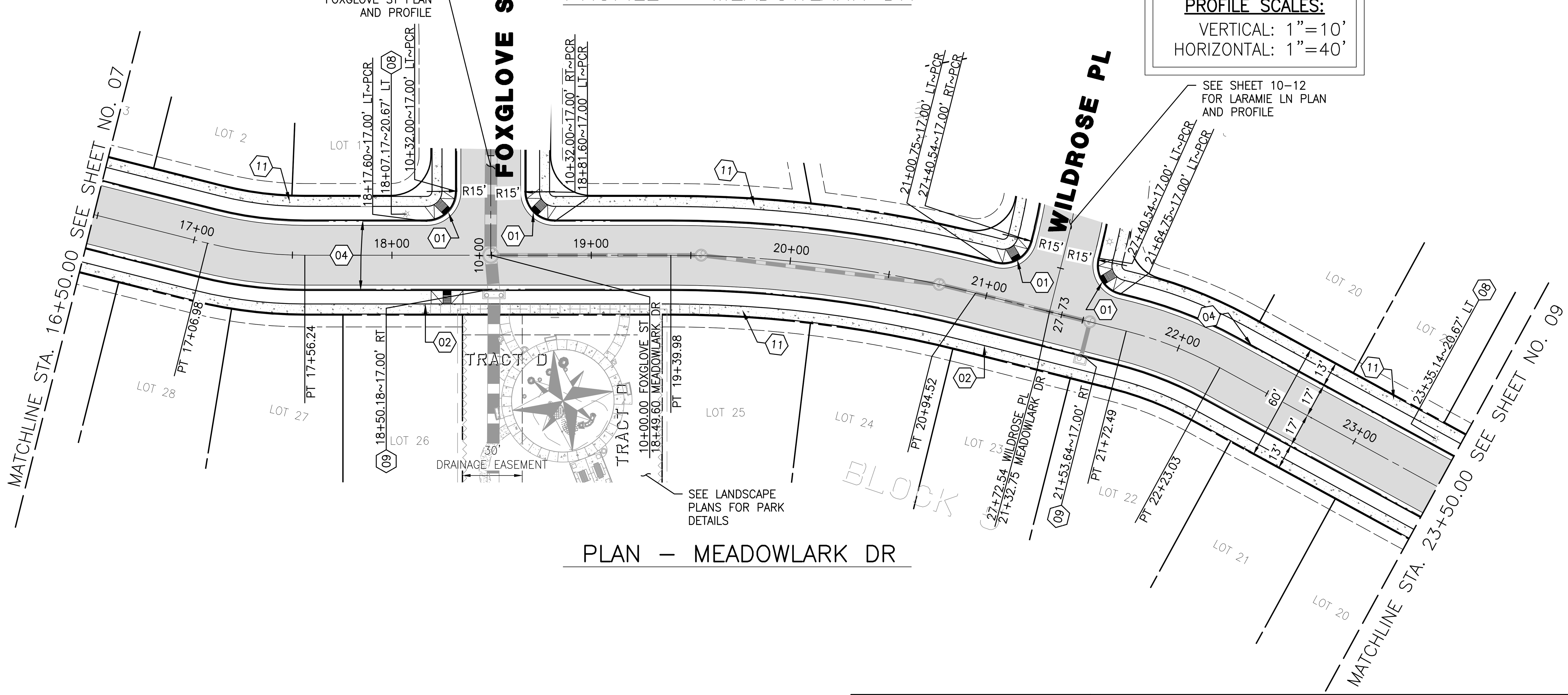
SCALE: 1"=40'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 07 OF 55 SHEETS
DRAWING NO. RD–01

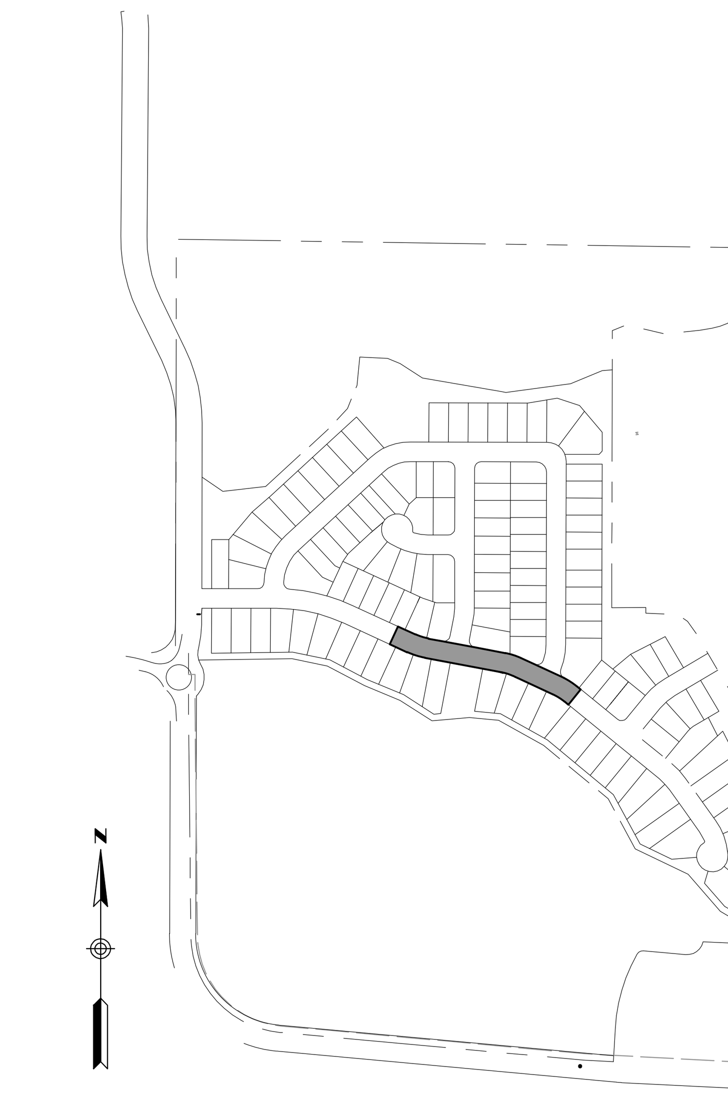


PROFILE – MEADOWLARK DR

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'



PLAN – MEADOWLARK DR



KEY MAP

SCALE 1"=500'

CL ALIGNMENT TABLE				
NUMBER	LENGTH	RADIUS	DELTA (Δ)	LINE/CHORD DIRECTION
4	49.27'	200.00'	14°06'49"	S72° 19' 44.01"E
5	183.74'	N/A	N/A	S79° 23' 08.54"E
6	154.54'	625.00'	14°10'01"	S72° 18' 08.06"E
7	77.96'	N/A	N/A	S65° 13' 07.58"E
8	50.54'	200.00'	14°28'43"	S57° 58' 46.31"E

CONSTRUCTION NOTES

01 CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02 CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05 CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06 SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07 DRIVE CUT-DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08 STREET LIGHT
09 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
10 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
11 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13 CHASE DRAIN
14 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M-609-1
15 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
16 5' CURB TRANSITION

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GRAPHIC SCALE: 1"=40'

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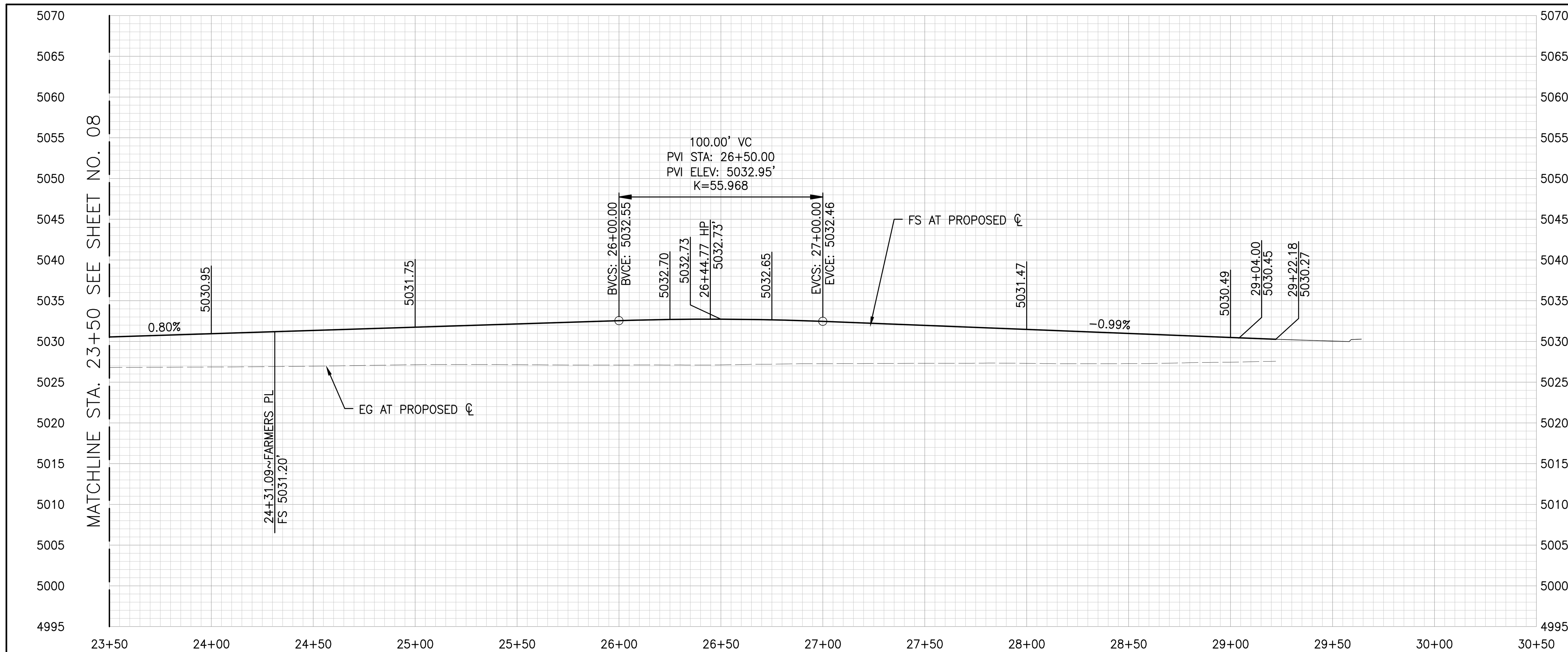
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

ROADWAY PLAN AND PROFILE

TOWN OF ERIE

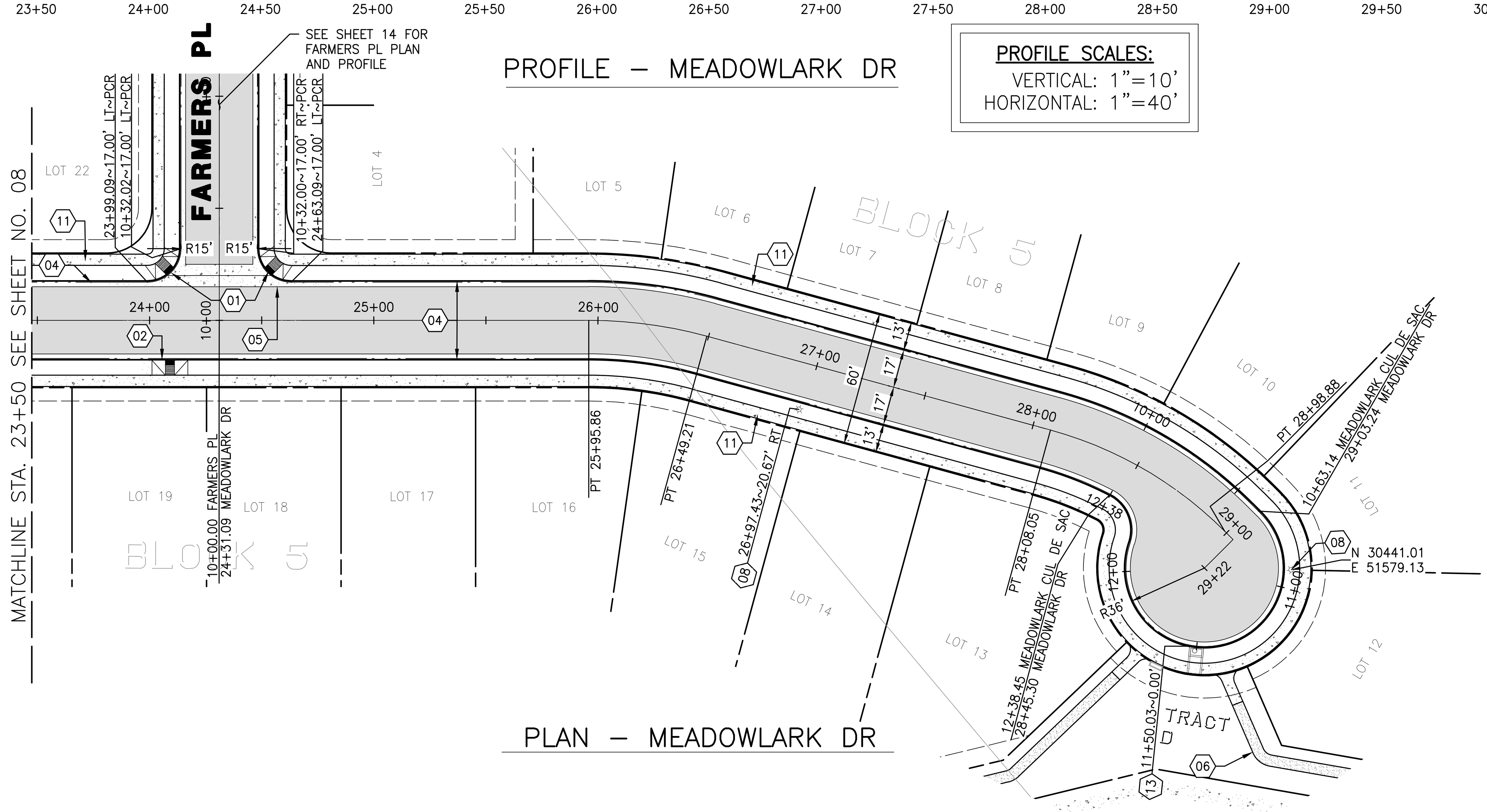
SCALE: 1"=40'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 08 OF 55 SHEETS
DRAWING NO. RD-02

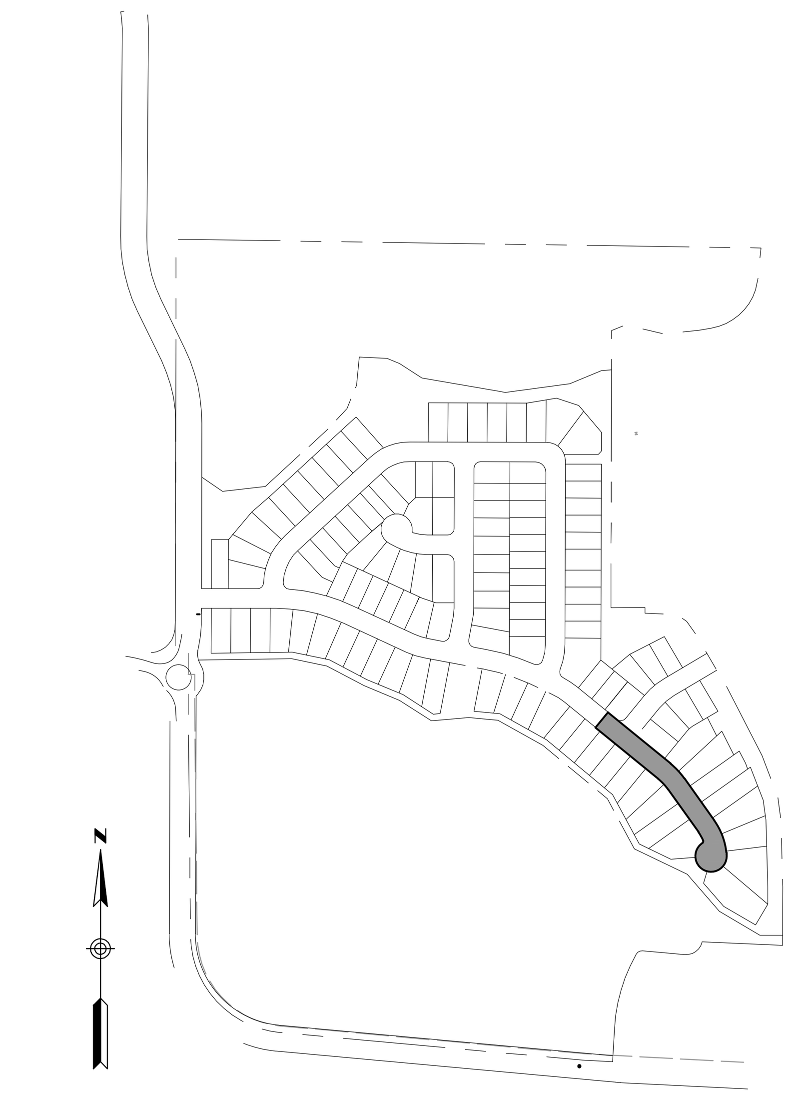


PROFILE – MEADOWLARK DR

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'



PLAN – MEADOWLARK DR



KEY MAP
SCALE 1"=500'

CL ALIGNMENT TABLE				
NUMBER	LENGTH	RADIUS	DELTA (Δ)	LINE/CHORD DIRECTION
9	372.83'	N/A	N/A	S50° 44' 25.05"E
10	53.35'	200.00'	15°17'01"	S43° 05' 54.72"E
11	158.85'	N/A	N/A	S35° 27' 24.39"E
12	90.83'	175.00'	29°44'16"	S20° 35' 16.63"E
13	5.30'	N/A	N/A	S5° 43' 08.87"E
14	18.00'	N/A	N/A	S84° 16' 51.13"W

CONSTRUCTION NOTES

- 01 CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
- 02 CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
- 03 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
- 04 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
- 05 CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
- 06 SPINE TRAIL PER TOWN OF ERIE STD DTL P25
- 07 DRIVE CUT-DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
- 08 STREET LIGHT
- 09 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
- 10 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
- 11 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
- 12 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
- 13 CHASE DRAIN
- 14 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M-609-1
- 15 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
- 16 5' CURB TRANSITION

40 20 0 40
GRAPHIC SCALE: 1"=40'

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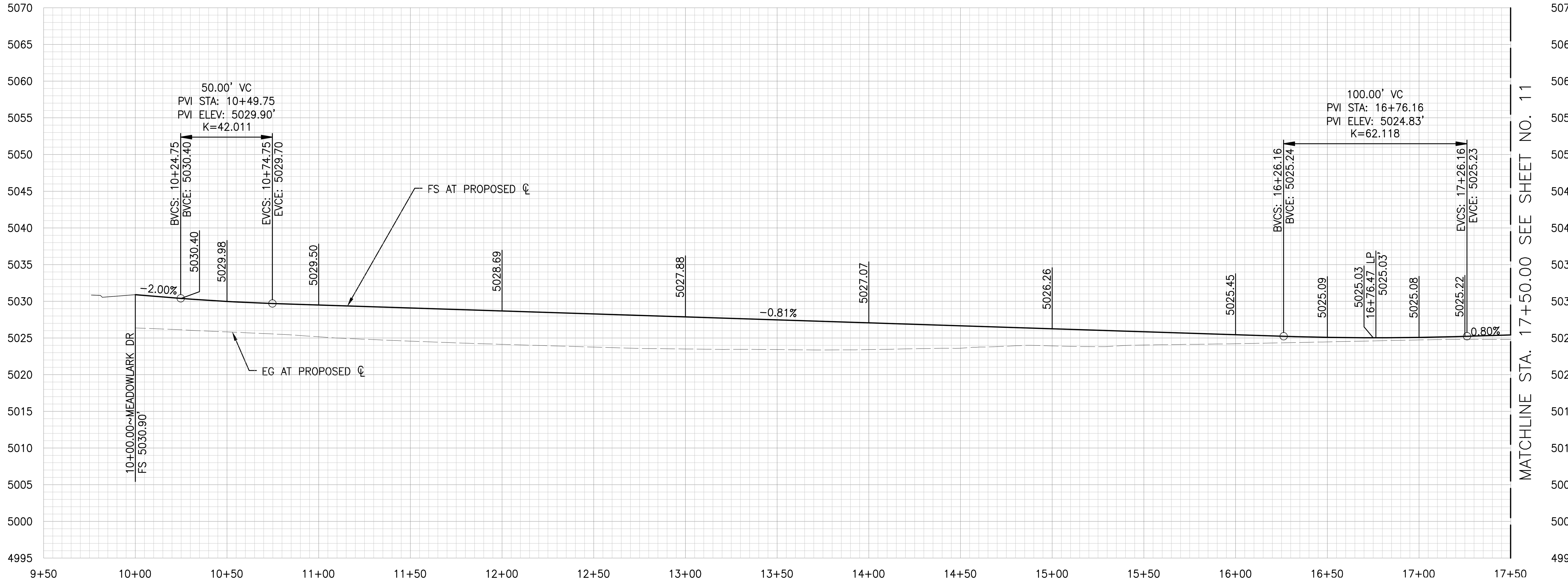
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

ROADWAY PLAN AND PROFILE

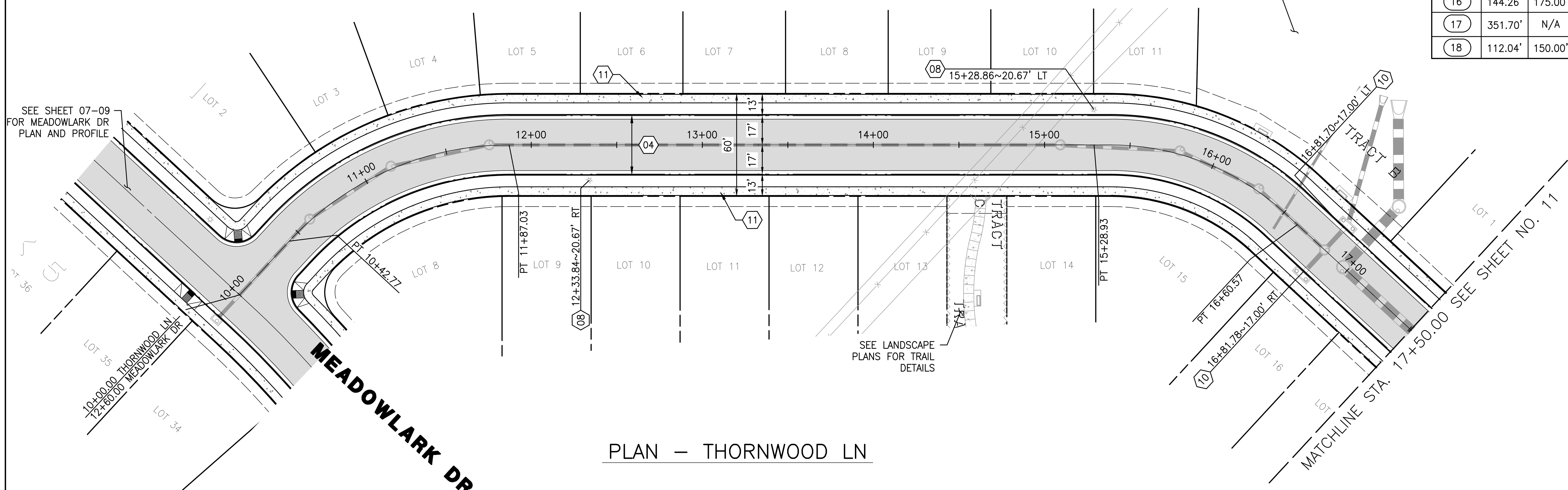
TOWN OF ERIE

SCALE: 1"=40'	SHEET NO. 09
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. RD-03
JOB NO: D1048	

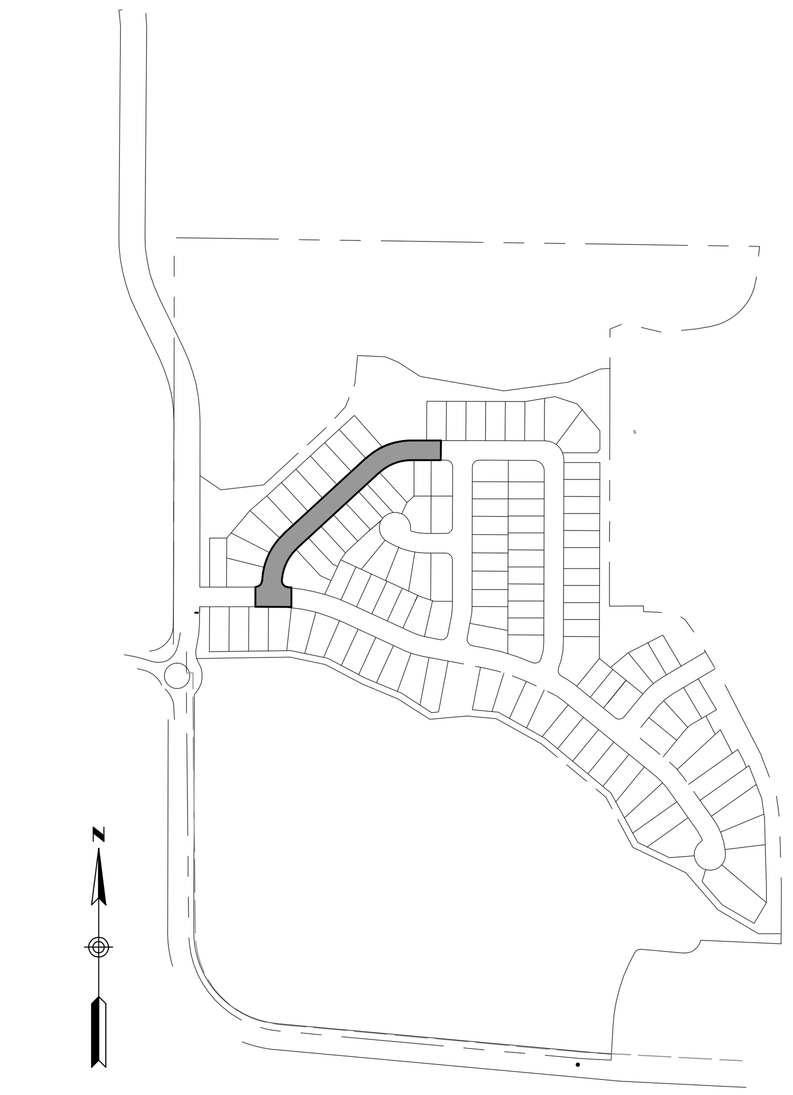


PROFILE – THORNWOOD LN

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'



PLAN – THORNWOOD LN



KEY MAP

SCALE 1"=500'

CL ALIGNMENT TABLE

NUMBER	LENGTH	RADIUS	DELTA (Δ)	LINE/CHORD DIRECTION
15	42.77'	N/A	N/A	N0° 07' 34.39"E
16	144.26'	175.00'	47°13'50"	N23° 44' 29.58"E
17	351.70'	N/A	N/A	N47° 21' 24.76"E
18	112.04'	150.00'	42°47'46"	N68° 45' 17.95"E

CONSTRUCTION NOTES

- 01 CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
- 02 CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
- 03 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
- 04 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
- 05 CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
- 06 SPINE TRAIL PER TOWN OF ERIE STD DTL P25
- 07 DRIVE CUT–DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
- 08 STREET LIGHT
- 09 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
- 10 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
- 11 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
- 12 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
- 13 CHASE DRAIN
- 14 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M–609–1
- 15 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
- 16 5' CURB TRANSITION

40 20 0 40
GRAPHIC SCALE: 1"=40'

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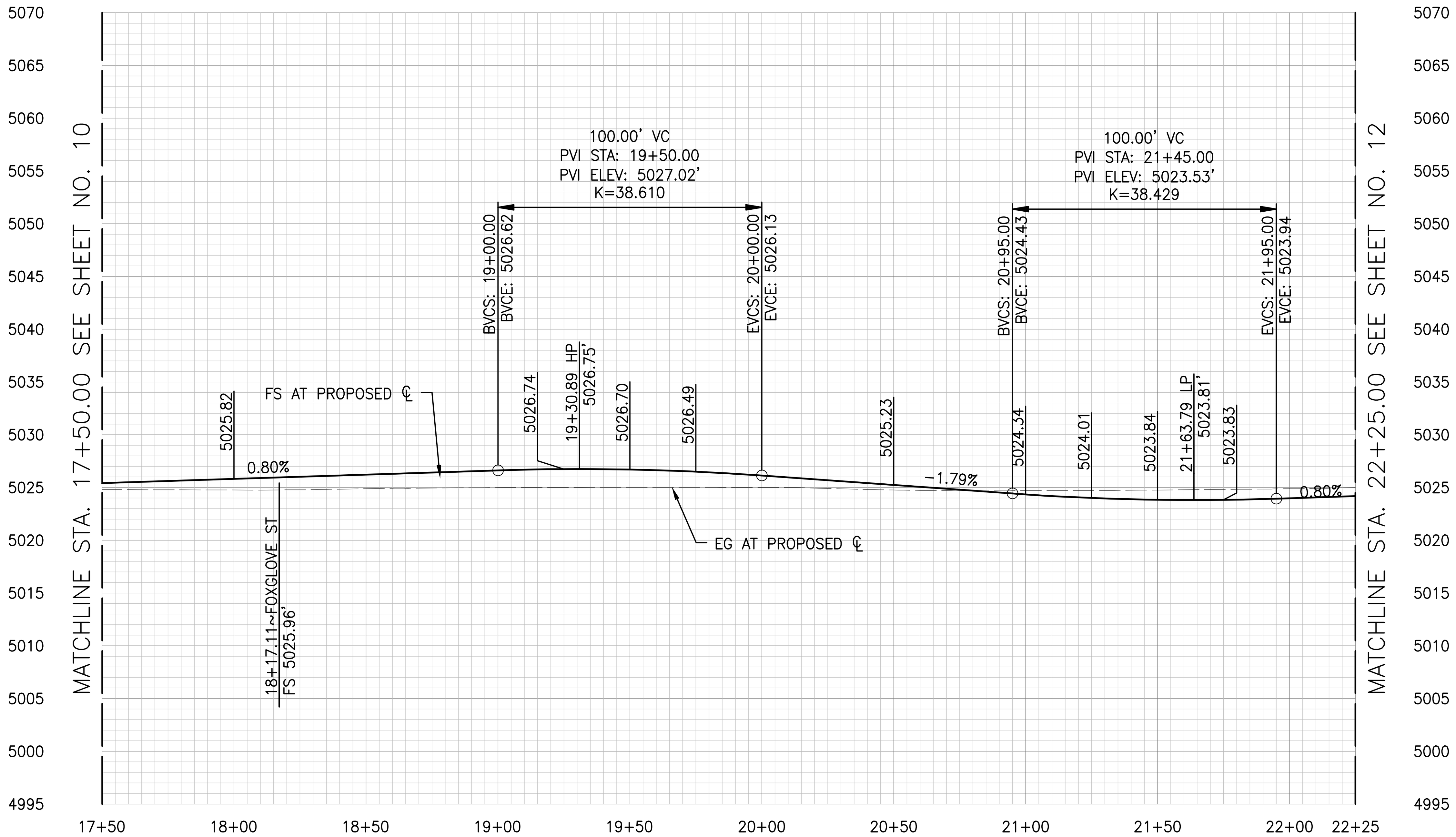
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

ROADWAY PLAN AND PROFILE

TOWN OF ERIE

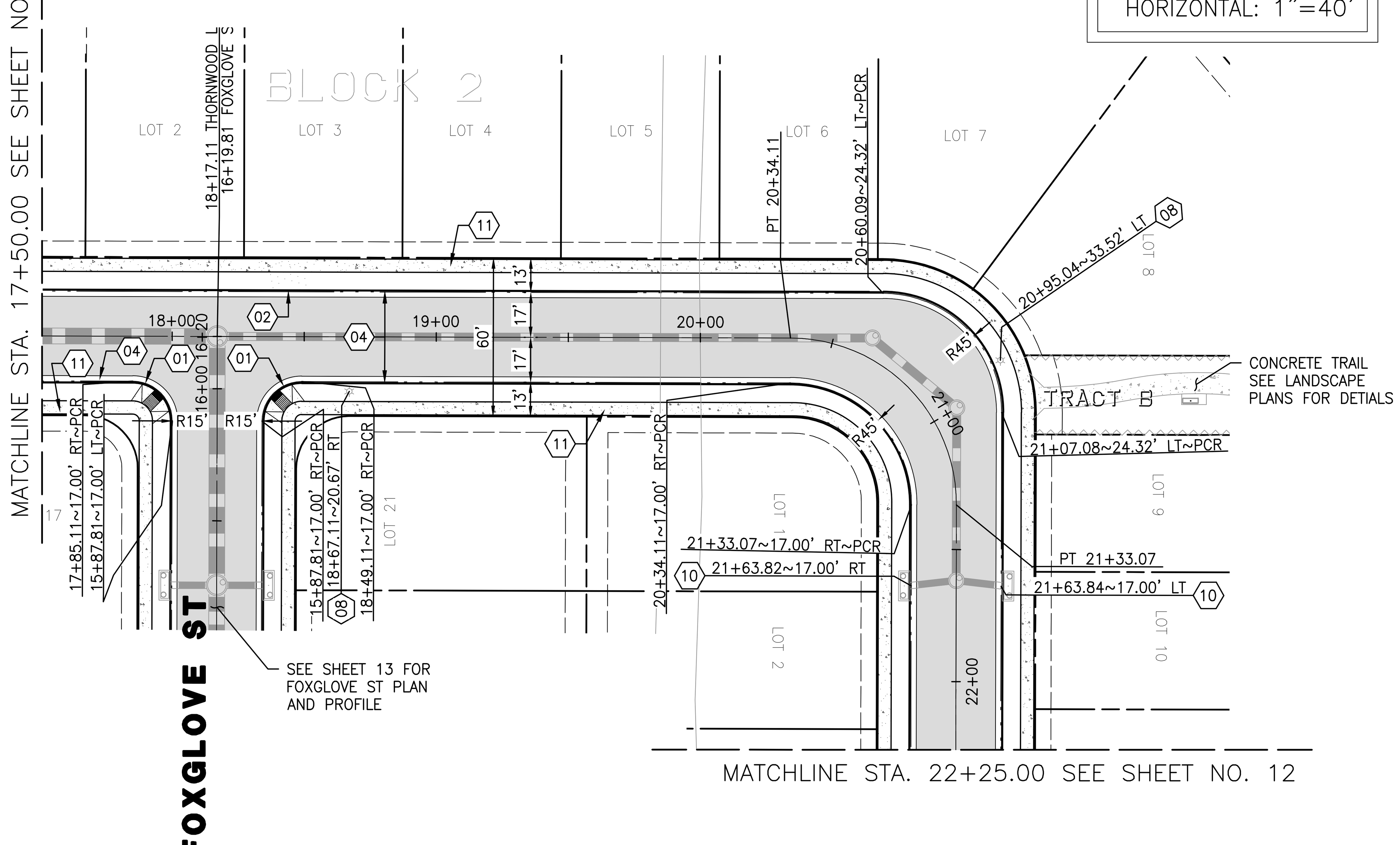
SCALE: 1"=40'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 10 OF 55 SHEETS
DRAWING NO. RD–04



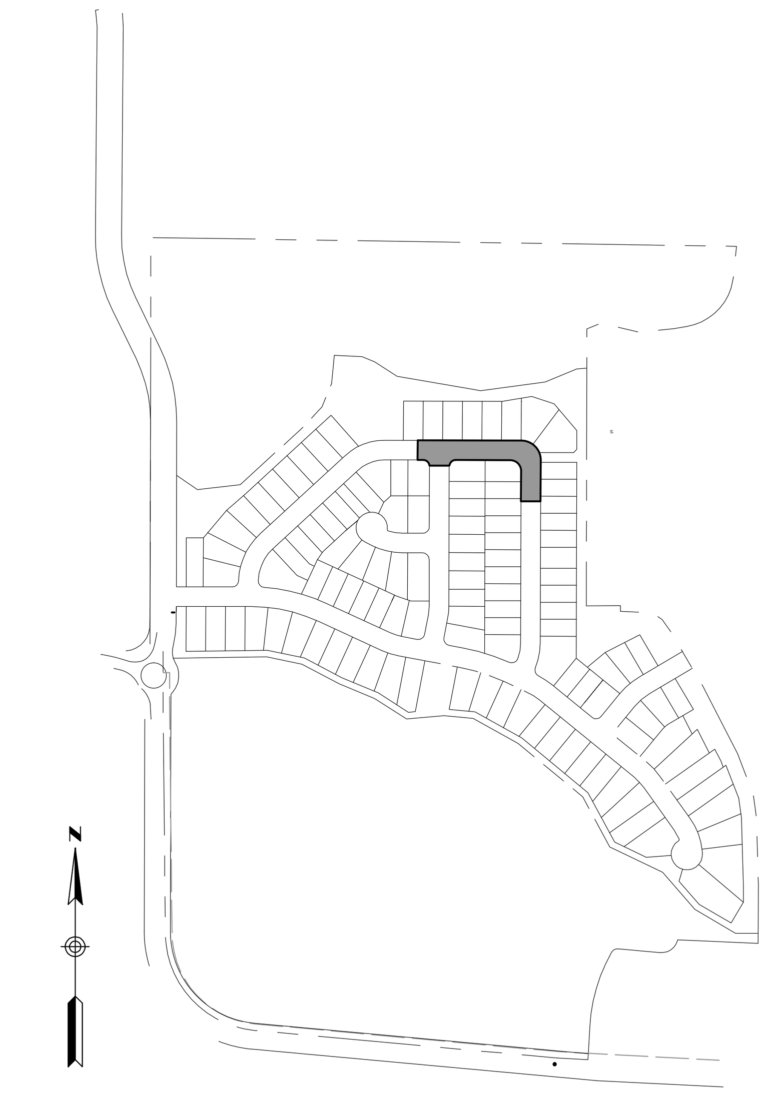
PROFILE – THORNWOOD LN & WILDROSE PL

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'



PLAN – THORNWOOD LN & WILDROSE PL

GRAPHIC SCALE: 1"=40'



KEY MAP

SCALE 1"=500'

CONSTRUCTION NOTES

01 CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02 CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05 CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06 SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07 DRIVE CUT–DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08 STREET LIGHT
09 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
10 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
11 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13 CHASE DRAIN
14 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M–609–1
15 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
16 5' CURB TRANSITION

CL ALIGNMENT TABLE

NUMBER	LENGTH	RADIUS	DELTA (Δ)	LINE/CHORD DIRECTION
19	383.34'	N/A	N/A	S89° 50' 48.86"E
20	98.96'	63.00'	90°00'00"	S44° 50' 48.86"E

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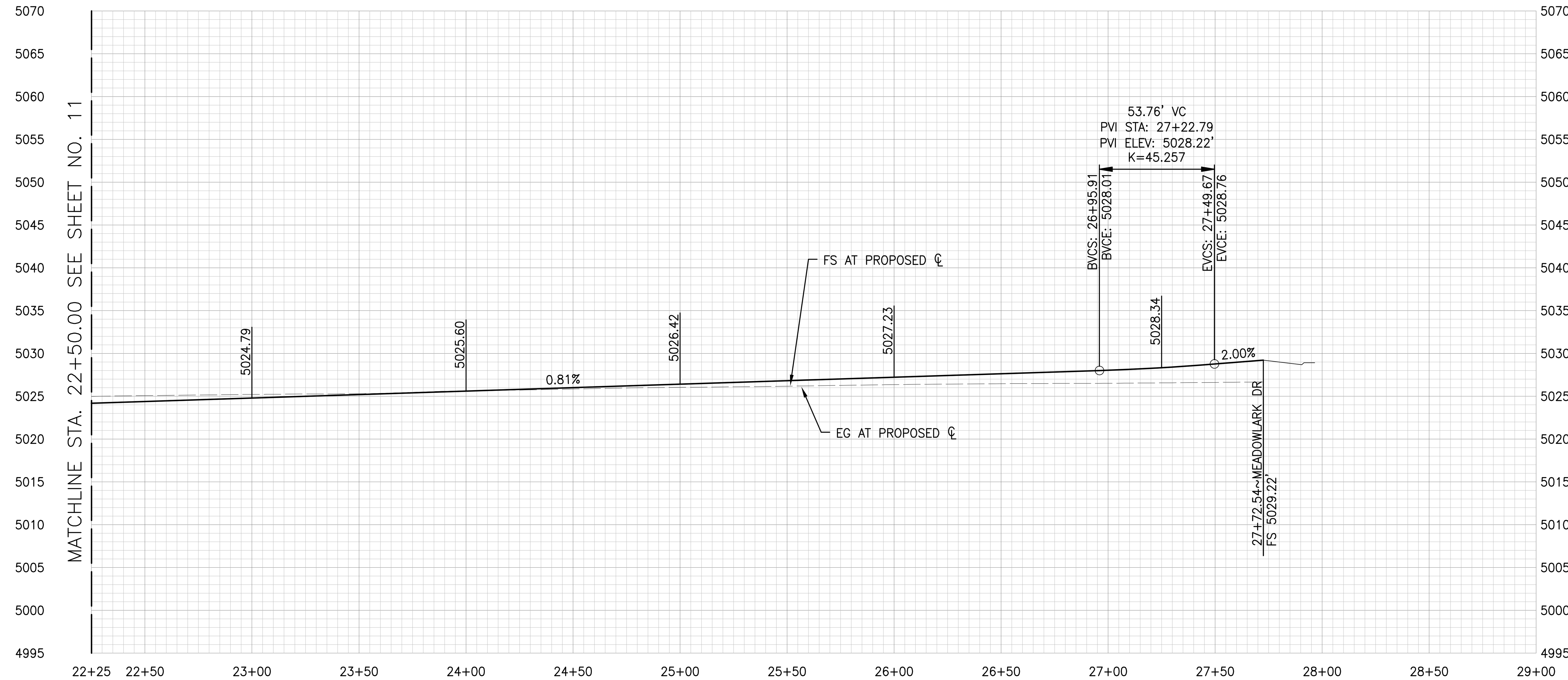
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

ROADWAY PLAN AND PROFILE

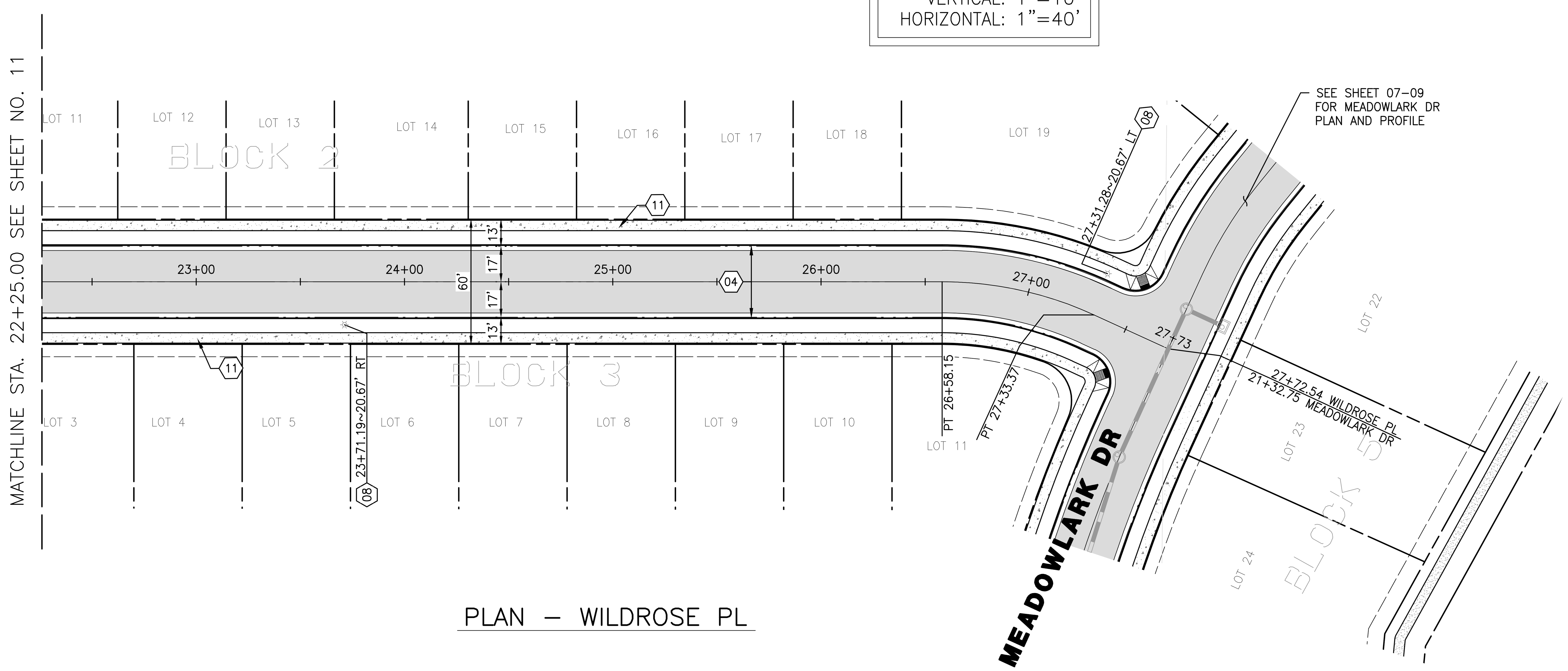
TOWN OF ERIE

SCALE: 1"=40'	SHEET NO. 11
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. RD–05
JOB NO: D1048	

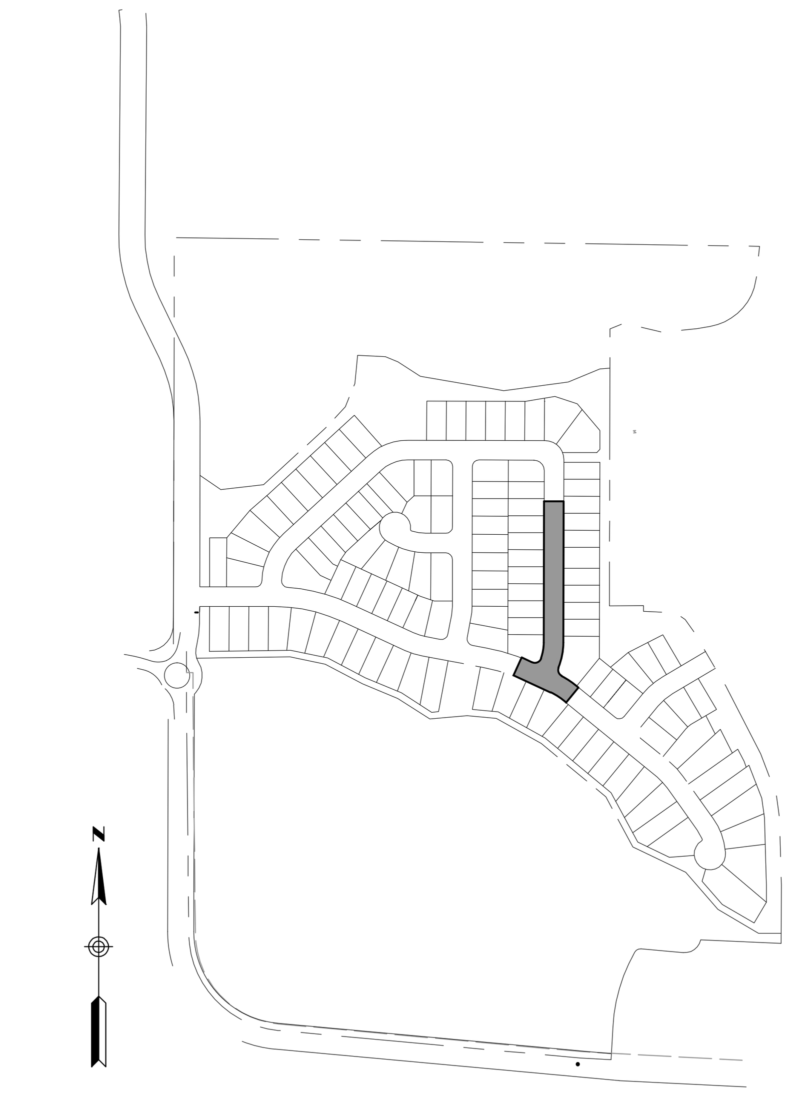


PROFILE – WILDROSE PL

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'



PLAN – WILDROSE PL



KEY MAP
SCALE 1"=500'

CONSTRUCTION NOTES

01 CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02 CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05 CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06 SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07 DRIVE CUT–DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08 STREET LIGHT
09 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
10 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
11 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13 CHASE DRAIN
14 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M–609–1
15 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
16 5' CURB TRANSITION

CL ALIGNMENT TABLE

NUMBER	LENGTH	RADIUS	DELTA (Δ)	LINE/CHORD DIRECTION
21	525.09'	N/A	N/A	S0° 09' 11.14"W
22	75.22'	175.00'	24°37'41"	S12° 28' 01.78"W
23	39.16'	N/A	N/A	S24° 46' 52.42"W

40 20 0 40
GRAPHIC SCALE: 1"=40'

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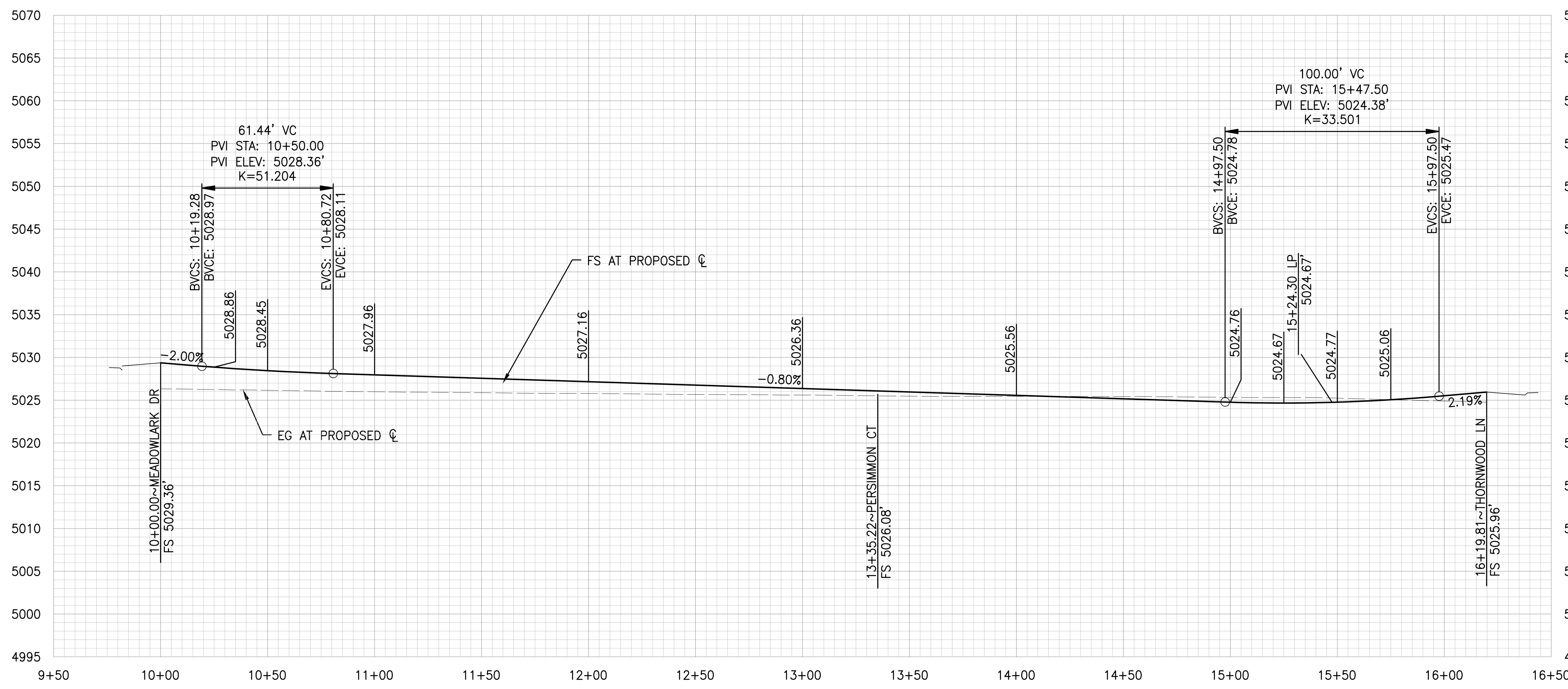
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

ROADWAY PLAN AND PROFILE

TOWN OF ERIE

SCALE: 1"=40'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

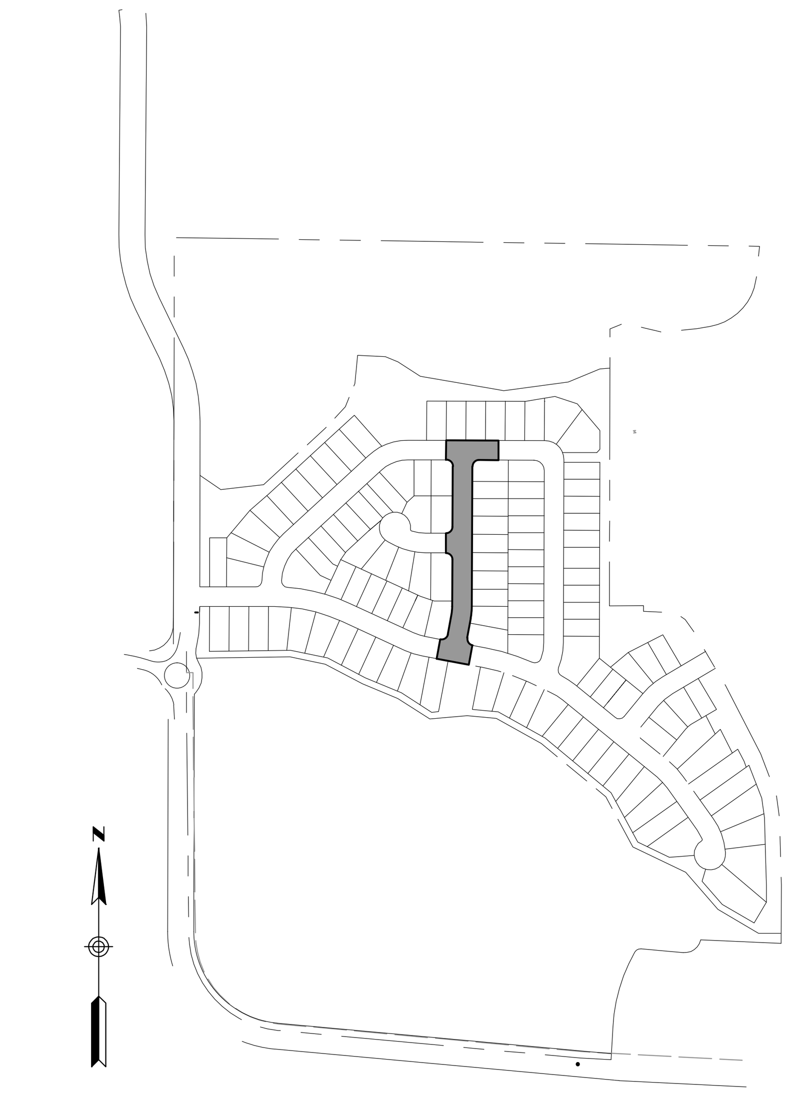
SHEET NO. 12 OF 55 SHEETS
DRAWING NO. RD-06



PROFILE – FOXGLOVE ST

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'

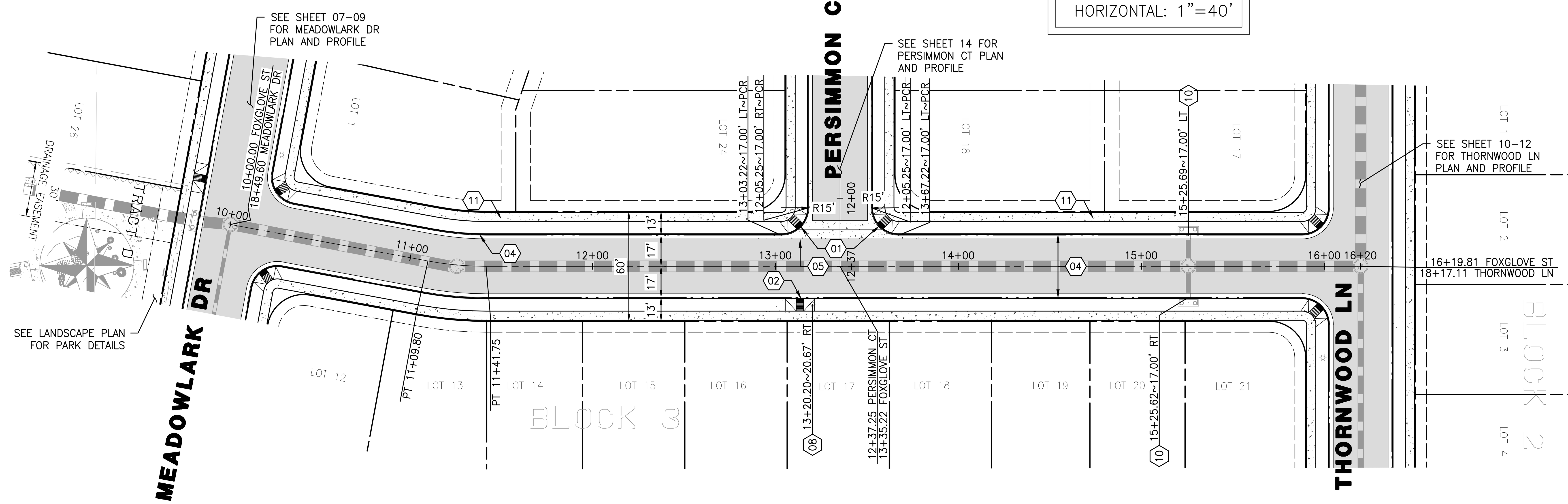
CL ALIGNMENT TABLE				
NUMBER	LENGTH	RADIUS	DELTA (Δ)	LINE/CHORD DIRECTION
24	109.80'	N/A	N/A	N10° 36' 51.46"E
25	31.95'	175.00'	10°27'40"	N5° 23' 01.30"E
26	478.06'	N/A	N/A	N0° 09' 11.14"E



KEY MAP
SCALE 1"=500'

CONSTRUCTION NOTES

01. CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02. CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03. 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04. 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05. CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06. SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07. DRIVE CUT–DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08. STREET LIGHT
09. 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
10. 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
11. 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12. 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13. CHASE DRAIN
14. 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M–609–1
15. 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M–604–12
16. 5' CURB TRANSITION



PLAN – FOXGLOVE ST

GRAPHIC SCALE: 1"=40'

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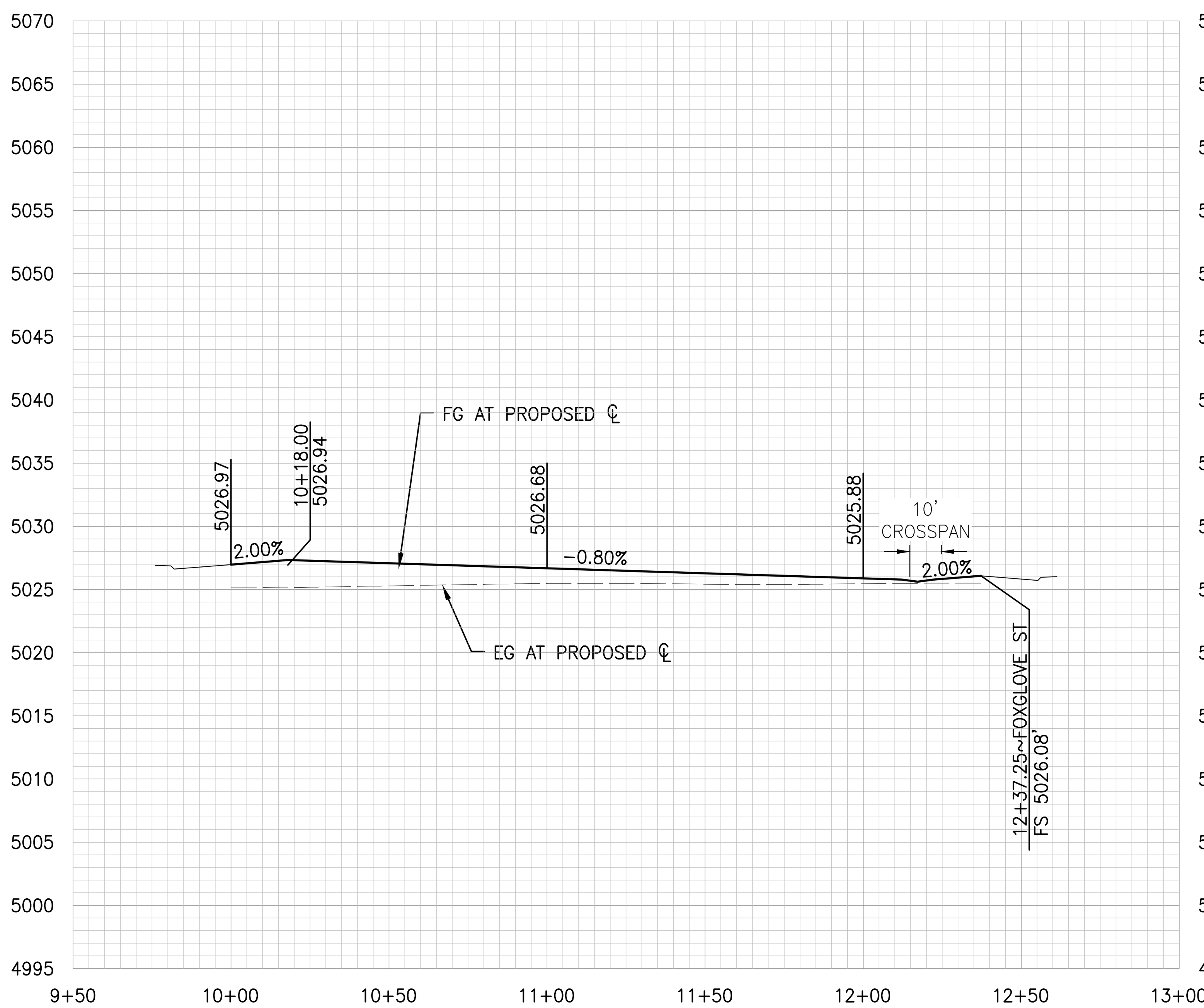
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

ROADWAY PLAN AND PROFILE

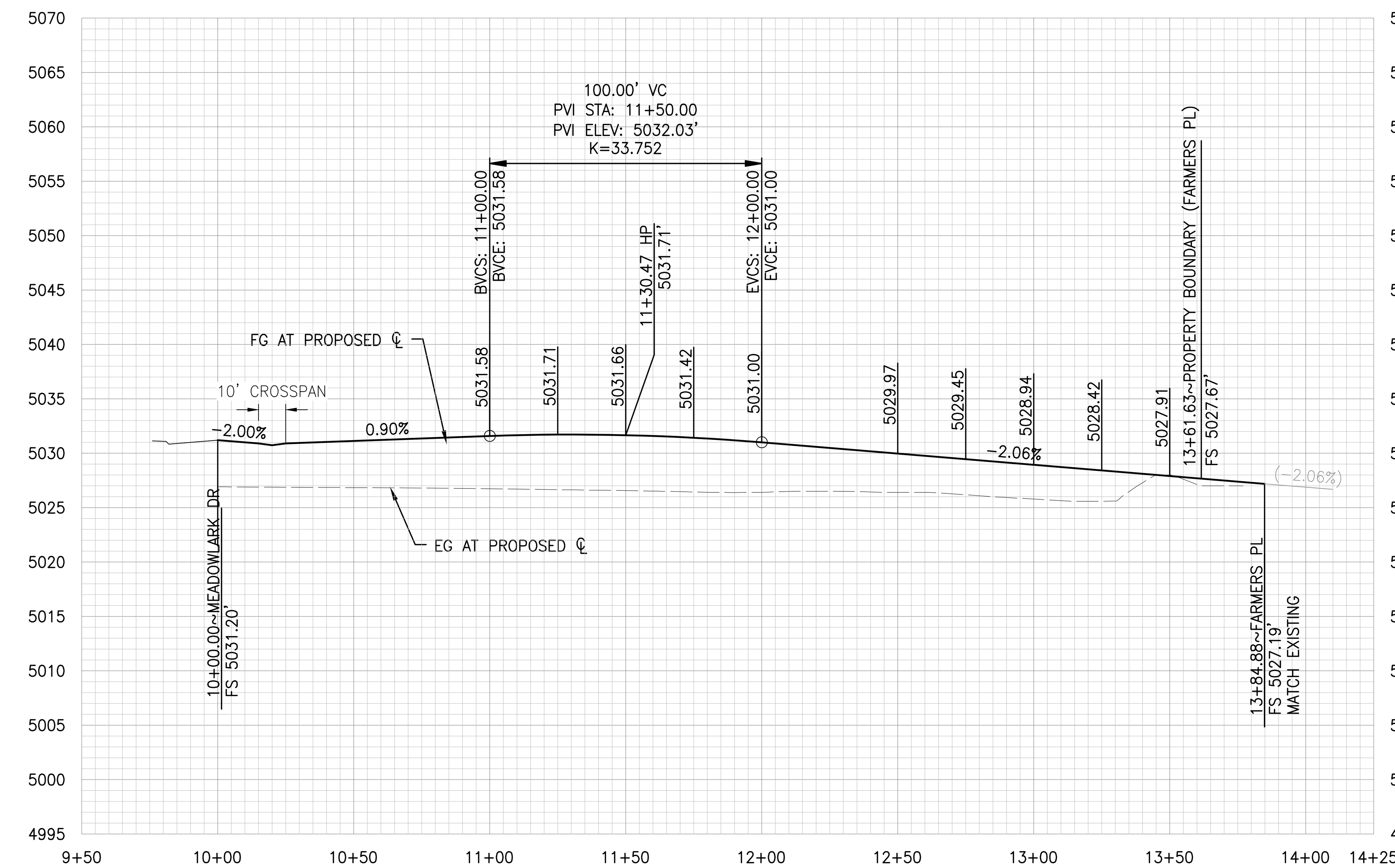
TOWN OF ERIE

SCALE: 1"=40'	SHEET NO. 13
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	DRAWING NO. RD–07
CHECKED BY: TB	
JOB NO: D1048	



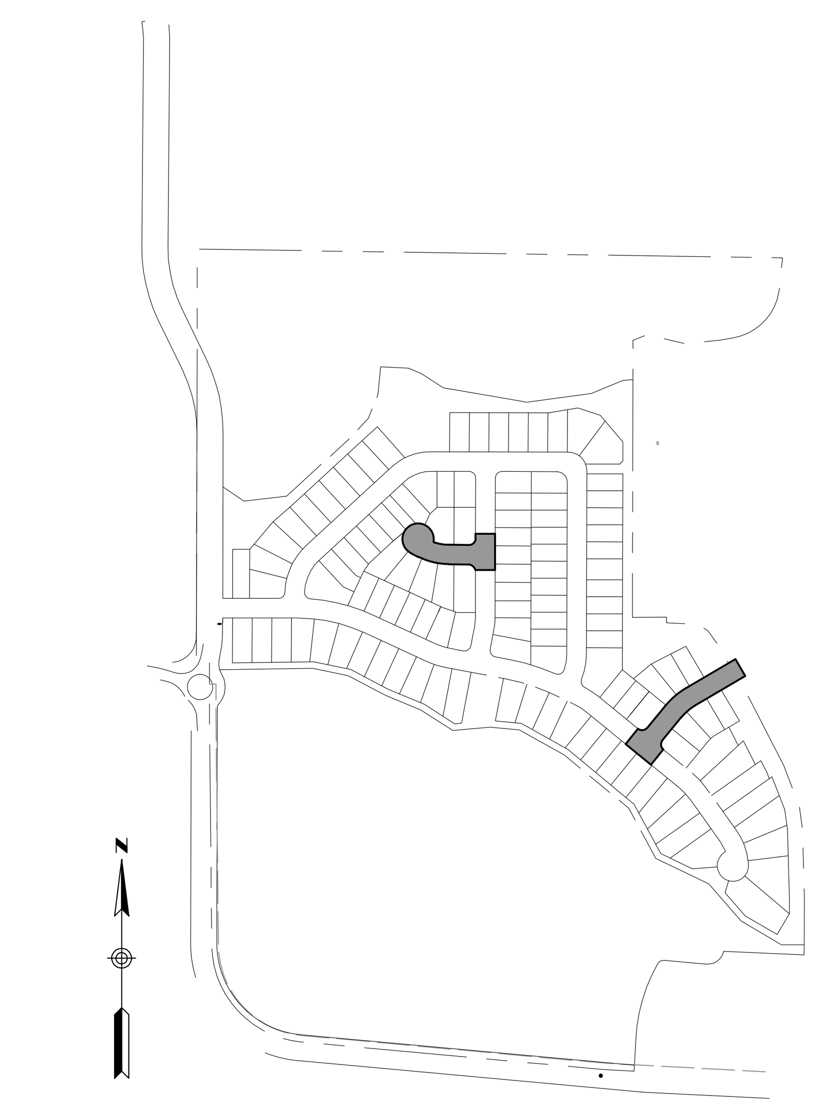
PROFILE – PERSIMMON CT

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'



PROFILE – FARMERS PL

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'

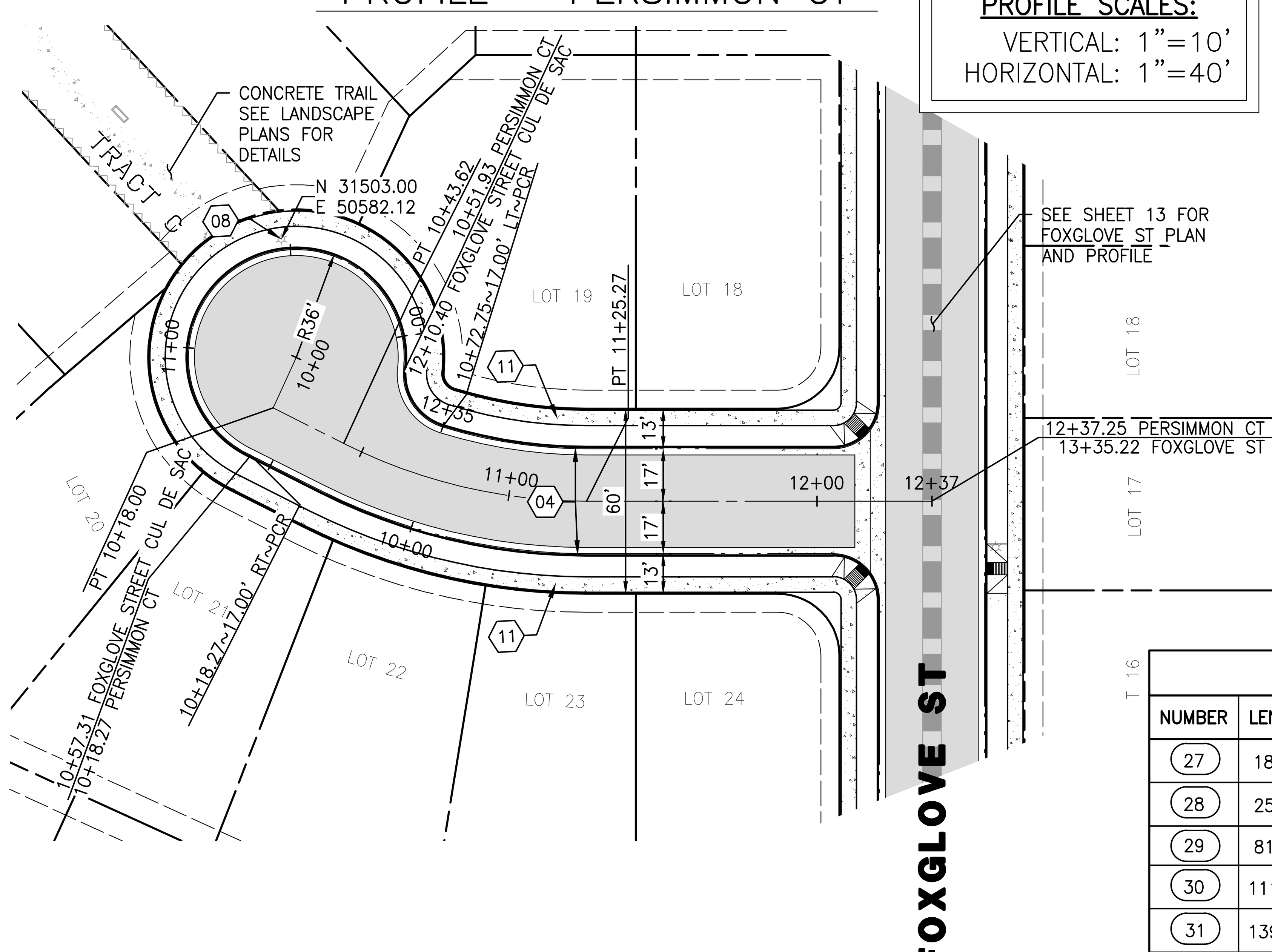


KEY MAP

SCALE 1"=500'

CONSTRUCTION NOTES

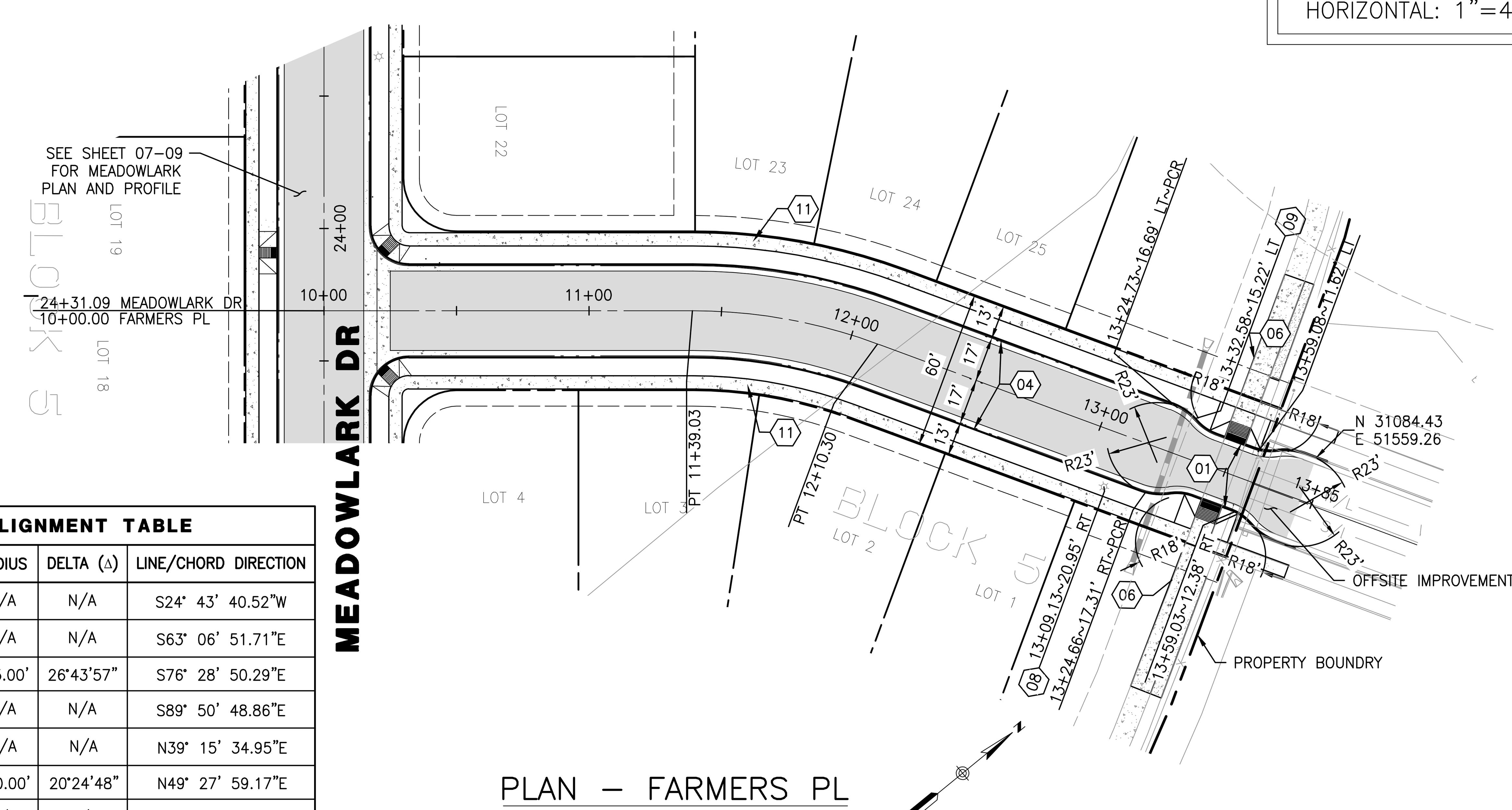
01. CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02. CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03. 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04. 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05. CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06. SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07. DRIVE CUT–DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08. STREET LIGHT
09. 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
10. 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
11. 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12. 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13. CHASE DRAIN
14. 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M–609–1
15. 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
16. 5' CURB TRANSITION



PLAN – PERSIMMON CT

CL ALIGNMENT TABLE

NUMBER	LENGTH	RADIUS	DELTA (Δ)	LINE/CHORD DIRECTION
27	18.00'	N/A	N/A	S24° 43' 40.52"W
28	25.62'	N/A	N/A	S63° 06' 51.71"E
29	81.65'	175.00'	26°43'57"	S76° 28' 50.29"E
30	111.98'	N/A	N/A	S89° 50' 48.86"E
31	139.03'	N/A	N/A	N39° 15' 34.95"E
32	71.26'	200.00'	20°24'48"	N49° 27' 59.17"E
33	165.81'	N/A	N/A	N59° 40' 23.39"E



PLAN – FARMERS PL

40 20 0 40
GRAPHIC SCALE: 1"=40'

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MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

ROADWAY PLAN AND PROFILE

TOWN OF ERIE

SCALE: 1"=40'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 14
OF 55 SHEETS
DRAWING NO. RD–08

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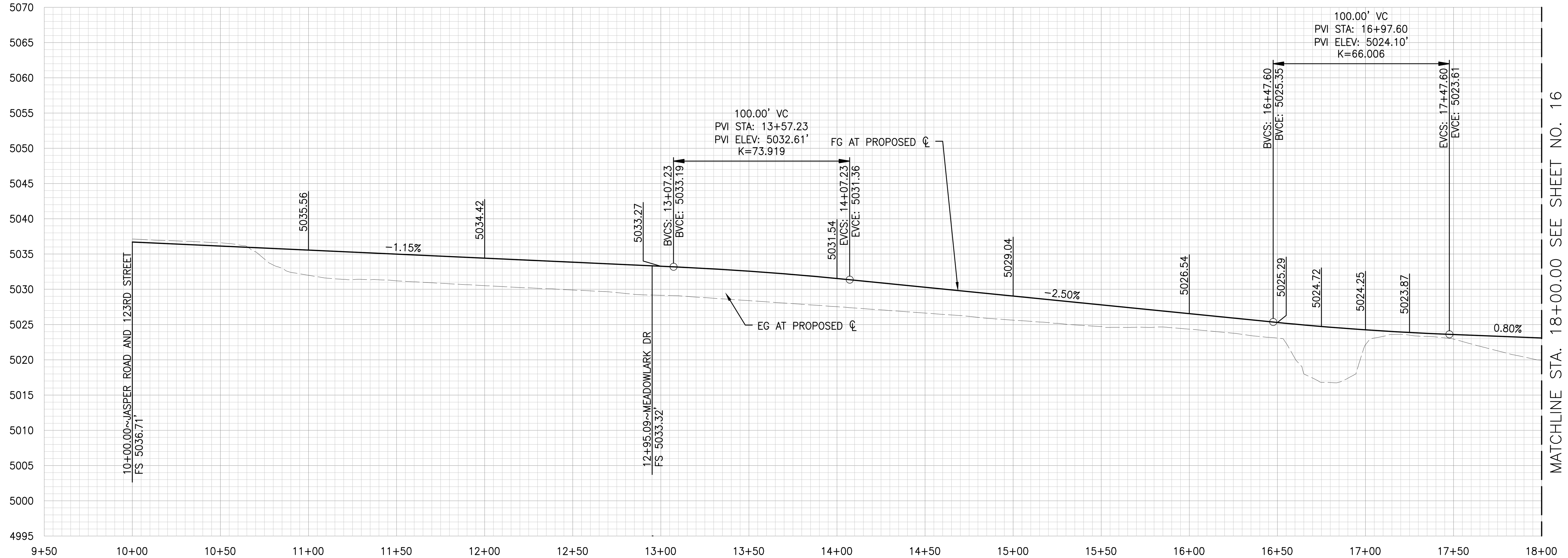
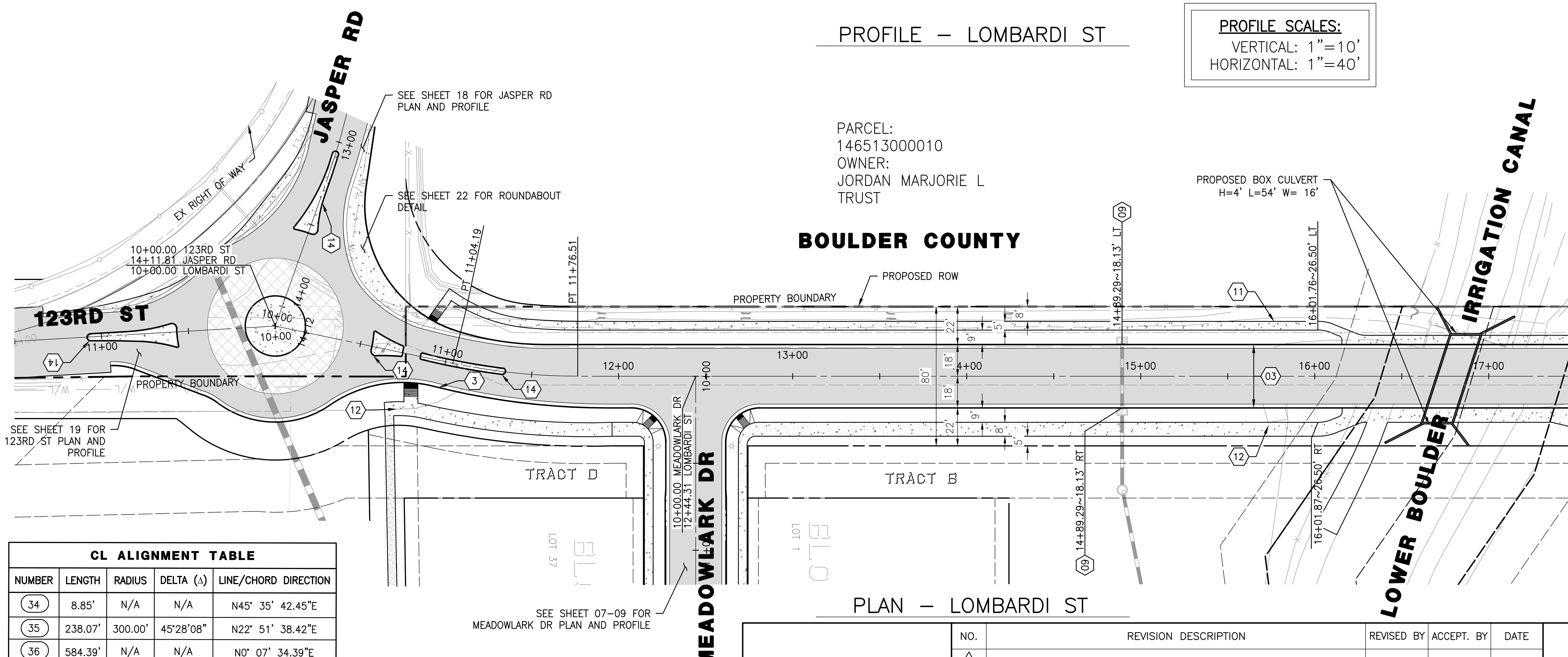


PROFILE – LOMBARDI ST

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'

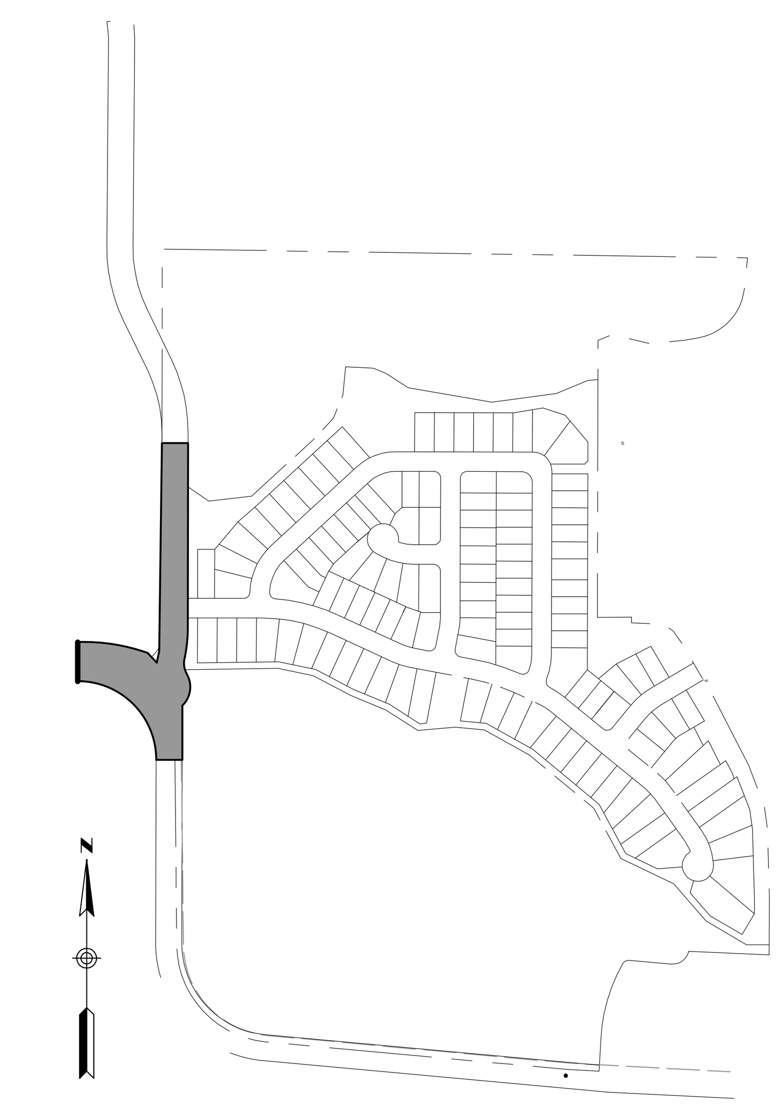


PLAN – LOMBARDI ST

CL ALIGNMENT TABLE

NUMBER	LENGTH	RADIUS	DELTA (Δ)	LINE/CHORD DIRECTION
34	8.85'	N/A	N/A	N45° 35' 42.45"E
35	238.07'	300.00'	45°28'08"	N22° 51' 38.42"E
36	584.39'	N/A	N/A	N0° 07' 34.39"E

GRAPHIC SCALE: 1"=40'



KEY MAP

SCALE 1"=500'

CONSTRUCTION NOTES

01 CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02 CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05 CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06 SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07 DRIVE CUT-DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08 STREET LIGHT
09 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
10 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
11 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13 CHASE DRAIN
14 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M-609-1
15 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
16 5' CURB TRANSITION

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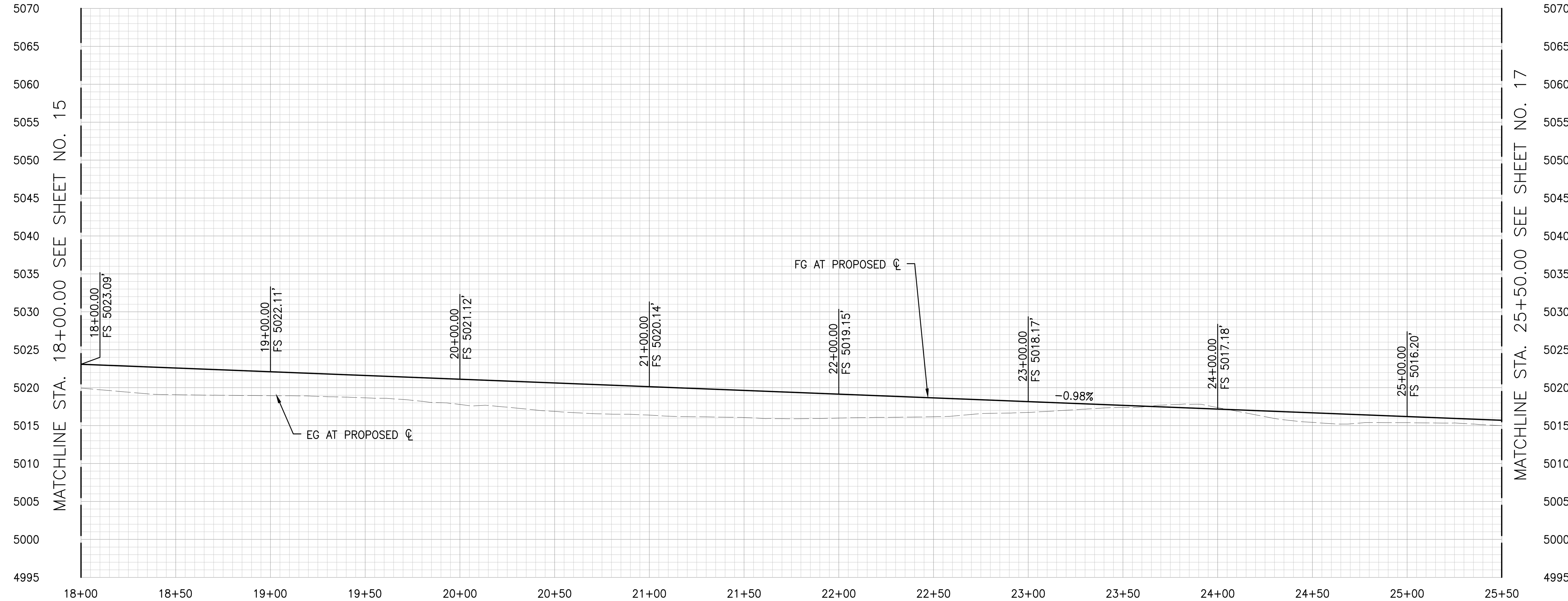
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

ROADWAY PLAN AND PROFILE

TOWN OF ERIE

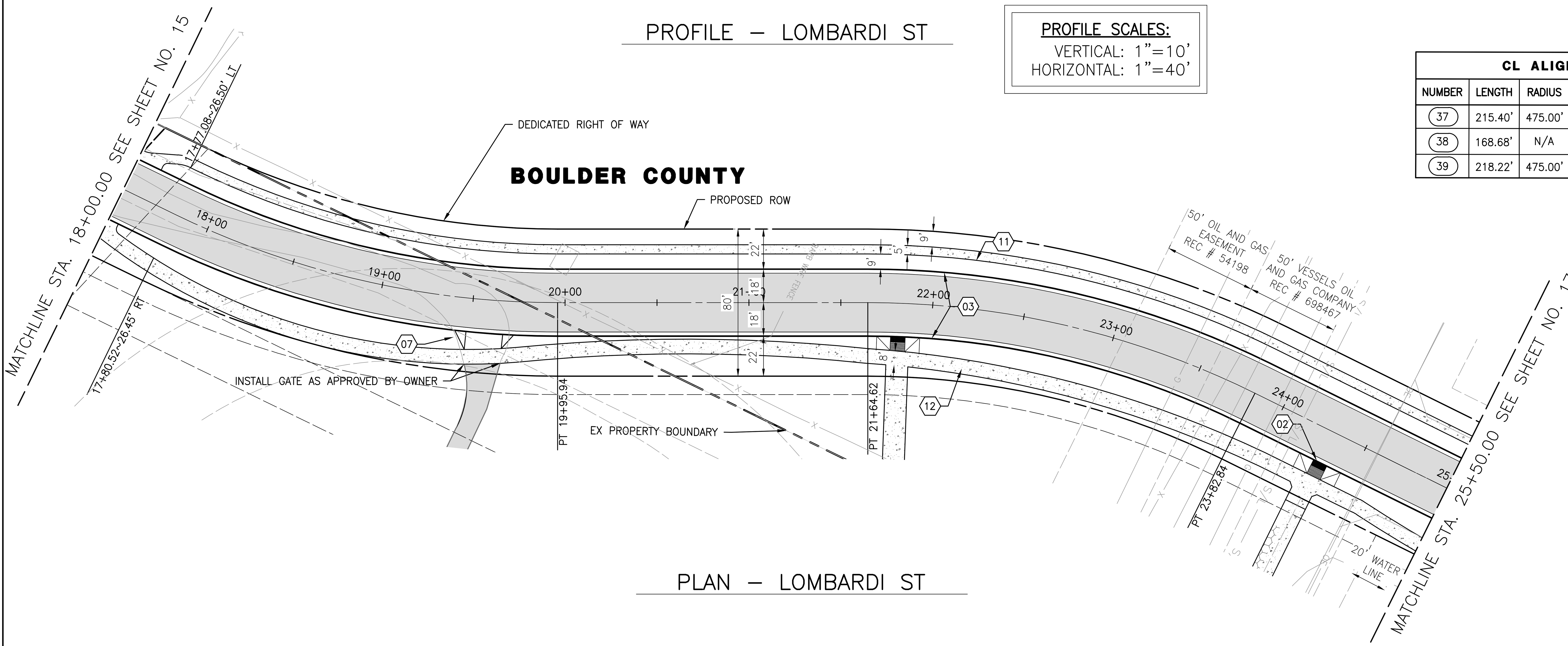
SCALE: 1"=40'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 15 OF 55 SHEETS
DRAWING NO. RD-09



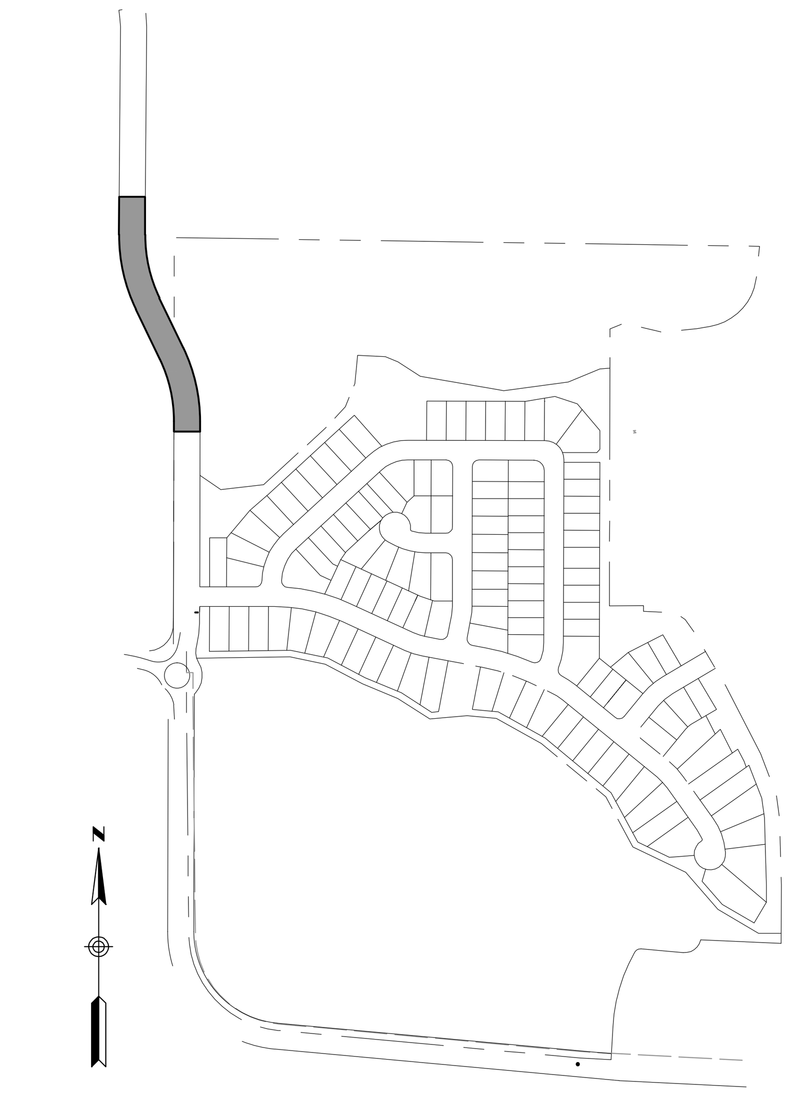
PROFILE – LOMBARDI ST

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'



PLAN – LOMBARDI ST

CL ALIGNMENT TABLE				
NUMBER	LENGTH	RADIUS	DELTA (Δ)	LINE/CHORD DIRECTION
37	215.40'	475.00'	25°58'56"	N12° 51' 53.57"W
38	168.68'	N/A	N/A	N25° 51' 21.52"W
39	218.22'	475.00'	26°19'21"	N12° 41' 41.26"W



KEY MAP

SCALE 1"=500'

CONSTRUCTION NOTES

01. CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02. CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03. 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04. 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05. CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06. SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07. DRIVE CUT-DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08. STREET LIGHT
09. 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
10. 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
11. 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12. 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13. CHASE DRAIN
14. 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M-609-1
15. 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
16. 5' CURB TRANSITION

40 20 0 40
GRAPHIC SCALE: 1"=40'

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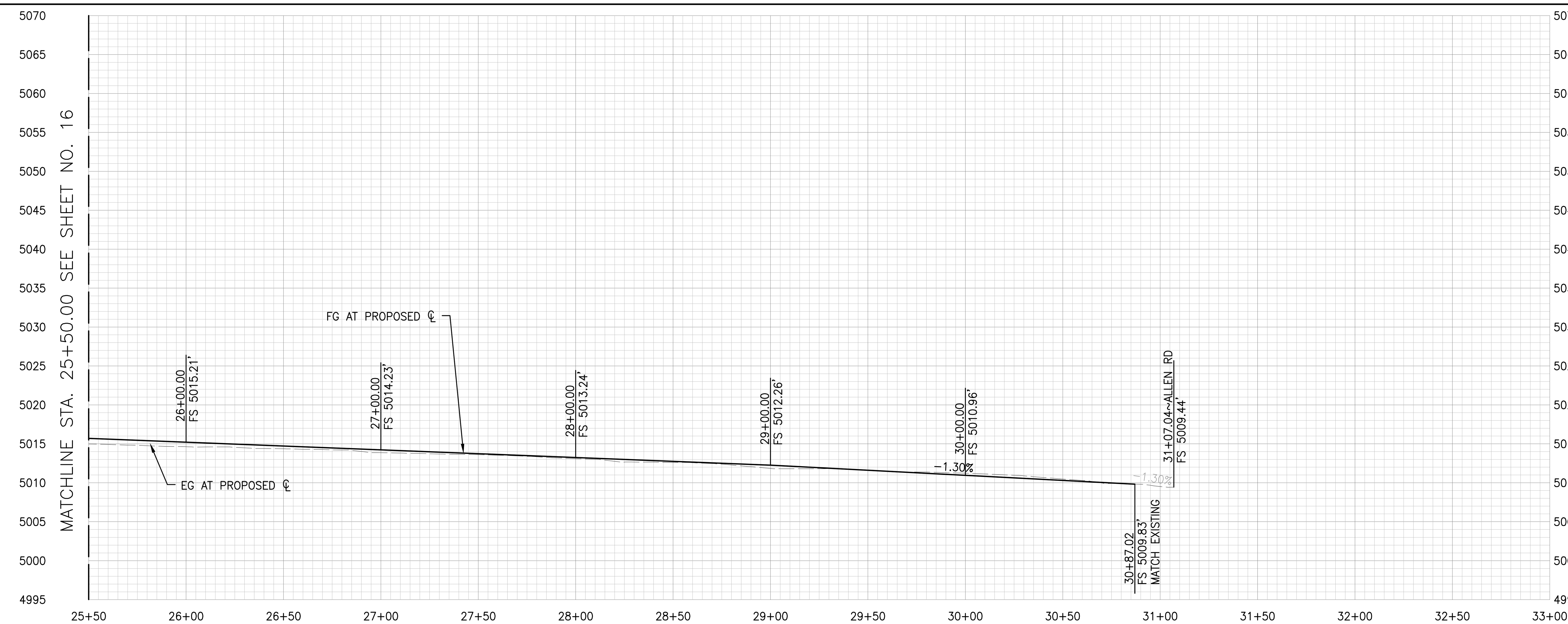
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

ROADWAY PLAN AND PROFILE

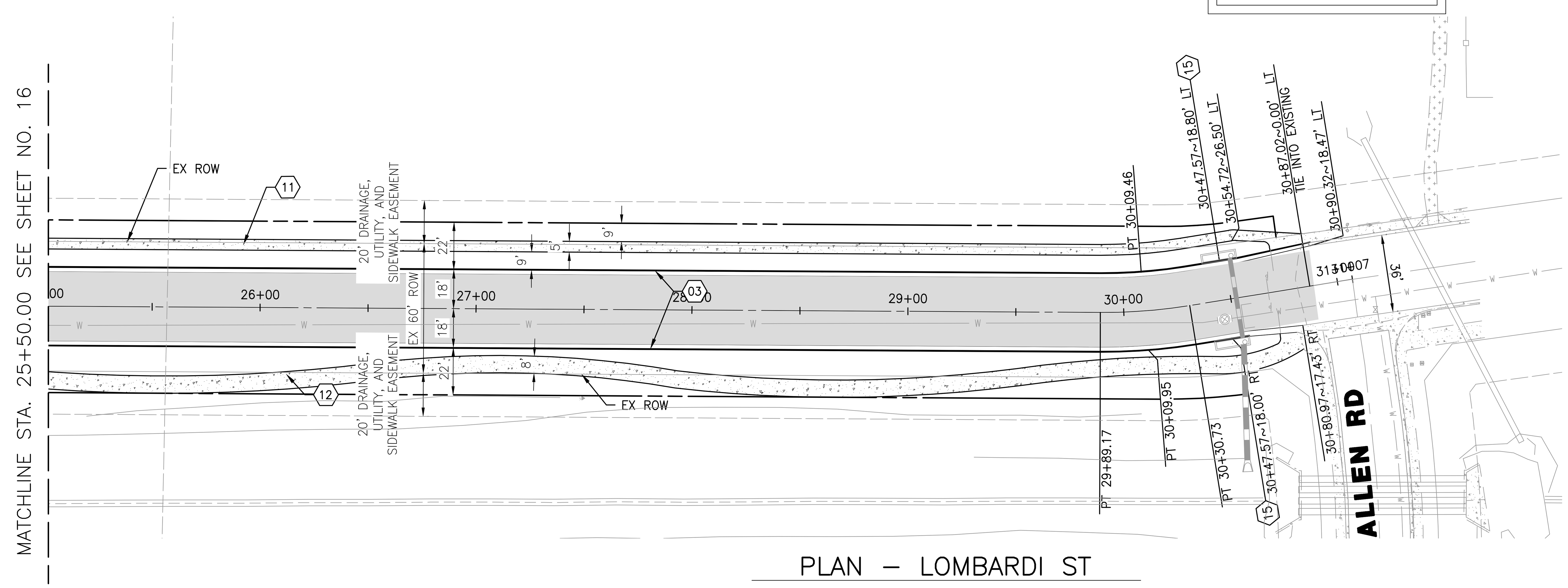
TOWN OF ERIE

SCALE: 1"=40'	SHEET NO. 16
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	DRAWING NO. RD-10
CHECKED BY: TB	
JOB NO: D1048	

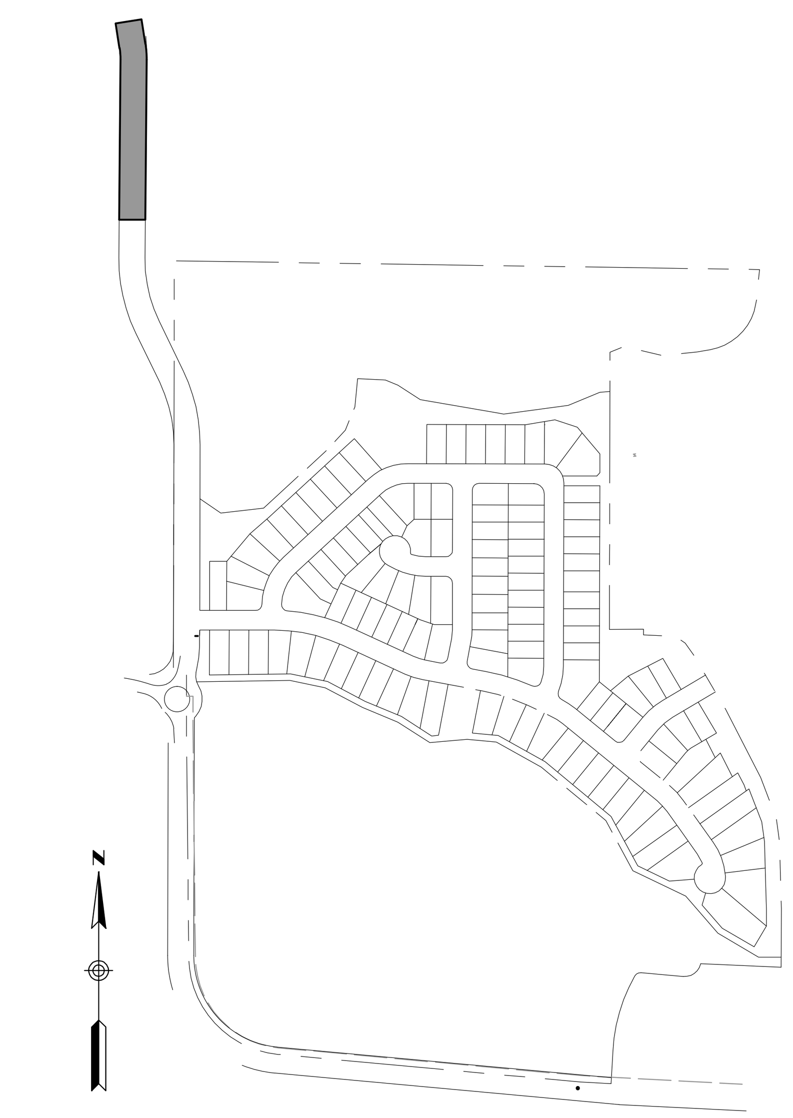


PROFILE – LOMBARDI ST

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'



PLAN – LOMBARDI ST



KEY MAP
SCALE 1"=500'

CL ALIGNMENT TABLE				
NUMBER	LENGTH	RADIUS	DELTA (Δ)	LINE/CHORD DIRECTION
40	606.34'	N/A	N/A	N0° 27' 59.00"E
41	41.56'	250.00'	9°31'29"	N4° 17' 45.70"W
42	76.30'	N/A	N/A	N9° 03' 30.41"W

CONSTRUCTION NOTES

01 CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02 CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05 CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06 SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07 DRIVE CUT-DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08 STREET LIGHT
09 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
10 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
11 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13 CHASE DRAIN
14 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M-609-1
15 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
16 5' CURB TRANSITION

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40 20 0 40
GRAPHIC SCALE: 1"=40'

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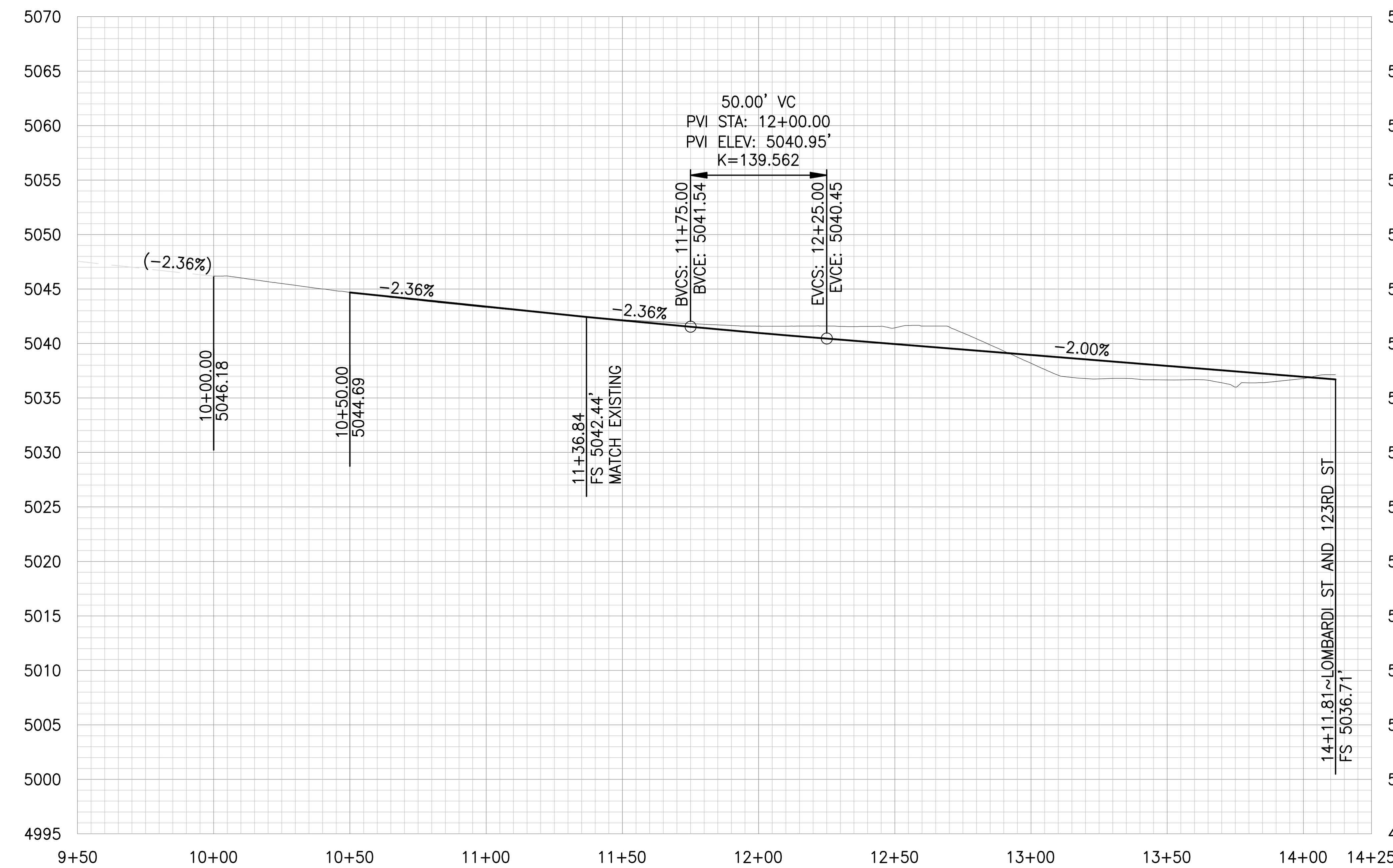
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

ROADWAY PLAN AND PROFILE

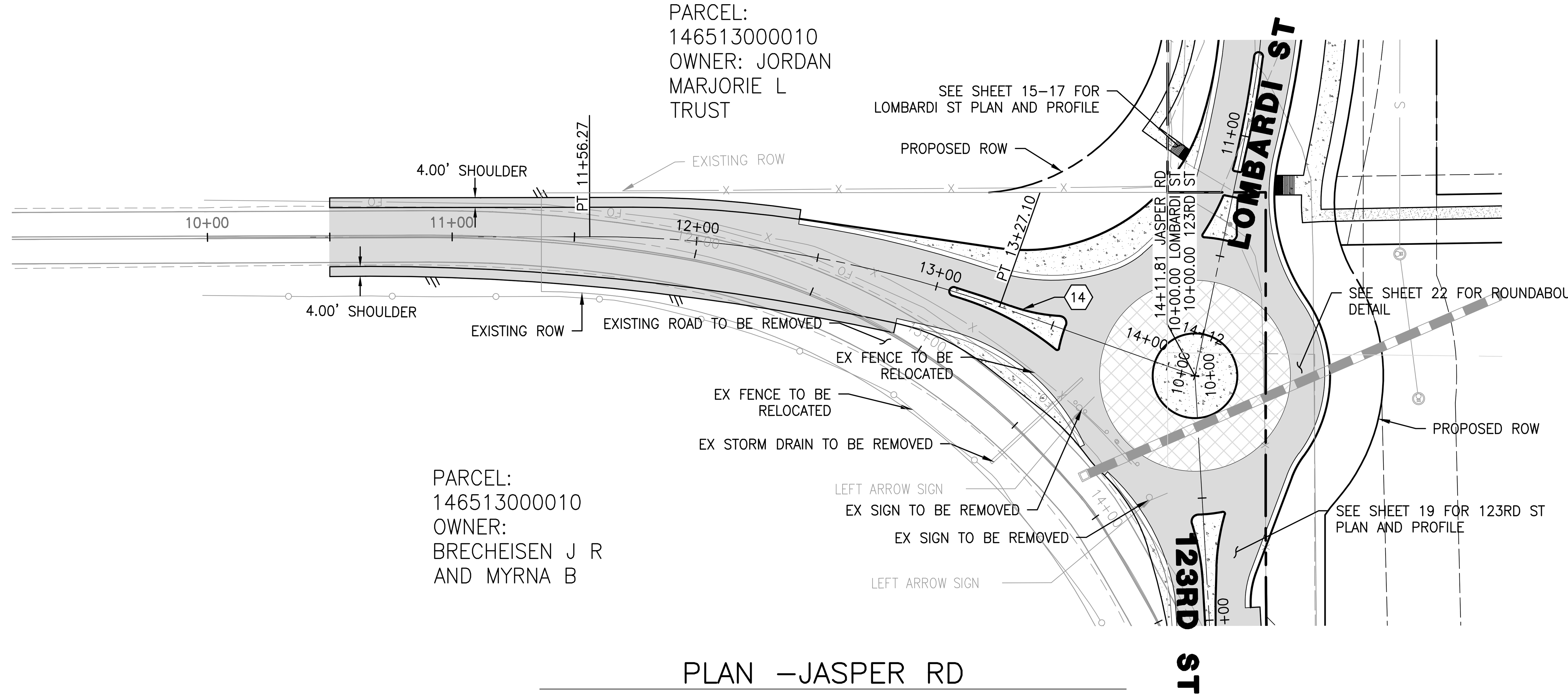
TOWN OF ERIE

SCALE: 1"=40'	SHEET NO. 17
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	DRAWING NO. RD-11
CHECKED BY: TB	
JOB NO: D1048	

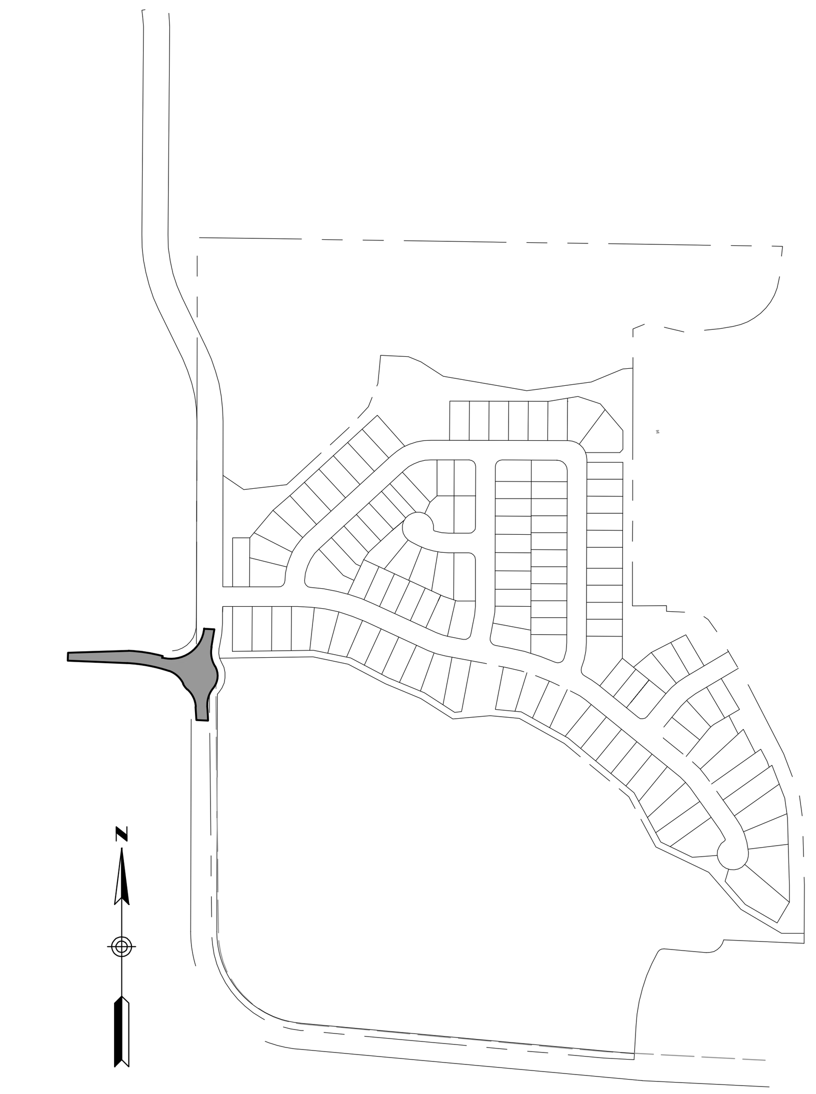


PROFILE -JASPER RD

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'



PLAN -JASPER RD



KEY MAP
SCALE 1"=500'

CONSTRUCTION NOTES

01 CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02 CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05 CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06 SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07 DRIVE CUT-DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08 STREET LIGHT
09 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
10 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
11 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13 CHASE DRAIN
14 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M-609-1
15 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
16 5' CURB TRANSITION

40 20 0 40
GRAPHIC SCALE: 1"=40'

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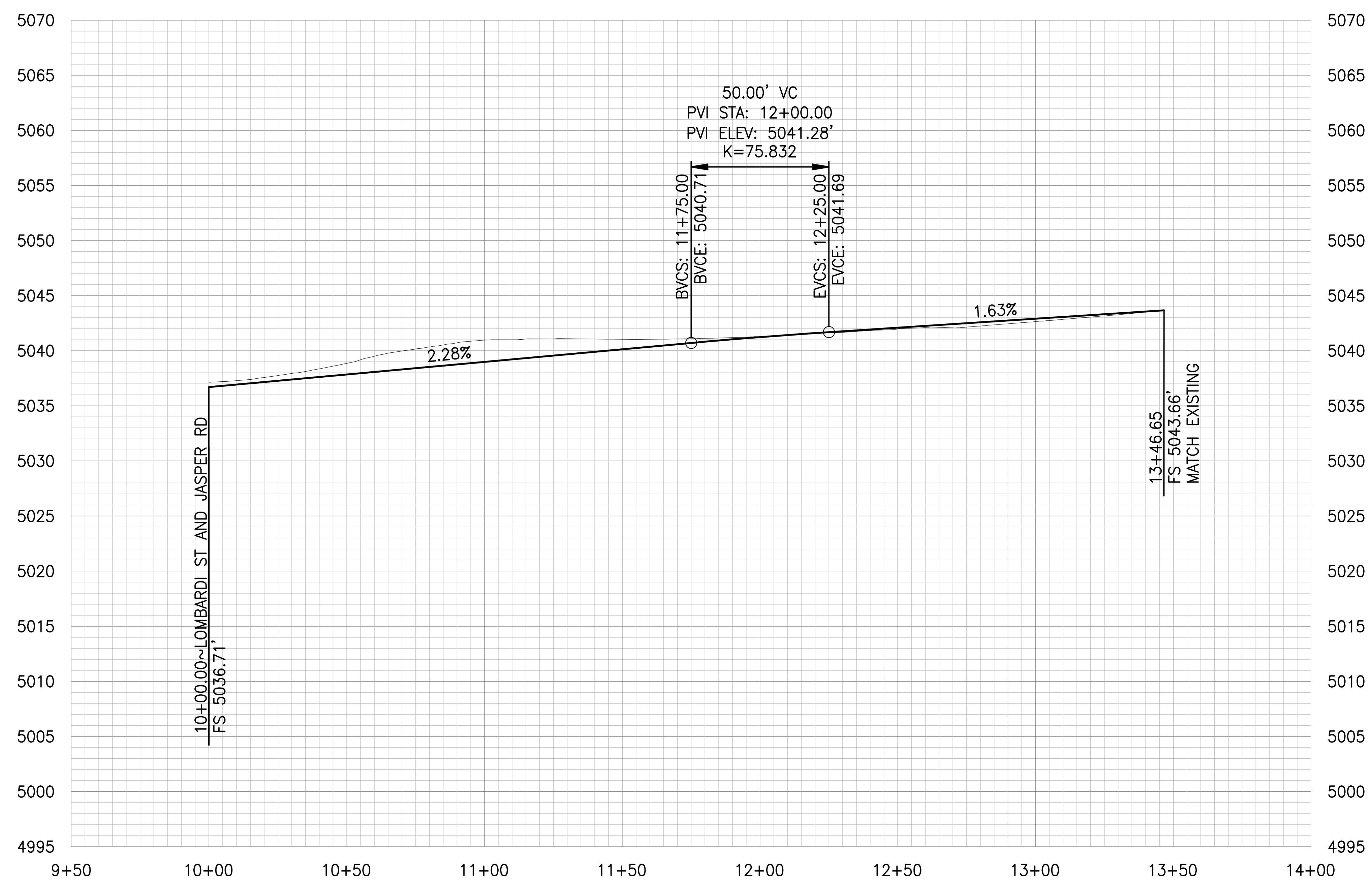
ROADWAY PLAN AND PROFILE

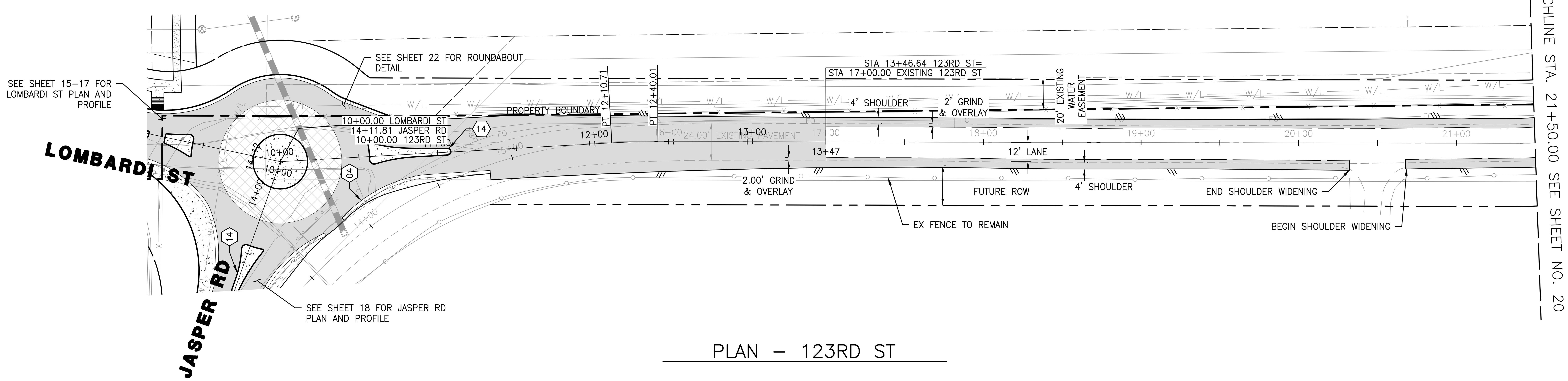
TOWN OF ERIE

SCALE: 1"=40'	SHEET NO. 18
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. RD-12
JOB NO: D1048	

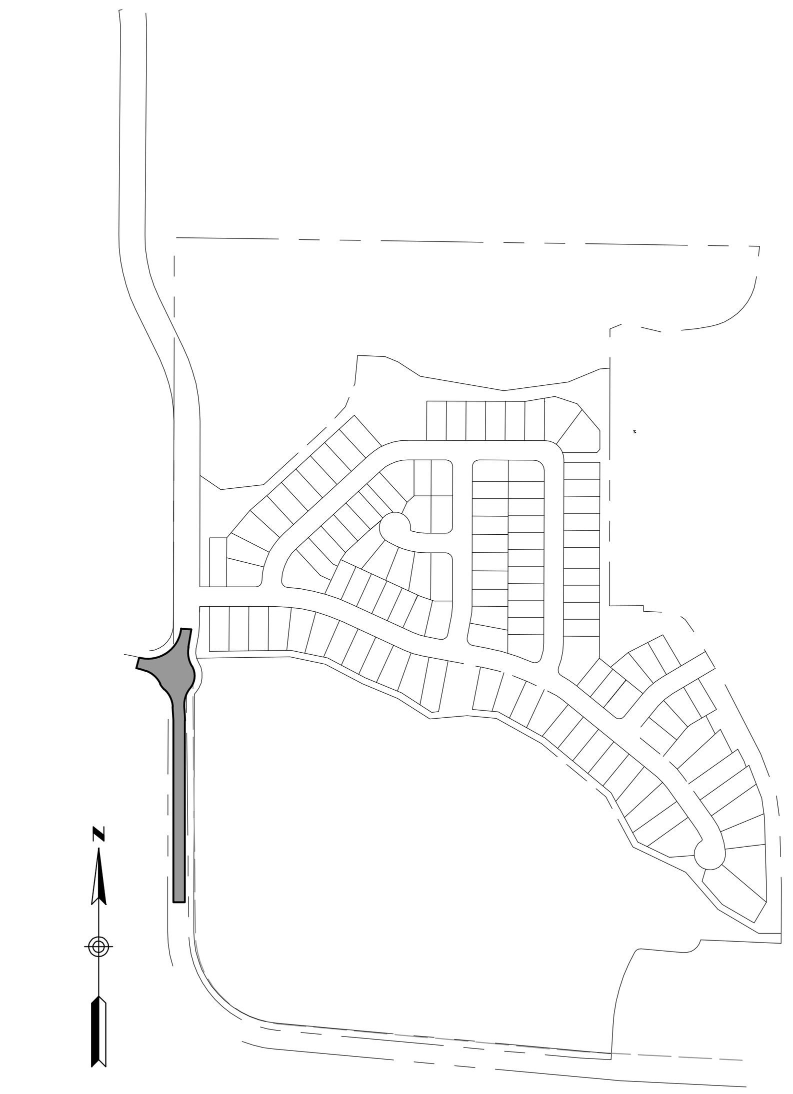


PROFILE – 123RD ST

PROFILE SCALES:
VERTICAL: 1"=10'
HORIZONTAL: 1"=40'



PLAN – 123RD ST



KEY MAP
SCALE 1"=500'

CONSTRUCTION NOTES

01 CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02 CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05 CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06 SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07 DRIVE CUT-DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08 STREET LIGHT
09 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
10 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
11 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13 CHASE DRAIN
14 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M-609-1
15 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
16 5' CURB TRANSITION

40 20 0 40
GRAPHIC SCALE: 1"=40'

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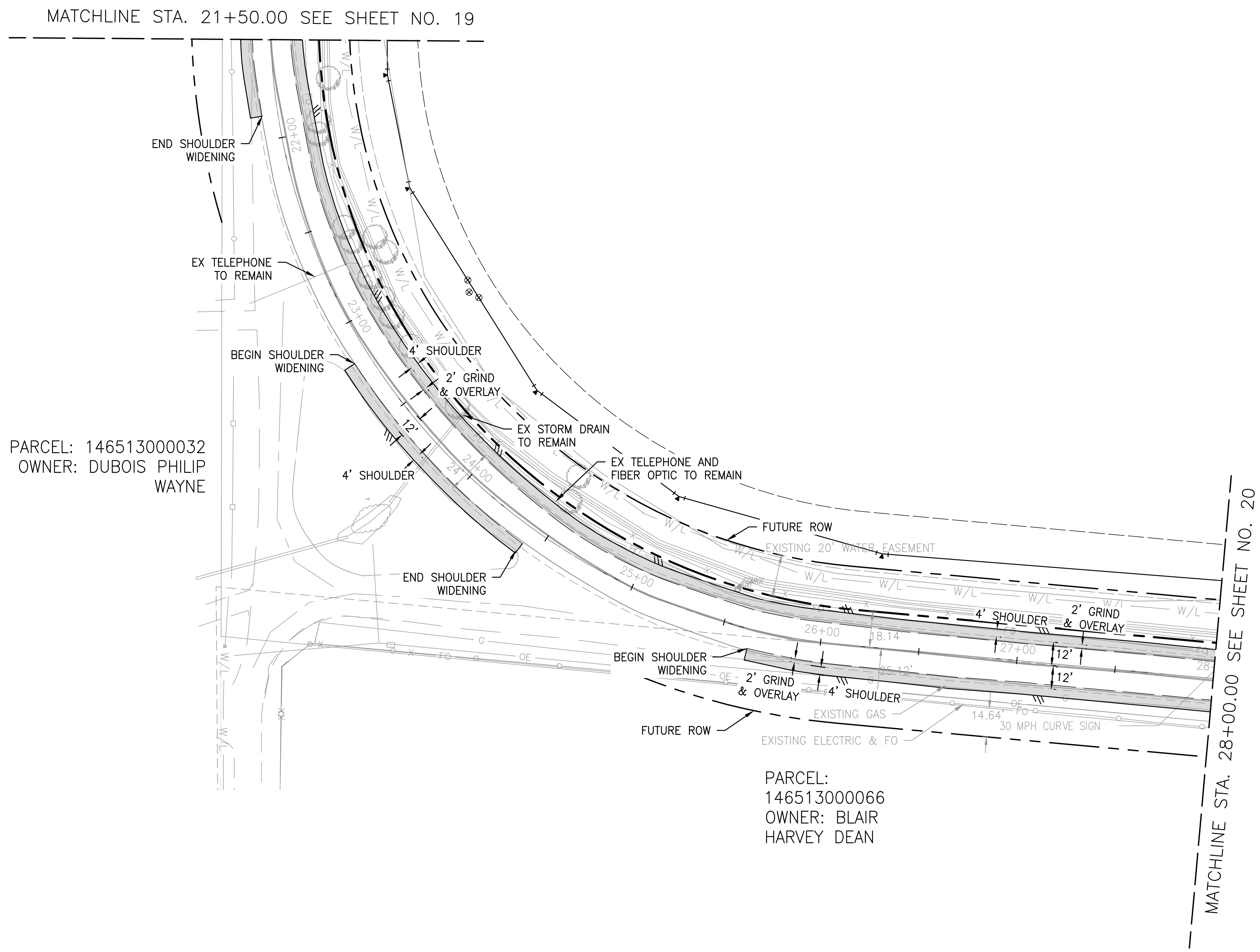
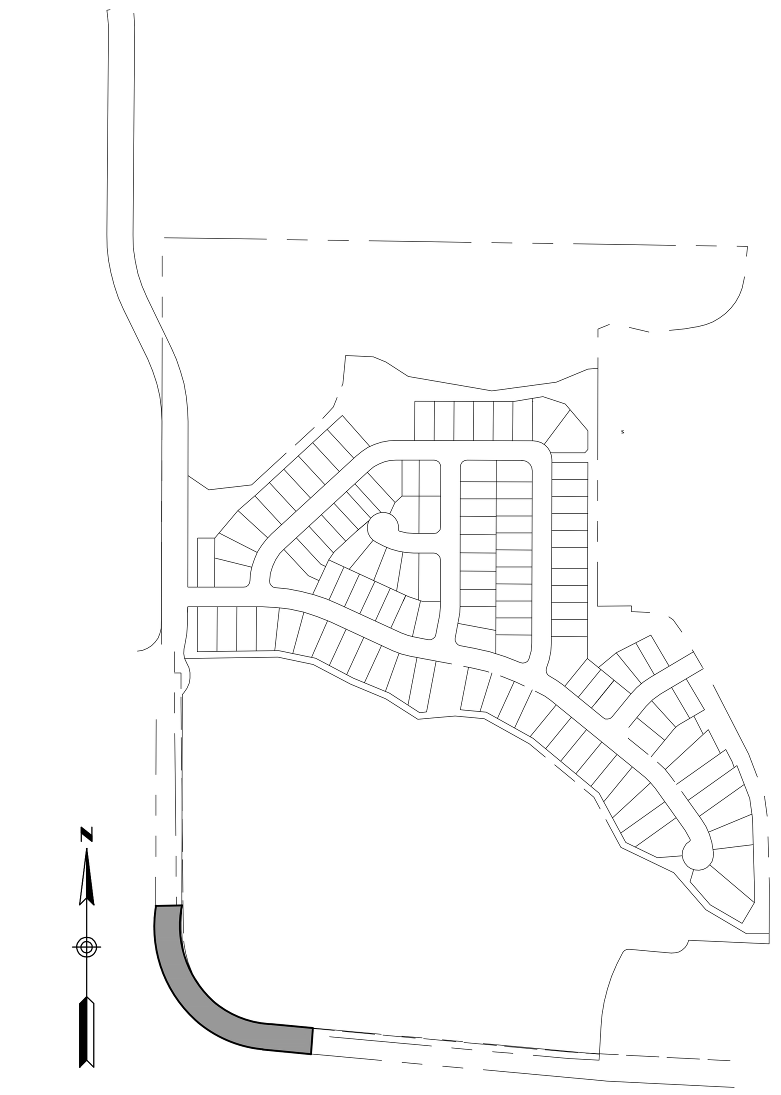
ROADWAY PLAN AND PROFILE

TOWN OF ERIE

SCALE: 1"=40'	SHEET NO. 19
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. RD-13
JOB NO: D1048	





KEY MAP

SCALE 1"=500'

CONSTRUCTION NOTES

01 CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02 CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05 CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06 SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07 DRIVE CUT-DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08 STREET LIGHT
09 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
10 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
11 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13 CHASE DRAIN
14 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M-609-1
15 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
16 5' CURB TRANSITION

PLAN – 123RD ST AND JAY RD

N

40 20 0 40
GRAPHIC SCALE: 1"=40'

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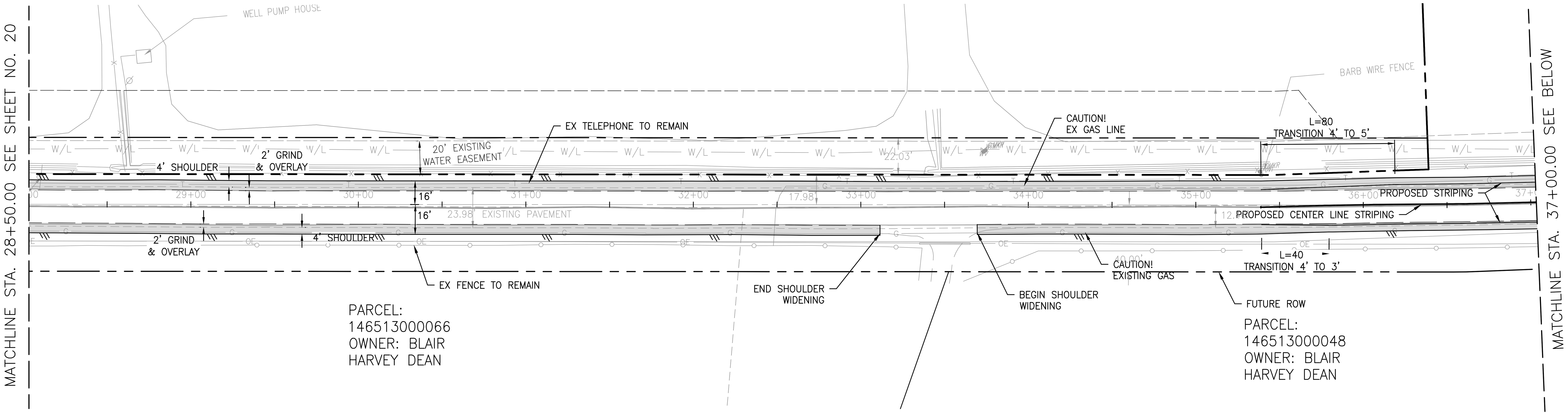
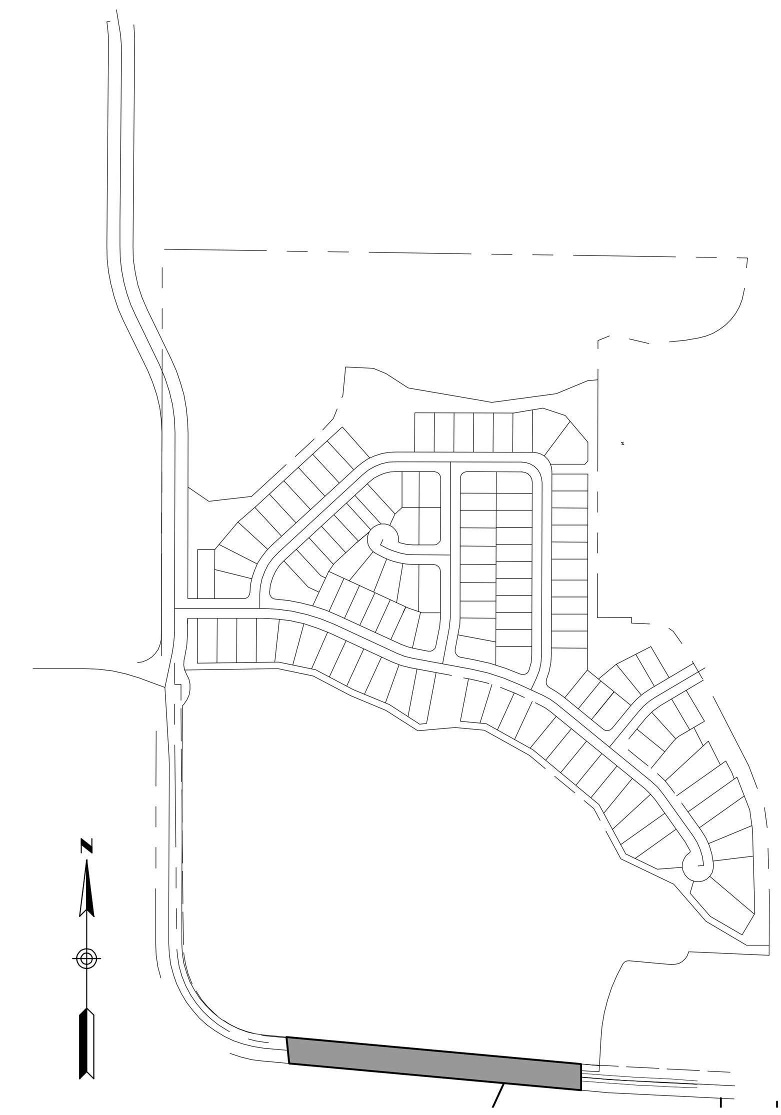
ROADWAY PLAN AND PROFILE

TOWN OF ERIE

SCALE: 1"=40'	SHEET NO. 20
DATE: 02/06/2018	
DRAWN BY: KS	OF 55 SHEETS
CHECKED BY: TB	DRAWING NO. RD-14
JOB NO: D1048	

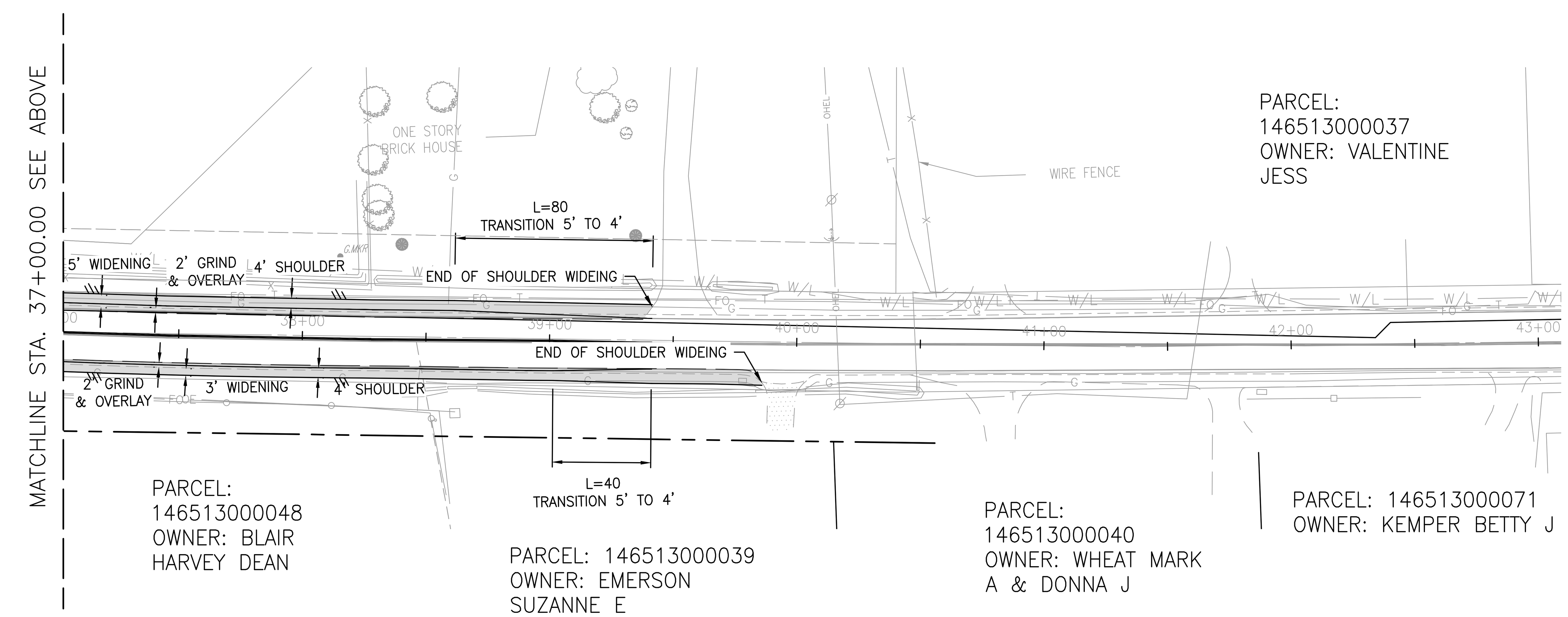


PLAN – JAY ROAD



CONSTRUCTION NOTES

01 CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02 CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05 CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06 SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07 DRIVE CUT–DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08 STREET LIGHT
09 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
10 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
11 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13 CHASE DRAIN
14 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M–609–1
15 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M–604–12
16 5' CURB TRANSITION



PLAN – JAY ROAD

40 20 0 40
GRAPHIC SCALE: 1"=40'

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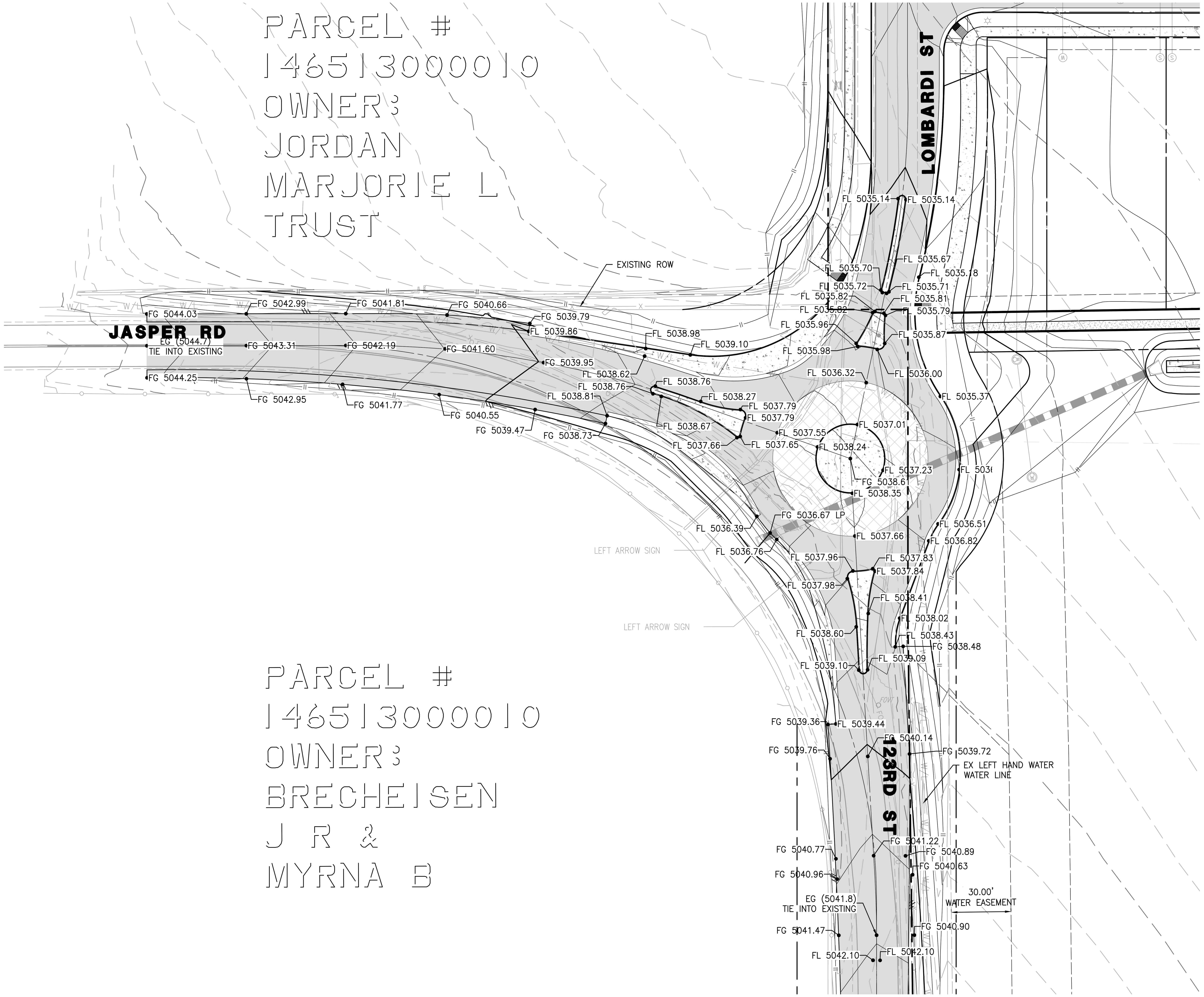
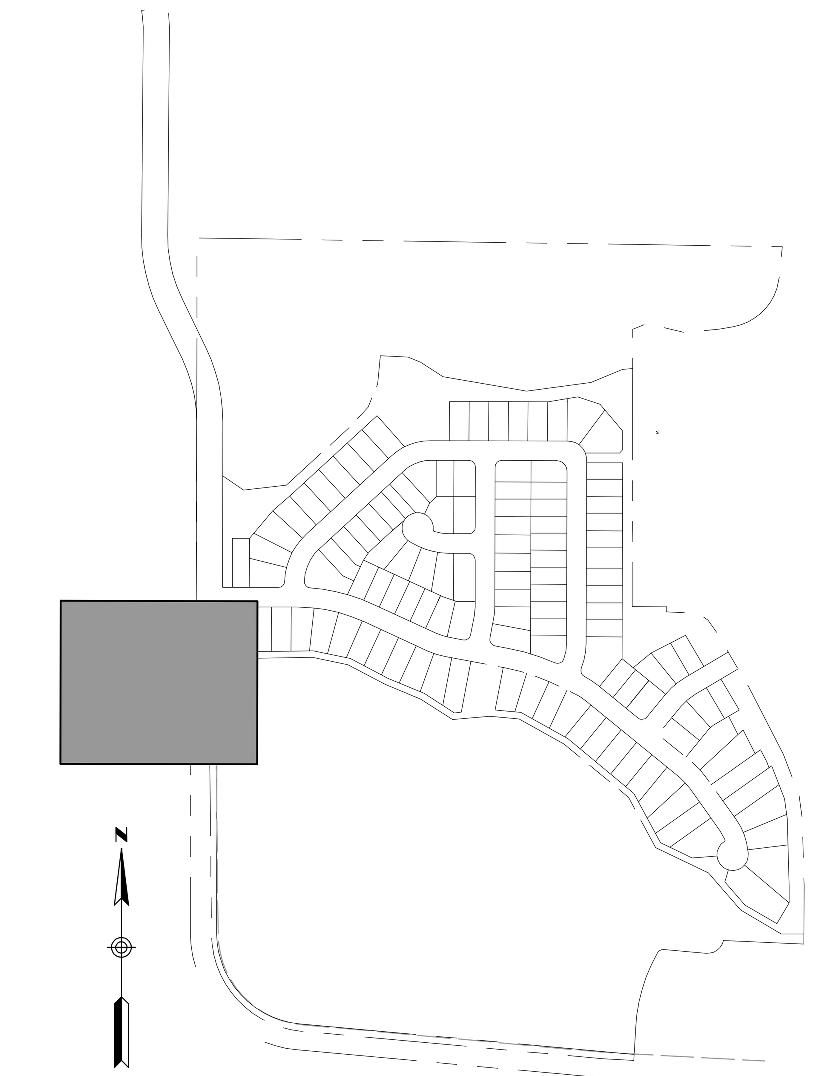
ROADWAY PLAN AND PROFILE

TOWN OF ERIE

SCALE: 1"=40'	SHEET NO. 21
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. RD–15
JOB NO: D1048	





KEY MAP

SCALE 1"=500'

CONSTRUCTION NOTES

01. CURB RAMP TYPE 4 PER TOWN OF ERIE STD DTL SW8
02. CURB RAMP MID BLOCK TYPE 1 PER TOWN OF ERIE STD DTL SW10A
03. 6" VERTICAL CURB, GUTTER PER TOWN OF ERIE STD DTL SW13
04. 6" MOUNTABLE CURB, GUTTER PER TOWN OF ERIE STD DTL SW11
05. CONCRETE CROSS PAN PER TOWN OF ERIE STD DTL SW3
06. SPINE TRAIL PER TOWN OF ERIE STD DTL P25
07. DRIVE CUT-DETACHED WALK PER TOWN OF ERIE STD DTL SW4A
08. STREET LIGHT
09. 5' CURB INLET TYPE R WITH FLOWLINE TRANSITION PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
10. 10' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
11. 5' DETACHED SIDEWALK PER TOWN OF ERIE STD DTL SW13
12. 8' DETACHED MEANDERING SIDEWALK PER TOWN OF ERIE STD DTL SW13
13. CHASE DRAIN
14. 6" BARRIER CURB TYPE 2 PER COLORADO DEPARTMENT OF TRASPORTATION STD DTL M-609-1
15. 15' CURB INLET TYPE R PER COLORADO DEPARTMENT OF TRANSPORTATION STD DTL M-604-12
16. 5' CURB TRANSITION

30 15 0 30
GRAPHIC SCALE: 1"=30'

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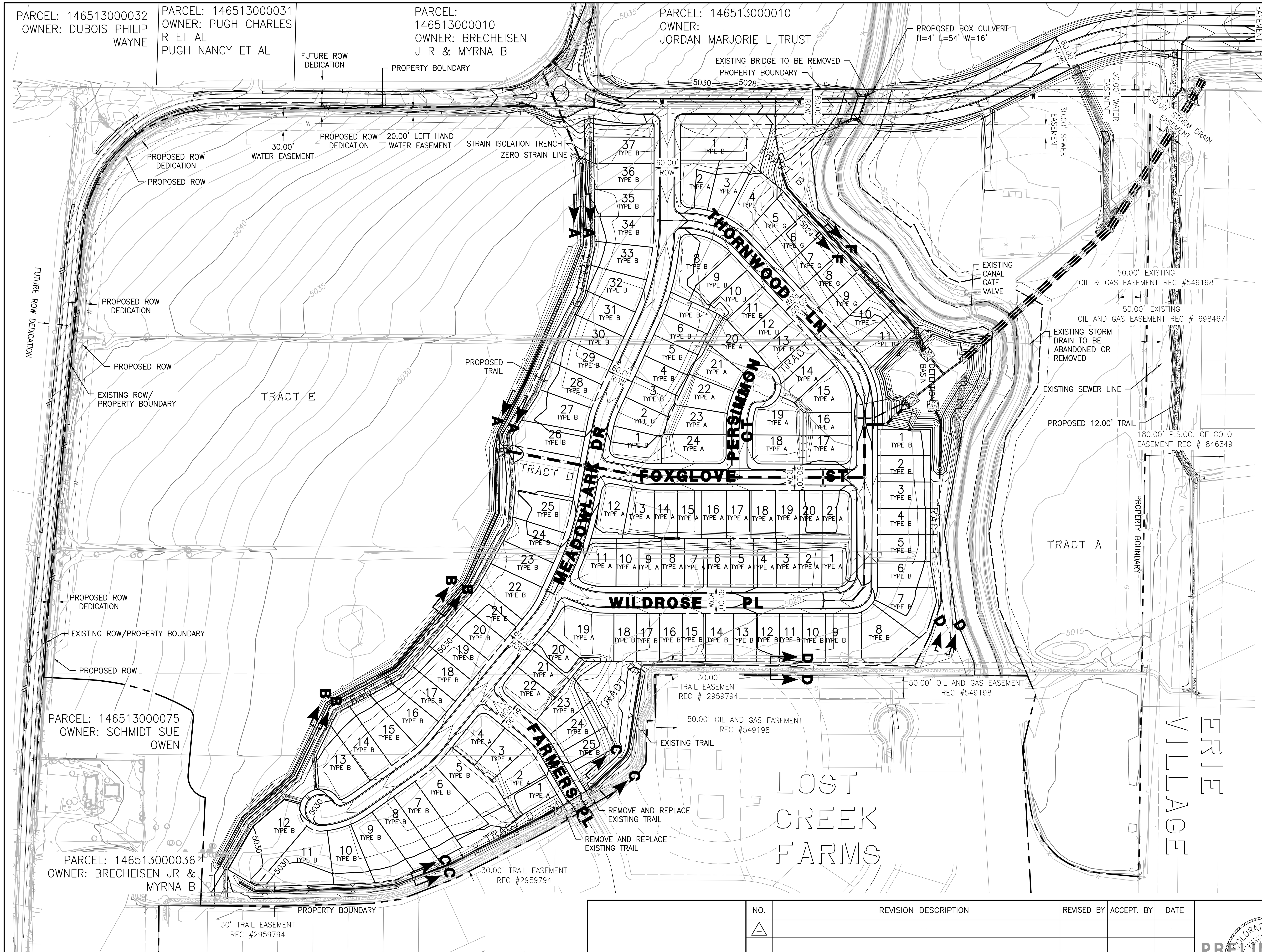
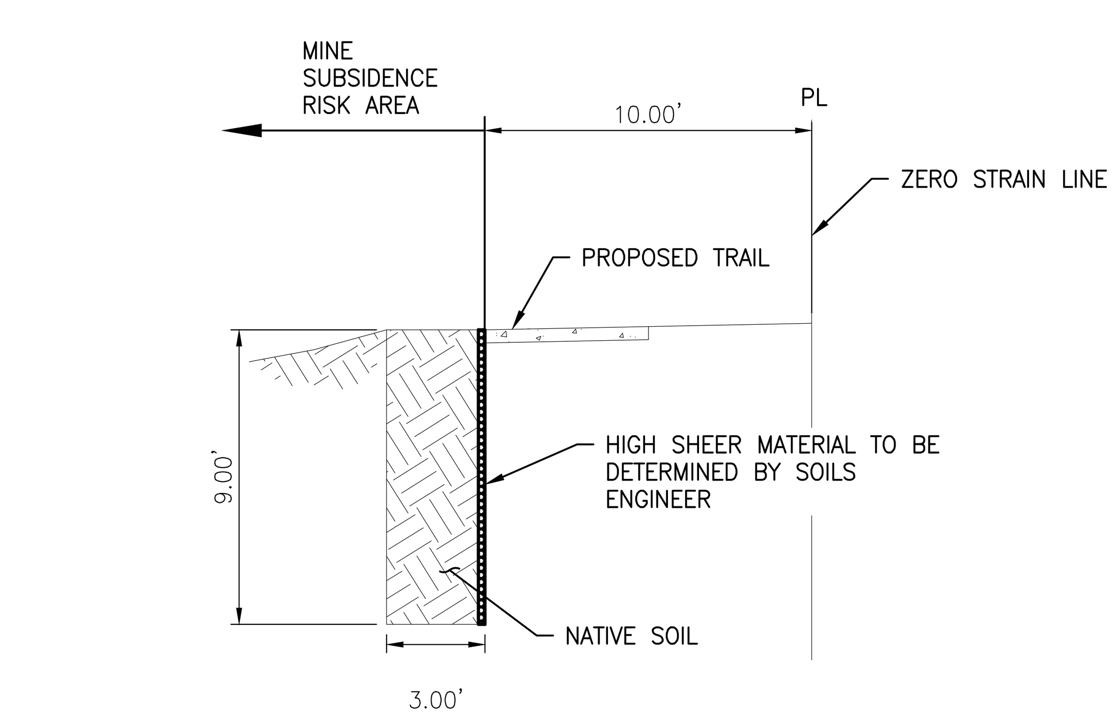
ROUNDABOUT DETAIL

TOWN OF ERIE

SCALE: 1"=30'	SHEET NO. 22
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. RD-16
JOB NO: D1048	





1 STRAIN ISOLATION TRENCH
SCALE 1"=5'

120 60 0 120
GRAPHIC SCALE: 1"=120'

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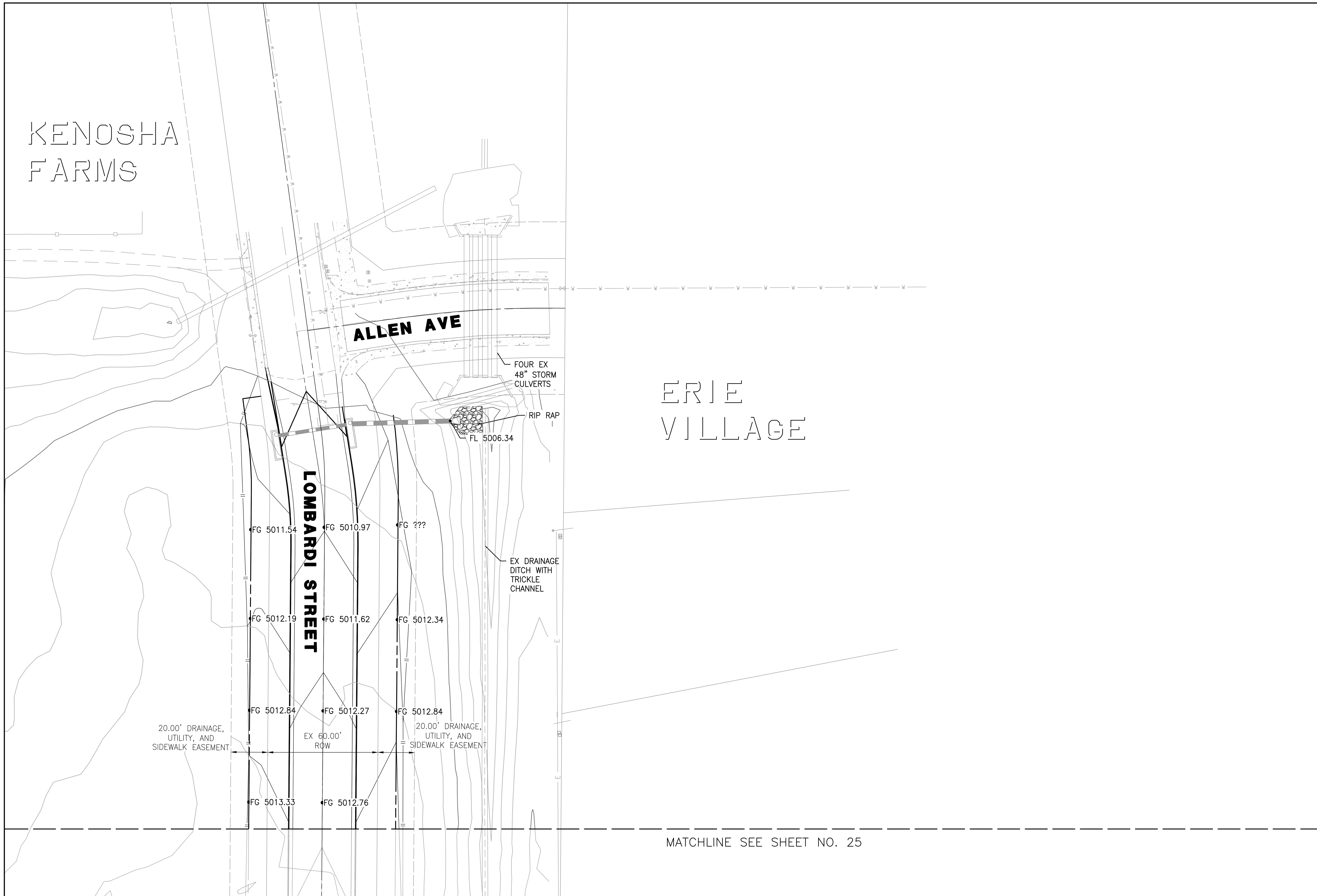
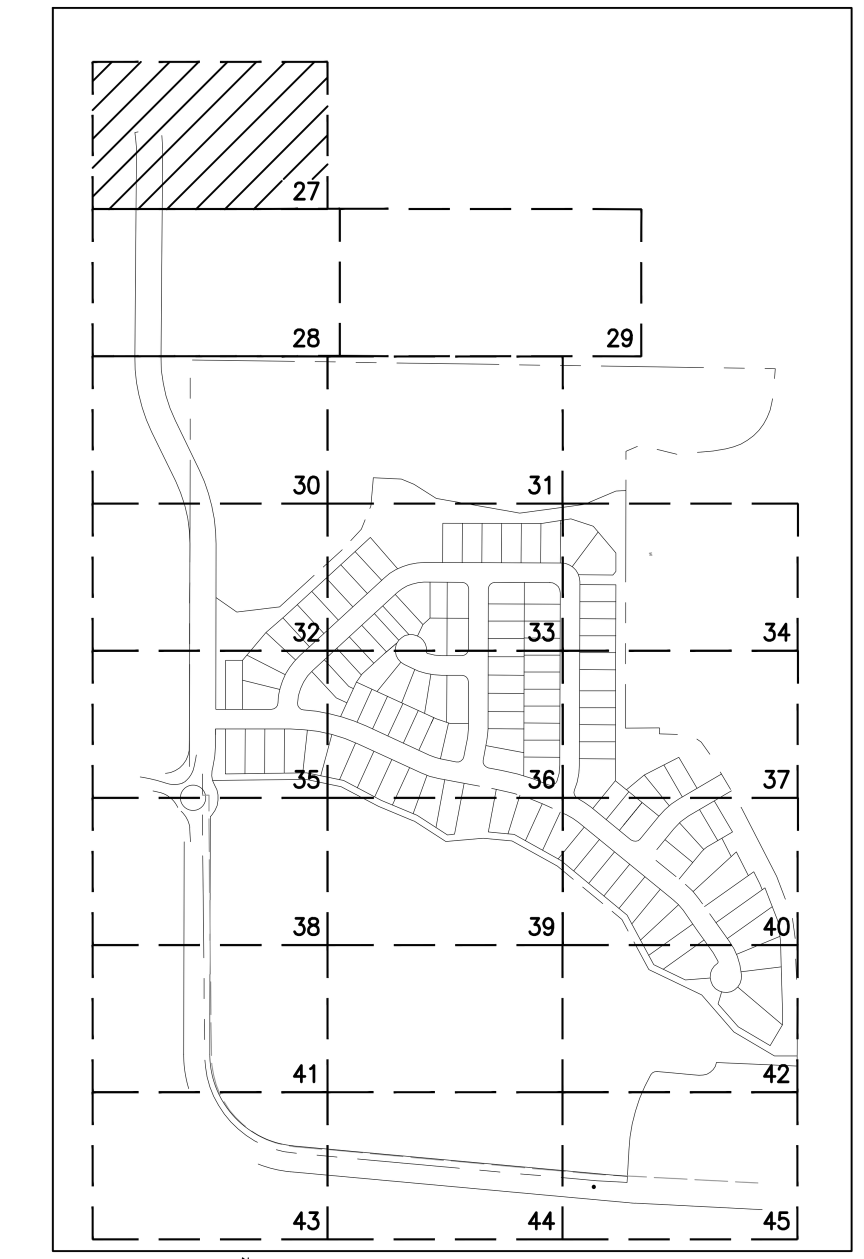
OVERALL GRADING

TOWN OF ERIE

SCALE: 1"=120'	SHEET NO. 23
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	DRAWING NO. GRD-01
CHECKED BY: TB	
JOB NO: D1048	





KEY MAP

SCALE 1"=500'

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30 15 0 30
GRAPHIC SCALE: 1"=30'

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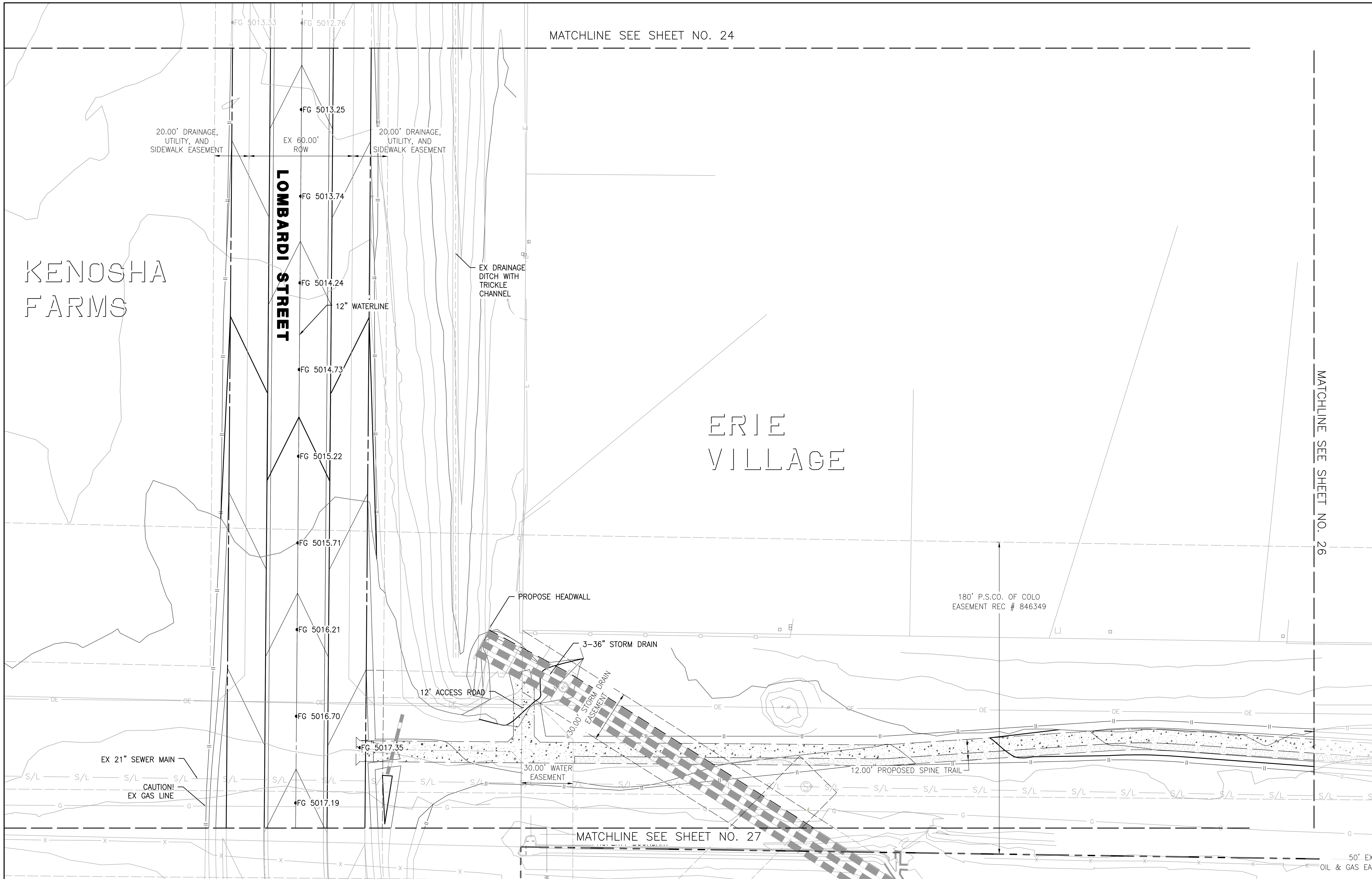
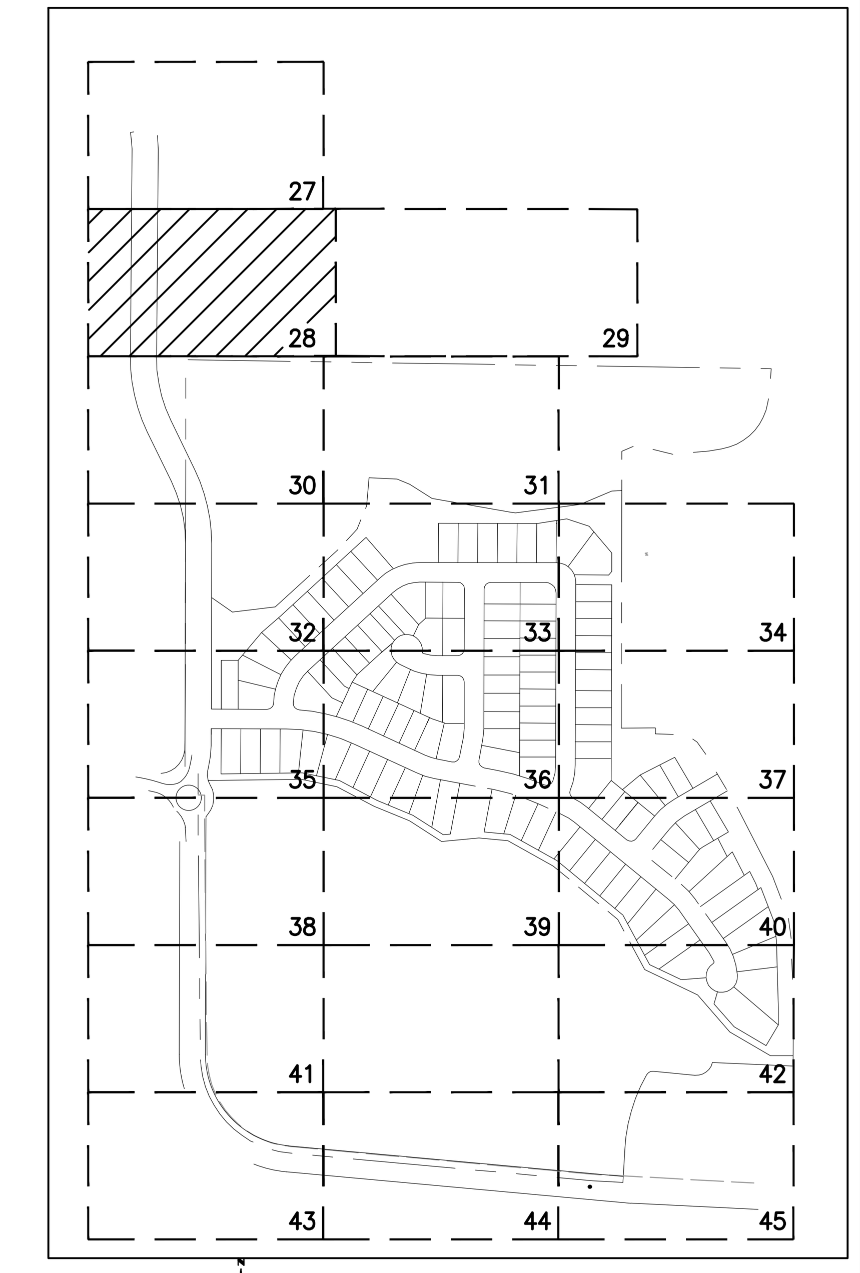
GRADING

TOWN OF ERIE

SCALE: 1"=30'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 24 OF 55 SHEETS
DRAWING NO. GRD-02





KEY MAP

SCALE 1"=500'

30 15 0 30
GRAPHIC SCALE: 1"=30'

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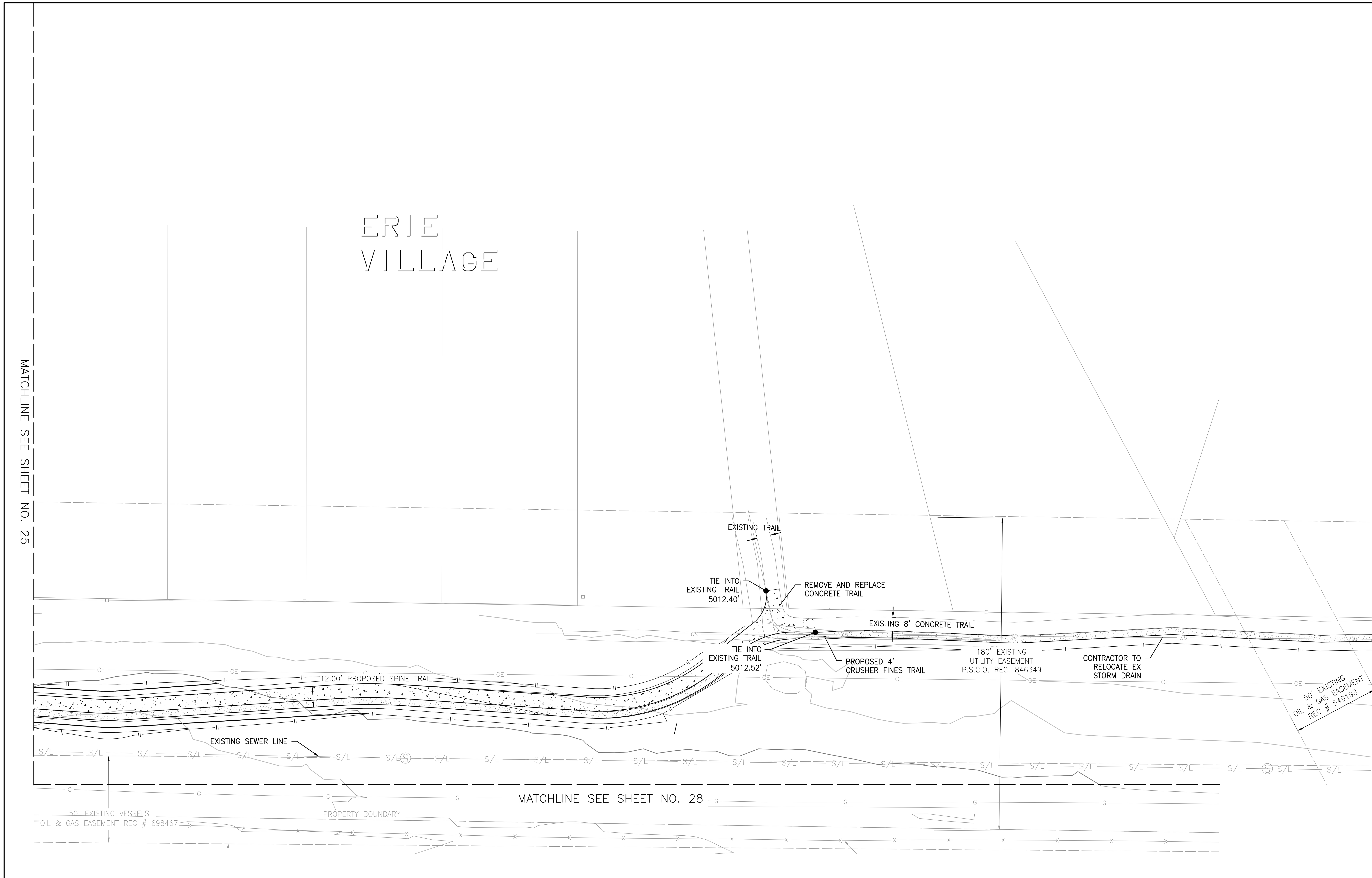
GRADING

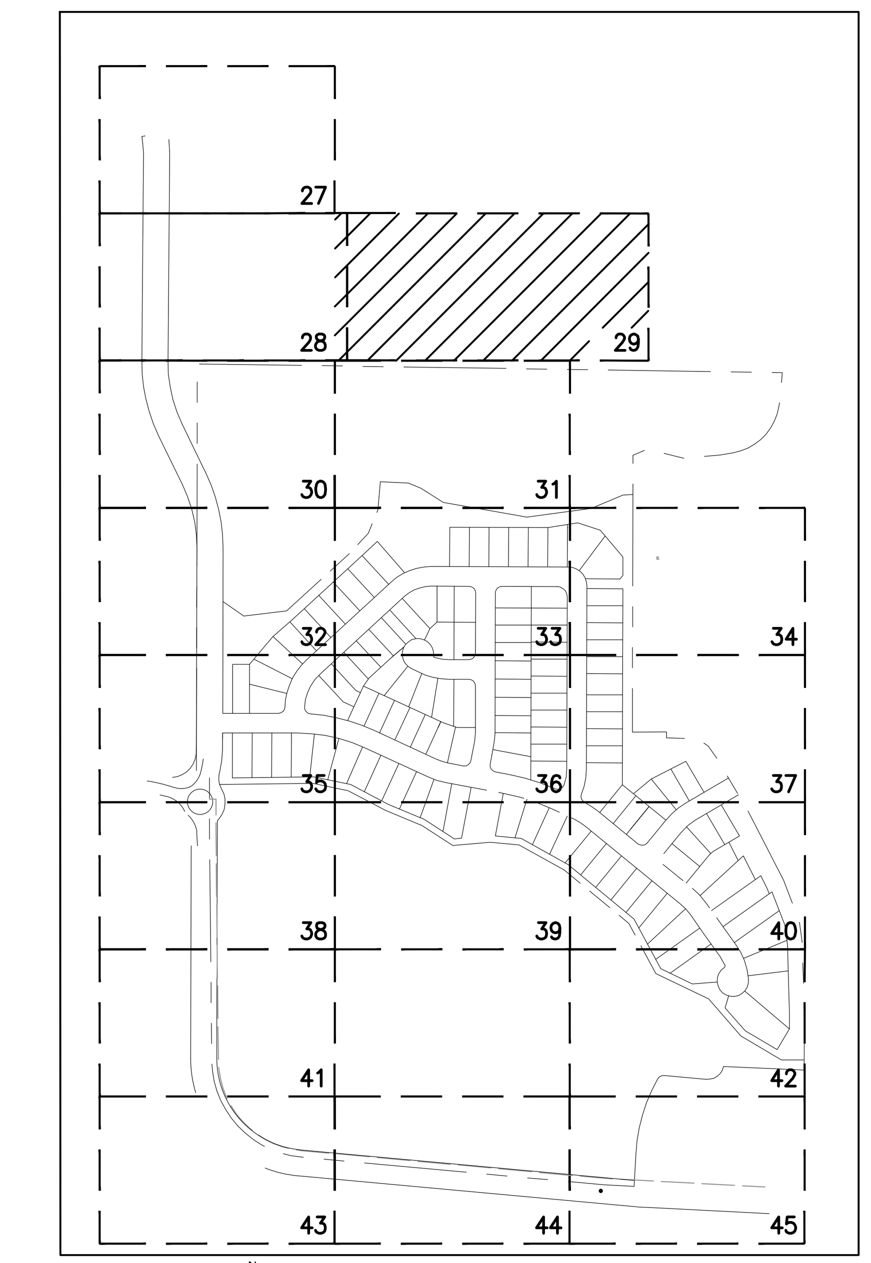
TOWN OF ERIE

SCALE: 1"=30'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 25 OF 55 SHEETS

DRAWING NO. GRD-03





KEY MAP

SCALE 1"=500'

30 15 0 30
GRAPHIC SCALE: 1"=30'

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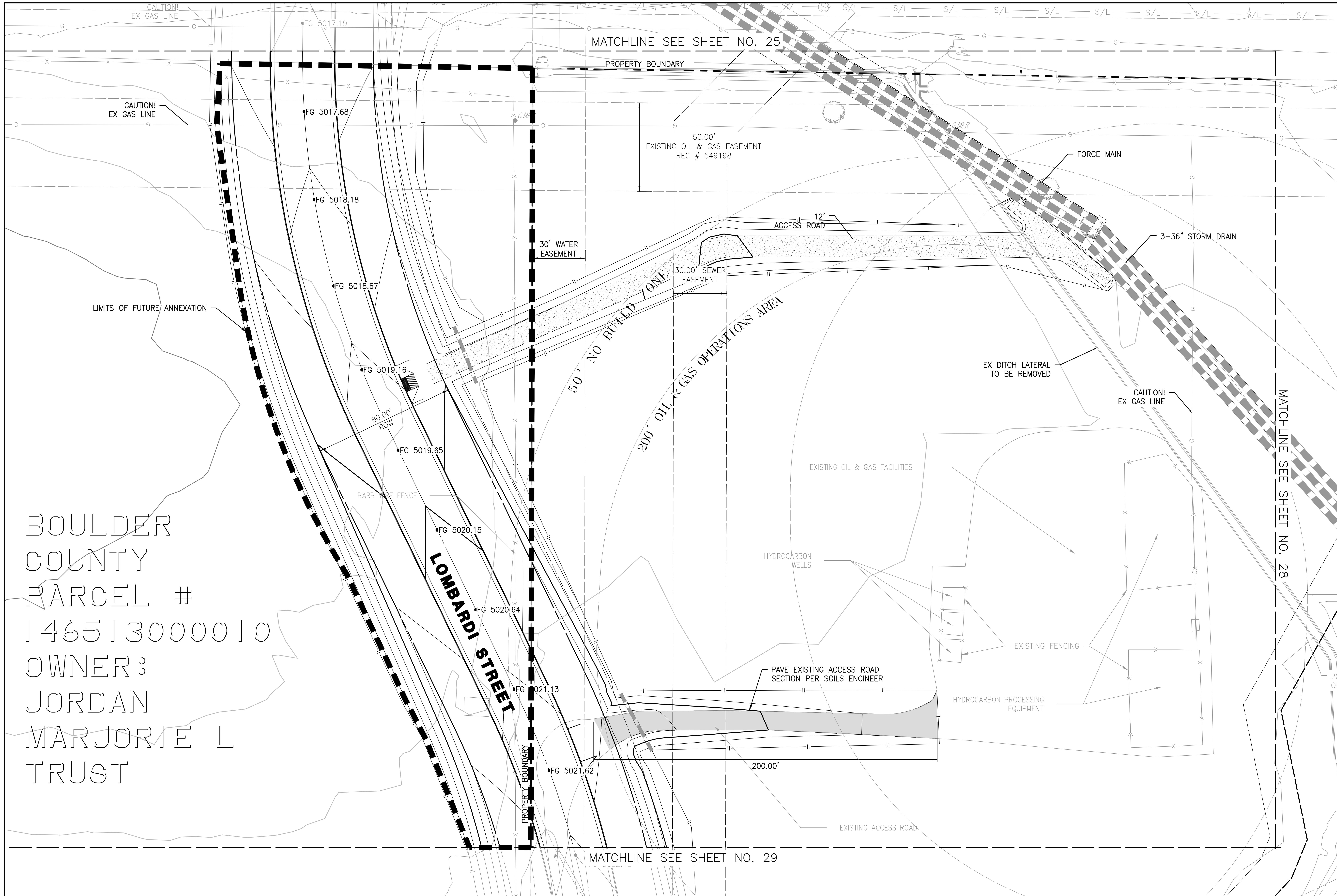
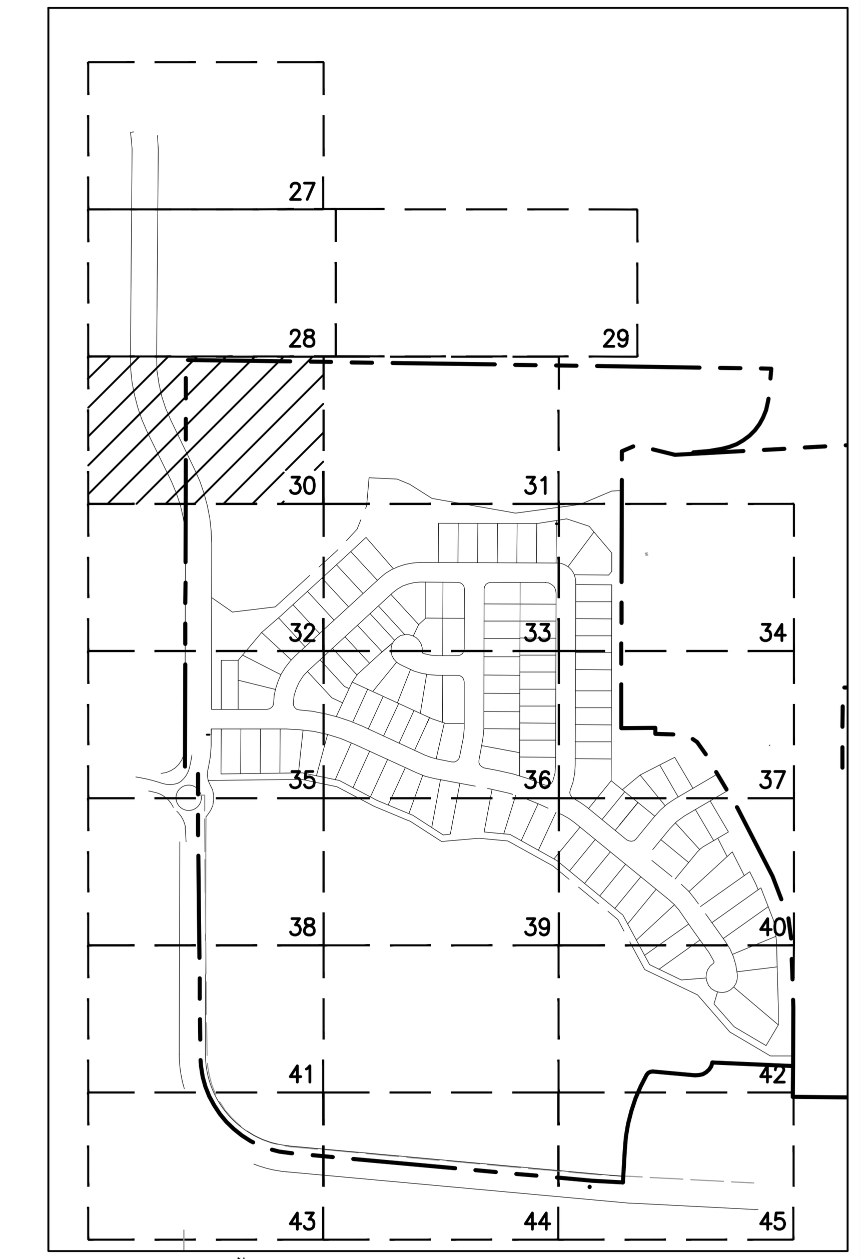
GRADING

TOWN OF ERIE

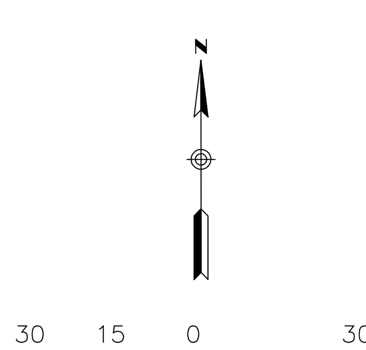
SCALE: 1"=30'	SHEET NO. 26
DATE: 02/06/2018	
DRAWN BY: KS	OF 55 SHEETS
CHECKED BY: TB	DRAWING NO. GRD-04
JOB NO: D1048	





KEY MAP

SCALE 1"=500'



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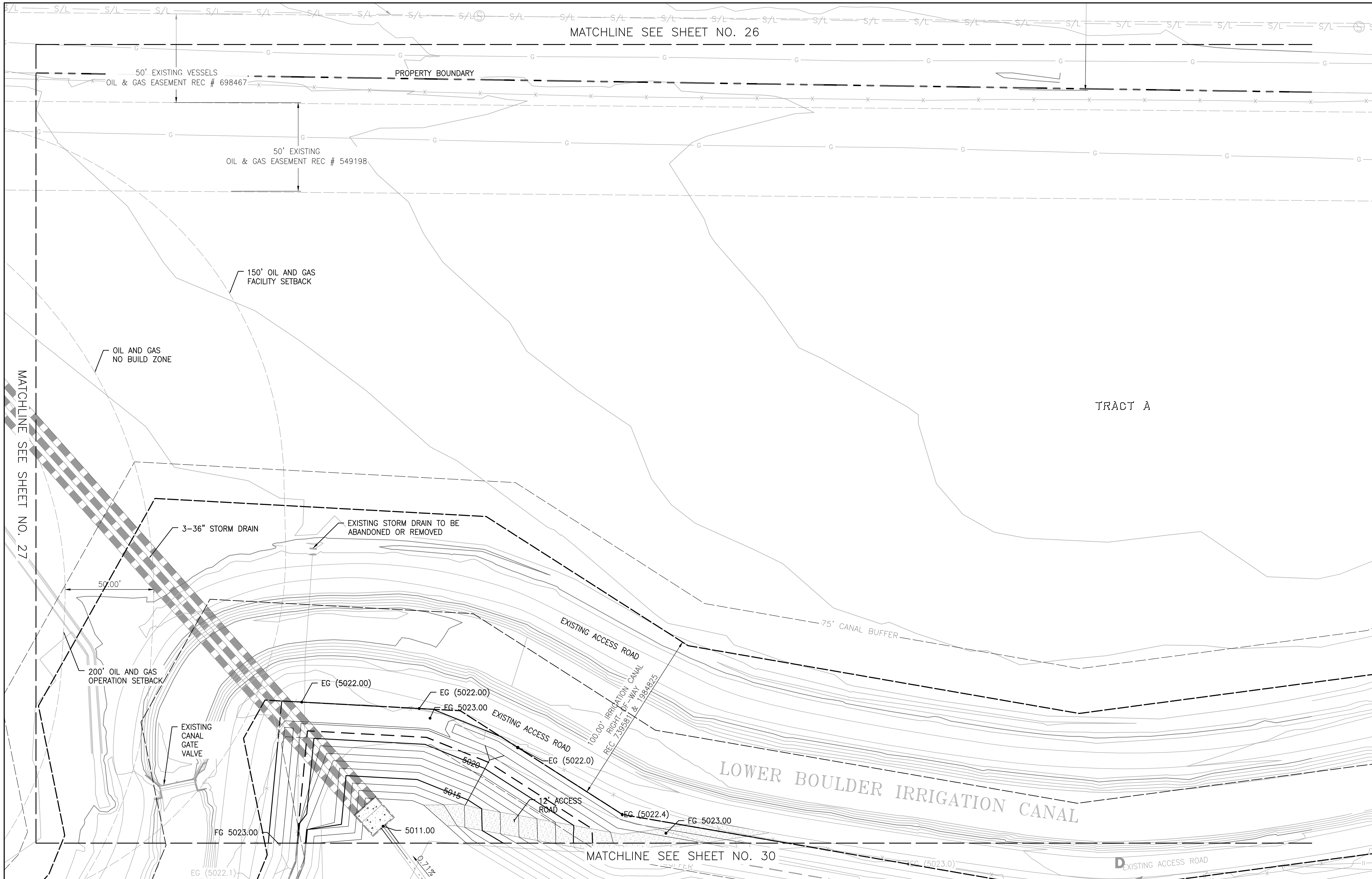
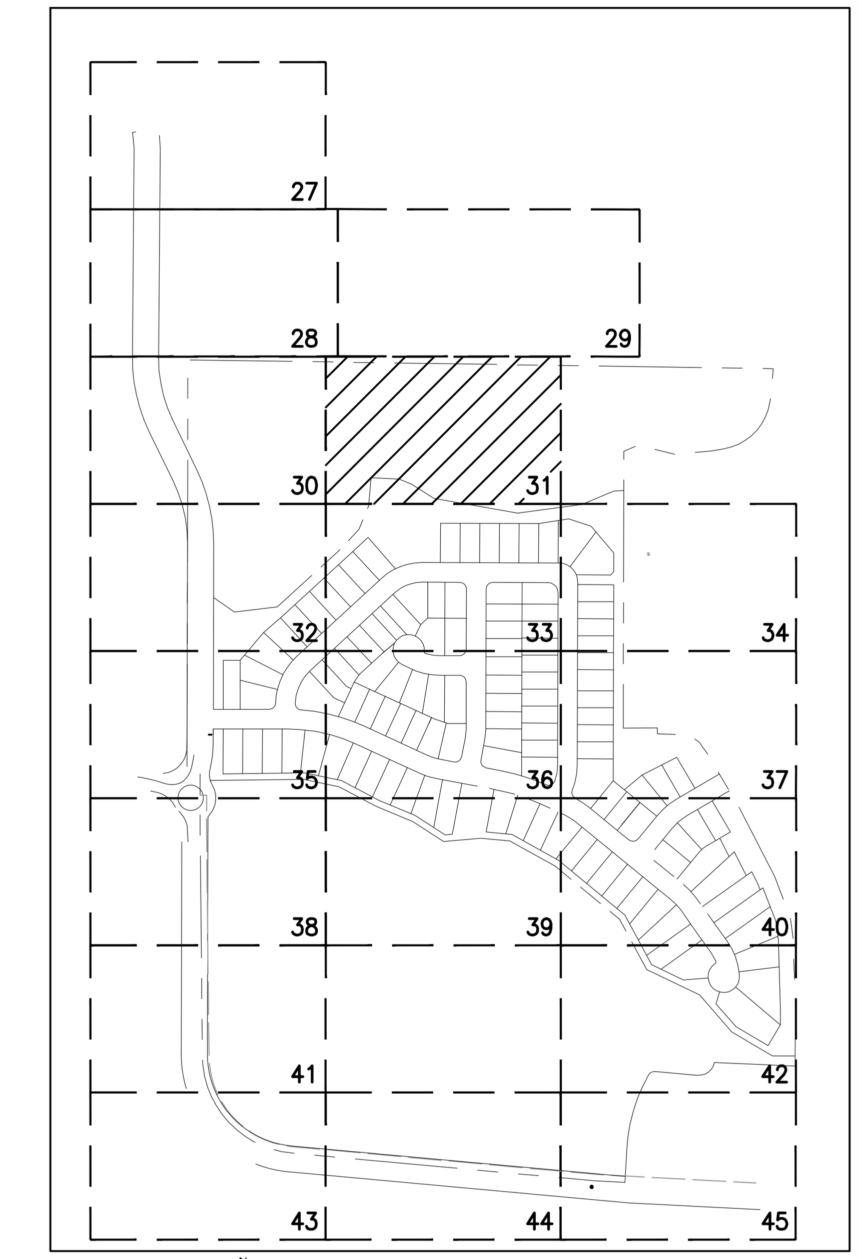
GRADING

TOWN OF ERIE

SCALE: 1"=30'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 27
OF 55 SHEETS
DRAWING NO. GRD-05





KEY MAP

SCALE 1"=500'

30 15 0 30

GRAPHIC SCALE: 1"=30'

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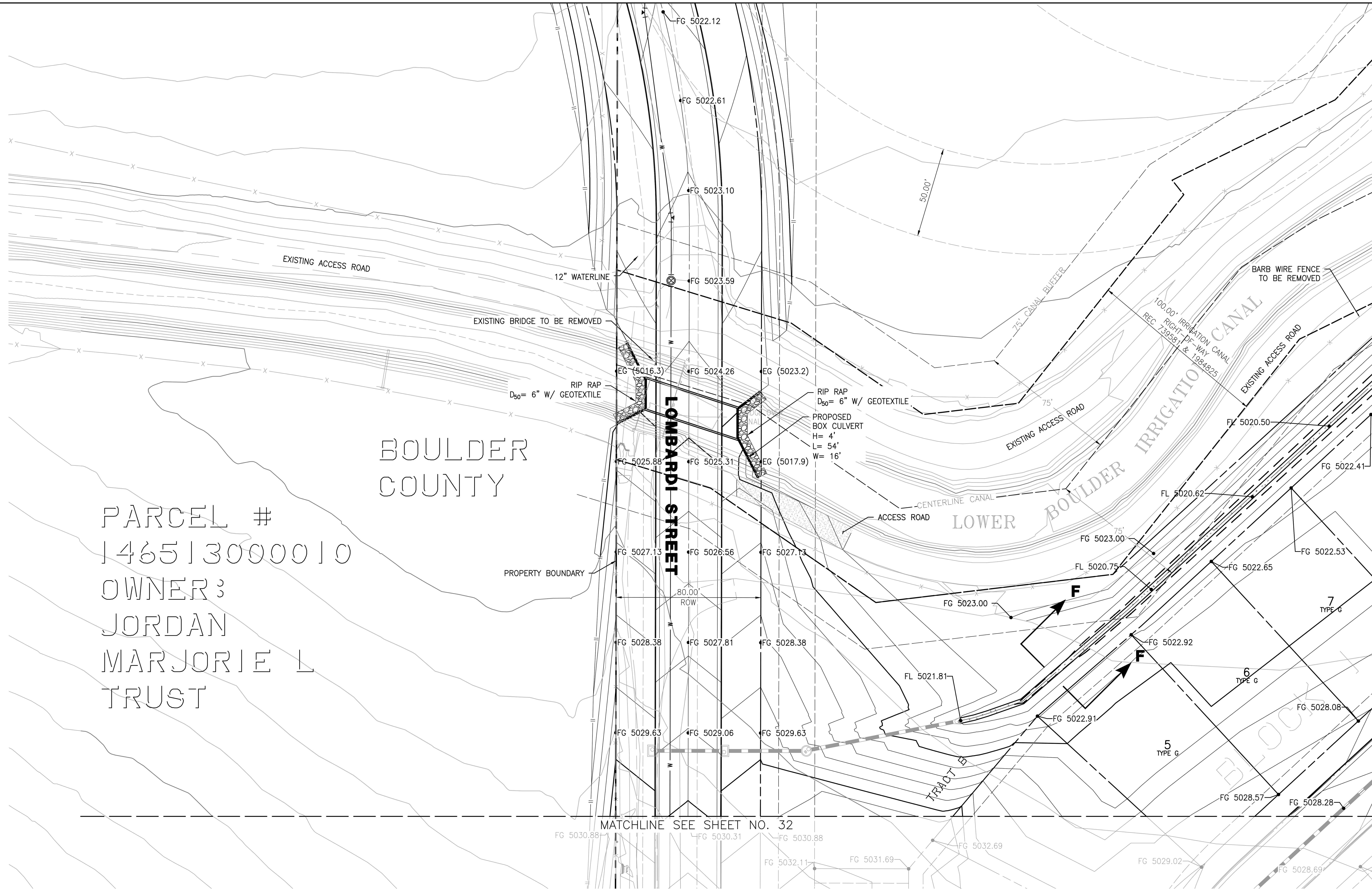
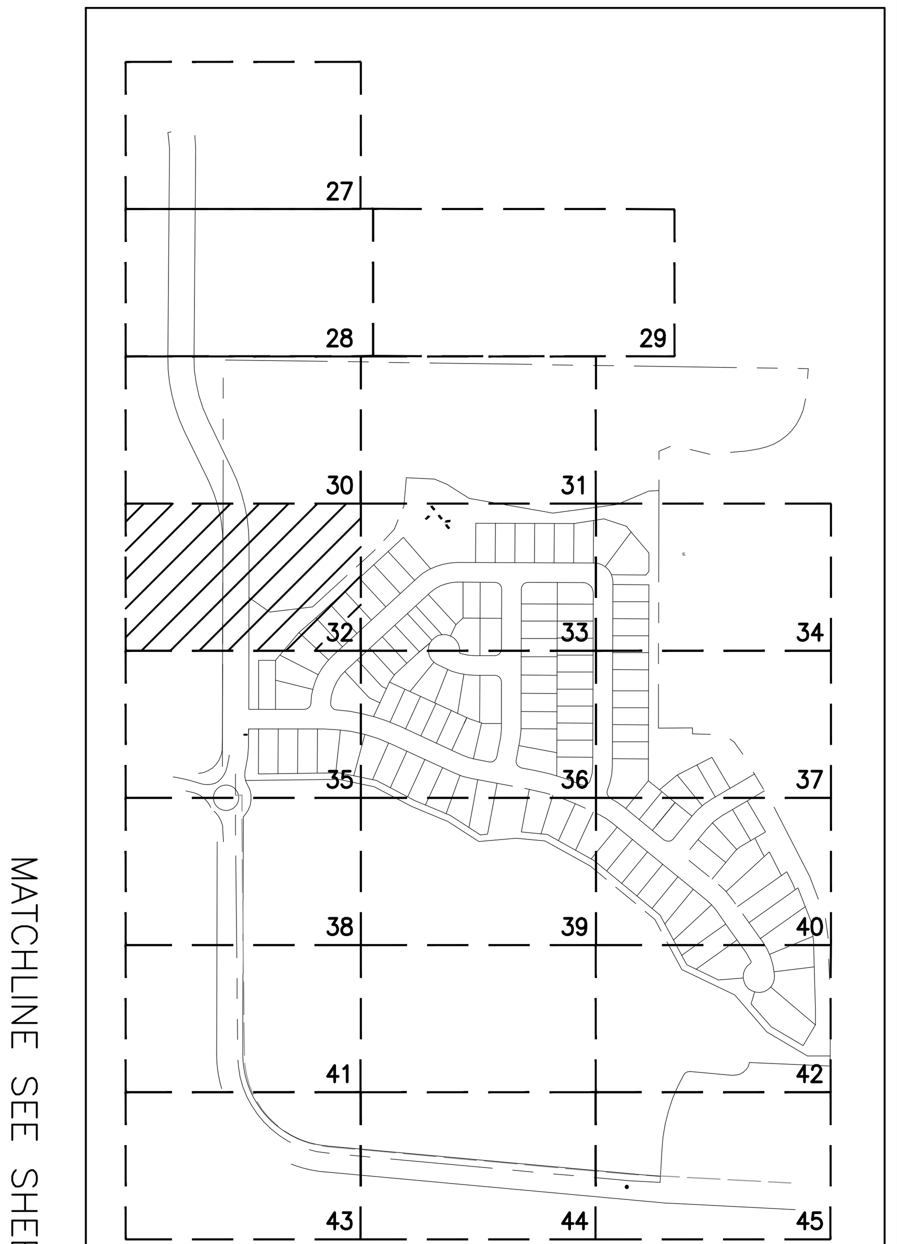
GRADING

TOWN OF ERIE

SCALE: 1"=30'	SHEET NO. 28
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. GRD-06
JOB NO: D1048	





KEY MAP

SCALE 1"=500'

GENERAL GRADING NOTES

1) SEE SHEET 05 FOR GRADING TEMPLATE

30 15 0 30

GRAPHIC SCALE: 1"=30'

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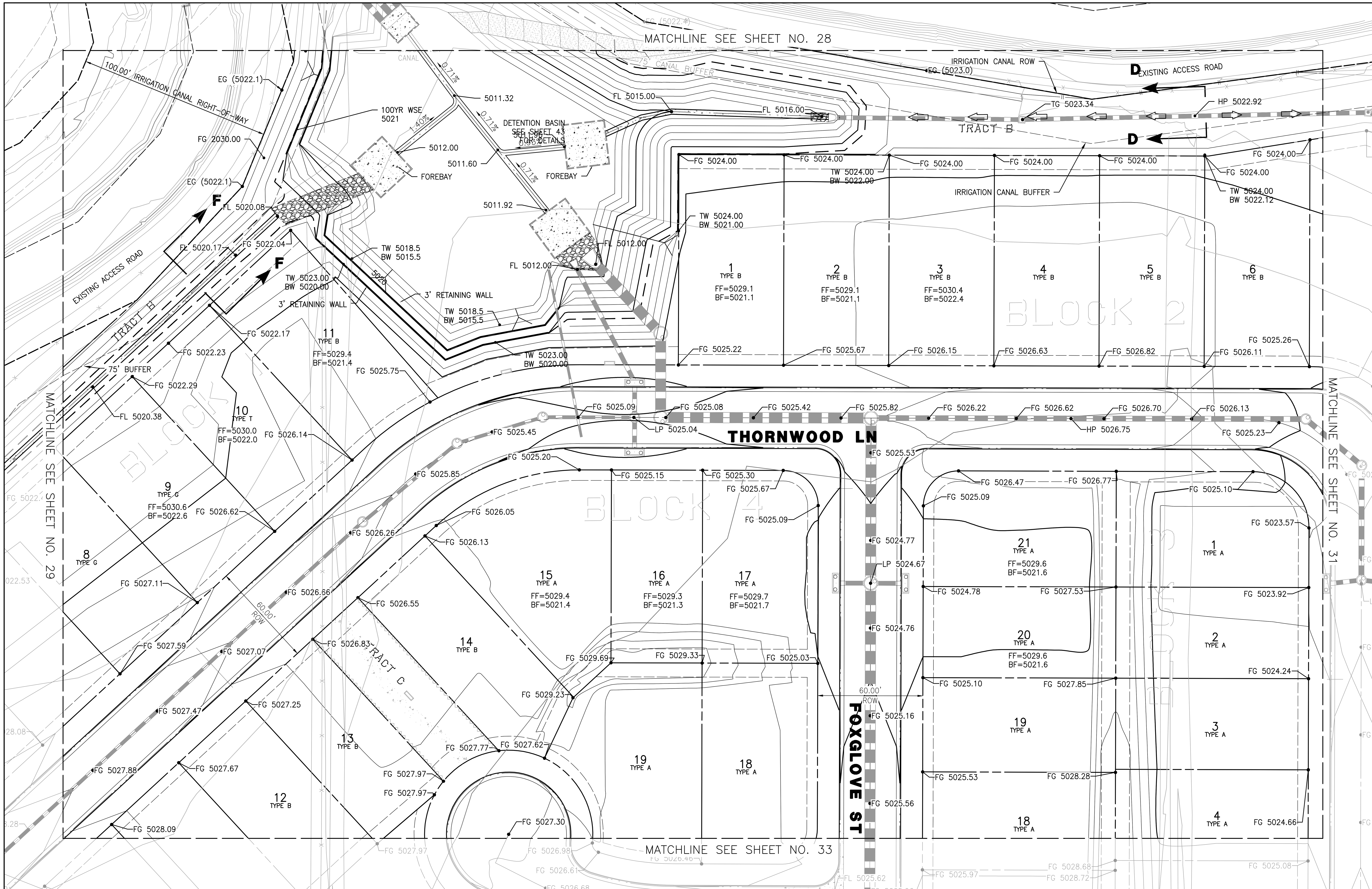
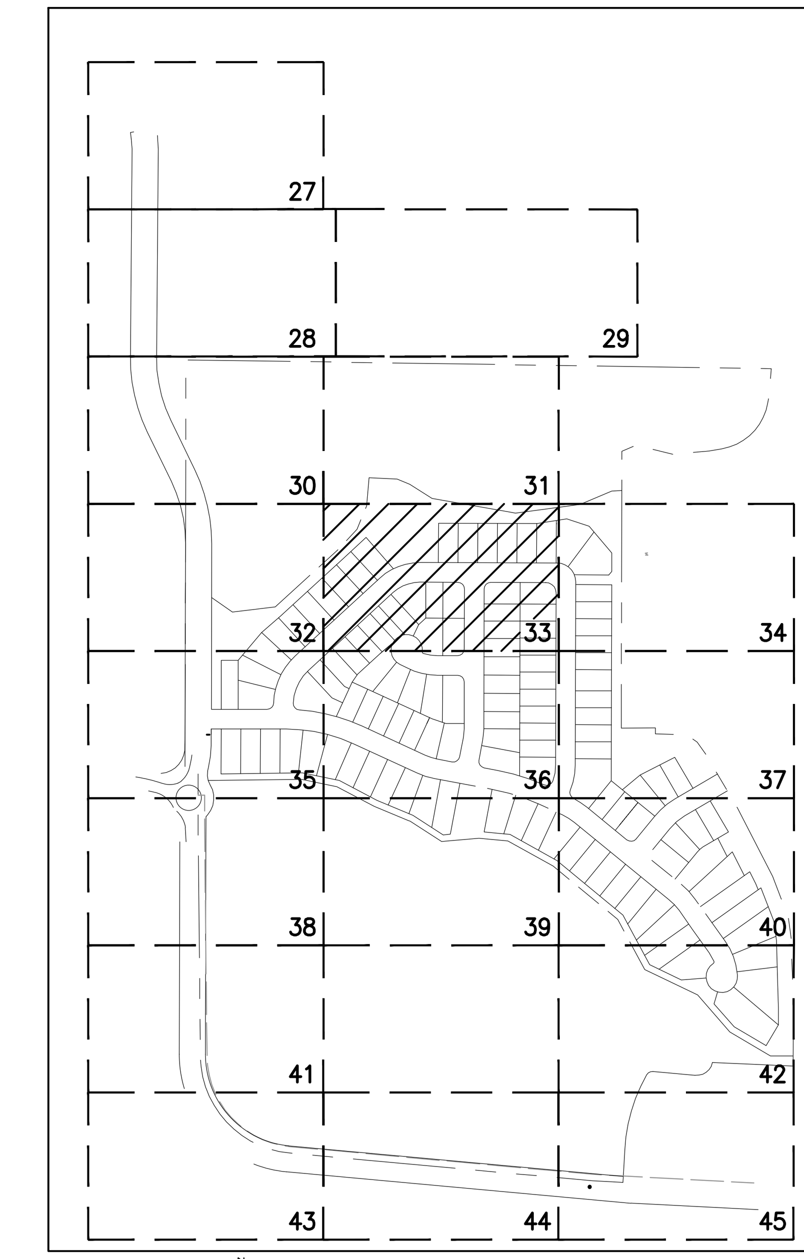
GRADING

TOWN OF ERIE

SCALE: 1"=30'	SHEET NO. 29
DATE: 02/06/2018	
DRAWN BY: KS	OF 55 SHEETS
CHECKED BY: TB	DRAWING NO. GRD–07
JOB NO: D1048	





KEY MAP

SCALE 1"=500'

GENERAL GRADING NOTES

1) SEE SHEET 05 FOR GRADING TEMPLATE

30 15 0 30

GRAPHIC SCALE: 1"=30'

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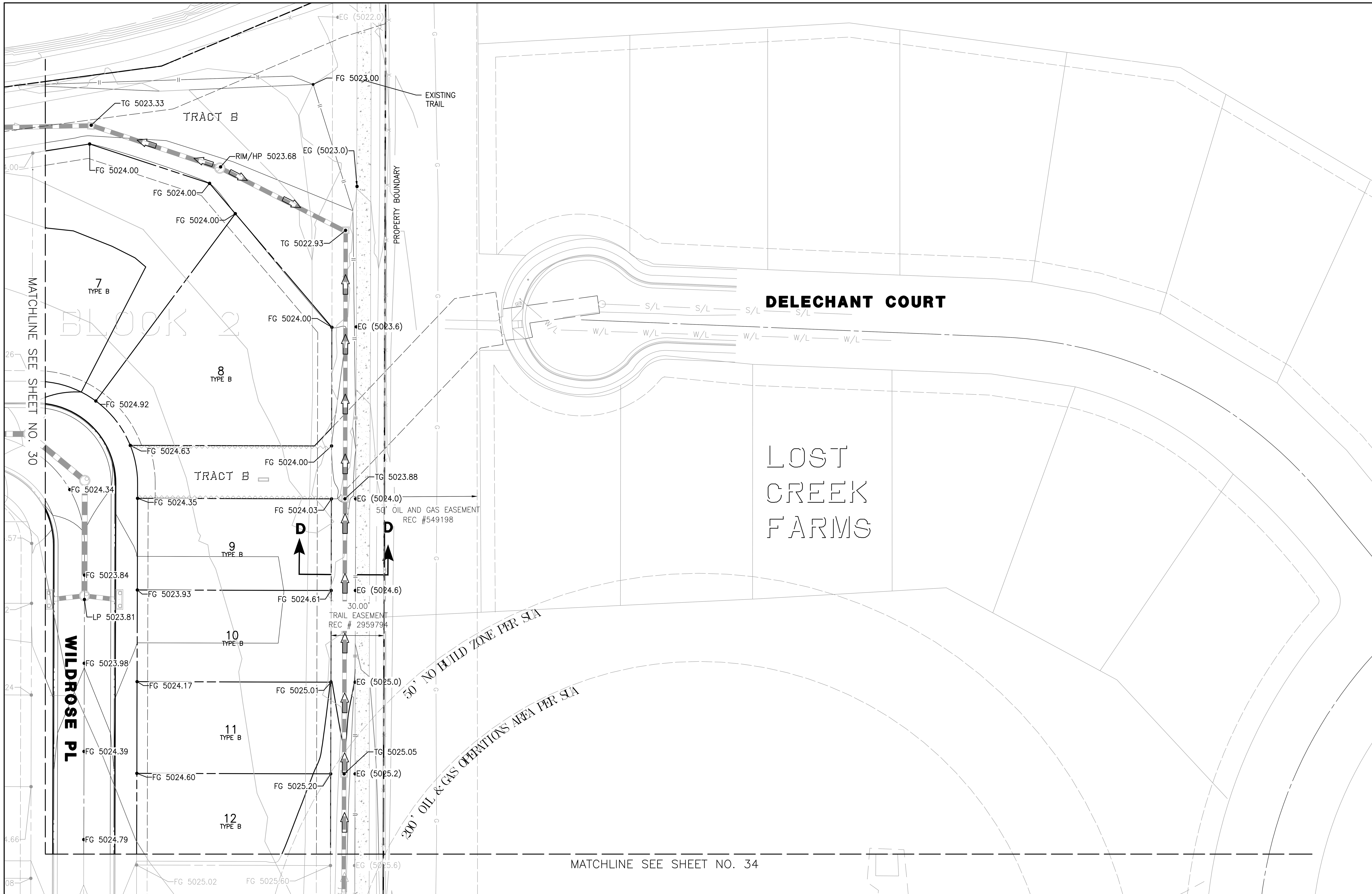
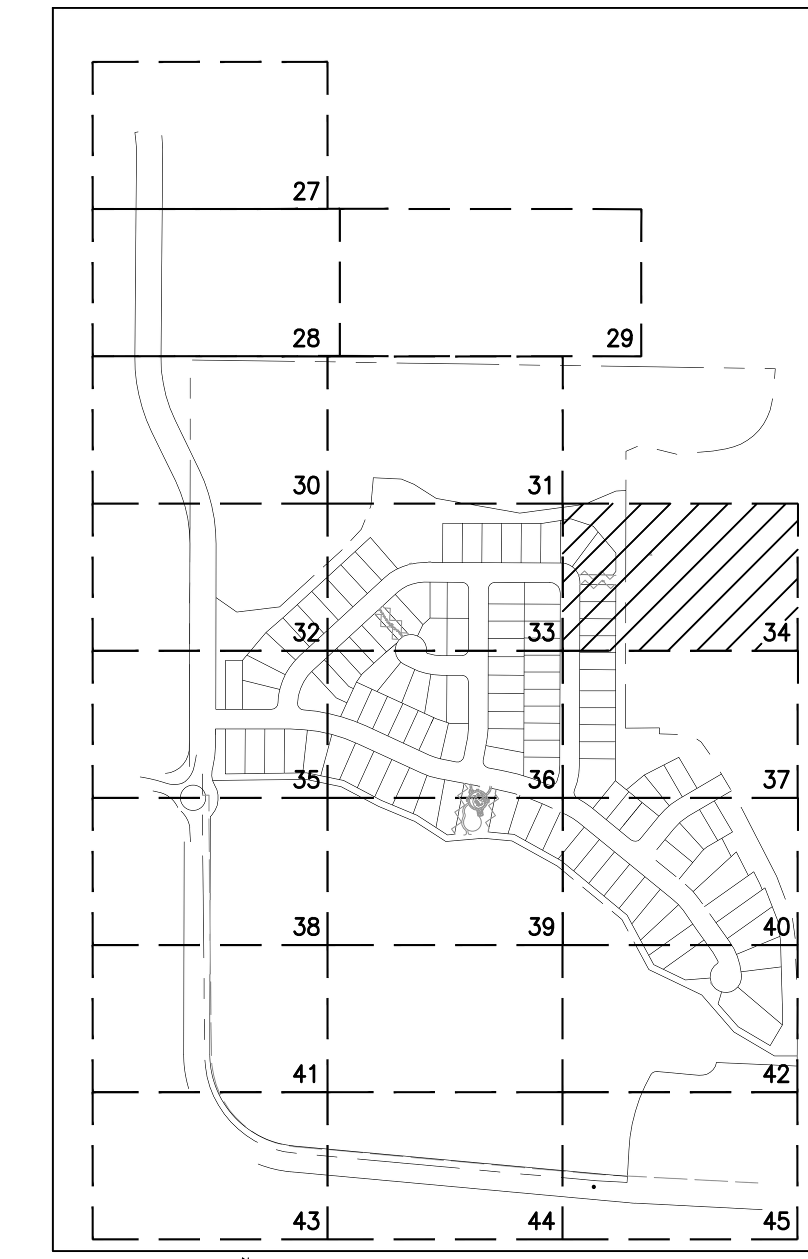
GRADING

TOWN OF ERIE

SCALE: 1"=30'	SHEET NO. 30
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. GRD-08
JOB NO: D1048	





KEY MAP

SCALE 1"=500'

30 15 0 30

GRAPHIC SCALE: 1"=30'

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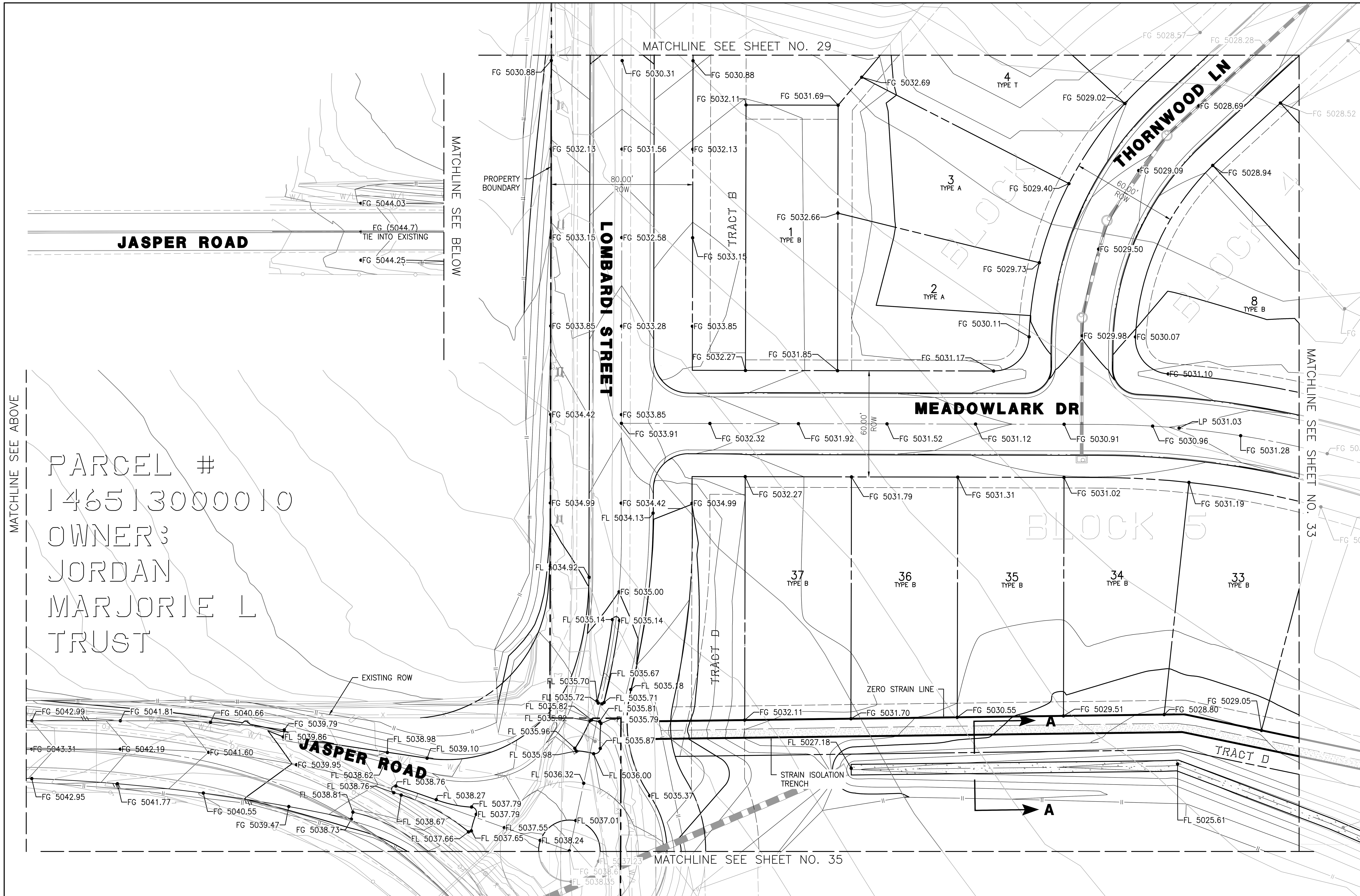
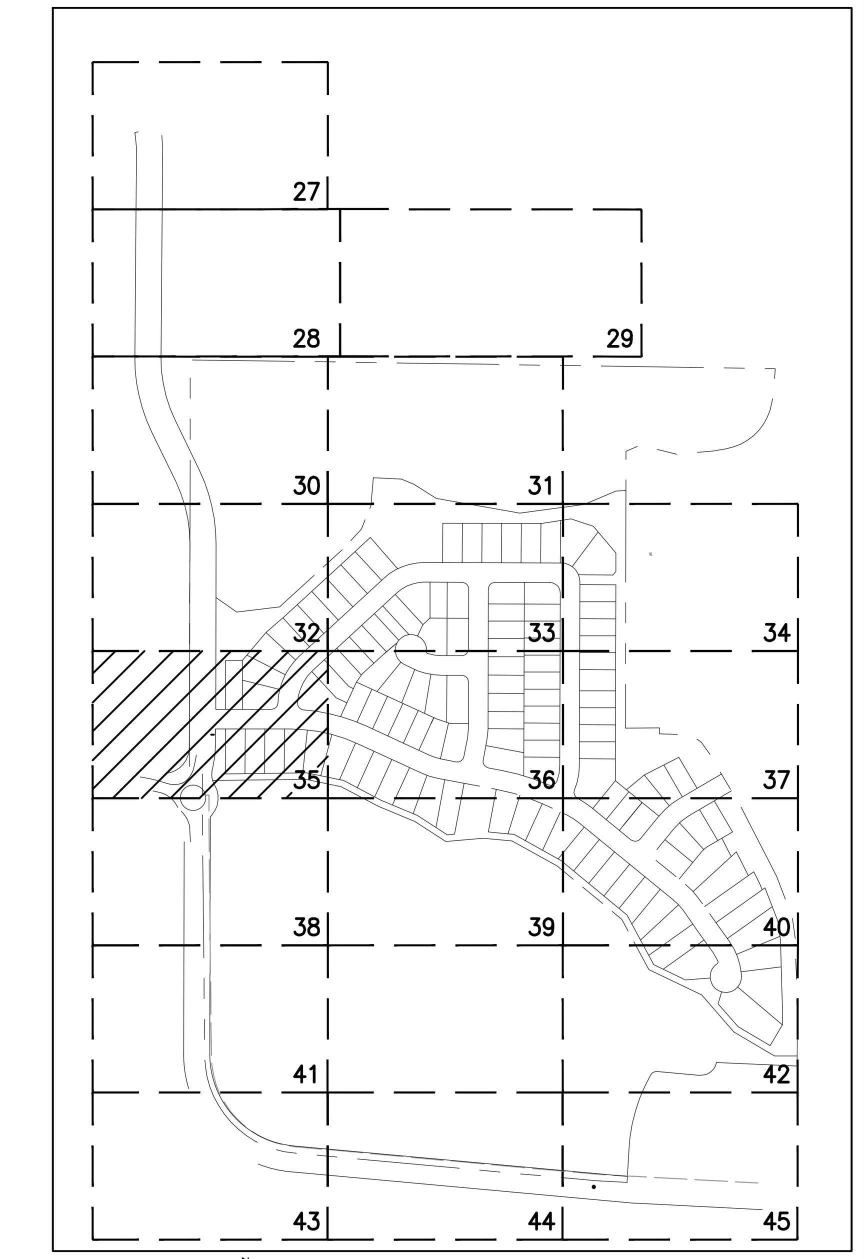
GRADING

TOWN OF ERIE

SCALE: 1"=30'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 31
OF 55 SHEETS
DRAWING NO. GRD-09





KEY MAP

SCALE 1"=500'

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GRAPHIC SCALE: 1"=30'

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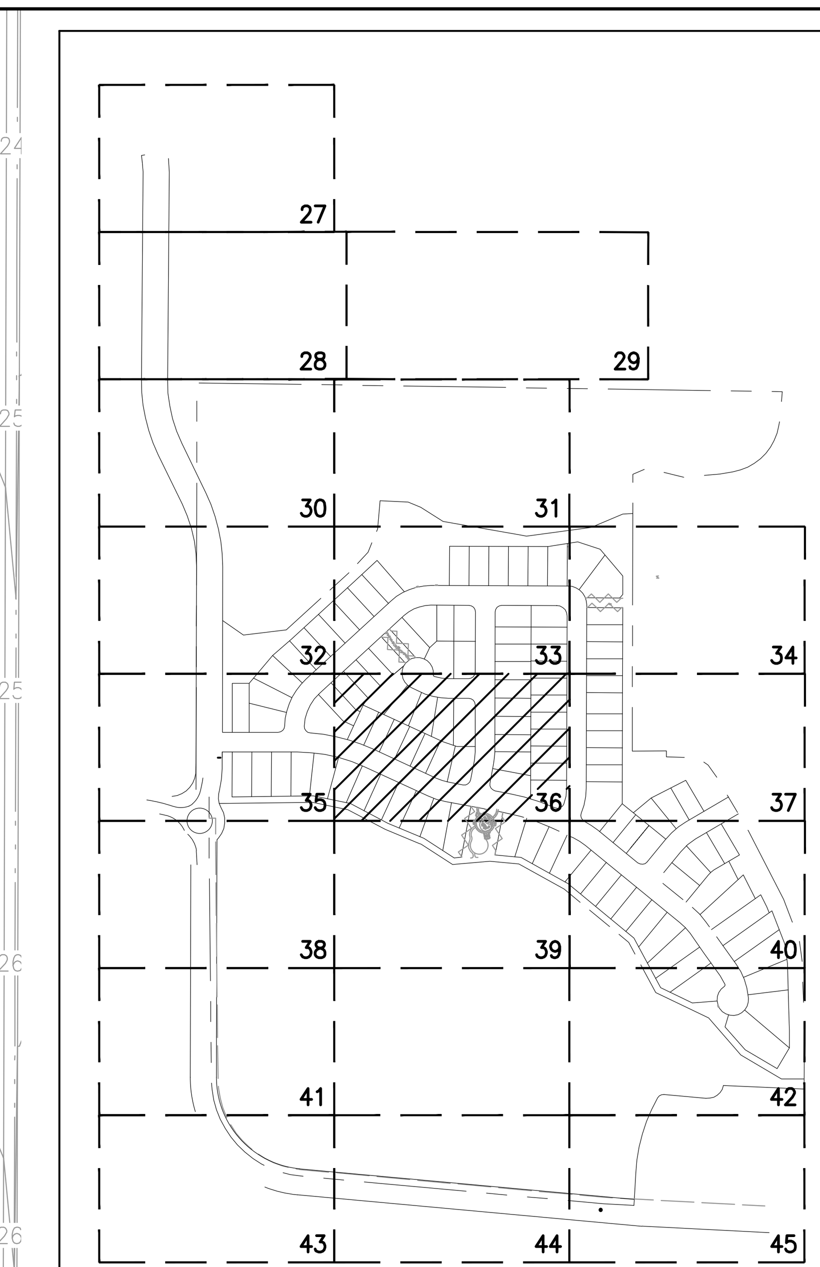
GRADING

TOWN OF ERIE

SCALE: 1"=30'	SHEET NO. 32
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. GRD-10
JOB NO: D1048	



KEY MAP

SCALE 1"=500'

GENERAL GRADING NOTES

1) SEE SHEET 05 FOR GRADING TEMPLATE

GRAPHIC SCALE: 1"=30'

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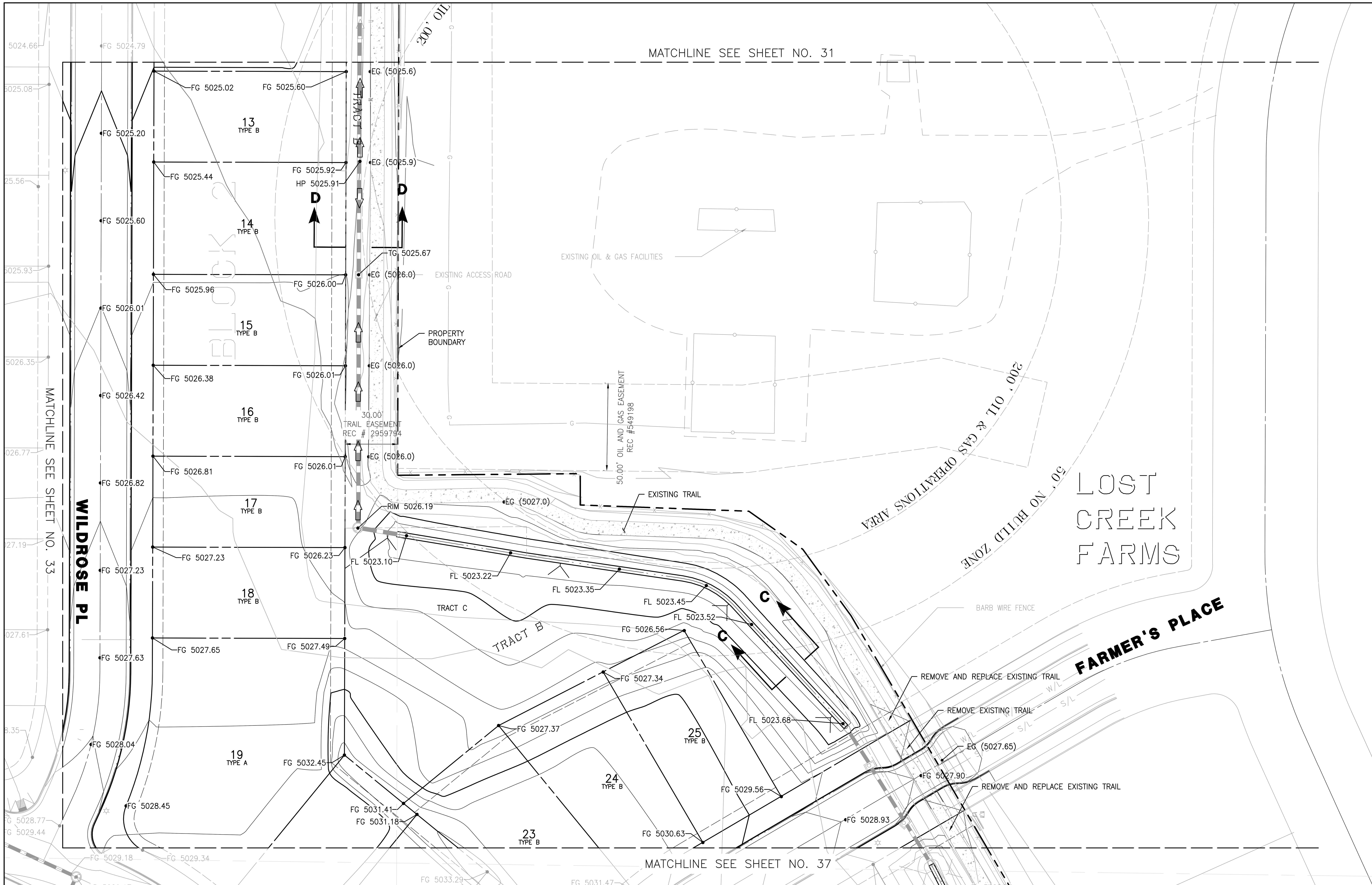
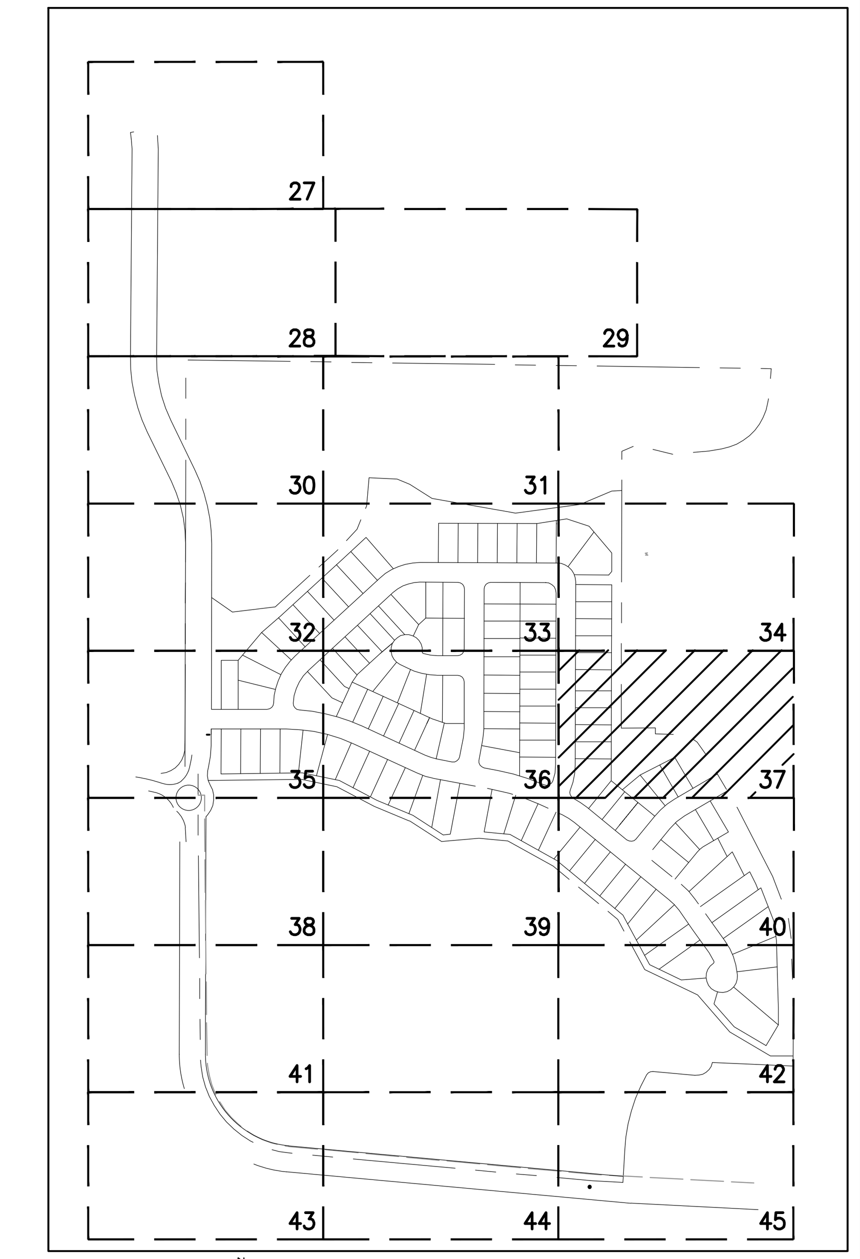
GRADING

TOWN OF ERIE

SCALE: 1"=30'	SHEET NO. 33
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. GRD-11
JOB NO: D1048	





KEY MAP

SCALE 1"=500'

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GRAPHIC SCALE: 1"=30'

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GRADING

TOWN OF ERIE

SCALE: 1"=30'	SHEET NO. 34
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. GRD-12
JOB NO: D1048	

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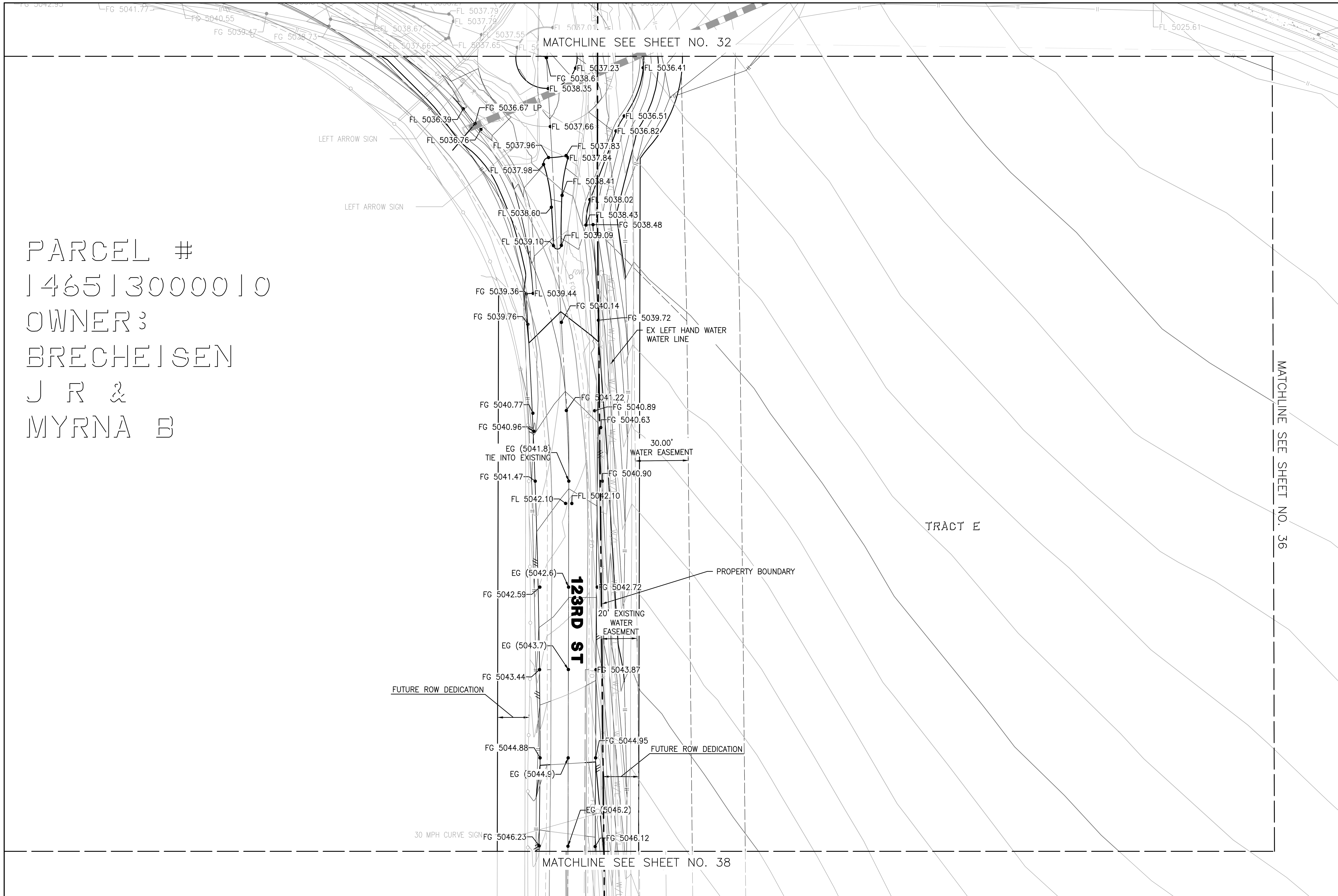

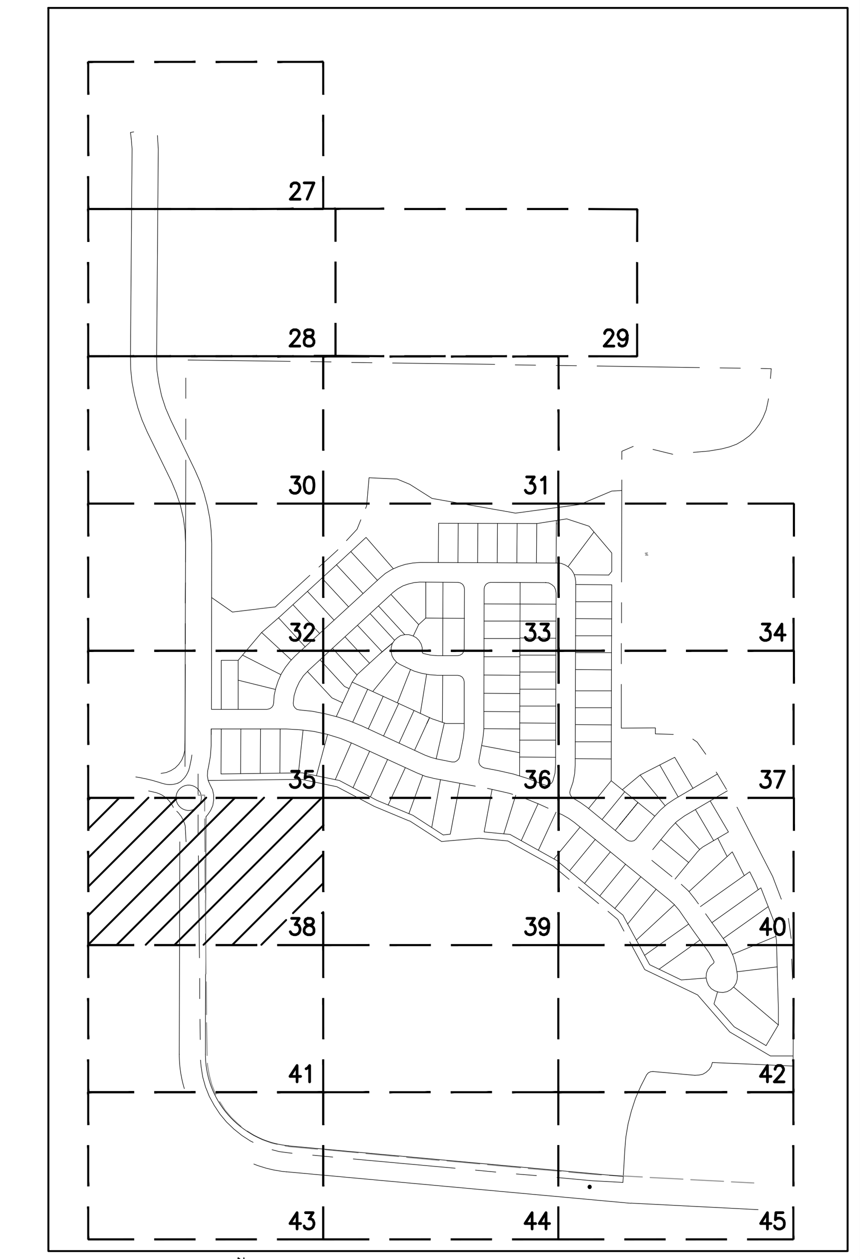

KEY MAP

SCALE 1"=500'

GRAPHIC SCALE: 1"=30'

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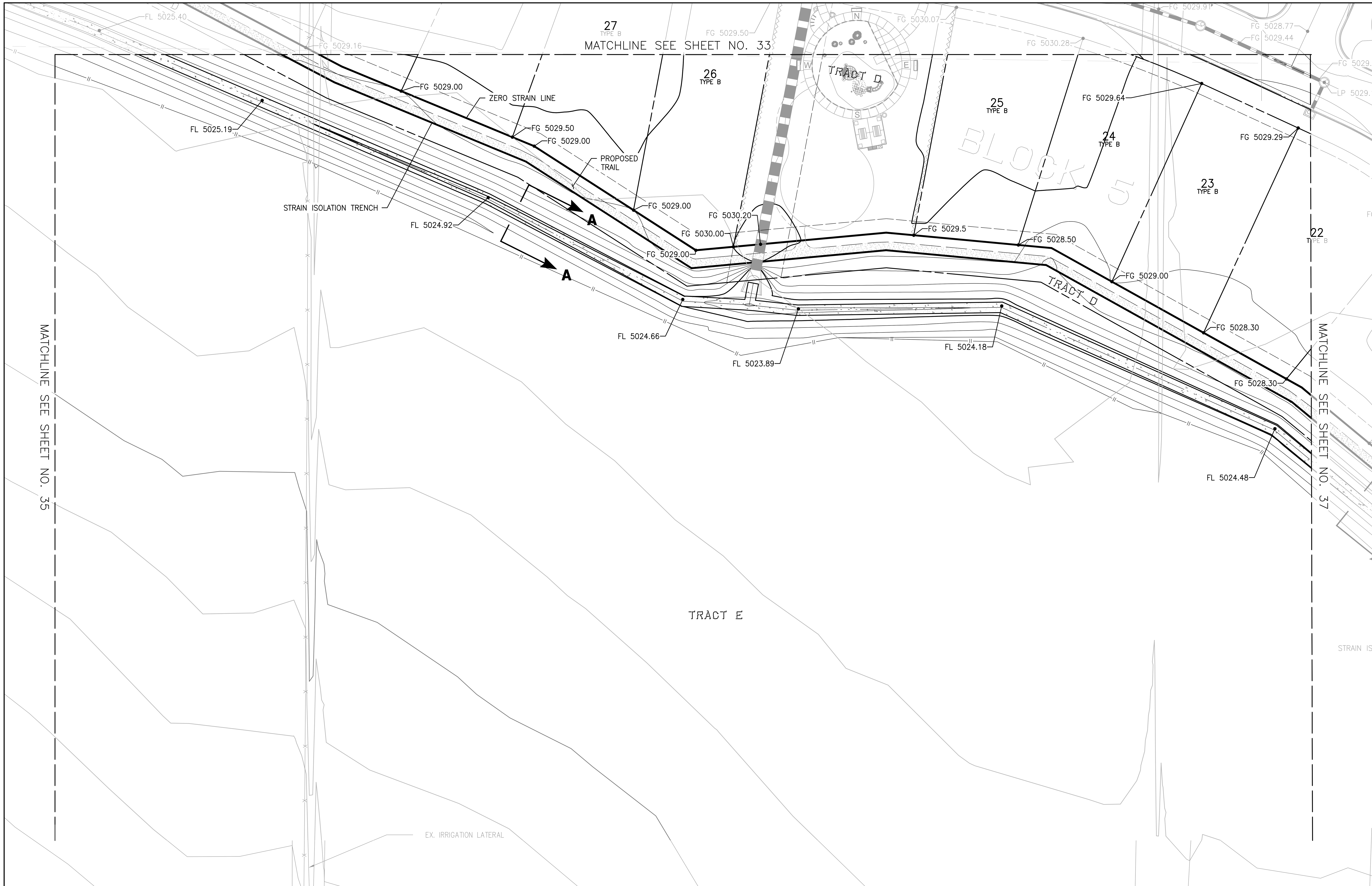
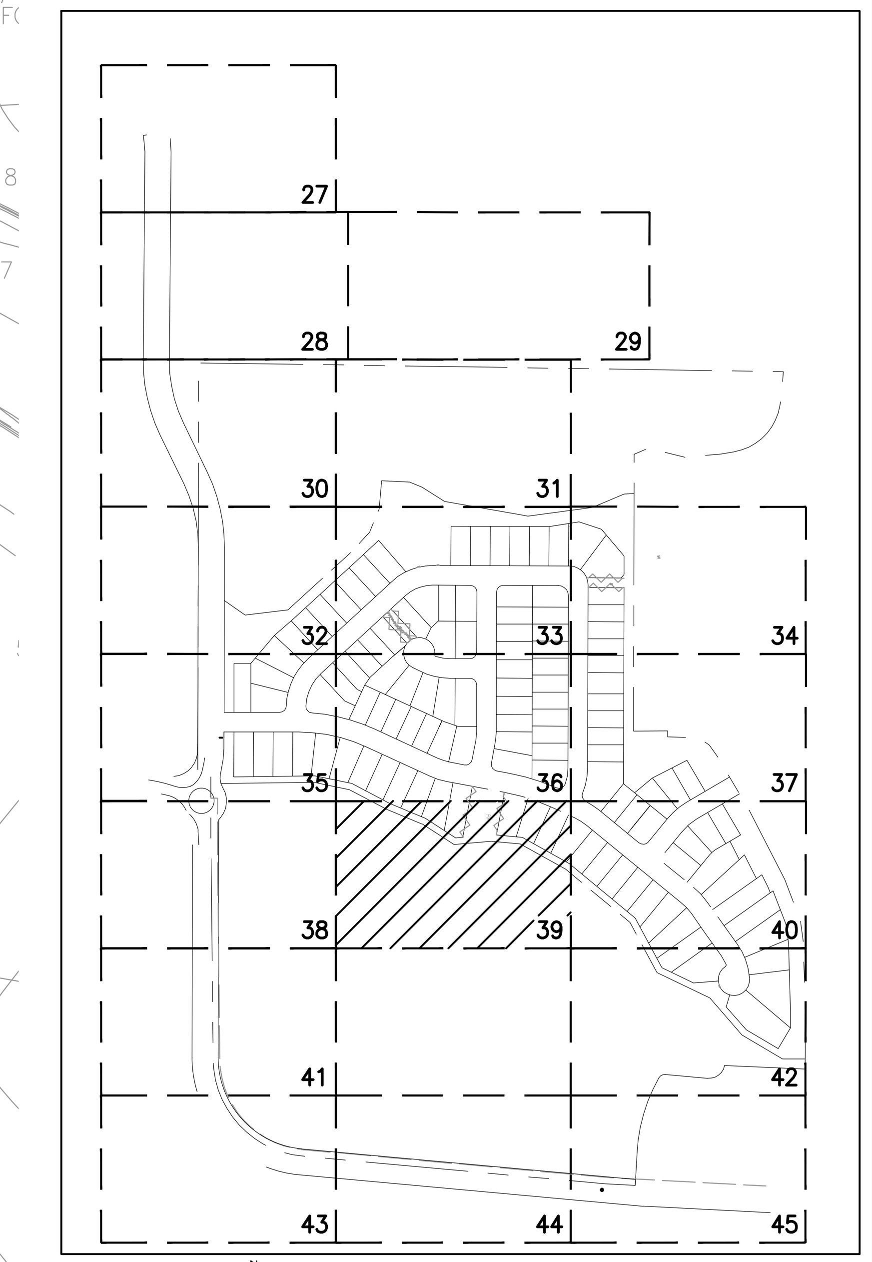
GRADING

TOWN OF ERIE

SCALE: 1"=30'	SHEET NO. 35
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. GRD-13
JOB NO: D1048	





GENERAL GRADING NOTES

1) SEE SHEET 05 FOR GRADING TEMPLATE

GRAPHIC SCALE: 1"=30'

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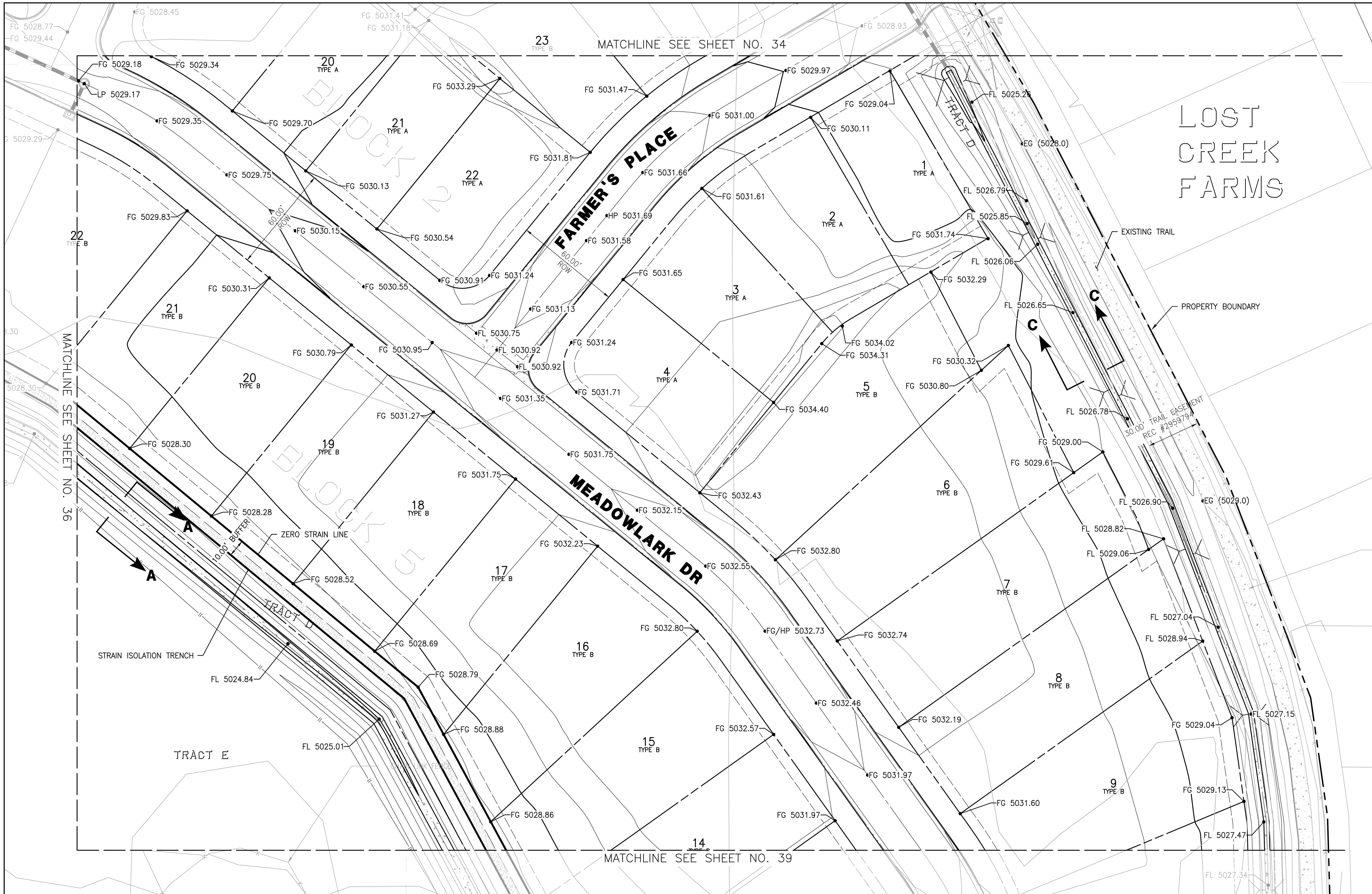
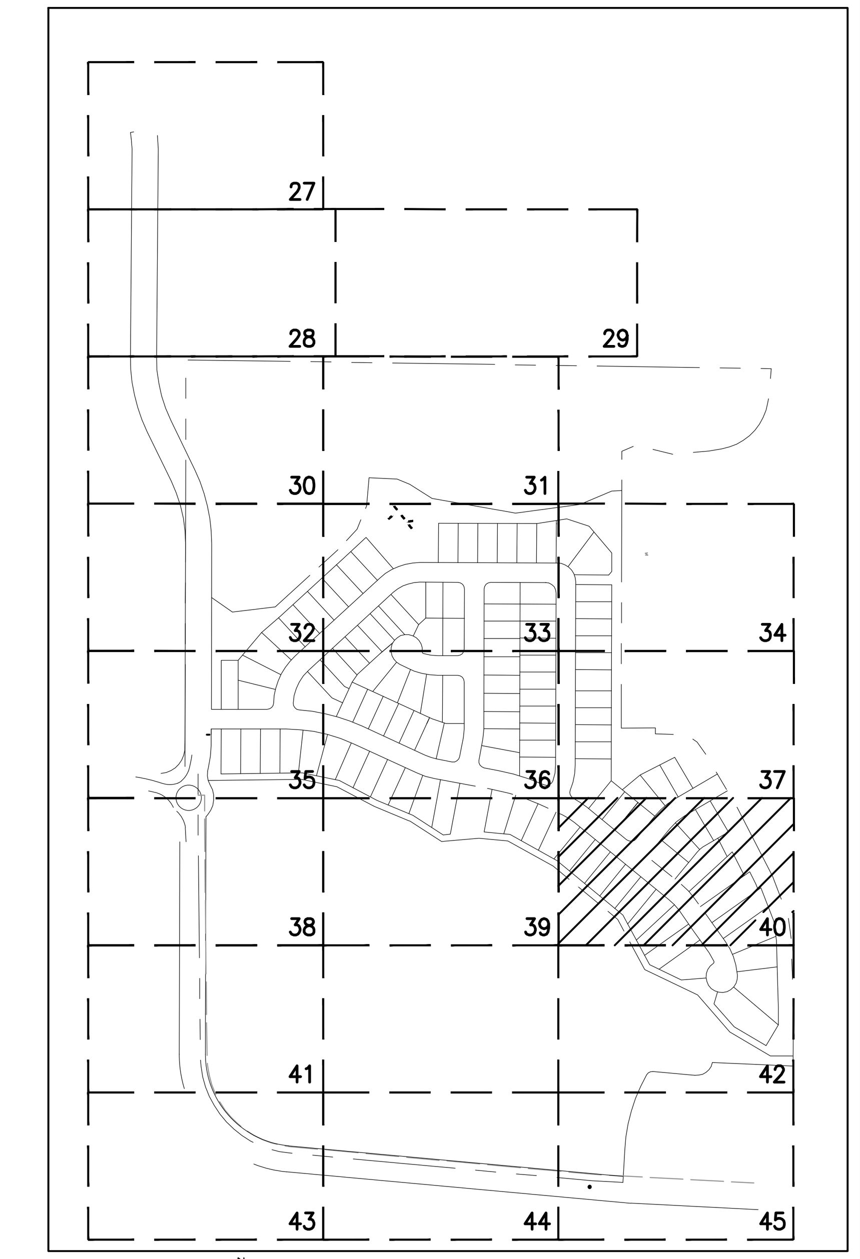
GRADING

TOWN OF ERIE

SCALE: 1"=30'	SHEET NO. 36
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. GRD-14
JOB NO: D1048	





KEY MAP

SCALE 1"=500'

GENERAL GRADING NOTES

1) SEE SHEET 05 FOR GRADING TEMPLATE

GRAPHIC SCALE: 1"=30'

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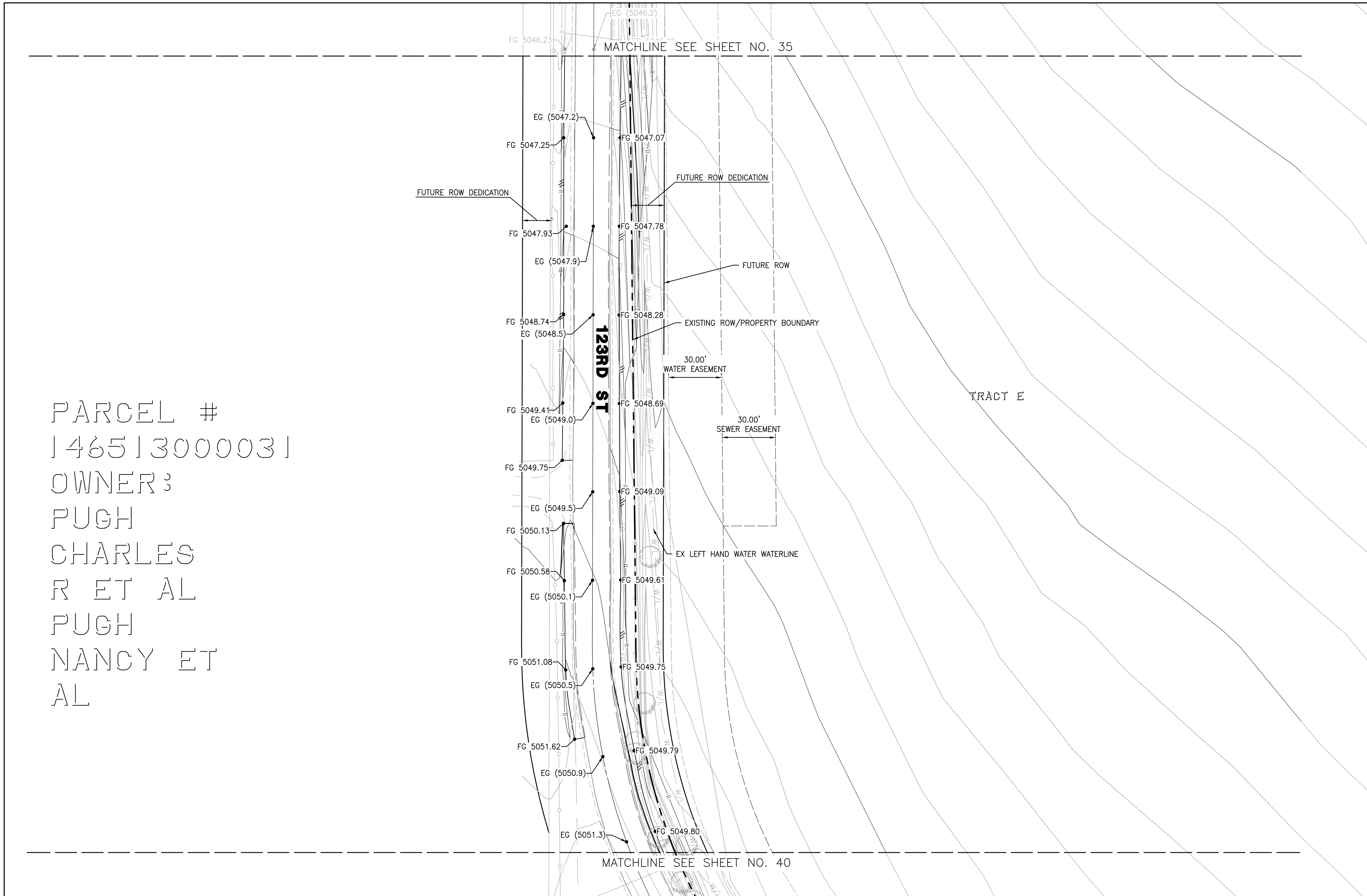
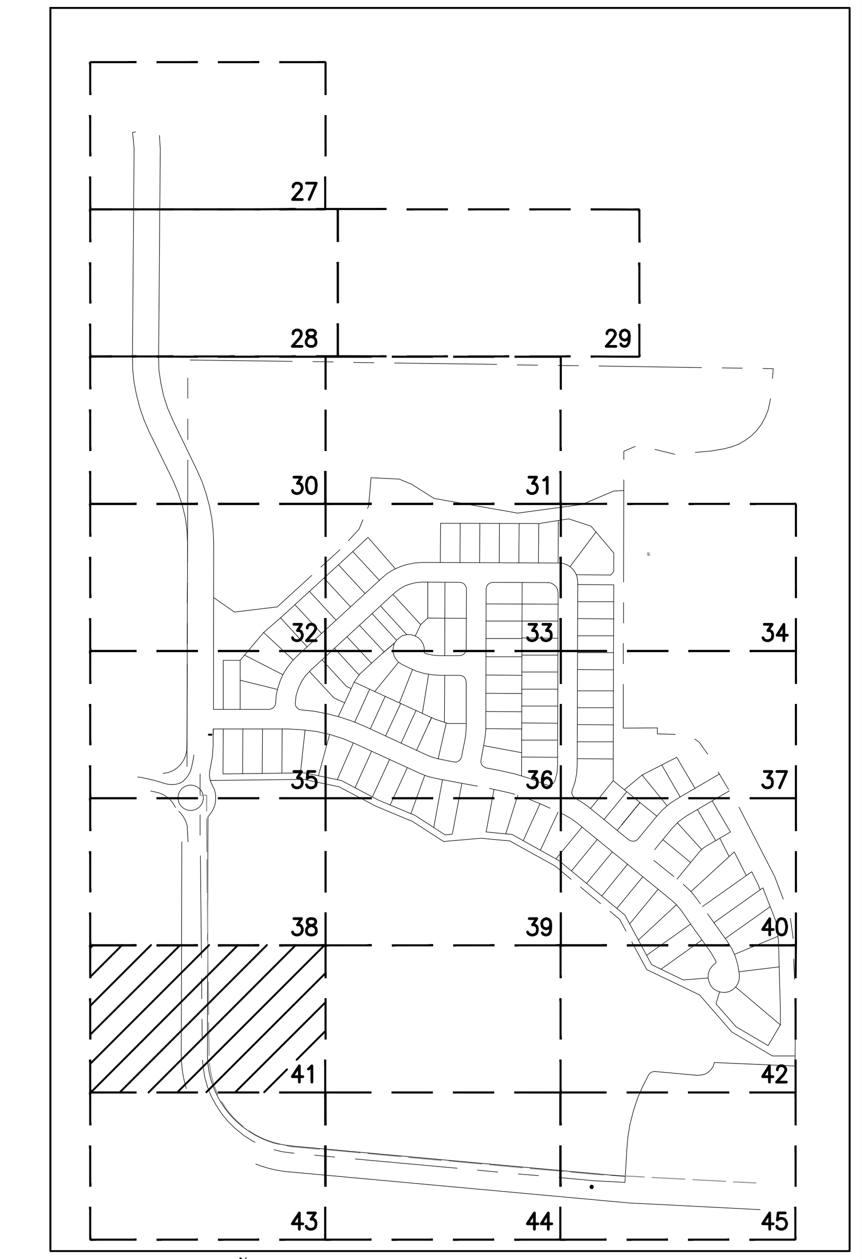
GRADING

TOWN OF ERIE

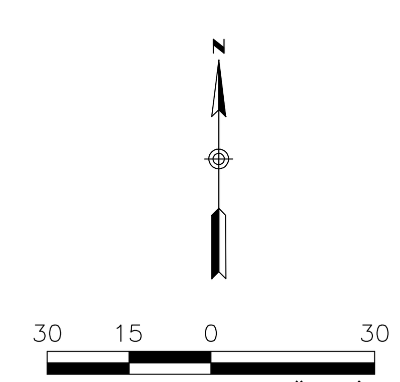
SCALE: 1"=30'	SHEET NO. 37
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. GRD–15
JOB NO: D1048	





KEY MAP

SCALE 1"=500'



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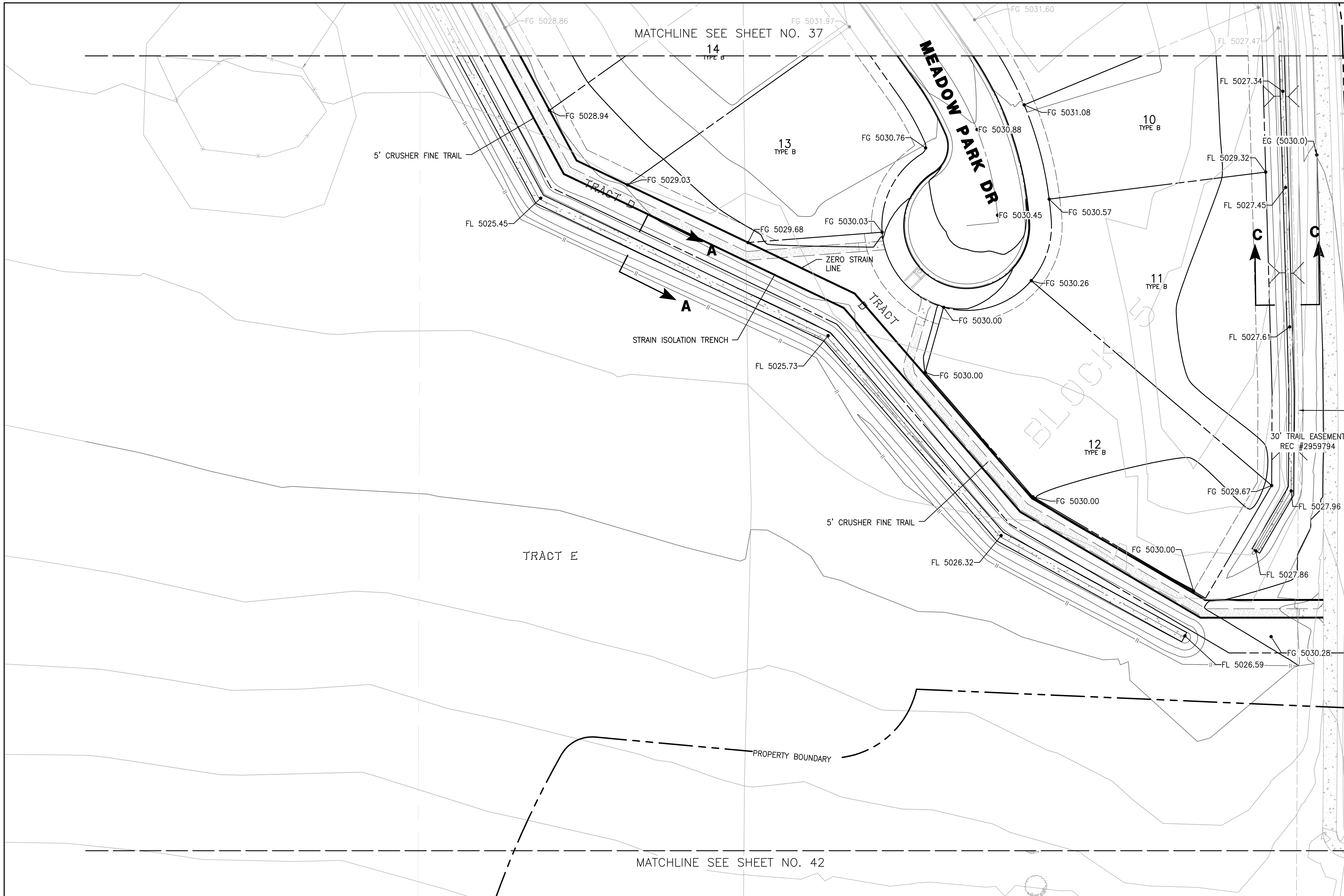
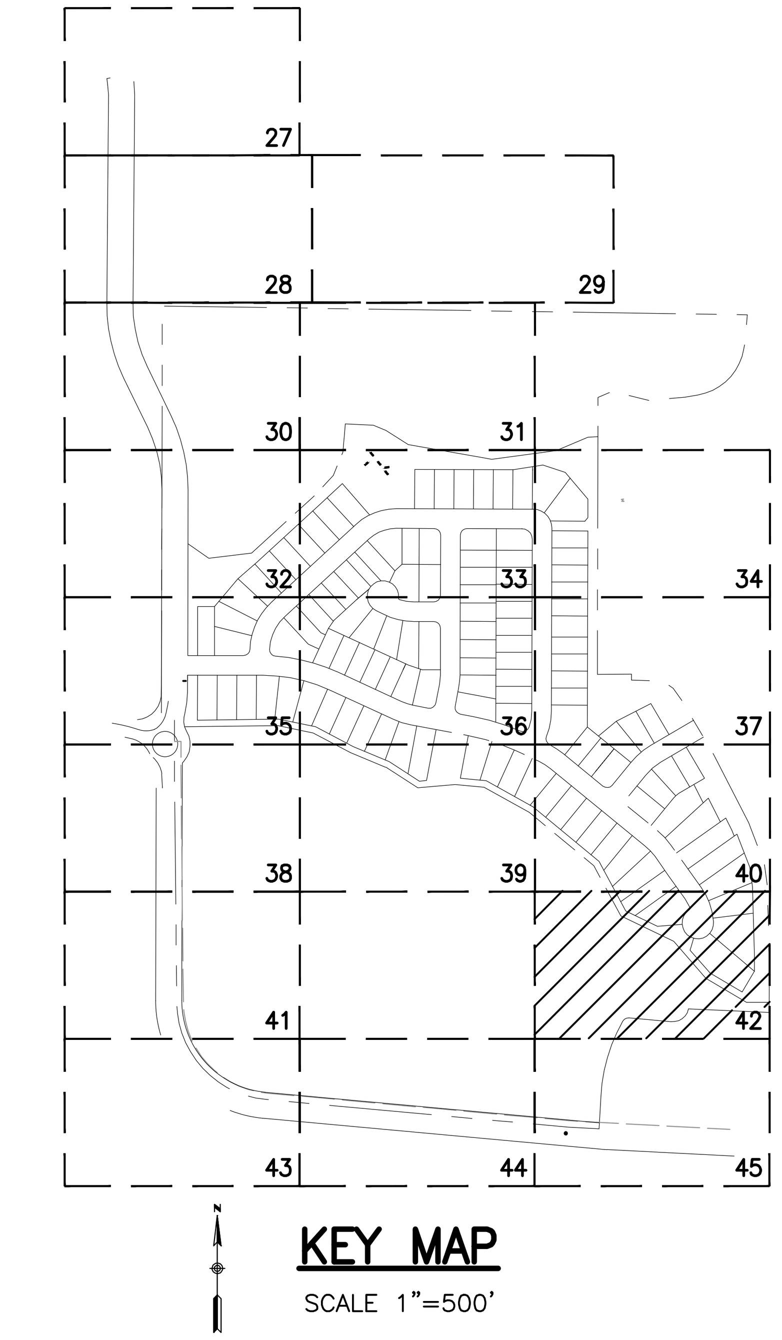
GRADING

TOWN OF ERIE

SCALE: 1"=30'	SHEET NO. 38
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. GRD–16
JOB NO: D1048	



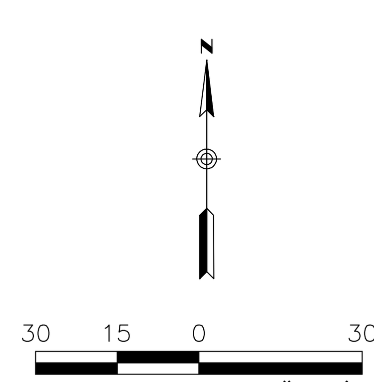


KEY MAP

SCALE 1"=500'

GENERAL GRADING NOTES

1) SEE SHEET 05 FOR GRADING TEMPLATE



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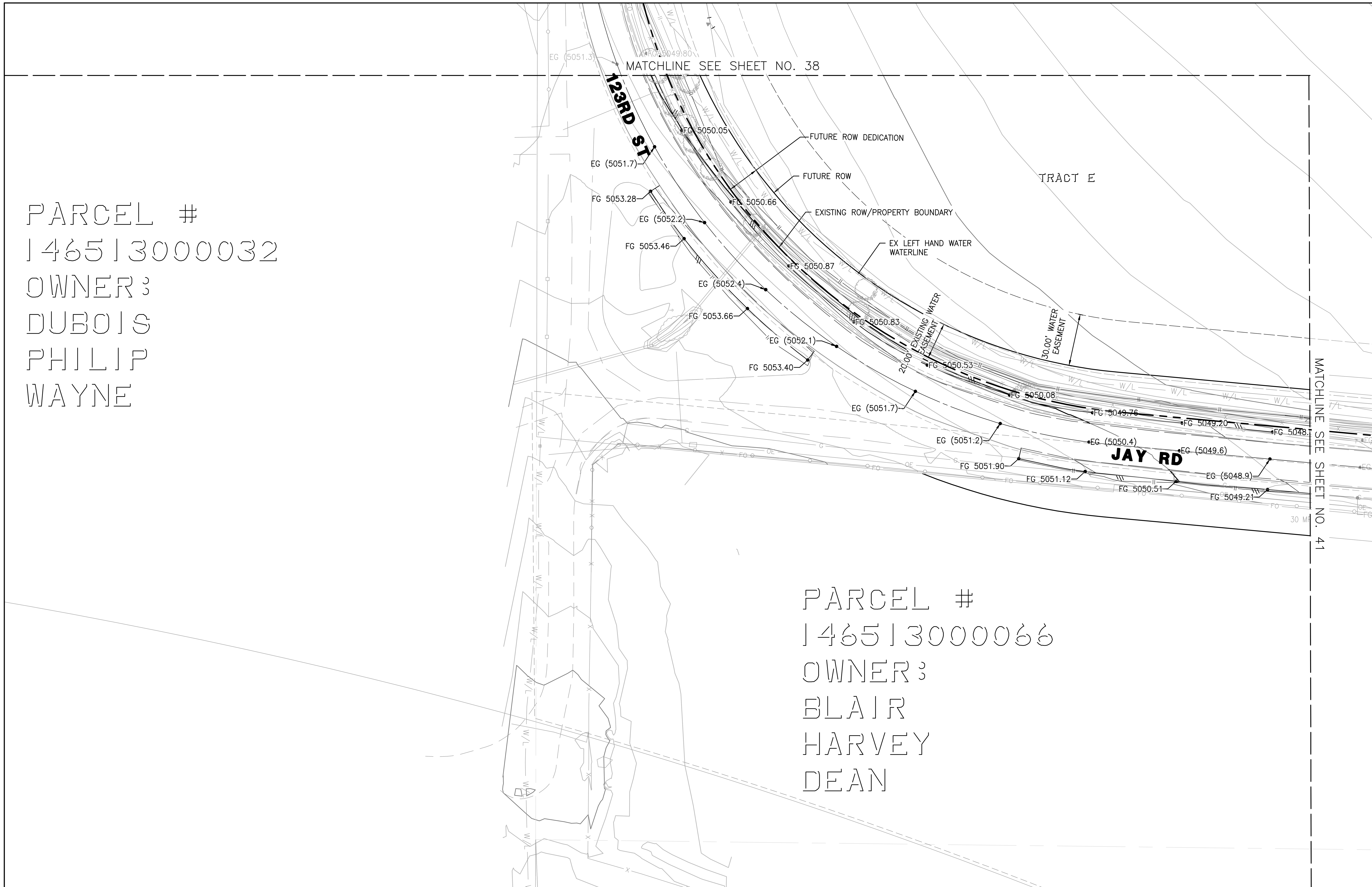
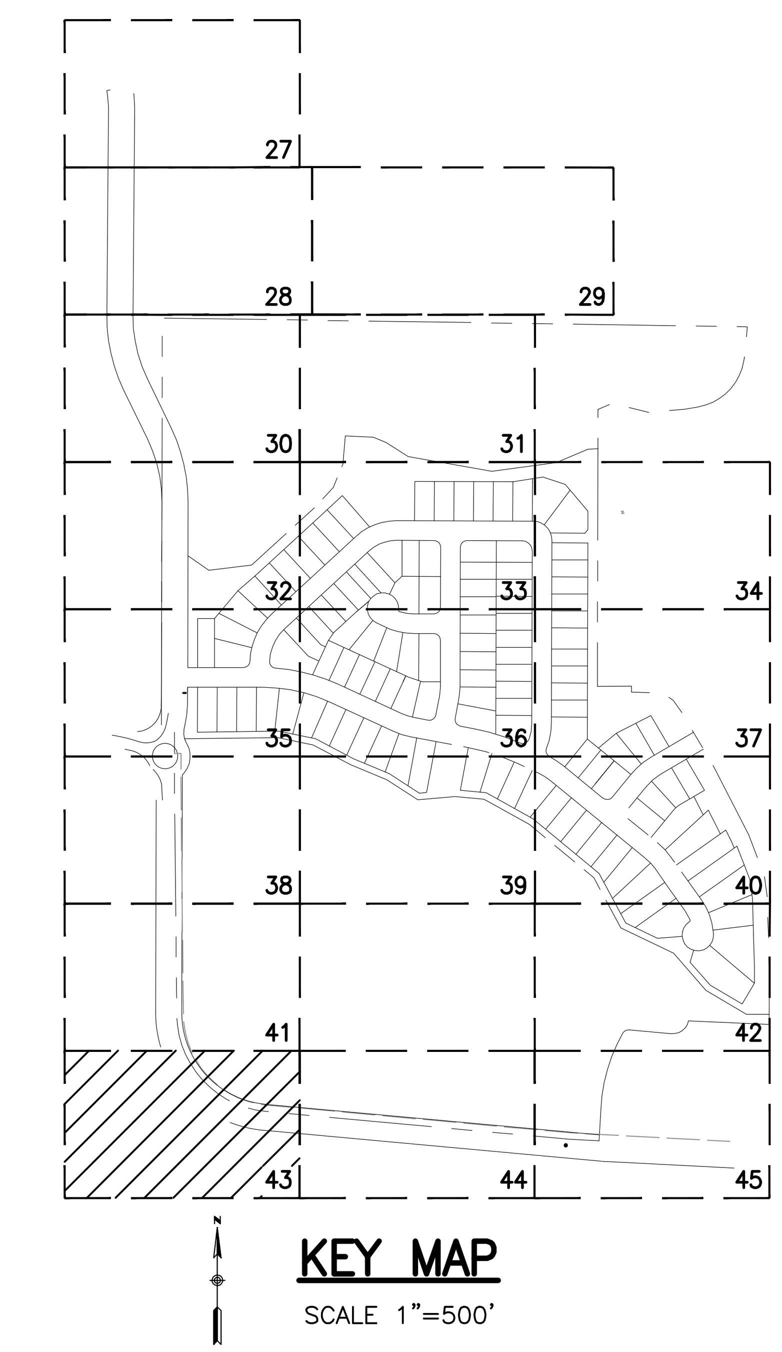
GRADING

TOWN OF ERIE

SCALE: 1"=30'	SHEET NO. 39
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. GRD-17
JOB NO: D1048	





KEY MAP

SCALE 1"=500'

30 15 0 30

GRAPHIC SCALE: 1"=30'

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GRADING

TOWN OF ERIE

SCALE: 1"=30'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 40
OF 55 SHEETS
DRAWING NO. GRD-18

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GRAPHIC SCALE: 1"=30'

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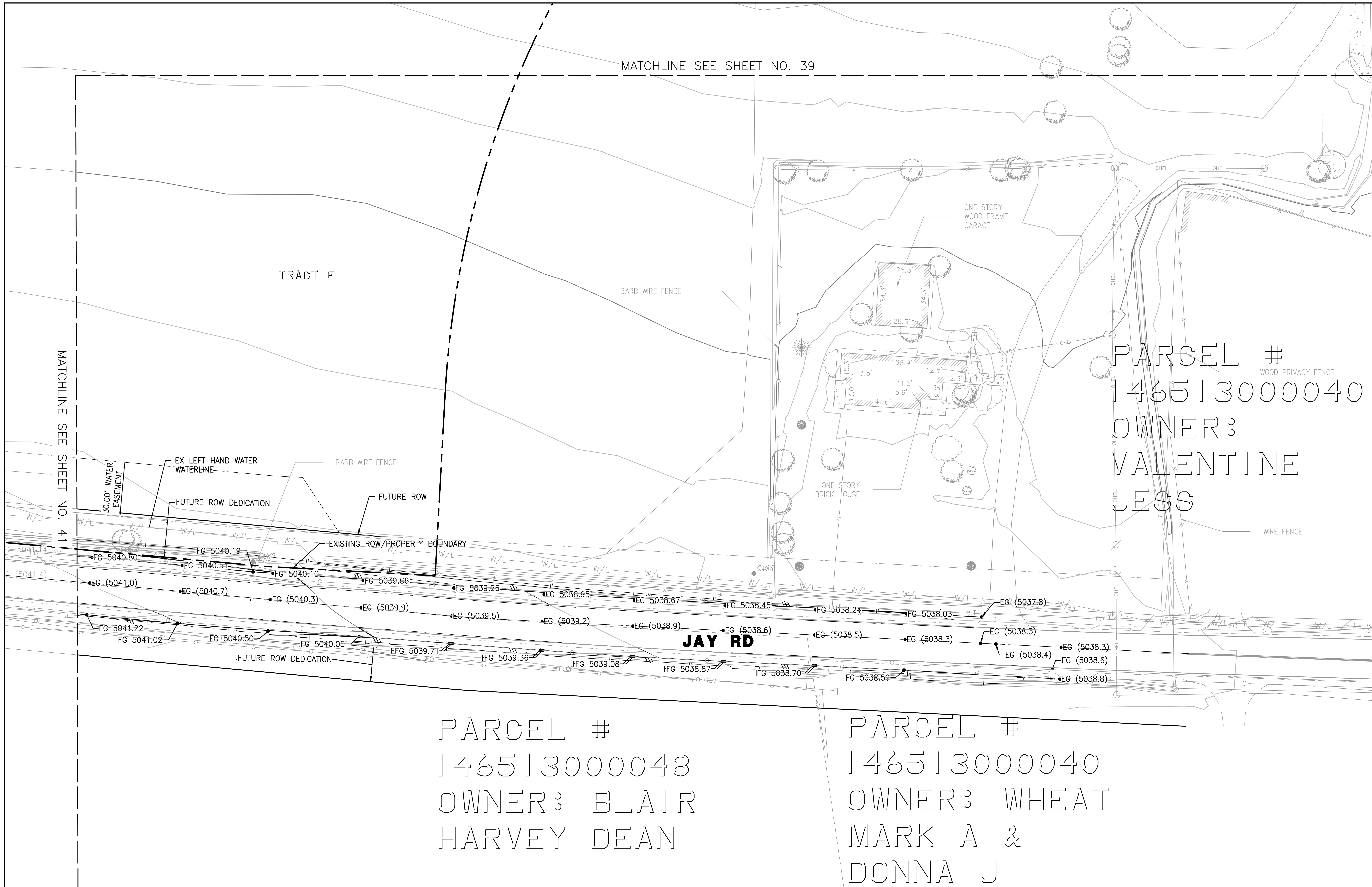
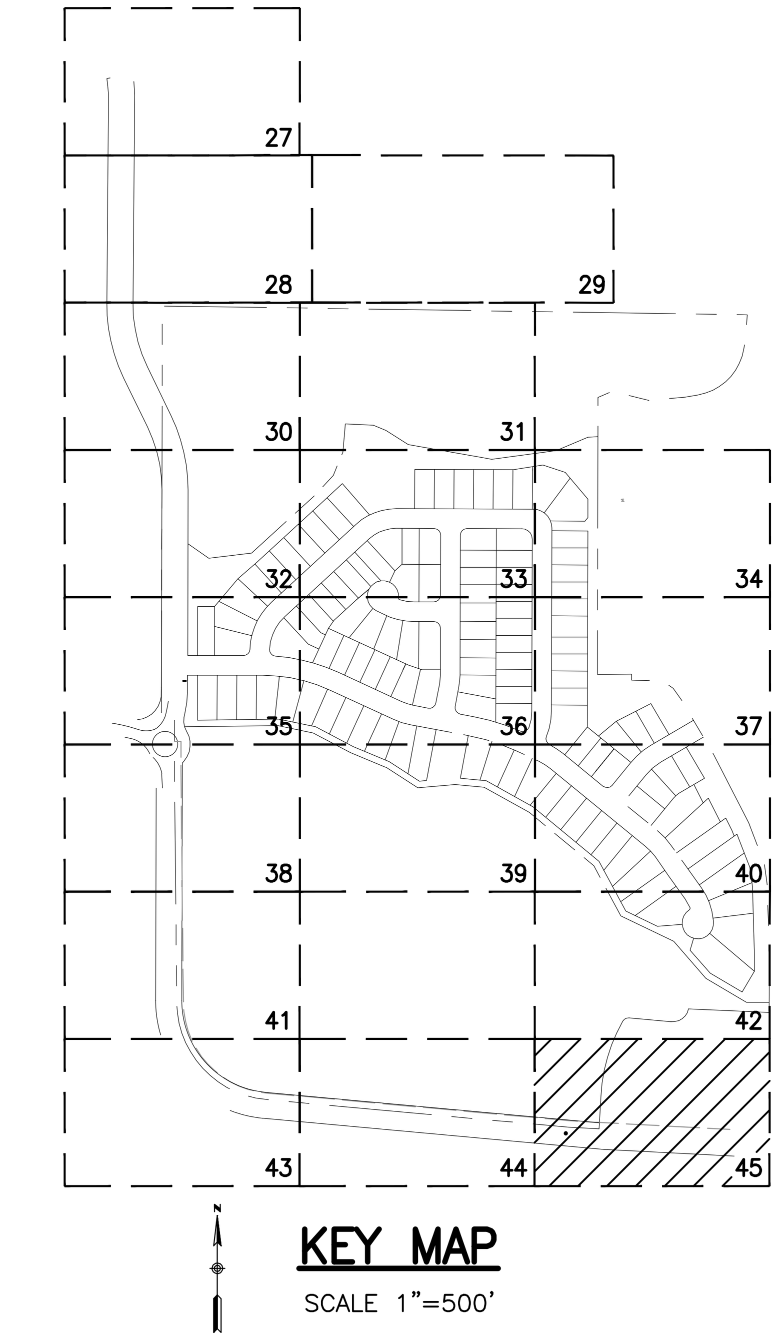
GRADING

TOWN OF ERIE

SCALE: 1"=30'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 41
OF 55 SHEETS
DRAWING NO. GRD–19





KEY MAP

SCALE 1"=500'

GRAPHIC SCALE: 1"=30'

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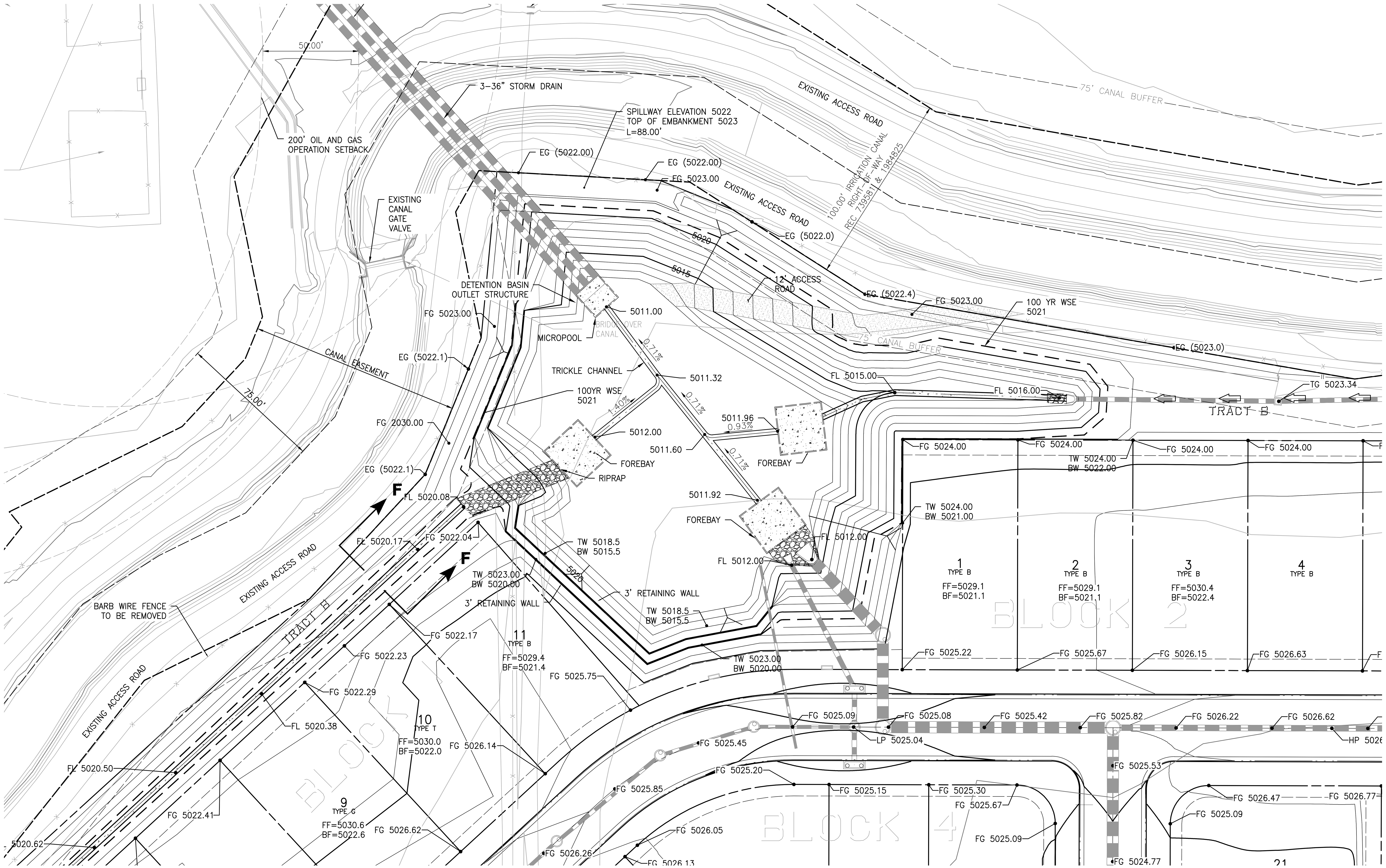
GRADING

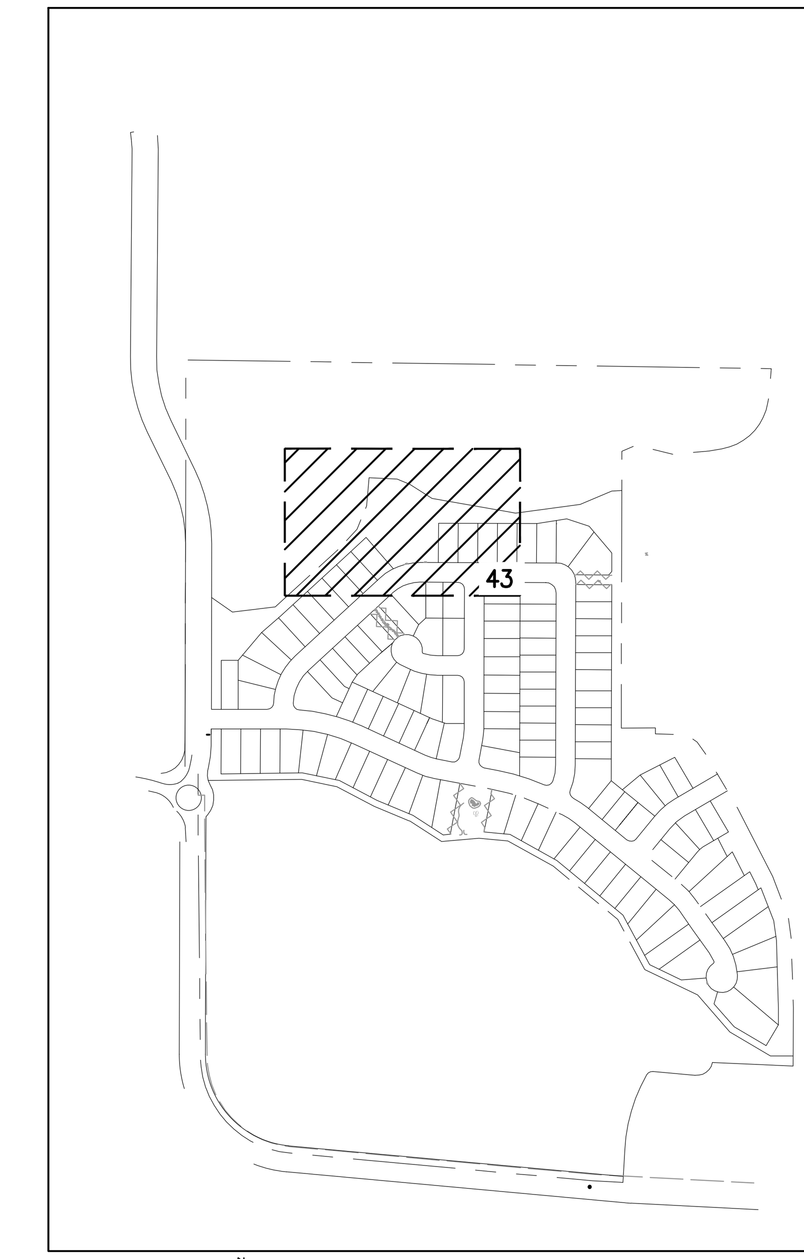
TOWN OF ERIE

SCALE: 1"=30'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 42 OF 55 SHEETS

DRAWING NO. GRD-20





KEY MAP

SCALE 1"=500'

GENERAL GRADING NOTES

1) SEE SHEET 05 FOR GRADING TEMPLATE

GRAPHIC SCALE: 1"=30'

NO.	REVISION DESCRIPTION	REVISED BY	ACCEPT. BY	DATE
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DETENTION POND DETAIL

TOWN OF ERIE

SCALE: 1"=30'	SHEET NO. 43
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. GRD–21
JOB NO: D1048	

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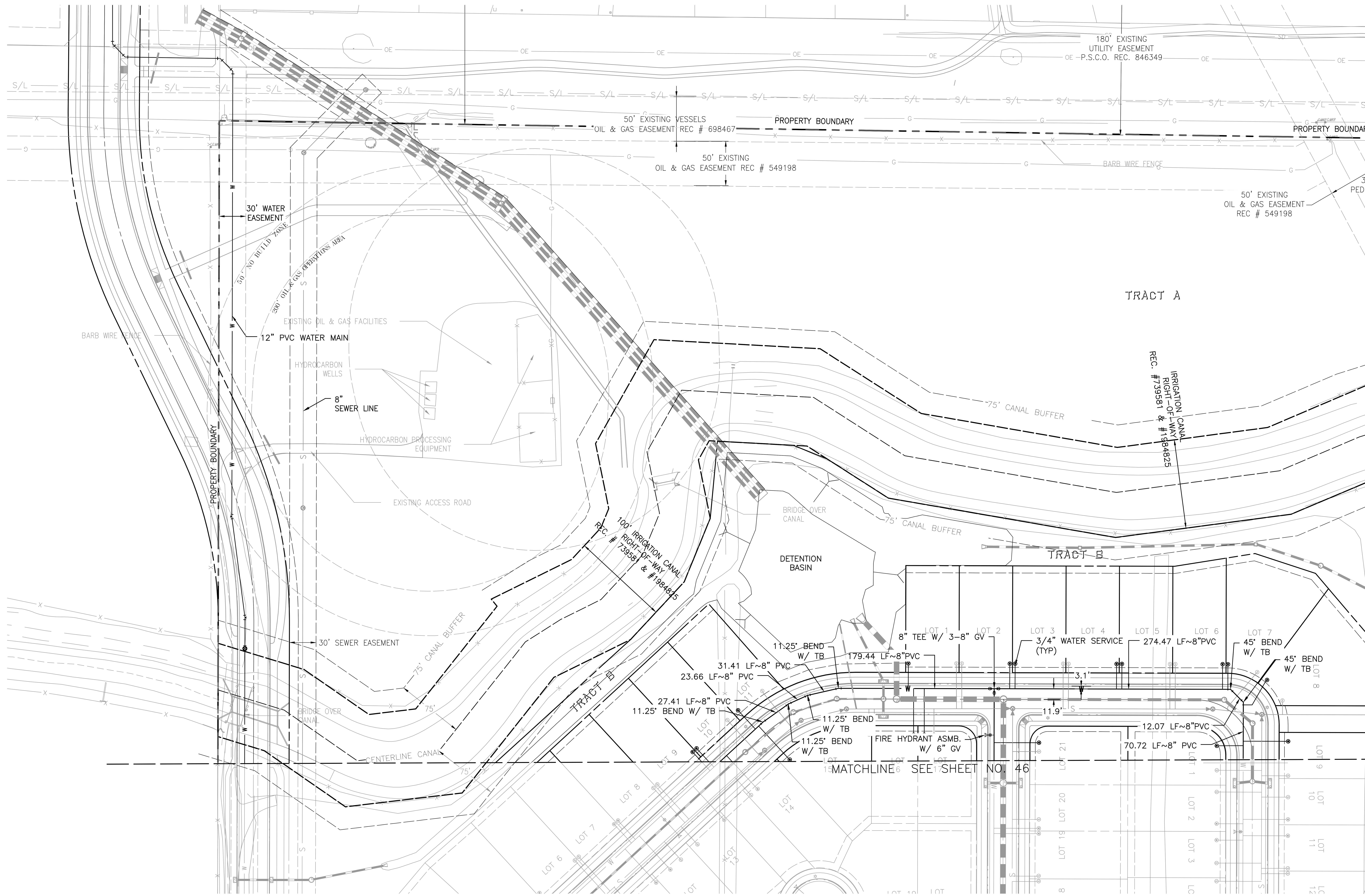
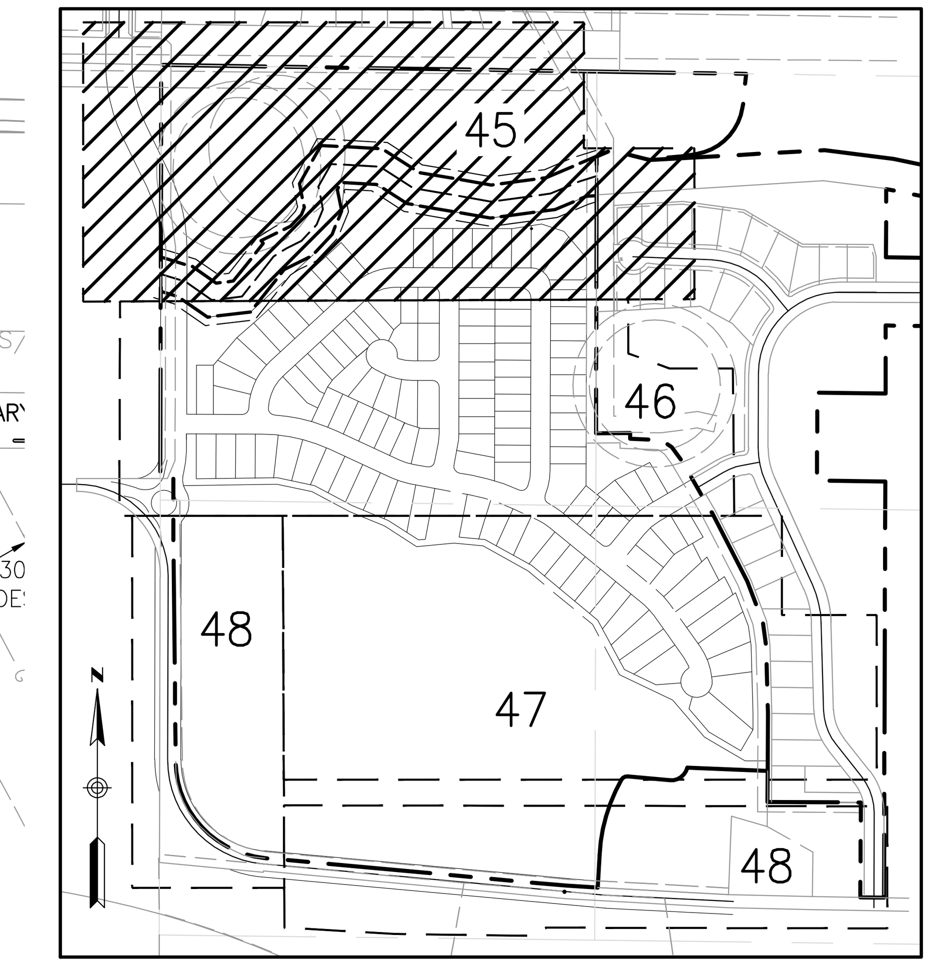
OVERALL UTILITY

TOWN OF ERIE

SCALE: 1"=100'	SHEET NO. 44
DATE: 05/16/2018	OF 58 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. UTL-01
JOB NO: D1048	





KEY MAP

SCALE 1"=500'

60 30 0 60

GRAPHIC SCALE: 1"=60'

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△	–	–	–	–

PRELIMINARY NOT FOR CONSTRUCTION

COLORADO LICENSED PROFESSIONAL ENGINEER 50961

PROJECT ENGINEER DATE

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

WATER PLAN

TOWN OF ERIE

SCALE: 1"=60'	SHEET NO. 45
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	DRAWING NO. WAT-01
CHECKED BY: TB	
JOB NO: D1048	

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PRELIMINARY NOT FOR CONSTRUCTION

PROJECT ENGINEER DATE

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

WATER PLAN

TOWN OF ERIE

SCALE: 1"=60'	SHEET NO. 46
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	DRAWING NO. WAT-02
CHECKED BY: TB	
JOB NO: D1048	

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60 30 0 60
GRAPHIC SCALE: 1"=60'

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PRELIMINARY
NOT FOR CONSTRUCTION
COLORADO LICENSED PROFESSIONAL ENGINEER 50961

PROJECT ENGINEER DATE

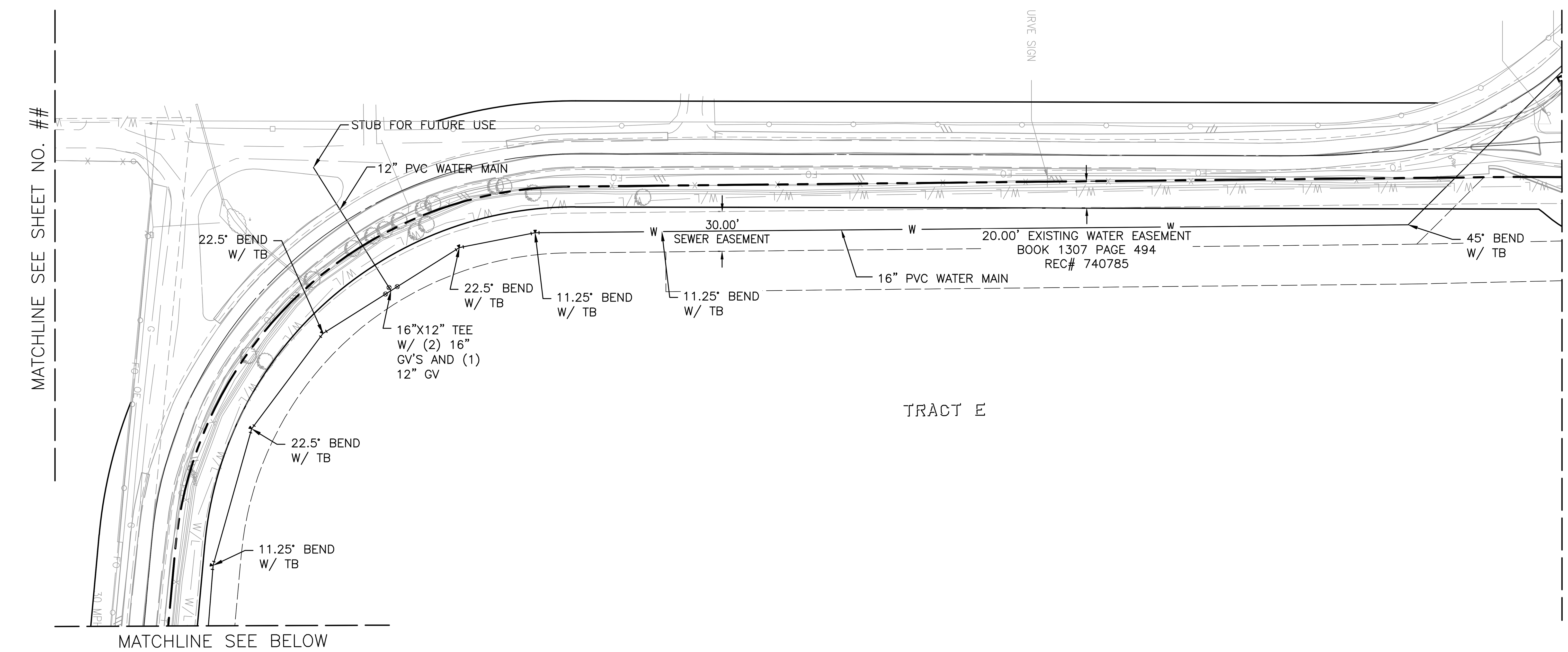
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

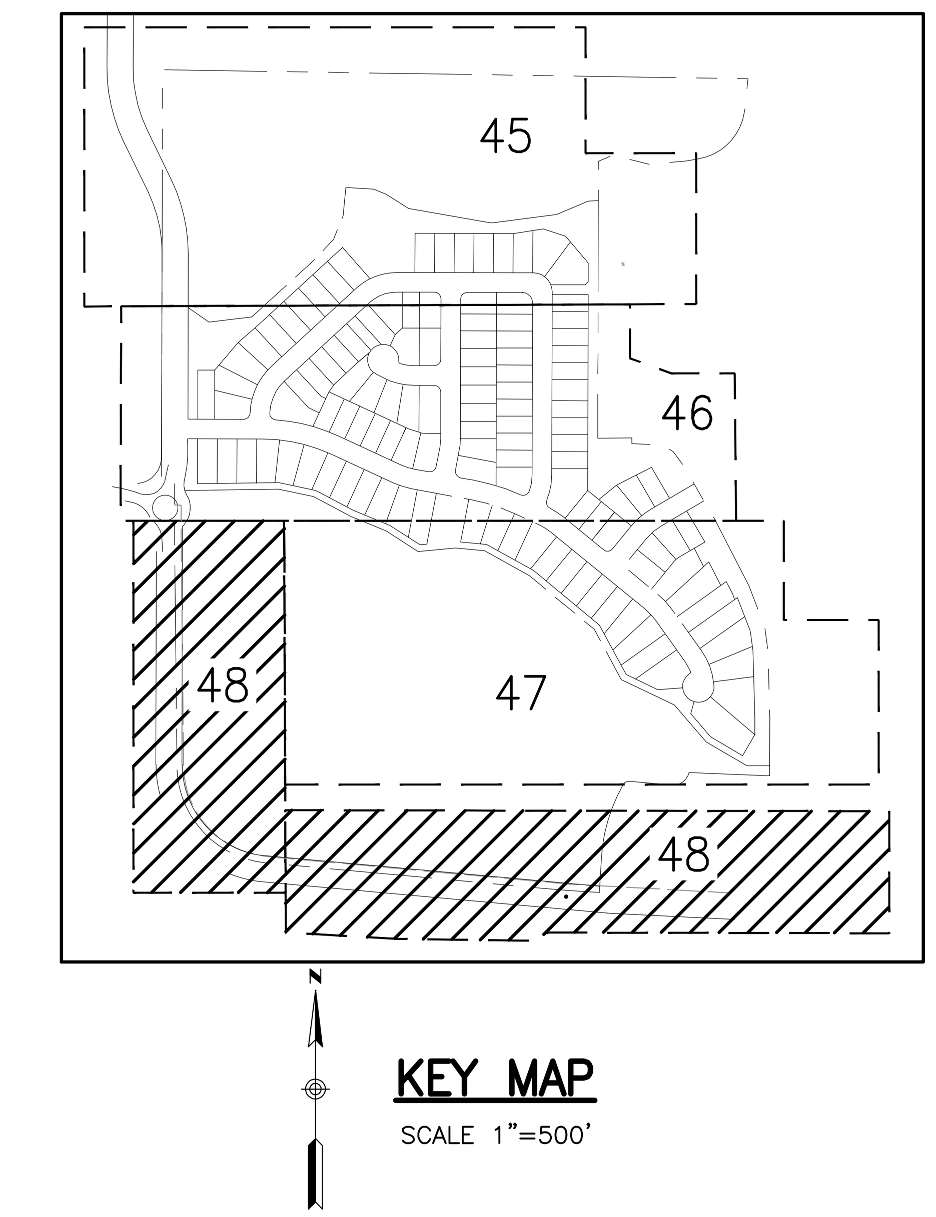
WATER PLAN

TOWN OF ERIE

SCALE: 1"=60'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 47
OF 55 SHEETS
DRAWING NO. WAT-03





60 30 0 60
GRAPHIC SCALE: 1"=60'

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PROJECT ENGINEER DATE

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

WATER PLAN

TOWN OF ERIE

SCALE: 1"=60'	SHEET NO. 48
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	DRAWING NO. WAT-04
CHECKED BY: TB	
JOB NO: D1048	

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PRELIMINARY NOT FOR CONSTRUCTION

PROJECT ENGINEER DATE

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

SEWER PLAN

TOWN OF ERIE

SCALE: 1"=60'

DATE: 02/06/2018

DRAWN BY: KS

CHECKED BY: TB

JOB NO: D1048

SHEET NO. 49 OF 55 SHEETS

DRAWING NO. SS-01

GRAPHIC SCALE: 1"=60'

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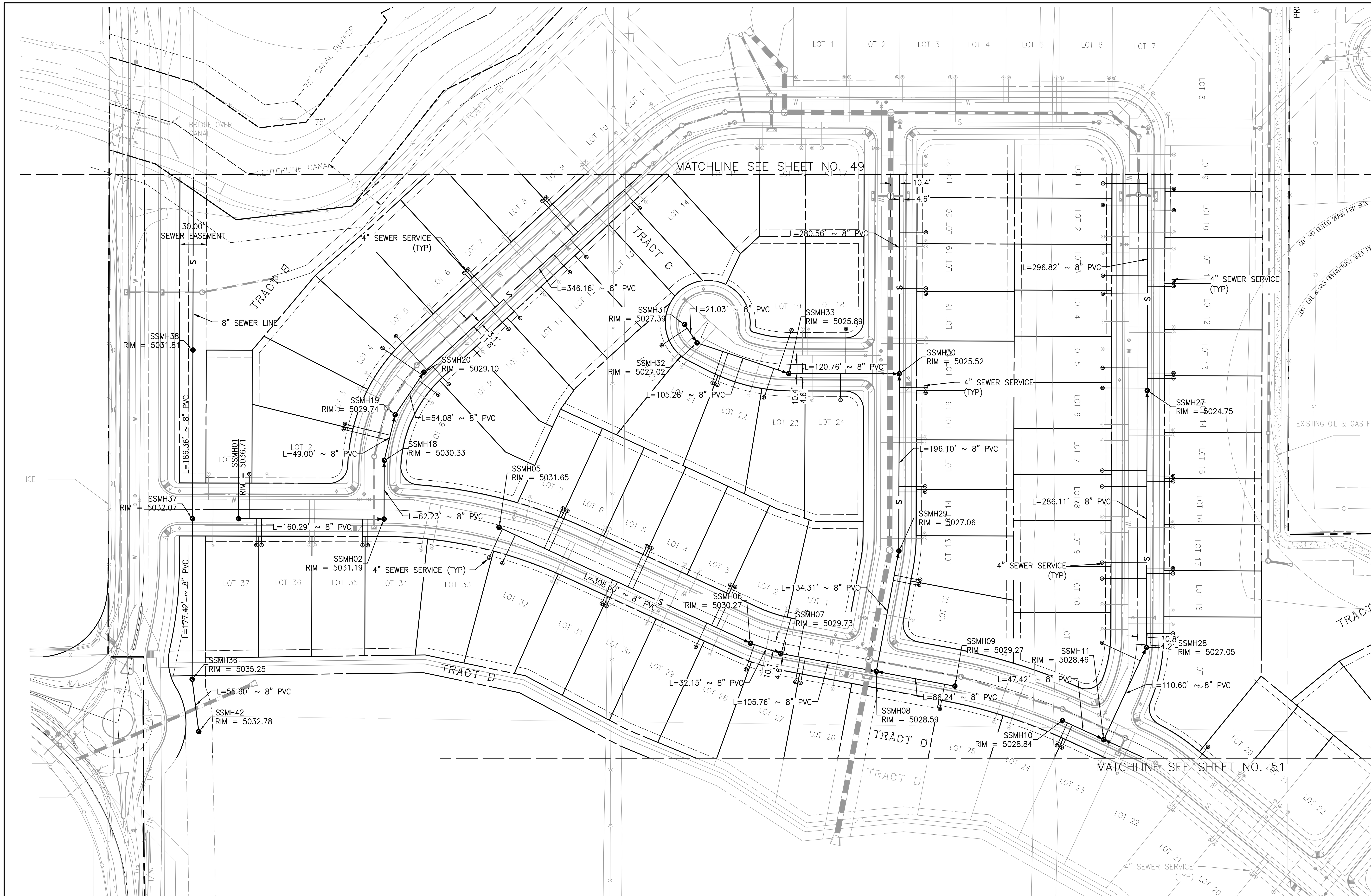

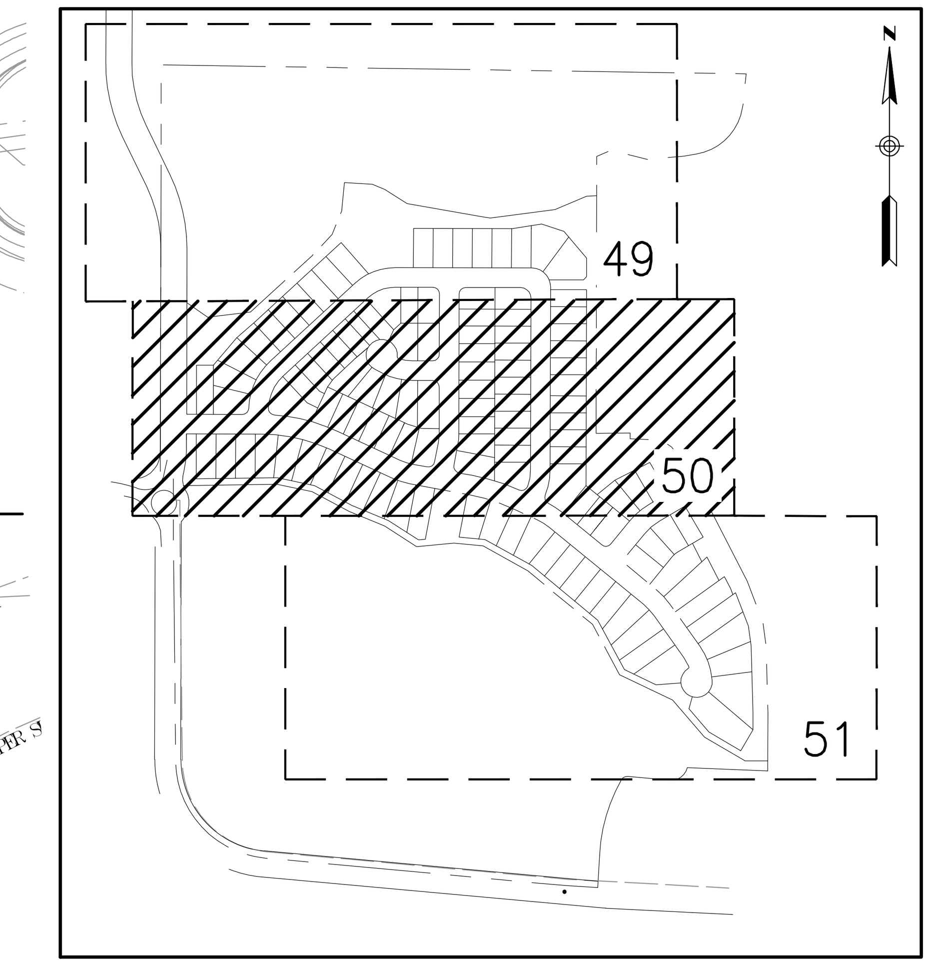

KEY MAP

SCALE 1"=500'

60 30 0 60
GRAPHIC SCALE: 1"=60'

NO.	REVISION DESCRIPTION	REVISED BY	ACCEPT. BY	DATE
△	–	–	–	–

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COLORADO LICENSED PROFESSIONAL ENGINEER 50961

PROJECT ENGINEER DATE

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

SEWER PLAN

TOWN OF ERIE

SCALE: 1"=60'
DATE: 02/06/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 50 OF 55 SHEETS
DRAWING NO. SS-02

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60 30 0 60
GRAPHIC SCALE: 1"=60'

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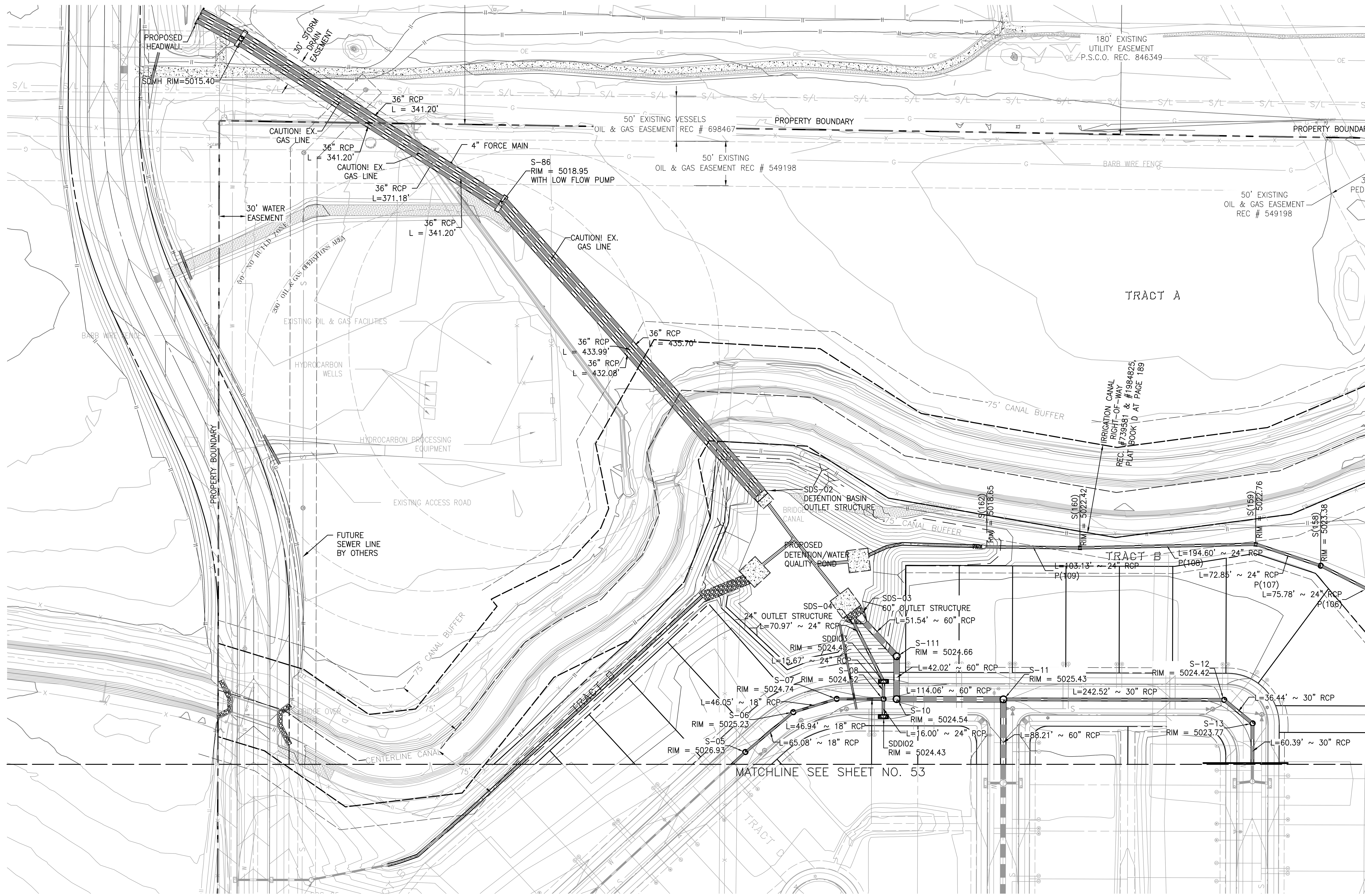
PROJECT ENGINEER DATE

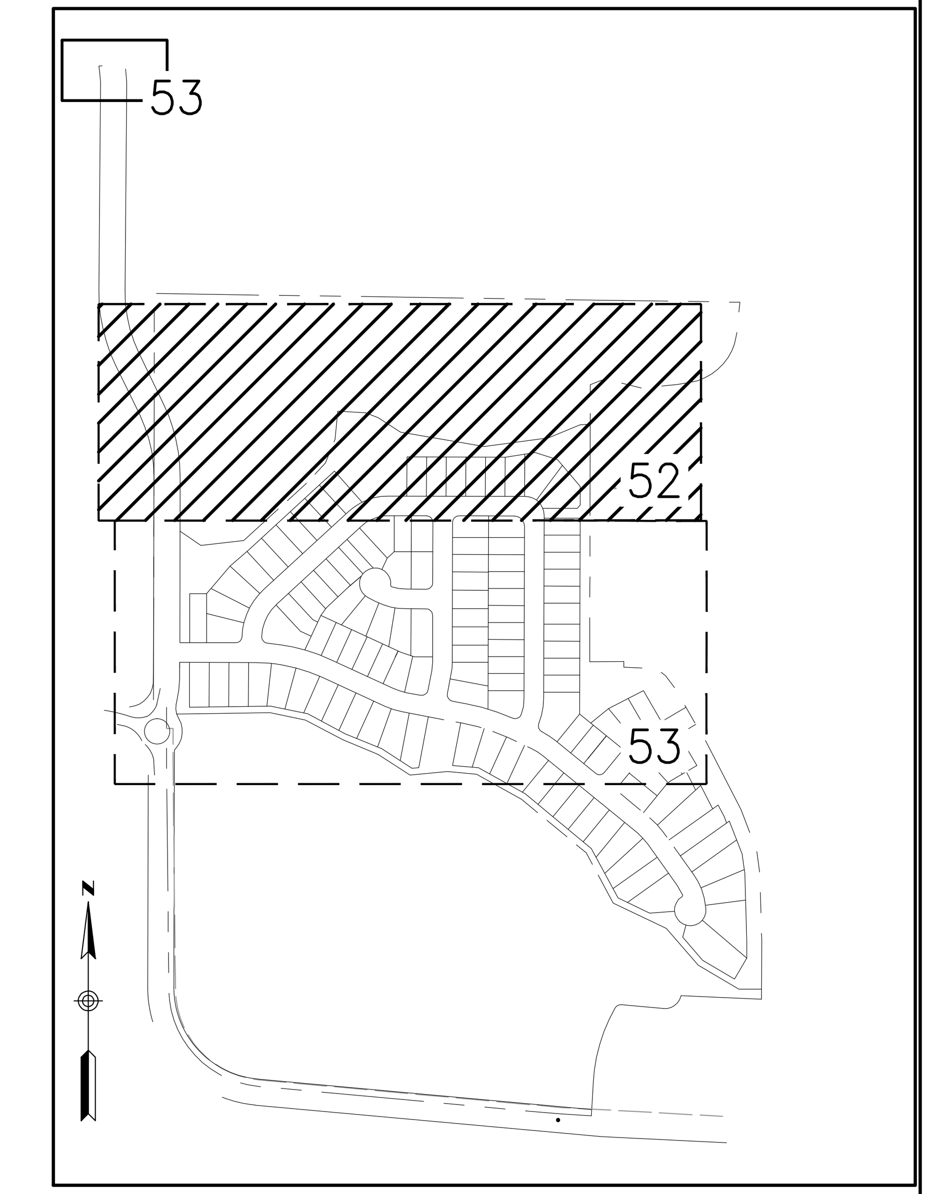
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

SEWER PLAN

TOWN OF ERIE

SCALE: 1"=60'	SHEET NO. 51
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. SS-03
JOB NO: D1048	





KEY MAP

SCALE 1"=500'

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60 30 0 60
GRAPHIC SCALE: 1"=60'

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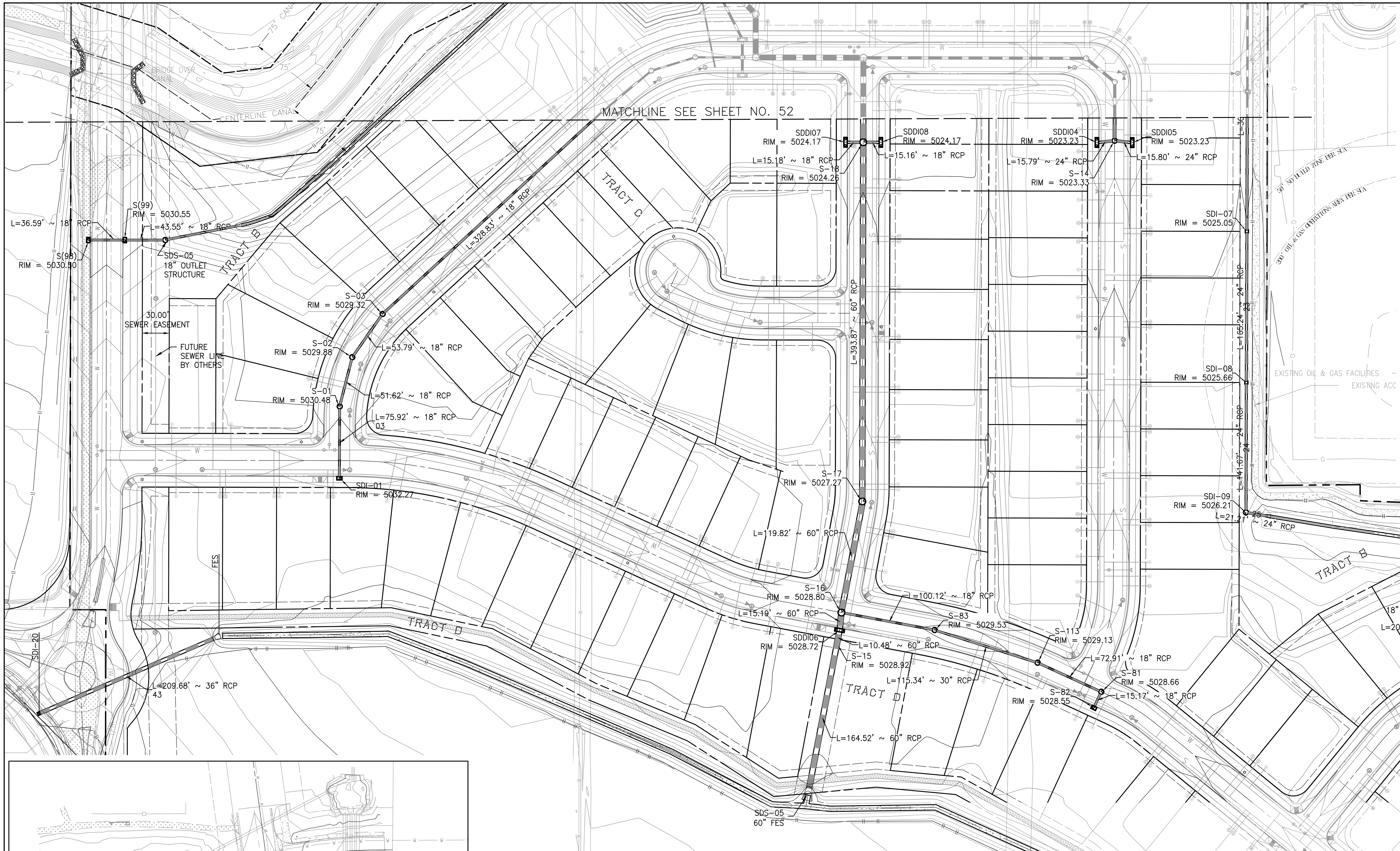
PROJECT ENGINEER DATE

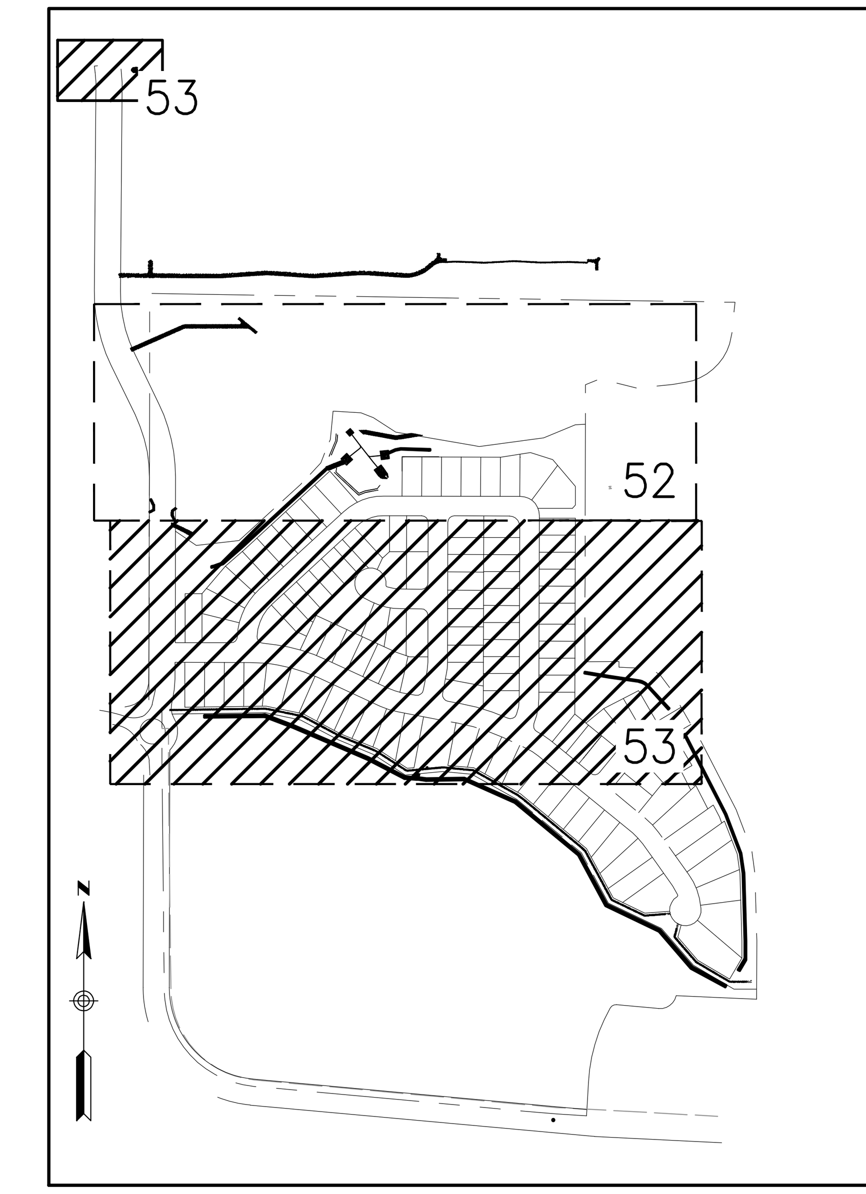
MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

STORM DRAIN

TOWN OF ERIE

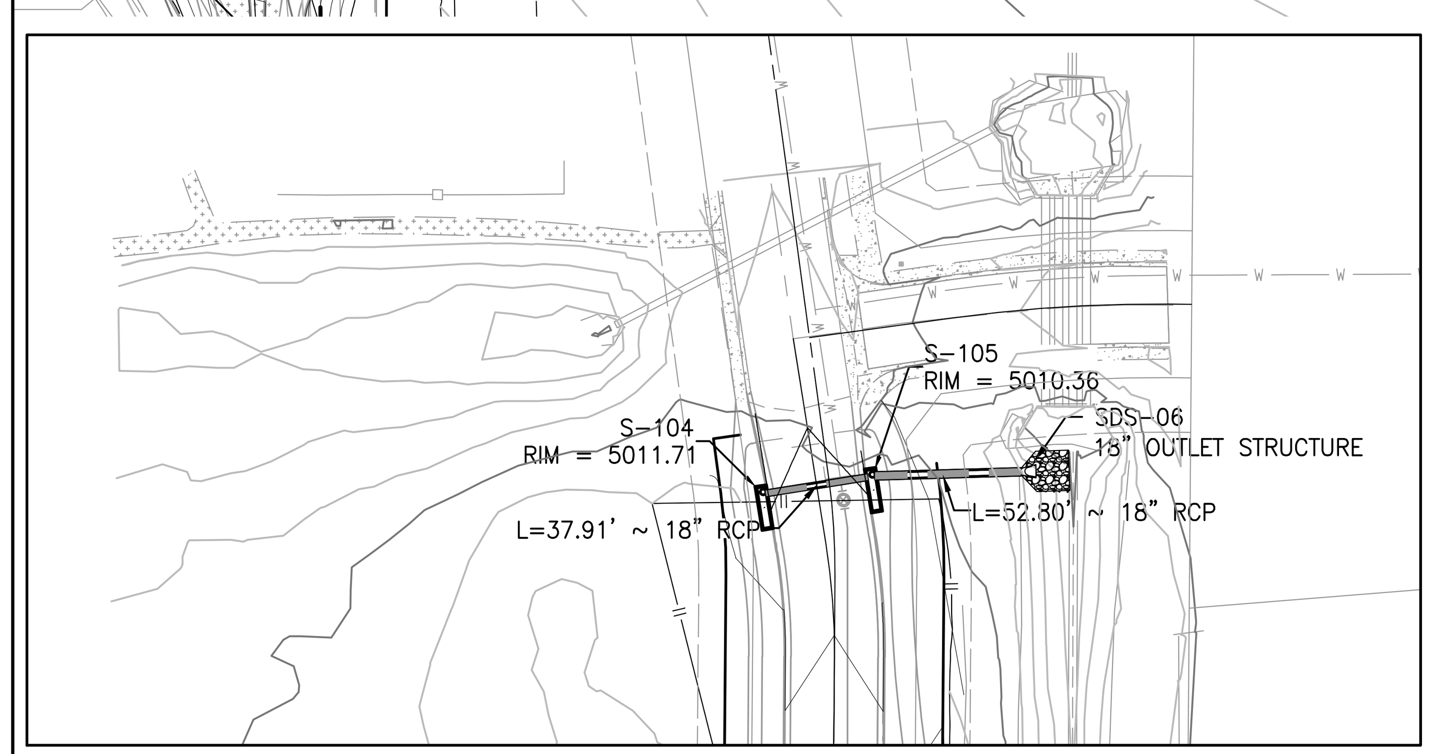
SCALE: 1"=60'	SHEET NO. 52
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	DRAWING NO. SD-01
CHECKED BY: TB	
JOB NO: D1048	





KEY MAP

SCALE 1"=500'



60 30 0 60
GRAPHIC SCALE: 1"=60'

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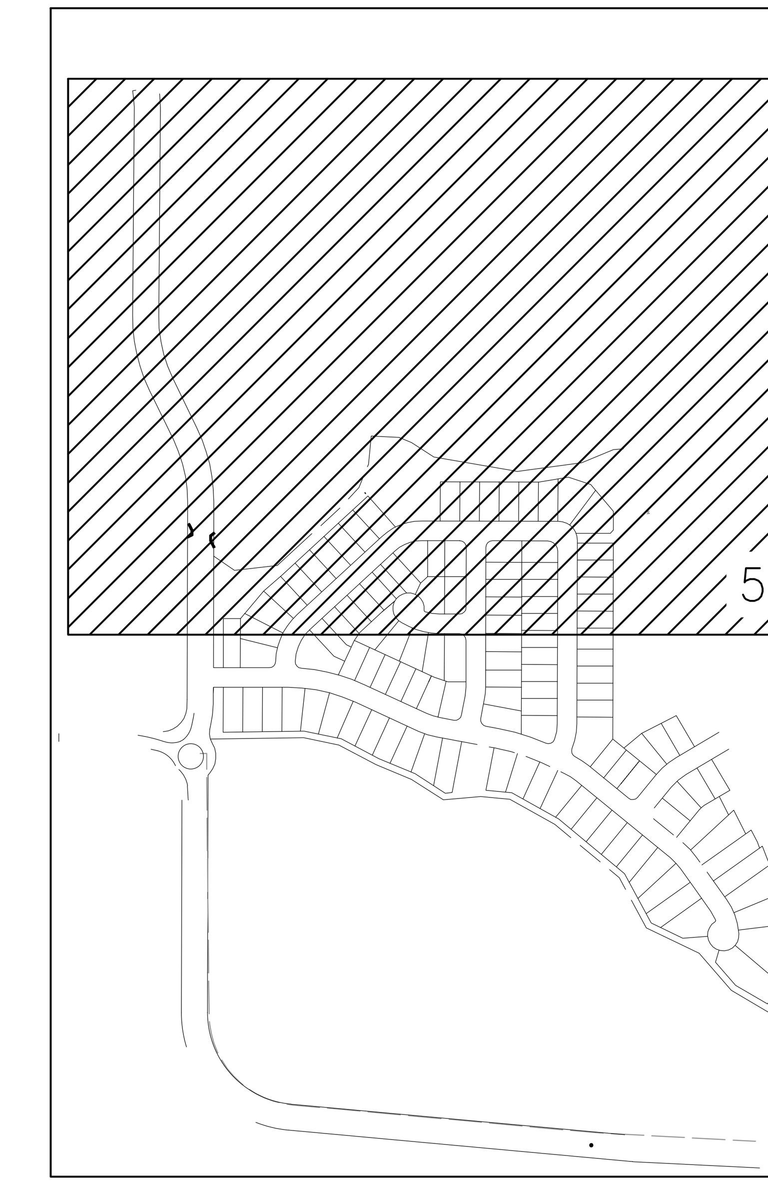
PROJECT ENGINEER DATE

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

STORM DRAIN

TOWN OF ERIE

SCALE: 1"=60'	SHEET NO. 53
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. SD-02
JOB NO: D1048	



KEY MAP

SCALE 1"=500'

LEGEND

LIMITS OF CONSTRUCTION	LOC
AREA OUTSIDE OF WORK	
EXISTING STORM DRAIN	
PROPOSED STORM DRAIN	

TEMPORARY BMP'S

SEDIMENT BASIN PER UDFCD SC-7	SB
CURB INLET GRAVEL FILTER PER TOWN OF ERIE STANDARD DRAWING NO. STM3	IP
TRACKING CONTROL PAD-CRUSHED ROCK PER TOWN OF ERIE STANDARD DRAWING NO, STM 6A	VTC
EROSION CONTROL BLANKET PER UDFCD EC-5	ECB
FLOW DIRECTION	
CONSTRUCTION FENCE PER UDFCD SM-3	CF
SILT FENCE EROSION BARRIER PER TOWN OF ERIE STANDARD DRAWING NO, STM 4	SF

PERMANENT BMP'S

STORM SEWER OUTLET PER TOWN OF ERIE STANDARD DRAWING NO, STM 2	OP
SURFACE ROUGHENING PER UDFCD EC-1	SR
PERMANENT SEEDING PER UDFCD EC-2	PS

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100 50 0 100
GRAPHIC SCALE: 1"=100'

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PRELIMINARY
NOT FOR CONSTRUCTION

COLORADO LICENSED PROFESSIONAL ENGINEER 50961

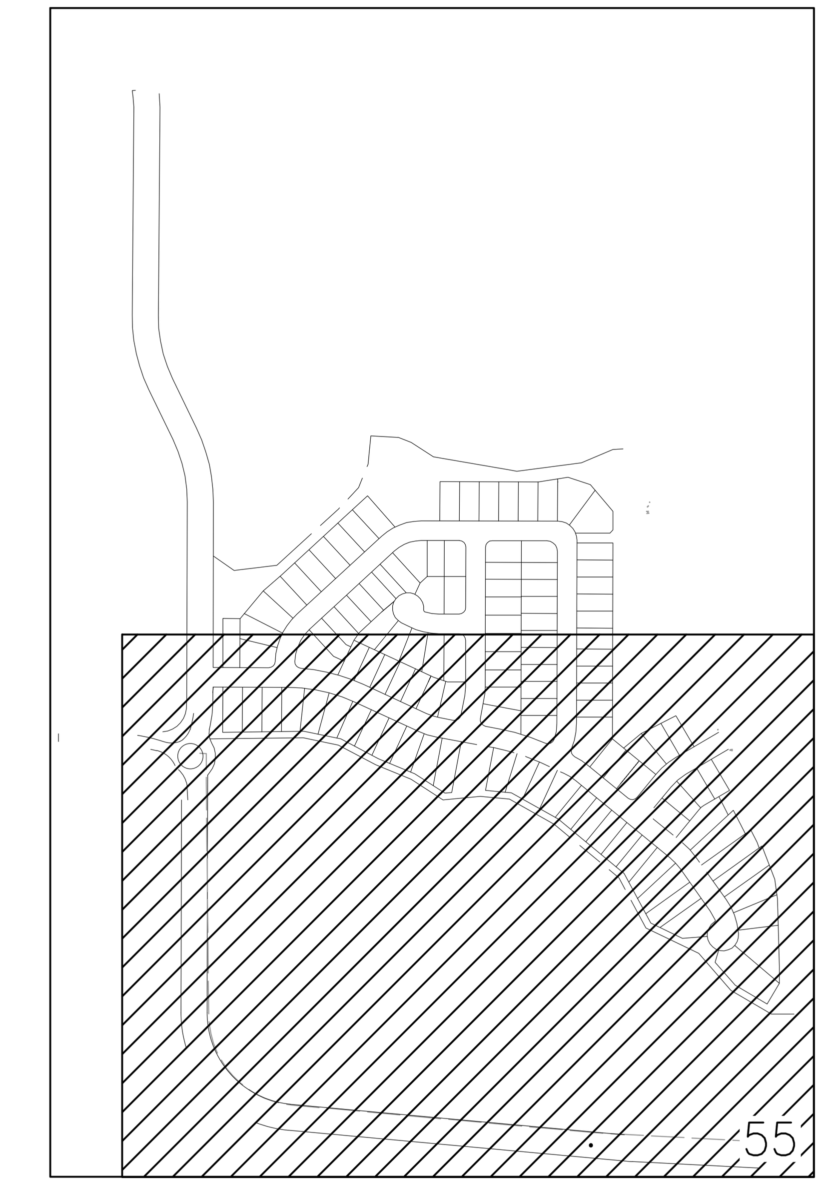
PROJECT ENGINEER DATE

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

EROSION CONTROL

TOWN OF ERIE

SCALE: 1"=100'	SHEET NO. 54
DATE: 02/06/2018	OF 55 SHEETS
DRAWN BY: KS	
CHECKED BY: TB	DRAWING NO. EC-01
JOB NO: D1048	



KEY MAP

SCALE 1"=500'

LEGEND

LIMITS OF CONSTRUCTION	LOC	
AREA OUTSIDE OF WORK		
EXISTING STORM DRAIN		
PROPOSED STORM DRAIN		

TEMPORARY BMP'S

SEDIMENT BASIN PER UDFCD SC-7	SB
CURB INLET GRAVEL FILTER PER TOWN OF ERIE STANDARD DRAWING NO. STM3	IP
TRACKING CONTROL PAD-CRUSHED ROCK PER TOWN OF ERIE STANDARD DRAWING NO, STM 6A	VTC
EROSION CONTROL BLANKET PER UDFCD EC-5	ECB
FLOW DIRECTION	
CONSTRUCTION FENCE PER UDFCD SM-3	CF
SILT FENCE EROSION BARRIER PER TOWN OF ERIE STANDARD DRAWING NO, STM 4	SF

PERMANENT BMP'S

STORM SEWER OUTLET PER TOWN OF ERIE STANDARD DRAWING NO, STM 2	OP
SURFACE ROUGHENING PER UDFCD EC-1	SR
PERMANENT SEEDING PER UDFCD EC-2	PS

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100 50 0 100
GRAPHIC SCALE: 1"=100'

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NOT FOR CONSTRUCTION
COLORADO LICENSED PROFESSIONAL ENGINEER 50961

PROJECT ENGINEER DATE

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

EROSION CONTROL

TOWN OF ERIE

SCALE: 1"=100'	SHEET NO. 55
DATE: 02/06/2018	
DRAWN BY: KS	OF 55 SHEETS
CHECKED BY: TB	DRAWING NO. EC-02
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE $\frac{1}{4}$ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF BOULDER, COLORADO
118 LOTS, 5 TRACTS CONTAINING 86.495±
PP-000946-2017

RICK ENGINEERING COMPANY SPECIAL NOTES:

1. CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOBSITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY, AND THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE OWNER AND ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.
2. NEITHER THE OWNER, NOR THE LANDSCAPE ARCHITECT OF WORK WILL ENFORCE SAFETY MEASURES OR REGULATIONS. THE CONTRACTOR SHALL DESIGN, CONSTRUCT, AND MAINTAIN ALL SAFETY DEVICES, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE, AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.
3. THE CONTRACTOR SHALL FOLLOW THE GUIDELINES AND REGULATIONS AS SET FORTH BY OSHA.
4. THE CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THAT ALL ELEMENTS WITHIN THESE PLANS ARE BUILT IN ACCORDINGLY. IF THERE ARE ANY QUESTIONS REGARDING THESE PLANS OR FIELD STAKES, THE CONTRACTOR SHALL REQUEST AN INTERPRETATION BEFORE DOING ANY WORK BY CALLING THE LANDSCAPE ARCHITECT OF WORK AT (303) 403-2430. THE CONTRACTOR SHALL ALSO TAKE THE NECESSARY STEPS TO PROTECT THE PROJECT AND ADJACENT PROPERTY FROM ANY EROSION AND SILTATION THAT RESULT FROM HIS OPERATIONS BY APPROPRIATE MEANS (SAND BAGS, HAY BALES, TEMPORARY DESILTING BASINS, DIKES, SHORING, ETC.) UNTIL SUCH TIME THAT THE PROJECT IS COMPLETED AND ACCEPTED FOR MAINTENANCE BY WHATEVER OWNER, AGENCY OR ASSOCIATIONS IS TO BE ULTIMATELY RESPONSIBLE FOR MAINTENANCE.
5. THE EXISTENCE AND LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED FROM A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO OTHER EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN HEREON AND ANY OTHER NOT OF RECORD OR NOT SHOWN ON THESE PLANS. ALL DAMAGES THERETO CAUSED BY THE CONTRACTOR SHALL BE REPAIRED TO THE APPROPRIATE SPECIFICATIONS AND AT THE EXPENSE OF THE CONTRACTOR.
6. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UNDERGROUND PIPELINES, TELEPHONE AND ELECTRIC CONDUITS AND STRUCTURES IN ADVANCE OF ANY CONSTRUCTION AND TO OBSERVE ALL POSSIBLE PRECAUTIONS TO AVOID ANY DAMAGE TO SUCH. THE ENGINEER, LANDSCAPE ARCHITECT AND/OR OWNER WILL NOT GUARANTEE ANY LOCATIONS AS SHOWN ON THESE PLANS OR THOSE OMITTED FROM SAME.
7. CONTRACTOR SHALL MAKE EXPLORATORY EXCAVATIONS AND LOCATE EXISTING UNDERGROUND FACILITIES SUFFICIENTLY AHEAD OF CONSTRUCTION TO PERMIT REVISIONS TO PLANS IF REVISIONS ARE NECESSARY BECAUSE OF ACTUAL LOCATIONS OF EXISTING FACILITIES.
8. BEFORE EXCAVATING FOR THIS CONTRACT, THE CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES WITH THE APPROPRIATE UTILITY COMPANY.
9. LOCATION AND ELEVATION OF IMPROVEMENTS TO BE MET BY WORK TO BE DONE SHALL BE CONFIRMED BY FIELD MEASUREMENTS PRIOR TO CONSTRUCTION OF NEW WORK.
10. CONTRACTOR SHALL TAKE THE NECESSARY PRECAUTIONS REQUIRED TO PROTECT ADJACENT PROPERTIES DURING THE GRADING OPERATIONS.
11. WHERE TRENCHES ARE WITHIN EASEMENTS OR WITHIN 10' OF ANY BUILDING, A SOILS REPORT SHALL BE SUBMITTED TO THE ENGINEER OF WORK BY A QUALIFIED SOILS ENGINEER WHICH INDICATES THAT TRENCH BACKFILL WAS COMPACTED UNDER THE OBSERVATION OF THE SOILS ENGINEER AND IN ACCORDANCE WITH THE ABOVE-NAMED SPECIFICATIONS.
12. ALL FRAMES, COVERS, VALVE BOXES AND MANHOLES SHALL BE ADJUSTED TO FINISHED GRADE UPON COMPLETION OF PAVING OR RELATED CONSTRUCTION.

RESIDENTIAL DEVELOPER:

TI RESIDENTIAL
9801 E EASTER AVE
CENTENNIAL CO, 80012

PHONE: (720) 413-3948
CONTACT: ANDREW TRIETLEY

CIVIL ENGINEER:

RICK ENGINEERING COMPANY
9801 E EASTER AVE
CENTENNIAL, C0 80012

PHONE: (303) 537-8020
CONTACT: TROY BALES

LANDSCAPE ARCHITECT:

RICK ENGINEERING COMPANY
5690 WEBSTER ST.
ARVADA, CO 80002

PHONE: (303) 403-2430
CONTACT: KIM NELSON

WORK TO BE DONE:

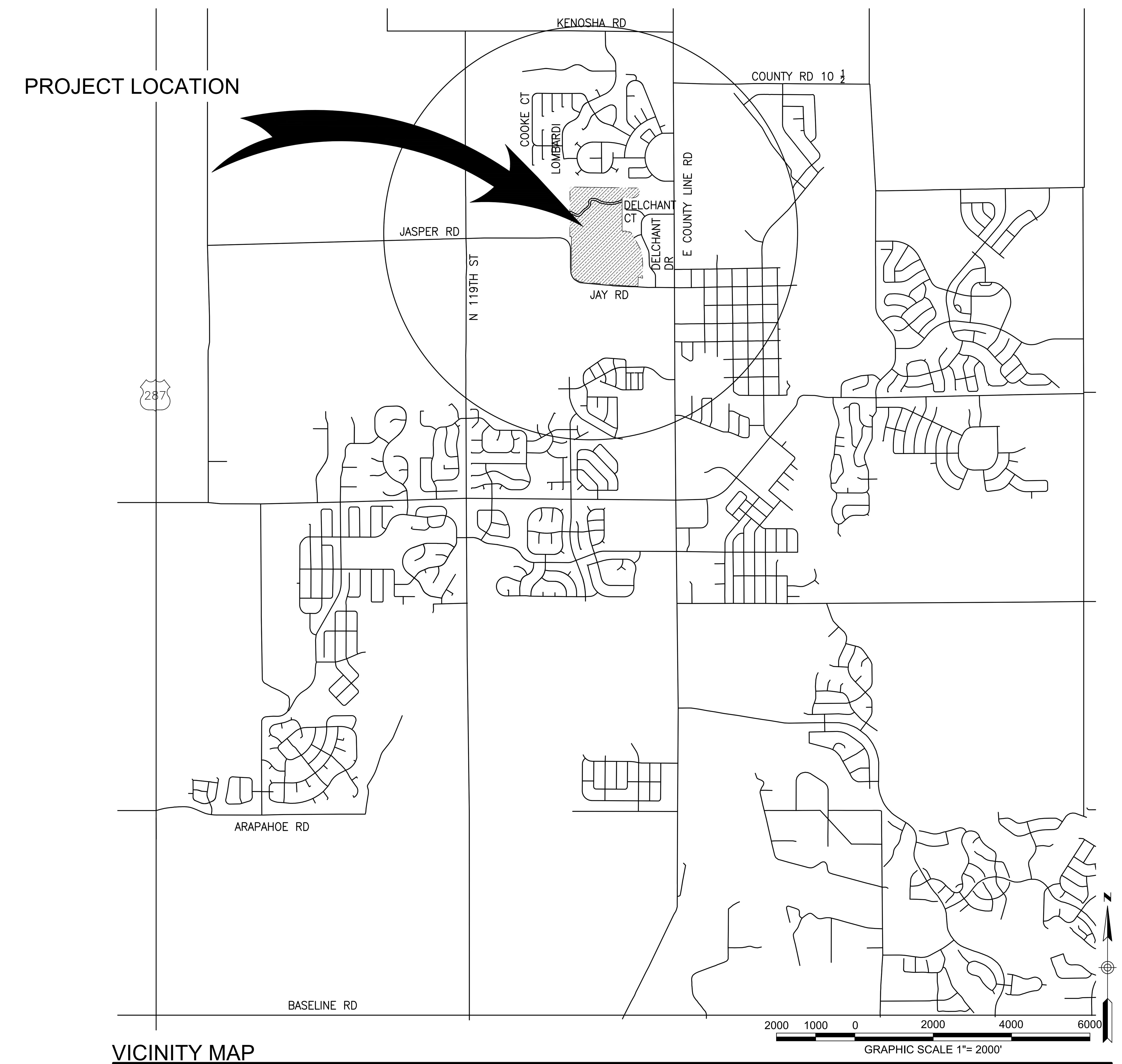
THE IMPROVEMENTS CONSIST OF THE FOLLOWING WORK TO BE DONE ACCORDING TO THESE PLANS AND THE SPECIFICATIONS AND STANDARD DRAWINGS OF THE TOWN OF ERIE.

STANDARD SPECIFICATIONS:

1. TOWN OF ERIE PARK & RECREATION STANDARDS & SPECIFICATION (1000)
2. TOWN OF ERIE, CO DEVELOPMENT AND DESIGN STANDRADS, CHAPTER 6 LANDSCAPING

BENCH MARK:

N 1 / 4 CORNER SEC. 13, T1N, R69W, 6TH P.M. FOUND 4" BRASS CAP STAMPED PLS 13446 PER MONUMENT RECORD FILED BY FRANK N. DREXEL. PLS 23405, DATED 02-13-1998.
ELEV: 5018.45



VICINITY MAP

INDEX OF SHEETS

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PATRICIA TRAUT 1218 12/19/2017 Original Date of Licensure STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

TITLE SHEET

TOWN OF ERIE

SCALE: 2000	SHEET NO. 01
DATE: 02/06/19	
DRAWN BY: TP/ER	OF 18 SHEETS
CHECKED BY: PT	DRAWING NO. T-01
JOB NO: D1048	

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MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE ¼ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
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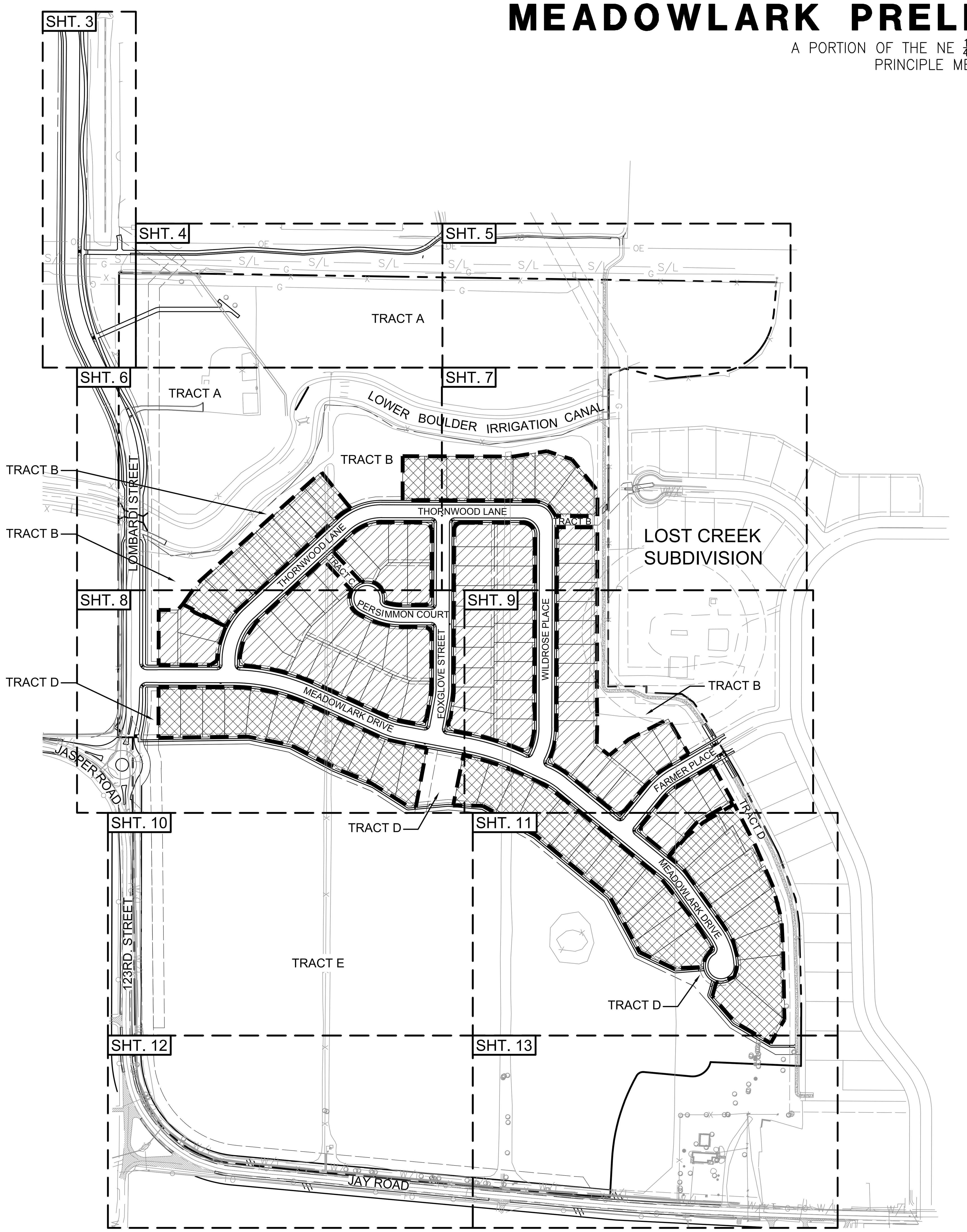
118 LOTS, 5 TRACTS CONTAINING 86.495±
PP-000946-2017



50' LOT WIDTHS

60' LOT WIDTHS

200 100 0 200 400 600

GRAPHIC SCALE: 1"=200'

SITE MAP

TRACT SUMMARY CHART				
TRACT	AREA (SQFT)	AREA (ACRES)	PURPOSE	OWNED BY/MAINTAINED BY
TRACT A	778,417	17.87	PUBLIC ACCESS, OPEN SPACE, DRAINAGE	TOWN OF ERIE/TOWN OF ERIE
TRACT B	186,008	4.27	DRAINAGE, PUBLIC ACCESS, OPEN SPACE	DISTRICT/DISTRICT
TRACT C	3,921	0.09	PUBLIC ACCESS, OPEN SPACE, DRAINAGE	DISTRICT/DISTRICT
TRACT D	110,962	2.55	PUBLIC ACCESS, OPEN SPACE, STRAIN ISOLATION TRENCH, PARK, DRAINAGE	DISTRICT/DISTRICT
TRACT E	1,388,918	31.89	VACANT, DRAINAGE, PUBLIC ACCESS	DISTRICT/DISTRICT

PARKS & OPEN SPACE SUMMARY CHART		
	REQUIRED	PROVIDED
POCKET PARK	0.17 AC	3.57 AC
NEIGHBORHOOD PARKS	1.02 AC	0.00 AC
COMMUNITY PARKS	1.70 AC	0.00 AC
PARK SUBTOTAL	2.89 AC	3.57 AC
OPEN SPACE	5.77 AC	13.23 AC
TOTAL	8.66 AC	16.80 AC

LAND SUMMARY CHART			
TYPE	AREA (SQFT)	AREA (ACRES)	% OF TOTAL AREA
RESIDENTIAL LOTS	894,722	20.54 AC	23.75%
TRACTS	2,468,545	56.67 AC	65.51%
PUBLIC ROW	404,673	9.29 AC	10.74%
TOTAL	3,767,940	86.50 AC	100.00%

RESIDENTIAL LOT COUNT		
TYPE	AREA	TOTAL ON SITE
50' x 100'	5,000 SQ. FT.	69 LOTS
60' x 120'	7,200 SQ. FT.	49 LOTS

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PATRICIA TRAUT 1219 STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT
PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

SITE MAP

TOWN OF ERIE

SCALE:	SHEET NO. 02
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	
CHECKED BY: PT	DRAWING NO. T-02
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE ¼ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
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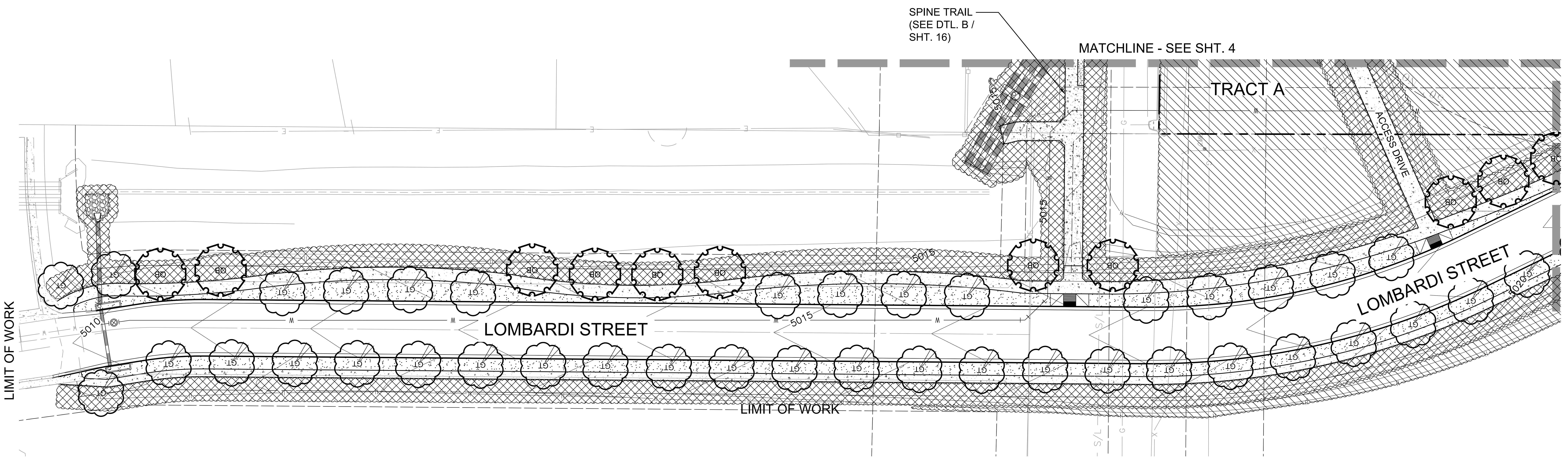


PLANT LEGEND (PRELIMINARY)

STREET TREES (SUCH AS)

BOTANICAL NAME / COMMON NAME

- QB — QUERCUS BICOLOR / SWAMP WHITE OAK
- CS — CATALPA SPECIOSA / WESTERN CATALPA
- GT — GLEDITSIA TRI. INERMIS 'SKYLINE' / SKYLINE HONEY LOCUST
- QR — QUERCUS RUBRA / NORTHERN RED OAK
- TILIA CORDATA 'GREENSPIRE' / GREENSPIRE LINDEN

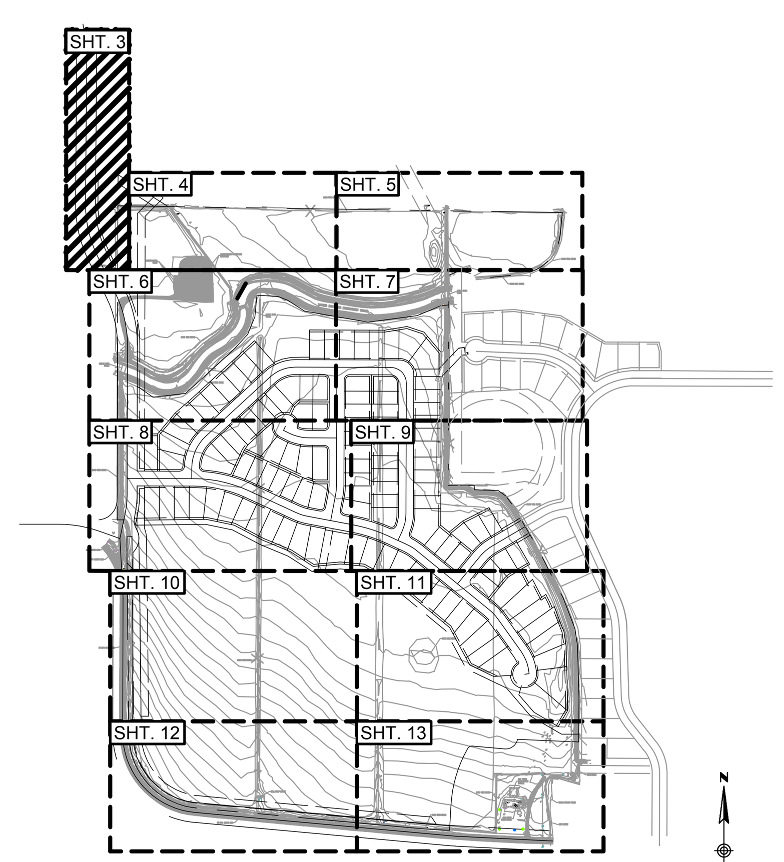
- MIXED GRASS PRAIRIE NATIVE SEED MIXTURE
- SHORTGRASS PRAIRIE NATIVE SEED MIXTURE
- MOIST SWALE SEED MIXTURE
- TURF

FENCING SCHEDULE

- OPEN-RAIL FENCE TYP. (DTL. E / SHT. 16)
- 6' HIGH FENCE TYP. (DTL. D / SHT. 16)
- BENCH

CONSTRUCTION MATERIALS SCHEDULE

- CRUSHER FINES (SEE FIN. SCH. / SHT. 15)
- CONCRETE PAVING (SEE FIN. SCH. / SHT. 15), (SEE CIVIL PLANS FOR DTL.).
- STAMPED CONCRETE - INTEGRAL COLOR (SEE FIN. SCH. / SHT. 15), (SEE CIVIL PLANS FOR DTL.).



KEY MAP

NTS

40 20 0 40 80 120

GRAPHIC SCALE 1"= 40'

LANDSCAPE NOTES:

1. ALL PLANT SYMBOLS ARE TYPICAL.
2. FOR MASTER PLANTING LEGEND, NOTES & DETAILS SEE SHT. L-14 THRU L-18.
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4. FOR ALL VERTICAL AND HORIZONTAL CONTROL, SEE CIVIL PLANS.
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△	–	–	–	–

PATRICIA TRAUT 1219 LICENSED LANDSCAPE ARCHITECT STATE OF COLORADO
PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

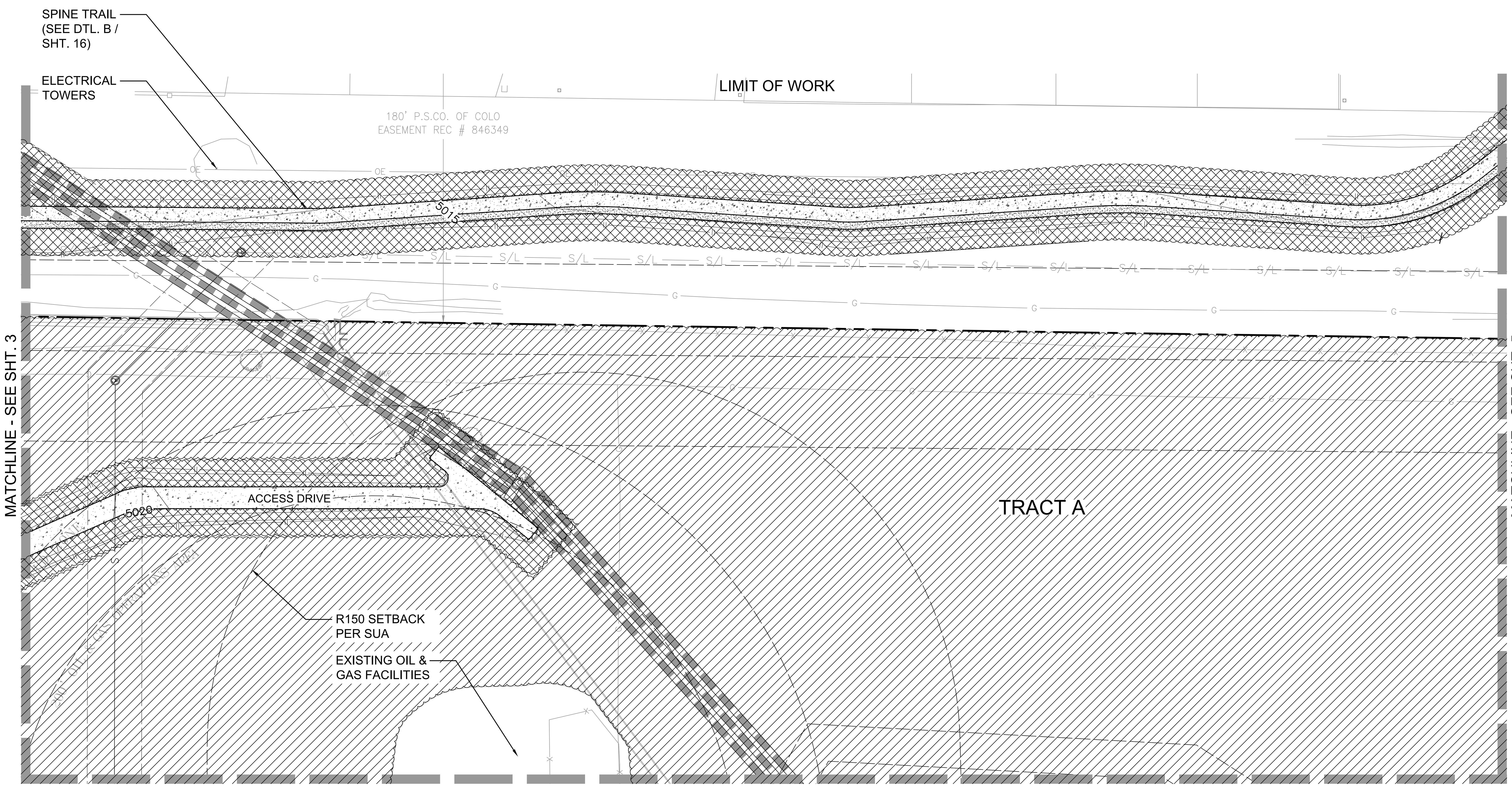
LANDSCAPE PLANTING SHEET

TOWN OF ERIE

SCALE: 1" – 40'	SHEET NO. 03
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	DRAWING NO. LP-01
CHECKED BY: PT	
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE 1/4 OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF BOULDER, COLORADO
118 LOTS, 5 TRACTS CONTAINING 86.495±
PP-000946-2017



PLANT LEGEND (PRELIMINARY)

STREET TREES (SUCH AS)

BOTANICAL NAME / COMMON NAME

- QB — QUERCUS BICOLOR / SWAMP WHITE OAK
- CS — CATALPA SPECIOSA / WESTERN CATALPA
- GT — GLEDITSIA TRI. INERMIS 'SKYLINE' / SKYLINE HONEY LOCUST
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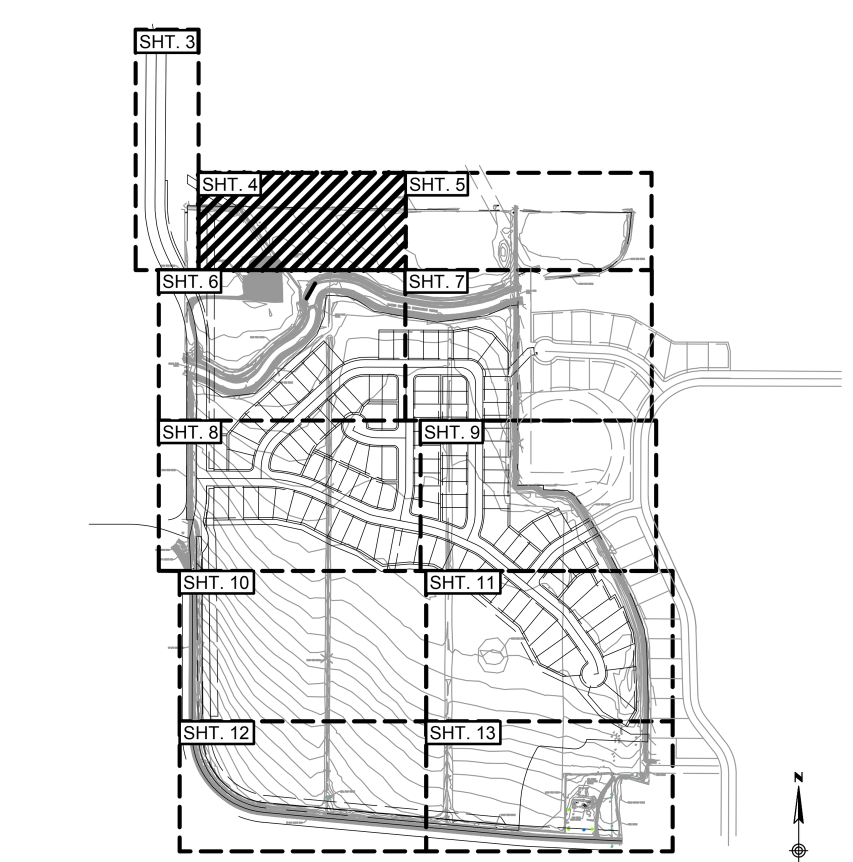
- MOIST SWALE SEED MIXTURE
- TURF

FENCING SCHEDULE

- OPEN-RAIL FENCE TYP. (DTL. E / SHT. 16)
- 6' HIGH FENCE TYP. (DTL. D / SHT. 16)
- BENCH

CONSTRUCTION MATERIALS SCHEDULE

- CRUSHER FINES (SEE FIN. SCH. / SHT. 15)
- CONCRETE PAVING (SEE FIN. SCH. / SHT. 15), (SEE CIVIL PLANS FOR DTL.).
- STAMPED CONCRETE - INTEGRAL COLOR (SEE FIN. SCH. / SHT. 15), (SEE CIVIL PLANS FOR DTL.).



KEY MAP

NTS

40 20 0 40 80 120

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PATRICIA TRAUT 1219 ... 19/201 Original Date of Licensure STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT
PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

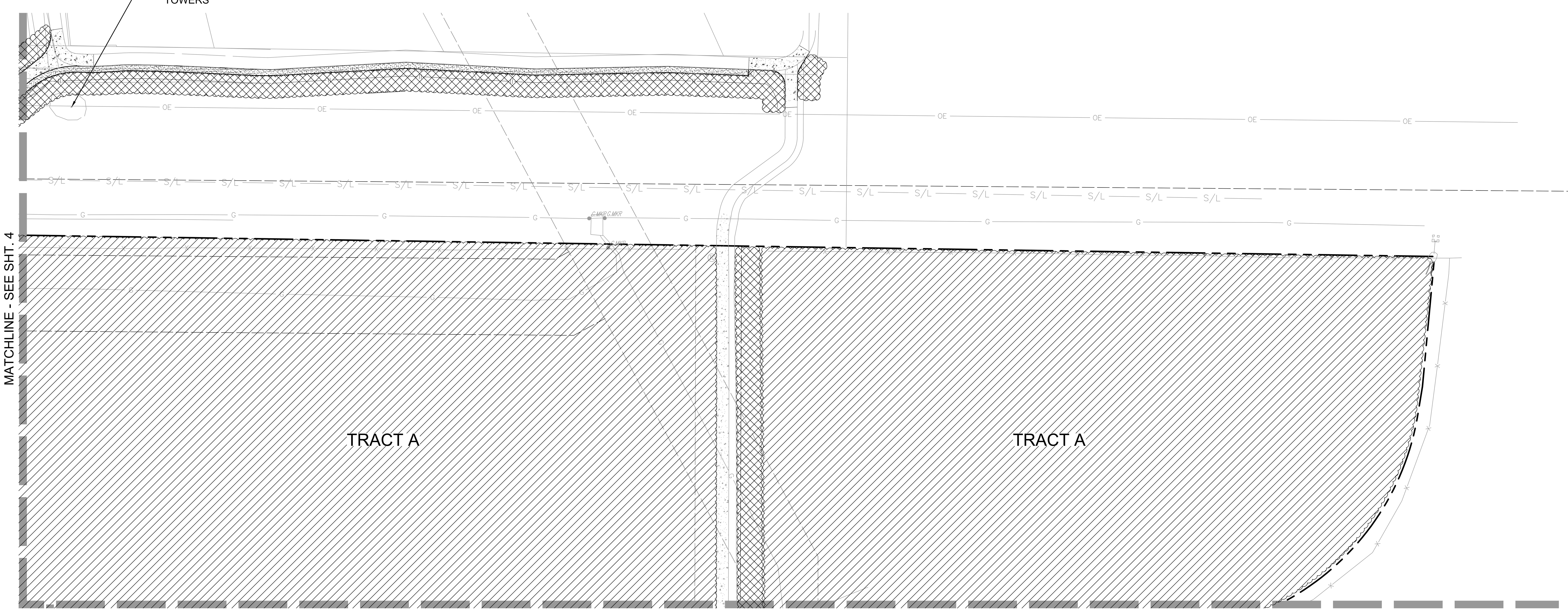
LANDSCAPE PLANTING SHEET

TOWN OF ERIE

SCALE: 1" – 40'	SHEET NO. 04
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	DRAWING NO. LP-02
CHECKED BY: PT	
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE ¼ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF BOULDER, COLORADO
118 LOTS, 5 TRACTS CONTAINING 86.495±
PP-000946-2017



PLANT LEGEND (PRELIMINARY)

STREET TREES (SUCH AS)

	BOTANICAL NAME / COMMON NAME
QB	QUERCUS BICOLOR / SWAMP WHITE OAK
CS	CATALPA SPECIOSA / WESTERN CATALPA
GT	GLEDITSIA TRI. INERMIS 'SKYLINE' / SKYLINE HONEY LOCUST
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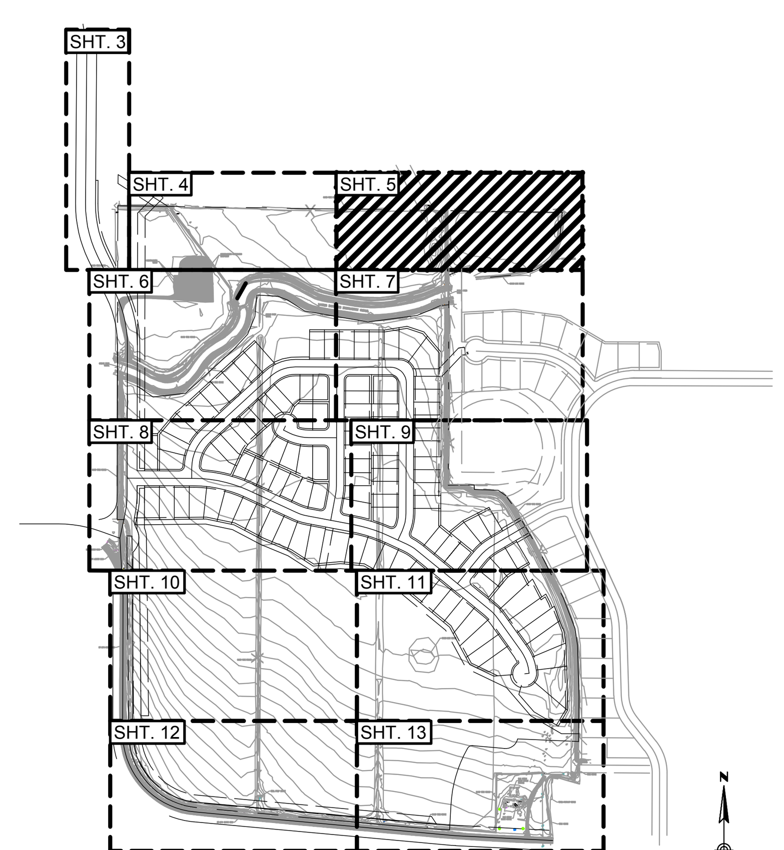
MOIST SWALE SEED MIXTURE
TURF

FENCING SCHEDULE

OPEN-RAIL FENCE TYP. (DTL. E / SHT. 16)
6' HIGH FENCE TYP. (DTL. D / SHT. 16)
BENCH

CONSTRUCTION MATERIALS SCHEDULE

CRUSHER FINES (SEE FIN. SCH. / SHT. 15)
CONCRETE PAVING (SEE FIN. SCH. / SHT. 15), (SEE CIVIL PLANS FOR DTL.).
STAMPED CONCRETE - INTEGRAL COLOR (SEE FIN. SCH. / SHT. 15), (SEE CIVIL PLANS FOR DTL.).



KEY MAP
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PATRICIA TRAUT 1218 STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT
PRELIMINARY NOT FOR CONSTRUCTION
PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT
LANDSCAPE PLANTING SHEET
TOWN OF ERIE

SCALE: 1" – 40'	SHEET NO. 05
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	DRAWING NO. LP-03
CHECKED BY: PT	
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE ¼ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
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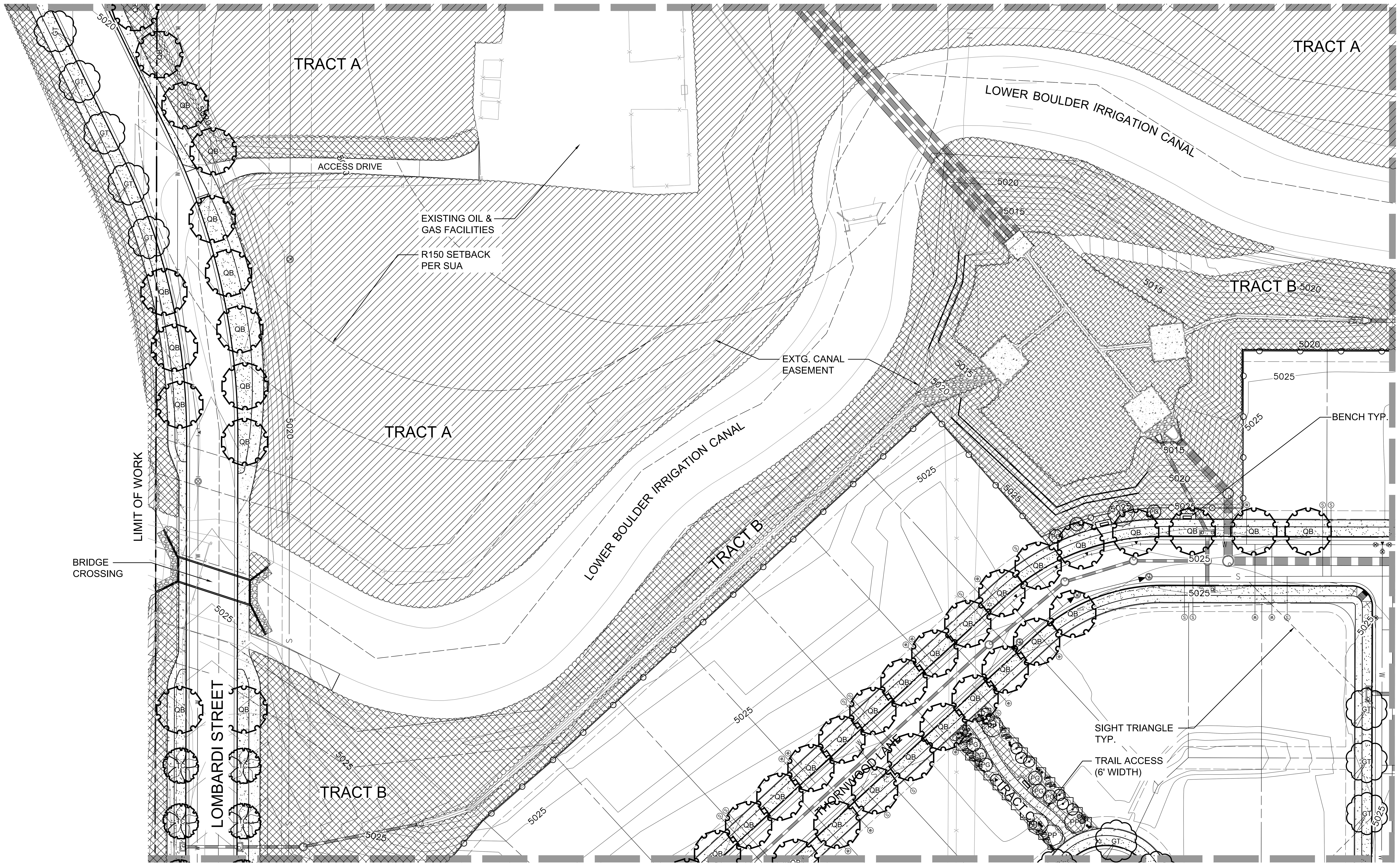
PP-000946-2017



PLANT LEGEND (PRELIMINARY)

STREET TREES (SUCH AS)

BOTANICAL NAME / COMMON NAME

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- TURF

FENCING SCHEDULE

- OPEN-RAIL FENCE TYP. (DTL. E / SHT. 16)
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CONSTRUCTION MATERIALS SCHEDULE

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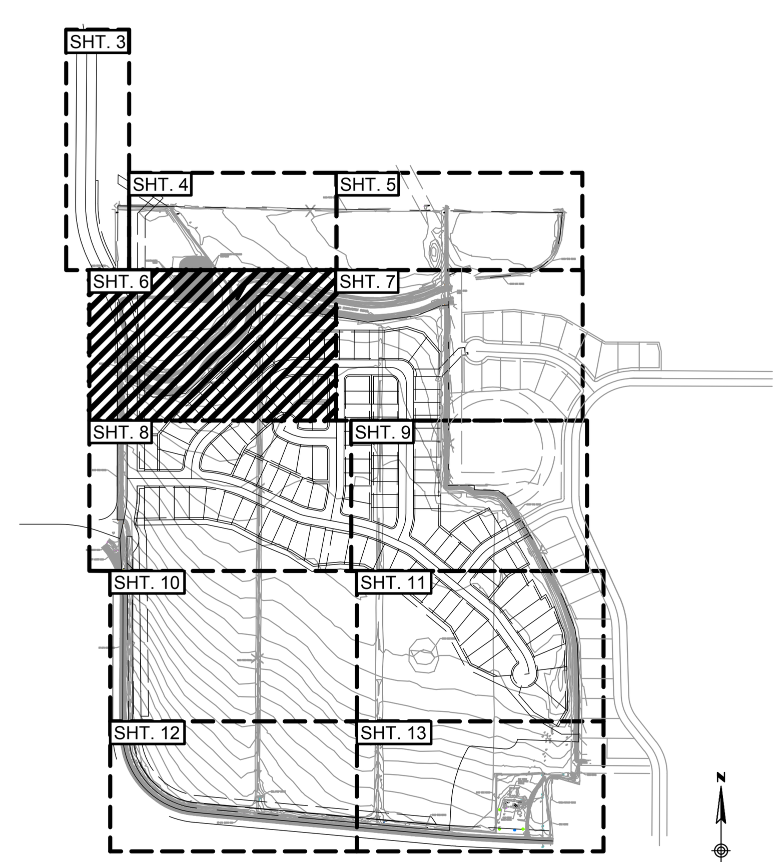

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PATRICIA TRAUT 1219 Original Date of Licensure STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT
PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

LANDSCAPE PLANTING SHEET

TOWN OF ERIE

SCALE: 1" – 40'	SHEET NO. 06
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	DRAWING NO. LP-04
CHECKED BY: PT	
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE ¼ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
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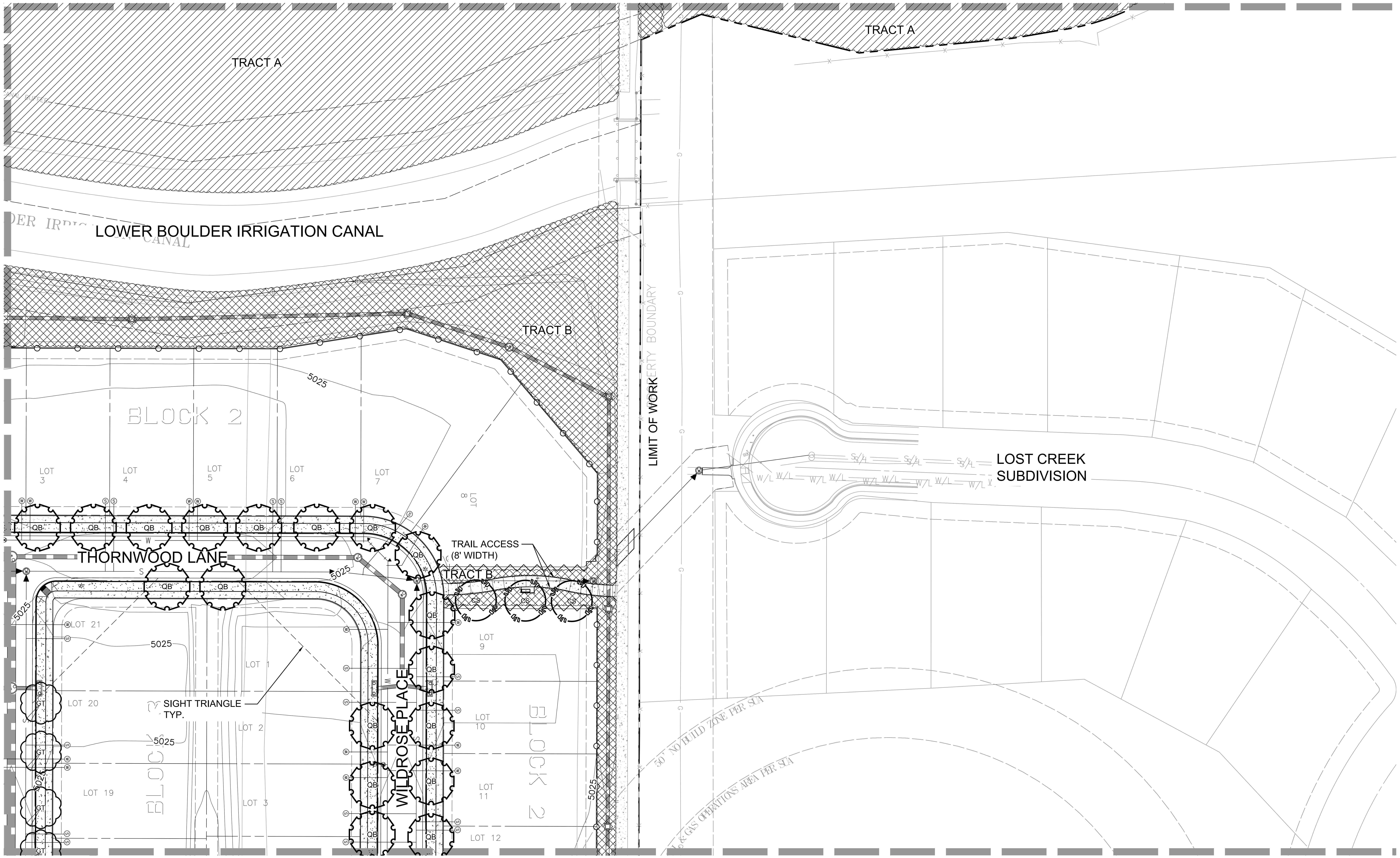

PLANT LEGEND (PRELIMINARY)

STREET TREES (SUCH AS)

	BOTANICAL NAME / COMMON NAME
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CONSTRUCTION MATERIALS SCHEDULE

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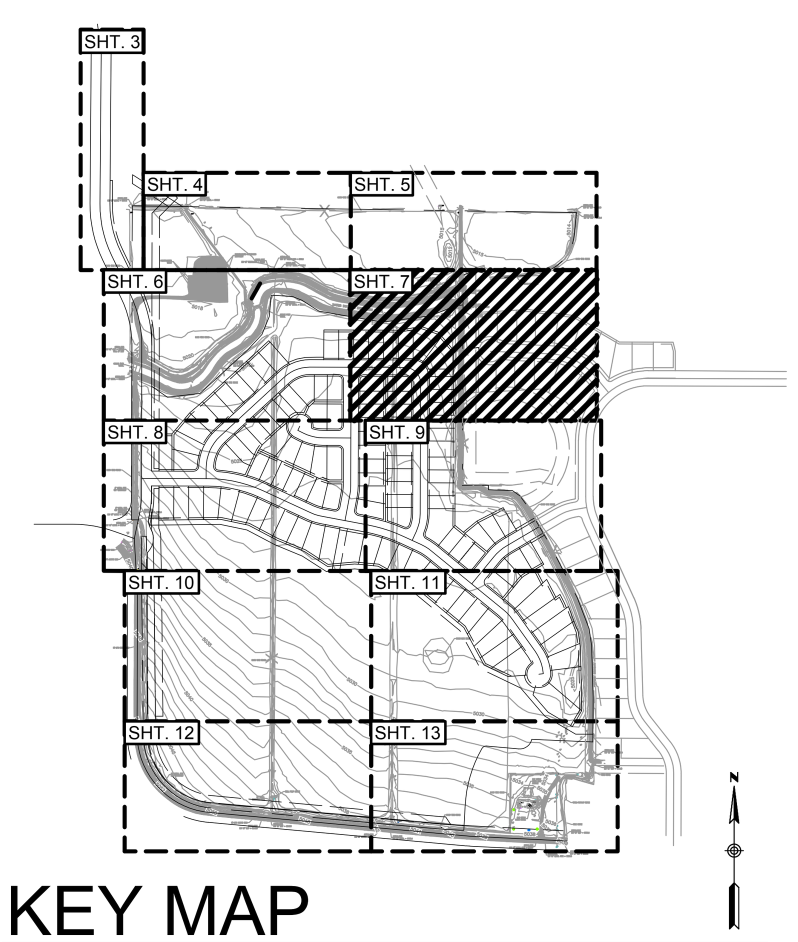

KEY MAP

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PATRICIA TRAUT 1219 — STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT — PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

LANDSCAPE PLANTING SHEET

TOWN OF ERIE

SCALE: 1" – 40'	SHEET NO. 07
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	
CHECKED BY: PT	DRAWING NO. LP-05
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE ¼ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
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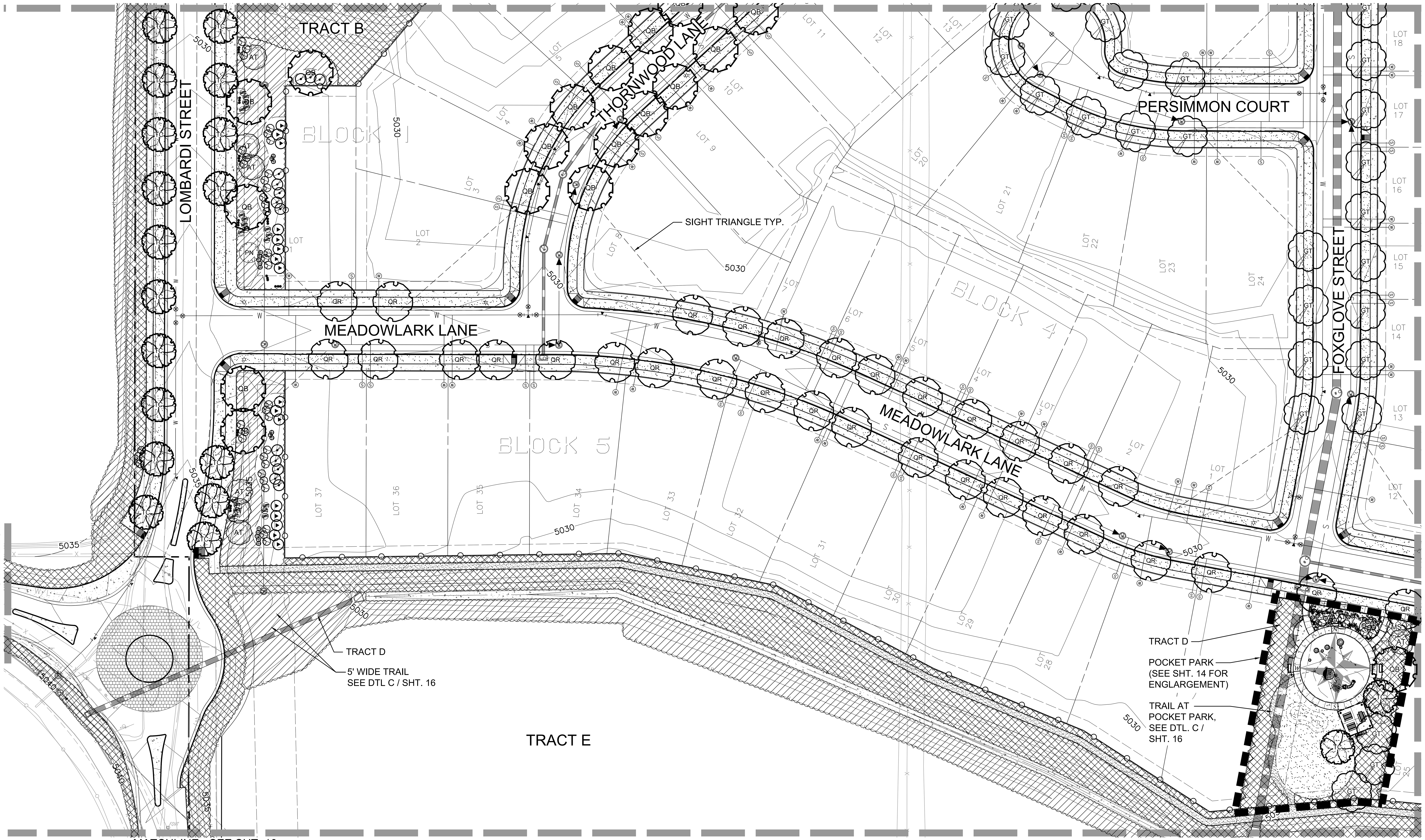

PLANT LEGEND (PRELIMINARY)

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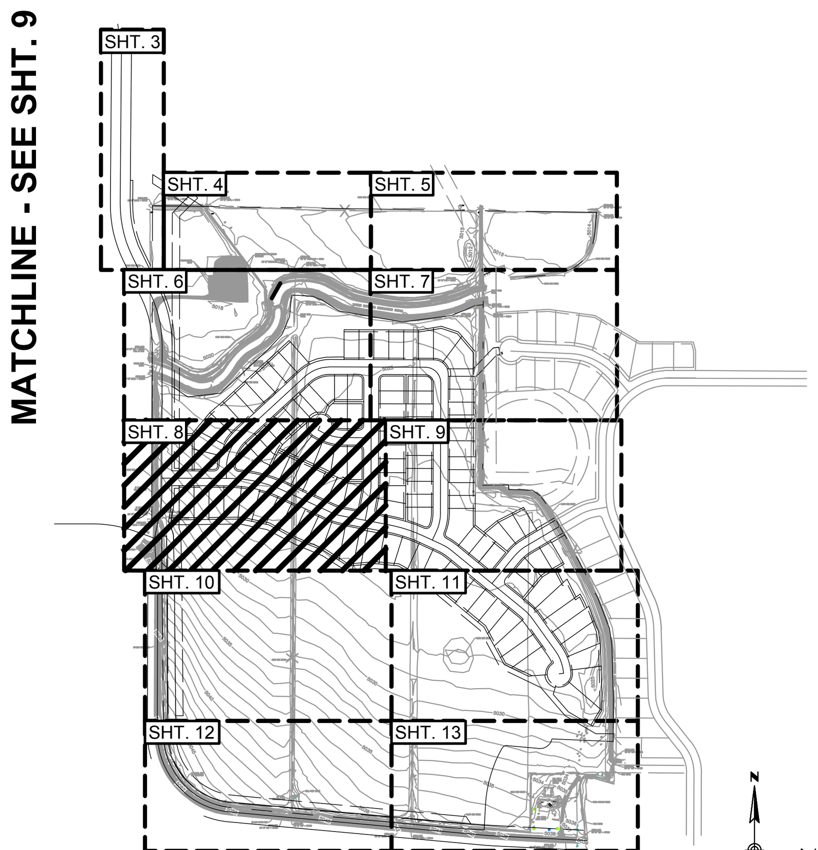
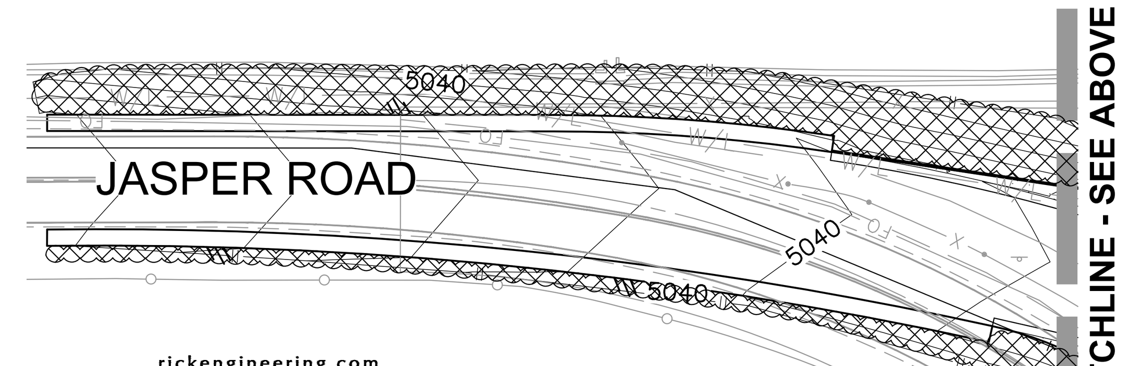


KEY MAP

NTS

40 20 0 40 80 120
GRAPHIC SCALE 1"= 40'



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PATRICIA TRAUT 1218 — STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT — PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

LANDSCAPE PLANTING SHEET

TOWN OF ERIE

SCALE: 1" – 40'	SHEET NO. 08
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	DRAWING NO. LP-06
CHECKED BY: PT	
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE ¼ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
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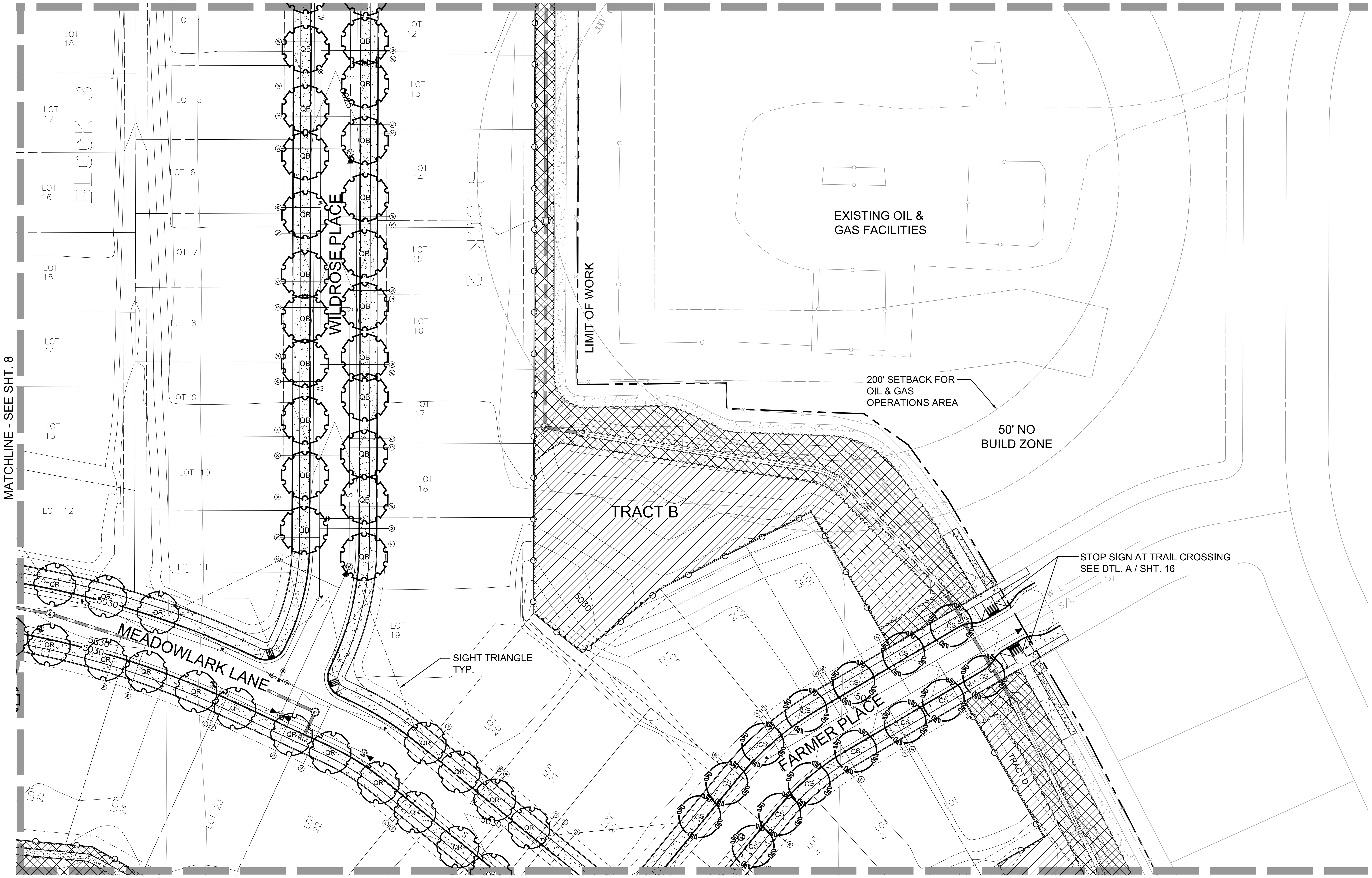

PLANT LEGEND (PRELIMINARY)

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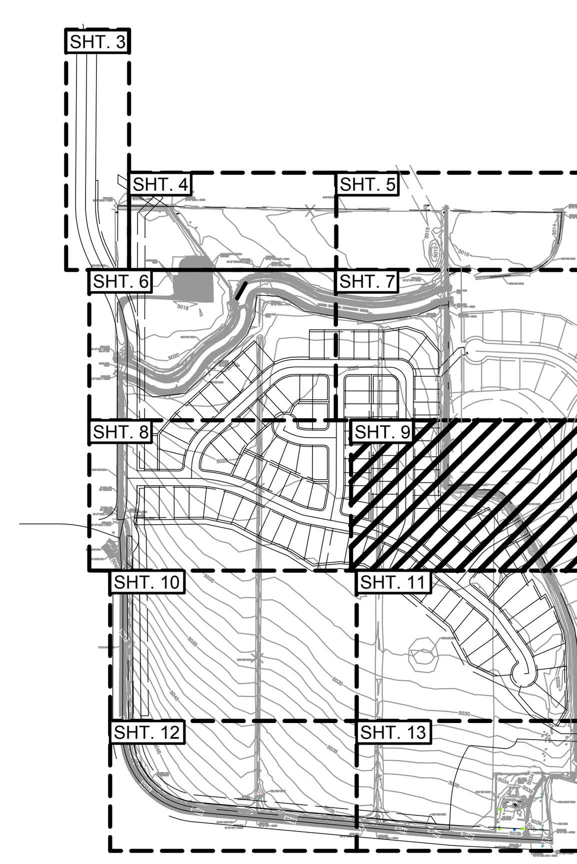

KEY MAP

NTS

40 20 0 40 80 120

GRAPHIC SCALE 1"= 40'

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NO.	REVISION DESCRIPTION	REVISED BY	ACCEPT. BY	DATE
△	–	–	–	–

PATRICIA TRAUT 1219 — STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT — PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

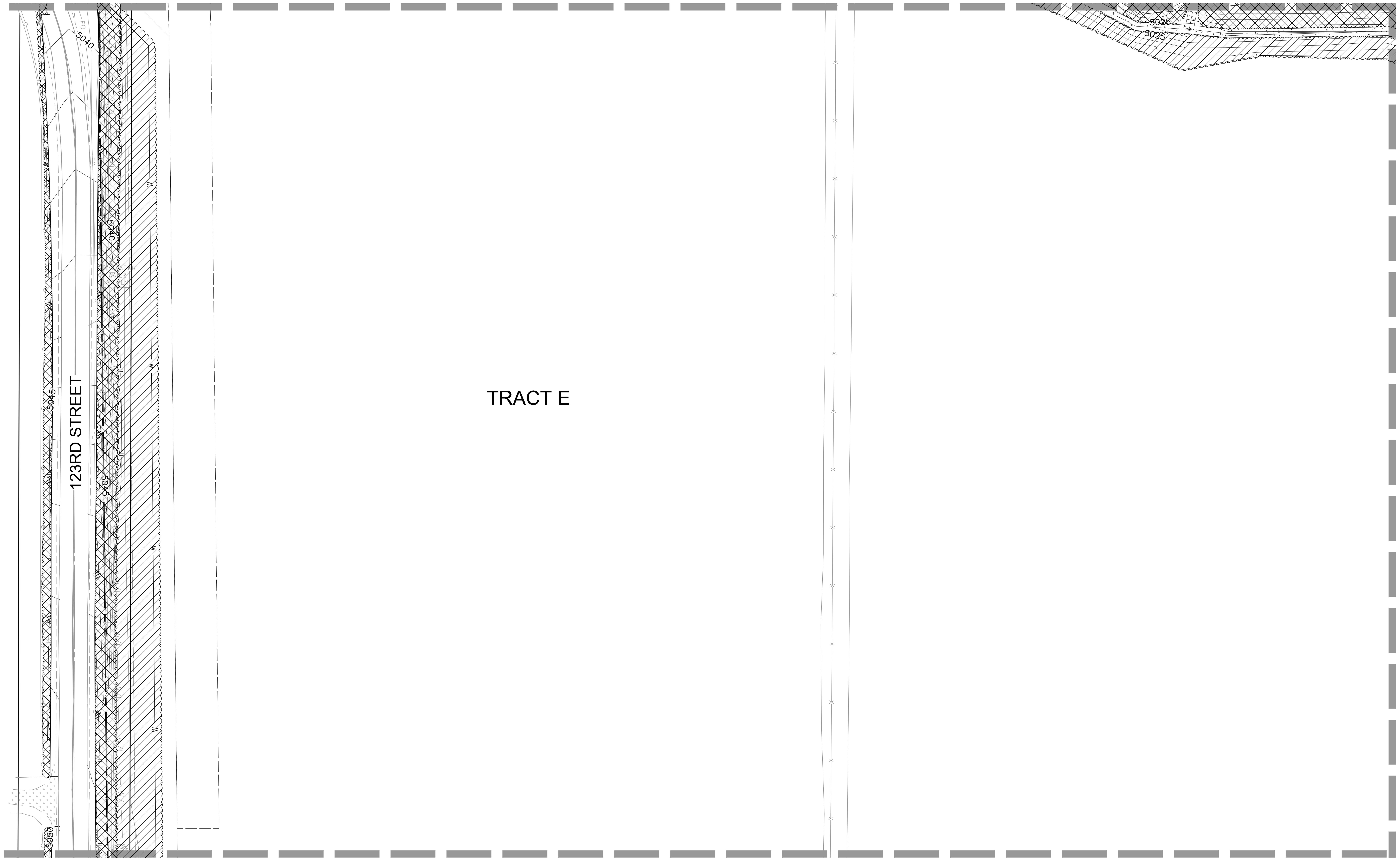
LANDSCAPE PLANTING SHEET

TOWN OF ERIE

SCALE: 1" – 40'	SHEET NO. 09
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	
CHECKED BY: PT	DRAWING NO. LP-07
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE ¼ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF BOULDER, COLORADO
118 LOTS, 5 TRACTS CONTAINING 86.495±
PP-000946-2017



PLANT LEGEND (PRELIMINARY)

STREET TREES (SUCH AS)

BOTANICAL NAME / COMMON NAME

- QB — QUERCUS BICOLOR / SWAMP WHITE OAK
- CS — CATALPA SPECIOSA / WESTERN CATALPA
- GT — GLEDITSIA TRI. INERMIS 'SKYLINE' / SKYLINE HONEY LOCUST
- QR — QUERCUS RUBRA / NORTHERN RED OAK
- TILIA CORDATA 'GREENSPIRE' / GREENSPIRE LINDEN

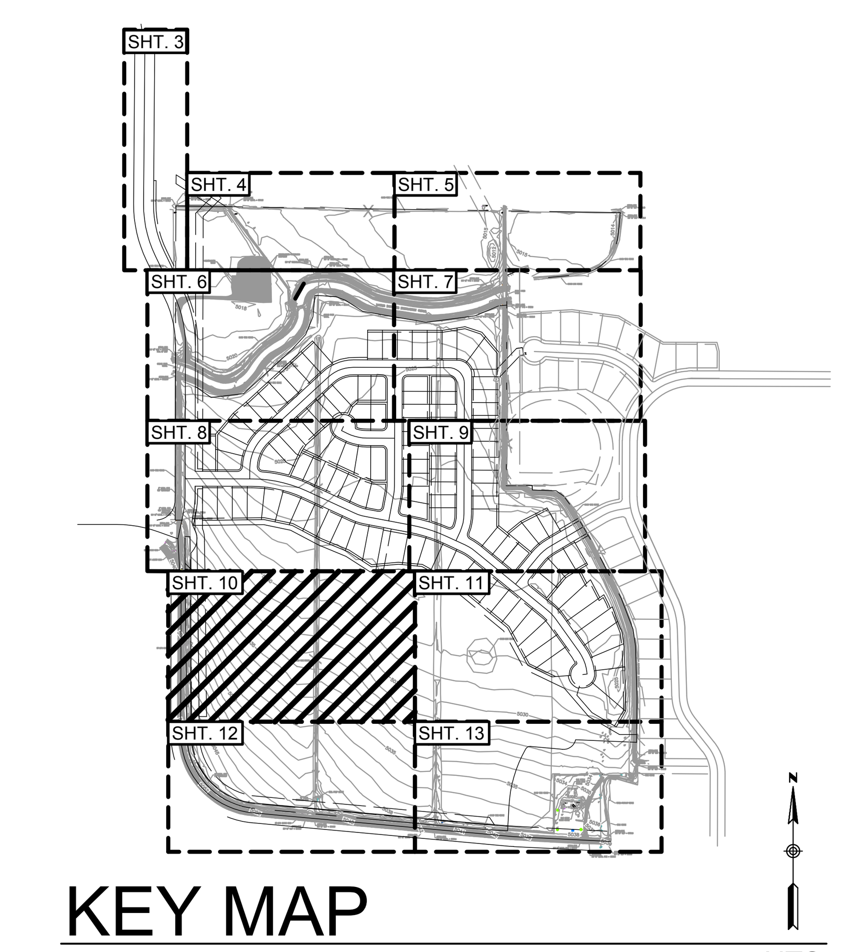
- MIXED GRASS PRAIRIE NATIVE SEED MIXTURE
- SHORTGRASS PRAIRIE NATIVE SEED MIXTURE
- MOIST SWALE SEED MIXTURE
- TURF

FENCING SCHEDULE

- OPEN-RAIL FENCE TYP. (DTL. E / SHT. 16)
- 6' HIGH FENCE TYP. (DTL. D / SHT. 16)
- BENCH

CONSTRUCTION MATERIALS SCHEDULE

- CRUSHER FINES (SEE FIN. SCH. / SHT. 15)
- CONCRETE PAVING (SEE FIN. SCH. / SHT. 15), (SEE CIVIL PLANS FOR DTL.).
- STAMPED CONCRETE - INTEGRAL COLOR (SEE FIN. SCH. / SHT. 15), (SEE CIVIL PLANS FOR DTL.).



40 20 0 40 80 120
GRAPHIC SCALE 1"= 40'

LANDSCAPE NOTES:

1. ALL PLANT SYMBOLS ARE TYPICAL.
2. FOR MASTER PLANTING LEGEND, NOTES & DETAILS SEE SHT. L-14 THRU L-18.
3. FOR ALL WET AND DRY UTILITIES, DRAINAGE, SEE CIVIL PLANS.
4. FOR ALL VERTICAL AND HORIZONTAL CONTROL, SEE CIVIL PLANS.
5. TRANSFORMERS, GROUND MOUNTED HVAC EQUIPMENT, UTILITY PEDESTALS, ETC. ARE NOT SHOWN ON THE LANDSCAPE PLAN. ADDITIONAL LANDSCAPING AND ASSOCIATED IRRIGATION WILL BE REQUIRED BASED UPON FIELD CONDITIONS IN ORDER TO SCREEN ABOVE GROUND UTILITY FACILITIES. THE ADDITIONAL LANDSCAPING OF THE ABOVE GROUND UTILITY FACILITIES SHALL BE INSTALLED PRIOR TO INSPECTION BY THE LANDSCAPE ARCHITECT. THE COMPLIANCE STATEMENT SUBMITTED FOR INITIAL ACCEPTANCE OF THE LANDSCAPING SHALL INCLUDE A DECLARATION THAT THE UTILITY FACILITIES HAVE BEEN LANDSCAPED AS REQUIRED.

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PATRICIA TRAUT 1219 Original Date of Licensure STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT
PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

LANDSCAPE PLANTING SHEET

TOWN OF ERIE

SCALE: 1" – 40'	SHEET NO. 10
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	
CHECKED BY: PT	DRAWING NO. LP-08
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE ¼ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF BOULDER, COLORADO
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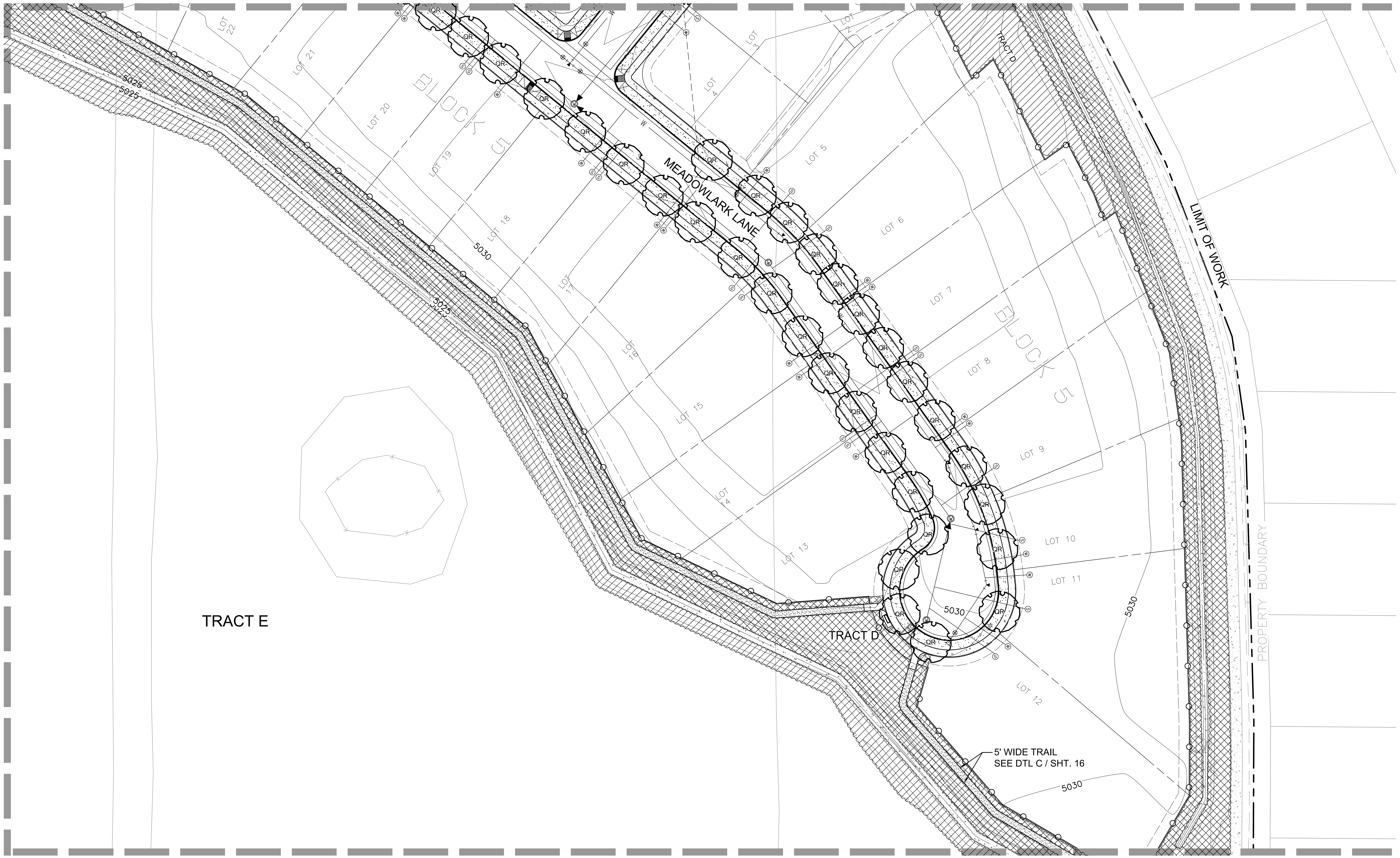
PP-000946-2017

MATCHLINE - SEE SHT. 9



MATCHLINE - SEE SHT. 10

MATCHLINE - SEE SHT. 13

PLANT LEGEND (PRELIMINARY)

STREET TREES (SUCH AS)

BOTANICAL NAME / COMMON NAME

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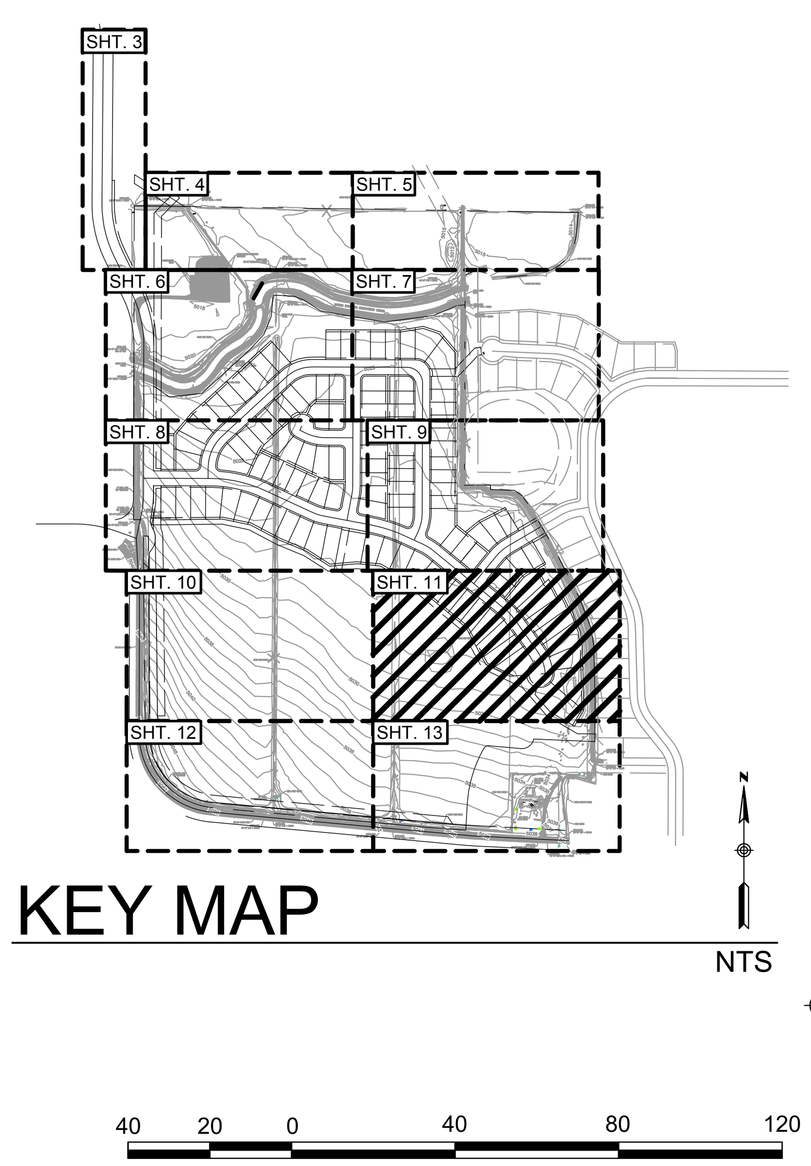
- MOIST SWALE SEED MIXTURE
- TURF

FENCING SCHEDULE

- OPEN-RAIL FENCE TYP. (DTL. E / SHT. 16)
- 6' HIGH FENCE TYP. (DTL. D / SHT. 16)
- BENCH

CONSTRUCTION MATERIALS SCHEDULE

- CRUSHER FINES (SEE FIN. SCH. / SHT. 15)
- CONCRETE PAVING (SEE FIN. SCH. / SHT. 15), (SEE CIVIL PLANS FOR DTL.).
- STAMPED CONCRETE - INTEGRAL COLOR (SEE FIN. SCH. / SHT. 15), (SEE CIVIL PLANS FOR DTL.).



KEY MAP

NTS

40 20 0 40 80 120
GRAPHIC SCALE 1"= 40'

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PATRICIA TRAUT 1219 ... 19/2019 Original Date of Licensure STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT
PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

LANDSCAPE PLANTING SHEET

TOWN OF ERIE

SCALE: 1" – 40'	SHEET NO. 11
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	DRAWING NO. LP-09
CHECKED BY: PT	
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

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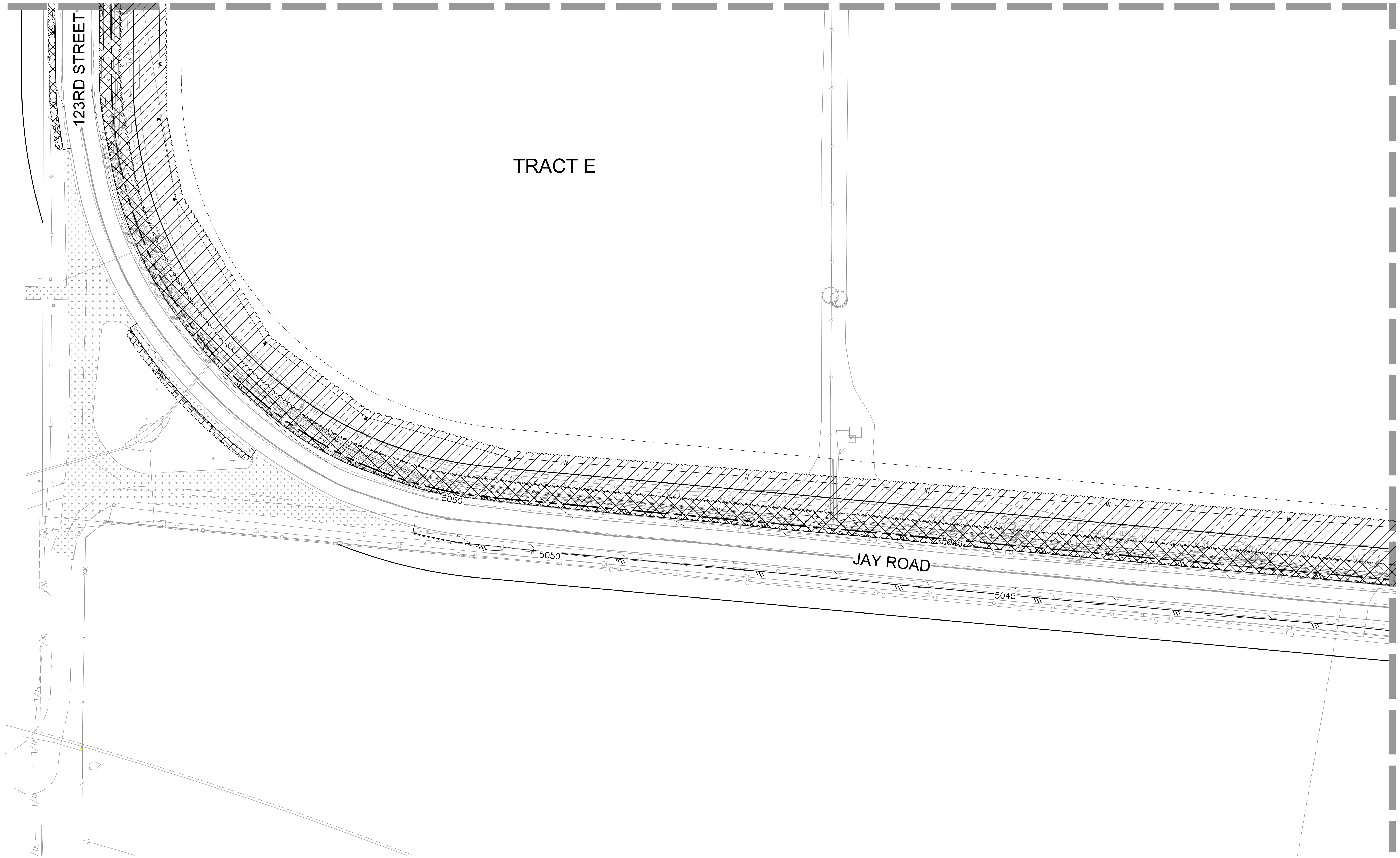

PLANT LEGEND (PRELIMINARY)

STREET TREES (SUCH AS)

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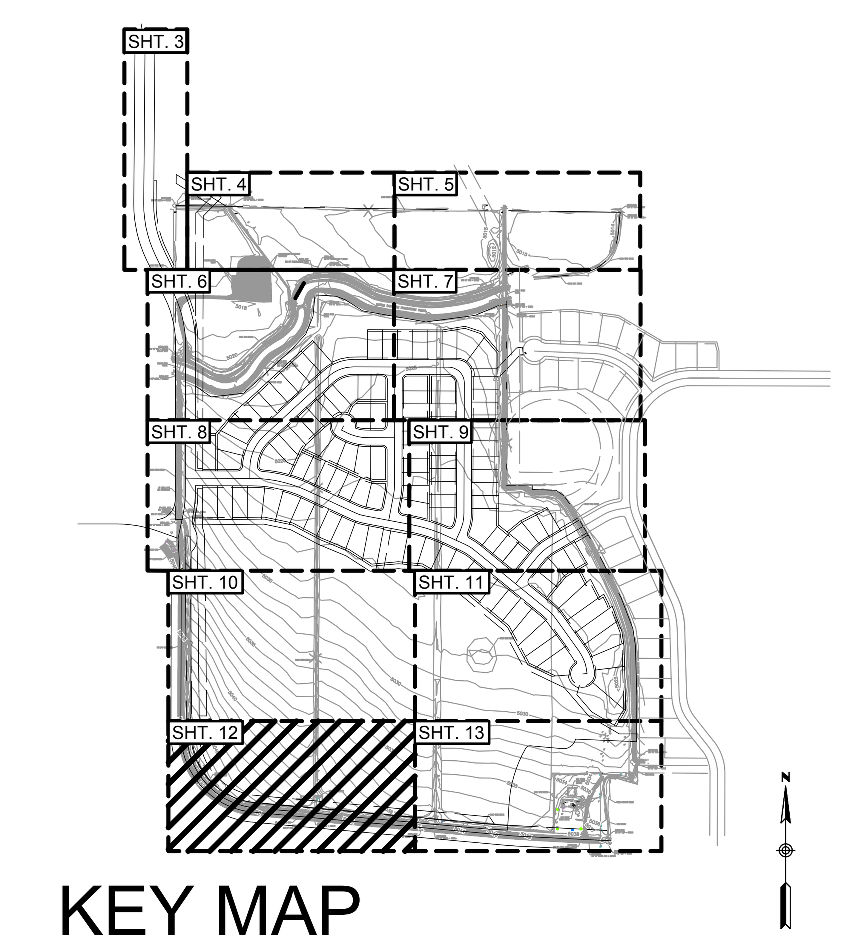

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PATRICIA TRAUT 1219 — STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT
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MEADOWLARK PRELIMINARY PLAT

LANDSCAPE PLANTING SHEET

TOWN OF ERIE

SCALE: 1" – 40'	SHEET NO. 12
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	
CHECKED BY: PT	DRAWING NO. LP–10
JOB NO: D1048	

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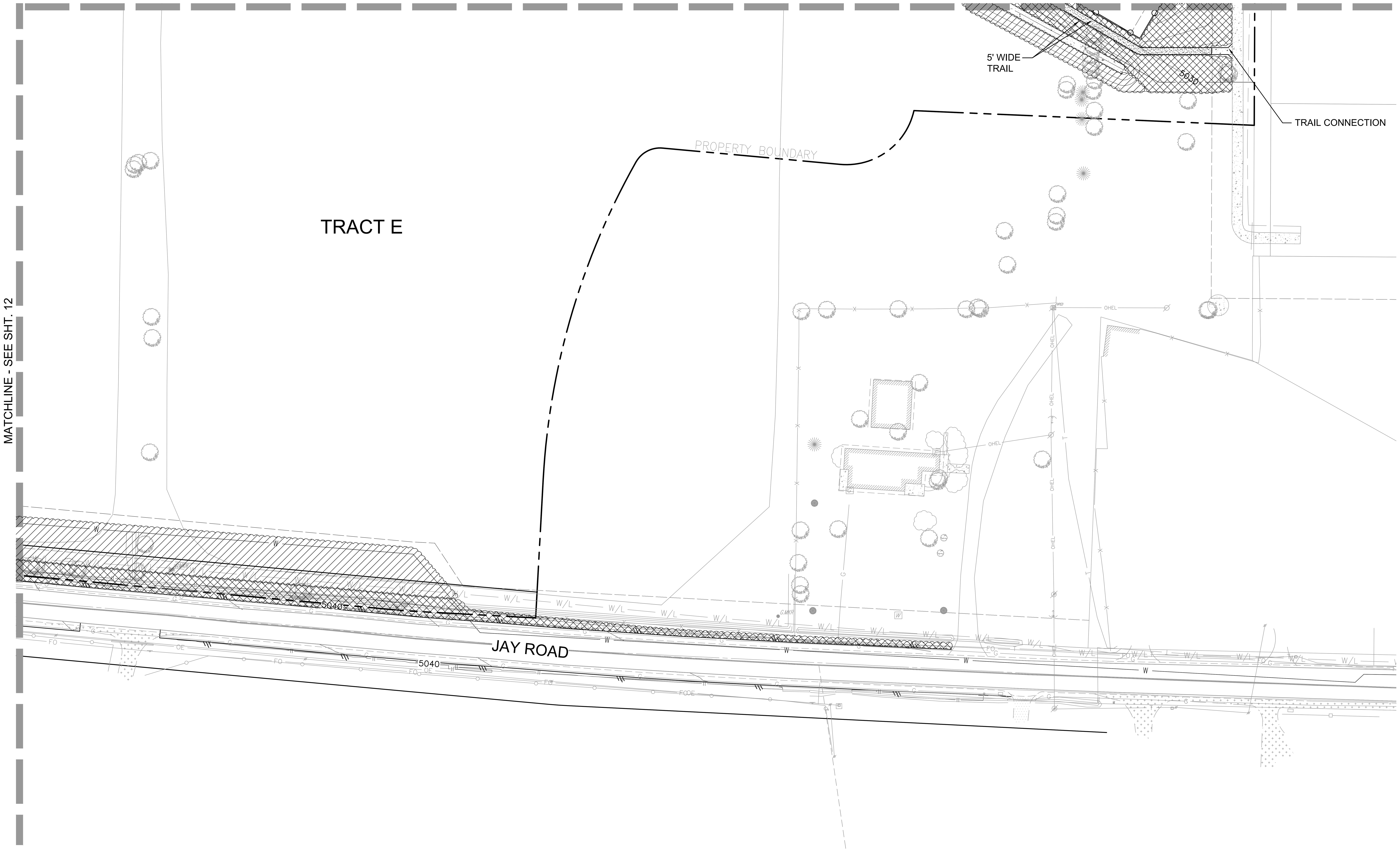

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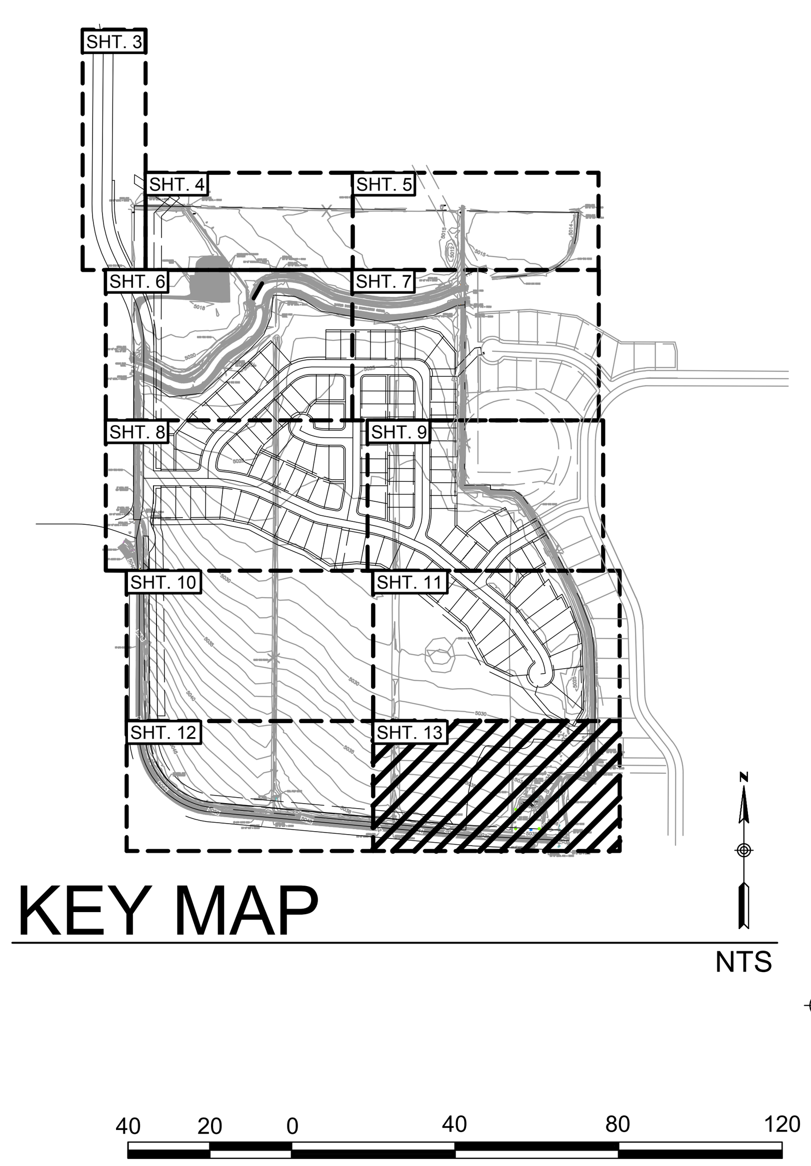

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PATRICIA TRAUT 1213 2/19/2019 Original Date of Licensure STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

LANDSCAPE PLANTING SHEET

TOWN OF ERIE

SCALE: 1" – 40'	SHEET NO. 13
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	DRAWING NO. LP-11
CHECKED BY: PT	
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

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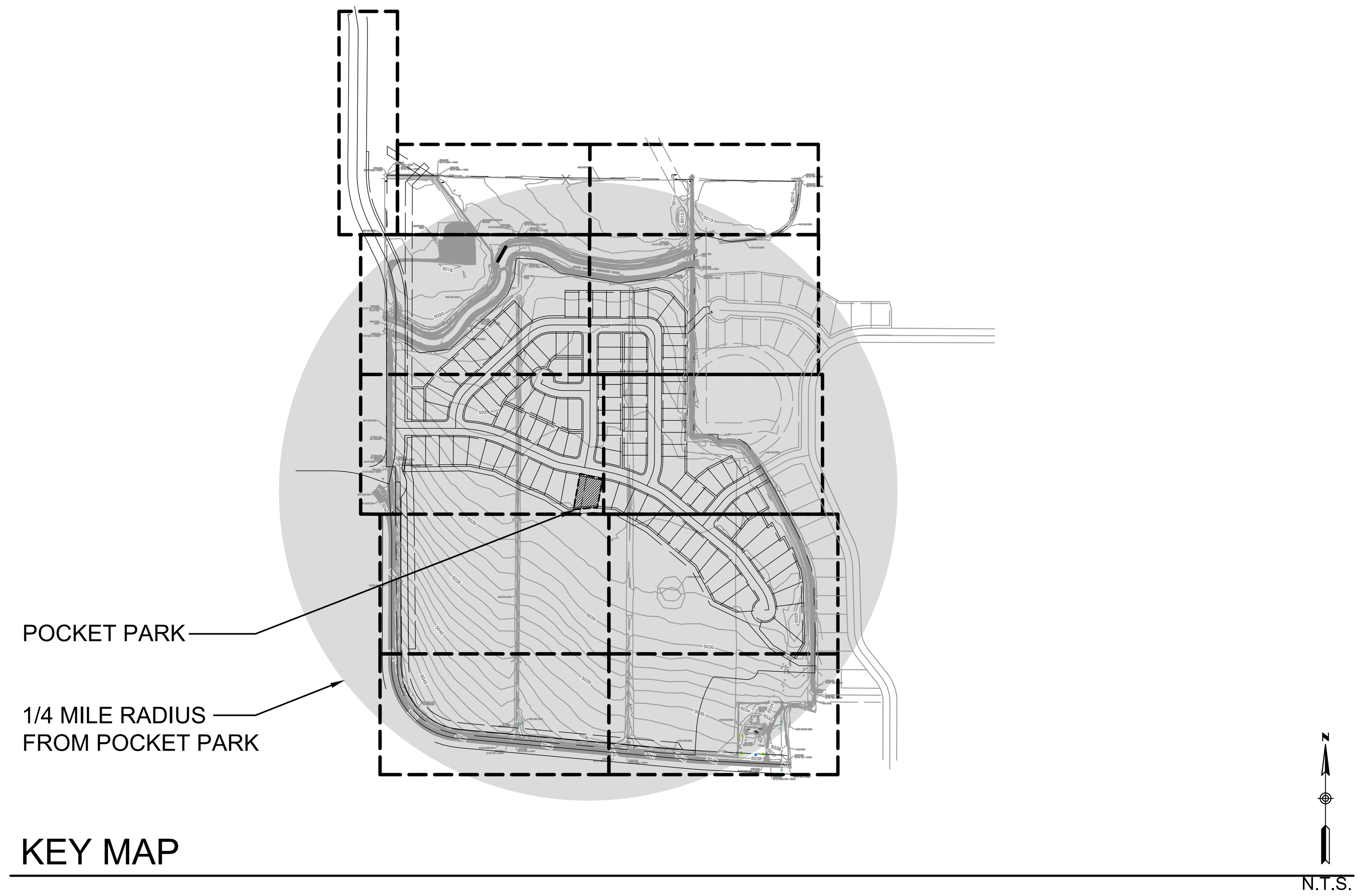
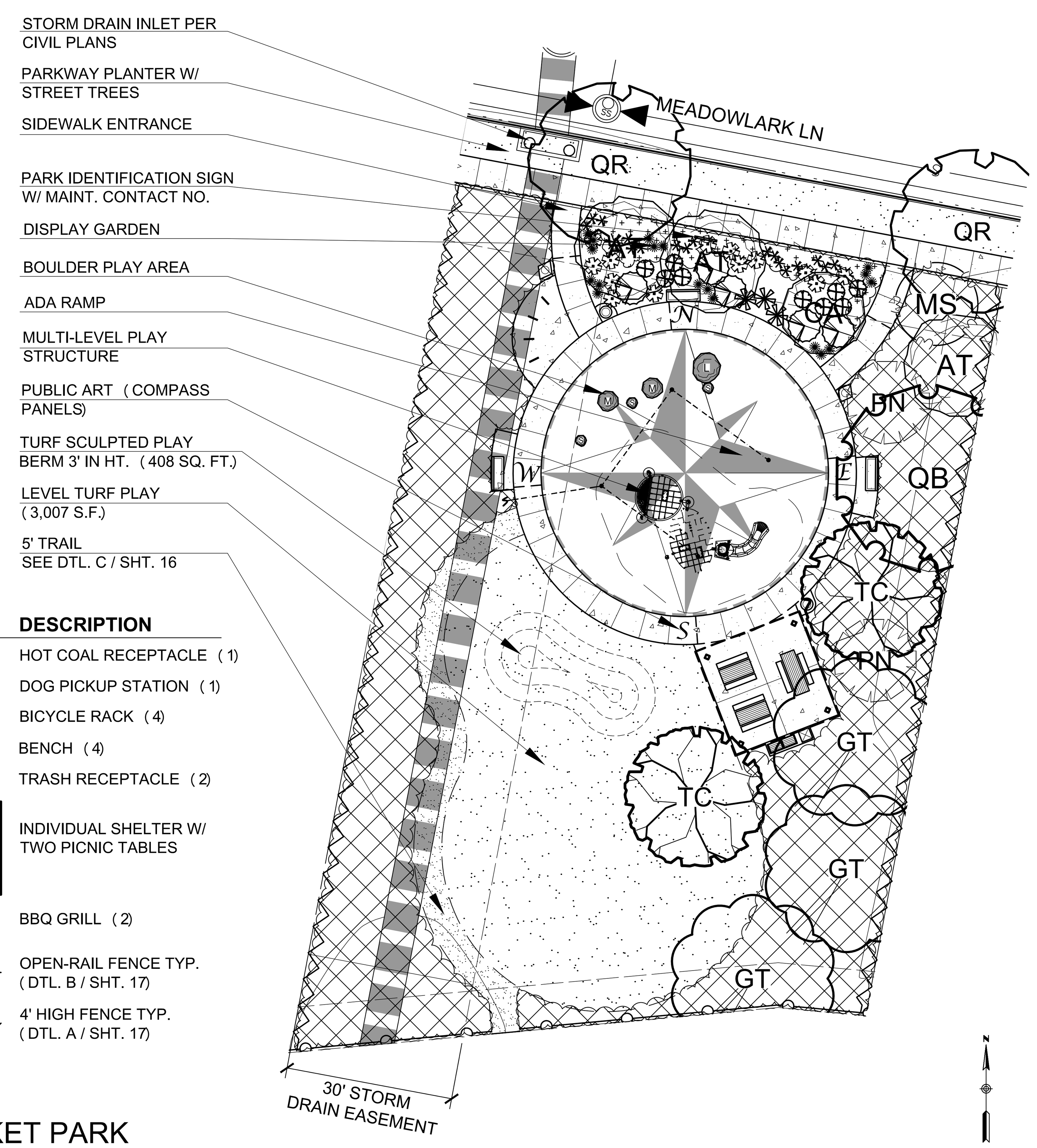


KEY MAP



SYMBOL	DESCRIPTION
	HOT COAL RECEPTACLE (1)
	DOG PICKUP STATION (1)
	BICYCLE RACK (4)
	BENCH (4)
	TRASH RECEPTACLE (2)
	INDIVIDUAL SHELTER W/ TWO PICNIC TABLES
	BBQ GRILL (2)
	OPEN-RAIL FENCE TYP. (DTL. B / SHT. 17)
	4' HIGH FENCE TYP. (DTL. A / SHT. 17)

POCKET PARK

SCALE: 1" = 20'

PLANT MATERIAL LEGEND (POCKET PARK)

SYMBOL	BOTANICAL NAME / COMMON NAME
ORNAMENTAL TREES - 1.5" CAL.:	
AT	ACER TATARICUM / TATARIAN MAPLE
CA	CRATAEGUS AMBIGUA / RUSSIAN HAWTHORN
DECIDUOUS SHRUBS - 5 GAL.:	
	BUDDLEIA DAVIDII / BUTTERFLY BUSH
	PEROVSKIA ATRIPLICIFOLIA / RUSSIAN SAGE
PERENNIALS & ORNAMENTAL GRASSES - 1 GAL.:	
	CALAMAGROSTIS BRACHYTRICHA / KOREAN FEATHER REED GRASS
	SCHIZACHYRIUM SCOPARIUM / LITTLE BLUE STEM
	SPOROBOLUS WRIGHTII / GIANT SACATON GRASS
	VERONICA LIWANENSIS / TURKISH VERONICA

PLANT MATERIAL LEGEND (OVERALL SITE)

SYMBOL	BOTANICAL NAME / COMMON NAME
DECIDUOUS CANOPY TREES - 1.5" CAL.:	
QB	QUERCUS BICOLOR / SWAMP WHITE OAK
CS	CATALPA SPECIOSA / WESTERN CATALPA
GT	GLEDITSIA TRIACANTHOS INERMIS / SKYLINE HONEY LOCUST
QR	QUERCUS RUBRA / NORTHERN RED OAK
	TILIA CORDATA 'GREENSPIRE' / GREENSPIRE LINDEN
EVEGREEN TREES - 6' HT.:	
PG	PICEA GLAUCA 'PENDULA' / WEEPING WHITE SPRUCE
PP	PICEA PUNGENS 'BABY BLUE EYES' / BABY BLUE EYES SPRUCE
PE	PINUS EDULIS / PINON PINE
PH	PINUS HELDREICHII / BOSNIAN PINE
PN	PINUS NIGRA / AUSTRIAN PINE
ORNAMENTAL TREES - 1.5" CAL.:	
AT	ACER TATARICUM / TATARIAN MAPLE
CA	CRATAEGUS AMBIGUA / RUSSIAN HAWTHORN
MS	MALUS 'SPRING SNOW' / SPRING SNOW CRABAPPLE
PN	PRUNUS NIGRA 'PRINCESS KAY' / PRINCESS KAY CANADA PLUM
TURF	
	HYBRID BLUEGRASS SOD / THERMAL BLUE

NOTES:
1. FOR COMPLETE SEED MIXES, SEE SHT. 17.
2. SOME CANOPY TREES PROPOSED ARE SUSCEPTIBLE TO SUNSCALD. TRUNKS OF YOUNG TREES SHALL BE WRAPPED DURING WINTER MONTHS.

SYMBOL	BOTANICAL NAME / COMMON NAME
EVERGREEN SHRUBS - 5 GAL.:	
	PINUS MUGO / MUGO PINE
	PICEA PUNGENS 'GLOBOSA' / DWARF GLOBE SPRUCE
	JUNIPERUS SABINA 'BUFFALO' / BUFFALO JUNIPER
	PINUS NIGRA 'HORNIBROOKIANA" / 'HORNIBROOKIANA' DWARF AUSTRIAN PINE
DECIDUOUS SHRUBS - 5 GAL.:	
	CARYOPTERIS X CLANDONENSIS / BLUE MIST SPIREA
	FORSYTHIA X INTERMEDIA 'KOLGOLD' / MAGICAL GOLD FORSYTHIA
	ROSA SPP. / MEIDILAND ROSE
	CYTISUS PURGAN / SPANISH GOLD BROOM
	CORNUS SERICEA 'BAILEYI' / RED TWIG DOGWOOD
	SYRINGIA SPP. / LILAC
	PRUNUS X CISTENA / PURPLE LEAF SANDCHERRY
	PEROVSKIA ATRIPLICIFOLIA / RUSSIAN SAGE
	BUDDLEIA DAVIDII / BUTTERFLY BUSH
	SPIREA SPP. / SPIREA
PERENNIALS & ORNAMENTAL GRASSES - 1 GAL.:	
	CALAMAGROSTIS ACUTIFLORA 'KARL FOERSTER' / FEATHER REED GRASS
	HELICTOTRICHON SEMPREVIRENS / BLUE OAT GRASS
	MISCANTHUS SINENSUS 'PURPURESCENS' / MAIDEN GRASS, PURPLE FLAME
	HEMEROCALLIS SPP. / DAYLILY
	RUDBECKIA FULGIDA 'GOLDSTRUM' / BLACK EYED SUSAN
	PENSTEMON SPP. / PENSTEMON
	PENNISETUM ALOPECUROIDES 'HAMLEN' / DWARF FOUNTAIN GRASS
	SCHIZACHYRIUM SCOPARIUM / LITTLE BLUE STEM
	PANICUM VIRGATUM 'SHENANDOAH' / RED SWITCH GRASS
	PANICUM VIRGATUM 'HEAVY METAL' / SWITCH GRASS

STANDARD LANDSCAPE NOTES:

A. ALL LANDSCAPE AND IRRIGATION SHALL CONFORM TO THE STANDARDS OF ERIE PARKS AND RECREATION CONSTRUCTION SPECIFICATIONS, SECTION 1000.
B. POCKET PARK SHALL COMPLY WITH POCKET PARK DESIGN STANDARDS SECTION 1074.00.
C. IRRIGATION: AN AUTOMATIC IRRIGATION SYSTEM SHALL BE PROVIDED AS REQUIRED FOR PROPER IRRIGATION, DEVELOPMENT AND MAINTENANCE OF THE VEGETATION. THE DESIGN OF THE SYSTEM SHALL PROVIDE ADEQUATE SUPPORT FOR THE VEGETATION SELECTED.
D. MAINTENANCE: ALL REQUIRED LANDSCAPED AREAS SHALL BE MAINTAINED FREE OF DEBRIS AND LITTER AND ALL PLANT MATERIAL SHALL BE MAINTAINED IN A HEALTHY GROWING CONDITION. DISEASED OR DEAD PLANT MATERIAL SHALL BE SATISFACTORILY TREATED AND/OR REPLACED WITHIN 30 DAYS IN KIND.
E. ALL PLANTING AREAS SHALL RECEIVE A 3-INCH LAYER OF BARK MULCH, TYP.
F. LONG TERM MAINTENANCE RESPONSIBILITY: ALL LANDSCAPE AND IRRIGATION SHOWN ON THE POCKET PARK PLAN SHALL BE THE RESPONSIBILITY OF THE OWNER.
G. POCKET PARK SHALL COMPLY WITH ERIE, COLORADO UNIFIED DEVELOPMENT CODE, CHAPTER 6 DEVELOPMENT AND DESIGN STANDARDS FOR LANDSCAPE.

POCKET PARK DESIGN STANDARDS

SECTION 1074.00 - ERIE PARKS AND RECREATION CONSTRUCTION

POCKET PARK AMENITIES
LIST A (ALL REQUIRED)
AMENITIES CURRENTLY SHOWN:
1. BENCHES (2 MINIMUM, 3 PROVIDED)
2. BICYCLE RACK (4 SERVED)
3. DOG PICK UP STATION (2 PROVIDED)
4. ID SIGN W/ MAINT. CONTACT NUMBER
5. INDIVIDUAL SHELTER W/ TWO PICNIC TABLES.
6. IRRIGATION
7. OPEN TURF AREA (MIN. REQ. 3,000 S.F./MAX. ALLOWED 15,000 S.F.) OPEN TURF AREA PROVIDED: 3,415 S.F.
8. SIDEWALKS (ADA ACCESSIBLE)
9. TRASH RECEPTACLE (MIN. OF 2, 2 PROVIDED)
10. PLANT MATERIALS
   a. FIVE (5) DECIDUOUS TREES.
   b. THREE (3) ORNAMENTAL TREES.
   c. TWO (2) EVERGREEN TREES.
   d. TWENTY (20) SHRUBS.
   e. TWENTY FOUR (24) PERENNIALS.
   f. THREE (3) ORNAMENTAL GRASSES

POCKET PARK AMENITIES CONT.
LIST B (TWO (2) SELECTED FROM LIST)
AMENITIES SHOWN:
1. DISPLAY GARDEN.
5. MULTI-LEVEL PLAY STRUCTURE.

LIST C (THREE (3) SELECTED FROM LIST):
AMENITIES SHOWN:
7. BOULDER PLAY AREA
12. TURF SCULPTED PLAY BERM, 3' IN HT.
15. PUBLIC ART, COMPASS PANELS

LIST D (SELECT 2)
AMENITIES SHOWN:
1. TWO BBQ GRILLS
2. TWO ADT'L. BENCHES

*ADDITIONAL AMENTIES:
1. HOT COAL RECEPTACLE, ONE PROVIDED.

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USA NORTH 811 Call 811 Before You Dig

PATRICIA TRAUT 1219 Original Date of Licensure STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT
PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT
POCKET PARK ENLARGEMENT
TOWN OF ERIE

SCALE: 1" – 40'
DATE: 02/06/19
DRAWN BY: TP/ER
CHECKED BY: PT
JOB NO: D1048
SHEET NO. 14 OF 18 SHEETS
DRAWING NO. LPD–01

RICK ENGINEERING COMPANY
Denver
9801 EAST EASTER AVE
CENTENNIAL, CO 80112
303.537.8020
rickengineering.com
Tucson - San Diego - Sacramento - Riverside - Orange - San Luis Obispo - Phoenix

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE ¼ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF BOULDER, COLORADO
118 LOTS, 5 TRACTS CONTAINING 86.495±
PP-000946-2017

FINISH SCHEDULE

PUBLIC ART (SIDEWALK COMPASS PANELS)
SHALL FEATURE ENHANCED CONCRETE WITH ARTISTIC, ILLUSTRATIVE DIRECTIONAL LETTERING: EXPOSED AGGREGATE ⅜ SMOOTH ROUND PEBBLE REVEAL AT DIRECTIONAL LETTERING (N, S, E, W). LETTERING TO BE LUCIDA CALLIGRAPHY (OR APPROVED EQUAL).

RUBBERIZED COMPASS SURFACING
COLORS: BACKGROUND SHALL BE 50% HUNTER GREEN/50% BLACK (G/B), ROYAL BLUE (RB) AND PRIMARY RED (R) FOR STAR. PH. 303-278-1455 | RECREATIONPLUS.COM. SUB-SURFACE DRAINAGE INLETS (4) SHALL BE 6" ROUND SPEE-D BASINS W/ 6" ROUND GRATE. AVAILABLE AT NDS.PRO.COM.

BENCH
SHALL BE EVA-REVERIE COLLECTION; STANDARD 6' LENGTH W/ BACK & ARMREST - SURFACE MOUNT. FINISH SHALL BE WOOD / RECYCLED SOLID STEEL BARS (SILVER IN COLOR). INSTALL PER MANUFACTURER'S RECOMMENDATIONS. AVAILABLE AT VICTOR STANLEY, INC. (OR APPROVED EQUAL). 1-800-368-2573 | VICTORSTANLEY.COM

BIKE RACK
SHALL BE MODEL BRWS-161, SATIN STAINLESS-STEEL FINISH, SURFACE MOUNT. AVAILABLE AT VICTOR STANLEY (OR APPROVED EQUAL). INSTALL PER MANUFACTURER'S RECOMMENDATIONS. AVAILABLE AT VICTOR STANLEY, INC (OR APPROVED EQUAL). 1-800-368-2573 | VICTORSTANLEY.COM

TRASH RECEPTACLE
SHALL BE 24-GALLON STANDARD TAPERED FORMED LID, MODEL T-24 (SILVER IN COLOR). INSTALL PER MANUFACTURER'S RECOMMENDATIONS. AVAILABLE AT VICTOR STANLEY, INC (OR APPROVED EQUAL). 1-800-368-2573 | VICTORSTANLEY.COM

PET WASTE STATION
SHALL BE POLY DOGIPOT QUIK PET STATION (#1011-POLY). INSTALL 4-8' GALVANIZED STEEL POST IN CONCRETE FOOTING PER MANUFACTURER'S RECOMMENDATIONS. 1-800-364-7681 | DOGIPOT.COM

PICNIC TABLES
SHALL BE PARSONS COLLECTION, PT-2. FINISH SHALL BE SILVER AND WOOD, FREESTANDING MOUNT. (1) TABLE @ 6' LENGTH, (1) TABLE @ 8' LENGTH (ADA). INSTALL PER MANUFACTURER'S RECOMMENDATIONS. AVAILABLE AT VICTOR STANLEY, INC. (OR APPROVED EQUAL). 1-800-368-2573 | VICTORSTANLEY.COM

CONCRETE SIDEWALK
SHALL BE BROOM FINISH (MEDIUM), NATURAL GRAY COLOR.

CRUSHER FINES AT TRAIL
SHALL BE CRUSHER FINES (TAN IN COLOR), CRUSHED GRANITE 3/8" MINUS, 4" MIN. DEPTH W/ LANDSCAPE FABRIC. BLEND 12 LBS. STABILIZER PER TON OF CRUSHER FINES. AVAILABLE AT COLORADO MATERIALS, INC. LONGMONT, CO (OR APPROVED EQUAL). 303-682-2314 | COLORADOMATERIALSINC.COM

ROCK COBBLE
SHALL BE 1½ - 3" RIVER ROCK W/ LANDSCAPE FABRIC. COLORS TO BE SHADES OF PINK, MAROON, BEIGE, BROWN AND SHADES OF GREY. AVAILABLE AT PIONEER SAND, OR APPROVED EQUAL. 866.600.0652 | PIONEERSAND.COM

METAL EDGER
SHALL BE DURAEDGE STEEL EDGING (OR APPROVED EQUAL), 4" ROLLTOP, 14 GUAGE GALVANIZED, INTERLOCKING TYPE, BROWN (BASE BID) OR GREEN (DEDUCTIVE ALTERNATE) IN COLOR. AVAILABLE AT DIRECT LANDSCAPE SUPPLY | 303-781-2270 | DIRECTLANDSCAPESUPPLY.COM

BOULDERS
SHALL BE FROM NEARBY QUARRY, COLORADO BUFF SANDSTONE OR APPROVED EQUAL. BOULDERS SHALL BE SMOOTH TO THE TOUCH, TO BE HAND SELECTED BY LANDSCAPE ARCHITECT. AVAILABLE AT COLORADO MATERIALS, INC., LONGMONT, CO, 303-682-2314 | COLORADOMATERIALSINC.COM

LANDSCAPE FABRIC (WEED BARRIER)
SHALL BE MIRIFI 140N, TAN IN COLOR TO BE INSTALLED IN ALL AREAS RECEIVING WOOD MULCH, ROCK MULCH, ROCK COBBLE AND DECOMPOSED TRAIL.

LANDSCAPE WOOD MULCH AT TREE RINGS & PLANTERS
SHALL BE WASHINGTON CEDAR GORILLA HAIR MULCH, 4' DIAMETER, 3" THK. AT ALL TREE RINGS, NOT IN DIRECT CONTACT WITH TRUNK, 3" THICK IN PLANTER AREAS TYP.

WOOD PRIVACY FENCE
TBD.

SPLIT-RAIL FENCE
TBD.

CONCRETE AT CIRCULAR ROUNDABOUT MEDIAN
SHALL BE INTEGRAL COLOR, STAMPED CONCRETE.

MULTI-LEVEL PLAY STRUCTURE
SHALL BE INET-1705. AVAILABLE AT PLAYWORLD.COM

SHADE STRUCTURE
SHALL BE POLIGON WSQ-15, FOUR SIDED, HIP ROOF, WOOD TRUSS SHELTER W/ MULTI-RIB ROOF (FOREST GREEN IN COLOR). MANUFACTURER TO PROVIDE SHOP DRAWINGS, STRUCTURAL CALCULATIONS AND PERMITS AS REQUIRED BY TOWN OF ERIE . AVAILABLE AT POLIGON.COM | 616-888-3500

OUTDOOR GRILL
OUTDOOR DOUBLE PARK GRILL, ULINE GRILL H-6580. INSTALL PER MANUFACTURER'S RECOMMENDATIONS AVAILABLE AT ULINE.COM | 1-800-295-5510.

HOT ASH RECEPTACLE
SHALL BE HOT ASH RECEPTACLE MODEL 500-0715-LSB-WHITE (SAND TAN), AVAILABLE AT BELSON.COM | 800-323-5664

PARK ID SIGN W/ MAINT. CONTACT NUMBER
SIGNAGE DETAIL AND ARTWORK TO BE PROVIDED IN FINAL PLATT SUBMITTAL PLAN SET.

NOTE: MATERIAL SUBMITTALS FOR ALL PRODUCTS IN THIS SECTION SHALL BE SUBMITTED FOR APPROVAL BY LANDSCAPE ARCHITECT, PRIOR TO ORDERING AND/OR DELIVERING MATERIALS ON-SITE.

LANDSCAPE BOULDER SCHEDULE		SIZE
SURFACE SELECT BOULDERS AS AVAILABLE THROUGH LOCAL SOURCES. SUBMIT PHOTO SAMPLE FOR APPROVAL BY LANDSCAPE ARCHITECT PRIOR TO ORDERING MATERIAL.	L	4'-6'
	M	2'-4'
	S	1.5'-2'

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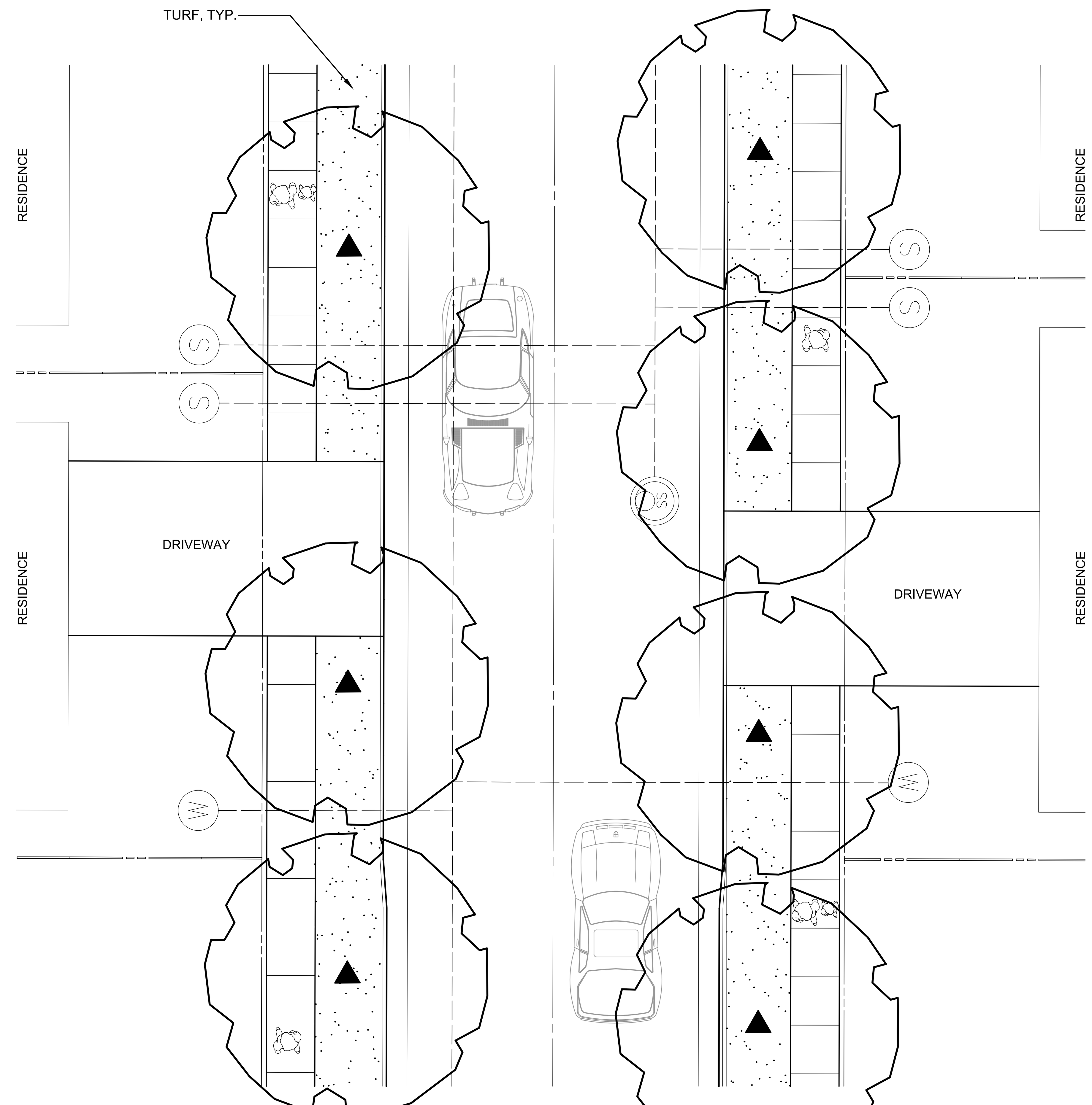


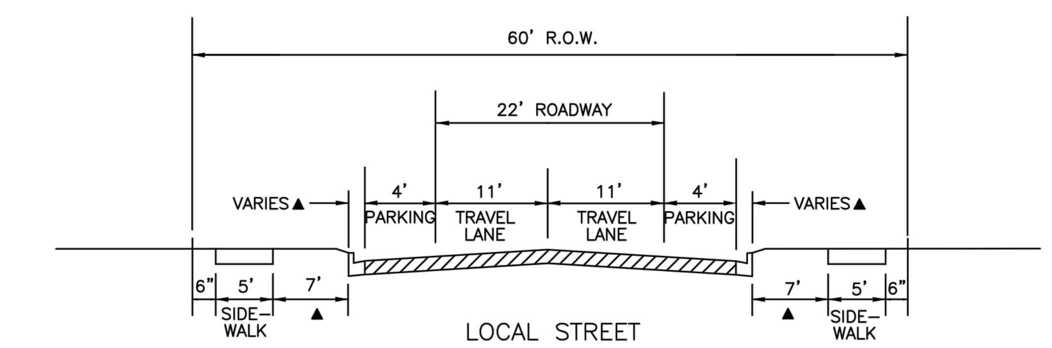
NOTES:
1. TREE LAWN TURF & TREES BY HOMEOWNER.
2. TREE LAWN IRRIGATION BY HOMEOWNER.

50' WIDE LOT FRONTAGE TYP.

60' WIDE LOT FRONTAGE TYP.

LOT FRONTAGE (TYPICALS)

N.T.S.



NOTE:
PRIVATE UTILITIES TO BE OUTSIDE OF THE PUBLIC RIGHT-OF-WAY
▲ WIDTH DEPENDS ON VERTICAL OR ROLLOVER CURB

The Town of ERIE COLORADO

DRAWING TITLE: LOCAL STREETS
DRAWING NUMBER: ST6
DRAWN BY: J. ASCUNCE APPROVED BY: G. BEHLEN DATE: 01/2017

LOCAL STREETS CROSS SECTION

N.T.S.

USA NORTH 811 Call 811 Before You Dig

NO.	REVISION DESCRIPTION	REVISED BY	ACCEPT. BY	DATE
△	–	–	–	–

PATRICIA TRAUT 1219 STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT
PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

FINISH SCHEDULE & LOT FRONTAGE TYP.

TOWN OF ERIE

SCALE:	SHEET NO. 15
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	
CHECKED BY: PT	DRAWING NO. LPD–02
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE 1/4 OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF BOULDER, COLORADO
118 LOTS, 5 TRACTS CONTAINING 86.495±
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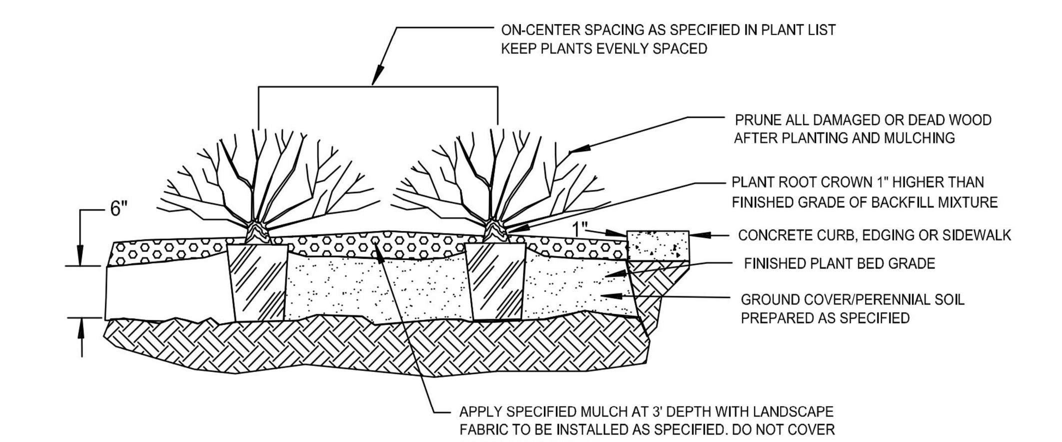
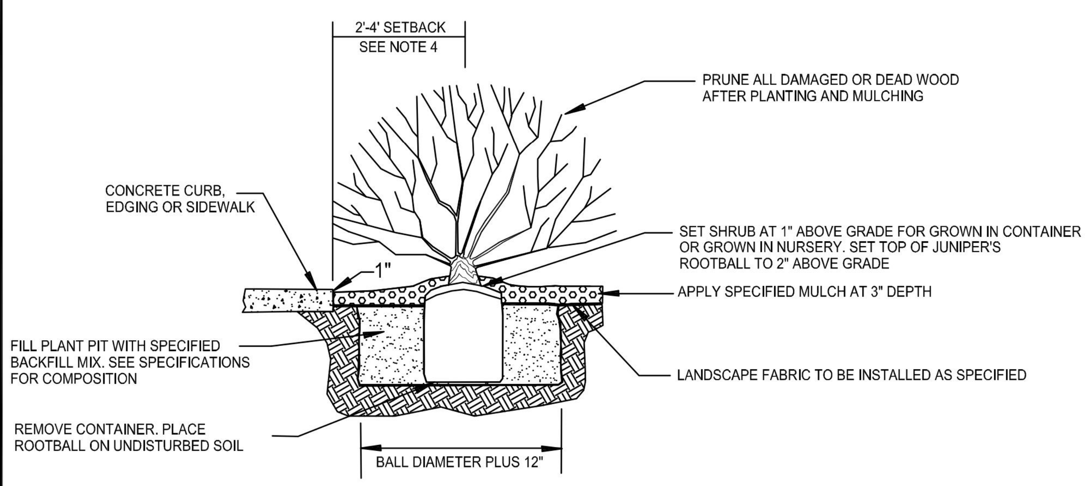


NOTE:
1. HOLD MULCH GRADE 1" BELOW EDGE OF WALK, EDGING OR CURB. HOLD BACK PLANTS 12-18" FROM EDGES.
2. REMOVE ALL CONTAINERS & POTS PRIOR TO PLANTING.

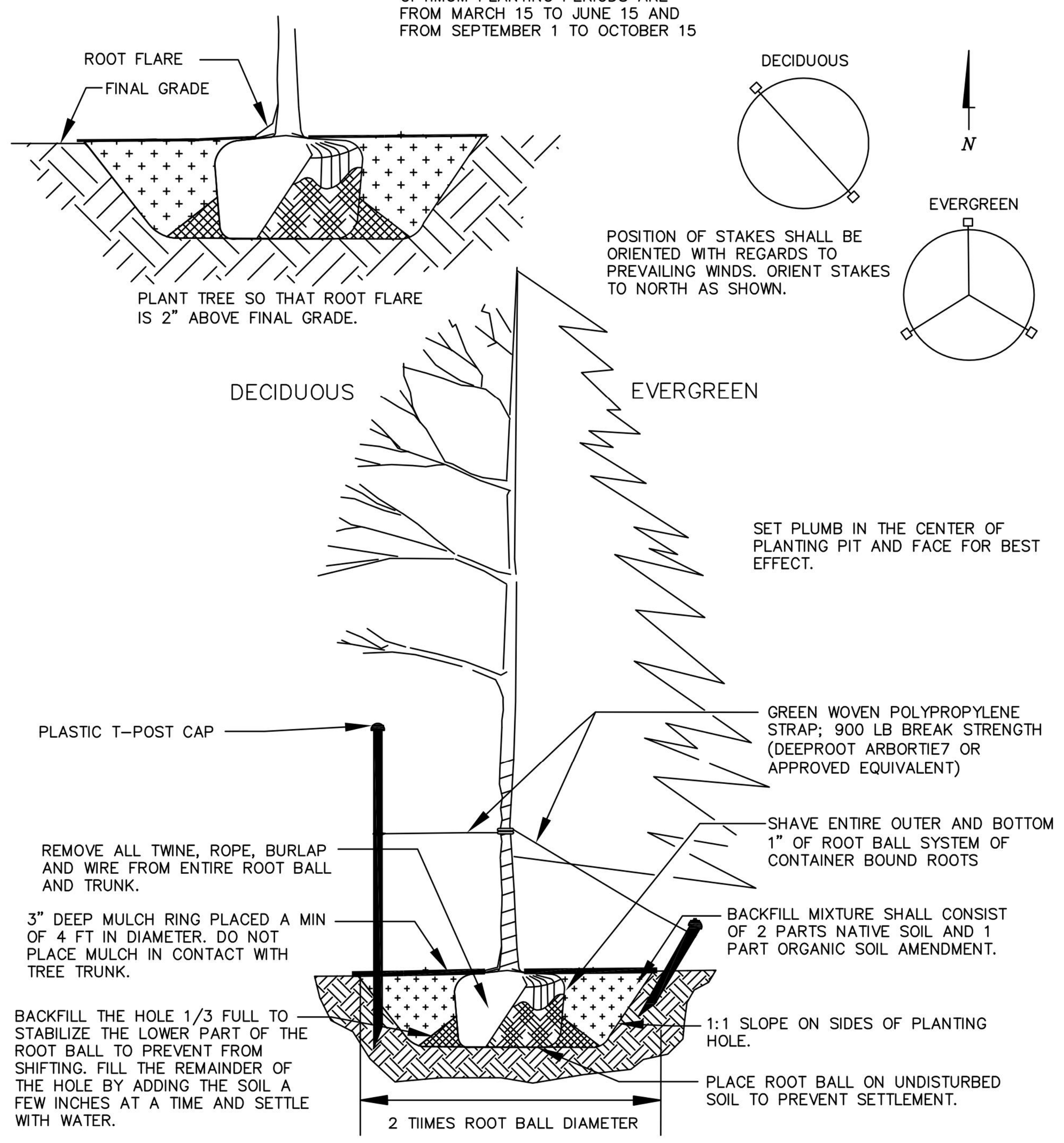
GROUNDCOVER / PERENNIAL



SHRUB

NOTE:
1. DO NOT PLANT ANY PLANT WITH ROOTBALL NOT IN CONFORMANCE WITH COLORADO NURSERY ACT REQUIREMENTS
2. HOLD MULCH GRADE 1" BELOW EDGE OF WALK, EDGING OR CURB
3. SHRUBS NOT PLANTED WITHIN A MULCHED BED REQUIRE A 4" HIGH EARTH SAUCER TO BE CONSTRUCTED CONTAINING A 1' RADIUS AND 3" DEEP MULCH COLLAR.
4. USE A 2' TO 4' SETBACK DEPENDING ON SPECIES. SETBACK TO ACCOMODATE MATURE SPREAD OF SPECIES TO PREVENT OVERHANG.
5. REMOVE ALL CONTAINERS & POTS PRIOR TO PLANTING.

OPTIMUM PLANTING PERIODS ARE FROM MARCH 15 TO JUNE 15 AND FROM SEPTEMBER 1 TO OCTOBER 15



STAKING NOTES:
DECIDUOUS TREES SHALL BE STAKED USING TWO(2) SIX(6) FOOT STEEL T-POSTS DRIVEN PERPENDICULAR TO THE TREE AT 180 DEGREES.
EVERGREEN TREES SHALL BE STAKED USING THREE(3) TWO(2) FOOT STAKES DRIVEN AT 120 DEGREES.
ALL STAKES SHALL BE DRIVEN OUTSIDE OF ROOTBALL AND IN UNDISTURBED SOIL.

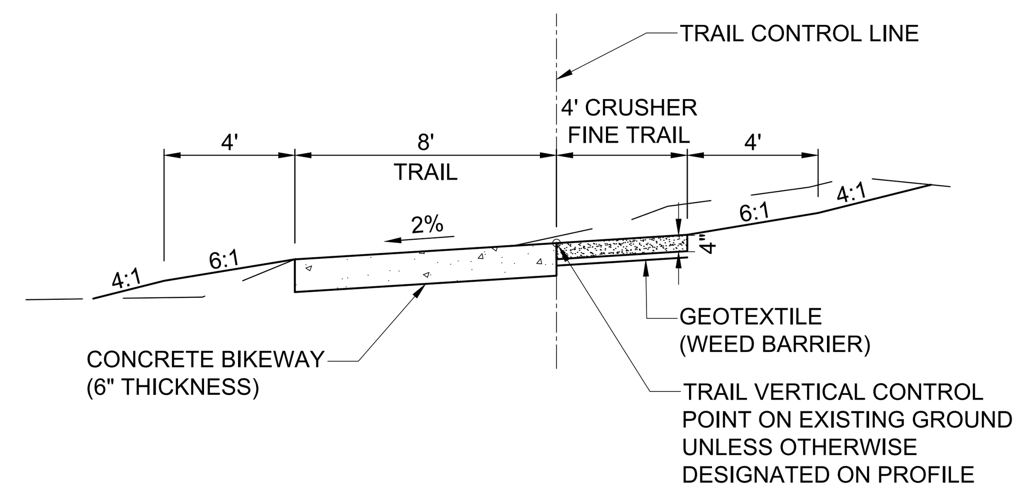
The Town of ERIE COLORADO

DRAWING TITLE: TREE PLANTING DETAIL
DRAWING NUMBER: P20A
DRAWN BY: D. JENKINS APPROVED BY: G. HEGNER DATE: 1/2014

STOP SIGN: MUTCD R1-1 12"x12"
CROSS TRAFFIC SIGN: MUTCD W4-4P 12"x24"

A TRAIL STOP SIGN (TYP.)

NOT TO SCALE



B SPINE TRAIL CROSS SECTION

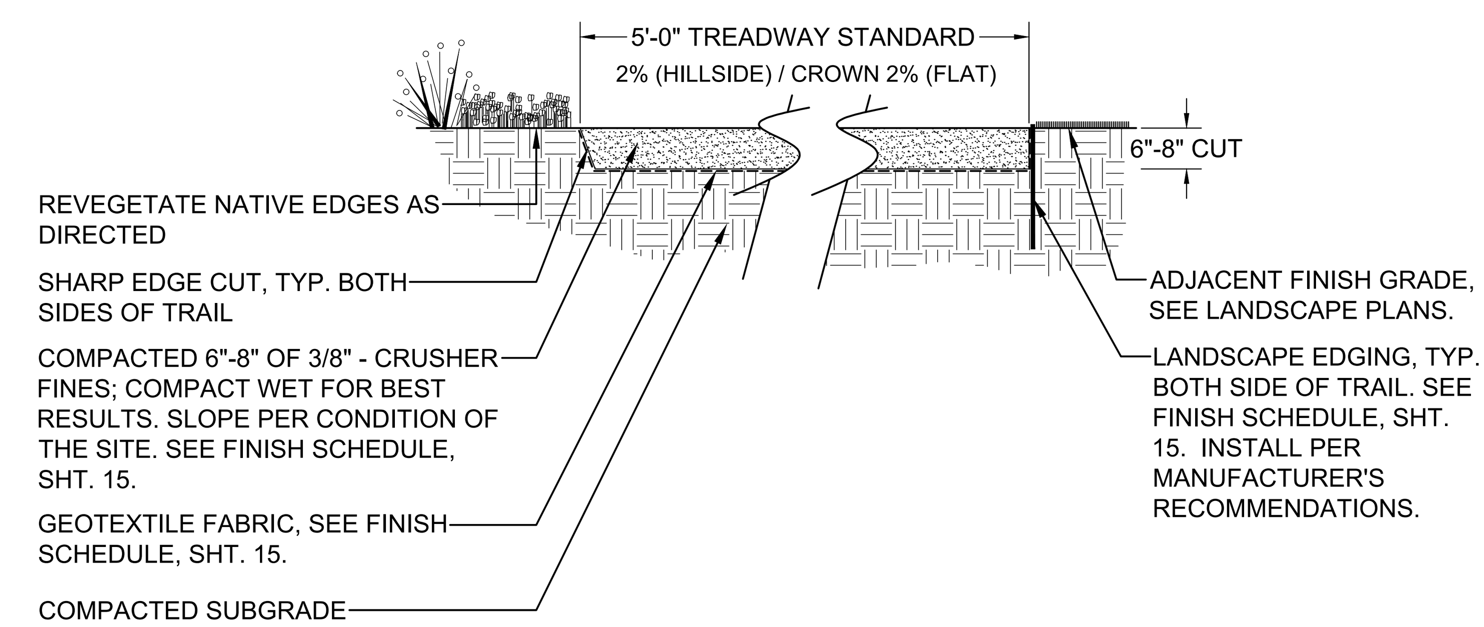
NOT TO SCALE

STREET TREE REQUIREMENT - SECTION 1000

Small Deciduous Trees	Medium Deciduous Trees	Large Deciduous Trees
under 30' mature height	30' – 45' Mature Height	Over 45' Mature Height
12' Minimum Spacing Between Trees, 20' Recommended	20' Minimum Spacing Between Trees, 30' Recommended	30' Minimum Spacing Between Trees, 40' Recommended

Small Evergreen Trees	Large Evergreen Trees
Under 30' Mature Height	Over 30' Mature Height
12' Minimum, 20' Recommended Spacing Between Trees	20' Minimum, 30' Recommended Spacing Between Trees
Do Not Use as a Street Tree	Do Not Use as a Street Tree

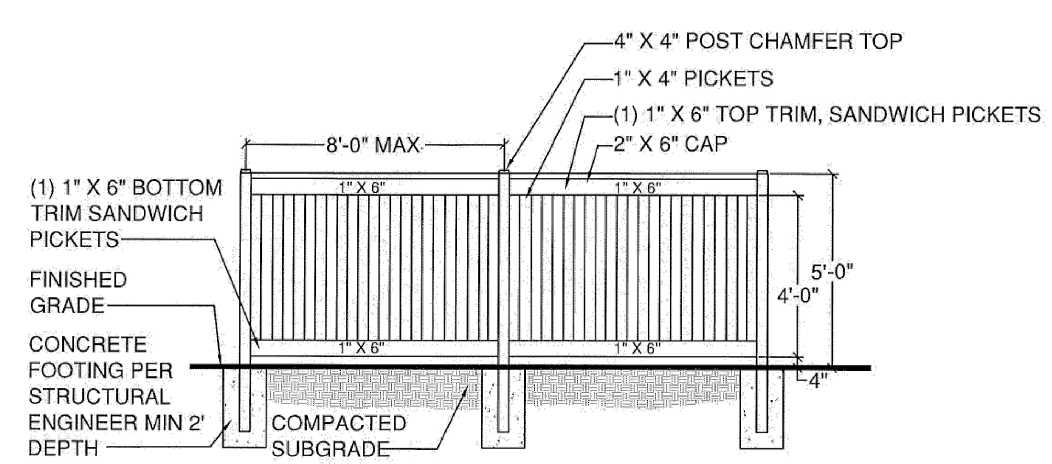
PERIMETER TRAIL (TYP.) TRAIL AT POCKET PARK (TYP.)



NOTES:
1. THE EXCAVATED AREA TO BE COMPACTED USING A DOUBLE-DRUM VIBRATORY ROLLER.
2. TREAD SURFACE ("CRUSHER FINE" OR "GRANITE SAND") TO BE RAKED BY HAND OR MACHINE TO PROVIDE ADEQUATE OUTSLOPING (2%).
3. WHILE WET, THE SURFACE IS COMPACTED DOWN TO THE FINAL GRADE WITH THE VIBRATORY ROLLER.
4. TRENCH SHOULD BE COMPACTED TO 8" DEPTH. COMPACTED SUBGRADE IS TO BE COVERED WITH GEOTEXTILE FABRIC PRIOR TO INSTALLATION OF GRANITE SANDS.
5. FOR AREAS WITH A CROSS SLOPE, A DRAINAGE SWALE IS INSTALLED ON THE UPHILL SIDE OF THE TRAIL.
6. TRAIL ALIGNMENT SHOULD WORK WITH THE NATURAL TOPOGRAPHY.
7. CONSIDER PROVIDING OCCASIONAL VIEWING AND SEATING AREAS ALONG THE PATH TO ACCOMMODATE PASSIVE RECREATION AREAS.

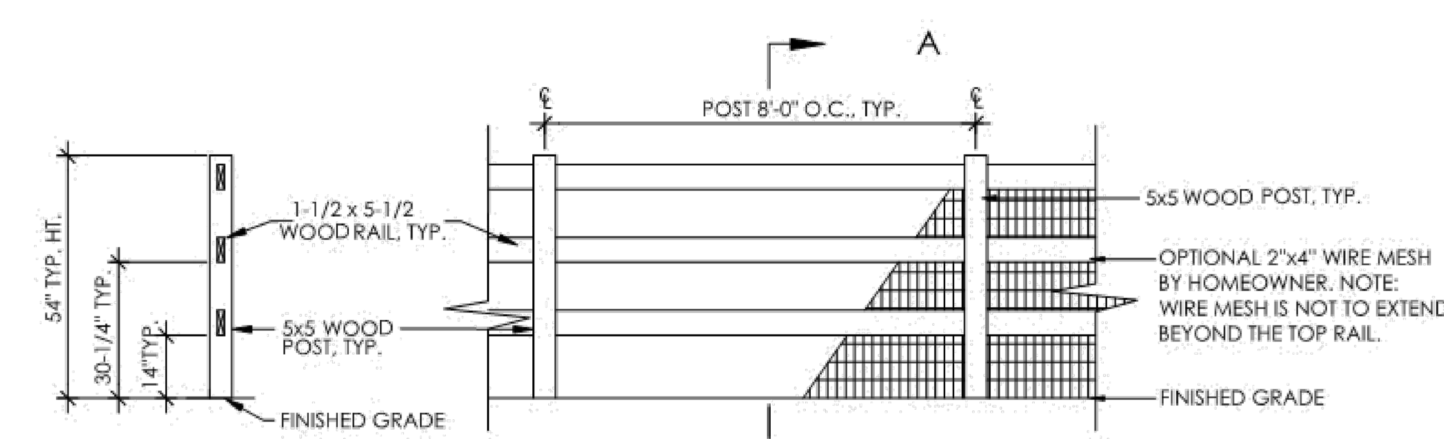
C SOFT TRAIL DETAIL

NOT TO SCALE



D 6' HIGH WOOD PRIVACY FENCE

NOT TO SCALE



NOTES:
1. FENCE TYPE- WOOD
2. LOCATE FENCE INSIDE RESIDENTIAL PROPERTY LINE BUTTED AGAINST PROPERTY LINE.
3. FINISHED SIDE OF FENCE SHALL BE FACING THE STREET.

E 4'-6" SPLIT-RAIL WOOD FENCE

NOT TO SCALE

STREET TREE INDEX

STREET NAME	TREES REQR'D.	TREES PROVIDED	1 TREE / 40 LF x 0,000 LF
MEADOWLARK DRIVE	96	67	1 TREE / 40 LF x 3,844 LF
LARAMIE LANE	52	29	1 TREE / 40 LF x 2,068 LF
PERSIMMON COURT	12	6	1 TREE / 40 LF x 476 LF
FOXGLOVE STREET	31	10	1 TREE / 40 LF x 1,240 LF
WILDROSE PLACE	37	21	1 TREE / 40 LF x 1,478 LF
FARMER PLACE	18	13	1 TREE / 40 LF x 722 LF
LOMBARDI STREET	103	95	1 TREE / 40 LF x 4,124 LF
	TOTAL 349	TOTAL 241	

NOTES:
1. LOCATION OF WET/DRY UTILITIES, DRIVEWAYS, STREET LIGHTS AND SIGHT DISTANCE TRIANGLES ETC. SKEW REQUIRED STREET TREE COUNT.
2. LINEAR FEET OF ROADWAY IS DOUBLED WHEN STREET TREES ARE LOCATED ON BOTH SIDES OF THE STREET.

NATIVE SEED MIXES

TABLE 1. MIXED GRASS PRAIRIE NATIVE SEED MIXTURE

COMMON NAME	SCIENTIFIC NAME	VARIETY	OZ/ACRE	PLS LBS/ACRE
Buffalo grass	*Buchloe dactyloides*	Native, Bison or Texoka		3
Sideoats grama	*Boutelua curtipendula*	Butte, Niner or El Reno		5
Prairie sandreed	*Calamovilfa longifolia*	Goshen or Bowman		1
Blue grama	*Chondrosum gracile*	Lovington, Alma, Native or Hachita		3
Western wheatgrass	*Pascopyrum smithii*	Arriba or Rosana		5
Little bluestem	*Schizachryium scoparium*	Pastura, Cimarron, Aldous Camper		4
Alkali sacaton	*Sporobolus airoides*	Common		1
Sand dropseed	*Sporobols cryptandrs*	Common		1
Switchgrass	*Panicum virgatum*	Blackwell		5
SEEDING RATE POUNDS PLS/ACRE				**28**
Optional Addition of Native Wildflowers				
Fringed sage	*Artemisia frigida*	Common	1	
Purple prairie clover	*Dalea purpurea*	Common	6	
Blanketflower	*Gaillardia aristata*	Common	6	
Gayfeather	*Liatris punctata*	Common	4	
Tansy aster	*Machaeranthera tanacetafolia*	Common	3	
Prairie coneflower	*Ratibida columnifera*	Common	3	
OUNCES			23	**1.44**
SEEDING RATE POUNDS PLS/ACRE WITH NATIVE WILDFLOWERS OPTION				**29.44**

TABLE 2. SHORTGRASS PRAIRIE NATIVE SEED MIXTURE

COMMON NAME	SCIENTIFIC NAME	VARIETY	OZ/ACRE	PLS LBS/ACRE
Buffalo grass	*Buchloe dactyloides*	Native, Bison or Texoka		14
Blue grama	*Chondrosum gracile*	Lovington, Alma, Native or Hachita		12
Sand dropseed	*Sporobols cryptandrs*	Common		4
SEEDING RATE POUNDS PLS/ACRE				30
Optional Addition of Native Wildflowers				
Fringed sage	*Artemisia frigida*	Common	1	
Purple prairie clover	*Dalea purpurea*	Common	4	
Gayfeather	*Liatris punctata*	Common	4	
Tansy aster	*Machaeranthera tanacetafolia*	Common	3	
OUNCES			12	0.75
SEEDING RATE POUNDS PLS/ACRE WITH NATIVE WILDFLOWERS OPTION				30.75

TABLE 3. MOIST SWALE SEED MIXTURE

COMMON NAME	SCIENTIFIC NAME	VARIETY	OZ/ACRE	PLS LBS/ACRE
Woolly sedge	*Carex lanuginosa*	Native		0.50
Nebraska sedge	*Carex nebrascensis*	Native		0.10
Blue grama	*Chondrosum gracile*	Lovington, Alma, Native or Hachita		1.50
Buffalo grass	*Buchloe dactyloides*	Native, Bison or Texoka		0.50
Inland saltgrass	*Distichlis stricta*	Native		0.50
Baltic rush	*Juncus balticus*	Native		0.10
Prairie cordgrass	*Spartina pectinata*	Native		1.00
Alkali sacaton	*Sporobolus airoides*	Common		3.00
Switchgrass	*Panicum virgatum*	Blackwell		3.00
Western wheatgrass	*Pascopyrum smithii*	Arriba or Rosana		5.00
SEEDING RATE POUNDS PLS/ACRE				**15.20**
Optional Addition of Native Wildflowers				
Aster	*Aster laevis*			0.05
Yarrow	*Achillea millefolium*	Western		0.05
Prairie coneflower	*Ratibida columnifera*			0.05
SEEDING RATE POUNDS PLS/ACRE WITH NATIVE WILDFLOWERS OPTION				15.35

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USA NORTH 811 Call 811 Before You Dig

PATRICIA TRAUT 1218 STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT
PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

PLANTING LEGEND & DETAILS

TOWN OF ERIE

SCALE:
DATE: 02/06/19
DRAWN BY: TP/ER
CHECKED BY: PT
JOB NO: D1048
SHEET NO. 16
OF 18 SHEETS
DRAWING NO. LPD-03

RICK ENGINEERING COMPANY
9801 EAST EASTER AVE
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rickengineering.com
Denver Tucson - San Diego - Sacramento - Riverside - Orange - San Luis Obispo - Phoenix

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE ¼ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF BOULDER, COLORADO
118 LOTS, 5 TRACTS CONTAINING 86.495±
PP-000946-2017

LANDSCAPE – GENERAL

ALL WORK SHALL CONFORM TO TOWN OF ERIE STANDARDS AND SPECIFICATIONS AND WITH THE ACCEPTED PLANS. REFER TO THESE STANDARDS FOR ADDITIONAL INFORMATION AS NEEDED. A COPY OF THESE SPECIFICATIONS SHALL BE AVAILABLE ON THE WORK SITE AT ALL TIMES.

THE DEVELOPER/ARCHITECT SHALL ENSURE THAT THE IRRIGATION PLAN IS COORDINATED WITH PLANS DONE BY OTHERS SO THE PROPOSED GRADING, DRAINAGE WORK, OR OTHER CONSTRUCTION DOES NOT CONFLICT NOR PRECLUDE INSTALLATION AND MAINTENANCE OF LANDSCAPE ELEMENTS ON THIS PLAN.

STORM WATER BEST MANAGEMENT PRACTICES SHALL CONFORM TO STATE OF COLORADO REQUIREMENTS. ALL STORM WATER REPORTS AND REQUIRED PAPERWORK SHALL ADHERE TO ALL STATE OF COLORADO REQUIREMENTS.

THE CONTRACTOR SHALL CERTIFY THAT THE GRADE IS WITHIN PLUS OR MINUS ONE-TENTH (1/10TH) OF THE FINAL GRADING PLAN PRIOR TO COMMENCEMENT OF ANY LANDSCAPE OR IRRIGATION WORK.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL PERMITS, FEES, AND LICENSES ASSOCIATED WITH THE WORK AS SHOWN ON THE PLANS.
THE CONTRACTOR SHALL BE RESPONSIBLE FOR UTILITY LOCATIONS PRIOR TO ANY EXCAVATION.

ANY REVISION TO THE IRRIGATION PLAN SHALL BE REVIEWED AND APPROVED BY THE PARKS & RECREATION DIRECTOR OR DESIGNEE PRIOR TO IMPLEMENTATION.

THE CONTRACTOR SHALL HAVE ACCEPTED SET OF PLANS AND MUST HAVE HELD A PRE-CONSTRUCTION MEETING WITH THE TOWN OF ERIE PARKS DIVISION PRIOR TO THE COMMENCEMENT OF ANY AND ALL WORK.

THE CONTRACTOR SHALL WARRANTY THE WORKMANSHIP AND IRRIGATION SYSTEM FOR A PERIOD OF TWO YEARS.

DO NOT DISTURB PAVING, LIGHTING, LANDSCAPE OR IRRIGATION THAT EXISTS ADJACENT TO THE SITE UNLESS OTHERWISE NOTED ON PLANS.

THE CONTRACTOR SHALL IDENTIFY, VERIFY AND PROTECT CONTROL POINT. CONTRACTOR SHALL VERIFY LOCATION OF CONTROL POINT WEEKLY AND THE ORIGINAL CONDITION OF CONTROL POINT PIN SHALL BE MAINTAINED THROUGHOUT ENTIRE PROJECT. LOCATION AND G.P.S. COORDINATES OF THE CONTROL POINT SHALL BE IDENTIFIED ON ALL PLANS AND AS-BUILTS.

GRAPHIC SYMBOLS SHALL PRESIDE OVER WRITTEN PLANT QUANTITIES.

ALL TREE SPECIES SHALL BE FROM THE TOWN OF ERIE APPROVED TREE LIST.

NATIVE PLANTS SHALL BE USED IN NATIVE SEED AREAS. REFER TO STANDARDS AND SPECIFICATIONS FOR COMPLETE SPECIES LIST.

ALL STREET TREE SPECIES AND THEIR LOCATIONS SHALL BE APPROVED BY THE PARKS & RECREATION DIRECTOR OR DESIGNEE FOR TREES PLANTED ADJACENT TO RESIDENTIAL HOMES WHETHER THEY ARE INSTALLED BY THE DEVELOPER, CONTRACTOR, OR HOMEOWNER.

NO ASH TREES SHALL BE PLANTED UNDER ANY CIRCUMSTANCES.

LANDSCAPE – INSPECTIONS

FOR TOWN OF ERIE MAINTAINED TRACTS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SCHEDULING AND COORDINATION OF ALL REQUIRED INSPECTIONS WITH THE TOWN OF ERIE. REFER TO TOWN OF ERIE STANDARDS AND SPECIFICATIONS FOR ALL REQUIRED INSPECTIONS.

FOR TOWN OF ERIE MAINTAINED TRACTS, THE CONTRACTOR SHALL GIVE THE TOWN FORTY-EIGHT (48) HOURS NOTICE TO VISIT THE SITE AND PERFORM ALL INSPECTIONS. THIS DOES NOT PRECLUDE THE RIGHT OF THE TOWN TO MAKE INFORMAL INSPECTIONS AT ANY TIME. LANDSCAPE – THE CONTRACTOR SHALL NOTIFY THE TOWN FOR INSPECTIONS OF MATERIAL AND SOIL PREPARATION.

SOD SHALL BE INSTALLED FOR A MINIMUM OF THREE (3) WEEKS PRIOR TO CALLING FOR INSPECTIONS.

ALL HOA/METRO DISTRICT MAINTAINED TRACTS SHALL BE INSPECTED BY A COLORADO LANDSCAPE ARCHITECT IN GOOD STANDING AND PAID FOR BY THE DEVELOPER. ALL TOWN OF ERIE LANDSCAPE ACCEPTANCE PROCEDURES SHALL BE FOLLOWED.

LANDSCAPE – AS-BUILTS

APPROVED CONSTRUCTION DRAWINGS SHALL BE ON SITE AND UPDATED DAILY WITH AS-BUILT MARKUPS. CONTRACTOR SHALL MAKE AS-BUILTS AVAILABLE ON SITE TO TOWN STAFF FOR REVIEW AND INSPECTION IMMEDIATELY UPON REQUEST. RECORD ALL CHANGES WHICH ARE MADE FROM THE CONTRACT DRAWINGS. RECORD ALL REQUIRED INFORMATION ON AS-BUILT DRAWINGS. DO NOT USE THESE PRINTS FOR ANY OTHER PURPOSE.

CONTRACTOR SHALL SUBMIT A RED LINED PAPER SET OF AS-BUILTS FOR REVIEW TO THE PARKS & RECREATION DIRECTOR OR DESIGNEE AND WILL NOT PROCEED WITH THE PRODUCTION OF FINAL MYLARS UNTIL ACCEPTANCE AND ANY REQUIRED CHANGES HAVE BEEN MADE.

UPON COMPLETION OF THE PROJECT, DEVELOPER / LANDSCAPE ARCHITECT TO PROVIDE TOWN OF ERIE A FULL SET OF AS-BUILT DRAWINGS OF ALL LANDSCAPE AND IRRIGATION, ON A CD SET INCLUDING LATEST VERSION OF PDF AND AUTO-CAD.

CONTRACTOR SHALL SUBMIT A FULL SET OF AS-BUILTS, WITH THE ACCURACY ATTESTED TO BY A REGISTERED PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN COLORADO. ALL OF THE "AS-BUILT" DRAWINGS SHALL CONTAIN THE FOLLOWING STATEMENT:

THIS PLAN AND THE INFORMATION CONTAINED HEREON ACCURATELY REPRESENTS THE "AS-BUILT" CONDITION OF THE IMPROVEMENTS AS SHOWN AS OF (DATE).

BY:_________ __________ P.E. NO.______________

FOR FURTHER INFORMATION SEE SECTION 200 – ACCEPTANCE PROCEDURES OF THE TOWN OF ERIE STANDARDS AND SPECIFICATIONS.

LANDSCAPE – MATERIAL SPECIFICATIONS

SUBMITTALS

CONTRACTOR SHALL FURNISH MATERIAL SAMPLES (MULCH, AMENDMENTS, EDGING, ETC.) UPON REQUEST BY THE TOWN

MULCH

WOOD CHIP MULCH SHALL BE OF A HIGH QUALITY FIBROUS NATURE, SUCH AS SHREDDED WOOD CHIPS OR SHAVINGS, WHICH ARE BETWEEN ONE (1) INCH AND FOUR (4) INCHES IN LENGTH. MULCH SHALL BE CLEAN AND FREE OF SOIL OR MAN-MADE DEBRIS.

ROCK MULCH SHALL BE CLEAN, THREE-QUARTER (3/4) TO THREE (3) INCH ROUNDED, WASHED RIVER ROCK, ROCK COBBLE SHALL BE TWO TO FOUR (24) INCH OR THREE TO SIX (3-6) INCH WASHED COBBLE ROCK MULCH AND COBBLE SHALL BE CLEAN AND FREE OF SOIL OR MAN-MADE DEBRIS AND SHALL BE OF GOOD QUALITY. ALL ROCK MULCH OR COBBLE SAMPLES SHALL HAVE THE SIZE, PRODUCT NAME AND SUPPLIER LISTED WITH THE SAMPLE PROVIDED.

EDGING

EDGING SHALL BE THREE-SIXTEENTHS BY SIX (3/16 X 6) INCH GREEN PAINTED STEEL.

STAKING MATERIALS

STAKES: SIX (6) FOOT STEEL TEE POSTS FOR DECIDUOUS TREES. TWO (2) FOOT STEEL TEE POSTS FOR EVERGREEN TREES.

WIRES: A DOUBLE STRAND OF NUMBER TWELVE (12) GAUGE GALVANIZED WIRE.

NYLON STRAPS: ONE AND ONE-HALF INCH (1½) WIDE NYLON STRAP WITH EYELETS AT EACH END.

LANDSCAPE FABRIC

ALL LANDSCAPE FABRIC SHALL BE TYPAR 3401 OR MIRAFI MIRASCAPE GEO-TEXTILE POLYPROPYLENE FABRIC OR AN APPROVED EQUIVALENT.

ALL SEAMS IN THE FABRIC SHALL OVERLAP A MINIMUM OF TWELVE (12) INCHES. LANDSCAPE FABRIC PINS WILL BE USED A MINIMUM OF EVERY THREE (3) FEET ALONG THE EDGE OF THE FABRIC AS WELL AS A MINIMUM OF THREE (3) FEET ON CENTER THROUGHOUT THE FABRIC.

SOD

SOD SHALL CONSIST OF A BLEND OF AT LEAST THREE (3) VARIETIES OF BLUEGRASS. THIS BLEND IS TO BE APPROVED BY THE PARKS & RECREATION DIRECTOR OR DESIGNEE.

SOD SHALL BE STRONGLY ROOTED AND FREE OF NOXIOUS WEEDS, UNDESIRABLE PLANTS, ROOTS, STONES, AND OTHER FOREIGN MATERIALS THAT WILL BE DETRIMENTAL OR WILL HINDER THE PROPER DEVELOPMENT OF THE SOD. SEE SECTIONS 1023.00 AND 1043.00 WITHIN THE TOWN OF ERIE STANDARDS AND SPECIFICATIONS FOR FURTHER INFORMATION.

EXECUTION

SOIL AMENDMENTS

PRIOR TO THE INSTALLATION OF PLANT MATERIAL, SOD, OR SEED, THE CONTRACTOR SHALL THOROUGHLY TILL EXISTING MATERIALS. THE CONTRACTOR SHALL THEN THOROUGHLY INCORPORATE ORGANIC AMENDMENTS AT A RATE OF FIVE (5) CU. YARDS PER THOUSAND (1000) FEET FOR ALL LANDSCAPED AREAS AND AT A RATE OF THREE (3) CU. YARDS PER THOUSAND (1000) FEET FOR ALL NATIVE AREAS.

THE FOLLOWING IS A LIST OF THE REQUIRED SOIL PREPARATION INSPECTIONS IN THEIR ORDER:

1. THE CONTRACTOR SHALL CERTIFY THAT THE GRADE IS WITHIN PLUS OR MINUS ONE-TENTH (1/10TH) OF THE FINAL GRADING PLAN PRIOR TO COMMENCEMENT OF ANY LANDSCAPE OR IRRIGATION WORK.
2. DURING OR AFTER FIRST CULTIVATION
3. AFTER APPLICATION OF SPECIFIED ORGANIC MATERIALS
4. DURING OR AFTER SECOND CULTIVATION
5. AFTER FINAL GRADE IS COMPLETED

ANY WORKMANSHIP DEEMED BY THE TOWN TO BE FAULTY OR NOT IN ACCORDANCE WITH THE ACCEPTED PLANS AND THE TOWN OF ERIE STANDARDS AND SPECIFICATIONS SHALL BE CORRECTED AT THIS TIME.

FOR TOWN OF ERIE MAINTAINED TRACTS, THE TOWN SHALL INSPECT ALL MANURE ORGANIC MATERIALS, SEED AND SEED TAGS, MULCH, AND FERTILIZER UPON DELIVERY TO THE SITE. ANY UNSATISFACTORY MATERIALS SHALL BE REMOVED AND REPLACED WITH MATERIALS CONFORMING TO THE STANDARDS AND SPECIFICATIONS. WEIGHT TICKETS FOR ALL MATERIALS SHALL BE SUBMITTED TO THE TOWN AND CONFIRMATION IS REQUIRED BY TOWN INSPECTORS PRIOR TO SPREADING THE MATERIALS.

NATIVE SEEDING

DORMANT NATIVE SEEDING WITH STANDARD MIXTURES OF COOL-SEASON AND WARM-SEASON GRASSES (TABLES 1-7) MUST OCCUR BETWEEN OCTOBER 30TH AND APRIL 30TH. IN ORDER TO EXTEND THE SEEDING WINDOW AND MINIMIZE EROSION ON PROJECTS, SEEDING OF WARM-SEASON GRASSES ONLY WILL BE ALLOWED BETWEEN APRIL 1ST AND JUNE 15TH AND MIXTURES CONTAINING COOL-SEASON GRASSES ONLY WILL BE ALLOWED BETWEEN AUGUST 1ST AND SEPTEMBER 15TH AND APRIL 30TH AT PREVAILING RATES TO PROVIDE A FULL MIXTURE OF BOTH COOL AND WARM SEASON GRASSES. PERMISSION FOR EXCEPTIONS TO THIS SEEDING TIME MUST BE OBTAINED PRIOR TO SEEDING FROM THE PARKS & RECREATION DIRECTOR OR DESIGNEE. NO SEEDING SHALL BE DONE WHEN THE SOIL IS FROZEN, SNOW COVERED OR EXCESSIVELY WET.

ALL NATIVE SEED AREAS ADJACENT TO TALL TRAILS AND ROADS SHALL BE PLANTED WITH TOWN OF ERIE SPECIFIED SHORTGRASS PRAIRIE NATIVE SEED MIX WITHIN FIFTEEN (15) FEET OF EDGE OF TRAILS AND ROADS.

MOIST SWALE SEED MIX IS IN ADDITION TO MIXED GRASS PRAIRIE NATIVE AND SHORTGRASS PRAIRIE NATIVE SEED MIX IN AREAS REQUIRING, PER TOWN OF ERIE STANDARDS AND SPECIFICATIONS.

SEEDING, MOWING AND WEED CONTROL SHALL ALL BE CARRIED OUT AS DETAILED IN THE TOWN OF ERIE STANDARDS AND SPECIFICATIONS.

CONTRACTOR SHALL APPLY BIOSOL AT A RATE OF EIGHT HUNDRED (800) POUNDS PER ACRE TO ALL NATIVE AREAS IMMEDIATELY FOLLOWING SEEDING AND PRIOR TO THE APPLICATION OF HYDRO-MULCH.

HYDRO-MULCH SHALL BE WOOD CELLULOSE FIBER TYPE AND SHALL BE APPLIED AT THE MINIMUM RATE OF TWO THOUSAND FIVE HUNDRED (2,500) POUNDS PER ACRE WITH A MINIMUM RATE OF ONE HUNDRED FITY (150) POUNDS PER ACRE TACKIFIER AND SHALL BE APPLIED IMMEDIATELY AFTER SEED APPLICATION.

STRAW CONSISTING OF SEVENTY-FIVE (75) PERCENT STRAWS LONGER THAN TEN (10) INCHES MAY BE USED ON NATIVE SEEDING. IT SHALL BE APPLIED EVENLY OVER THE SEEDED SURFACE AT THE MINIMUM RATE OF TWO (2) TONS PER ACRE AND PARTIALLY EMBEDDED INTO THE SOIL USING A CRIMPER OR SIMILAR IMPLEMENT.

ALL HYDRO-MULCH SHALL BE REMOVED FROM ALL PLANT MATERIALS, FENCES, CONCRETE AND OTHER AREAS EXCEPT FOR SEED BED. OVERLY DENSE APPLICATIONS OF STRAW MULCH, OR WINDROWS OF LOOSE STRAW MULCH WHICH MAY SMOTHER SEEDLING GRASSES, MUST BE COLLECTED AND REMOVED. STRAW MULCH BLOWN ONTO ADJACENT RESIDENTIAL AREAS SHALL BE REMOVED BY THE LANDSCAPER RESPONSIBLE FOR THE PROJECT.

ALL NATIVE SEED SHALL RECEIVE TEMPORARY IRRIGATION UNTIL SEED IS ESTABLISHED.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING BARRIERS AND SIGNS AS REQUIRED TO PROTECT SEEDED AREAS FROM PEDESTRIAN AND VEHICULAR DAMAGE.

THE CONTRACTOR SHALL WARRANTY ALL NATIVE SEEDED AREAS FOR CONSISTENCY AND COMPLETION OF COVERAGE. THE STANDARD OF ACCEPTABLE ESTABLISHMENT SHALL BE AT LEAST SIX (6) DESIRABLE SEEDED PLANT SEEDLINGS PER SQUARE FOOT. ALL BARE AREAS SHALL BE RE-SEEDED AND RE-MULCHED.

ANY REMAINING PEAT, SOIL, SAND, ROCK, OR SIMILAR MATERIAL WHICH HAS BEEN BROUGHT ONTO THE SITE BY WORK OPERATIONS OR OTHERWISE SHALL BE REMOVED, AND ALL OTHER REMAINING DEBRIS WILL BE DISPOSED OF. ALL GROUND AREA DISTURBED SHALL BE RENOVATED TO ITS ORIGINAL CONDITION OR TO THE REQUIRED NEW CONDITION.

PLANT MATERIALS

PLANT MATERIALS

ALL PLANT MATERIAL SHALL COMPLY WITH THE AMERICAN STANDARD FOR NURSERY STOCK ANSI Z60.1-2004.

PLANTS SHALL EXHIBIT GOOD ANNUAL GROWTH AND BUDS SHALL BE PLUMP AND WELL FITTED FOR THE SPECIES. FOLIAGE SHALL BE FULL AND DISPLAY A HEALTHY AND CONSISTENT COLOR WHEN IN LEAF. EVERGREEN FOLIAGE WILL BE GOOD INTENSE COLOR.

PLANT TAGS STATING THE CORRECT PLANT NAME AND SIZE SHALL BE SECURELY ATTACHED TO ALL PLANT MATERIALS. PLANTS SHALL BE TRUE TO THEIR NAME AS SPECIFIED. PLANT MATERIALS NOT MEETING THESE STANDARDS ARE SUBJECT TO REJECTION.

ALL DECIDUOUS TREES SHALL BE TWO (2) INCH CALIPER OR LARGER. ALL ORNAMENTAL TREES SHALL BE ONE AND A HALF (1.5) INCH CALIPER OR LARGER. CALIPER MEASUREMENT SHALL BE TAKEN SIX (6) INCHES ABOVE THE ROOT FLARE IF FOUR (4) INCHES OR LESS AND TWELVE (12) INCHES ABOVE THE ROOT FLARE FOR LARGER TREE SIZES.

ALL EVERGREEN TREES SHALL BE A MINIMUM OF SIX (6) FEET TALL OR LARGER. HEIGHT DIMENSIONS REFER TO THE MAIN BODY OF THE TREE, FROM THE ROOT COLLAR AND ABOVE.
SHRUBS SHALL BE FIVE (5) GALLON CONTAINERS OR LARGER.

PERENNIALS AND GROUNDCOVERS SHALL BE ONE (1) GALLON CONTAINER OR LARGER.

- ANY CHANGES IN SPECIES AND PLANT LOCATIONS SHALL BE SUBMITTED TO THE PARKS & RECREATION DIRECTOR OR DESIGNEE FOR REVIEW AND APPROVAL. OVERALL QUALITY AND DESIGN CONCEPT SHALL BE CONSISTENT WITH APPROVED LANDSCAPE DESIGN.
- ALL NEW AND REPLACEMENT PLANT MATERIALS REQUIRE INSPECTION AND SHALL BE TAGGED BY THE PARKS & RECREATION DIRECTOR OR DESIGNEE FOR ALL TOWN OF ERIE MAINTAINED AREAS PRIOR TO PLANTING. CONTACT APPROPRIATE TOWN OF ERIE STAFF TO ARRANGE FOR MATERIALS TO BE TAGGED.
- PLANT MATERIALS SHALL BE LIVE, HEALTHY, VIGOROUS, STRUCTURALLY SOUND, AND FREE OF DISEASE AND INSECT INFESTATIONS. PLANT MATERIALS NOT MEETING THESE STANDARDS SHALL BE SUBJECT TO REJECTION AND SHALL BE REPLACED.
- REPLACEMENT OF PLANT MATERIALS SHALL OCCUR AT THE FOLLOWING RATE:

TYPE	1 YEAR	2 YEAR
DECIDUOUS TREE	INCREASE CALIPER BY (1) INCH	INCREASE CALIPER BY (1.5) INCHES
EVERGREEN TREE	INCREASE HEIGHT BY (1.5) FEET	INCREASE HEIGHT BY (2) FEET

PLANTING PROCEDURES

OPTIMUM PLANTING PERIODS ARE FROM MARCH 15 TO JUNE 15 AND FROM SEPTEMBER 1 TO OCTOBER 15.

STORAGE

TREES SHALL BE PLANTED AS SOON AS POSSIBLE. IF NOT PLANTED ON THE DAY OF DELIVERY ALL PLANTS SHALL BE PLACED IN A TEMPORARY NURSERY, IRRIGATED DAILY, SHADED AND PROTECTED FROM SUN OR WIND. BALLED AND BURLAPPED TREES SHALL BE HEELED IN WITHIN 24 HOURS OF DELIVERY IN A COMPACT GROUP WITH SUITABLE MULCH MATERIAL PLACED AROUND AND BETWEEN THE BALLS SO THEY ARE COMPLETELY COVERED. NO PLANT SHALL REMAIN ON THE JOB SITE IN TEMPORARY STORAGE FOR OVER A MONTH.

EXCAVATION

TREE PITS SHALL BE EXCAVATED A MINIMUM OF TWO (2) TIMES GREATER THAN THE DIAMETER OF THE ROOT BALL AND SHALL BE SAUCER SHAPED.

IF TREE PITS ARE DUG UTILIZING MECHANICAL EQUIPMENT, EDGES OF PLANTING HOLE SHALL BE FLARED DOWN TO CREATE A SAUCER SHAPED PLANTING PIT AND THE SIDES OF THE HOLE SHALL BE SCORED TO PREVENT GLAZING OR COMPACTION OF PLANTING HOLE.

THE DIAMETER OF ALL SHRUB PLANTING PITS SHALL BE TWELVE (12) INCHES GREATER IN DIAMETER THAN THE DIAMETER OF THE CONTAINER.

PLANTING DEPTH

THE ROOT FLARE SHALL BE IDENTIFIED ON ALL TREES PRIOR TO PLANTING TO ASSURE THAT THE HOLE HAS BEEN DUG TO THE PROPER DEPTH – AND NO MORE. THE PLANTING PIT SHALL BE DEEP ENOUGH TO ALLOW FOR THE ROOT FLARE TO REMAIN TWO (2) INCHES HIGHER THAN THE SURROUNDING FINISH GRADE.

SHRUB PITS SHALL BE EXCAVATED SO THAT THE TOP OF THE BALL SHALL BE ONE (1) INCH ABOVE FINISH GRADE AND AMENDED AS SHOWN ON THE PLANTING DETAIL.

PERENNIAL OR GROUNDCOVER PLANTS SHALL BE PLANTED ONE (1) INCH ABOVE FINISHED GRADE WITHIN THE AMENDED SOIL. THE CONTRACTOR SHALL INSTALL PERENNIAL OR GROUNDCOVER PLANTS TAKING NOTE OF REQUIRED ON-CENTER SPACING AND REQUIRED DISTANCES FROM EDGES.

PLANTING

THE ROOT BALL SHALL BE PLACED ON FIRM, UNDISTURBED SOIL IN THE PLANTING PIT TO PREVENT SETTLING. ALL PLANTS SHALL BE SET PLUMB AND STRAIGHT AND IN THE CENTER OF THE PITS AND FACED FOR THE BEST EFFECT.

ALL TWINE, ROPE, BURLAP, AND WIRE FROM ENTIRE ROOT BALL OF BALLED AND BURLAPPED STOCK SHALL BE REMOVED.

ALL CONTAINERS SHALL BE REMOVED PRIOR TO BACKFILLING. THIS INCLUDES ANY ORGANIC MANUFACTURED CONTAINERS. IF THE ROOT SYSTEM OF A CONTAINER GROWN PLANT HAS BECOME CONTAINER-BOUND, THE ROOTS SHALL BE CUT VERTICALLY ON A MINIMUM OF TWO (2) SIDES OF THE ROOT MASS PRIOR TO PLANTING.

PLANTING PIT BACKFILL MIXTURE SHALL CONSIST OF TWO (2) PARTS OF EXCAVATED NATIVE SOIL AND ONE (1) PART ORGANIC SOIL AMENDMENT.

ALL PLANT TAGS, FLAGGING TAPE, LABELS, STRING, ETC. SHALL BE REMOVED FROM ALL PLANT MATERIALS.

MULCH

ALL DECIDUOUS TREES SHALL HAVE A SOD-FREE BASE AT LEAST FOUR (4) FEET IN DIAMETER AND EVERGREENS SHALL HAVE A SOD-FREE BASE EXTENDING TO THE DRIP LINE. MULCH SHALL BE THREE (3) INCHES DEEP AND SHALL BE PLACED TWO (2) INCHES FROM AND NOT MAKE CONTACT WITH TREE TRUNKS.

COBBLE AND WOOD MULCH SHALL BE SEPARATED BY THREE-SIXTEENTHS BY SIX (3/16 X 6) INCH GREEN STEEL EDGING.

PRUNING

ALL PRUNING SHALL COMPLY WITH ANSI A300 STANDARDS AND SHALL BE ONLY PERFORMED BY AN I.S.A. CERTIFIED TREE WORKER OR ARBORIST. CONTRACTOR SHALL REMOVE AND REPLACE EXCESSIVELY PRUNED OR MALFORMED STOCK RESULTING FROM IMPROPER PRUNING.

WATERING

THE CONTRACTOR SHALL ENSURE THAT ALL PLANT MATERIALS, SOD, AND SEEDED AREAS ARE WATERED AS NECESSARY UNTIL FINAL ACCEPTANCE HAS BEEN GRANTED.

ALL PLANT MATERIALS SHALL BE GIVEN SUPPLEMENTAL WATER AS REQUIRED THROUGHOUT THE WINTER MONTHS.

FERTILIZATION

TREES AND SHRUBS SHALL NOT BE FERTILIZED DURING INSTALLATION OR FOR THE FIRST TWELVE (12) MONTHS FOLLOWING INSTALLATION.

STALKING

ALL DECIDUOUS TREES SHALL BE STALKED FOR TWELVE (12) MONTHS AND EVERGREEN TREES FOR TWENTY-FOUR (24) MONTHS. CONTRACTOR IS RESPONSIBLE FOR PERIODICALLY RE-TENSIONING AND THE REMOVAL OF TREE STAKES THROUGHOUT THIS PERIOD.

WEEDING

ALL TREE WELLS, SHRUB, AND PERENNIAL BEDS; SEEDED AND SODDED AREAS; AND AREAS WHERE GRAVEL, ROCK OR WOOD MULCH IS TO BE USED AS A GROUND COVER SHALL BE KEPT FREE OF GRASS AND WEEDS.

SOD

THE MAINTENANCE OF SODDED AREAS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR UNTIL FINAL ACCEPTANCE HAS BEEN GRANTED. MAINTENANCE SHALL CONSIST OF REPAIR AND REPLACEMENT OF ERODED AREAS, WATERING, MOWING (WHEN THE SOD IS ESTABLISHED). WEEDING, FERTILIZING, AND RE-SODDING AS NECESSARY TO PROVIDE AN EVEN, CONSISTENT STAND OF GRASS. ALL REPLACEMNT SODDING DEEMED NECESSARY BY THE TOWN WILL BE DONE BY THE CONTRACTOR.
THE CONTRACTOR SHALL MAINTAIN A MOWING HEIGHT OF THREE INCHES (3) FREQUENCY OF MOWING SHALL BE DETERMINED BY THE GROWTH RATE OF THE GRASS BUT AT NO TIME SHOULD THE CLIPPINGS EXCEED TWO INCHES (2) IN LENGTH.

LITTER REMOVAL

THE CONTRACTOR SHALL COLLECT AND REMOVE ALL LITTER AND TRASH FROM THE AREA WEEKLY AT HIS OWN EXPENSE.

RICK ENGINEERING COMPANY
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CENTENNIAL, CO 80112
303.537.8020
rickengineering.com
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NO.	REVISION DESCRIPTION	REVISED BY	ACCEPT. BY	DATE
△	–	–	–	–

PATRICIA TRAUT
1218
12/19/2017
Original Date of Licensure
STATE OF COLORADO
LICENSED LANDSCAPE ARCHITECT

PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

MEADOWLARK PRELIMINARY PLAT

PLANTING SPECIFICATIONS

TOWN OF ERIE

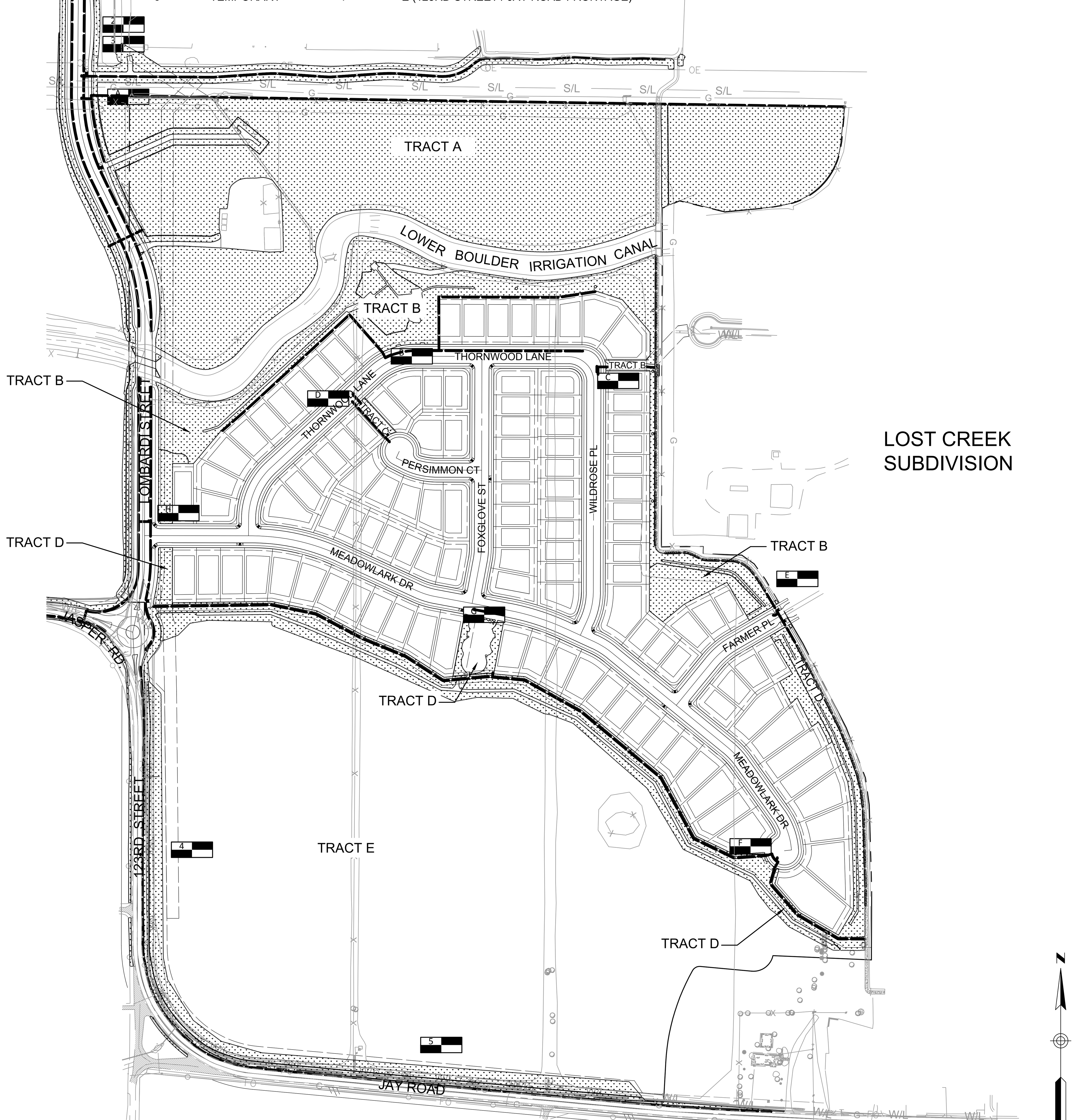
SCALE:	SHEET NO. 17
DATE: 02/06/19	OF 18 SHEETS
DRAWN BY: TP/ER	
CHECKED BY: PT	DRAWING NO. LPS–01
JOB NO: D1048	

MEADOWLARK PRELIMINARY PLAT LANDSCAPE PLANS

A PORTION OF THE NE ¼ OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH
PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF BOULDER, COLORADO
118 LOTS, 5 TRACTS CONTAINING 86.495±
PP-000946-2017

WATER METER TABLE (PRELIMINARY)

WM ID	PERMANENT / TEMP.	SIZE	TRACT
A	PERMANENT	1"	A (LOMBARDI STREET FRONTAGE)
B	PERMANENT	1-1/2"	B
C	PERMANENT	1-1/2"	B
D	PERMANENT	3/4"	C
E	PERMANENT	1-1/2"	B / D
F	PERMANENT	1"	D
G	PERMANENT	1-1/2"	D
H	PERMANENT	1-1/2"	D
1	TEMPORARY	2"	A
2	TEMPORARY	2"	A
3	TEMPORARY	2"	A
4	TEMPORARY	1"	E (123RD STREET / JAY ROAD FRONTAGE)
5	TEMPORARY	1"	E (123RD STREET / JAY ROAD FRONTAGE)



LANDSCAPE POC - IRRIGATION LEGEND (PRELIMINARY)

A — POC - IRRI. CONTROLLER W/ METER & BACKFLOW DEVICE TYP.

MAINLINE ROUTING (CONCEPTUAL, FINAL ROUTING TO BE DETERMINED IN FINAL PLAT SUBMITTAL).

200 100 0 200 400 600
GRAPHIC SCALE: 1"=200'

SITE MAP

IRRIGATION NOTES

IRRIGATION – GENERAL

ALL WORK SHALL CONFORM TO TOWN OF ERIE STANDARDS AND SPECIFICATIONS AND WITH THE ACCEPTED PLANS. REFER TO THESE STANDARDS FOR ADDITIONAL INFORMATION AS NEEDED. A COPY OF THESE SPECIFICATIONS SHALL BE AVAILABLE ON THE WORK SITE AT ALL TIMES.

THE DEVELOPER/ARCHITECT SHALL ENSURE THAT THE IRRIGATION PLAN IS COORDINATED WITH PLANS DONE BY OTHERS SO THE PROPOSED GRADING, DRAINAGE WORK, OR OTHER CONSTRUCTION DOES NOT CONFLICT NOR PRECLUDE INSTALLATION AND MAINTENANCE OF LANDSCAPE ELEMENTS ON THIS PLAN.

STORM WATER BEST MANAGEMENT PRACTICES SHALL CONFORM TO STATE OF COLORADO REQUIREMENTS. ALL STORM WATER REPORTS AND REQUIRED PAPERWORK SHALL ADHERE TO ALL STATE OF COLORADO REQUIREMENTS.

THE CONTRACTOR SHALL CERTIFY THAT THE GRADE IS WITHIN PLUS OR MINUS ONE-TENTH (1/10TH) OF THE FINAL GRADING PLAN PRIOR TO COMMENCEMENT OF ANY LANDSCAPE OR IRRIGATION WORK.
THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL PERMITS, FEES, AND LICENSES ASSOCIATED WITH THE WORK AS SHOWN ON THE PLANS.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR UTILITY LOCATIONS PRIOR TO ANY EXCAVATION.

ANY REVISION TO THE IRRIGATION PLAN SHALL BE REVIEWED AND APPROVED BY THE PARKS & RECREATION DIRECTOR OR DESIGNEE PRIOR TO IMPLEMENTATION.

THE CONTRACTOR SHALL HAVE ACCEPTED SET OF PLANS AND MUST HAVE HELD A PRE-CONSTRUCTION MEETING WITH THE TOWN OF ERIE PARKS DIVISION PRIOR TO THE COMMENCEMENT OF ANY AND ALL WORK.

THE CONTRACTOR SHALL WARRANTY THE WORKMANSHIP AND IRRIGATION SYSTEM FOR A PERIOD OF TWO YEARS.

DO NOT DISTURB PAVING, LIGHTING, LANDSCAPE OR IRRIGATION THAT EXISTS ADJACENT TO THE SITE UNLESS OTHERWISE NOTED ON PLANS.

THE CONTRACTOR SHALL IDENTIFY, VERIFY AND PROTECT CONTROL POINT. CONTRACTOR SHALL VERIFY LOCATION OF CONTROL POINT WEEKLY AND THE ORIGINAL CONDITION OF CONTROL POINT PIN SHALL BE MAINTAINED THROUGHOUT ENTIRE PROJECT. LOCATION AND G.P.S. COORDINATES OF THE CONTROL POINT SHALL BE IDENTIFIED ON ALL PLANS AND AS-BUILTS.

THE IRRIGATION SYSTEM SHALL BE INSTALLED AFTER SOIL PREPARATION AND PRIOR TO PLANT MATERIALS.

IRRIGATION – INSPECTIONS

FOR TOWN OF ERIE MAINTAINED TRACTS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SCHEDULING AND COORDINATION OF ALL REQUIRED INSPECTIONS WITH THE TOWN OF ERIE. REFER TO TOWN OF ERIE STANDARDS AND SPECIFICATIONS FOR ALL REQUIRED INSPECTIONS.

FOR TOWN OF ERIE MAINTAINED TRACTS, THE CONTRACTOR SHALL GIVE THE TOWN FORTY-EIGHT (48) HOURS NOTICE TO VISIT THE SITE AND PERFORM ALL INSPECTIONS. THIS DOES NOT PRECLUDE THE RIGHT OF THE TOWN TO MAKE INFORMAL INSPECTIONS AT ANY TIME. (LANDSCAPE – THE CONTRACTOR SHALL NOTIFY THE TOWN FOR INSPECTIONS OF MATERIAL AND SOIL PREPARATION).

THE IRRIGATION SYSTEM SHALL PASS A MAINLINE PRESSURE TEST AND COVERAGE TEST AND A WATERING SCHEDULE WITH RUN TIMES AND APPLICATION RATES SHALL BE SUBMITTED PRIOR TO SODDING, SEEDING, OR PLANTING.

CONTRACTOR SHALL SCHEDULE PRESSURE TEST AT COMPLETION OF MAINLINE, MAINLINE SHALL HOLD AT ONE HUNDRED TWENTY (120) P.S.I. FOR TWO (2) HOURS.

ALL HOA/METRO DISTRICT MAINTAINED TRACTS SHALL BE INSPECTED BY A COLORADO LANDSCAPE ARCHITECT IN GOOD STANDING AND PAID FOR BY THE DEVELOPER. ALL TOWN OF ERIE LANDSCAPE ACCEPTANCE PROCEDURES SHALL BE FOLLOWED.

IRRIGATION – AS-BUILTS

APPROVED CONSTRUCTION DRAWINGS SHALL BE ON SITE AND UPDATED DAILY WITH AS-BUILT MARKUPS. CONTRACTOR SHALL MAKE AS-BUILTS AVAILABLE ON SITE TO TOWN STAFF FOR REVIEW AND INSPECTION IMMEDIATELY UPON REQUEST.
RECORD ALL CHANGES WHICH ARE MADE FROM THE CONTRACT DRAWINGS. RECORD ALL REQUIRED INFORMATION ON AS-BUILT DRAWINGS. DO NOT USE THESE PRINTS FOR ANY OTHER PURPOSE.

CONTRACTOR SHALL SUBMIT A RED LINED PAPER SET OF AS-BUILTS FOR REVIEW TO THE PARKS & RECREATION DIRECTOR OR DESIGNEE AND WILL NOT PROCEED WITH THE PRODUCTION OF FINAL MYLARS UNTIL ACCEPTANCE AND ANY REQUIRED CHANGES HAVE BEEN MADE.

CONTRACTOR SHALL SUBMIT REPRODUCIBLE MYLARS, FOUR (4) MIL THICKNESS, DOUBLE MATTED REVERSE FILM, (24" X 36") (SEPIA'S NOT ACCEPTABLE), AND AN ELECTRONIC VERSION (CD/THUMB DRIVE) OF AS-BUILT PLAN DRAWINGS IN AUTOCAD AND PDF COMPATIBLE FORMAT PRIOR TO ENTERING THE WARRANTY PERIOD.

CONTRACTOR SHALL SUBMIT A FULL SET OF AS-BUILTS, WITH THE ACCURACY ATTESTED TO BY A REGISTERED PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN COLORADO. ALL OF THE "AS-BUILT" DRAWINGS SHALL CONTAIN THE FOLLOWING STATEMENT:

THIS PLAN AND THE INFORMATION CONTAINED HEREON ACCURATELY REPRESENTS THE "AS-BUILT" CONDITION OF THE IMPROVEMENTS AS SHOWN AS OF (DATE).

BY: ______________________________ P.L.A. NO. 1218
PATRICIA TRAUTH

FOR FURTHER INFORMATION SEE SECTION 200 – ACCEPTANCE PROCEDURES OF THE TOWN OF ERIE STANDARDS AND SPECIFICATIONS.

IRRIGATION – MATERIALS

REPLACEMENT PARTS SHALL MATCH PARTS BEING REPLACED, NO ALTERNATIVES WILL BE ALLOWED.

CONTROLLER GROUND WIRE SHALL BE NUMBER SIX (#6) BARE COPPER WIRE AND EIGHT (8) FEET AWAY FROM THE CONTROLLER PAD.

COMMON WIRE SHALL BE NUMBER TWELVE (#12) UF SINGLE STRAND DIRECT BURIAL PVC JACKETED COPPER WIRE.

TOWN OF ERIE MAINTAINED TRACTS - ALL IRRIGATION MATERIALS SHALL FOLLOW SECTION 1000 OF THE TOWN ERIE STANDARDS AND SPECIFICATIONS.

IRRIGATION – INSTALLATION

FOR TOWN OF ERIE MAINTAINED TRACTS, CONTRACTOR SHALL CONTACT PARKS DIVISION PRIOR TO COMMENCEMENT OF ANY AND ALL WORK.

FOR TOWN OF ERIE MAINTAINED TRACTS, CONTRACTOR SHALL CONTACT PARKS DIVISION PRIOR TO INSTALLATION OF BACKFLOW DEVICE/METER PIT.

ALL COPPER BELOW GRADE SHALL BE SILVER SOLDERED AT ELEVEN HUNDRED FORTY-FIVE (1145) DEGREES (BRAZED).

LOOP WIRE IN TRENCH EVERY ONE HUNDRED (100) FEET AND AT EVERY CHANGE IN DIRECTION OF PIPE.

ALL MAINLINE SHALL HAVE TWENTY-FOUR (24) INCH COVER, ROTOR LATERAL LINES SHALL HAVE EIGHTEEN (18) INCH COVER, AND POP-UPS SHALL HAVE TWELVE (12) INCH COVER.

ALL VALVES SHALL BE WITHIN THREE (3) INCHES FROM THE BOTTOM OF VALVE BOX LID AND THREE (3) INCH MINIMUM OF DEPTH FROM THE BOTTOM OF THE VALVE TO THE GRAVEL LAYER IN THE VALVE BOX.

ALL VALVE BOXES SHALL BE SET TO FINAL GRADE.

ALL QUICK COUPLERS SHALL BE AT PROPER OPERATING HEIGHT AND STAKED WITH REBAR AND SECURED WITH HOSE CLAMPS.

ALL VALVE BOXES SHALL BE BRANDED WITH ASSOCIATED VALVE NUMBER.

ALL LINES (PIPE AND ELECTRICAL) SHALL BE SLEEVED UNDER HARDSCAPES.

ALL WIRE CONNECTIONS SHALL UTILIZE 3M DBYR CONNECTIONS OR APPROVED EQUAL.

IRRIGATION – MAINTENANCE

THE CONTRACTOR SHALL ENSURE THAT ALL PLANT MATERIALS, SOD, AND SEEDED AREAS ARE WATERED AS NECESSARY UNTIL FINAL ACCEPTANCE HAS BEEN GRANTED.

CONTRACTOR SHALL BE RESPONSIBLE FOR MONTHLY WATER APPLICATION ADJUSTMENTS, CLEANING OF ALL FILTERS AND SCREENS, ANNUAL BACKFLOW PREVENTION TESTING, AND SPRING TURN ON AND WINTER BLOW OUTS DURING THE WARRANTY PERIOD.

CONTRACTOR SHALL BE RESPONSIBLE FOR THE COST OF ALL MAINTENANCE DURING THE WARRANTY PERIOD.

RICK ENGINEERING COMPANY
Denver
9801 EAST EASTER AVE
CENTENNIAL, CO 80112
303.537.8020
rickengineering.com
Tucson - San Diego - Sacramento - Riverside - Orange - San Luis Obispo - Phoenix

NO.	REVISION DESCRIPTION	REVISED BY	ACCEPT. BY	DATE
△	–	–	–	–

PATRICIA TRAUTH 1218 12/19/2017 Original Date of Licensure STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT LANDS. ARCHITECT DATE

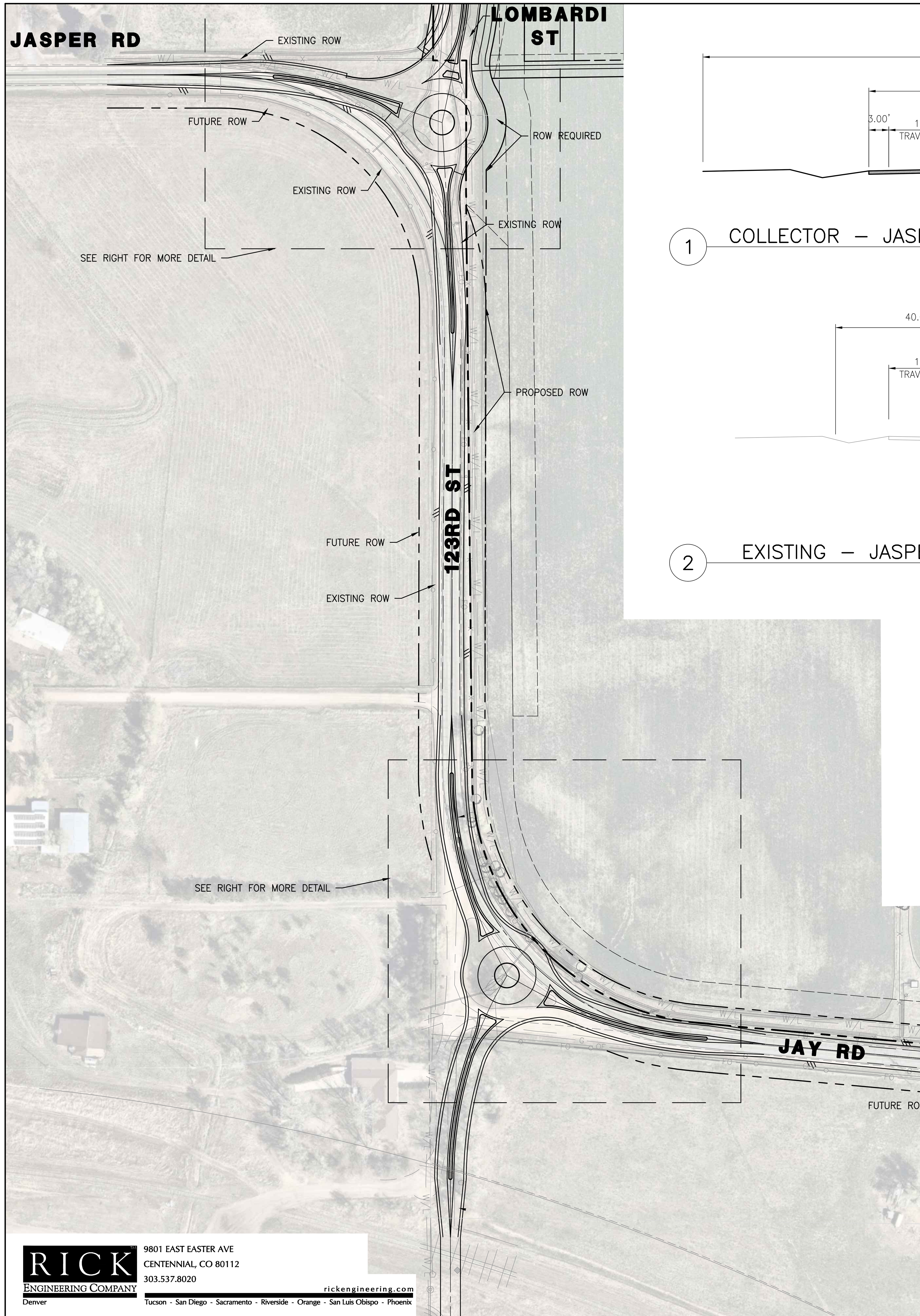
MEADOWLARK PRELIMINARY PLAT

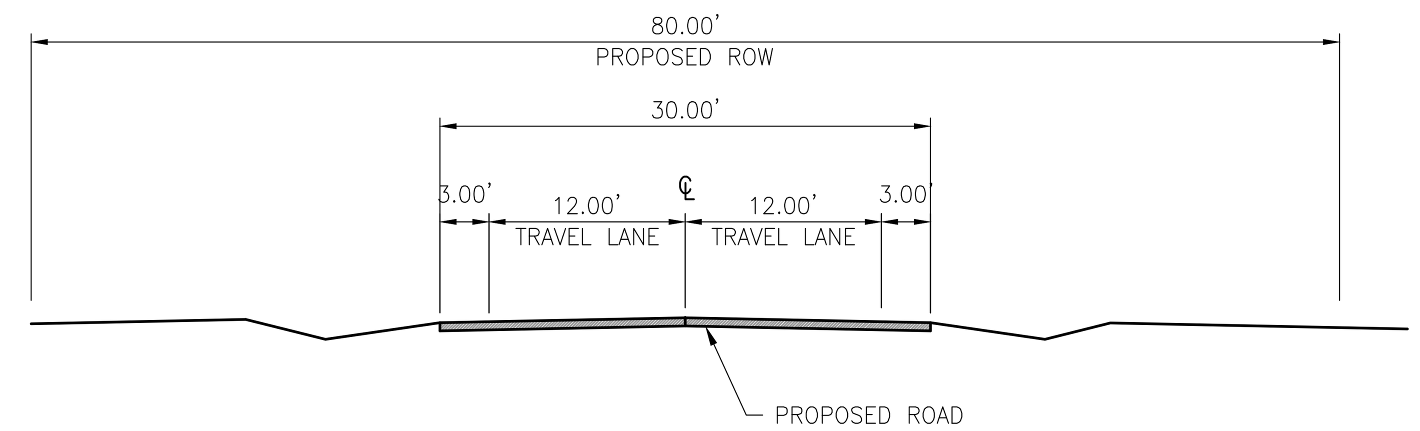
IRRIGATION NOTES & METER EXHIBIT

TOWN OF ERIE

SCALE:	SHEET NO. 18
DATE: 02/06/19	
DRAWN BY: TP/ER	OF 18 SHEETS
CHECKED BY: PT	DRAWING NO. LID-01
JOB NO: D1048	

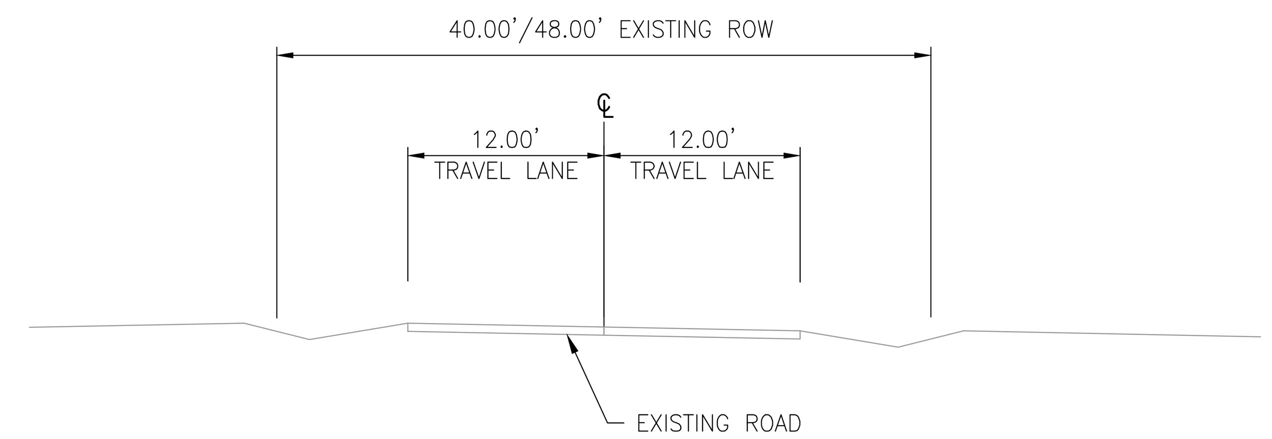
U:\18144_Schmidt\Landscape\ConstDocs\Preliminary-Plat\Pltg\18144_LP-Sup_PP.dwg 2019-02-05 – 3:06PM – erowan





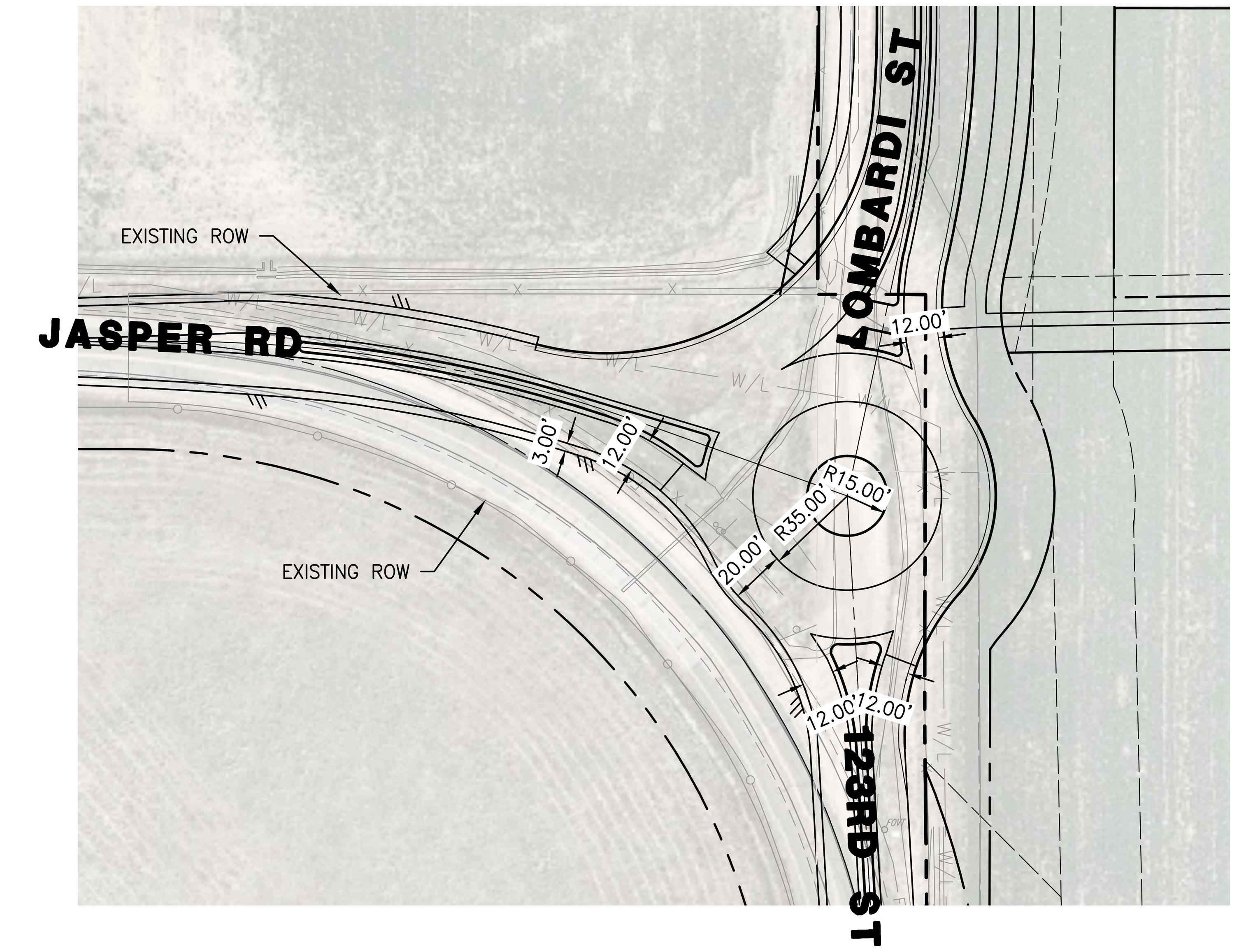
1 COLLECTOR – JASPER RD, 123RD ST, AND JAY RD

SCALE 1"=10'



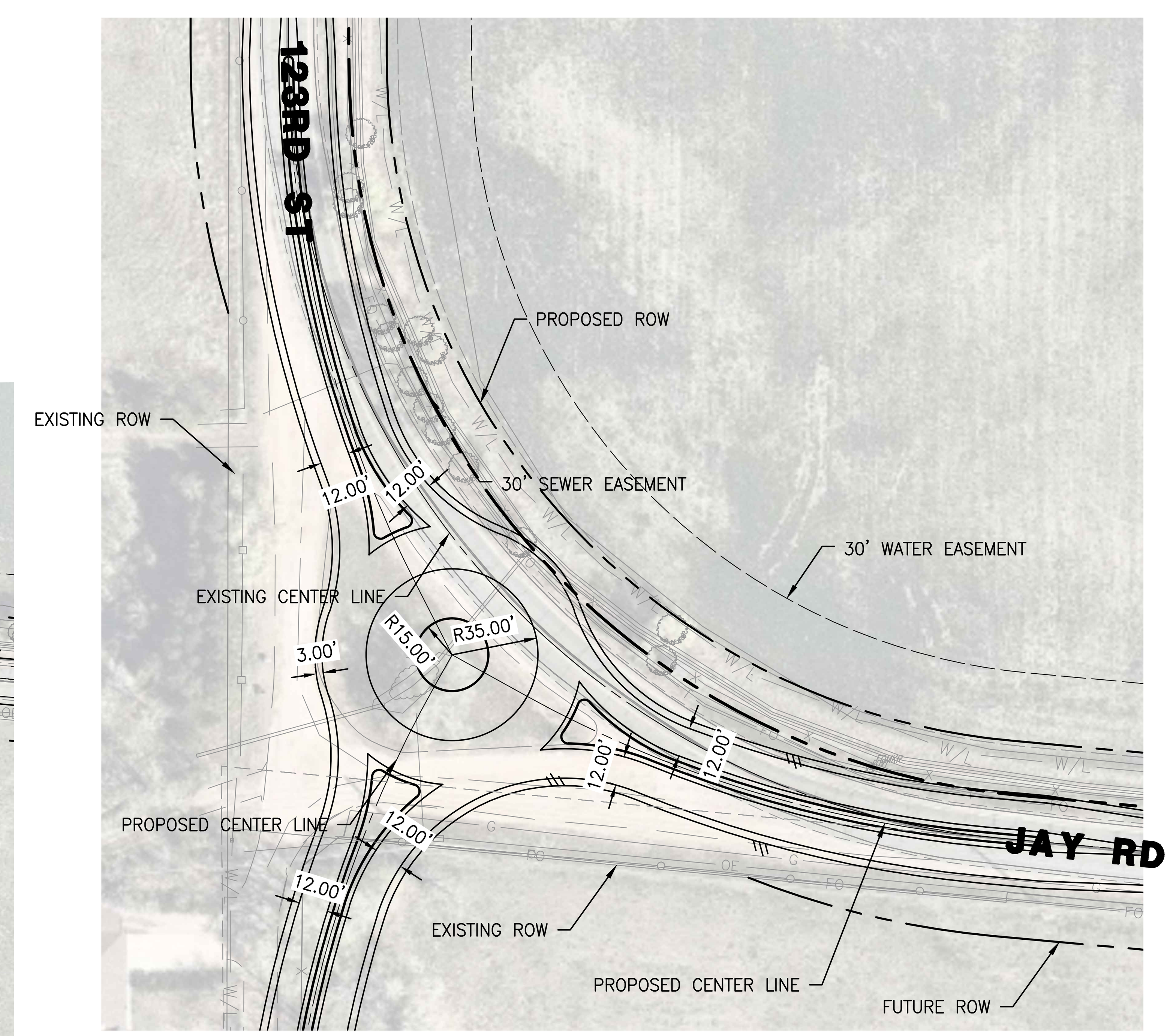
2 EXISTING – JASPER RD, 123RD ST, AND JAY RD

SCALE 1"=10'



1 JASPER RD, LOMBARDI ST, AND 123RD ST

SCALE 1"=50'



2 123RD AND JAY ROAD

SCALE 1"=50'

RICK ENGINEERING COMPANY
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FUTURE JASPER, JAY, AND 123RD

TOWN OF ERIE

SCALE: 1"=80'	SHEET NO. 01
DATE: 01/02/2019	
DRAWN BY: KCS	OF 01 SHEETS
CHECKED BY: TWB	DRAWING NO.
JOB NO: D1048	

Northern Water

Memorandum

Date: December 14, 2018

To: Troy Bales – Rick Engineering Company

From: Devin Shable, Northern Water

CC: Amy Johnson, Dennis Baker, Jim Struble, Brian Flockhart - Northern Water
Eric Doering, Famuer Rasmusson, Mark Monger, Jeff Kahn – Lower Boulder Ditch Company

Subject: Meadowlark Preliminary Construction Plans (Second Submittal) - Review Comments Lower Boulder Ditch Crossings

---

We have received and reviewed the revised Meadowlark Preliminary Plat Construction Documents dated September 24, 2018. These revised drawings show the proposed development is located adjacent to Northern Water's Permanent Easement and the prescriptive easement for the Lower Boulder Ditch (aka the South Platte Supply Canal) with some utilities crossing the Lower Boulder Ditch. The following list summarizes Northern Water's review comments.

<u>Proposed Utility Crossings (Storm Sewer and Sanitary Sewer)</u>

1) Utility Crossings: The plans do not include a detail of the utilities crossing the ditch. Northern Water understands the detail was omitted because the plans are "preliminary" and that level-of-detail is unnecessary at this time. The final construction plans should include a canal/ditch crossing detail in accordance with the detail attached to this memo (see Attachment A).
2) Property: Some utilities will cross through Northern Water's Permanent Easement and the prescriptive easement for the Lower Boulder Ditch. A license agreement and fee are required and must be obtained from Jeff Kahn, Esq., with Lyons Gaddis.
3) Property: Add reference to recorded documents 577289 and 560173 to the Easement for the South Platte Supply Canal.

<u>Attachments</u>

A. Canal/Ditch Crossing Detail

If you have additional questions, please feel free to contact me at 970-622-2358 or dshable@northernwater.org.

Troy Bales

From:	Devin Shable <dshable@northernwater.org>
Sent:	Friday, December 28, 2018 1:05 PM
To:	Troy Bales
Cc:	Kevin San; Jeffrey J. Kahn; Amy Johnson; Dennis Baker; Brian Flockhart; Jim L. Struble; mark monger; EDoe@Knoll9025.com; sanuer1342@comcast.net
Subject:	RE: Meadowlark Preliminary Construction Plans - Norther Water Review

You are welcome.
In response to your question about comment #3, no, I don't need a revised plan.

Northern Water
Northern Colorado Water Conservancy District
Devin Shable, P.E. | Project Engineer
220 Water Ave | Berthoud, CO 80538
Direct 970-622-2358 | Cell 970-617-9337
Main 800-369-RAIN (7246) | Fax 877-851-0018
www.northernwater.org | Find us on Facebook

From: Troy Bales <tbales@rickengineering.com>
Sent: Friday, December 28, 2018 1:04 PM
To: Devin Shable <dshable@northernwater.org>
Cc: Kevin San <ksan@rickengineering.com>; Jeffrey J. Kahn <JKahn@lyonsgaddis.com>; Amy Johnson <ajohnson@northernwater.org>; Dennis Baker <dbaker@northernwater.org>; Brian Flockhart <bflockhart@northernwater.org>; Jim L. Struble <jstruble@northernwater.org>; mark monger <markmonger@hotmail.com>; EDoe@Knoll9025.com; sanuer1342@comcast.net
Subject: RE: Meadowlark Preliminary Construction Plans - Norther Water Review

Devin

Thanks for your review and response.

We plan to comply with comment #1 during the final construction plan submittal

For comment #2 we will work with Jeff Kahn to obtain a license agreement

For comment #3 we have added the reference numbers to the plans. (do you need a revised plan?)

Feel free to reach out with any further questions

Thanks again

Troy Bales P.E.
ASSOCIATE

RICK ENGINEERING COMPANY
9801 East Easter Ave Centennial, CO 80112

t 303.537.8020 **d** 303.537.8025 **c** 619.540.6848
tbales@rickengineering.com www.rickengineering.com

WARNING: The information provided via electronic media is not guaranteed or warranted against any defects, including design, calculation, data translation or transmission errors or omissions.

From: Devin Shable [mailto:dshable@northernwater.org]
Sent: Friday, December 14, 2018 11:48 AM
To: Troy Bales
Cc: Kevin San; Jeffrey J. Kahn; Amy Johnson; Dennis Baker; Brian Flockhart; Jim L. Struble; mark monger; EDoe@Knoll9025.com; sanuer1342@comcast.net
Subject: Meadowlark Preliminary Construction Plans - Norther Water Review

Troy,

Northern Water has received and reviewed the preliminary construction plans dated September 24, 2018 (attached).
The attached memo summarizes Norther Water's review comments.
Please feel free to call or email with questions or concerns.

Thank you,
-Devin

Northern Water
Northern Colorado Water Conservancy District
Devin Shable, P.E. | Project Engineer
220 Water Ave | Berthoud, CO 80538
Direct 970-622-2358 | Cell 970-617-9337
Main 800-369-RAIN (7246) | Fax 877-851-0018
www.northernwater.org | Find us on Facebook

Troy Bales

From: Adam Buffington <adam.buffington@CRESTONEPR.COM>
Sent: Tuesday, December 18, 2018 6:12 AM
To: Troy Bales
Cc: Kevin San
Subject: RE: [EXT]D1048 - Schmidt Property Utiltiy Crossings

Troy, sorry for the late response. We have a lot of people out of the office for the holidays. I checked with both our land group as well as our P+A group. First, land has no issue with your plans. Second as it stands now, we do not have plans to P+A any of the wells in question. They are still profitable enough to justify keeping. That being said we will treat this like any other crossing we encounter. Once you get your final plans, we should have another look. Also, when work actually begins there will need to be some coordination between your guys and my locators. I assume we will need to have some standby's which is where my locators will be on site while the lines are exposed and or crossed. We can go over that process once you have your final plans in place. One thing I want to stress is to make sure 811 is called prior to any activity.

If you have any questions, please let me know.

Thanks

AJ Buffington
Construction Coordinator
o. 303.774.3933
c. 970-739-5874
e. adam.buffington@crestonepr.com

Crestone Peak Resources
CRESTONE PEAK RESOURCES

From: Troy Bales <tbales@rickengineering.com>
Sent: Tuesday, December 11, 2018 5:27 PM
To: Adam Buffington <adam.buffington@CRESTONEPR.COM>
Cc: Kevin San <ksan@rickengineering.com>
Subject: [EXT]D1048 - Schmidt Property Utiltiy Crossings

Adam

Per our call attached is an overall utility plan showing the existing Crestone Wigget well heads and the oil and gas lines we have located in the vicinity. I have also shown the proposed utility crossings (Storm Drain (3 total)) and (Sewer (1)) I have also included the preliminary profiles for each utility and the proposed separation from the existing gas lines. We have assumed 48" depth on all gas lines. Actual depths will need to be verified however this is our initial assumption for preliminary designs. Note as discussed the plans we working to obtain approval on at this time are the preliminary plans. Final plans will be processed early next year for final approvals.

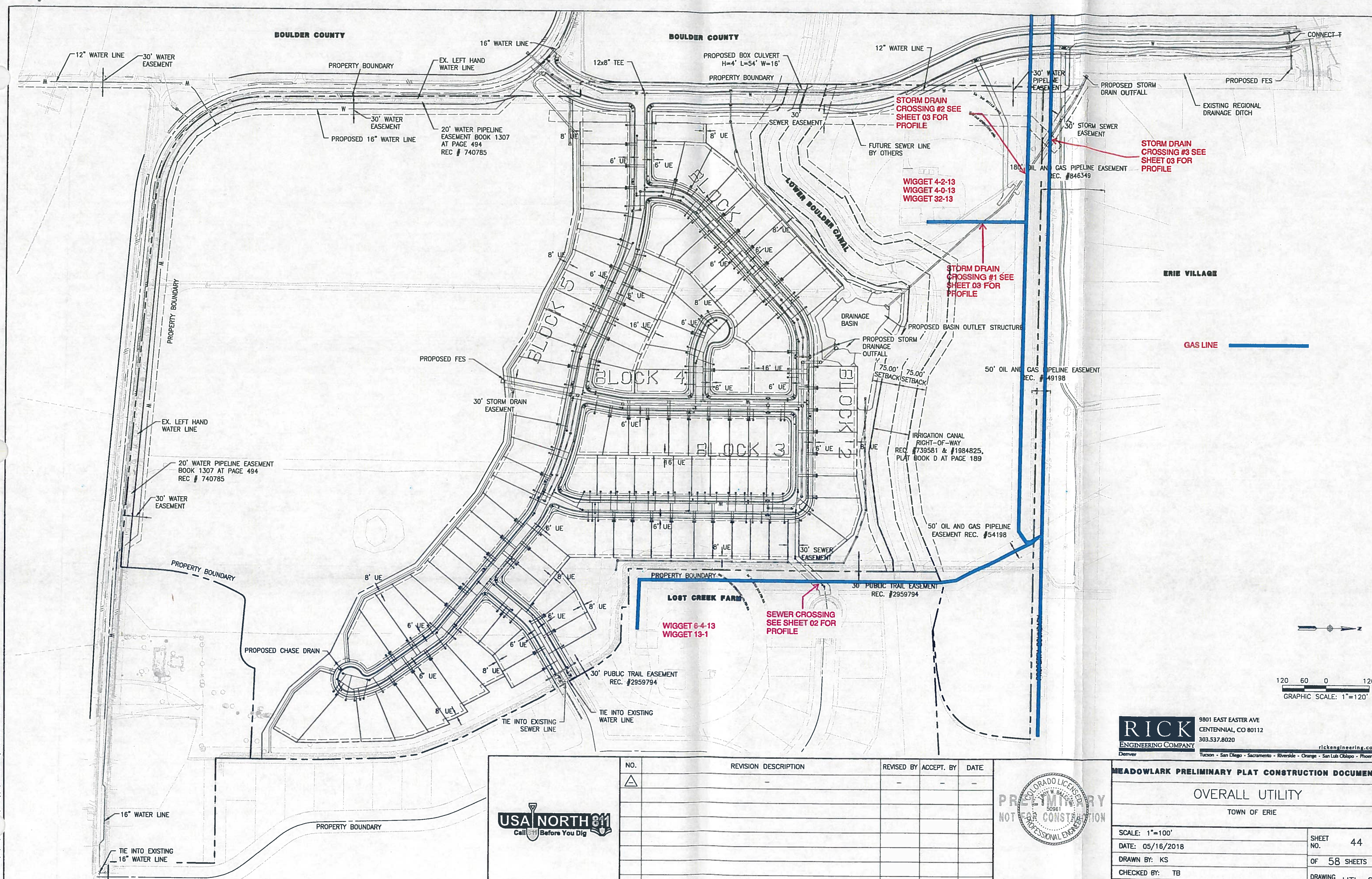
Please review and advise if the preliminary crossings are acceptable?

Thanks

Troy Bales P.E.
ASSOCIATE

RICK ENGINEERING COMPANY
9801 East Easter Ave   Centennial, CO 80112

t 303.537.8020   **d** 303.537.8025   **c** 619.540.6848
tbales@rickengineering.com   www.rickengineering.com



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NO.	REVISION DESCRIPTION	REVISED BY	ACCEPT. BY	DATE
△	–	–	–	–

PRELIMINARY NOT FOR CONSTRUCTION

COLORADO LICENSED PROFESSIONAL ENGINEER 50961

PROJECT ENGINEER DATE

MEADOWLARK PRELIMINARY PLAT CONSTRUCTION DOCUMENTS

OVERALL UTILITY

TOWN OF ERIE

SCALE: 1"=100'
DATE: 05/16/2018
DRAWN BY: KS
CHECKED BY: TB
JOB NO: D1048

SHEET NO. 44
OF 58 SHEETS
DRAWING NO. UTL-01

Preliminary Utility Report

Meadowlark
12587 Jay Road
Erie, CO 80516

Job Number: D01048-A

September 24, 2018

Prepared For:

TI Residential, LLC
9801 East Easter Avenue
Centennial, CO 80112

Prepared By:

Rick Engineering Company
9801 East Easter Avenue
Centennial, Co 80112

TABLE OF CONTENTS

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. <u>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.</u>

Accepted by: ____________________________ Date: _____________
TOWN ENGINEER

If during the construction process or at any time within one year following the acceptance by the TOWN of the completed improvements, any deficiencies or errors are discovered in the construction plans, specifications, drainage reports, or the actual constructed improvements, the TOWN shall have the right to require the developer to make any and all corrections which may be deemed necessary by the TOWN. The costs associated with any such corrections shall be the sole responsibility of the developer.

I. PROJECT DESCRIPTION

A. Purpose

The intent of this report is to present a preliminary analysis of the water and sewer systems that will serve the proposed Meadowlark Project. This analysis includes the preliminary sizing calculations for the proposed major water and sewer mains.

B. Project Location

The Project is located in the Northeast quarter of section 13, Township 1 North, Range 69 West 6th P.M. Town of Erie, County of Boulder, State of Colorado.

The Project is located northwest of the intersection of Jay Rd and NE Countyline Rd. as shown on the Vicinity Map. The project is bounded on the north by Erie Village subdivision, on the east by Lost Creek Farms Subdivision, and on the south and west by rural residential land.

C. Project Description

The Meadowlark Property proposes 118 dwelling units on approximately 86.5 acres. Within the 86.5 acres there will be open space of 18.82 acres and a currently undeveloped mine subsidence area of 33.66 acres located south of the 0% strain line. The site generally slopes from the south to the north. The Lower Boulder Ditch traverses the site in the east, west direction and bisects the open space and Low Density Residential Zoning districts. On the north end of the project, there is an existing 50’ oil and gas easement running east to west. On the East end of the project, there is an existing 30’ trail easement.

II. WATER SUPPLY

A. On Site Water System

The sizing and layout of the proposed water system will be per the Town of Erie Standards and Specification. The water distribution system for this development will be tied into two existing water mains, one to the west and one to the east. This will provide a looped system for redundancy and consistent supply and quality.

1. **East Supply**
   The Erie Water master Plan was referenced to determine the pressures of the system feeding the east connection. Erie Master plan junctions J-148 (70 psi) and J-87 (62.8 psi) are located on NE County Line road and are the Erie model connections for the Lost Creek Farm subdivision to the east of

Meadowlark. Meadowlarks east water connection is from the Lost Creek subdivision. The Meadowlark model shows routing of water through Lost Creek to determine the pressure at connection between Meadowlark and Lost Creek.

2. **West Supply**

   Meadowlark will connect to the Wise Farms proposed water line that connects to Kenosha Farms north of Jasper road. Junction J29 (75.7 psi for average day) of the Wise Farms model is close to the Meadowlark West water connection. 75 psi was used for the West supply for Meadowlark.

3. **Fire Flow Model - printouts provided**

   Per Erie, 2 – 1000 GPM fire flows were run on top of the peak day demand. Fire flows were placed on junctions 4 and 10. During Fire flow all pipe velocities stay below 10fps and the fire node residual pressure are at 57psi or better (code is 20psi or greater).

4. **Water Quality – printouts provided**

   The dead-end pipe in the southeast of the site (Pipe 12) is the pipe where water quality was being questioned. Average day demands were applied to the junctions. The velocity in Pipe 12 is approximately 0.02 fps with a travel/"residence" time of 6.154 hours.

UNIT WATER DEMANDS			
PROPOSED USE	**AVERAGE DEMAND (GPCD)**	**MAX. DAY/AVG. DAY**	**MAX. HR./FLOW RATIO (GPM)**
Residential	140	2.6	3.9

*Gallons Per Capita/Day

A. Available fire flow must be 20 psi residual minimum

B. Minimum fire flow (2 hour duration) for any newly developed areas:
   1. 1 and 2 family units……………………………….1,000gpm

RESIDENTIAL WATER DEMAND			
PROPOSED USE	**AVERAGE DAILY DEMAND (GPM)**	**MAX. DAILY DEMAND (GPM)**	**MAX. HOURLY DEMAND (GPM)**
Residential	0.271	0.705	2.75

Please refer to the Preliminary Water Main System exhibit in Appendix B for the proposed water system layout.

B. Offsite Water System

Connecting to the existing water line on the south end of Lombardi and will connect to an existing water line in the Creekside subdivision. A 12” x16” reducer will be installed to connect a 16” water line down to Jay rd. and comply with the water master plan. A 12” line will then be branched off to connect down to a 12” main on Tellen Ave in the Creekside Subdivision. These water mains will not be included with the calculations as it is not involve in the site.

III. SEWER

A. On Site Sewer System

The sanitary collection system for this development will be tied into two existing sanitary mains, on the north east and south east of the site in Lost Creek Farms Subdivision.

The average residential flow per the town of Erie Standards and Specifications is 90 gallons per capita per day. The 90 gallons per capita per day was then multiplied by an estimated 2.79 people per unit to an average flow per unit of 0.000251.1 MGD. See below for the peaking factor equation taken from the Erie Standards and Specifications.

$PF=3.8 / (ADF)^{0.17}$
Where ADF = Annual average daily flow in MGD
Peaking factor = 2.5< PF <5

RESIDENTIAL SEWER DEMAND								
Connection	**Number of Units**	**Average Flow (MGD)**	**Calculated Peaking Factor**	**Peaking Factor**	**Peak Flow (MGD)**	**Velocity (FPS)**	**Pipe Capacity 80% (MGD)**	**d/D**
North East 8” PVC	113	0.0289	6.9628	5	01445	2.13	0.60	33.44%
South East 8” PVC	5	0.0013	11.8300	5	0.00325	4.12	1.15	3.83%

The sewer system will be preliminarily sized based on points where major areas converge. The sewer load at each point will be determined by calculating the areas upstream that would contribute to the flow at that point. Pipe sizing will be based on an allowable pipe flow depth of 80% during peak flows per the town of Erie Standards and Specifications.

See Appendix E for Calculations

Please refer to the Preliminary Sewer Main System exhibit in Appendix D for the proposed water system layout.

B. Offsite Sewer System

Connection point up north, line will go down Lombardi and will stub out at the 123rd and Jay Rd curve. This will not be included in the onsite sewer calculations.

IV. CONCLUSION

The proposed water system had be sized properly and meets Town of Erie Standards and Specifications for fire flow and water quality. The proposed sanitary system will be sufficient during peak flows and have been sized to have less than 80% capacity.

V. REFERENCES

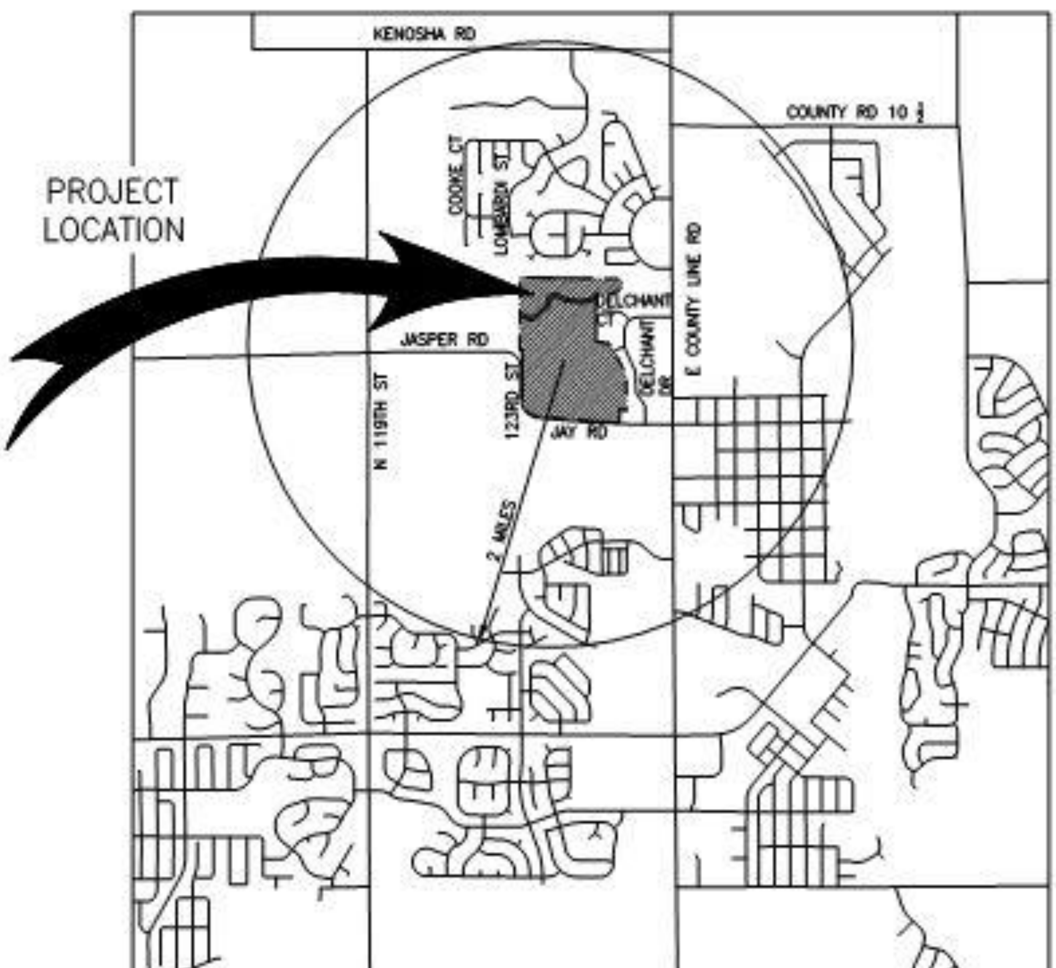
- Town of Erie Standards and Specifications
- City and County of Denver Department of Public Works

VI. APPENDICES

Appendix A: Vicinity Map
Appendix B: Preliminary Water Layout – Fire Flow
Appendix C: Preliminary Water Calculations – Fire Flow
Appendix D: Preliminary Water Layout – Water Quality
Appendix E: Preliminary Water Calculations – Water Quality
Appendix F: Preliminary Sewer Layout
Appendix G: Preliminary Sewer Calculations

Appendix A

VICINITY MAP



Appendix B

PRELIMINARY WATER LAYOUT – FIRE FLOW

Appendix C

PRELIMINARY WATER CALCULATIONS – FIRE FLOW

Appendix D

PRELIMINARY WATER LAYOUT – WATER QUALITY

Appendix E

PRELIMINARY WATER CALCULATIONS – WATER QUALITY

Appendix F

PRELIMINARY SEWER LAYOUT

Appendix G

PRELIMINARY SEWER CALCULATIONS

Troy Bales

From: Greg Sherman <Greg@westernenvironment.com>
Sent: Thursday, March 01, 2018 10:33 AM
To: Troy Bales
Subject: RE: D1048 - Schmidt Property

Troy:

Sorry to take so long to get back, our server when down on Tuesday and we have been flying blind. Regarding your question on the separation between the "strain isolation trench" and the drainage swale, I would recommend a distance equal to the depth to groundwater. I thought the water table was +- 10 feet.

Call if you need further clarification.

Greg D Sherman P.G
President

WESTERN ENVIRONMENT AND ECOLOGY, INC.
2217 West Powers Avenue
Littleton, Colorado 80120
(303)-730-3452

From: Troy Bales [mailto:tbales@rickengineering.com]
Sent: Thursday, February 15, 2018 8:24 AM
To: Greg Sherman
Subject: RE: D1048 - Schmidt Property

Thanks Greg

The intent of the swales is to stop runoff from entering the subdivision however it does concentrate the flow and convey it to one collection point.

We have not discussed the solar panels but will reach out to him on that inquiry.

As for the "strain isolation trench" can you clarify or describe or provide a detail of what that entails, ie width, depth, etc?

Thanks for your help

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

Customer Distribution

Our Order Number: ABZ70535358.2

Date: 11-30-2017

Property Address: TI RESIDENTIAL PARCEL, ERIE, CO 80516

For Title Assistance
KIM ZIMMERMAN
5975 GREENWOOD PLAZA BLVD
GREENWOOD VILLAGE, CO 80111
720-406-2083 (phone)
303-393-4842 (fax)
kzimmerman@ltgc.com

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

Seller/Owner
TI RESIDENTIAL LLC
Attention: ANDREW TRIETLEY
9801 E EASTER AVE
CENTENNIAL, CO 80112
303-346-7006 (work)
atrietley@ventanacap.com
Delivered via: Linked Commitment Delivery

RICK ENGINEERING COMPANY
Attention: TROY BALES
9801 EAST EASTER AVE.,
CENTENNIAL, CO 80112
303-537-8020 (work)
tbales@rickengineering.com
Delivered via: Electronic Mail

Land Title Guarantee Company

Estimate of Title Fees

Order Number: ABZ70535358.2 Date: 11-30-2017

Property Address: TI RESIDENTIAL PARCEL, ERIE, CO 80516

Buyer/Borrower: A BUYER TO BE DETERMINED

Seller: TI RESIDENTIAL LLC, A COLORADO LIMITED LIABILITY COMPANY

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

Estimate of Title Insurance Fees	
TBD Commitment	$270.00
If Land Title Guarantee Company will be closing this transaction, the fees listed above will be collected at closing.	
Total	$270.00
THANK YOU FOR YOUR ORDER!	

ALTA COMMITMENT
Old Republic National Title Insurance Company
Schedule A

Order Number: ABZ70535358.2

Customer Ref-Loan No.:

Property Address:

TI RESIDENTIAL PARCEL, ERIE, CO 80516

1. Effective Date:

11-21-2017 At 5:00 P.M.

2. Policy to be Issued and Proposed Insured:

"TBD" Commitment $0.00
Proposed Insured:
A BUYER TO BE DETERMINED

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

A FEE SIMPLE

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

TI RESIDENTIAL LLC, A COLORADO LIMITED LIABILITY COMPANY

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

A PARCEL OF LAND LOCATED IN THE NORTHEAST QUARTER OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF BOULDER, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE EAST QUARTER CORNER OF SAID SECTION 13,
THENCE NORTH 00°10'48" EAST ALONG THE EAST LINE OF THE NORTHEAST QUARTER OF SAID SECTION 13, A DISTANCE OF 116.80 FEET;
THENCE NORTH 89°24'12" WEST, A DISTANCE OF 666.10 FEET;
THENCE NORTH 88°05'06" WEST, A DISTANCE OF 258.00 FEET;
THENCE NORTH 2°11'05" EAST, A DISTANCE OF 23.32 FEET TO A POINT ON THE APPARENT NORTH RIGHT OF WAY LINE OF JAY ROAD, EVIDENCED BY A 5/8" REBAR AND PLASTIC CAP, PLS 6716, SAID POINT ALSO BEING THE TRUE POINT OF BEGINNING;
THENCE NORTH 86°53'01" WEST, A DISTANCE OF 493.00 FEET;
THENCE NORTH 84°46'00" WEST, A DISTANCE OF 929.46 FEET TO A POINT OF CURVE;
THENCE ALONG THE ARC OF A CURVE TO THE RIGHT HAVING A RADIUS OF 300.00 FEET AND A CENTRAL ANGLE OF 84°10'43", AN ARC DISTANCE OF 440.76 FEET, (CHORD BEARS NORTH 42°40'38" WEST, A DISTANCE OF 402.17 FEET) TO A POINT OF TANGENT;
THENCE NORTH 00°35'17" WEST, A DISTANCE OF 708.07 FEET;
THENCE NORTH 00°07'43" EAST, A DISTANCE OF 156.84 FEET;
THENCE NORTH 89°54'17" WEST, A DISTANCE OF 40.13 FEET TO A POINT ON THE WEST LINE OF THE SAID NORTHEAST QUARTER OF SECTION 13 FROM WHENCE THE SOUTHWEST CORNER OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SAID SECTION 13 BEARS SOUTH 00 ° 07'34" WEST, A DISTANCE OF 65.45 FEET;
THENCE NORTH 00°07'34" EAST ALONG SAID WEST LINE, A DISTANCE OF 1264.78 FEET TO THE NORTH QUARTER CORNER OF SAID SECTION 13, EVIDENCED BY A 4" BRASS CAP SET IN CONCRETE, PLS 13446;
THENCE SOUTH 89°08'12" EAST ALONG THE NORTH LINE OF THE NORTHEAST QUARTER OF SAID SECTION 13, A DISTANCE OF 1789.05 FEET TO A POINT ON THE APPROXIMATE CENTERLINE OF AN

IRRIGATION DITCH;

THENCE ALONG SAID DITCH CENTERLINE THE FOLLOWING FIVE COURSES:

1. SOUTH 05°18'53" WEST, A DISTANCE OF 85.95 FEET;
2. SOUTH 09°21'45" WEST, A DISTANCE OF 18.85 FEET TO A POINT OF CURVE;
3. ALONG THE ARC OF A CURVE TO THE RIGHT HAVING A RADIUS OF 171.00 FEET AND A CENTRAL ANGLE OF 71°01'12", AN ARC DISTANCE OF 211.96 FEET; (CHORD BEARS SOUTH 44°52'21" WEST, A DISTANCE OF 198.65 FEET) TO A POINT OF TANGENT;
4. SOUTH 80°22'57" WEST, A DISTANCE OF 39.94 FEET;
5. SOUTH 84°33'07" WEST, A DISTANCE OF 110.15 FEET TO A POINT ON THE NORTH LINE OF AN EASEMENT FOR THE LOWER BOULDER IRRIGATION CANAL, AS RECORDED AT BOOK 986, PAGES 266 AND 269, BOULDER COUNTY CLERK AND RECORDER'S OFFICE;

THENCE ALONG THE NORTH LINE OF SAID EASEMENT THE FOLLOWING TWO COURSES:

1. NORTH 76°17'21" WEST, A DISTANCE OF 116.57 FEET;
2. SOUTH 67°06'39" WEST, A DISTANCE OF 46.92 FEET TO A POINT ON THE WEST LINE OF THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF SAID SECTION 13;

THENCE SOUTH 00°09'11" WEST ALONG SAID WEST LINE, A DISTANCE OF 846.84 FEET TO A POINT, EVIDENCED BY A 5/8" REBAR AND PLASTIC CAP, PLS 6716;
THENCE NORTH 89°29'13" EAST, A DISTANCE OF 104.55 FEET;
THENCE SOUTH 00°09'16" WEST, A DISTANCE OF 17.93 FEET TO A POINT ON THE APPROXIMATE CENTERLINE OF AN IRRIGATION DITCH;

THENCE ALONG SAID DITCH CENTERLINE THE FOLLOWING NINE COURSES:

1. SOUTH 87°53'01" EAST, A DISTANCE OF 96.53 FEET;
2. SOUTH 54°47'37" EAST, A DISTANCE OF 37.79 FEET;
3. SOUTH 35°58'27" EAST, A DISTANCE OF 46.95 FEET;
4. SOUTH 30°22'26" EAST, A DISTANCE OF 187.12 FEET;
5. SOUTH 27°11'53" EAST, A DISTANCE OF 237.04 FEET;
6. SOUTH 20°56'33" EAST, A DISTANCE OF 133.69 FEET;
7. SOUTH 08°05'21" EAST, A DISTANCE OF 67.96 FEET;
8. SOUTH 01°39'24" EAST, A DISTANCE OF 209.10 FEET;
9. SOUTH 00°14'08" WEST, A DISTANCE OF 273.40 FEET TO A POINT ON THE NORTH LINE OF A PARCEL OF LAND RECORDED AT RECEPTION NO. 2484649, BOULDER COUNTY CLERK AND RECORDER'S OFFICE;

THENCE NORTH 89°36'22" WEST, A DISTANCE OF 0.66 FEET TO THE NORTHWEST CORNER OF SAID PARCEL, EVIDENCED BY A 5/8" REBAR AND ALUMINUM CAP, PLS 4846;
THENCE SOUTH 00 ° 14'06" WEST ALONG THE MOST WESTERLY LINE OF SAID PARCEL, A DISTANCE OF 75.50 FEET TO A POINT, EVIDENCED BY A 1-1/2" ALUMINUM CAP SET IN CONCRETE, PLS 2152;
THENCE NORTH 73°58'04" WEST, A DISTANCE OF 114.01 FEET TO A POINT, AS EVIDENCED BY A 1-1/2" ALUMINUM CAP SET IN CONCRETE, PLS 2152;
THENCE SOUTH 02°13'11" WEST, A DISTANCE OF 239.47 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPTING THEREFROM THE FOLLOWING PARCEL:

A PARCEL OF LAND LOCATED IN THE NORTHEAST QUARTER OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN, COUNTY OF BOULDER, STATE OF COLORADO,

ALTA COMMITMENT
Old Republic National Title Insurance Company
Schedule A

Order Number: ABZ70535358.2

Customer Ref-Loan No.:

BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE EAST QUARTER CORNER OF SAID SECTION 13,
THENCE NORTH 00°10'48" EAST, ALONG THE EAST LINE OF THE NORTHEAST QUARTER OF SAID SECTION 13, A DISTANCE OF 116.80 FEET;
THENCE NORTH 89°24'12" WEST, A DISTANCE OF 666.10 FEET;
THENCE NORTH 88°05'06" WEST, A DISTANCE OF 258.00 FEET;
THENCE NORTH 2°11'05" EAST, A DISTANCE OF 23.32 FEET TO A POINT ON THE APPARENT NORTH RIGHT OF WAY LINE OF JAY ROAD, EVIDENCED BY A 5/8" REBAR AND PLASTIC CAP, PLS 6716, SAID POINT ALSO BEING THE TRUE POINT OF BEGINNING;
THENCE ALONG THE NORTH RIGHT OF WAY LINE OF JAY ROAD, NORTH 86°53'01" WEST, A DISTANCE OF 400.00 FEET;
THENCE DEPARTING SAID RIGHT OF WAY LINE NORTH 03°06'59" EAST, A DISTANCE OF 100.00 FEET TO A POINT OF CURVE;
THENCE ALONG THE ARC OF A CURVE TO THE RIGHT HAVING A RADIUS OF 525.00 FEET AND A CENTRAL ANGLE OF 26°20'43", AN ARC DISTANCE OF 241.40 FEET (CHORD BEARS NORTH 16°17'21" EAST, A DISTANCE OF 239.28 FEET) TO A POINT OF COMPOUND CURVE;
THENCE ALONG THE ARC OF A CURVE TO THE RIGHT HAVING A RADIUS OF 20.00 FEET AND A CENTRAL ANGLE OF 65°46'18", AN ARC DISTANCE OF 22.96 FEET (CHORD BEARS NORTH 62°20'51" EAST, A DISTANCE OF 21.72 FEET);
THENCE SOUTH 84°46'00" EAST, A DISTANCE OF 128.96 FEET TO A POINT OF CURVE; THENCE ALONG THE ARC OF A CURVE TO THE LEFT HAVING A RADIUS OF 50.00 FEET AND A CENTRAL ANGLE OF 82°34'31", AN ARC DISTANCE OF 72.06 FEET (CHORD BEARS NORTH 53°56'45" EAST, A DISTANCE OF 65.98 FEET);
THENCE SOUTH 87°31'40" EAST, A DISTANCE OF 246.29 FEET;
THENCE SOUTH 00°14'08" WEST, A DISTANCE OF 94.50 FEET TO A POINT ON THE NORTH LINE OF A PARCEL OF LAND RECORDED AT RECEPTION NO. 2484649, BOULDER COUNTY CLERK AND RECORDER'S OFFICE;
THENCE NORTH 89°36'22" WEST, A DISTANCE OF 0.66 FEET TO THE NORTHWEST CORNER OF SAID PARCEL, EVIDENCED BY A 5/8" REBAR AND ALUMINUM CAP, PLS 4846;
THENCE SOUTH 00°14'06" WEST ALONG THE MOST WESTERLY LINE OF SAID PARCEL, A DISTANCE OF 75.50 FEET TO A POINT, EVIDENCED BY A 1-1/2" ALUMINUM CAP SET IN CONCRETE, PLS 2152;
THENCE NORTH 73°58'04" WEST, A DISTANCE OF 114.01 FEET TO A POINT, AS EVIDENCED BY A 1-1/2" ALUMINUM CAP SET IN CONCRETE, PLS 2152;
THENCE SOUTH 02°13'11" WEST, A DISTANCE OF 239.47 FEET TO THE TRUE POINT OF BEGINNING.

ALTA COMMITMENT
Old Republic National Title Insurance Company
Schedule B-1

(Requirements)

Order Number: ABZ70535358.2

The following are the requirements to be complied with:

Payment to or for the account of the grantors or mortgagors of the full consideration for the estate or interest to be insured.

Proper instrument(s) creating the estate or interest to be insured must be executed and duly filed for record, to-wit:

THIS COMMITMENT IS FOR INFORMATION ONLY, AND NO POLICY WILL BE ISSUED PURSUANT HERETO.

Old Republic National Title Insurance Company
Schedule B-2

(Exceptions)

Order Number: ABZ70535358.2

The policy or policies to be issued will contain exceptions to the following unless the same are disposed of to the satisfaction of the Company:

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. EXISTING LEASES AND TENANCIES, IF ANY.

9. ALL OIL, GAS AND OTHER MINERALS AND TERMS THEREIN AS RESERVED IN DEED RECORDED JANUARY 17, 1921, IN BOOK 445 AT PAGE 534.

   NOTE: MINERAL DEED WAS RECORDED JUNE 16, 2008 UNDER RECEPTION NO. 2936492.

   NOTE: REQUEST FOR NOTICE OF SURFACE DEVELOPMENT WAS RECORDED SEPTEMBER 28, 2009 UNDER RECEPTION NO. 03032258.

10. OIL AND GAS LEASE BETWEEN THE ROCKY MOUNTAIN FUEL COMPANY, LESSOR, AND THE VESSELS COMPANY, LESSEE, AS MEMORIALIZED BY MEMORANDUM OF LEASE RECORDED OCTOBER 31, 1980 UNDER RECEPTION NO. 420402, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

    DECLARATION OF UNITIZATION RECORDED APRIL 21, 1981 UNDER RECEPTION NO. 442785 AND AMENDMENT THERETO RECORDED SEPTEMBER 14, 1992 UNDER RECEPTION NO. 01219238.

    PRODUCTION AFFIDAVIT RECORDED JULY 27, 1981 UNDER RECEPTION NO. 456647.

    NOTICE OF RIGHT TO USE SURFACE OF LANDS WAS RECORDED DECEMBER 24, 1996 UNDER RECEPTION NO. 1666157.

    REQUEST FOR NOTIFICATION OF SURFACE DEVELOPMENT WAS RECORDED APRIL 11, 2006

Old Republic National Title Insurance Company
Schedule B-2

(Exceptions)

Order Number: ABZ70535358.2

The policy or policies to be issued will contain exceptions to the following unless the same are disposed of to the satisfaction of the Company:

UNDER RECEPTION NO. 2769128.

AMENDMENT TO LEASES RECORDED DECEMBER 13, 2007 UNDER RECEPTION NOS. 2899426 AND DECEMBER 13, 2007 UNDER RECEPTION NO. 2899427.

DECLARATION OF POOLING RECORDED FEBRUARY 5, 2013 UNDER RECEPTION NO. 03287549 AND FEBRUARY 5, 2013 UNDER RECEPTION NO. 03287555.

(AFFECTS W1/2 NE1/4)

11. OIL AND GAS LEASE BETWEEN RUSSELL L. PEATE, LESSOR, AND THE VESSELS COMPANY, LESSEE, RECORDED MARCH 11, 1981 UNDER RECEPTION NO. 437378, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

    NOTE: PRODUCTION AFFIDAVIT RECORDED JULY 27, 1981, UNDER RECEPTION NO. 456647.

    REQUEST FOR NOTIFICATION OF SURFACE DEVELOPMENT RECORDED APRIL 11, 2006 AT RECEPTION NO. 2769128.

    AMENDMENT TO LEASES RECORDED DECEMBER 13, 2007 UNDER RECEPTION NOS. 2899426 AND DECEMBER 13, 2007 UNDER RECEPTION NO. 2899427.

    DECLARATION OF POOLING WAS RECORDED FEBRUARY 5, 2013 UNDER RECEPTION NO. 03287549.

    (AFFECTS PORTION NE1/4 NE1/4)

12. EASEMENT AND RIGHT OF WAY FOR WATER PIPELINE PURPOSES AS GRANTED TO THE TOWN OF ERIE BY INSTRUMENT RECORDED JULY 06, 1923, IN BOOK 465 AT PAGE 483.

13. EASEMENTS AND RIGHTS OF WAY FOR COMMUNICATION LINE PURPOSES AS GRANTED TO MOUNTAIN STATES TELEPHONE AND TELEGRAPH COMPANY BY INSTRUMENT RECORDED AUGUST 05, 1928, IN BOOK 559 AT PAGE 436 AND RECORDED FEBRUARY 14, 1955, IN BOOK 971 AT PAGE 495.

14. EASEMENT AND RIGHT OF WAY FOR IRRIGATION CANAL AND INCIDENTAL PURPOSES AS GRANTED TO THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT BY INSTRUMENT RECORDED JULY 28, 1955, IN BOOK 986 AT PAGE 269 FOR THE LOWER BOULDER CANAL, ALSO KNOWN AS SOUTH PLATTE SUPPLY CANAL.

15. EASEMENT AND RIGHT OF WAY FOR WATER PIPELINE PURPOSES AS GRANTED TO FOOTHILLS WATER USERS ASSOCIATION BY INSTRUMENT RECORDED OCTOBER 21, 1963, IN BOOK 1306 AT PAGE 160.

16. EASEMENT AND RIGHT OF WAY FOR WATER PIPELINE PURPOSES AS GRANTED TO FOOTHILLS WATER USERS ASSOCIATION BY INSTRUMENT RECORDED OCTOBER 31, 1963, IN BOOK 1307 AT PAGE 494.

17. EASEMENT AND RIGHT OF WAY FOR AN OIL AND GAS PIPELINE AS GRANTED TO PANHANDLE EASTERN PIPE LINE COMPANY BY INSTRUMENT RECORDED MARCH 12, 1983, UNDER

Old Republic National Title Insurance Company
Schedule B-2

(Exceptions)

Order Number: ABZ70535358.2

The policy or policies to be issued will contain exceptions to the following unless the same are disposed of to the satisfaction of the Company:

RECEPTION NO. 549198.

18. EASEMENT AND RIGHT OF WAY FOR AN UNNAMED IRRIGATION DITCH AND ANY AND ALL LATERAL DITCHES AS REFERENCED IN DECREE RECORDED JANUARY 31, 1986, UNDER RECEPTION NO. 739581.

19. EASEMENT AND RIGHT OF WAY FOR THE LOWER BOULDER EXTENSION DITCH AS FILED OCTOBER 25, 1910 IN PLAT BOOK D AT PAGE 189 AND AS SET FORTH IN AFFIDAVIT RECORDED SEPTEMBER 24, 1999, UNDER RECEPTION NO. 1984825.

20. ANY TAX, LIEN, FEE, OR ASSESSMENT BY REASON OF INCLUSION OF SUBJECT PROPERTY IN THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT, AS EVIDENCED BY INSTRUMENT RECORDED APRIL 22, 2005, UNDER RECEPTION NO. 2682176.

21. TERMS, CONDITIONS, PROVISIONS, BURDENS, OBLIGATIONS AND EASEMENTS AS SET FORTH AND GRANTED IN GRANT OF PERMANENT ACCESS AND UTILITIES EASEMENT AGREEMENT DATED JANUARY 31, 2004 AND RECORDED MARCH 06, 2007 UNDER RECEPTION NO. 2840481.

22. UNRECORDED COMPATIBLE DEVELOPMENT AND SURFACE USE AGREEMENT DATED APRIL 1, 2008 AS EVIDENCED IN MEMORANDUM OF COMPATIBLE DEVELOPMENT AND SURFACE USE AGREEMENT BY AND BETWEEN ENCANA OIL & GASE (USA INC., AND TI RESIDENTIAL LLC, RECORDED SEPTEMBER 5, 2008 UNDER RECEPTION NO. 2953523.

23. TERMS, CONDITIONS, PROVISIONS, BURDENS, OBLIGATIONS AND EASEMENTS AS SET FORTH AND GRANTED IN SCHMIDT PROPERTY PUBLIC TRAIL CONSTRUCTION COMPREHENSIVE DEVELOPMENT PLAN INTERGOVERNMENTAL AGREEMENT RECORDED OCTOBER 15, 2008 UNDER RECEPTION NO. 2959619 AND RECORDED NOVEMBER 06, 2008 UNDER RECEPTION NO. 2963193.

24. TERMS, CONDITIONS, PROVISIONS, BURDENS, OBLIGATIONS AND EASEMENTS AS SET FORTH AND GRANTED IN PUBLIC TRAIL EASEMENT AGREEMENT RECORDED OCTOBER 15, 2008 UNDER RECEPTION NO. 2959794.

25. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN SCHMIDT PARCEL PRE-DEVELOPMENT AGREEMENT RECORDED OCTOBER 15, 2008 UNDER RECEPTION NO. 2959795.
    ACKNOWLEDGEMENT OF PAYMENT AND PERFORMANCE UNDER SCHMIDT PARCEL PRE-DEVELOPMENT AGREEMENT RECORDED DECEMBER 4, 2014 UNDER RECEPTION NO. 03416132

26. TERMS, CONDITIONS AND PROVISIONS OF ANNEXATION ORDINANCE RECORDED DECEMBER 30, 2016 AT RECEPTION NO. 03566775.

27. THE EFFECT OF SCHMIDT PROPERTY ANNEXATION MAP TO THE TOWN OF ERIE RECORDED DECEMBER 30, 2016, UNDER RECEPTION NO. 03566776.

28. TERMS, CONDITIONS AND PROVISIONS OF SCHMIDT PROPERTY TI RESIDENTIAL ANNEXATION AGREEMENT RECORDED DECEMBER 30, 2016 AT RECEPTION NO. 03566777.

29. TERMS, CONDITIONS AND PROVISIONS OF ZONING ORDINANCE RECORDED DECEMBER 30, 2016 AT RECEPTION NO. 03566779.

Old Republic National Title Insurance Company
Schedule B-2

(Exceptions)

Order Number: ABZ70535358.2

The policy or policies to be issued will contain exceptions to the following unless the same are disposed of to the satisfaction of the Company:

30. THE EFFECT OF SCHMIDT PROPERTY ZONING MAP RECORDED DECEMBER 30, 2016, UNDER RECEPTION NO. 03566780.

31. ANY TAX, LIEN, FEE, OR ASSESSMENT BY REASON OF INCLUSION OF SUBJECT PROPERTY IN THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT, MUNICIPAL SUBDISTRICT, AS EVIDENCED BY INSTRUMENT RECORDED OCTOBER 13, 2017, UNDER RECEPTION NO. 03619917.

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 and Meridian Land Title, LLC, as agents 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 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 either obtain 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 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 access 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 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.

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-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 the 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 a 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.

Commitment to Insure

ALTA Commitment - 2006 Rev.

OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY, a Minnesota corporation, (Company) for a valuable consideration, commits to issue its policy or policies of title insurance, as identified in Schedule A, in favor of the Proposed Insured named in Schedule A, as owner or mortgagee of the estate or interest in the land described or referred to in Schedule A, upon payment of the premiums and charges and compliance with the requirements; all subject to the provisions of Schedule A and B and to the Conditions of this Commitment.

This Commitment shall be effective only when the identity of the Proposed Insured and the amount of the policy or policies committed for have been inserted in Schedule A by the Company. All liability and obligation under this commitment shall cease and terminate six months after the Effective Date or when the policy or policies committed for shall issue, whichever first occurs, provided that the failure to issue such policy or policies is not the fault of the Company.

CONDITIONS AND STIPULATIONS

1. The term "mortgage", when used herein, shall include deed of trust, trust deed, or other security instrument.
2. If the proposed Insured has or acquires actual knowledge of any defect, lien, encumbrance, adverse claim or other matter affecting the estate or interest or mortgage thereon covered by this Commitment other than those shown in Schedule B hereof, and shall fail to disclose such knowledge to Company in writing, the Company shall be relieved from liability for any loss or damage resulting from any act of reliance hereon to the extent the Company is prejudiced by failure to so disclose such knowledge. If the proposed Insured shall disclose such knowledge to the Company, or if the Company otherwise acquires actual knowledge of any such defect, lien, encumbrance, adverse claim or other matter, the Company at its option may amend Schedule B of this Commitment accordingly, but such amendment shall not relieve the Company from liability previously incurred pursuant to paragraph 3 of these Conditions and Stipulations.
3. Liability of the Company under this Commitment shall be only to the named proposed Insured and such parties included under the definition of Insured in the form of policy or policies committed for and only for actual loss incurred in reliance hereon in undertaking in good faith (a) to comply with the requirements hereof or (b) to eliminate exceptions shown in Schedule B, or (c) to acquire or create the estate or interest or mortgage thereon covered by this Commitment. In no event shall such liability exceed the amount stated in Schedule A for the policy or policies committed for and such liability is subject to the insuring provisions and the Conditions and Stipulations and the Exclusions from Coverage of the form of policy or policies committed for in favor of the proposed Insured which are hereby incorporated by reference and are made a part of this Commitment except as expressly modified herein.
4. This commitment is a contract to issue one or more title insurance policies and is not an abstract of title or a report of the condition of title. Any action or actions or rights of action that the proposed Insured may have or may bring against the Company arising out of the status of the title to the estate or interest or the status of the mortgage thereon covered by this Commitment must be based on and are subject to the provisions of this Commitment.
5. The policy to be issued contains an arbitration clause. All arbitrable matters when the Amount of Insurance is $2,000,000 or less shall be arbitrated at the option of either the Company or the Insured as the exclusive remedy of the parties. You may review a copy of the arbitration rules at www.alta.org.

STANDARD EXCEPTIONS

In addition to the matters contained in the Conditions and Stipulations and Exclusions from Coverage above referred to, this Commitment is also subject to the following:

1. Rights or claims of parties in possession not shown by the Public Records.
2. Easements, or claims of easements, not shown by the Public Records.
3. Discrepancies, conflicts in boundary lines, shortage in area, encroachments, and any facts which a correct survey or inspection of the Land would disclose and which are not shown by the Public Records.
4. Any lien, or right to a lien, for services, labor or material theretofore 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 the proposed insured acquires of record for value the estate or interest or mortgage thereon covered by this Commitment.

IN WITNESS WHEREOF, Old Republic National Title Insurance Company 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

John E. Freyer, Jr
President

OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY

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

Mark Bilbrey
President

AMERICAN LAND TITLE ASSOCIATION

Rande Yeager
Secretary

Technical Memorandum
File and Literature Review
Schmidt Property
Erie, Boulder County, Colorado

Prepared for:
TI Residential L.L.C.
November 14, 2017

TI Residential L.L.C. contracted ERO Resources Corporation (ERO) to conduct a file and literature for the Schmidt Property in Erie, Colorado (project). The project requires compliance with the Town of Erie's *Preliminary Plat User's Guide*. Under the submittal requirements (Section 10.g), a cultural, archaeological, and historical resource report and protection plan must be submitted. The results of the file and literature review will provide TI Residential L.L.C. planners with information about the presence of cultural resources that may be impacted by the project and a summary of current regulatory requirements related to those resources.

Project Area

The project area includes all areas of currently known potential ground disturbance, including the limits of disturbance of the Schmidt Property Residential Development at the northeast corner of Jay Road and North 123rd Street, outside of the town limits of Erie, Colorado. The property consists of two parcels; addresses for the property include 12301 Jay Road and 12587 Jay Road. The entire project area is 84.4 acres; the legal location is the northeast quarter of Section 13 in Township 1 North, Range 69 West, of the 6th Principal Meridian (Figure 1, attached).

Methodology

The purpose of the cultural resource file and literature review is to determine whether any previously documented cultural resources listed in or eligible for listing in the National Register of Historic Places (NRHP) or State Register of Historic Places (SRHP) could be impacted by the proposed project. A "cultural resource" is defined as an archaeological site, structure, or building constructed 50 or more years ago. A cultural resource listed in or eligible for listing in the NRHP/SRHP is a "historic property." To assist with project planning and potential consultation obligations under Section 106 of the National Historic Preservation Act (NHPA) (36 CFR 800) and the State Register Act (CRS 34-80.1-104), ERO reviewed the previous cultural resource surveys and resource documentation completed in the project area by conducting a file and literature review using the Office of Archaeology and Historic Preservation

(OAHP) Compass online database on November 9, 2017. The file search area included the entirety of the project area as defined above. In addition to the OAHP file search, ERO reviewed existing literature, historical maps, public records, and General Land Office (GLO) records to determine if historical buildings or structures may have been previously located in the project area.

Results

The file search identified one previous intensive cultural resource survey, located directly adjacent to the project area. Western Cultural Resource Management conducted the survey, *A Class III Cultural Resource Survey of the Wiggit Subdivision, Boulder County, Colorado (BLM PERMIT #C-40308) (BL.R.R15)* in 2001; the survey covered a very small portion of the northeastern portion of current project area.

The OAHP Compass database shows that one previously documented cultural resource is located within the project area. The South Platte Supply Canal (5BL7355) cuts across the northern portion of the subject property. GLO records demonstrate that the land within the project area was acquired by Joseph Mitchell, Jr. on August 5, 1890, through a sale-cash entry (GLO Document No. 6399). No additional information on Mr. Mitchell was found. The road that borders the southern and southwestern portion of the project area was constructed by 1904; the road is visible on a 1904 1:62,500 quadrangle map.

Summary

The project area intersects one previously documented cultural resource, the South Platte Supply Canal (5BL7355). If a federal nexus is identified for the project, the lead federal agency would likely require a pedestrian cultural resource survey of the project area to take into account the project's effects on potential historic properties; the survey would document and assess the South Platte Supply Canal segment for its eligibility to be listed on the NRHP.

Please feel free to contact ERO with any questions you may have in reference to the file and literature review results and additional work potentially needed for NHPA or State Register Act compliance.

Certification of Results

C. Kathleen Croll

Kathy Croll
ERO Resources Corporation
Senior Archaeologist

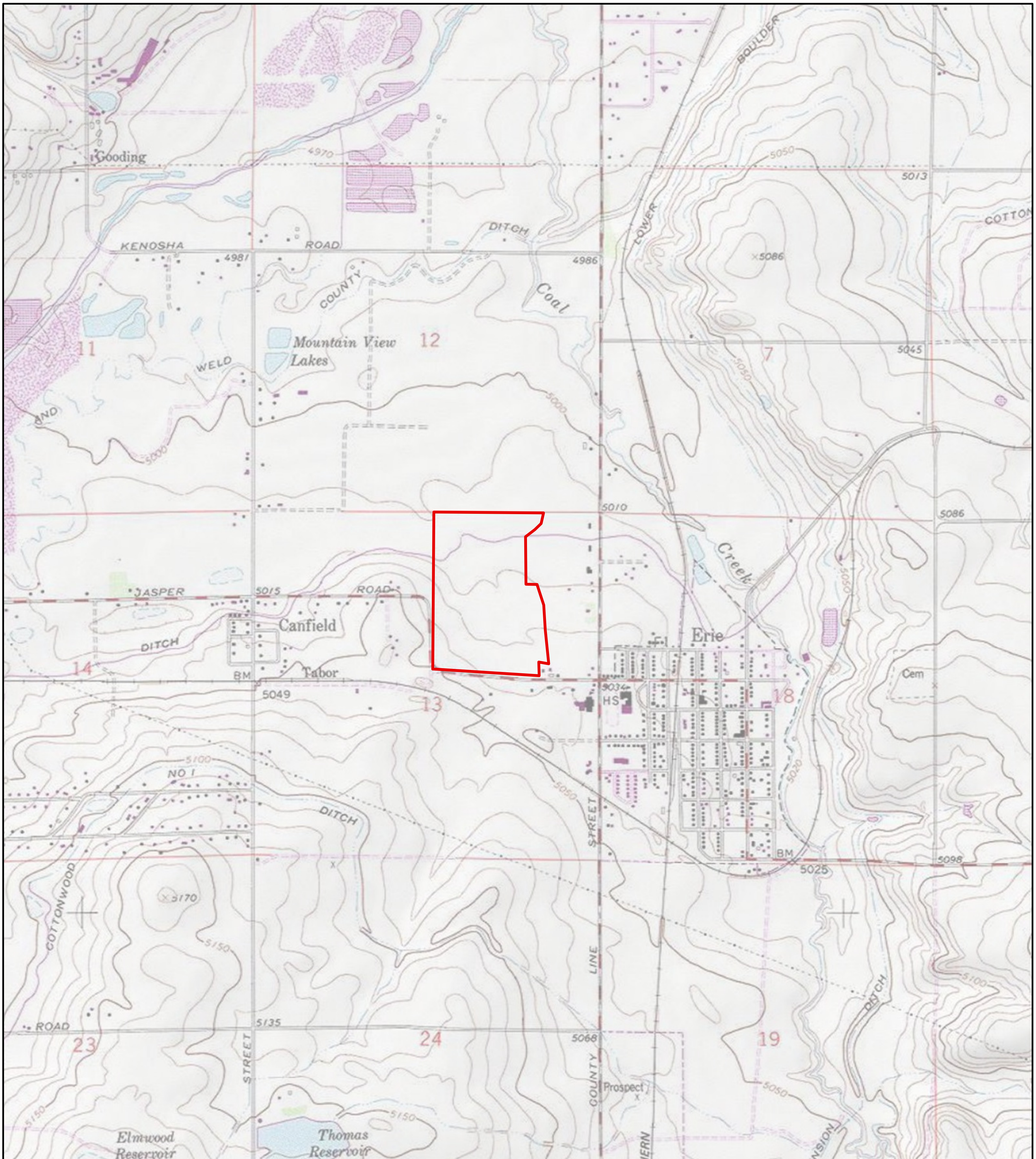
Attachment

Figure 1. Project area (USGS 1:24,000 topographic quadrangle).

References Cited

General Land Office (GLO)

1890 State Volume Patent, Accession No. COCOAA 040717, Document No. 6399. Issued to Joseph Mitchell, Jr. Denver Land Office, Colorado.



File and Literature Review
Schmidt Property Development
Erie, Boulder County, Colorado

N

Figure 1
Project Location

APE

T1N, R69 W, Section 13; T1N, R1W, Section 18; 6th PM
Erie, CO USGS Quad. (1980)

0 1,000 2,000 Feet
1:24,000

Prepared for: TI Residential L.L.C.
File: Fig1.mxd (KC)
November 2017

ERO
ERO Resources Corp.

Tim Dunn Design
Landscape Architecture & Planning

April 12, 2018

Troy Bales, PE
RICK ENGINEERING
9801 East Easter Avenue
Centennial, Colorado 80112

RE: Schmidt Property Filing No. 2
Existing Vegetation Survey and Narrative

Tree survey provided by Tim Dunn, Registered Landscape Architect
State of Colorado, License #400

The predominate species found on the Schmidt property occurring naturally are Siberian Elm, Ulmus pumila. These trees are mostly found along Jasper Street and the trees vary from 12' height to 40' in height and are multi-stem plants. The trees were most likely not planted but are "volunteer trees" with little or no value. With the future expansion of Jasper Street, these trees will be removed.

The existing trees in Tract E, the residential tract located at the southeast portion of the site have been planted by the previous owner and are to remain and will not be affected by the Schmidt residential development.

Tim Dunn R.L.A. A.S.L.A.

EXISTING TREE DATA CHART

TREE	TYPE	CALIPER SIZE/HEIGHT	CONDITION	TO REMAIN
1	MAPLE	8" MULTI STEM/25'	FAIR	YES
2	ELM		DEAD	
3	ELM		DEAD	
4	MAPLE	15" CAL./40'HT.	GOOD	YES
5	ELM	16" CAL./40' HT.	POOR	
6	BLUE SPRUCE	12' HT.	GOOD	
7	ELM CLUSTER	6" CAL. MAX/30' HT	POOR	YES
8	ELM CLUSTER	5" CAL. MAX/25' HT.	POOR	YES
9	ELM	14" CAL./45' HT.	FAIR	YES
10	ELM	22" CAL./50'	FAIR	YES
11	ELM	12" CAL./30' HT	FAIR	YES
12	ELM	10" CAL./30' HT.	FAIR	YES
13	ELM CLUSTER	5" CAL. MAX/ 25' HT.	FAIR	YES
14	ELM	18" CAL./40' HT.	FAIR	YES
15	ELM CLUSTER	8" CAL. MAX/35' HT.	FAIR	YES
16	ELM CLUSTER	7" CAL. MAX/30' HT.	FAIR	YES
17	ASPEN CLUSTER	7" CAL. MAX/40' HT.	FAIR	YES
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19	ELM CLUSTER	12" CAL. MAX/45' HT.	FAIR	YES
20	ELM CLUSTER	5" CAL. MAX/45' HT.	FAIR	YES
21	ELM	20" CAL. MAX/45' HT.	POOR	YES
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23	ELM	4" CAL. MAX/20' HT.	FAIR	YES
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25	ELM	12" CAL. MAX/40' HT.	POOR	YES
26	SPRUCE	12' HT.	FAIR	YES
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28	SPRUCE	10' HT.	FAIR	YES
29	SPRUCE	10' HT.	FAIR	YES
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32	ASPEN	10" CAL. MAX/45' HT.	FAIR	YES
33	ASPEN	10" CAL. MAX/45' HT.	FAIR	YES
34	ASPEN	12" CAL. MAX/45' HT.	FAIR	YES
35	ASPEN	10" CAL. MAX/45' HT.	FAIR	YES
36	ASPEN	12" CAL. MAX/45' HT.	FAIR	YES
37	ASPEN	12" CAL. MAX/45' HT.	FAIR	YES
38	ASPEN	12" CAL. MAX/45' HT.	FAIR	YES
39	ASPEN	12" CAL. MAX/45' HT.	FAIR	YES
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44	ELM		DEAD	NO
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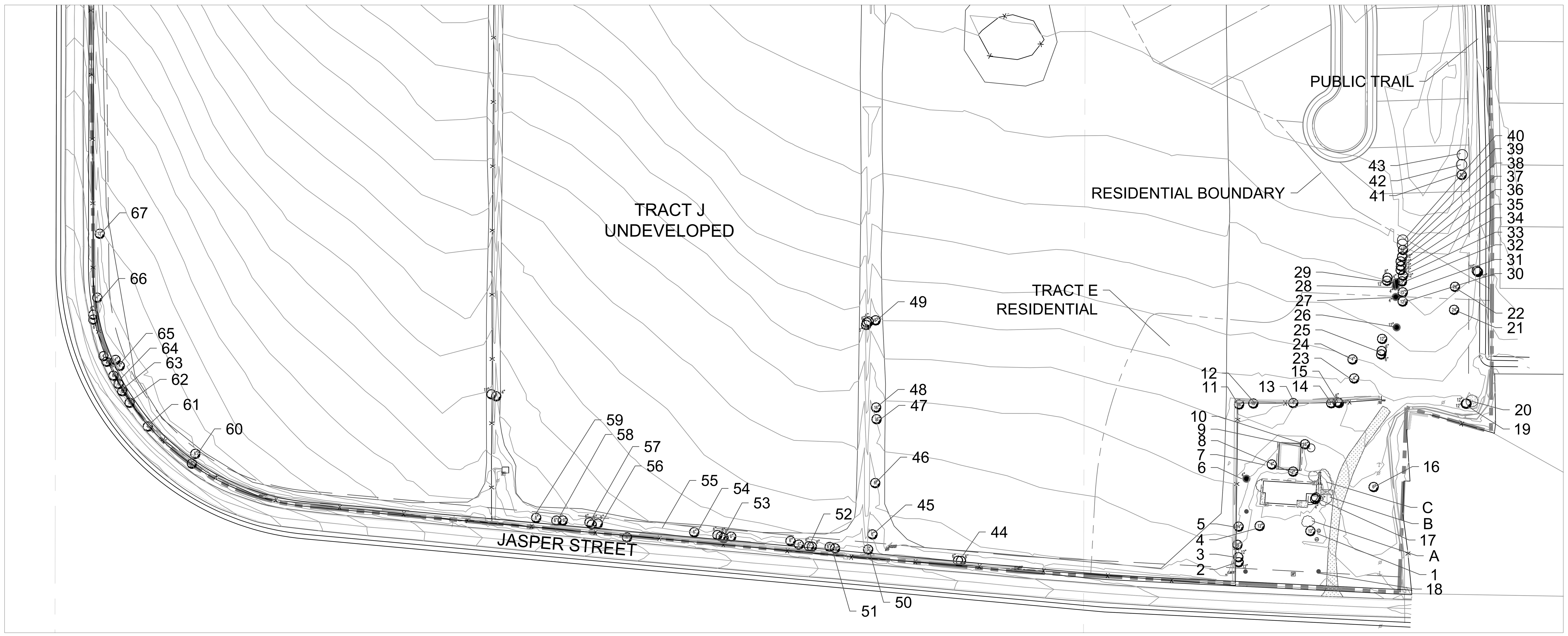
66	ELM CLUSTER	8" CAL. MAX/25' HT.	POOR	NO
67	ELM CLUSTER	14" CAL. MAX/25' HT.	POOR	YES
68	ELM CLUSTER	10" CAL. MAX/25' HT.	POOR	YES
69	ELM CLUSTER	4" CAL. MAX/20' HT.	POOR	YES
SHRUBS				
A	JUNIPER SHRUBS	6' HT.	FAIR	YES
B	JUNIPER SHRUBS	4' HT.	FAIR	YES
C	JUNIPER SHRUBS	6' HT.	FAIR	YES

NARRATIVE:

THE PREDOMINATE SPECIES OF TREES ON THE SCHMIDT PROPERTY ARE ELM TREES. THESE TREES ARE "VOLUNTEER" TREES AND WERE MOST LIKELY NOT PLANTED BY THE PROPERTY OWNER.

DUE TO LACK OF IRRIGATION AND ROUTINE MAINTENANCE ALMOST ALL TREES ARE IN A POOR TO FAIR CONDITION THROUGHOUT THE SITE.

ALL TREES MEASURED AT "DBH", DIAMETER AT BREAST HEIGHT OR 4'-6" ABOVE GRADE.



SCHMIDT EXISTING VEGETATION SURVEY
SOUTH HALF OF SITE

North 0 80' 160' Scale 1"=80'

LANDSCAPE ARCHITECT:

TIM DUNN DESIGN, LLC
Tim A. Dunn A.S.L.A. R.L.A.
720-240-2411
timdunn1958@gmail.com
www.timdunnlandscapearchitect.com

RICK ENGINEERING COMPANY
Denver
9801 EAST EASTER AVE
CENTENNIAL, CO 80112
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rickengineering.com
Tucson - San Diego - Sacramento - Riverside - Orange - San Luis Obispo - Phoenix

TIM DUNN 400
02/20/2008
Original Date of Licensure
STATE OF COLORADO
LICENSED LANDSCAPE ARCHITECT

NO.	REVISION DESCRIPTION	REVISED BY	ACCEPT. BY	DATE
1	REVISED 4.10.18 ADD NORTH HALF OF SITE	TD	TD	4.10.18

SCHMIDT EXISTING VEGETATION SURVEY

DEPARTMENT OF PUBLIC WORKS
TOWN OF ERIE

SCALE:
DATE:
DRAWN BY: TD
CHECKED BY: TD
JOB NO: D1048

SHEET NO. 19
OF 19 SHEETS 20
DRAWING NO.

NARRATIVE:

THE PREDOMINATE SPECIES OF TREES ON THE SCHMIDT PROPERTY ARE ELM TREES. THESE TREES ARE "VOLUNTEER" TREES AND WERE MOST LIKELY NOT PLANTED BY THE PROPERTY OWNER.

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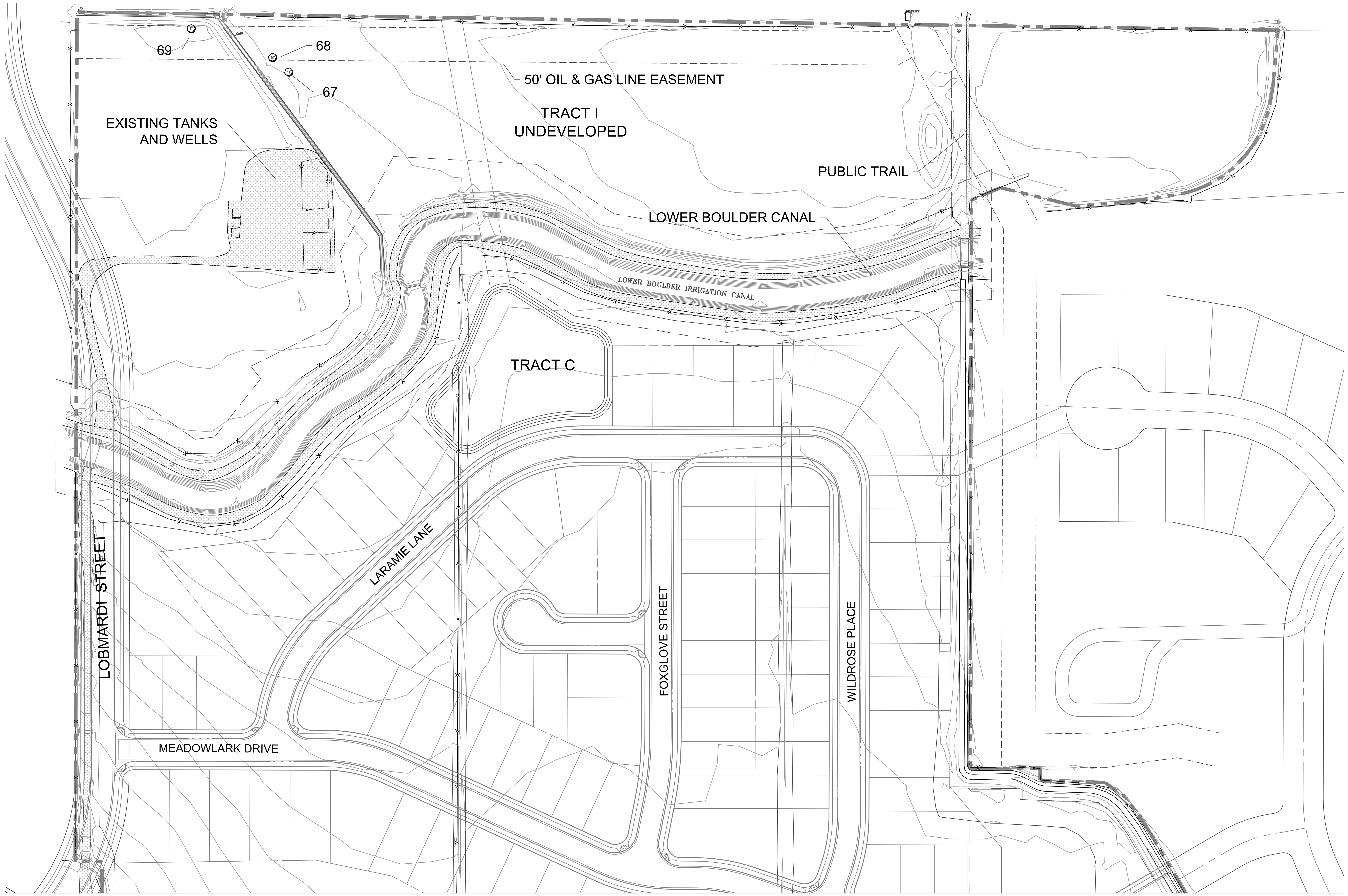

SCHMIDT EXISTING VEGETATION SURVEY NORTH HALF OF SITE

0 80' 160'

North Scale 1"=80'

LANDSCAPE ARCHITECT:

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Tucson - San Diego - Sacramento - Riverside - Orange - San Luis Obispo - Phoenix

TIM DUNN 400 02/20/2008 Original Date of Licensure STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT

NO.	REVISION DESCRIPTION		REVISED BY	ACCEPT. BY	DATE
1	REVISED 4.10.18	ADD NORTH HALF OF SITE	TD	TD	4.10.18

SCHMIDT EXISTING VEGETATION SURVEY

DEPARTMENT OF PUBLIC WORKS
TOWN OF ERIE

SCALE:	SHEET NO. 20
DATE:	
DRAWN BY: TD	OF 20 SHEETS 20
CHECKED BY: TD	DRAWING NO.
JOB NO: D1048	

EXISTING TREE DATA CHART

TREE	TYPE	CALIPER SIZE/HEIGHT	CONDITION	TO REMAIN
1	MAPLE	8" MULTI STEM/25'	FAIR	YES
2	ELM		DEAD	
3	ELM		DEAD	
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5	ELM	16" CAL./40' HT.	POOR	
6	BLUE SPRUCE	12' HT.	GOOD	
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SHRUBS

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B	JUNIPER SHRUBS	4' HT.	FAIR	YES
C	JUNIPER SHRUBS	6' HT.	FAIR	YES

GENERAL NOTES:

THE PREDOMINATE SPECIES OF TREES ON THE SCHMIDT PROPERTY ARE ELM TREES. THESE TREES ARE "VOLUNTEER" TREES AND WERE MOST LIKELY NOT PLANTED BY THE PROPERTY OWNER.

DUE TO LACK OF IRRIGATION AND ROUTINE MAINTENANCE ALMOST ALL TREES ARE IN A POOR TO FAIR CONDITION THROUGHOUT THE SITE.

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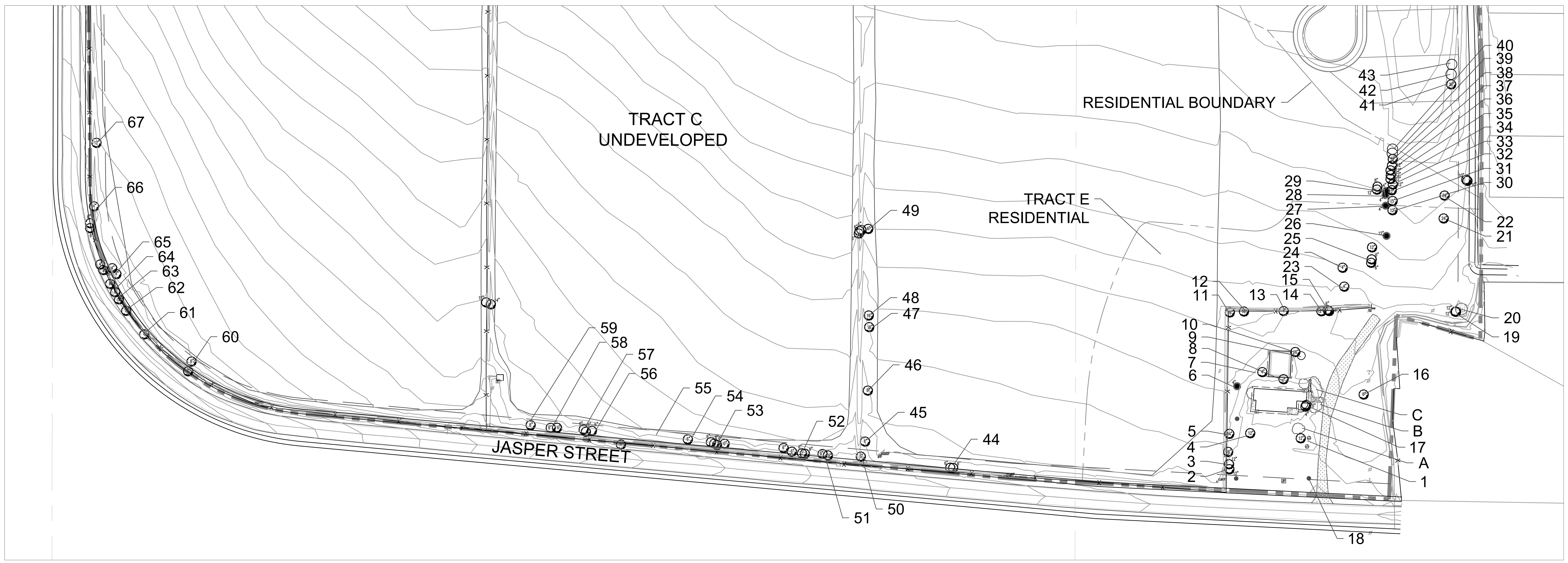

0 80' 160'

North Scale 1"=80'

LANDSCAPE ARCHITECT:

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TIM DUNN 400 02/20/2008 Original Date of Licensure STATE OF COLORADO LICENSED LANDSCAPE ARCHITECT

NO.	REVISION DESCRIPTION	REVISED BY	ACCEPT. BY	DATE
△	–	–	–	–

SCHMIDT EXISTING VEGETATION SURVEY

DEPARTMENT OF PUBLIC WORKS
TOWN OF ERIE

SCALE:

DATE:

DRAWN BY: TD

CHECKED BY: TD

JOB NO: D1048

SHEET NO.

OF SHEETS

DRAWING NO.

MINE SUBSIDENCE INVESTIGATION

Lost Creek Farm

90.032 Acres Northeast Quarter Section 13
Township 1 North, Range 69 West
Erie, Colorado 80516

Prepared For:

McStain Neighborhoods
7100 North Broadway, #5H
Denver, Colorado 80221

WESTERN ENVIRONMENT AND ECOLOGY, INC.

2217 West Powers Avenue
Littleton, Colorado 80210
phone (303) 730-3452
fax (303) 730-3461
www.westernenvironment.com

MINE SUBSIDENCE INVESTIGATION

Lost Creek Farm

90.032 Acres Northeast Quarter Section 13
Township 1 North, Range 69 West
Erie, Colorado 80516

Prepared For:

McStain Neighborhoods
7100 North Broadway, #5H
Denver, Colorado 80221

Project Number 45-021-01

July 29, 2016

Prepared By:

____
Greg D. Sherman, P.G.
President

WESTERN ENVIRONMENT AND ECOLOGY, INC.
2217 West Powers Avenue
Littleton, Colorado 80120
phone (303) 730-3452
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TABLE OF CONTENTS

FIGURES:

APPENDICES:

1.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of the investigation completed on the proposed Lost Creek Farm Subdivision, Erie, Colorado. Western Environment and Ecology, Inc. (Western Environment) presents the following:

- The top of the Longs Peak Mine ranges between 54 and 86 feet below the surface.
- Open voids (un-collapsed mine workings) were encountered during the investigation.
- The borings completed on the Lost Creek Farm project confirmed the northern limit of mine workings.

Using these conclusions, the following subsidence related recommendations for development are presented.

- **No mine subsidence related development or building restrictions are required north of the 0% strain line as shown on Figure 2.**
- **Due to the shallow depth of mine, sinkhole type subsidence has occurred and is likely to occur in the future south of the 0% strain line shown on Figure 2.**
- **Western Environment recommends that no utilities be constructed in the areas indicated on Figure 9 that are likely locations for sinkholes**.
- **A strain isolation trench (as described in the Appendix) should be constructed along the southern lot boundaries between borings M-20 and M-37.**
- **Home owners should be made aware of the potential risks for the appearance of sinkholes south of the 0% Strain Line.**

2.0 INTRODUCTION

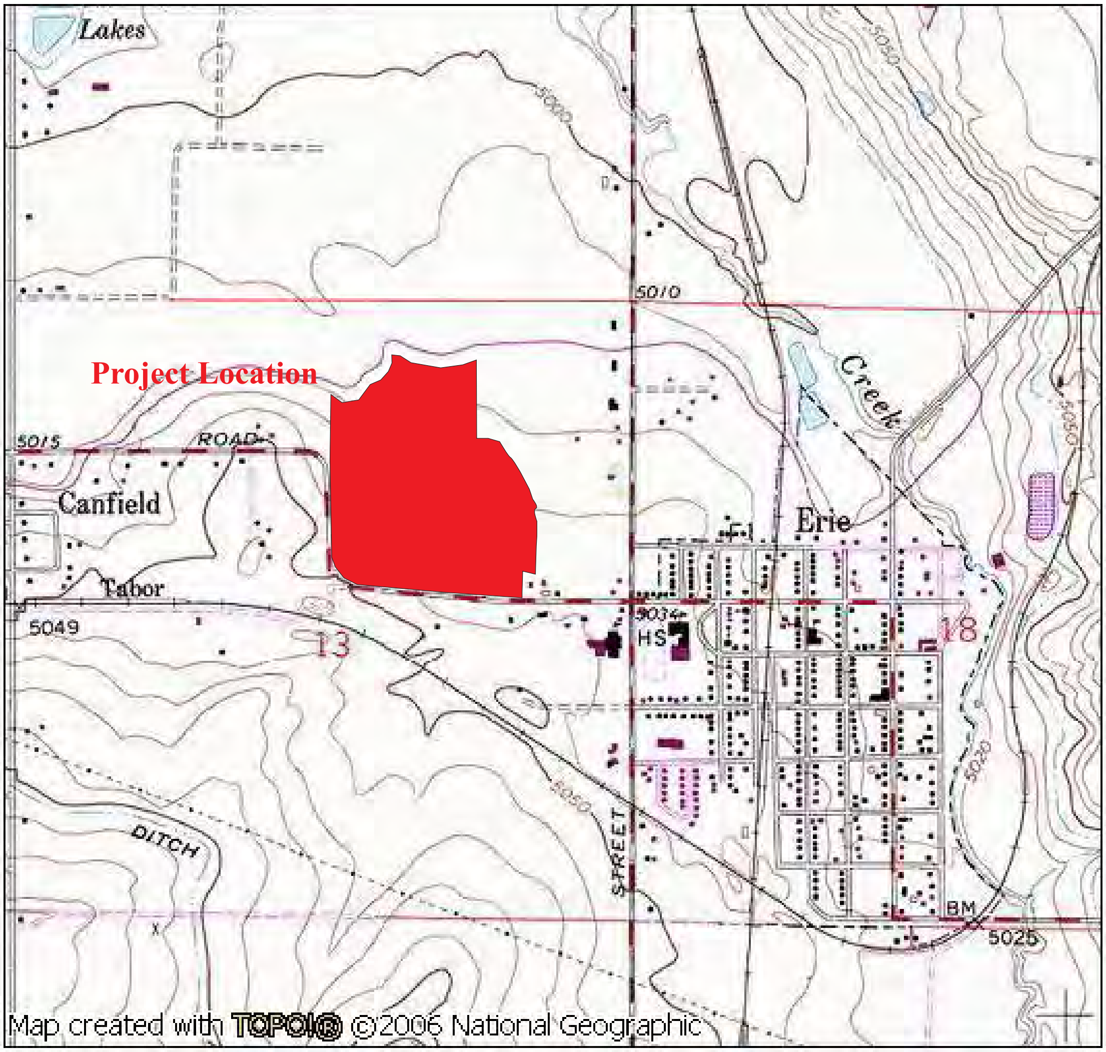
Western Environment & Ecology, Inc. (Western Environment) was retained by Mr. Mike Weiss, Land Development Manager for McStain Neighborhoods (McStain) to conduct a mine subsidence investigation of the proposed Lost Creek Farm subdivision in Erie, Colorado (Figure 1). McStain proposes to develop 107 single family detached residential lots on 32.89 acres of the 90 acre site. McStain develops and builds residential communities throughout the Colorado Front Range since 1966 and has completed several project on undermined properties.

The purpose of this investigation is to confirm and further delineate the northern extent of mine workings of the Longs Peak Mine. Based upon the data developed, specific recommendations for subsidence resistant planning, construction procedures and techniques are given.

Western Environment performed two earlier assessments on this site. The first (Project # 215-001-01) dated September 14th, 2000 was completed for Melody Homes, Inc. A second supplemental investigation, dated July 21, 2005, was conducted for D. R. Horton Inc. Data obtained during these previous investigations was submitted to the Colorado Geological Survey (CGS) for review and comment. As such, this information is public record and was incorporated into this report.

The CGS reviews (Appendix A) began on November 2, 2000 with a comment from Celia Greenman that stated “I reviewed their report dated September 2000 on the Schmidt property and agree with the conclusions and recommendations” additionally Ms. Greenman writes “Construction should only take place north of the 0 percent strain line shown in Figure 2 of the WE&E report.”. In subsequent CGS reviews from T.C. Wait dated May 12th and July 5th, 2005, Ms. Wait states that “CGS does not recommend approval for this proposed development at this time.” She includes in her July 5th, 2005 letter that 3 or 4 additional borings should be advanced north of the 0% strain line to help define the extent of mining.

The results and recommendations contained herein are intended for use as an aid in planning and design. The information should be made available to the project geo-technical and structural engineers. Additionally, this report should accompany the site development plan when submitted to the Town of Erie. The Town will then request that the Colorado Geological Survey review and comment on the subsidence investigation. This process will aid in assuring a more predictable and thus economic development process.



NATIONAL GEOGRAPHIC

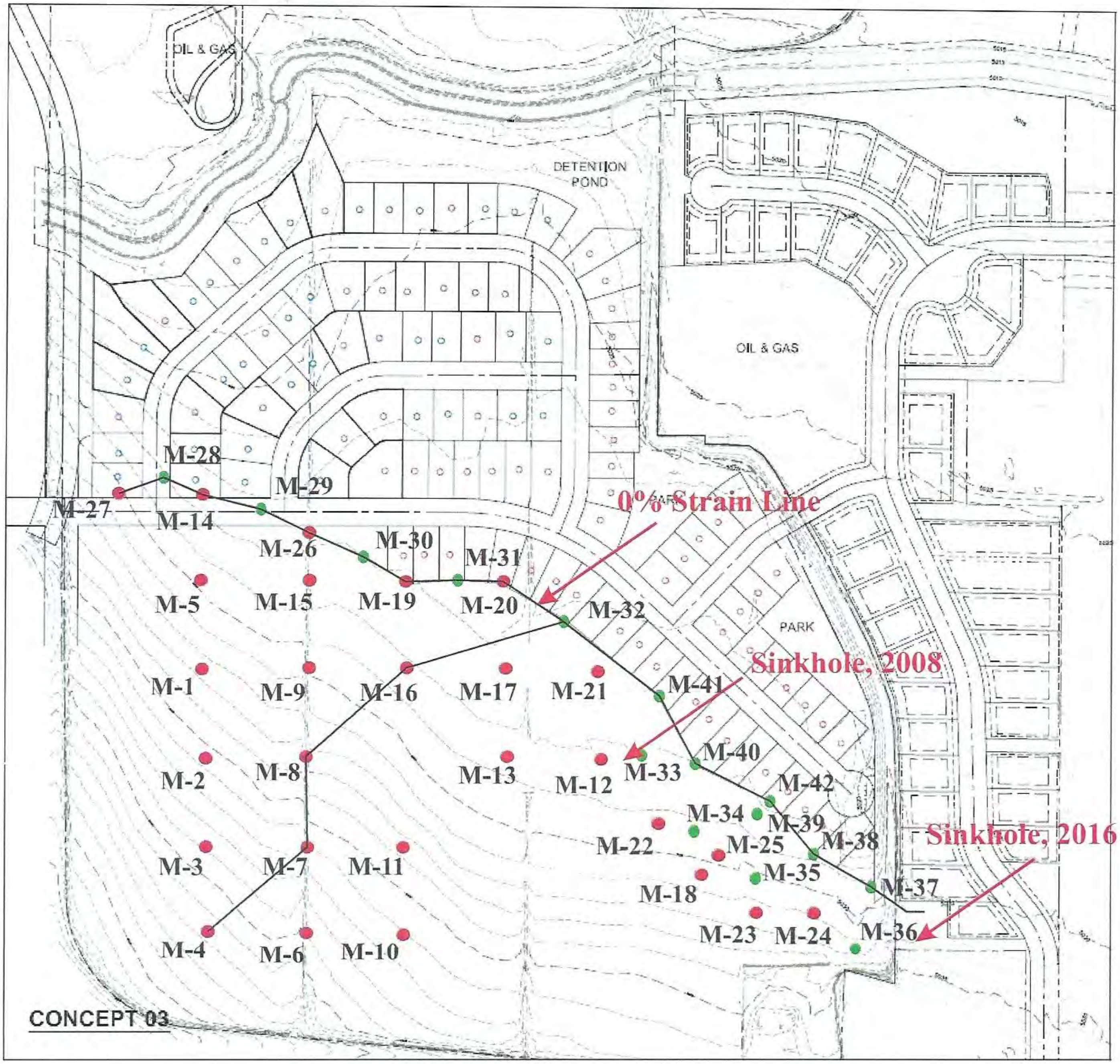
0.0 0.5 1.0 miles
0.0 0.5 1.0 1.5 km

TN MN 8½°

12/16/15

Western environment
and ecology, inc.
2217 West Powers Avenue
Littleton, Colorado 80120

Figure 1 Project Location Map
Lost Creek Farm II
Erie, Colorado



M-4 ● Melody Homes and DR Horton LLC Borings

M-36 ●

Geologic Cross Sections (Figures 14 and 15)

Scale in feet

0 200

WESTERN ENVIRONMENT AND ECOLOGY, INC. 2217 West Powers Avenue Littleton, Colorado 80120	**Figure 2 Site Map Showing Boring Locations Lost Creek Farm Filing II Erie, Colorado**

3.0 SITE CHARACTERISTICS

This mine subsidence investigation was conducted for approximately 90 acres in the northeast quarter of Section 13, Township 1 North, Range 69 West, in Erie, Colorado (Figure 1). The site is located north of Jay Street where it transitions to Jasper Road which borders the west side of the project. The Lower Boulder Ditch bisects the norther portion of the parcel. Vacant and agricultural properties border the site on the east and west respectively. Single family residential developments occur to the east and north.

Aerial view to north, circular feature in center 2008 subsidence event

4.0 COAL MINE DESCRIPTION

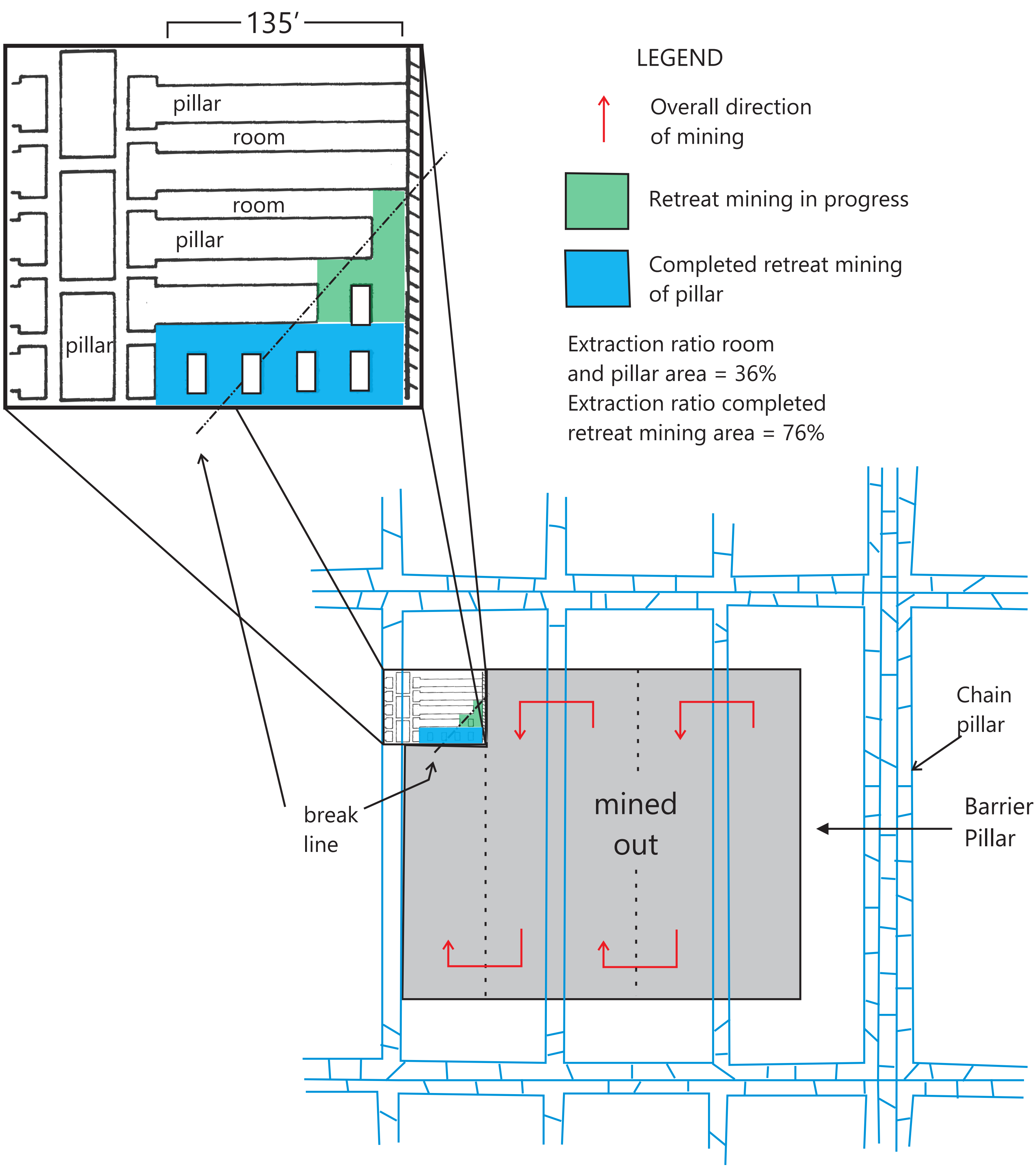
The mine located beneath the proposed Lost Creek Farm Filing #2 development is referred to as the Longs Peak Mine. Production from the Longs Peak Mine began in 1892 and continued until December of 1900. A total of 32,490 tons of sub-bituminous grade coal was produced from this operation. The original owner of the mine, the United Coal Company, operated from 1892 to 1896. From 1896 to 1900, the Longs Peak Coal Company was the owner of record.

The Longs Peak Mine accessed by a 100 foot deep, two compartment shaft located approximately 150 feet south of the proposed development, south of Jay Road. The air shaft is located 75 feet northwest of the main shaft.

The Longs Peak Mine utilized the retreat method of coal extraction (Figure 3). Based upon geologic conditions either a single approximately 150 foot working face was developed or random individual rooms mined. Following development of the rooms, the intervening pillars were mined leaving irregular stumps. This retreat was performed on a generally regular basis down each working face and then back along the adjacent unworked face.

Western Environment has performed numerous mine subsidence investigations in the Erie area. Several of the studies were conducted adjacent to the Lost Creek property. As a result of the investigations it became apparent that numerous discrepancies exist between the original mine maps and the actual mine locations as determined from drilling. It is our opinion that a land survey error, involving the monument for the Center of Section 13, of Township 1 North and Range 69 West, was made in the mid 1800's. It is likely this error was identified and corrected in the early 1900's as mine location references appear correct in later operations.

As a result of this error, the original mine map for the Longs Peak Mine is inaccurate and cannot be relied upon.



Literature Cited: Gray, Richard E. and Robert W. Bruhm, Coal Mine Subsidence - Eastern United States. Geological Society of America, Volume VI, 1984. And Tomlinson, H., "A Study of Falls of Roof and Coal In Northern Colorado", Dept. of Commerce, U.S. Bureau of Mines, Report of Investigations 3199, Jan., 1933.

w e s t e r n e n v i r o n m e n t a n d e c o l o g y , i n c
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Figure 3 Pillar Retreat Method for Coal Mining
Lost Creek Farm Filing II
Erie, Colorado

5.0 DRILLING PROCEDURES

Forty two borings, ranging in depth from sixty to hundred and twenty feet, were drilled under the supervision of Western Environment on the Lost Creek Farm property. The original 21 borings (M-1 through M-21) which were performed for Melody Homes, were completed using a truck mounted Mayhew 1500 mud rotary drill. Borings M-22 through M-27, which were drilled for D.R Horton, Inc. were solid stem auger borings that utilized a Mobil-B60 drill. The use of an auger drill did not allow for lithology samples to be obtained. The recent drilling (M-28 through M-42) conducted on behalf of McStain used a truck mounted Mobil-B 60 mud rotary drill with an external 3X4 inch mud pump.

All holes were geophysically logged. Geophysical logs consisting of natural gamma, spontaneous potential (SP), resistance and a three arm caliper were run on all holes intercepting the mine workings (Appendix B). The caliper tool was calibrated prior to each use to graphically show the diameter of the hole. The full extension of the arms would indicate a cavity of at least greater than 21 inches. The drill will normally make a 5.125 inch hole. Therefore, a significantly larger or smaller hole could indicate mining activity. Lithologic strip logs (Appendix C) were taken of cutting samples at five foot intervals, with the referenced exception of the auger holes (M-22 through M-27) which were only geophysically logged.

After drilling and logging, each hole required plugging in a manner which would not allow water to enter the workings. On all holes, a simple cement plug was set from near the surface to 35 feet with the remaining footage of the hole being filled with Colorado State Mined Land Reclamation Board approved abandonment fluid designed to inhibit fluid penetration. Native soil was replaced at the surface.

Mud rotary drilling

6.0 REGIONAL GEOLOGY

6.1 Outcropping Units

Outcropping units within and surrounding the Erie area are the Pierre Shale, the Fox Hills Sandstone, the Laramie Formation and Quaternary gravels and soils (Figure 4).

The Pierre Shale is a lead gray to brown and black shale of marine origin. Total thickness in the area is greater than 7,000 feet (Blair 1951), with the majority of the formation made up of shale. Near the top of the Pierre Shale it becomes increasingly sandy and contains beds of fine sandstones and siltstones as it grades into the Fox Hills Sandstone. This unit does not outcrop on the site but can be seen approximately one mile east of the project adjacent to the Erie Cemetery

The Fox Hills Sandstone is a massive to crossbedded sandstone. It was deposited in a beach and/or delta-front environment and comfortably overlies the Pierre Shale. The lower two-thirds of the formation is a fine to coarse grained, bluff colored sandstone which weathers to a light tan to tan color. The Fox Hills Sandstone contains numerous iron colored calcareous concretions, ranging in size from fractions of an inch to several feet. The upper one-third of the Fox Hills Sandstone is a fine to medium grained, light grey to pale yellow in color, crossbedded sandstone. The total thickness of the formation near this location is about 140 feet as measured in the NW 1/4 of Section 28, T1S, R70W. Thickness varies from 60 feet near Ralston Creek (Van Horn, 1957) to 250 feet near Baseline Reservoir.

The Laramie Formation, which directly underlies the site is predominantly a fresh water deltaic sequence, consisting of clays, sands, silts and coals (Figure 5). The lower portion is approximately 100 feet thick and is composed of sandstones, sandy shales, claystones, and coal beds. These coals have been economically mined in the past. The upper unit has a thickness of approximately 600 feet and is made up of mostly clay shales, very fine sandy shales, and lenticular beds of sandstone. The shales are largely carbonaceous and in places becomes lignitic. The Laramie Formation lies comfortably on the Fox Hills Sandstone.

6.2 Structure

The Lost Creek Farm project lies on the western edge of the Denver-Julesberg Basin against the Front Range Uplift. This basin contains up to 13,000 feet of sediments derived from the ancestral Rockies which laid to the west. Two kinds of faulting occur in this portion of the

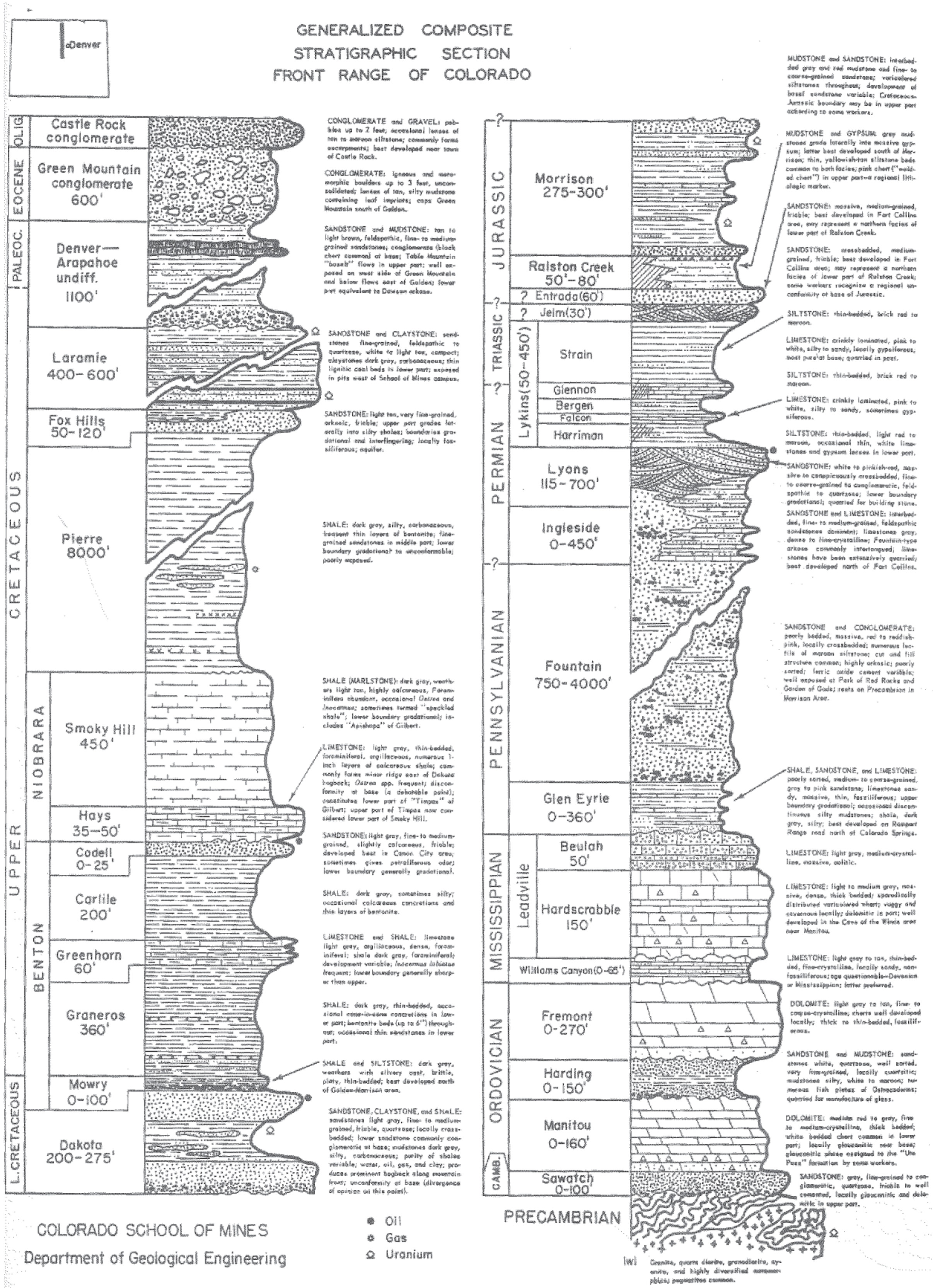

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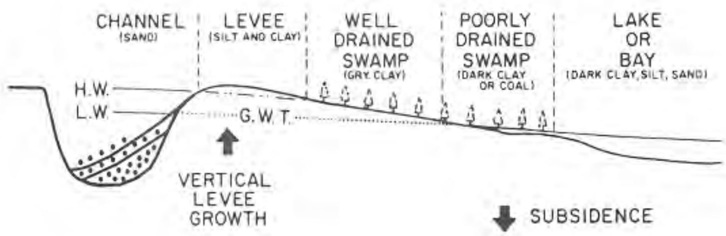
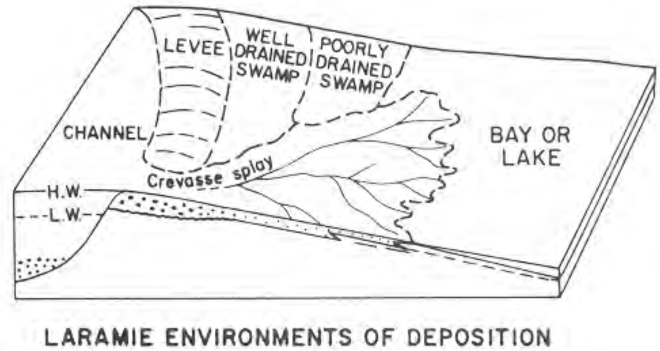
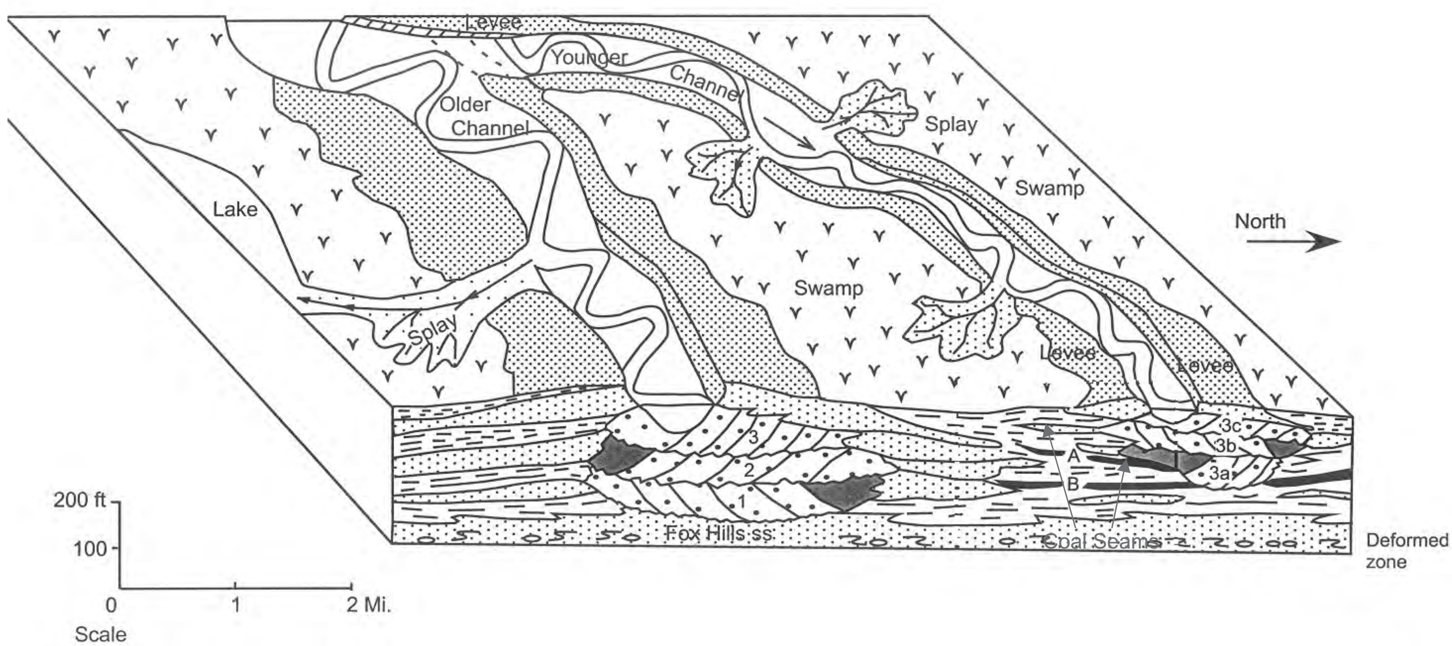
Figure 4 - Generalized Stratigraphic Section
Lost Creek Farm Filing II
Erie, Colorado



Channel and channel margin environments for lithologies in Laramie Formation.



Relationship of channel margin environments to crevasse splay deltas.



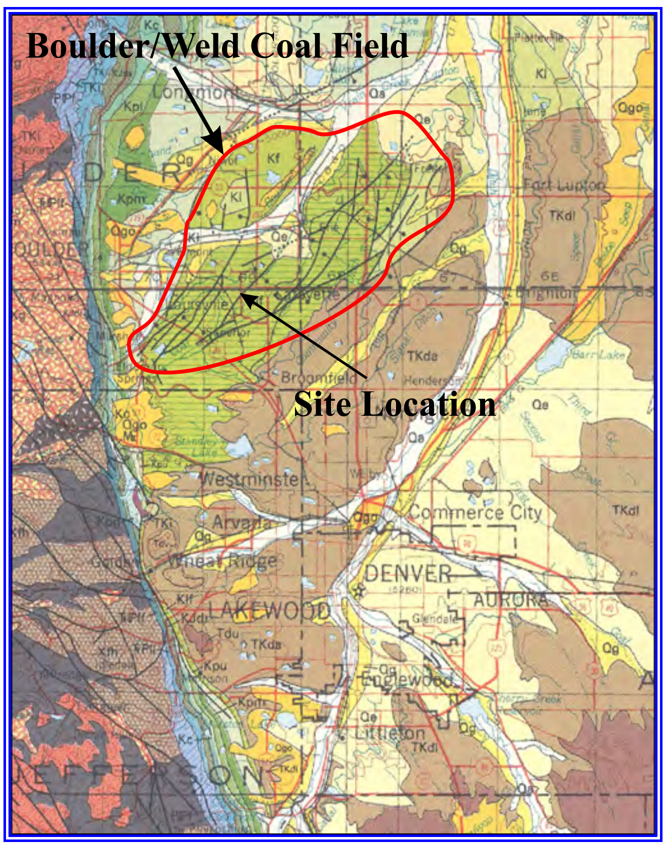
Figures from: A Guide to the uppermost Cretaceous stratigraphy, central Front Range Colorado, deltaic sedimentation, growth faulting and early Lamide vertical Movement
Weimer, R.J. 1973

w e s t e r n e n v i r o n m e n t a n d e c o l o g y , i n c 2217 West Powers Avenue Littleton, Colorado 80120	**Figure 5 - Generalized Stratigraphic Models of the Laramie Formation Lost Creek Farm Filing II Erie, Colorado**

basin. A basement-controlled late Cretaceous Laramide faulting is the most prevalent and is the result of deformation associated with uplift. The second basin has been described by Davis and Weimer (1976) as growth-faulting as a result of differential loading of the deltaic sequence at the time of deposition.

Growth faulting is the major structural feature seen in the area. A zone is present with dominant faults trending in a northeasterly direction. This system is ten miles wide and thirty miles long. These faults are high-angle, normal structures near the surface, but seismic work has shown that they tend to flatten and die out at depth. Work by Davis and Weimer (1976) shows that these listric normal faults do not continue below the Hygiene Member of the Pierre Shale. Antithetic faults resulting from tension then form horst and grabens. This effect had resulted in the increased thickness of sediments in the graben areas. The Fox Hills Sandstone has been reported to have a thickness near a growth fault of 484 feet (Spencer, 1961). The Laramie Formation also has increased thickness in these zones and this is believed to be the reason for the increased thickness of the coal seams in the Boulder-Weld coal field.

Recently investigators have recognized low angle reverse faults in the Boulder-Weld area. Kittleson (2009) describes the Longmont Detachment and identifies the Romero Fault as the footwall to the Detachment. These detachments are analogous to large scale sub-aqueous landslides, occurring in rocks exhibiting incomplete lithification. The footwalls to these detachments are low angle reverse faults seen on several projects near the subject site. Western Environment has documented a detachment fault approximately 2,000 feet south of the Lost Creek Farms subdivision.



Boulder/Weld Coal Field

7.0 SITE GEOLOGY

Four distinct geological units were encountered during drilling on the Lost Creek Farm subdivision. The uppermost unit is a sandy clay soil (loess), likely of aeolian origin, ranging from the surface to 40 feet in depth. It has been our experience that this soil, while not expansive, can collapse upon wetting. Beneath the soil is a medium grained clayey gravel. The gravel, when encountered, ranged from 20 to 60 beneath the surface. A pronounced "channel" was identified in the vicinity of boring M-21 where the gravel, which was normally 15 to 20 feet thick, increased to 34 feet. Groundwater was encountered from 9 to 16 feet.

The next unit penetrated was the Cretaceous Age Laramie Formation. This unit was encountered between 35 to 60 feet below grade and consists primarily of medium to dark gray claystone. The Laramie Formation claystones are interbedded with minor non-continuous coals and thin, well-cemented, fine grained, gray sandstone and silts. The Longs Peak Mine extracted from a single seam 5.0 foot thick that ranged in depth from 55 to 85 feet.

The lowest geologic unit, only encountered in borings M-4, 6, 11, 12, 16, 19, 20 and 21, is the Cretaceous Age Fox Hills Sandstone. The contact between the Laramie Formation and the Fox Hills Formation is placed at the first major sandstone beneath the lowest most coal and occurs on the Lost Creek Farm project at between 60 and 100 feet. The Fox Hills Formation is characterized by fine-grained, well-sorted, gray sandstone with characteristic limonite nodules.

While the original mine map can be interpreted to indicate that mining was limited on the west and north by faults, Western Environment was unable to confirm their existence. It is our opinion that mining was limited, in particular on the north, by the main seam encountering the gravel paleo-channel. The attached geologic Cross Sections, Figures 8 and 9, show a pronounced dip to the southwest of the main seam. As the main seam neared the paleo-channel the structural integrity of the roof rock would decease to a point that collapse of the mining would occur. This collapse appears to occur when the roof of the mine is less than 20 feet below the gravel at a depth of approximately 60 feet below the surface.

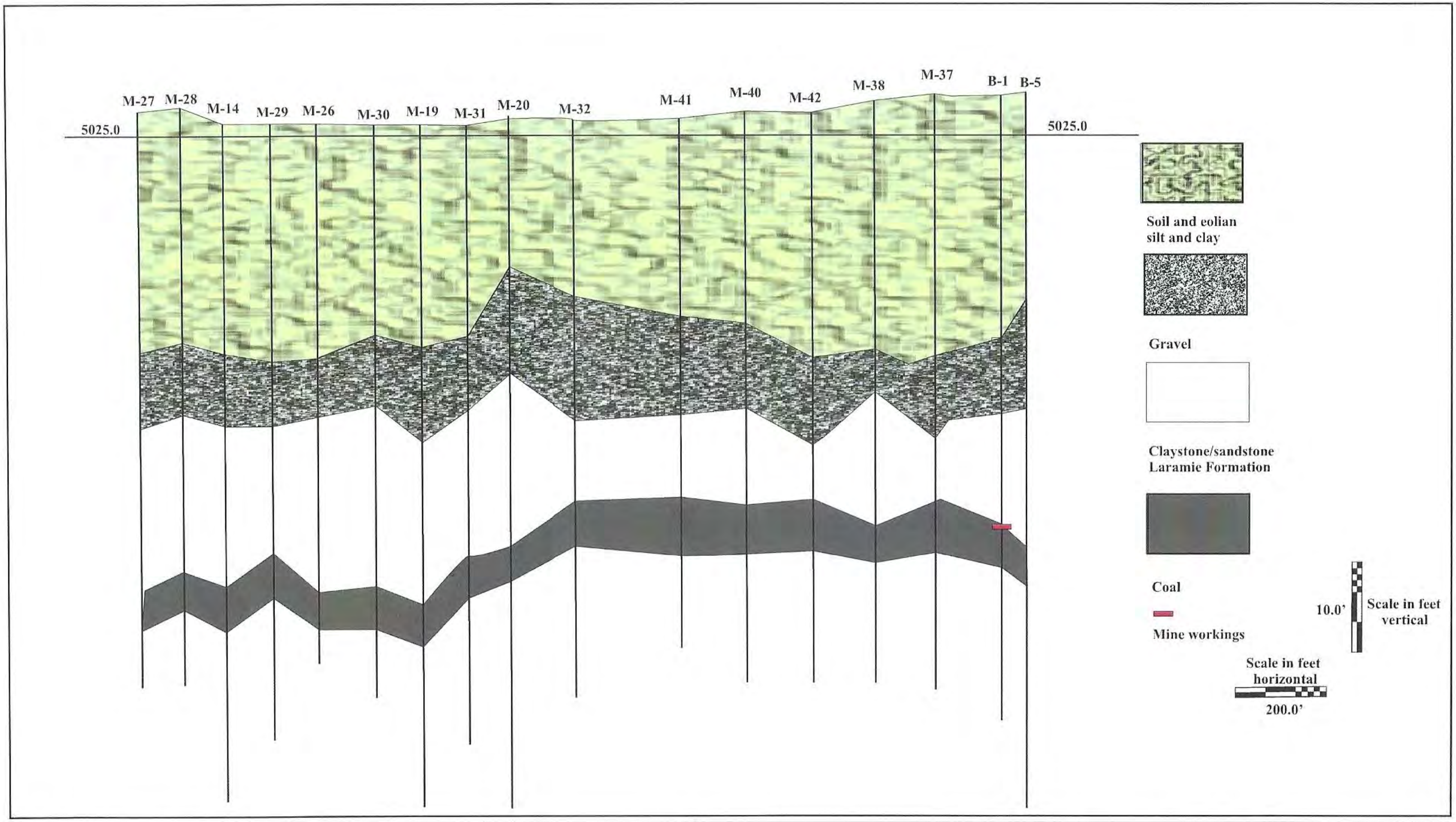


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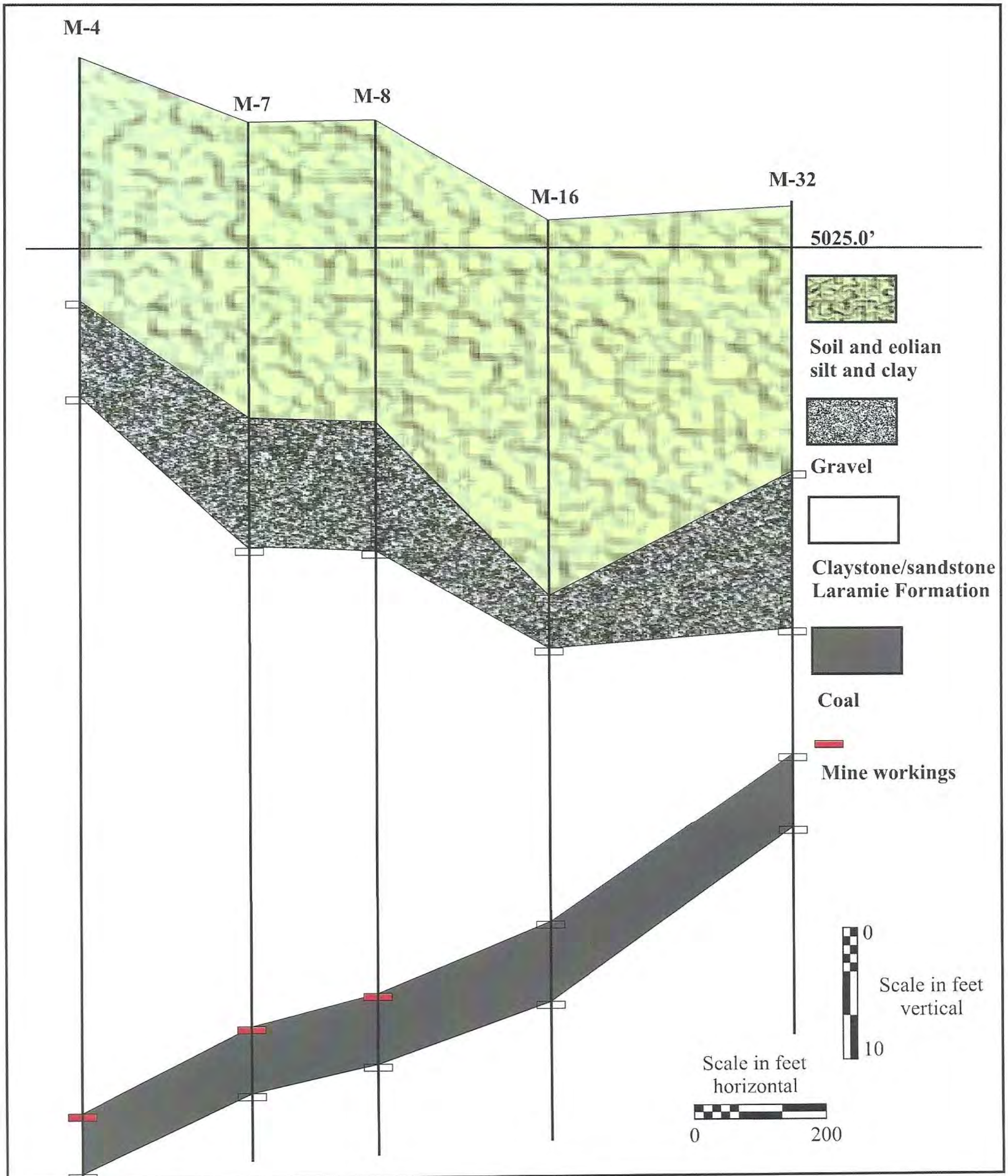
Figure 6 Northwest/Southeast Geologic Cross Section
Lost Creek Farm Filing II
Erie, Colorado



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Littleton, Colorado 80120

Figure 7 Southwest/Northeast Geologic Cross Section Lost Creek Farm Filing II Erie, Colorado

8.0 DESCRIPTION OF HOLES

The description of each rotary hole drilled on the Lost Creek Farm Filing #2 Subdivision were derived from the electric logs and the lithologic logs taken from the cutting samples. Borings M #22 through #27 were drilled using a 4.5 inch solid flight auger. As such, no lithologic logs were taken. The descriptions of borings M-22 through M-27 are based solely on the electric logs. The geophysical and lithologic logs are presented in the Appendix.

M 1:

A light brown, grading to grey, argillaceous soil occurred from 0 to 28 feet. A layer of medium grey claystone was encountered from 28 to 60 feet. Drilling circulation was lost at a depth of 60 feet. The "main" seam interval occurred from 74 to 78 feet. The total depth of the hole was 100 feet. The maximum caliper deflection was 13" at 59 feet. Collapse was complete with no open voids.

M 2:

A light brown argillaceous soil occurred from 0 to 20 feet. From 20 to 30 feet medium grained gravel was penetrated. A layer of medium grey claystone with minor sandstone was encountered from 30 to 60 feet. A mixture of medium grey sandstone and claystone was penetrated from 65 to 75 feet. The "main" coal seam interval occurred at a depth of 78, where drilling circulation was lost. The caliper log indicated a 5.0 foot **open void** occurring from 78 to 82 feet. Total depth of the hole was 100 feet.

M 3:

A light brown argillaceous soil occurred from 0 to 30 feet. A layer of light brown to grey sandstone with traces of coal was present from 35 to 45 feet. Medium to dark grey claystone was encountered from 55 to 85 feet. The "main" coal seam was penetrated from 85 to 90 feet. Light grey sandstone was penetrated from 95 to 120 feet. Total depth of the hole was 120 feet. No mine workings were encountered.

M 4:

A light brown argillaceous soil occurred from 0 to 20 feet. A layer of light brown to medium grey sand, with gravel, was encountered from 20 to 25 feet. Light brown to medium grey sandy claystone was observed from 30 to 40 feet. Light to medium grey claystone was penetrated from 45 to 70. Claystone with traces of coal occurred from 70 to 86 feet. The "main" coal seam interval was penetrated from 86 to 92 feet. Total depth of the hole was 120 feet. Maximum caliper deflection of 9.5" occurred at 88 feet. Collapse was complete with no open voids.

M 5:

A light brown grading to grey argillaceous soil occurred from 0 to 30 feet. Medium grained gravel was present from 30 to 36 feet. Medium grey claystone was encountered from 36 to 60 feet. Light grey sandy claystone was observed from 60 to 65 feet, where drilling circulation was lost. Total depth of the hole was 100 feet. Maximum caliper deflection of 16.2" occurred at 73 feet. Collapse was complete with open voids.

M 6:

Light brown argillaceous soil occurred from 0 to 10 feet. Medium grained gravel was present from 10 to 25 feet. Light brown claystone, was encountered from 25 to 40 feet. Medium grey claystone with traces of coal was observed at 40 to 45 feet. A medium to dark grey claystone was penetrated from 45 to 77 feet. The “main” coal seam was present from 77 to 82 feet. A light grey sandstone was encountered from 82 to 120 feet. Total depth of the hole was 120 feet. No mine workings were encountered.

M 7:

A light brown argillaceous soil occurred from 0 to 25 feet. Medium grained gravel was present from 25 to 35 feet. Light to medium grey claystone was encountered from 35 to 65, where drill circulation was lost. The “main” seam interval was penetrated from 74 to 80 feet. Total depth of the hole was 100 feet. Maximum caliper deflection of 18.8" at 78 feet. Collapse was complete with no open voids.

M 8:

A light brown argillaceous soil occurred from 0 to 25 feet. Medium grained gravel was present from 25 to 35 feet. Light brown to medium grey claystone was encountered from 35 to 60 feet. The "main" coal seam interval was penetrated from 65 to 70 feet. A layer of medium grey claystone was observed from 70 to 80 feet, where drill circulation was partially lost. Total depth of the hole was 100 feet. Maximum caliper deflection of 8.3" occurred at 68 feet. Collapse was complete with no open voids.

M 9:

A light brown argillaceous soil occurred from 0 to 40 feet. Medium grey claystone was encountered from 40 to 60 feet, where drill circulation was lost. Total depth of the hole was 100 feet. The caliper indicated an **open void** occurring from 62 to 64 feet.

M 10:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium grained gravel was present from 30 to 40 feet. Medium grey claystone was encountered from 40 to 65 feet. The "main" coal seam interval was penetrated from 68 to 72 feet. Medium grey claystone was observed at 80 feet where circulation was lost. The maximum caliper deflection of 8 inches occurred at 70 feet. Total depth of the hole was 100 feet. Collapse was complete with no open voids.

M 11:

A light brown argillaceous soil occurred from 0 to 25 feet. A layer of light brown to grey gravel with sand was penetrated from 25 to 35. Medium grey claystone was encountered from 35 to 70 feet. The "main" coal seam was encountered from 70 to 75 feet. A layer of light grey sandstone was observed from 80 to 100 feet. The maximum caliper deflection of 12 inches occurred at 60 feet. Total depth of the hole was 100 feet. No mine workings were encountered.

M 12:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium to coarse gravel occurred from 30 to 35 feet. Medium grey claystone was penetrated from 40 to 50 feet. The "main" coal seam was encountered at 55 to 60 feet. Light to medium grey sandstone was observed fiom 60 to 80 feet. Total depth of the hole was 80 feet. No mine workings were encountered.

M 13:

A light brown argillaceous soil occurred from 0 to 30 feet. Gravel occurred from 30 to 40 feet. A light brown to grey sandy claystone was encountered from 40 to 55 feet, where drill circulation was lost. Total depth of the hole was 75 feet. The hole collapsed at 50 feet.

M 14:

A light brown to grey argillaceous soil occurred from 0 to 35 feet. Medium grained gravel was present from 35 to 45 feet. Medium grey claystone was penetrated from 45 to 60 feet. The "main" coal seam was encountered at 65 to 70 feet. Light grey sandstone was observed from 70 to 100 feet. Total depth of the hole was 100 feet. No mine workings were encountered.

M 15:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium grained gravel occurred from 30 to 35 feet. A layer of medium grey claystone was encountered from 40 to 65 feet, where circulation was lost. Total depth of the hole was 80 feet. The caliper log indicated an **open void** occurring from 62 to 68 feet.

M 16:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium to fine grained gravel was present from 30 to 35 feet. Medium grey claystone was penetrated from 35 to 65 feet. A lens of medium grey sandstone was encountered at 65 to 75 feet. The "main" coal seam was observed at 70 to 75 feet. A light grey sandstone was present from 75 to 80 feet. Total depth of the hole was 80 feet. No mine workings were encountered.

M 17:

A light brown argillaceous soil occurred from 0 to 25 feet. Medium grained gravel was present from 25 to 40 feet. Medium grey sandy claystone was encountered from 40 to 55 feet, where drill circulation was lost. The “main “seam interval occurred from 53 to 58 feet. The maximum caliper deflection was 14 inches at 55 feet. Total depth of the hole was 75 feet. Collapse was complete with no open voids.

M 18:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium to fine grained gravel was present from 35 to 40 feet. Medium grey claystone with traces of coal was encountered at 45 feet, where drill circulation was lost. Total depth of the hole was 80 feet. The “main” seam interval occurred from 55 to 60 feet. The maximum caliper deflection of 14 inches occurred at 59 feet. Collapse was complete with no open voids.

M 19:

A light brown argillaceous soil occurred from 0 to 25 feet. Medium grained gravel was present from 25 to 50 feet. Medium grey claystone was penetrated from 50 to 65 feet. A medium to light grey clayey sandstone was present from 65 to 80 feet. A light grey sandstone was encountered from 80 to 100 feet. Total depth of the hole was 100 feet. No mine workings were encountered.

M 20:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium to fine grained gravel was present from 30 to 45 feet. A layer of medium grey claystone was penetrated from 45 to 65 feet. A medium to light grey clayey sandstone was present from 65 to 100 feet. A light grey sandstone was encountered from 100 to 120 feet. Total depth of the hole was 120 feet. No mine workings were encountered.

M 21:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium to fine grained gravel was present from 30 to 60 feet. A layer of medium grey claystone was penetrated from 60 to 80 feet. A medium to light grey clayey sandstone was present from 80 to 100 feet. A light grey sandstone was encountered from 100 to 120 feet. Total depth of the hole was 120 feet. No mine workings were encountered.

M 22:

Hole collapsed after drilling.

M 23:

The "main" coal seam was penetrated from 56 to 60 feet. Total depth of the hole was 60 feet. No mine workings were encountered.

M 24:

The "main" coal seam was penetrated from 49 to 54 feet. Total depth of the hole was 70 feet. No mine workings were encountered.

M 25:

The "main" coal seam was not encountered. Total depth of the hole was 70 feet. No mine workings were encountered.

M 26:

The "main" coal seam was encountered from 57 to 65 feet. Total depth of the hole was 65 feet. No mine workings were encountered.

M 27:

The "main" coal seam was encountered from 57 to 59 feet. Total depth of the hole was 70 feet. No mine workings were encountered.

M 28:

A light brown argillaceous soil occurred from 0 to 25 feet. Medium to fine grained gravel was present from 25 to 40 feet. Medium grey claystone was penetrated from 40 to 55 feet. The "main" coal seam was observed at 53 to 57 feet. A light grey sandstone was present from 60 to 70 feet. Total depth of the hole was 70 feet. No mine workings were encountered.

M 29:

A light brown argillaceous soil occurred from 0 to 25 feet. Medium grained gravel was present from 25 to 40 feet. Medium grey claystone was penetrated from 40 to 45 feet. The "main" coal seam was observed at 45 to 51 feet. A light grey sandstone was present from 55 to 75 feet. Total depth of the hole was 75 feet. No mine workings were encountered.

M 30:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium grained gravel was present from 30 to 40 feet. Medium grey claystone was penetrated from 40 to 60 feet. The "main" coal seam was observed at 57 to 64 feet. A light grey sandstone was present from 65 to 75 feet. Total depth of the hole was 75 feet. No mine workings were encountered.

M 31:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium grained gravel was present from 30 to 35 feet. Medium grey claystone was penetrated from 35 to 55 feet. The "main" coal seam was observed at 51 to 56 feet. A light grey sandstone was present from 60 to 70 feet. Total depth of the hole was 70 feet. No mine workings were encountered.

M 32:

A light brown argillaceous soil occurred from 0 to 25 feet. Medium grained gravel was present from 25 to 35 feet. Medium grey claystone was penetrated from 35 to 45 feet. The "main" coal seam was observed at 46 to 51 feet. A light grey sandstone was present from 55 to 70 feet. Total depth of the hole was 70 feet. No mine workings were encountered.

M 33:

A light brown argillaceous soil occurred from 0 to 25 feet. Medium grained gravel occurred from 25 to 35 feet. A layer of medium grey claystone was encountered from 35 to 52 feet, where circulation was lost. The “main” seam interval occurred from 50 to 56 feet. Total depth of the hole was 70 feet. The caliper log indicated an **open void** occurring from 51 to 55 feet.

M 34:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium grained gravel occurred from 30 to 40 feet. A layer of medium grey claystone was encountered from 40 to 52 feet, where circulation was lost. The “main” seam interval occurred from 50 to 56 feet. Total depth of the hole was 70 feet. No open voids were encountered.

M 35:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium to fine grained gravel occurred from 30 to 40 feet. A layer of medium grey claystone was encountered from 40 to 52 feet, where circulation was lost. Total depth of the hole was 70 feet. Due to equipment failure no electric or caliper log was run.

M 36:

A light brown argillaceous soil occurred from 0 to 35 feet. Medium to fine grained gravel occurred from 35 to 40 feet, where the drill hit refusal. Total depth of the hole was 40 feet.

M 37:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium grained gravel was present from 30 to 42 feet. Medium grey claystone was penetrated from 42 to 50 feet. The "main" coal seam was encountered from 55 to 61 feet. A light grey sandstone was present from 61 to 63 feet where circulation was lost. Total depth of the hole was 75 feet. No mine workings were encountered.

M 38:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium grained gravel occurred from 30 to 35 feet. Medium grey claystone was encountered from 35 to 55 feet. The "main" coal seam was observed at 52 to 56 feet. A light grey sandstone was present from 60 to 70 feet. Total depth of the hole was 70 feet. No mine workings were encountered.

M 39:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium grained gravel occurred from 30 to 40 feet. Medium grey claystone was encountered from 40 to 47 feet where circulation was lost. Total depth of the hole was 70 feet. The electric log indicated that the "main" seam interval was penetrated from 53 to 56 feet. Maximum caliper deflection of 6" occurred at 53 feet. Collapse was complete with no open voids.

M 40:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium grained gravel occurred from 30 to 35 feet. Medium grey claystone was encountered from 35 to 45 feet. The "main" coal seam was observed at 48 to 54 feet. A light grey sandstone was present from 55 to 70 feet. Total depth of the hole was 70 feet. No mine workings were encountered.

M 41:

A light brown argillaceous soil occurred from 0 to 30 feet. Medium grained gravel occurred from 30 to 35 feet. Medium grey claystone was encountered from 35 to 45 feet. The "main" coal seam was observed at 47 to 52 feet. A light grey sandstone was present from 55 to 65 feet. Total depth of the hole was 65 feet. No mine workings were encountered.

M 42:

A light brown argillaceous soil occurred from 0 to 20 feet. Medium grained gravel occurred from 20 to 30 feet. Medium grey claystone was encountered from 30 to 45 feet. The "main" coal seam was observed at 48 to 53 feet. A light grey sandstone was present from 55 to 70 feet. Total depth of the hole was 70 feet. No mine workings were encountered.

2008 Schmidt property sinkhole

9.0 POTENTIAL MECHANISMS OF COAL MINE ROOF FAILURE AND SINKHOLE DEVELOPMENT

The following discussion presents what appears to be the most obvious progression for mine collapse and subsidence occurring within the Boulder-Weld Coal Field. Two types of subsidence have been observed; trough type, consisting of broad, large scale deformation and sinkhole subsidence resulting in small scale failures. This discussion is based upon research conducted by Western Environment personnel, the results of pillar and roof stability analysis performed for previous investigations and published research.

At the urging of the Colorado Geological Survey, Western Environment acquired NX core samples of the Laramie Formation during investigations conducted from 2004 to 2006. These samples came from projects in the Erie and Frederick areas. The purpose for acquiring the samples was to collect geo-technical data to evaluate regional coal pillar stability and the maximum possible roof spans that could occur in abandoned mines. The results of this analysis is published in a 2006 paper presented to the International Association of Engineering Geologists (Sherman, Greg D. 2006) and Volume 46, Number 1 of The Mountain Geologist January 2009 (Sherman, Greg D. 2009).

Twenty two samples of claystone, sandstone and coal were submitted to Advanced Terra Testing Inc. in Lakewood, Colorado, and Soils and Materials Consultants, Inc. in Arvada, Colorado. These samples were selected for unconfined compression testing and moisture/density analysis. Seventeen of the samples were chosen for unconfined compression testing.

To develop a comprehensive data set, Western Environment chose to include similar data documented in Dr. Gordon Matheson's paper *Observations on the Location of Chimney Subsidence Sinkhole Development Along the Colorado Front Range* (1986). The following tables present a list of the results from the three referenced investigations.

Average Rock (Wet) Density Comparison

Rock Type Tested	Matheson (1986)	WEE Erie (2006)	WEE Frederick (2004)
Claystone	141 pcf	134 pcf	135 pcf
Sandstone	144 pcf	166 pcf	135 pcf
Coal	83 pcf	83 pcf	91 pcf

Average Unconfined Compressive Strength

Rock Type Tested	Matheson (1986)	Erie (2006)	Frederick (2004)
Claystone	775 psi	1093 psi	696 psi
Sandstone	1450 psi	not tested	2111 psi
Coal	2640 psi	greater than 1377 psi*	1670 psi

* The sample strength exceeded the compression frame capacity

Unconfined compressive strength data varies somewhat between projects. However, qualitative observations of the data confirm that **coal has a substantially higher compressive strength then claystone, the most common roof and floor rock.** This relationship has significant implications when evaluating long term pillar stability.

The estimation of rock mass (pillar) strength is not a straight forward comparison of unconfined compressive strength and cross sectional pillar dimension. Matheson (1986) chose to "back calculate" a range of rock mass strengths from recorded floor failures of varying rock types. This method is further described by Terzaghi and Peck (1948) and Vesic (1970). The results of Boulder/Weld data reported by Matheson conclude that "**roof failure is the most critical failure mode followed by floor failure**". Dr. Matheson continues "**The mine pillars should be the most stable**". This observation is consistent with verbal descriptions provided by local miners (Tomlinson, 1933).

The many of the previously referenced authors, including Terzaghi and Peck (1948) and Vesic (1970), were working exclusively in room and pillar mines. Western Environment must emphasize that the mines in the Boulder/Weld Field incorporated **pillar retreat** methods to facilitate higher extraction rates. Oravecz (1977), in a paper entitled *Measurement of Surface Displacement Caused by Extraction of Coal Pillars* states **"From the point of view of the induced displacement field, the method of pillar extraction lies somewhere between the methods of board and pillar (room and pillar) and longwalling**. **In the development stage it is equivalent to board and pillar mining, when already a considerable proportion of the seam has been extracted without disturbing the roof strata significantly. In the stage when the pillars are extracted the roof strata are induced to cave just as in longwall faces."** This conclusion is consistent with Sherman (1984) that states "V_z"(percentage of maximum possible subsidence, S_{max}) for the Boulder/Weld field would be on the order of 20% of the NCB (predicted) value." **These data and the research of Matheson (1986) conclude that the majority of trough type subsidence occurred soon after, likely within two years, after the**

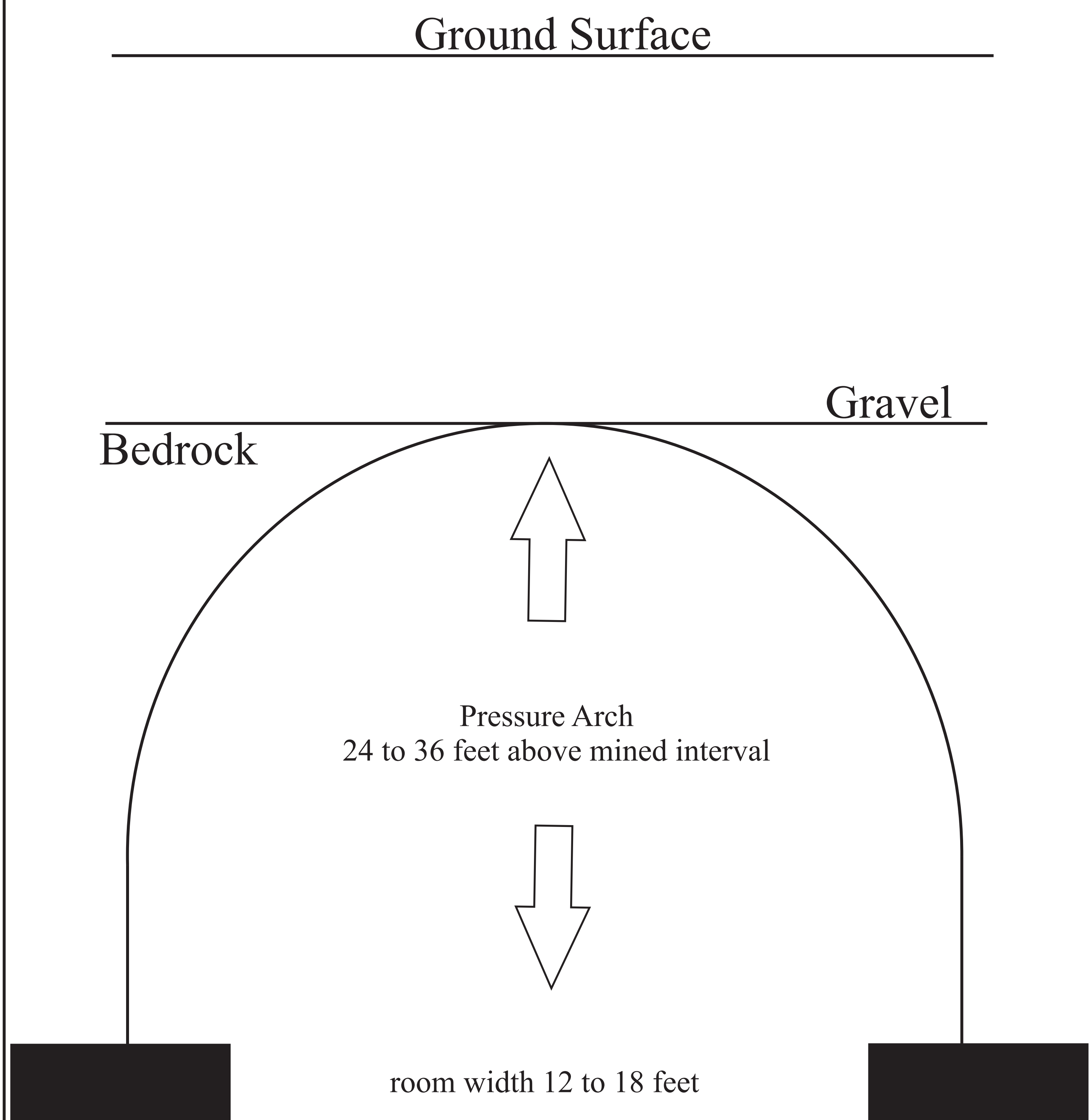
cessation of mining. This collapse is well documented in the hundreds of subsidence investigations performed in the Boulder/Weld Coal Field.

However, the formation of sinkholes, which occurs almost exclusively in shallow less than 100 foot deep (Matheson , 1986) mines, can continue for years. The idea of progressive collapse of overlying units continuing until a “pressure arch” or dome is formed above the collapsed workings is well-documented (U.S.G.S. Prof. Paper 969). Bell (1975) states that from his experiences in rock of similar character as those present in the Boulder/Weld Coal Field, upward migration is commonly one to two times the width of the intervening room. Ackenheil and Doughtery (1970) use a figure of twice the distance between supports for an approximation of arch development. The importance of the concept of the pressure arch increases as the depth to mining decreases. If mine geometry remains consistent, the pressure arch that forms 20 to 40 feet above the mine will encounter either weakened weathered rock or potential “fluid” soil at shallow mining depths. Should the top of the pressure arch (cupola) contact either the weathered rock or soil, a “sinkhole” can form.

To evaluate the potential for sinkhole formation, the tensile strength, or ability to span supports of roof rock needs to be determined. In his paper entitled “Pillar Design and Coal Strength” (Mark and Barton, 1997) Christopher Mark compared the results of over 4000 unconfined (uniaxial) compressive strength test results to case studies of coal mine pillar performance. This investigation included the analysis of pillar performance utilizing widely accepted pillar strength formulas (Bieniawski 1968) that incorporate uniaxial strength data from laboratory samples. In his conclusions Mark states “ **that laboratory testing should not be used to determine coal pillar strength**”. This conclusion is made because coal is “notoriously difficult to test due to mirco-fractures, cleats, bedding planes, partings shears and small faults.” Furthermore, even though the range of compressive strengths vary greatly (Salamon 1991, Galvin 1995, and Mark 1990), the back calculated in-situ coal strength falls between the very narrow range of 780 psi and 1,070 psi. (Mark and Barton 1997).

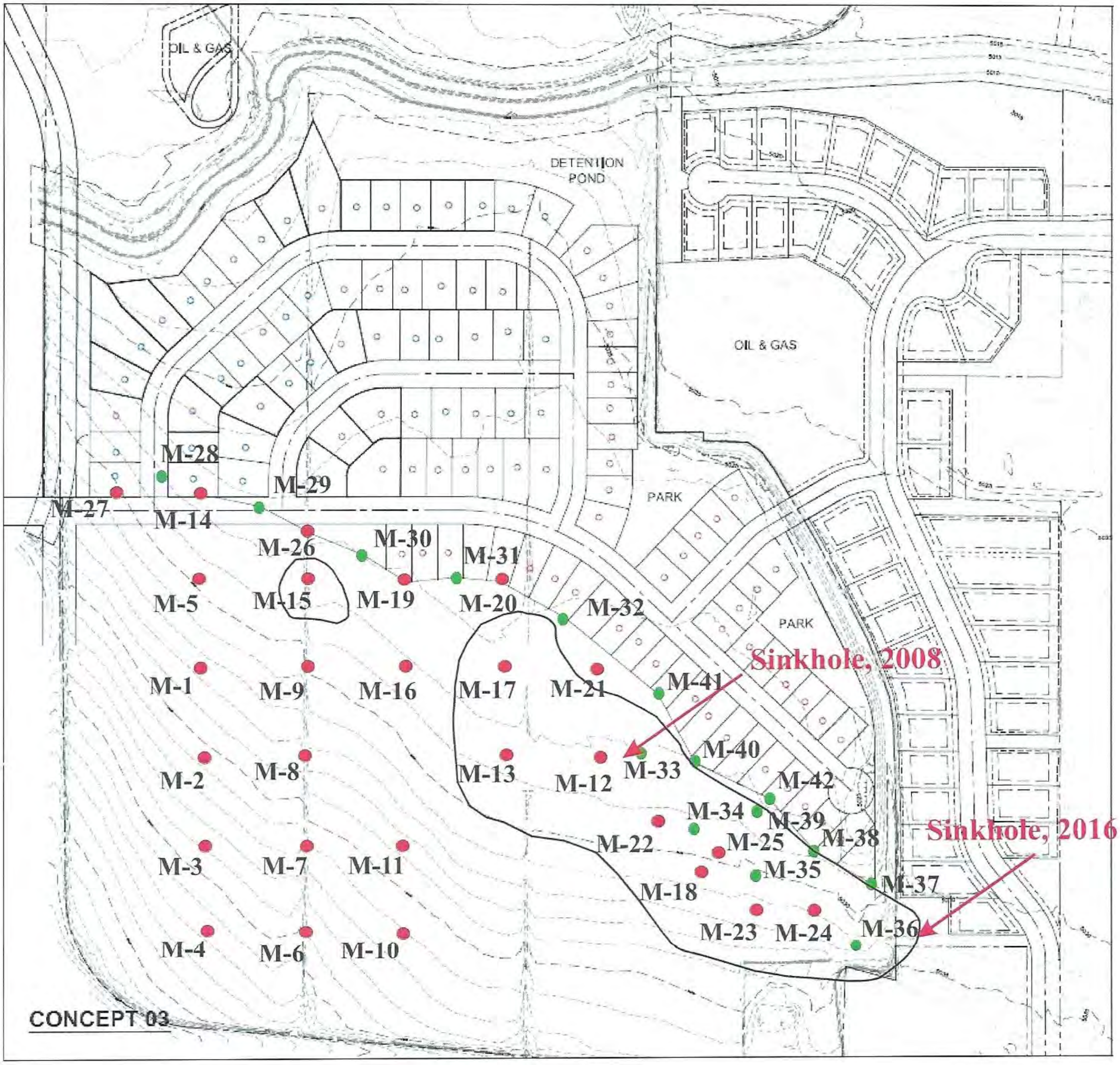
In response to this assessment, the Pittsburgh Research Center of the National Institute for Occupational Safety and Health developed the Analysis of Retreat Mining Pillar Stability (ARMPS) computer program. This program was specifically developed for retreat methods of coal production. Simple input values are required to calculate pillar size maintaining a safety factor of 1.0 while utilizing a default uniaxial strength value of 900 psi.

To utilize this program in determining pillar and roof stability of Boulder/Weld Coal Field Mines, Western Environment first determined the average chain or barrier pillar width and the average room pillar width from measurements of the original mine maps. This resulted in the



W e s t e r n e n v i r o n m e n t
a n d e c o l o g y , i n c .
2217 West Powers Avenue
Littleton, Colorado 80120

Figure 8 Sinkhole Geometry
Lost Creek Farms
Erie, Colorado



M-4 ● Melody Homes and DR Horton LLC Borings

M-36 ●

Geologic Cross Sections (Figures 14 and 15)

Scale in feet

0 200

WESTERN ENVIRONMENT AND ECOLOGY, INC.
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Figure 9 Site Map
Showing Potential Sinkhole Locations
Lost Creek Farm Filing II
Erie, Colorado

average chain pillar having a dimension of 36.0' X 65.5' and the average room pillar being 13.4' X 134.0'. To determine the size of the "stubs" occurring following retreat, Western Environment sequentially reduced the cross cut spacing input for the ARMPS until a safety factor of approximately 1.0 was achieved. The other documented input values, including seam thickness (5.0'), depth of cover (100') and overburden load (145 pcf), were used. This resulted in the dimension of the stubs (the smallest pillars left in-place) being **13.4' X 22.0'**

Unfortunately no records exist as to the dimensions of the "stubs" produced during retreat mining in the Boulder/Weld Field. However, Tomlinson (1933) indicates that room widths ranged from 14 to 18 feet and stub size varies from 5' X 15' to 15' X 36' for extraction ratios of 76% to 82%, respectively, in active Boulder/Weld mines. The 13.4' X 22.0' calculated from the ARMPS program appears consistent with this contemporary record. Furthermore, the resulting extraction ratio produced from stubs with a dimension of 13.4' X 22.0' is also consistent with published production rates.

Using these data the vertical load from 100 feet of overburden, at a density of 145 pcf, the horizontal stress, at approximate room widths of 13.4', results in a compressional stress of 1,349 psi. This value compares well with the 1,093 psi uniaxial test data developed for Boulder/Weld Mines (Matheson (1987) and Sherman (2006, 2009). Matheson (1987) indicates that with "assumed tensile strengths" maximum roof spans for safety factors of around 1.0 would be approximately **12.0** . This safety factor is consistent with the roof spans predicated in the Matheson study and the 14.0 to 18.0 foot room widths reported by Tomlinson (1933).

Assuming that the span between supports ranges from 12.0'' (Matheson, 1986), 13.4' (Western Environment using ARMPS) to 18.0' (Tomlinson, 1933), the cupola of the pressure arch will range from 24.0' to 36.0 feet above the top of the mine. When the cupola intersects unconsolidated soil, gravel or weathered bedrock, a sinkhole will form. Figure 8 presents a generalized depiction of the pressures arch formation beneath the undermined portions of the Lost Creek Farm project. Using the most conservative arch height of 24 feet, sinkholes are likely when the top of the mined interval is 24 feet or less below the bedrock gravel contact. The areas with this relationship are present on Figure 9.

10.0 CLOSURE

The recommendations provided herein were developed from the information obtained from field exploration which reflect subsurface conditions only at the specific locations, at the particular times designated. Subsurface conditions at other locations and times may differ from conditions occurring at these locations. The nature and extent of any variations between the drill holes may not become evident until or during the course of construction. If variations then appear, it may be necessary to re-evaluate the recommendations of this report after performing on-site observations during the excavation period and noting the characteristics of any variations.

This report was prepared by a Professional Engineering Geologist, not an engineer, and should not be construed as, or substituted for, engineering. This report is intended to inform geotechnical and structural engineers working on building design and the potential earth forces that could develop at the site.

Our professional services have been performed, our findings, and our recommendations prepared in, accordance with generally accepted geological principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

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APPENDICES

APPENDIX A

General Architectural Techniques to Reduce Subsidence Damage

GENERAL ARCHITECTURAL TECHNIQUES TO REDUCE STRUCTURAL DAMAGE DUE TO SUBSIDENCE

Numerous papers have been written concerning building techniques designed to accommodate strain associated with subsidence (NTIS 1979). Presented below are some very basic strain reduction techniques which could be incorporated into structures located in these areas.

A structure of simple box form, designed to act as a unit, is best suited to resist the effects of mining subsidence. The smaller the plan of the building, the less likelihood there is of damage, and therefore, attached structures should be avoided. Where it is desired to retain the attached plan, this can be achieved by building units with adequate gaps between them to permit movement. Semi-detached buildings are preferable to detached. Outbuildings should not be attached structurally to the main building; they should be able to move independently.

The gaps between the structural units should be kept free from obstructions and should extend through the foundations; they should be sufficient to prevent adjacent units from coming into contact when the ground is deformed by subsidence. A gap of at least four inches is suggested for two-story buildings. Suitable gaps should be provided in all boundary walls especially when they abut a structure.

If required, areas between units should be paved with a flexible material, such as asphalt, incapable of offering any appreciable resistance to horizontal compression. Solid concrete paving should not be used.

Openings are a source of weakness in walls and should be kept as small as other considerations permit. Windows and doors are best arranged with substantial widths of brickwork around them so that the wall, wether reinforced or not, may be as strong as possible. Arched lintels should not be used. Corner windows, bay windows, and other similar projections weaken the structure, door openings have more serious weakening effects than windows and are best located in the shorter sides of buildings. If in the longer sided, they should be installed in the middle rather than at the ends of the building. Front and back doors should not be arranged closely side by side.

Floors and flat roofs should be fastened to all walls and not merely to those which carry joists and rafters. Plasterboard or fiberboard should be used for ceilings. To ensure continued effective drainage if the building has been tilted by subsidence, the gradients of gutters should be kept higher than normal.

For complete protection against damage due to subsidence, a building would have to be able to resist the effects of vertical and horizontal differential movements. Protection against most damage by differential horizontal movements is comparatively simple and may be obtained by building the structure on a lightly reinforced concrete base slab which is bedded on granular material. The base slab ties the walls together and the flat underside forms slip surface. The total tensile strength of the slab in the direction of either principal axis should be adequate to resists a force equal to the product of half the weight of the structure on the slab and the coefficient of friction between the slab and granular material. Before placing the reinforcement and concrete in the base slab, the granular material in the sub-grade should be covered with a layer of stout waterproof paper (to form a slip plane). The provision of a reinforced base slab, combined with the recommendations already made, should be sufficient to prevent damage except where differential vertical movement occur.

The resistance of the walls to flexure may be increased by the introduction of steel reinforcement in any brickwork. The additional cost of such reinforcement is justifiable only in structures certain to be subjected to severe differential vertical movements, such as those near the boundaries of mine workings. Horizontal reinforcement may be used in brick walls of any thickness, but vertical reinforcement can only be used in wall 9 inches thick or more. Special care is necessary where steel reinforcement is to be used in conjunction with brickwork; the metal will not be protected from corrosion in the same way as rods in well made concrete. Lime mortar should be used in brickwork. Damp-proof courses should be of the bituminous type.

The weakest mortar consistent with the normal load-carrying requirements of the walls should be used. This will allow the walls to adjust themselves to moderate changes of curvature of the ground without serious cracking. If the ground on which the structures are built is of a yielding nature, the conditions will be more favorable than if it is yielding since abrupt changes of curvature are less likely.

APPENDIX B

Geophysical Logs

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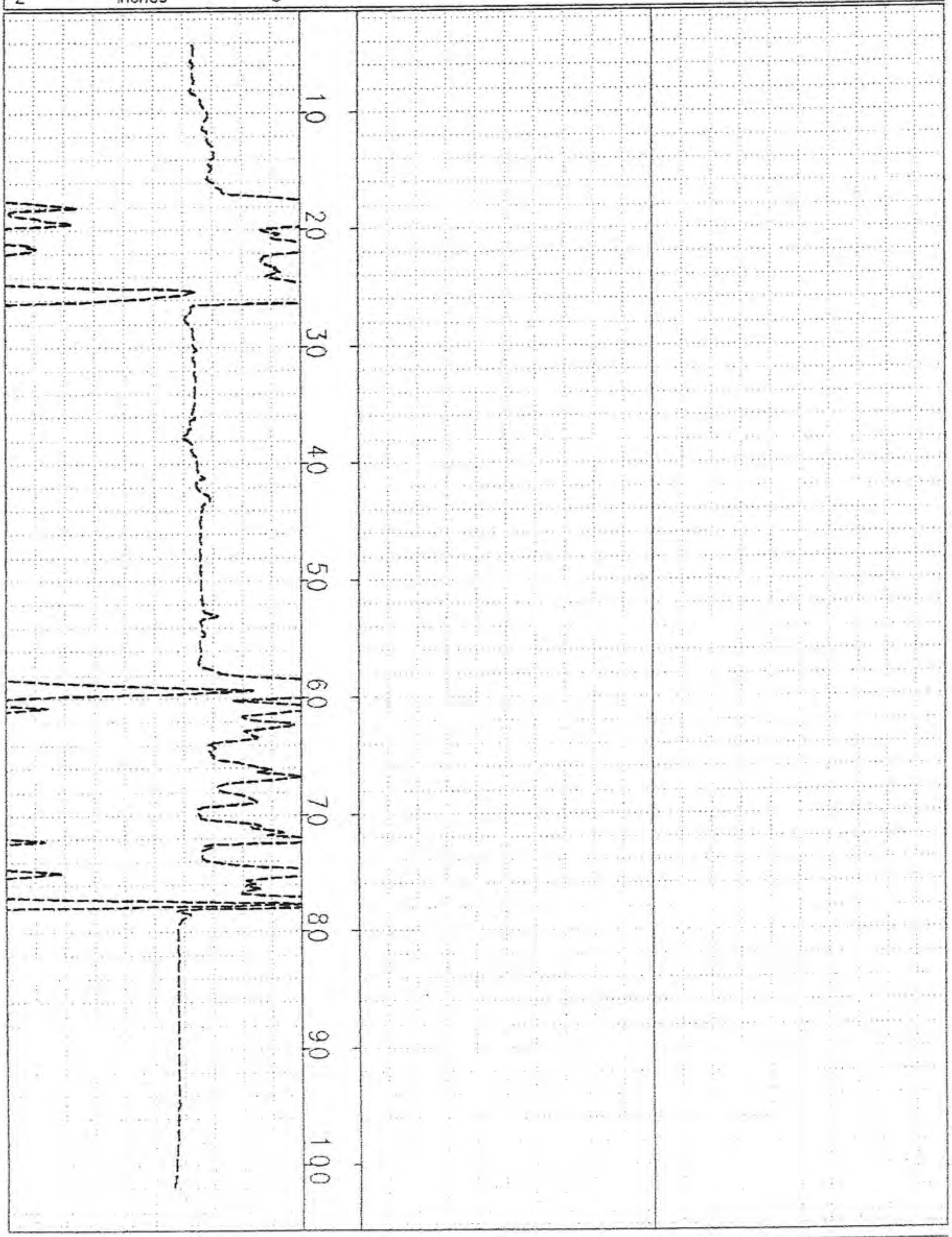

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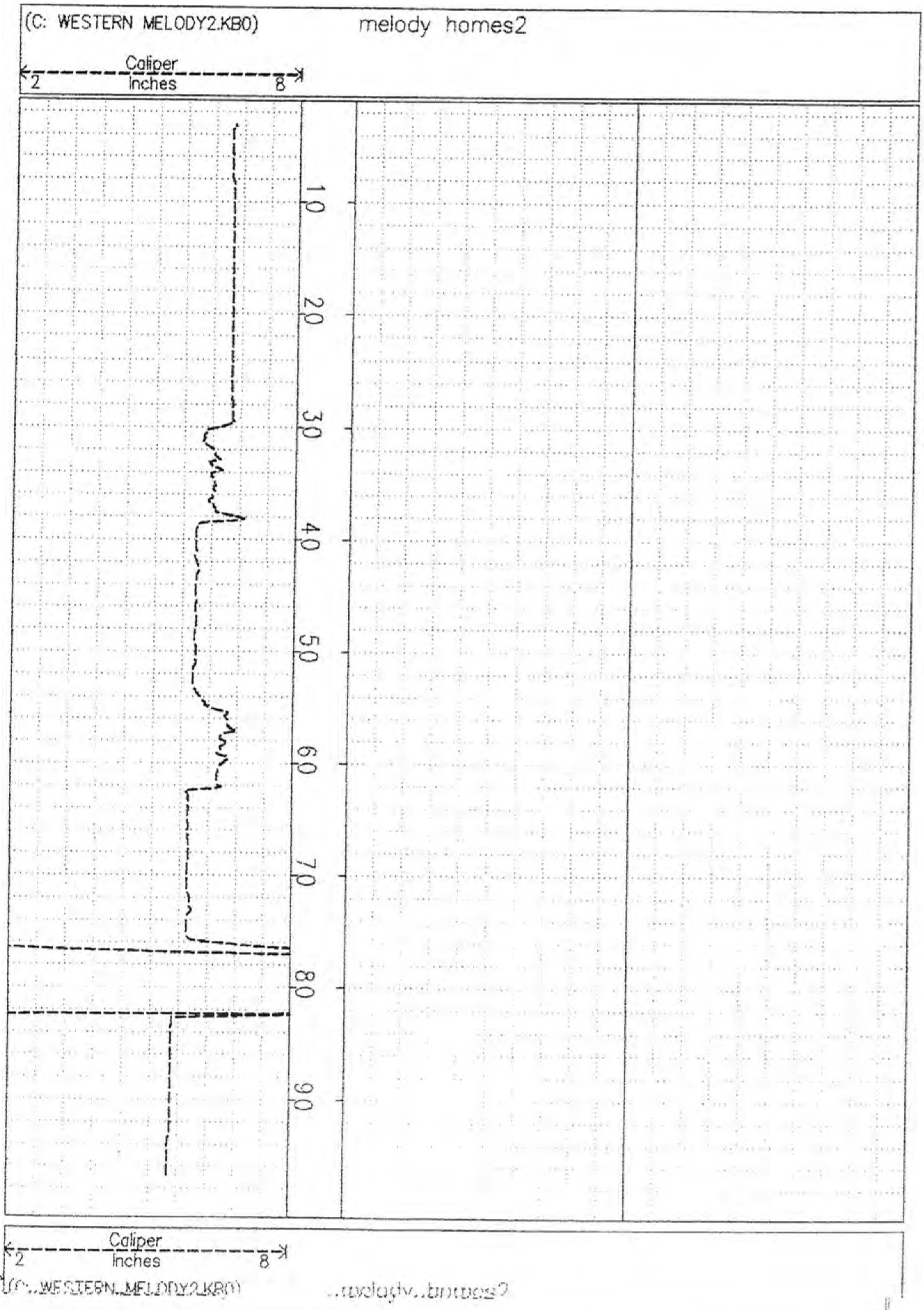
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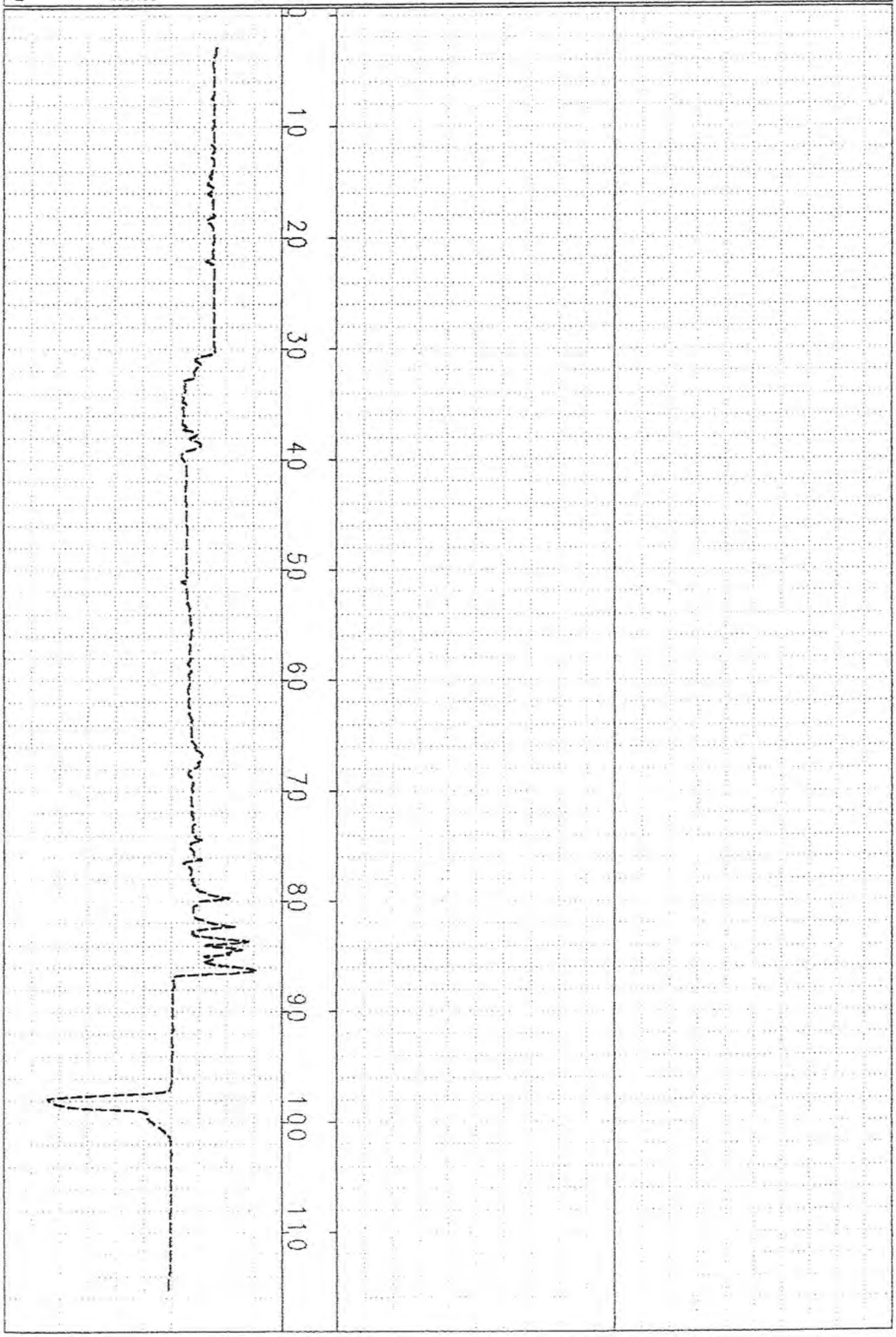

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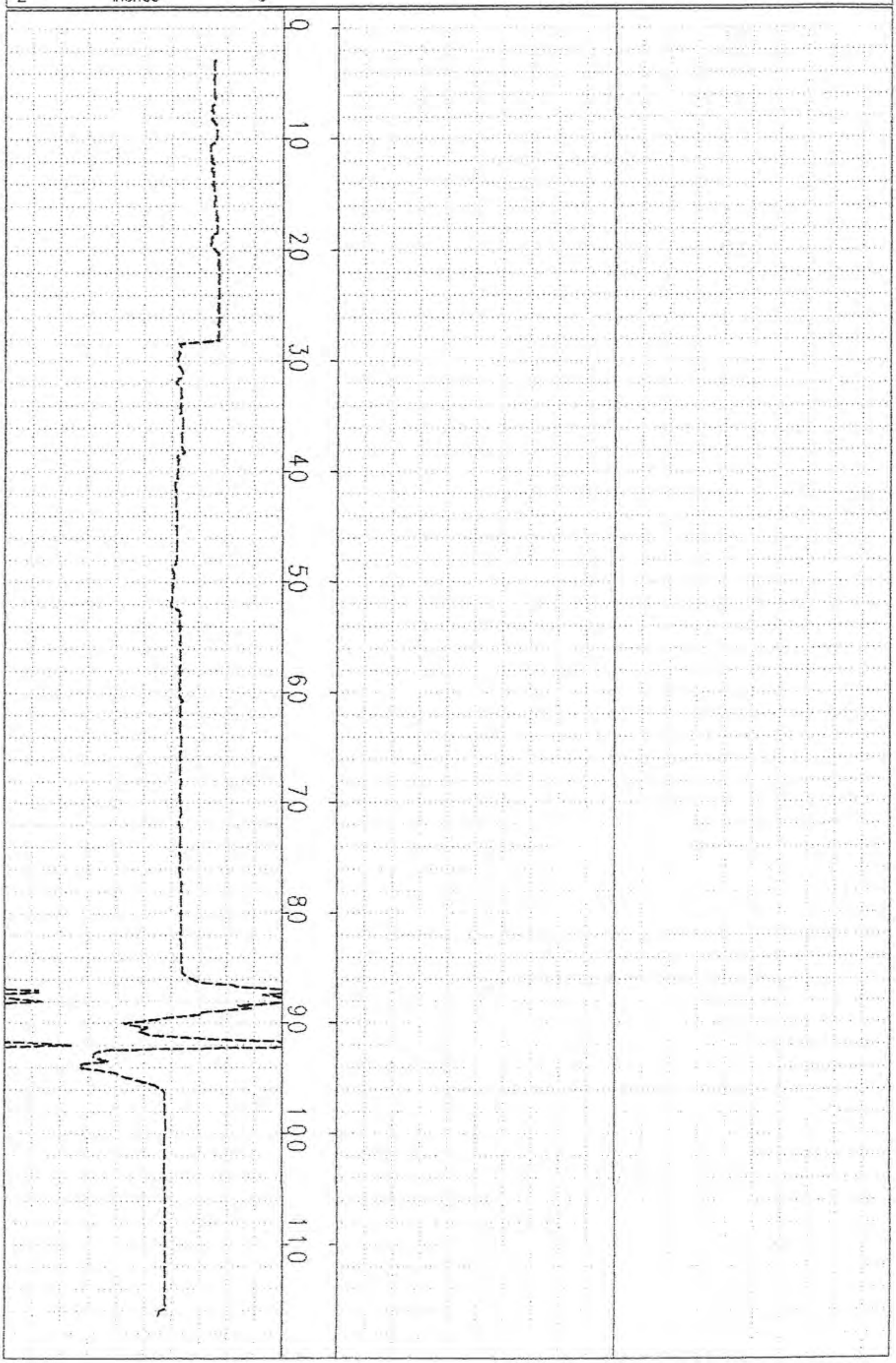

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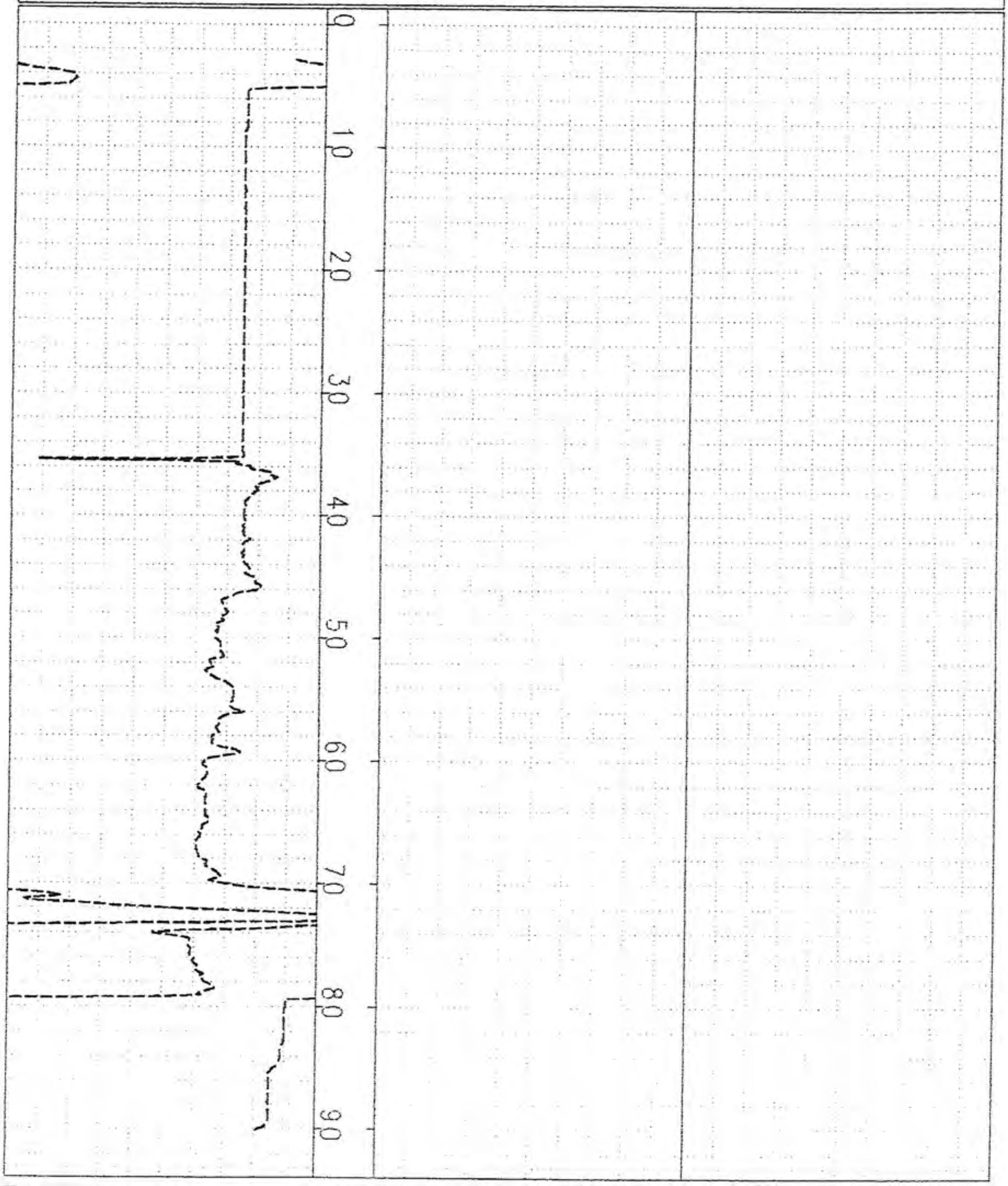

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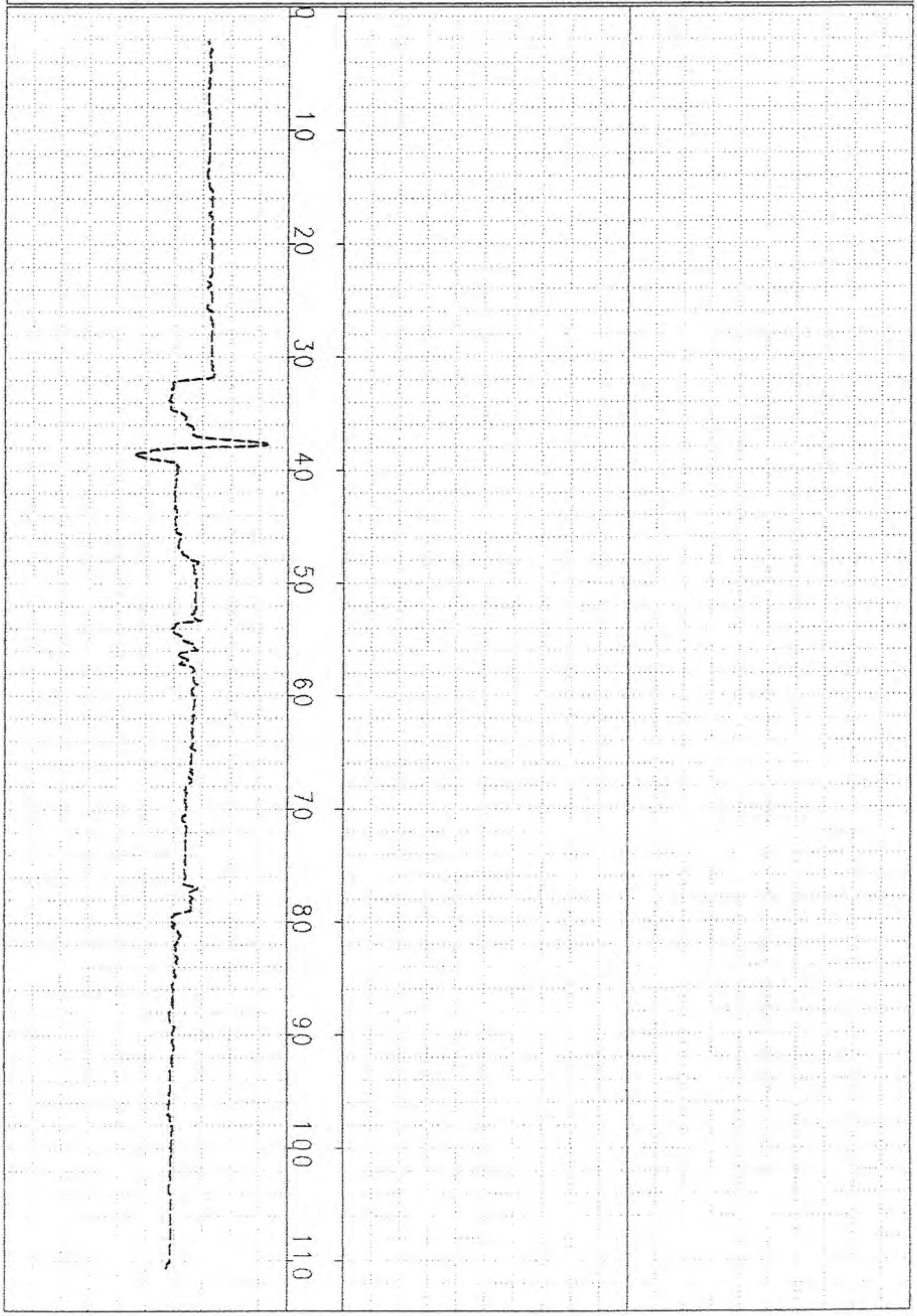

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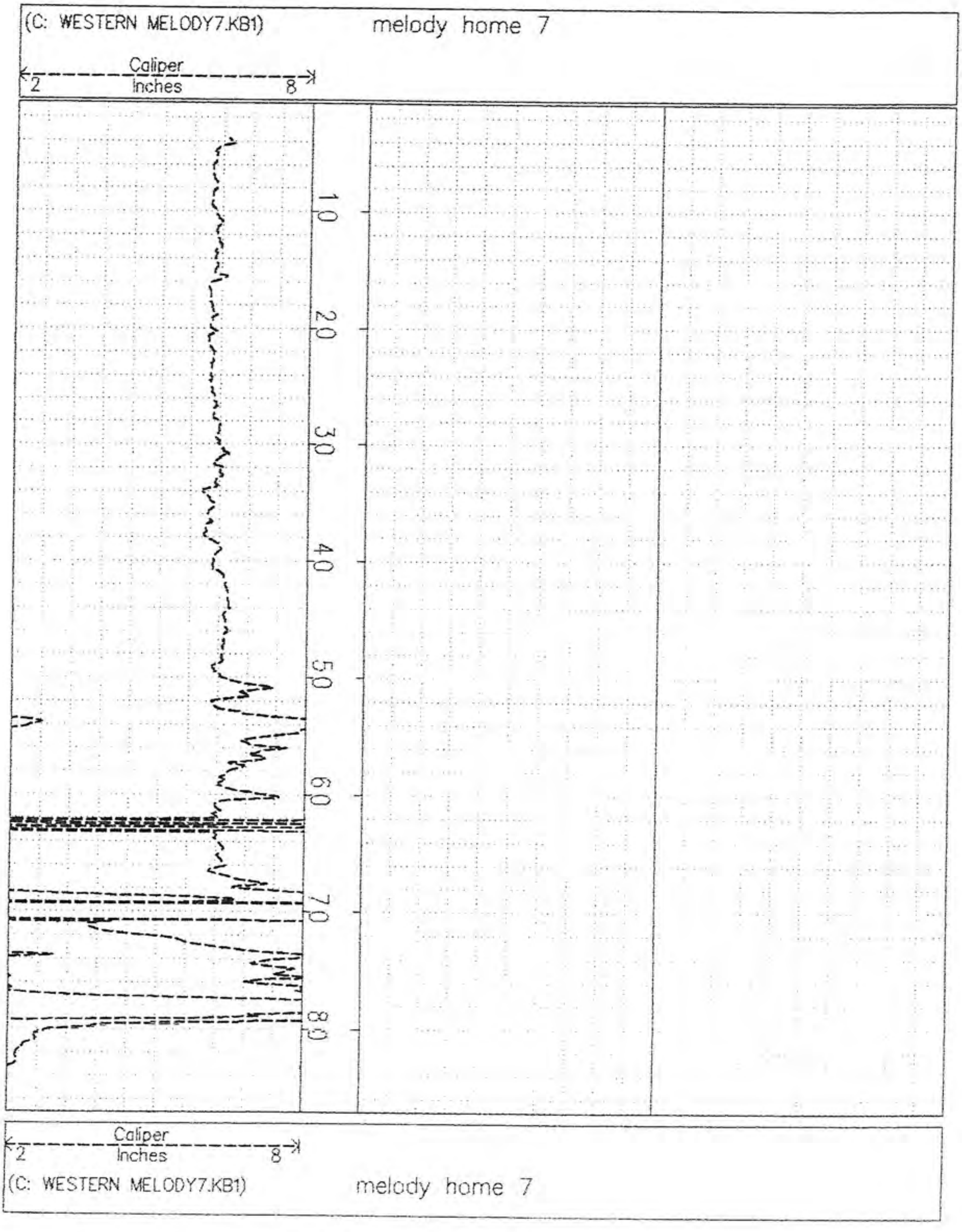

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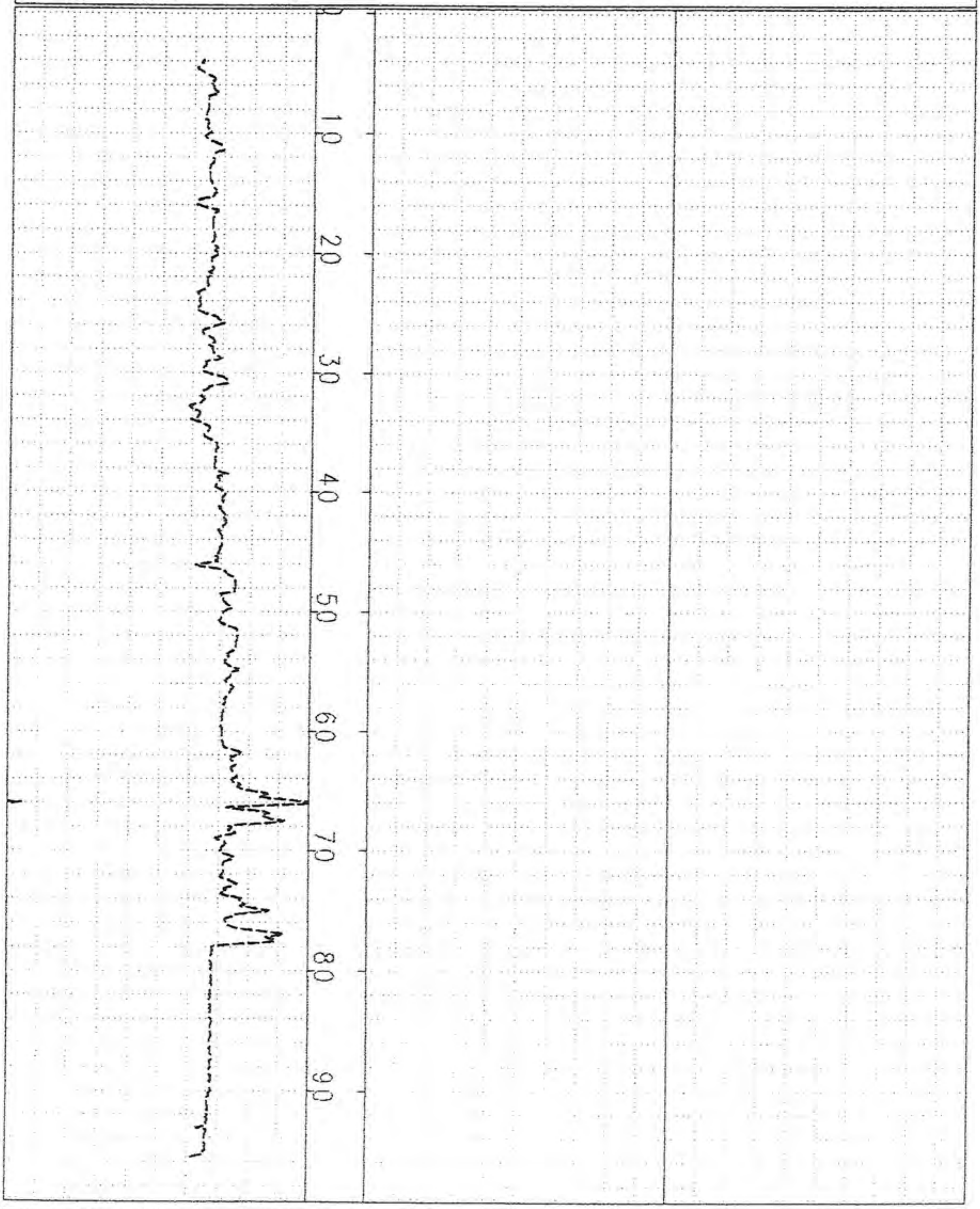

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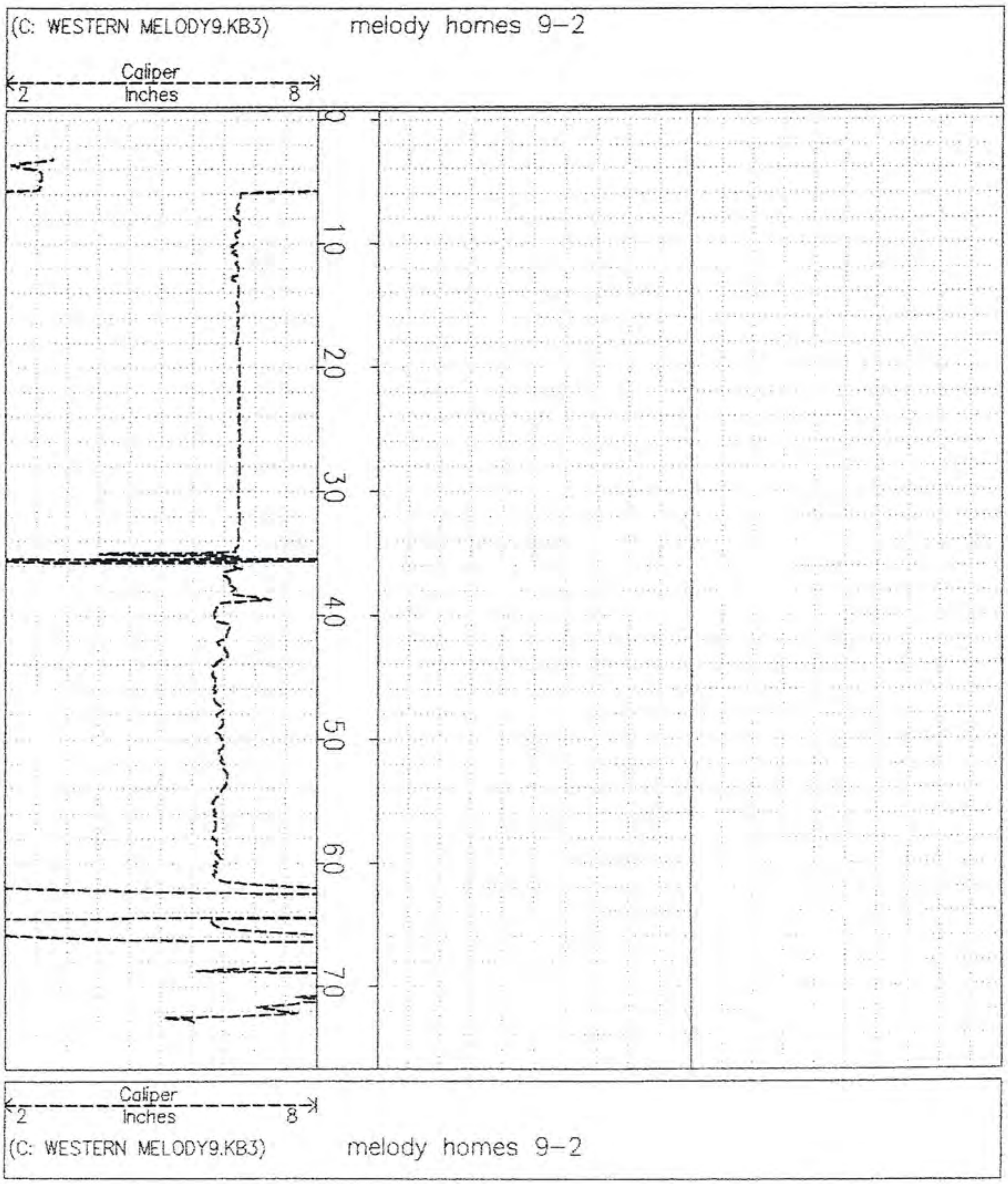
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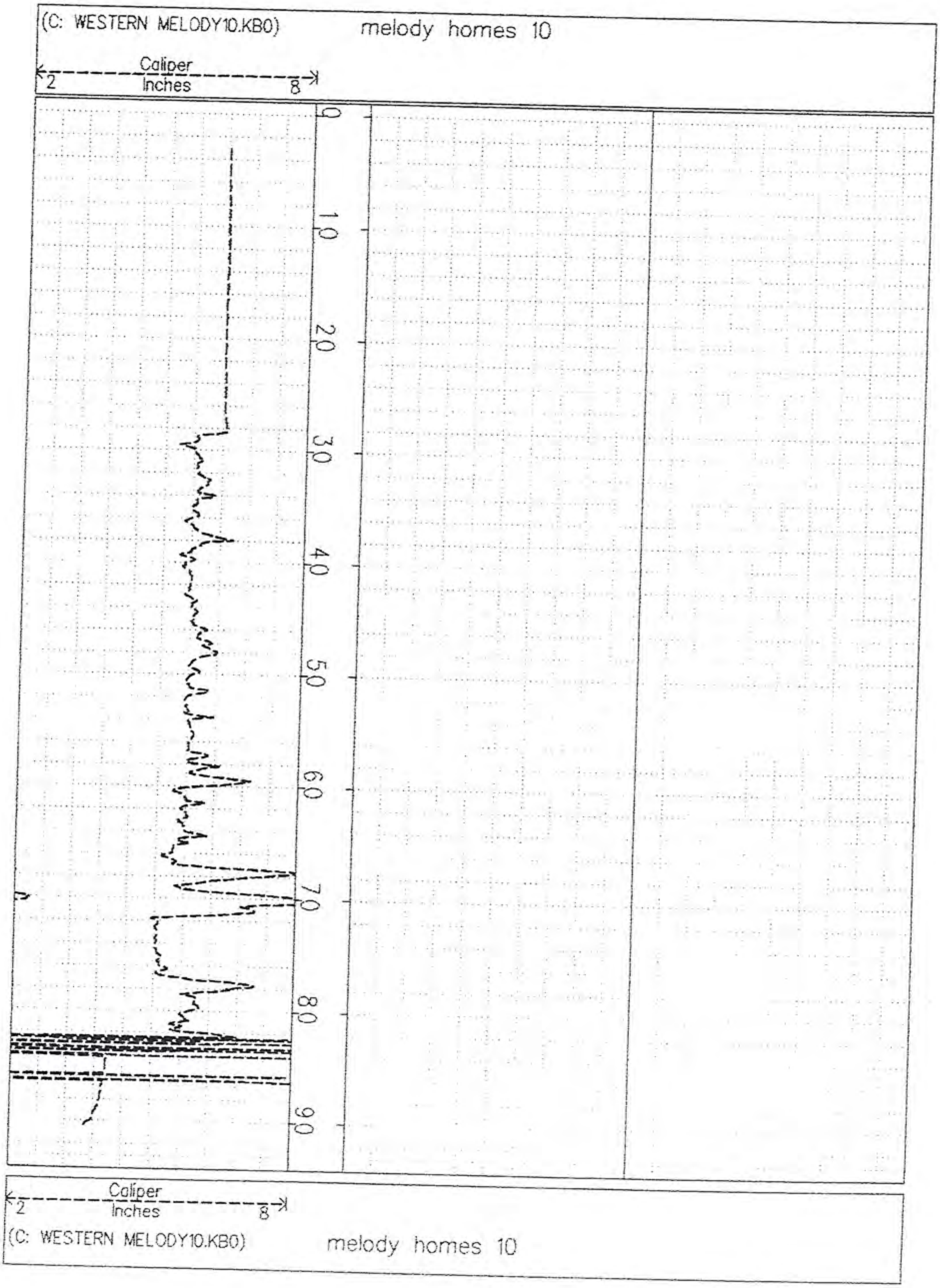
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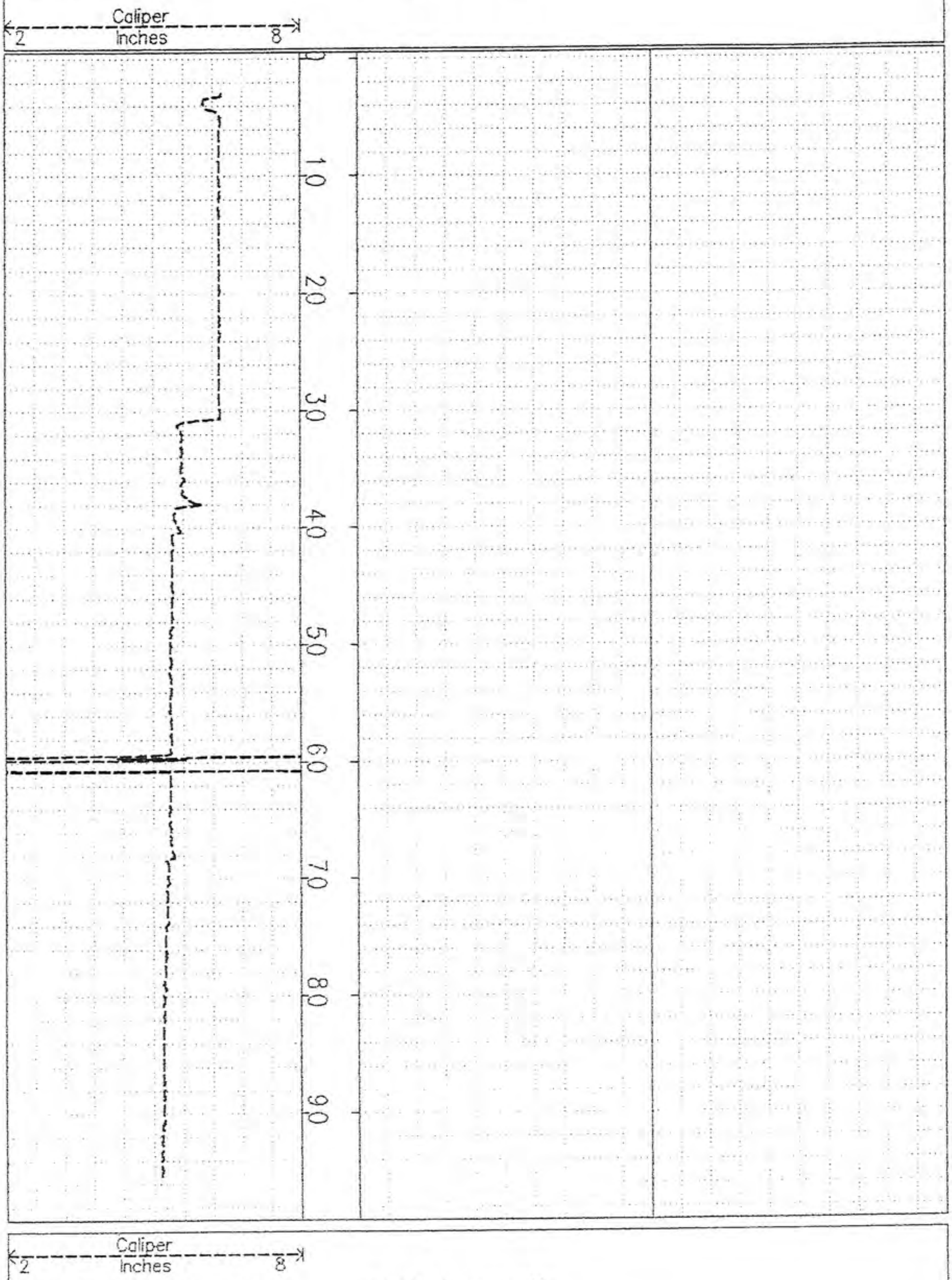
melody homes 10

(C: WESTERN MELODY11.KB0) melody homes 11



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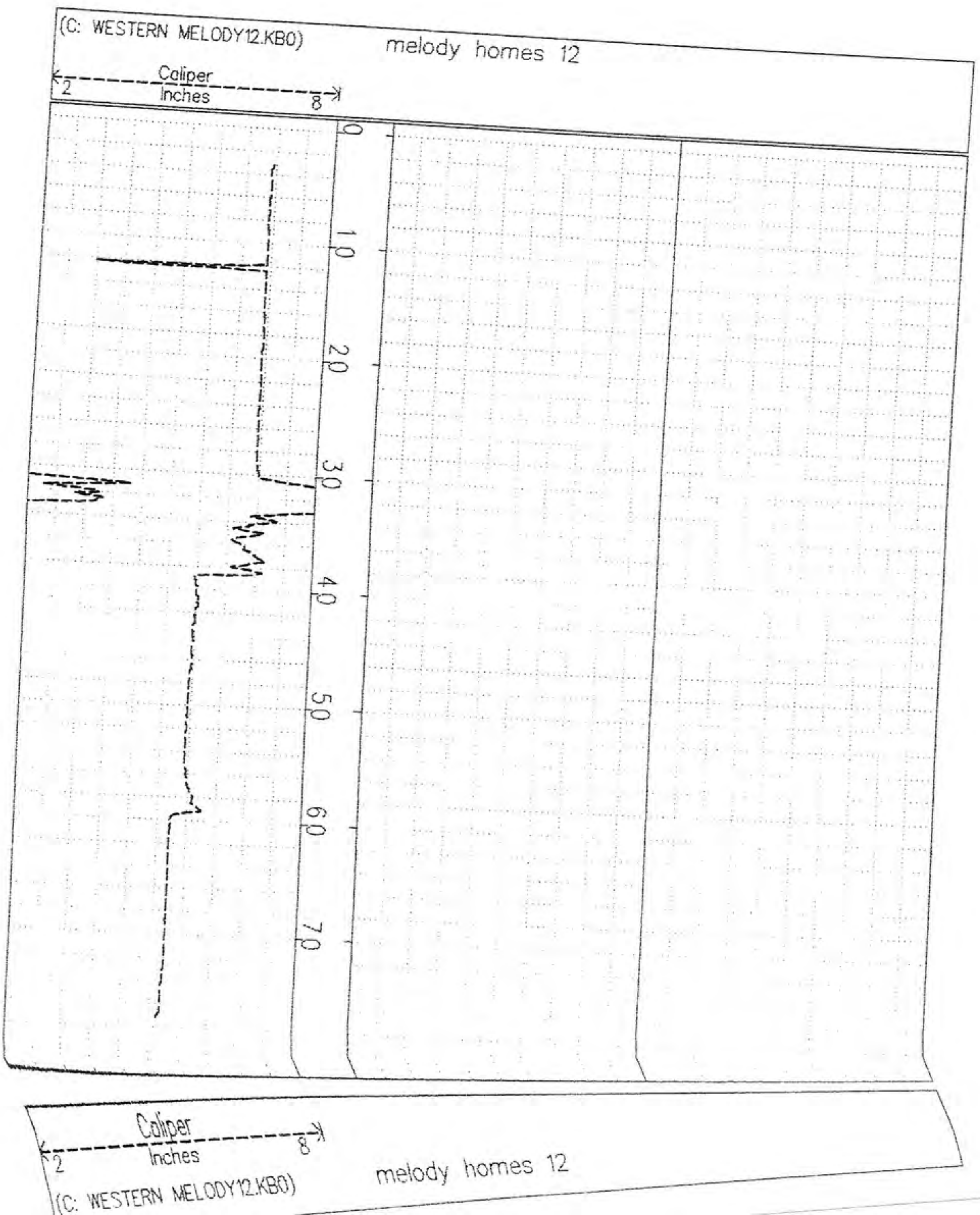
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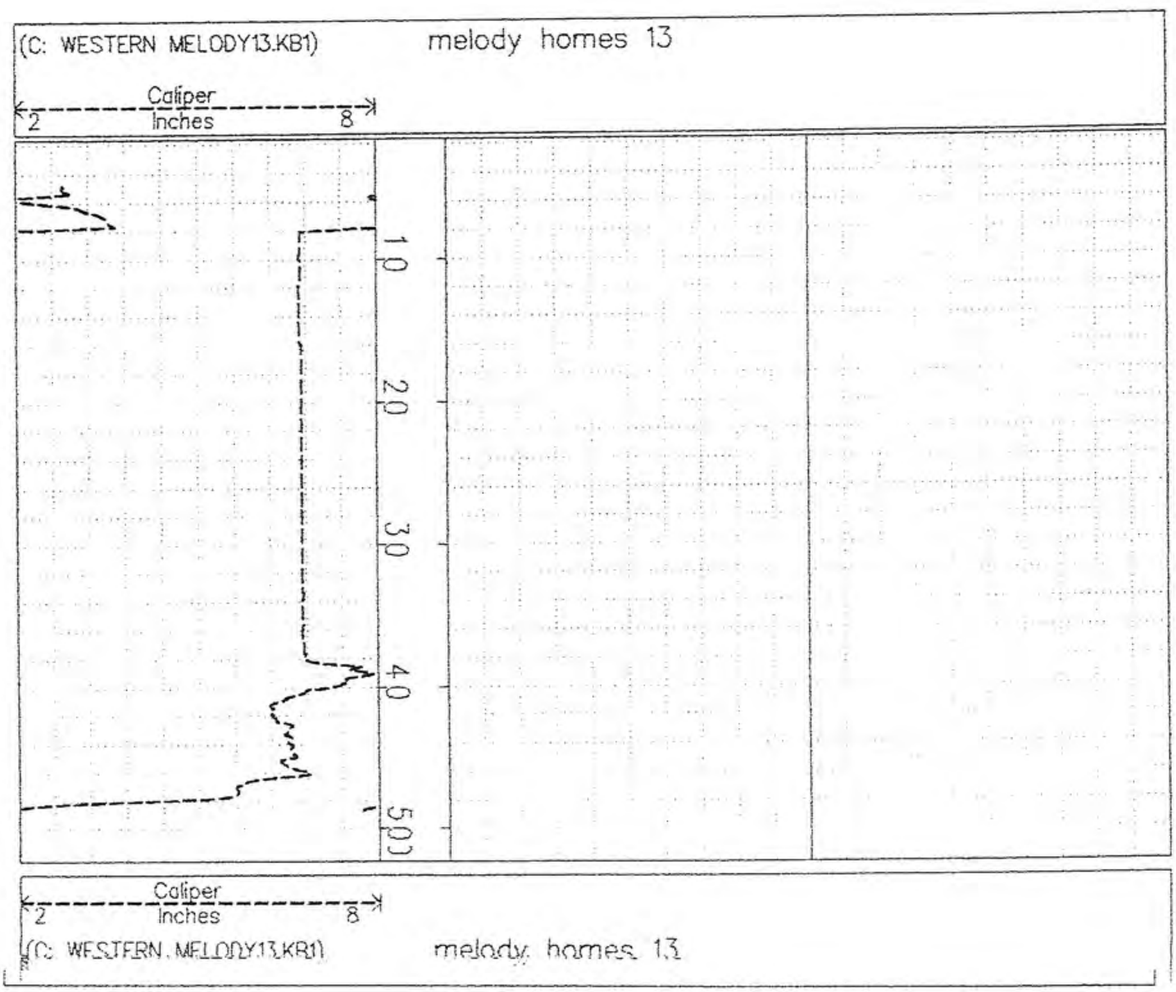
melody homes 12
Caliper
Inches
2
8
0
10
20
30
40
50
60
70
Caliper
Inches
2
8
melody homes 12
(C: WESTERN MELODY12.KB0)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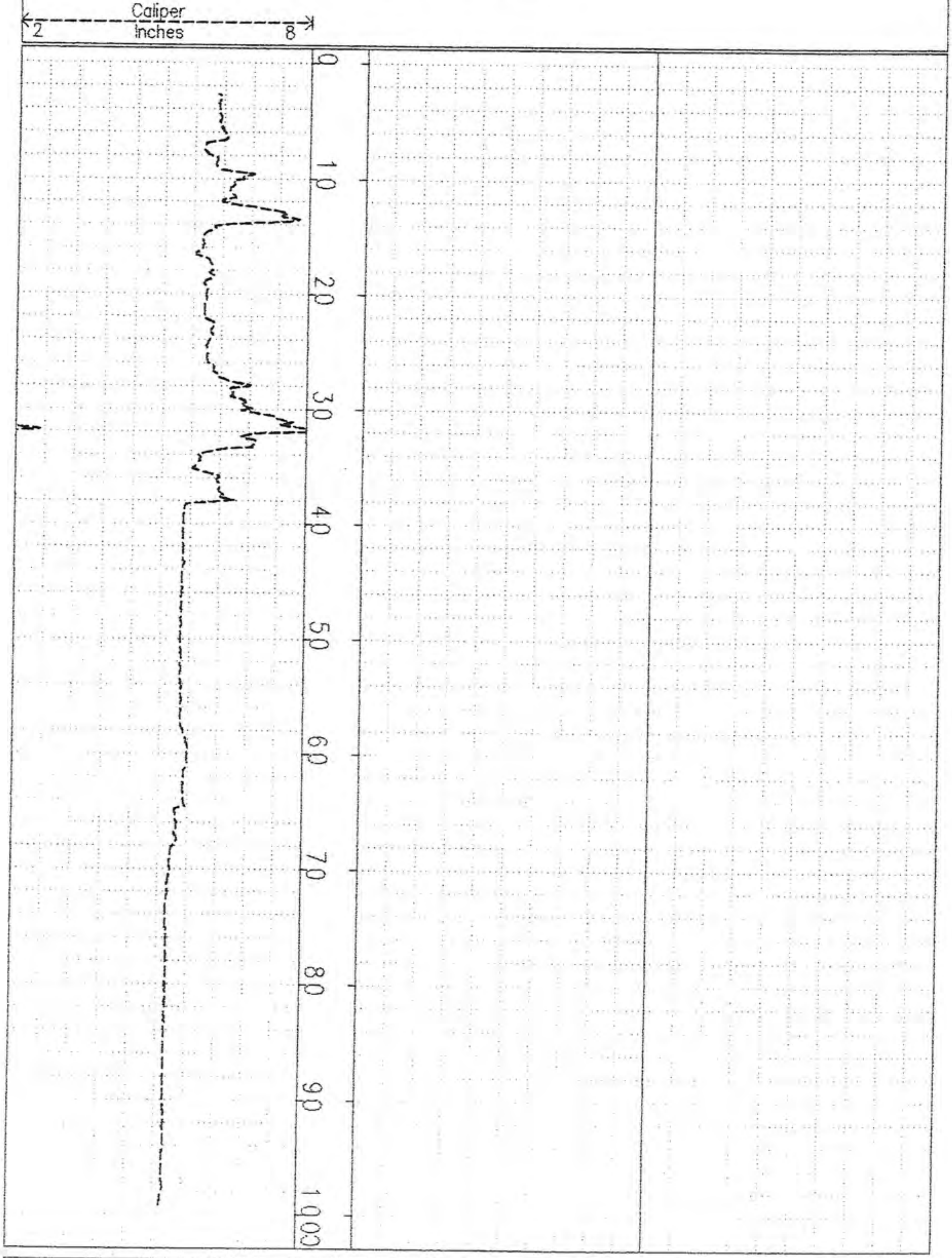
melody homes 13
Caliper
Inches
2
8
10
20
30
40
50
Caliper
Inches
2
8
(C: WESTERN MELODY13.KB1)
melody homes 13

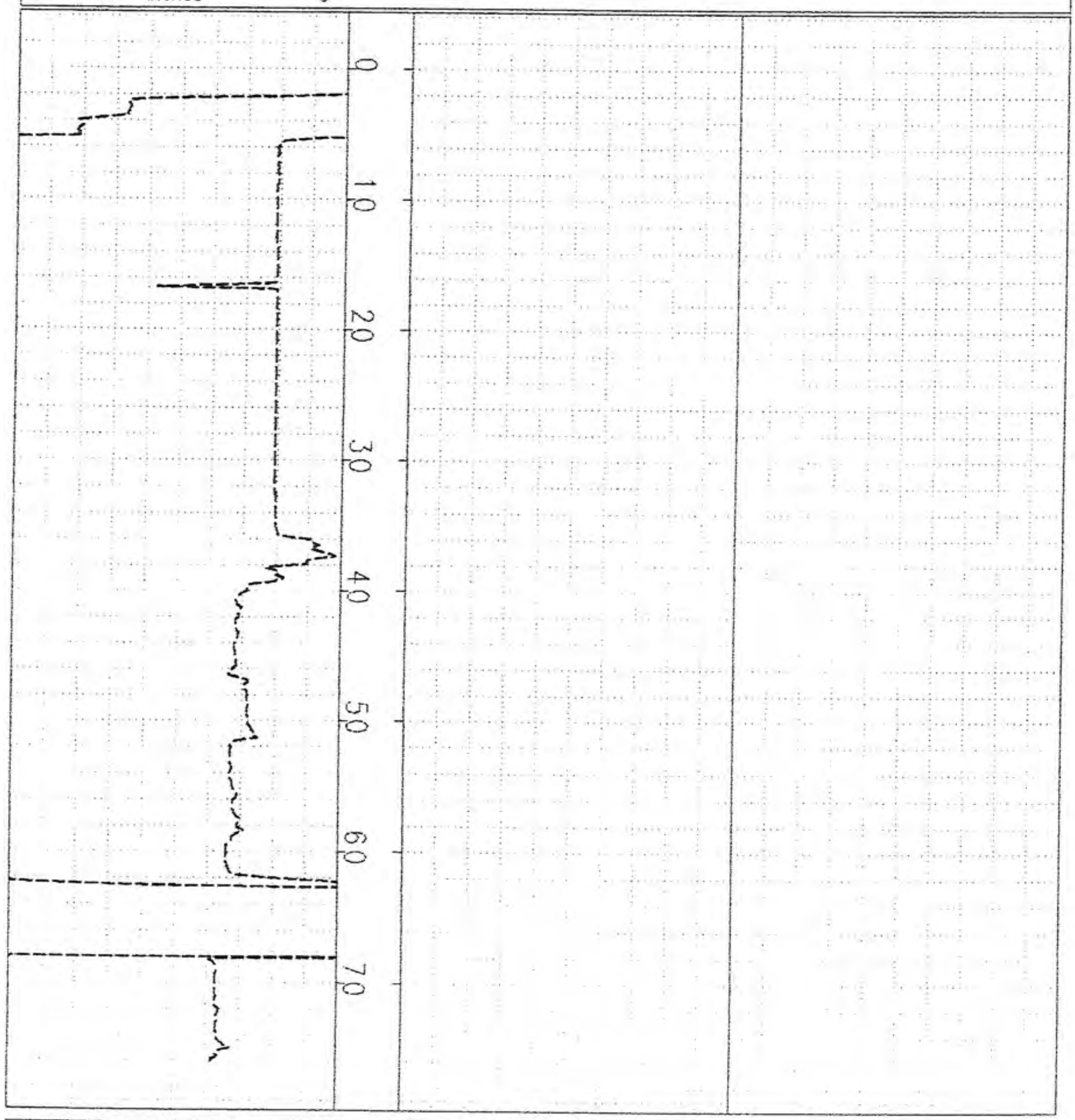
(C: WESTERN MELODY14.KB0) melody homes 14



(C: WESTERN MELODY14.KB0) melody homes 14

(C: WESTERN MELODY15.KB0) melody homes #15

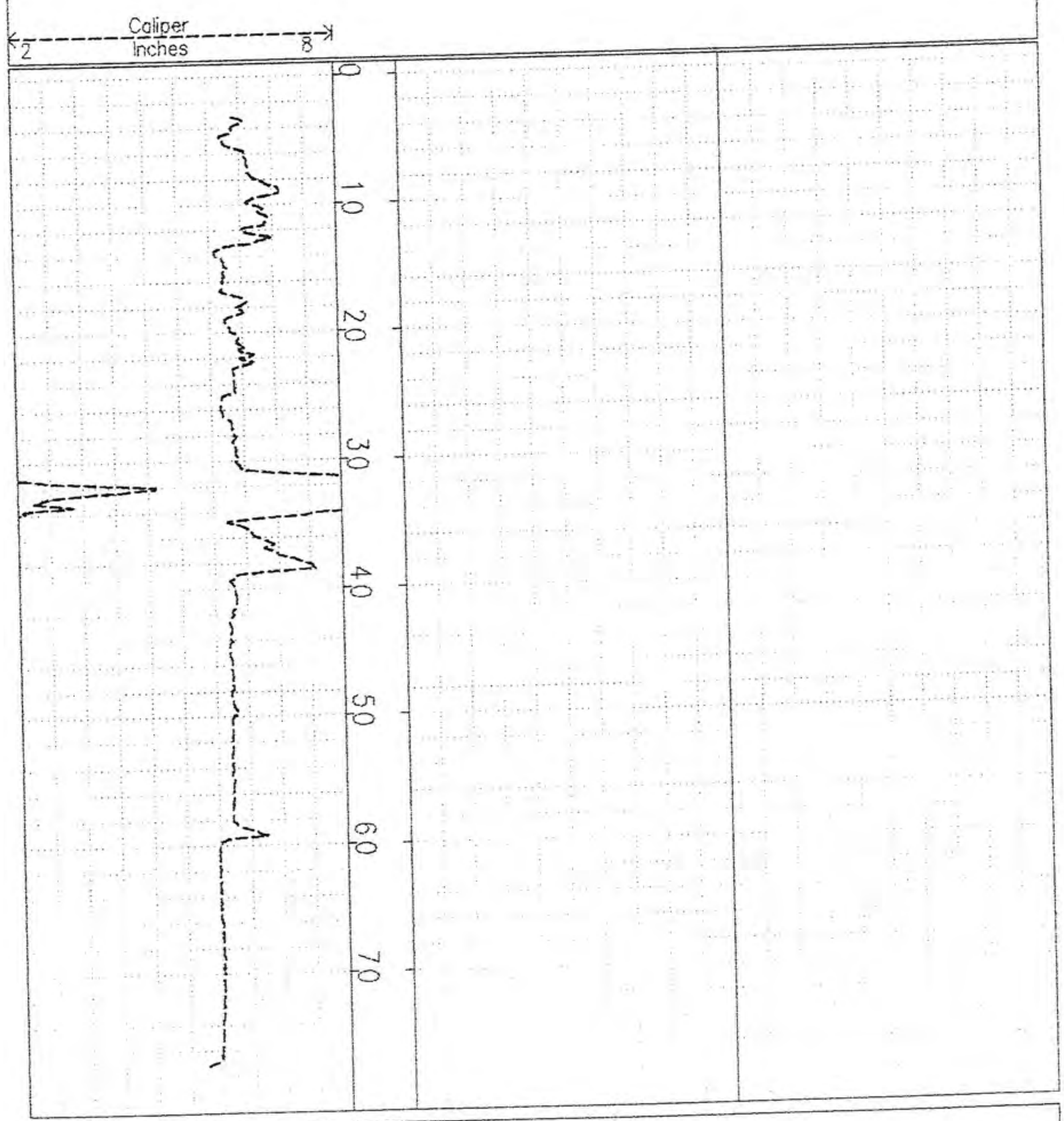
Caliper
2 Inches 8



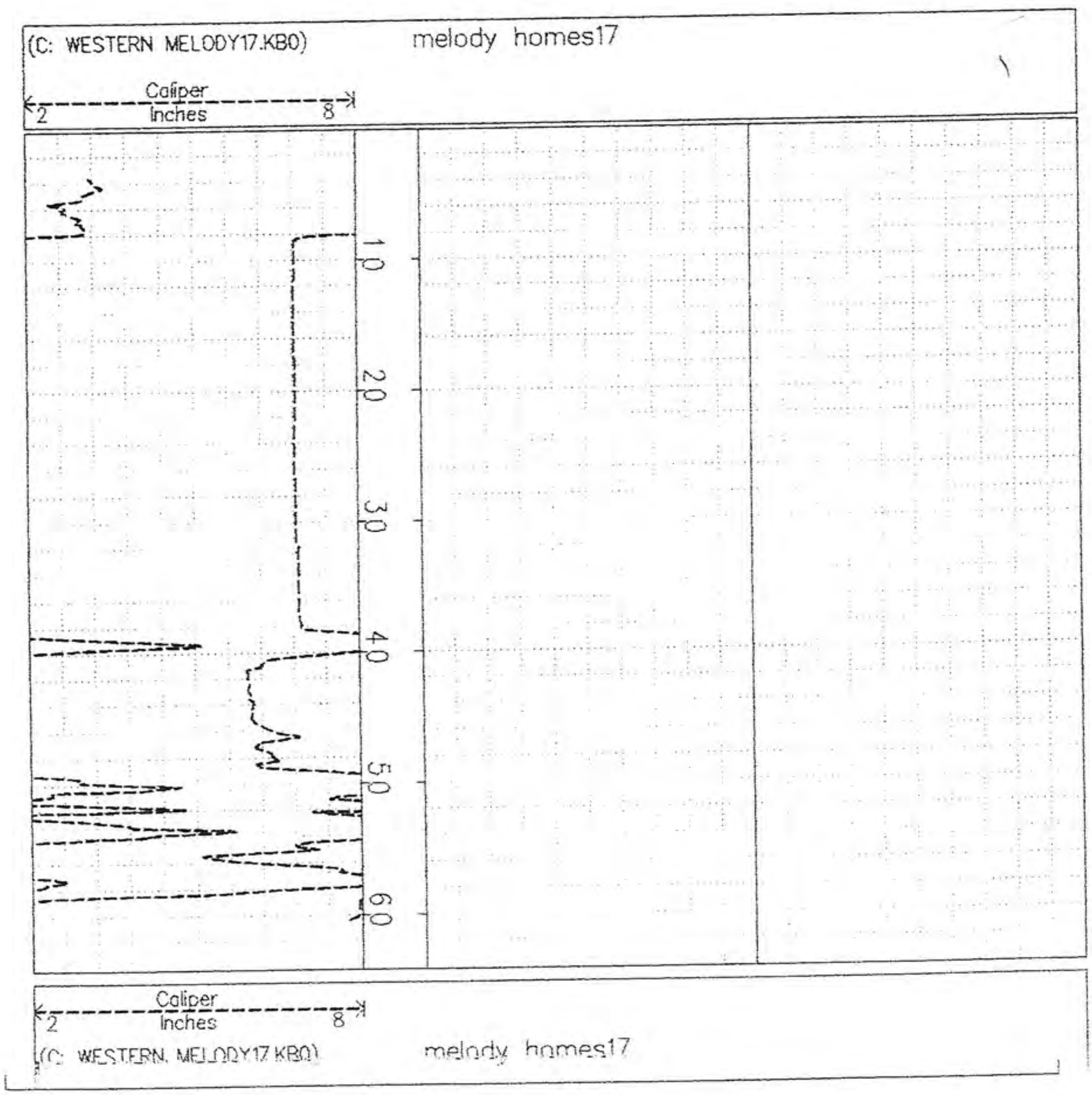
Caliper
2 Inches 8

(C: WESTERN MELODY15.KB0) melody homes 14

(C: WESTERN MELODY16.KB0) melody homes 16



(C: WESTERN MELODY16.KB0) melody homes 16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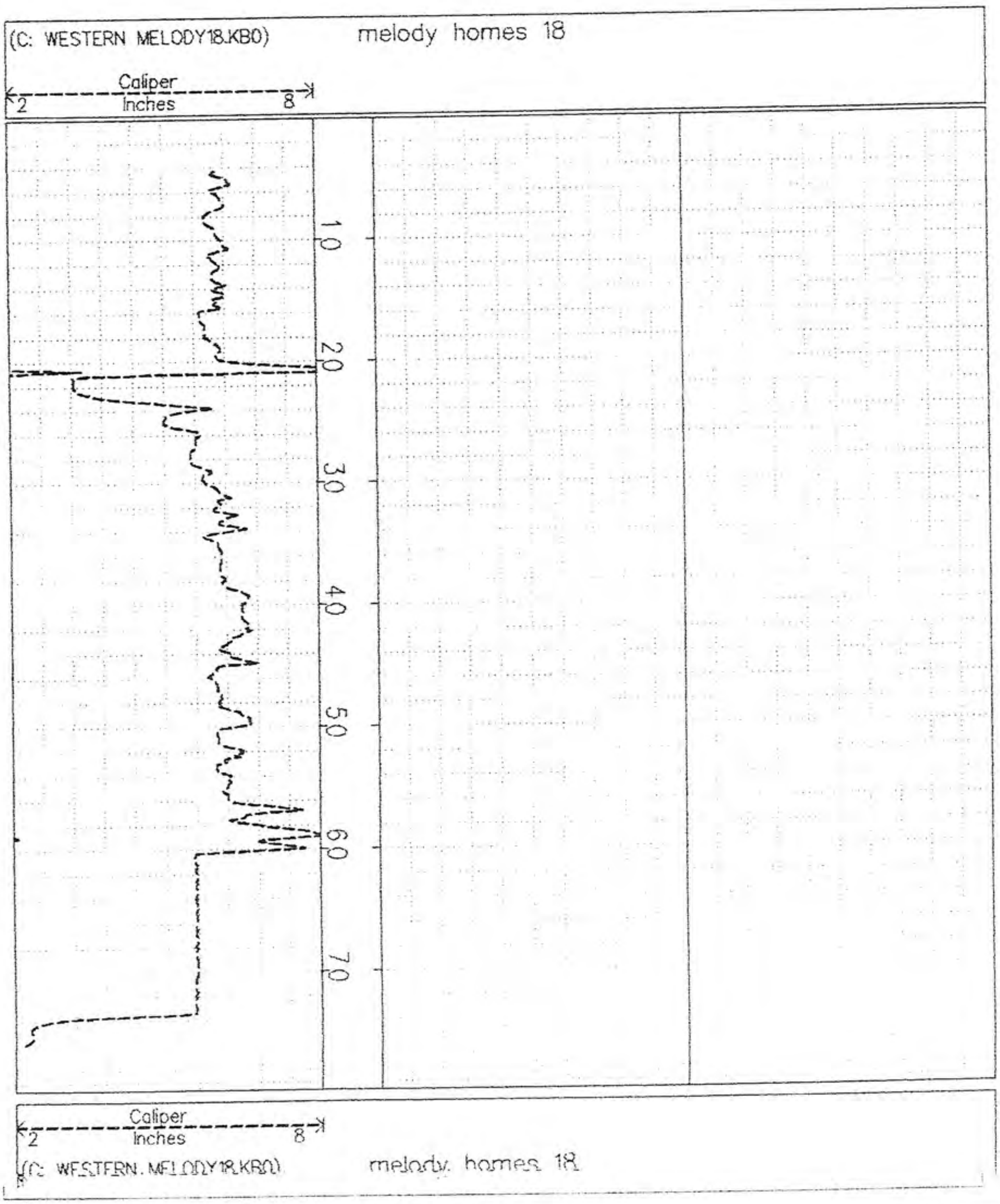
melody homes17
Caliper
Inches
2
8
10
20
30
40
50
60
Caliper
Inches
2
8
(C: WESTERN MELODY17.KB0)
melody homes17



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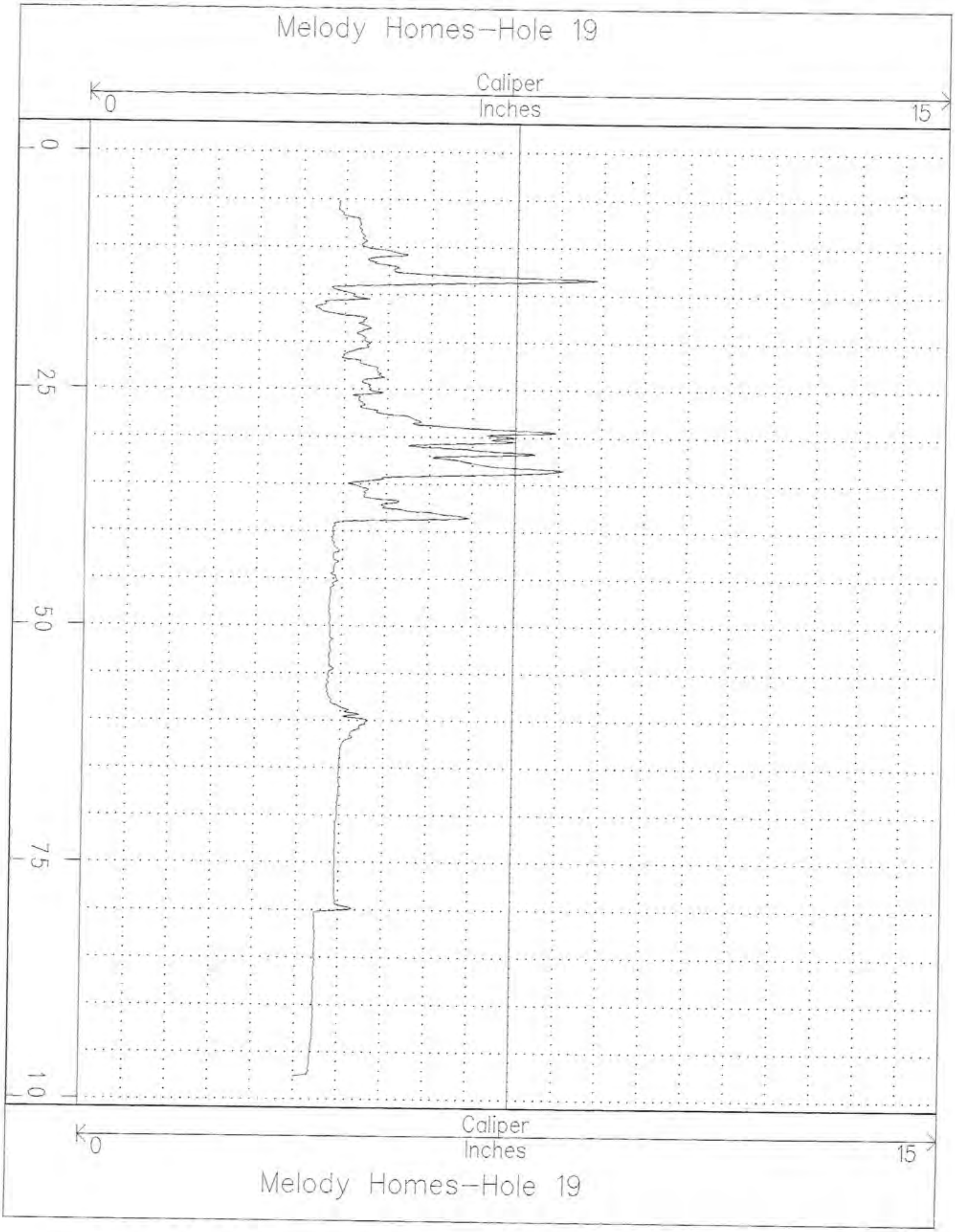
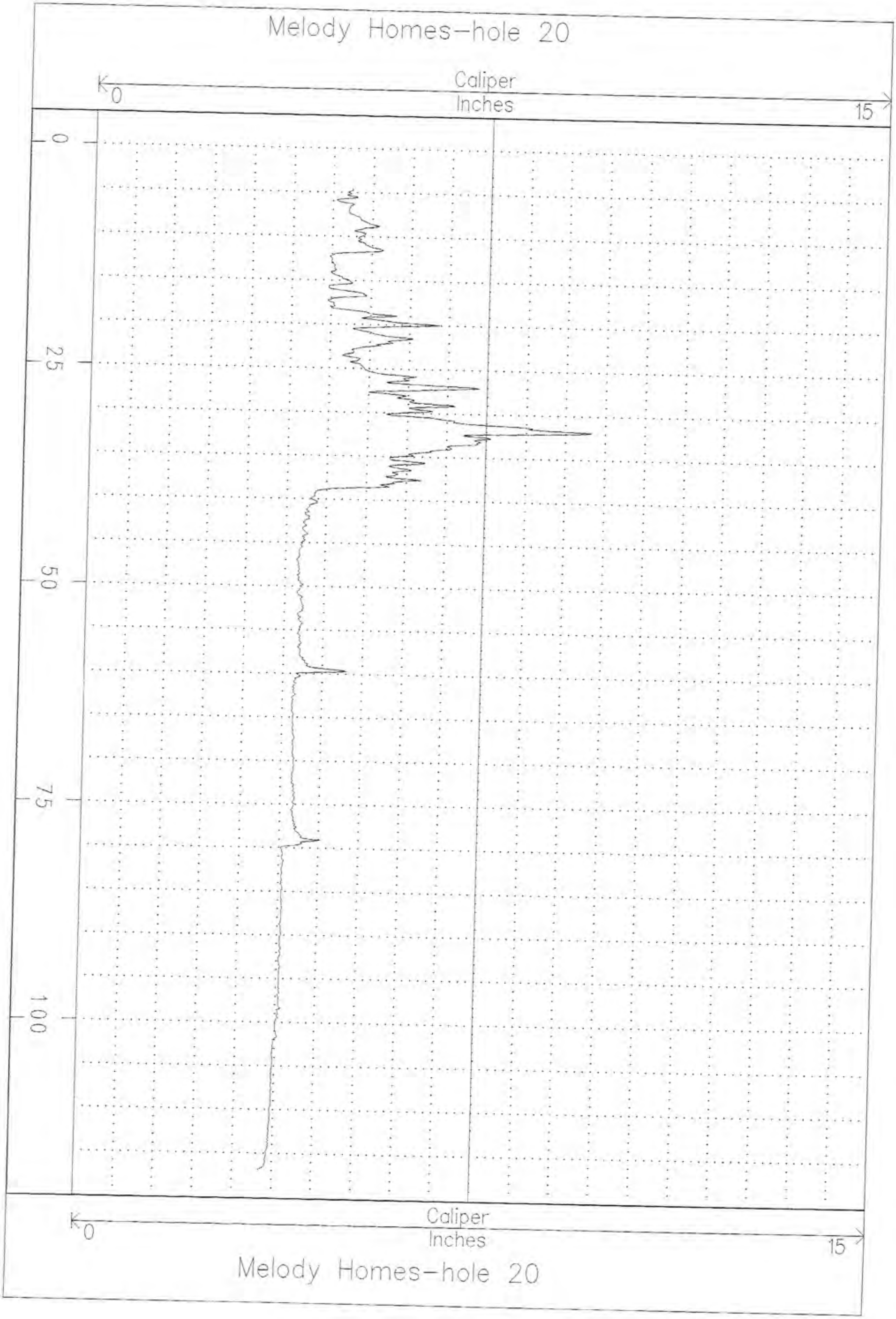
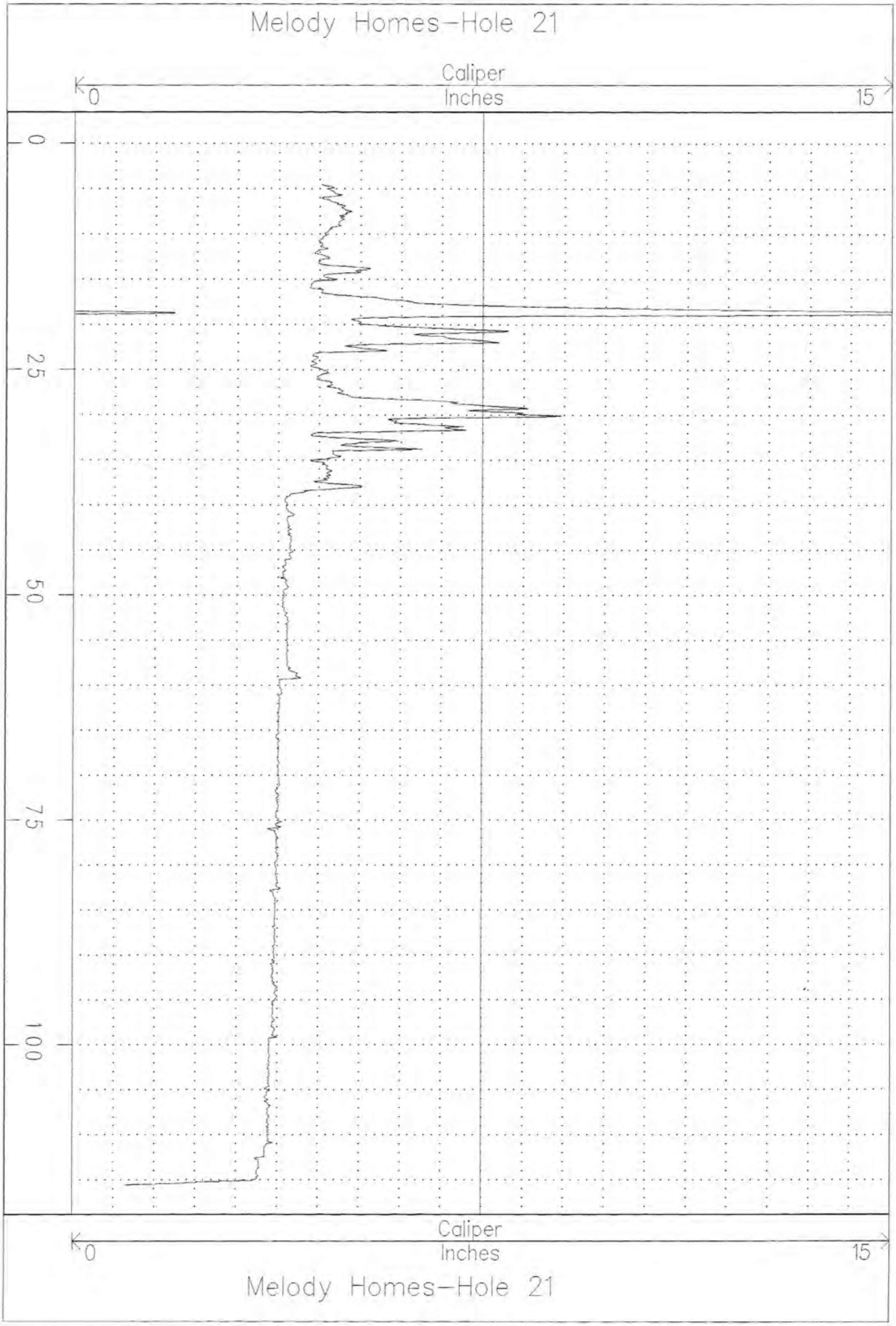
melody homes 18
Caliper
Inches
2
8
10
20
30
40
50
60
70
Caliper
Inches
2
8
(C: WESTERN MELODY18.KB0)
melody homes 18



Melody Homes–Hole 19



Melody Homes-hole 20
Caliper
Inches
0
15
0
25
50
75
100
Caliper
Inches
0
15
Melody Homes-hole 20



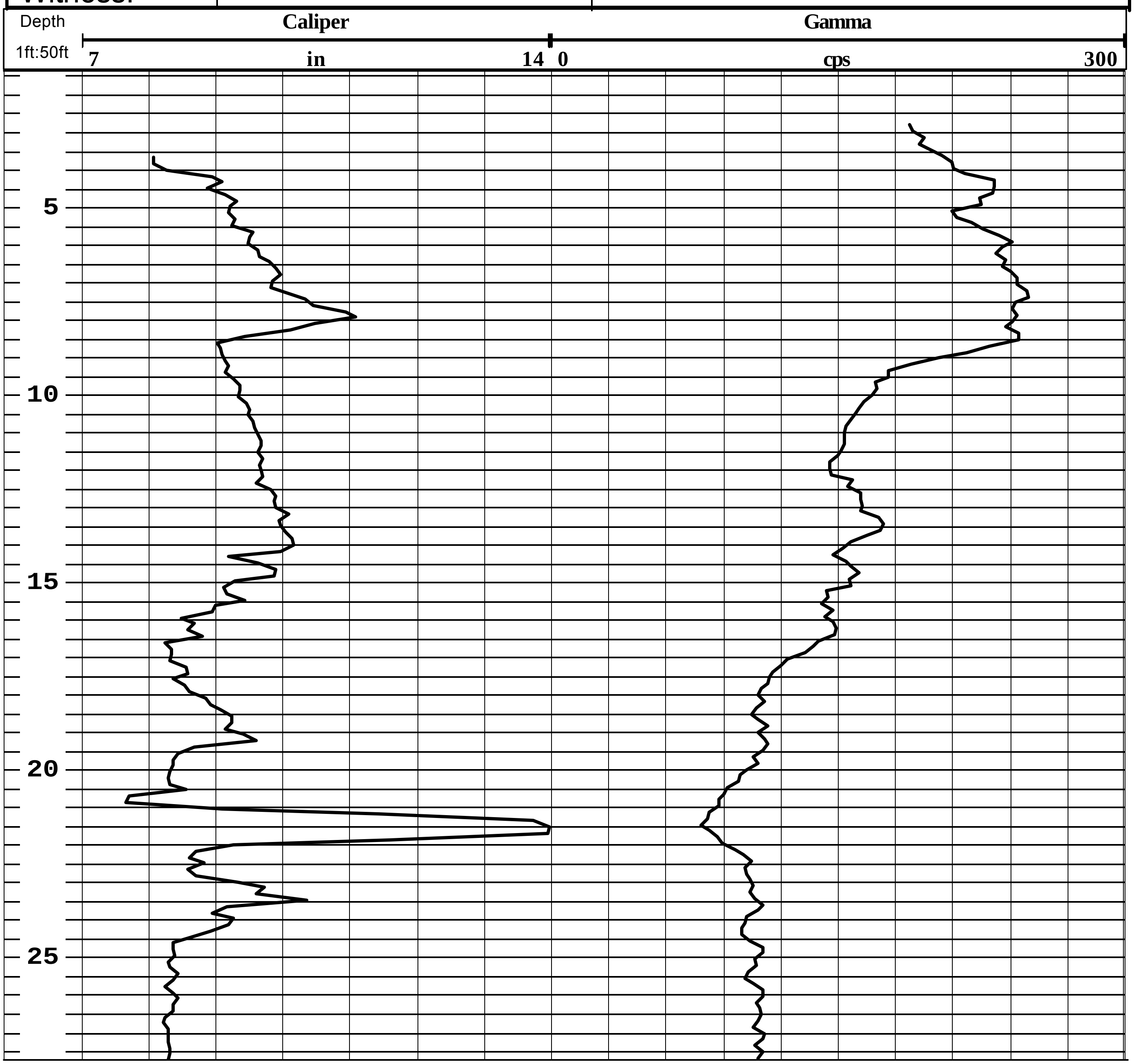
Melody Homes-Hole 21
Caliper
Inches
0
15
0
25
50
75
100
Caliper
Inches
0
15
Melody Homes-Hole 21

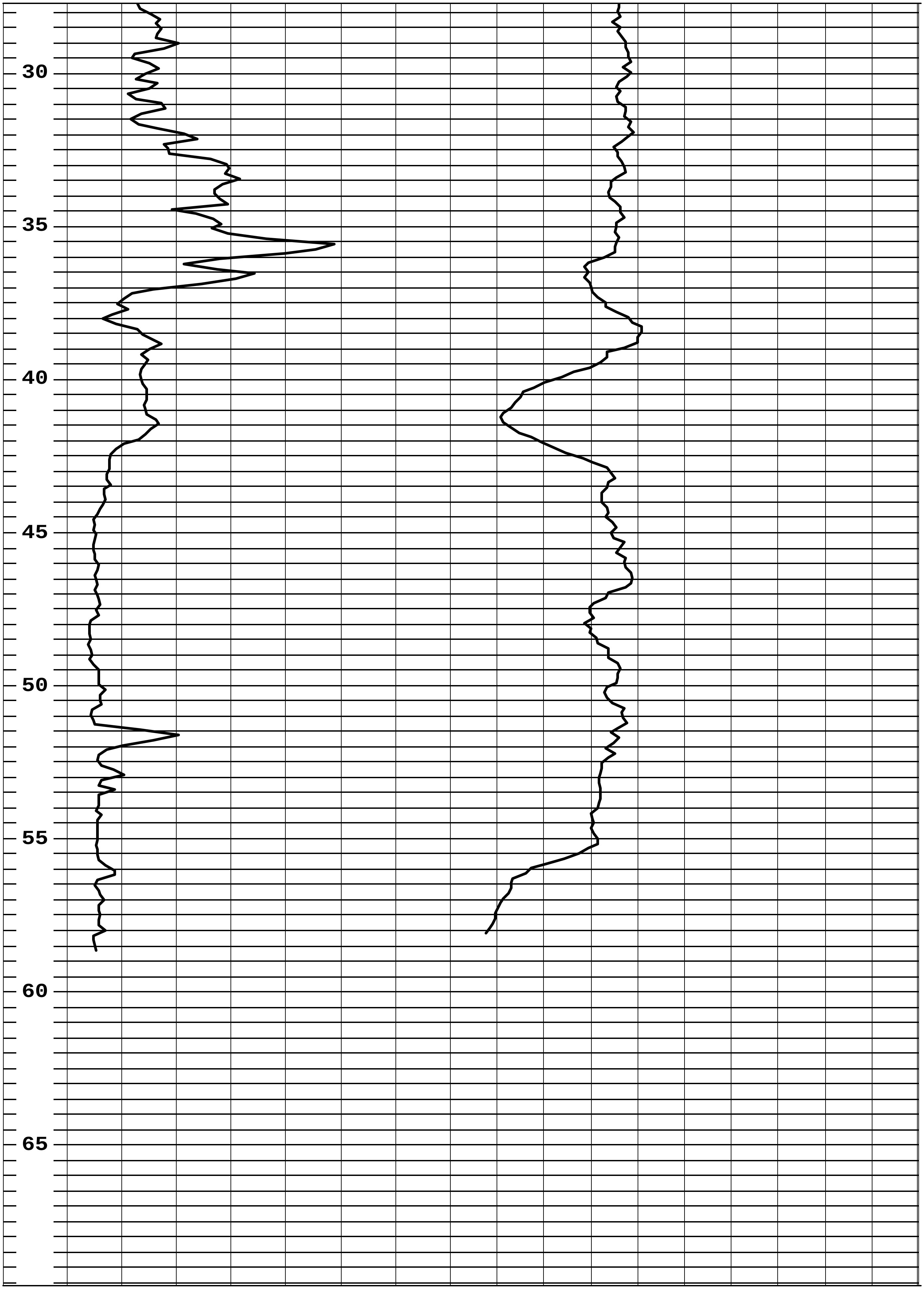
	Western Environment and Ecology, Inc
	Location: N40 03.168' W105 03.575'

Well	M-23		
Date	6/1/200	Bit Size	8 inches

Casing	No
File Name	m-23
Depth Driller	60'
Depth Logger	60'
Logged by:	B. Partington
Witness:	G.Sherman

OTHER SERVICES



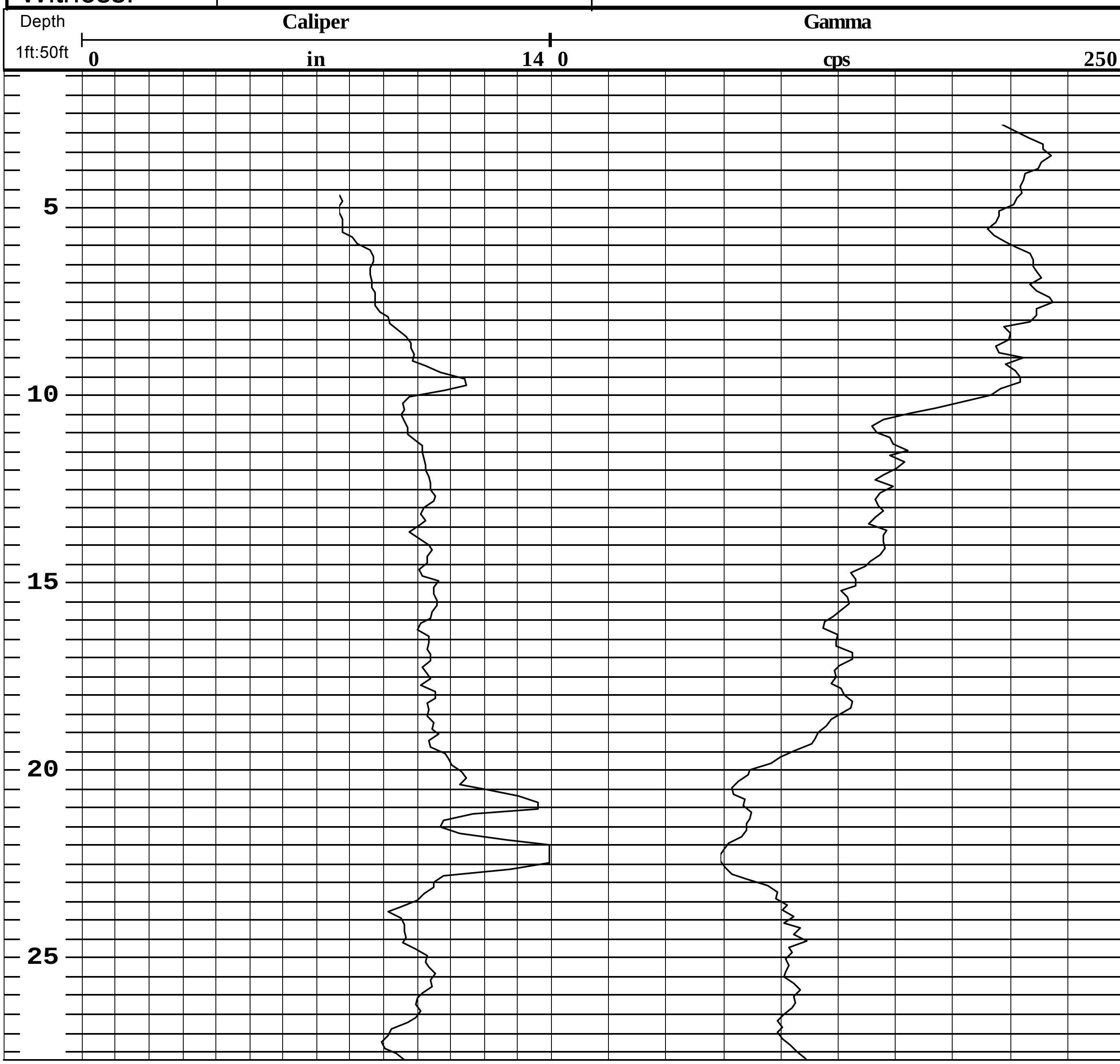

30
35
40
45
50
55
60
65

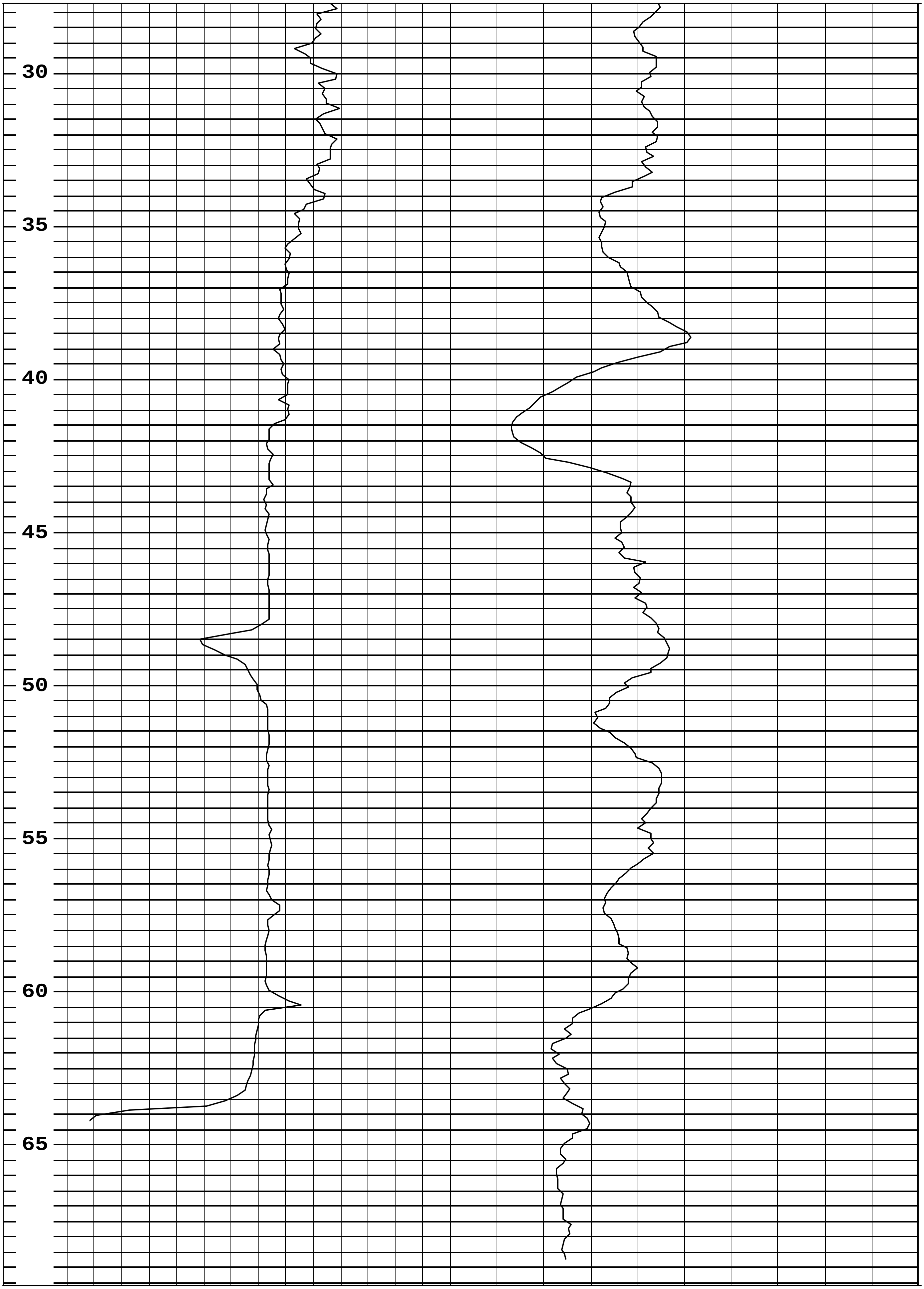
Western Environment and Ecology, Inc

Location: N40 03.165' W105 03.554'

Well	M-24		
Date	6/1/200	Bitsize	8.0 inches
Casing	No		
File Name	M-24		
Depth Driller	70'		
Depth Logger	69'		
Logged by:	B. Partington		
Witness:	G.Sherman		

OTHER SERVICES




30
35
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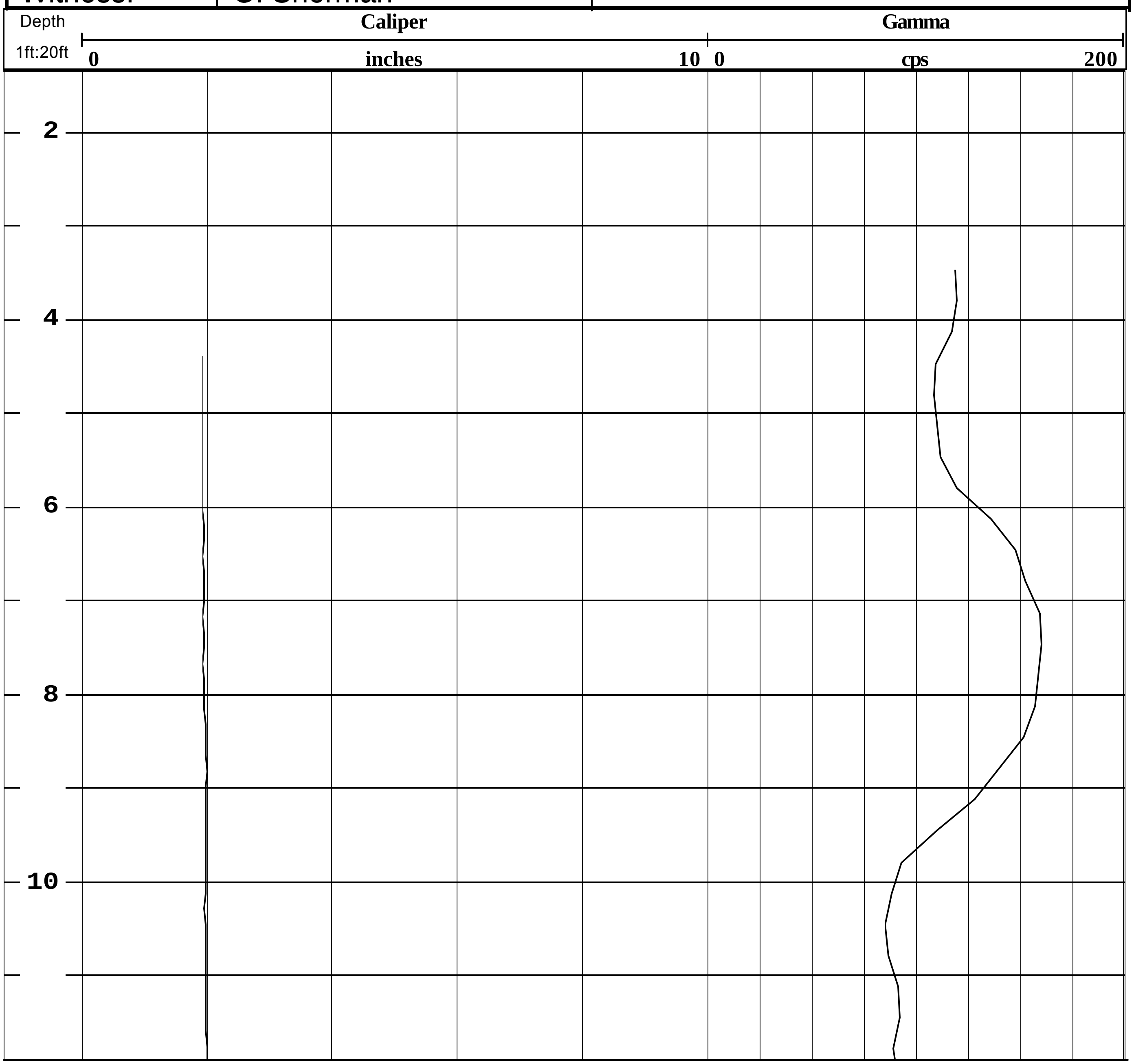
45
50
55
60
65

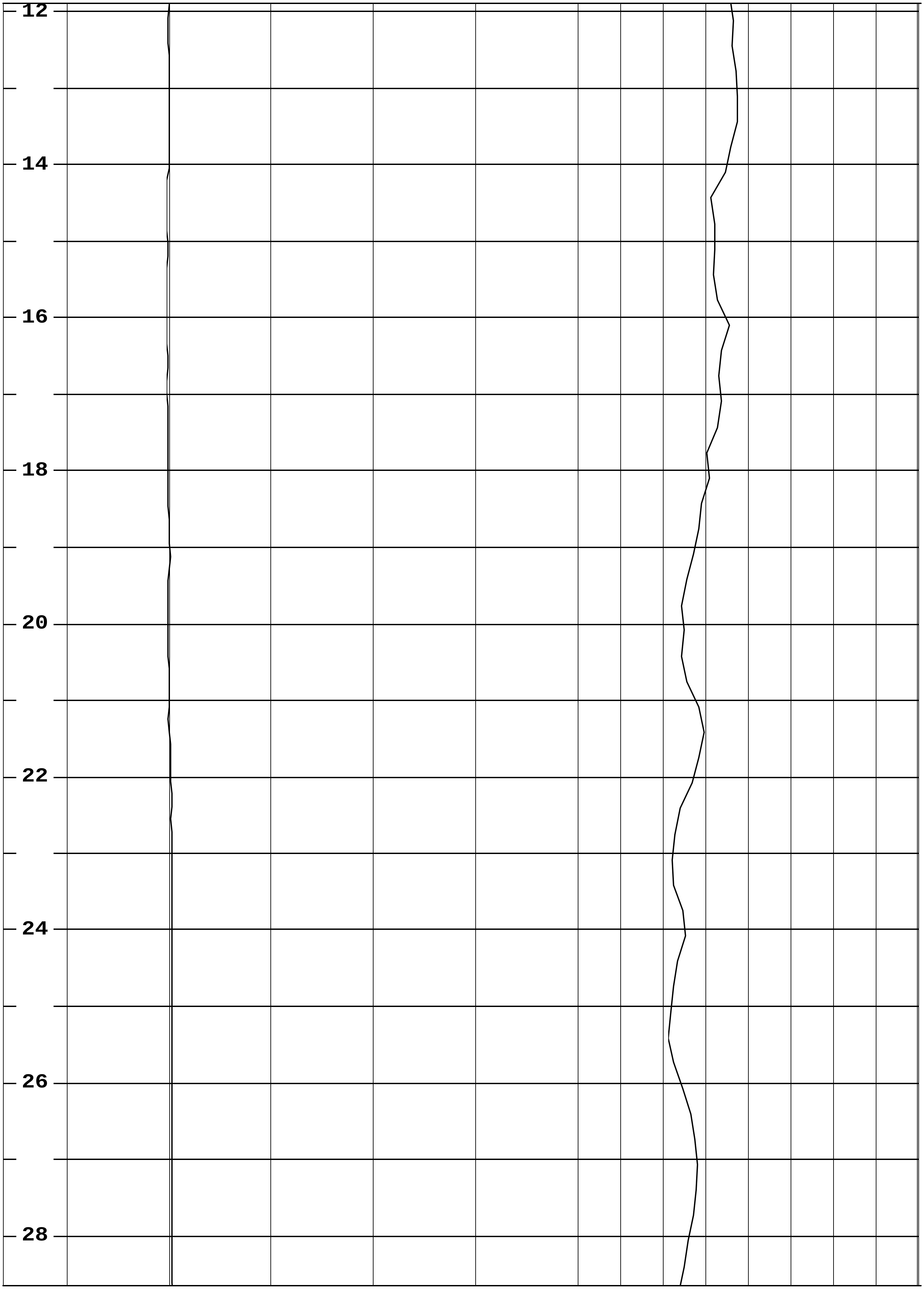
Western Environment and Ecology, Inc

Location:Section 13, T1N, R69W, Erie, Colorado

Well	M-25		
Date	7/11/2005	Bit size	8inches
Casing	To 44 feet		
File Name	m-25		
Depth Driller	70'		
Depth Logger	69'		
Logged by:	B. Partington		
Witness:	G. Sherman		

OTHER SERVICES




12
14
16
18
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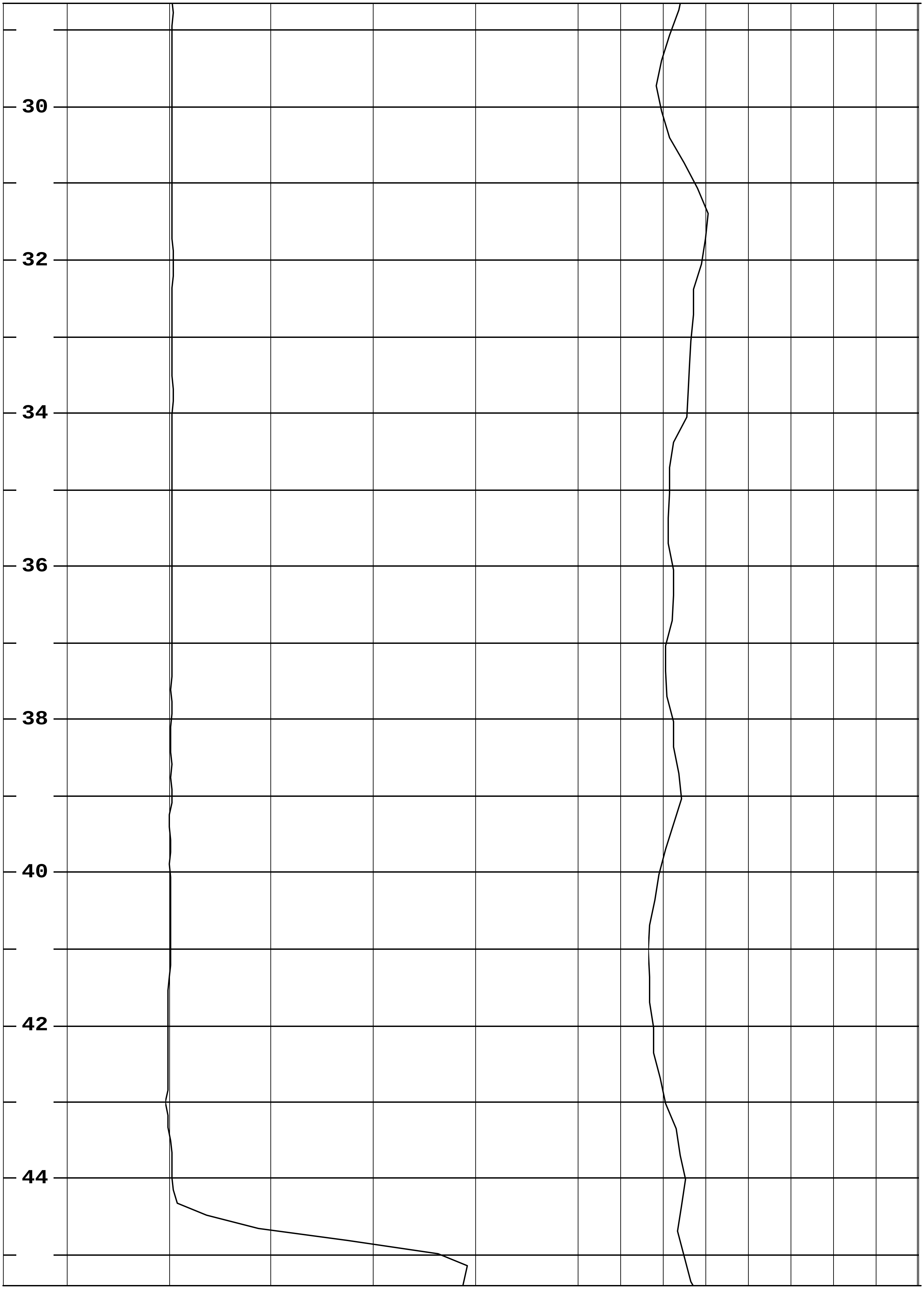
22
24
26
28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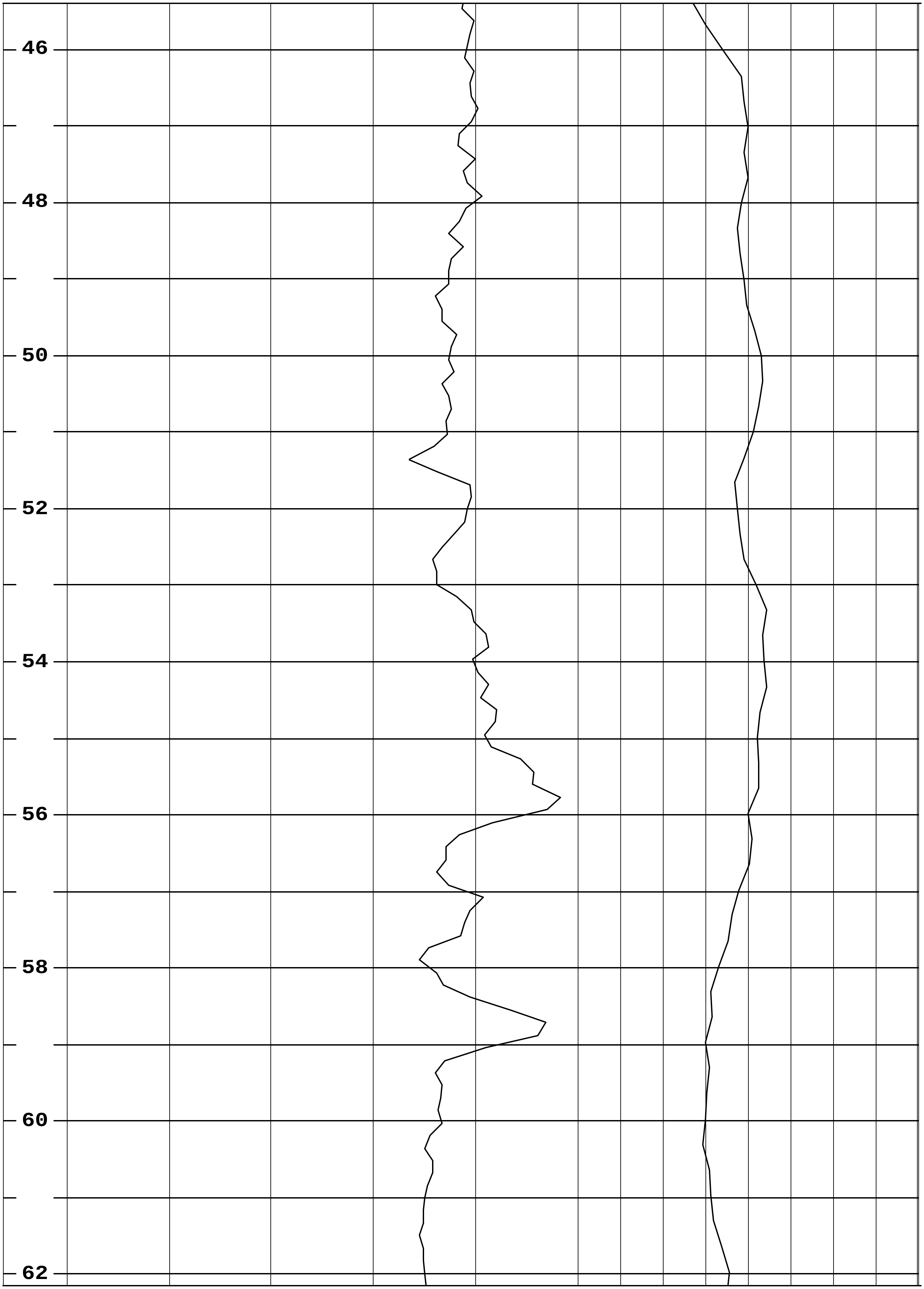
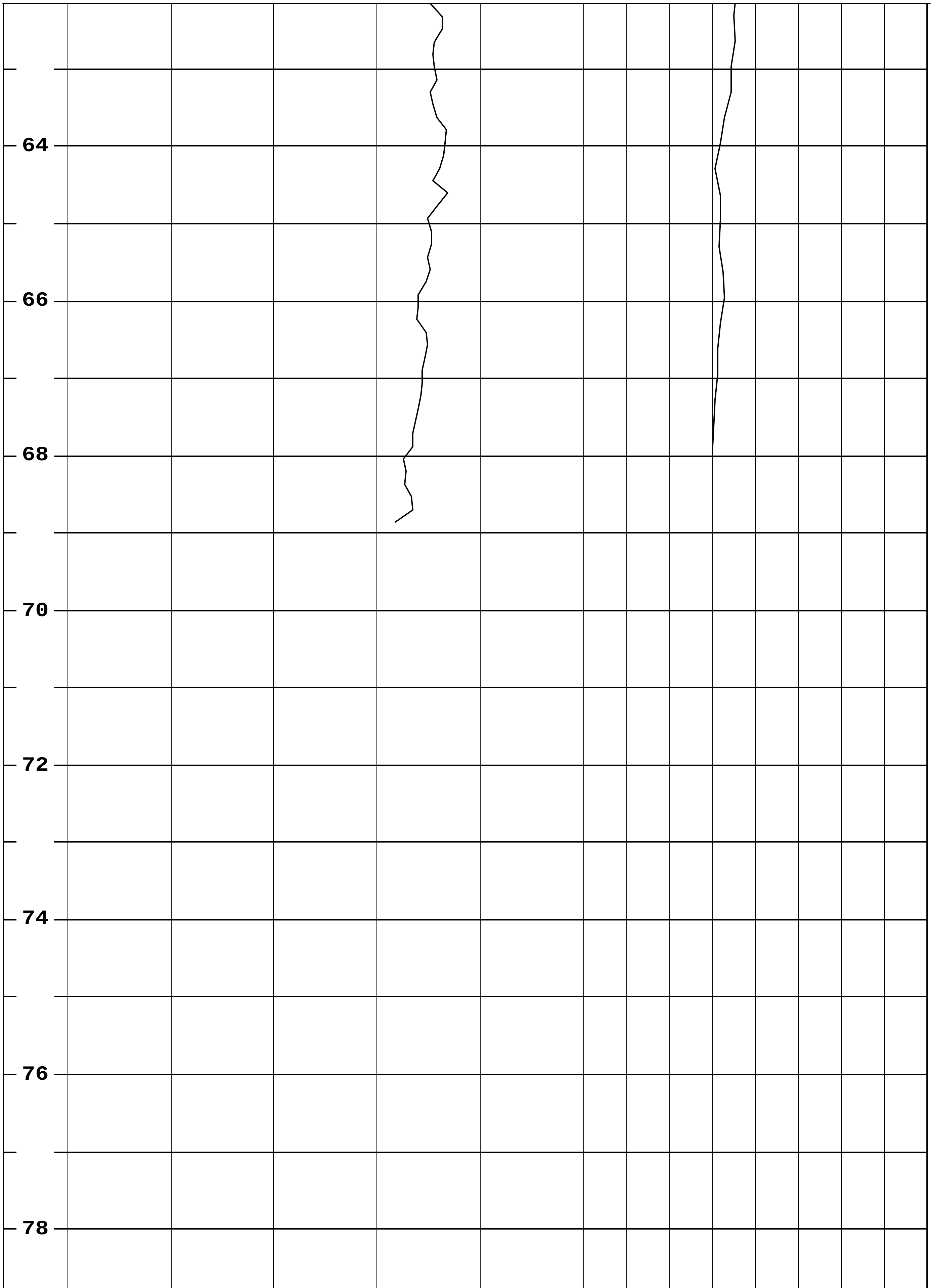
32
34
36
38
40
42
44


46
48
50
52
54
56
58
60
62

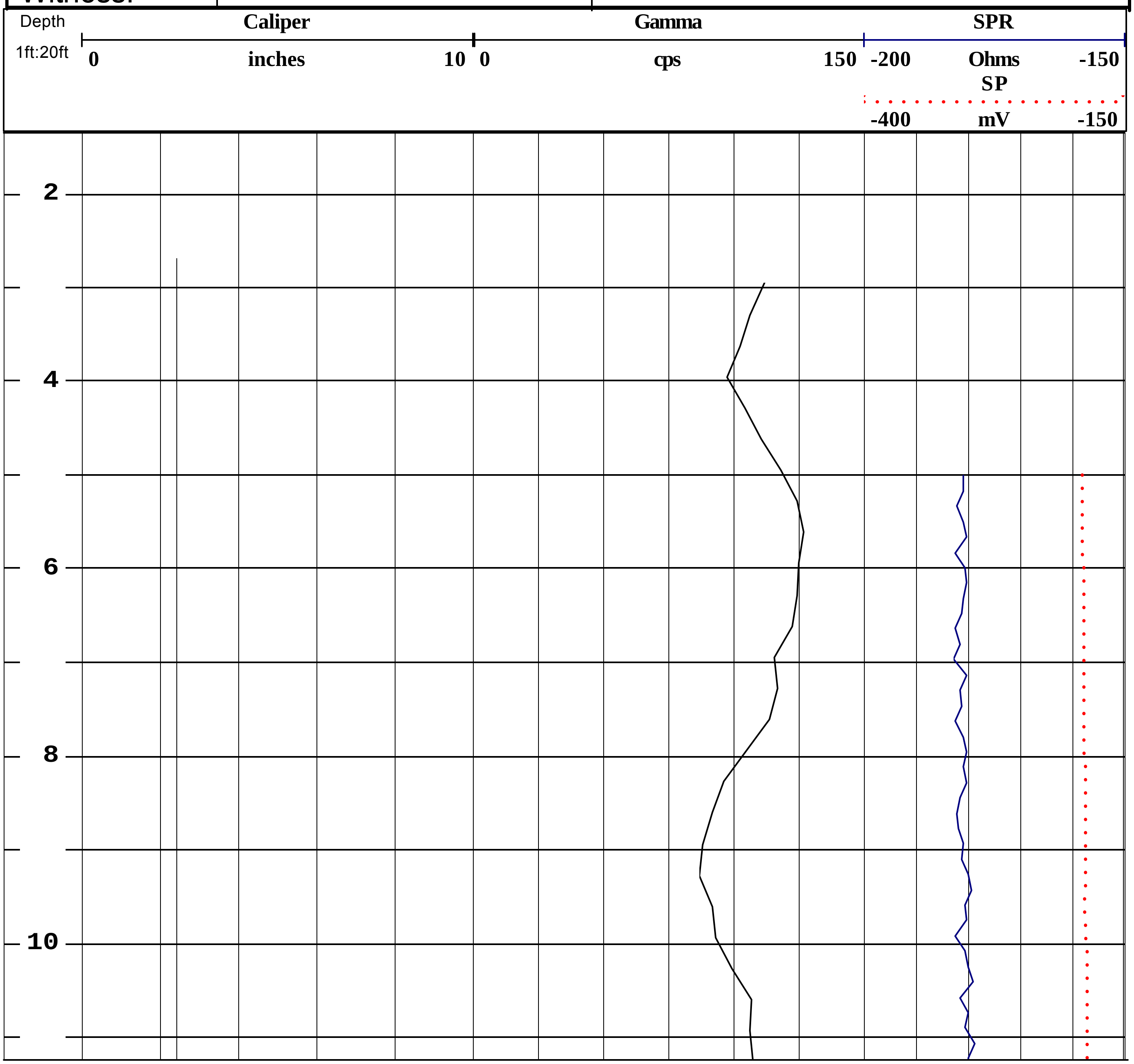

64
66
68
70
72
74
76
78

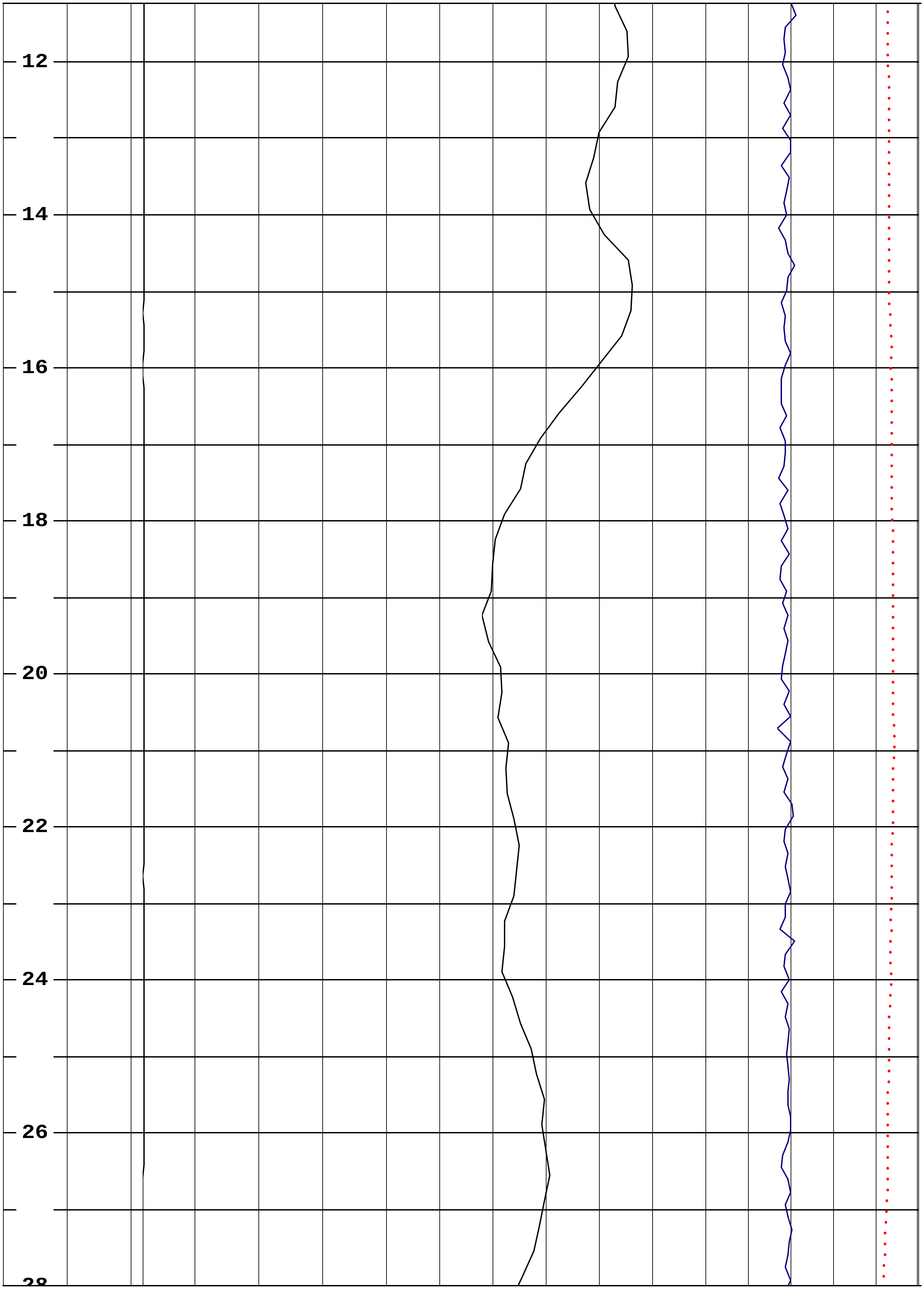
Western Environment and Ecology, Inc

Location: Section 13, T1N, R69W, Erie, Colorado

Well	M-26		
Date	7/11/2005	Bit Size	8 inches
Casing	To 34 Feet		
File Name	m-26		
Depth Driller	65'		
Depth Logger	62'		
Logged by:	B. Partington		
Witness:	G. Sherman		

OTHER SERVICES

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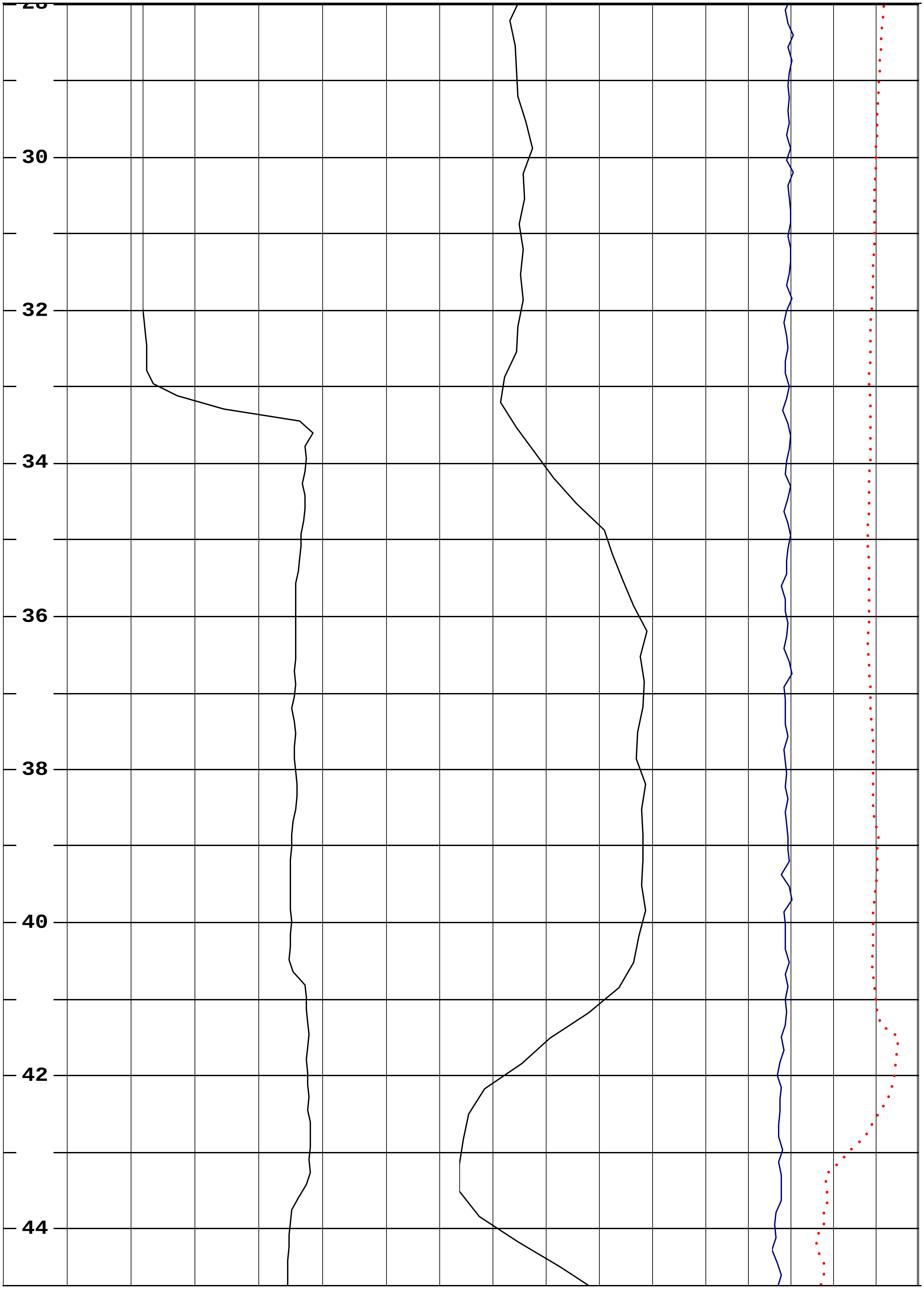
24
26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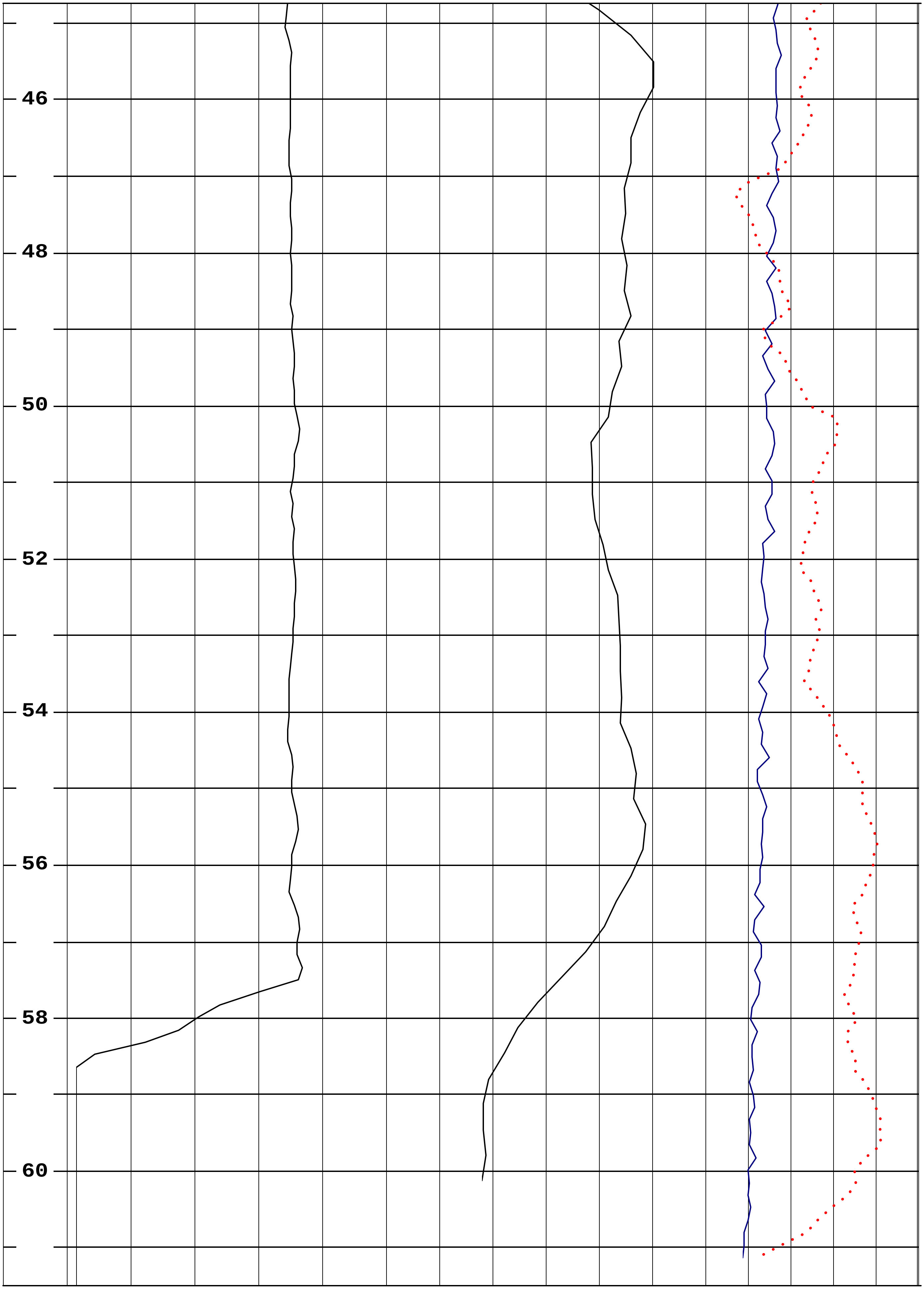
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56
58
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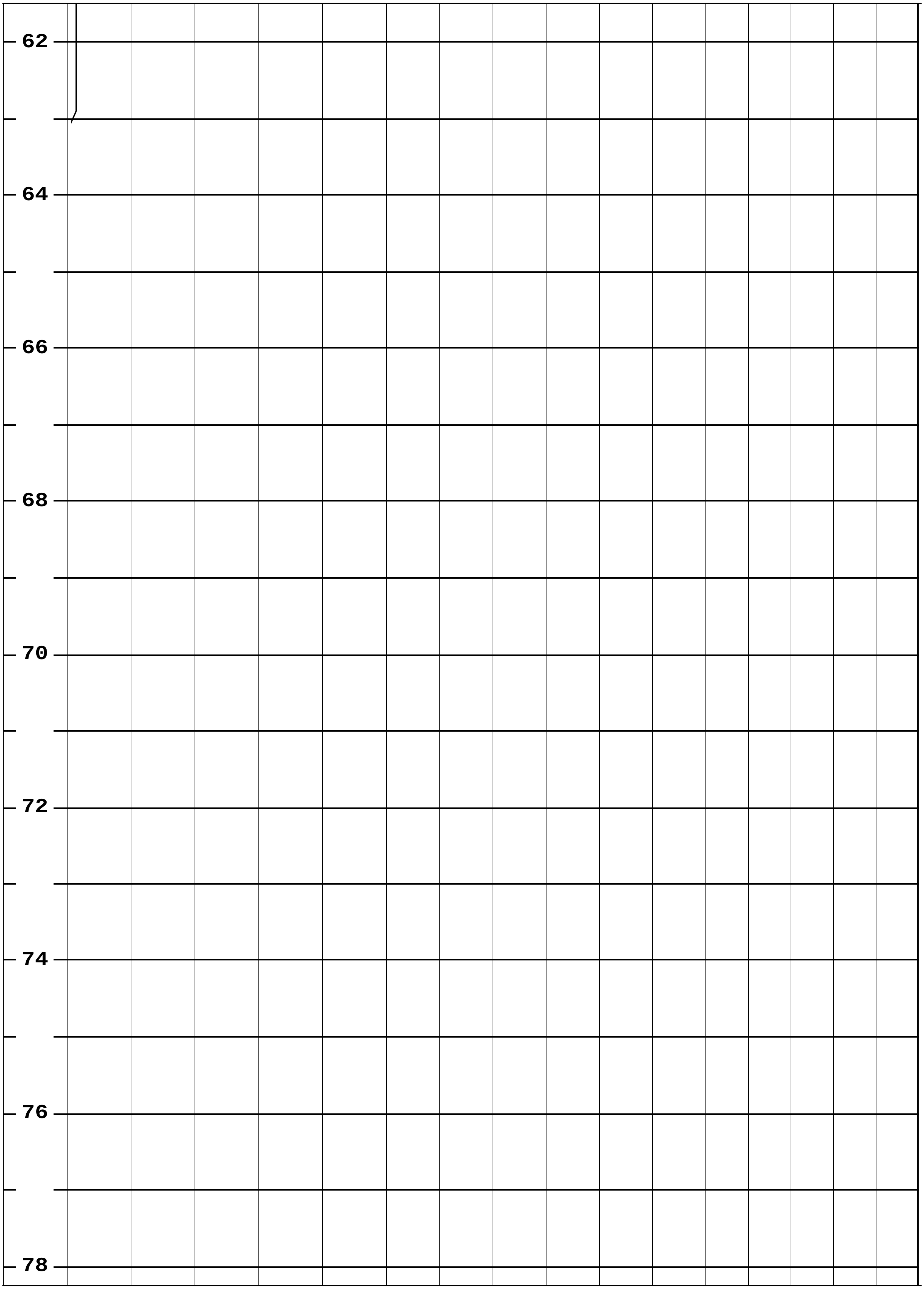

62
64
66
68
70
72
74
76
78

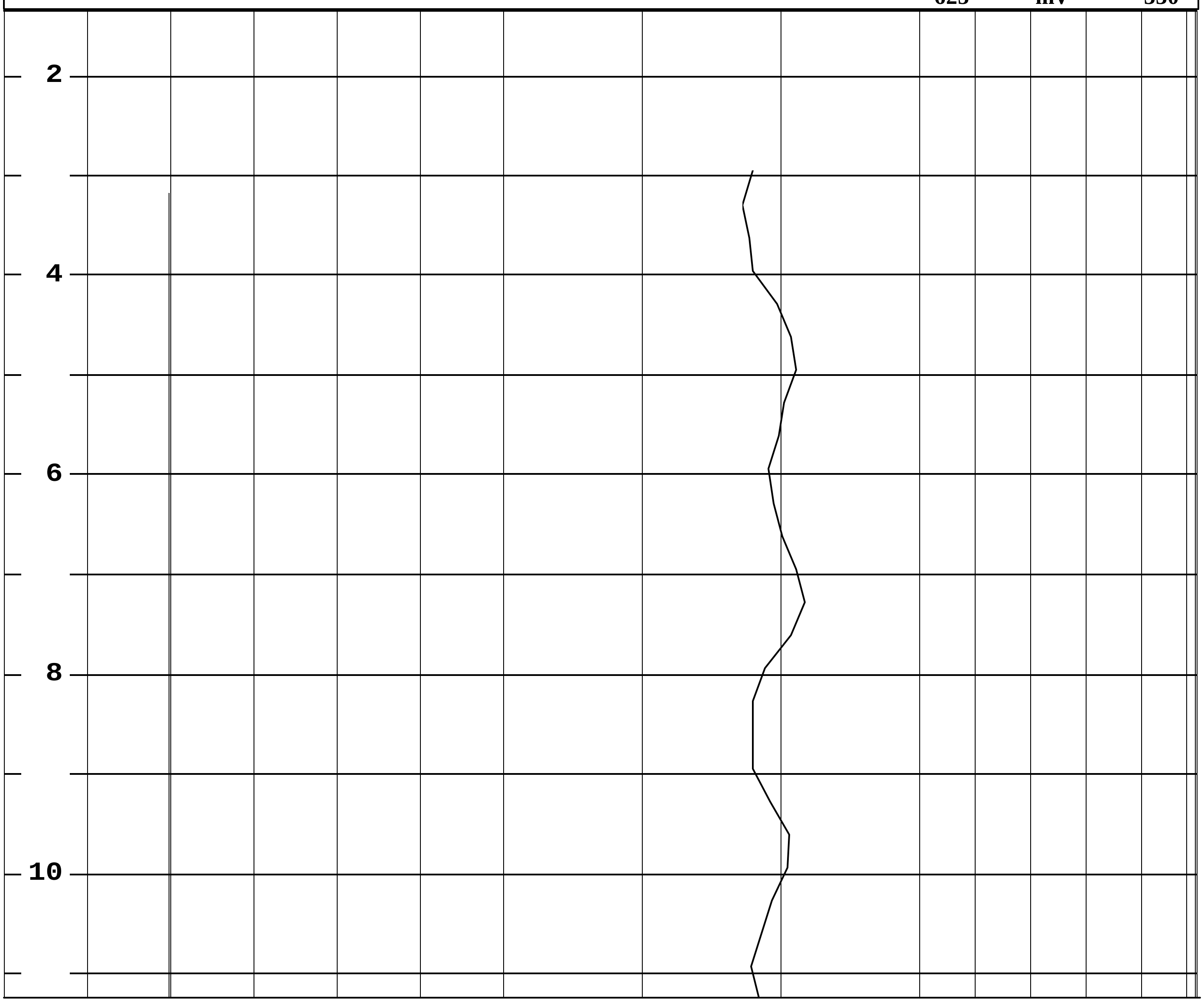
Western Environment and Ecology, Inc

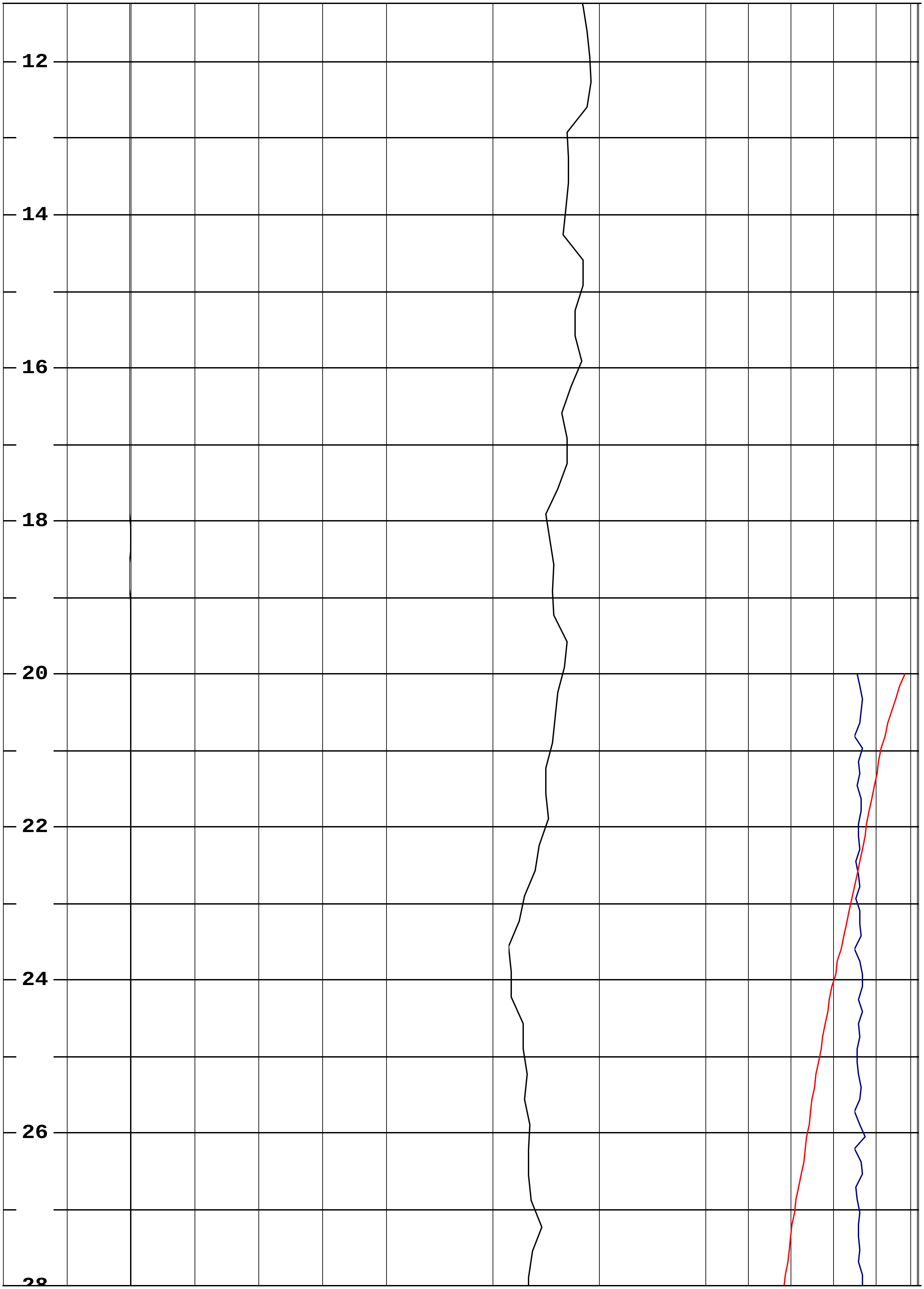
Location: Section 13, T1N, R69W, Erie, Colorado

Well	M-27		
Date	7/11/2005	Bit Size	8 inches
Casing	To 39 Feet		
File Name	m-27		
Depth Driller	70'		
Depth Logger	68'		
Logged by:	B. Partington		
Witness:	G. Sherman		

OTHER SERVICES

Depth	Caliper	Gamma	SPR / SP
1ft:20ft	0 inches 10	0 cps 150	-300 Ohms -200
			-625 mV -330

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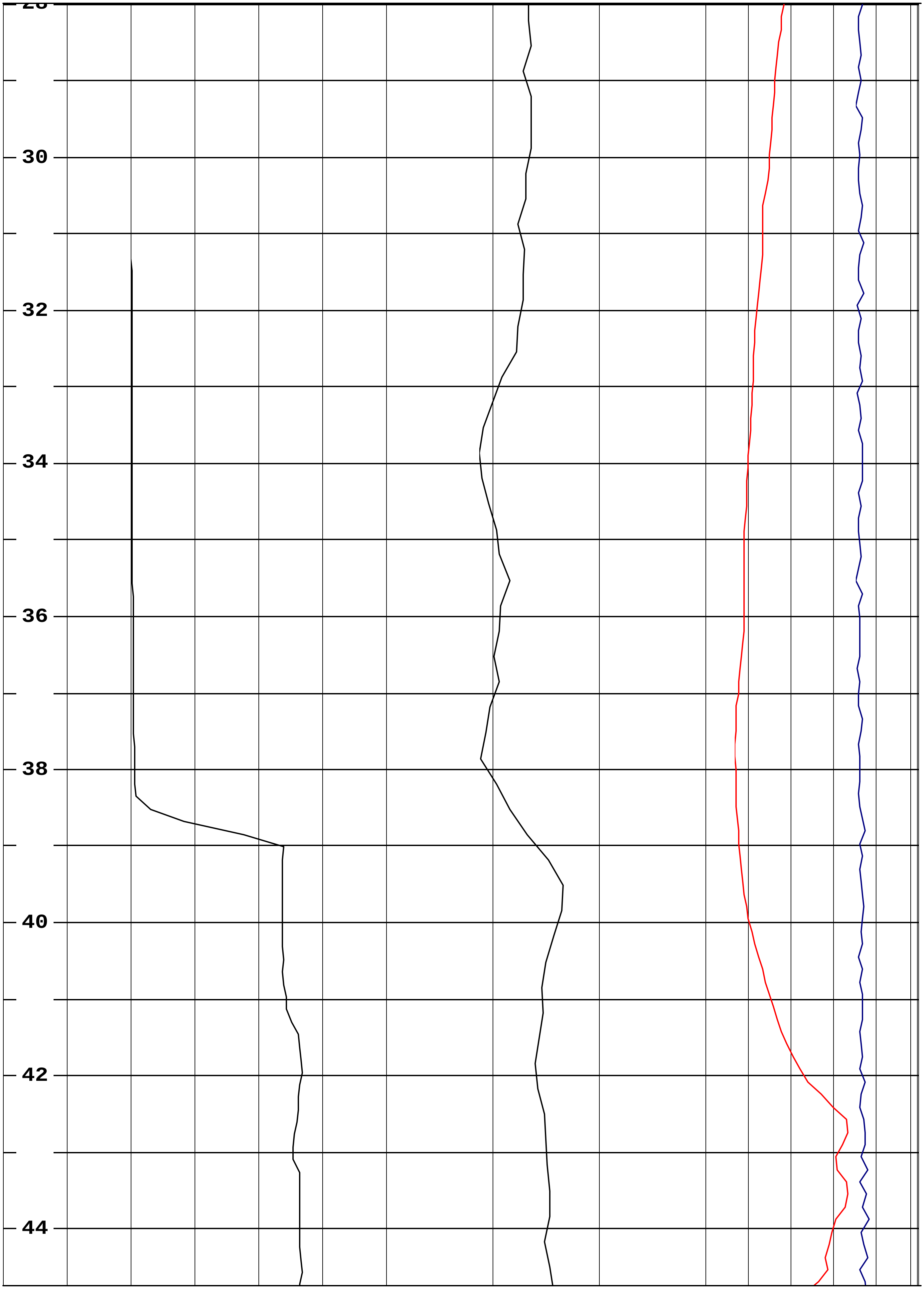
24
26
28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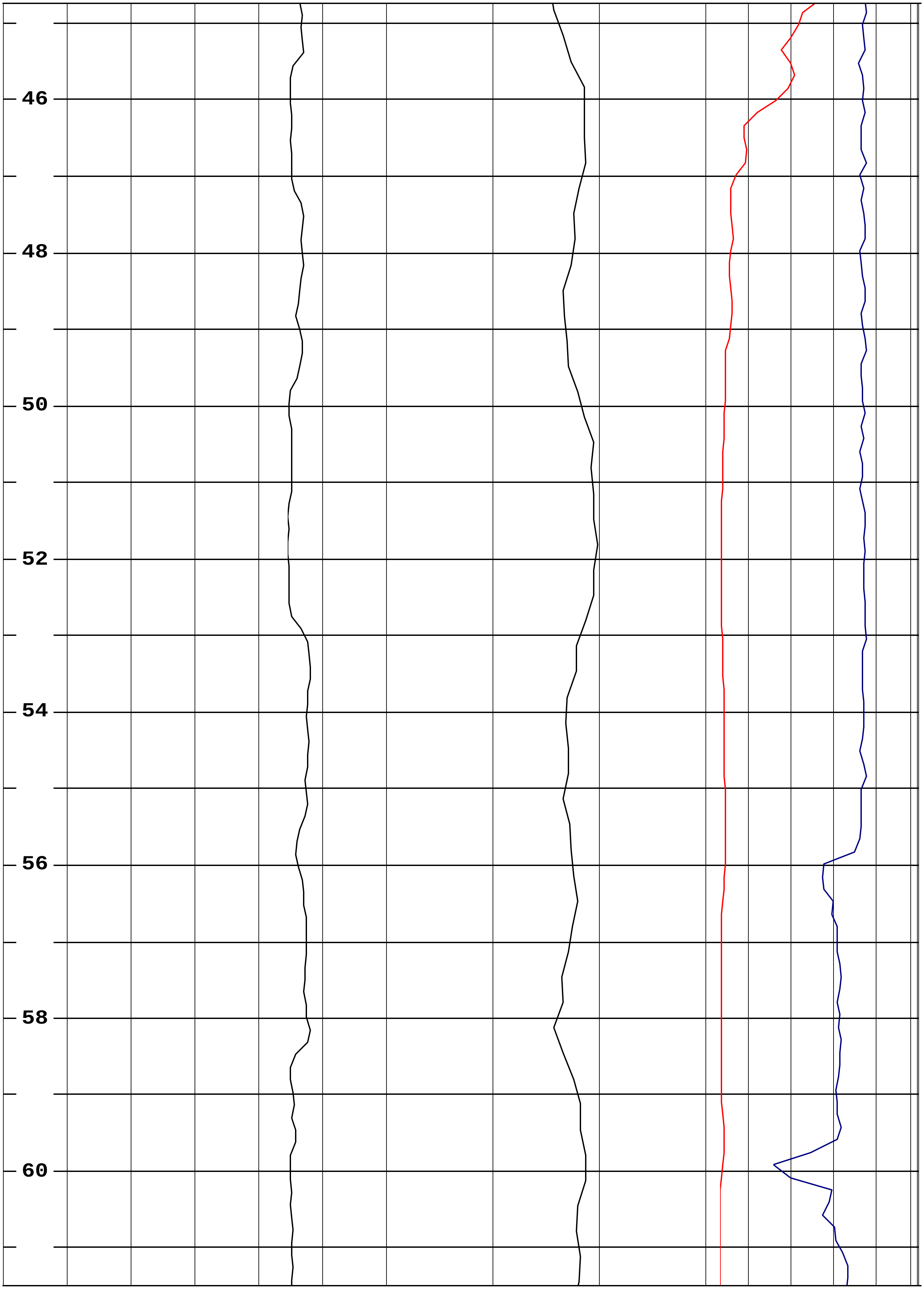
30
32
34
36
38
40
42
44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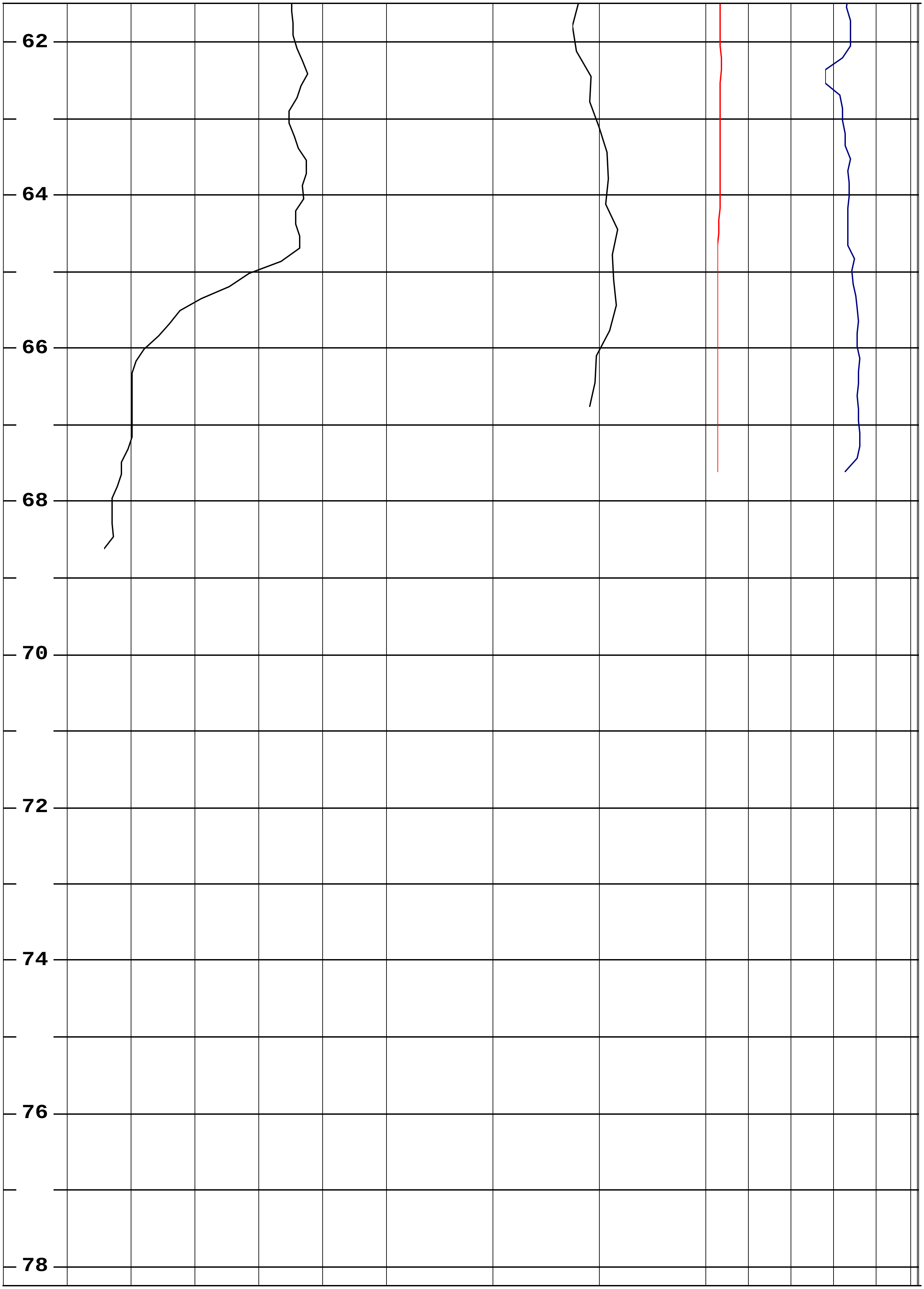
52
54
56
58
60


62
64
66
68
70
72
74
76
78

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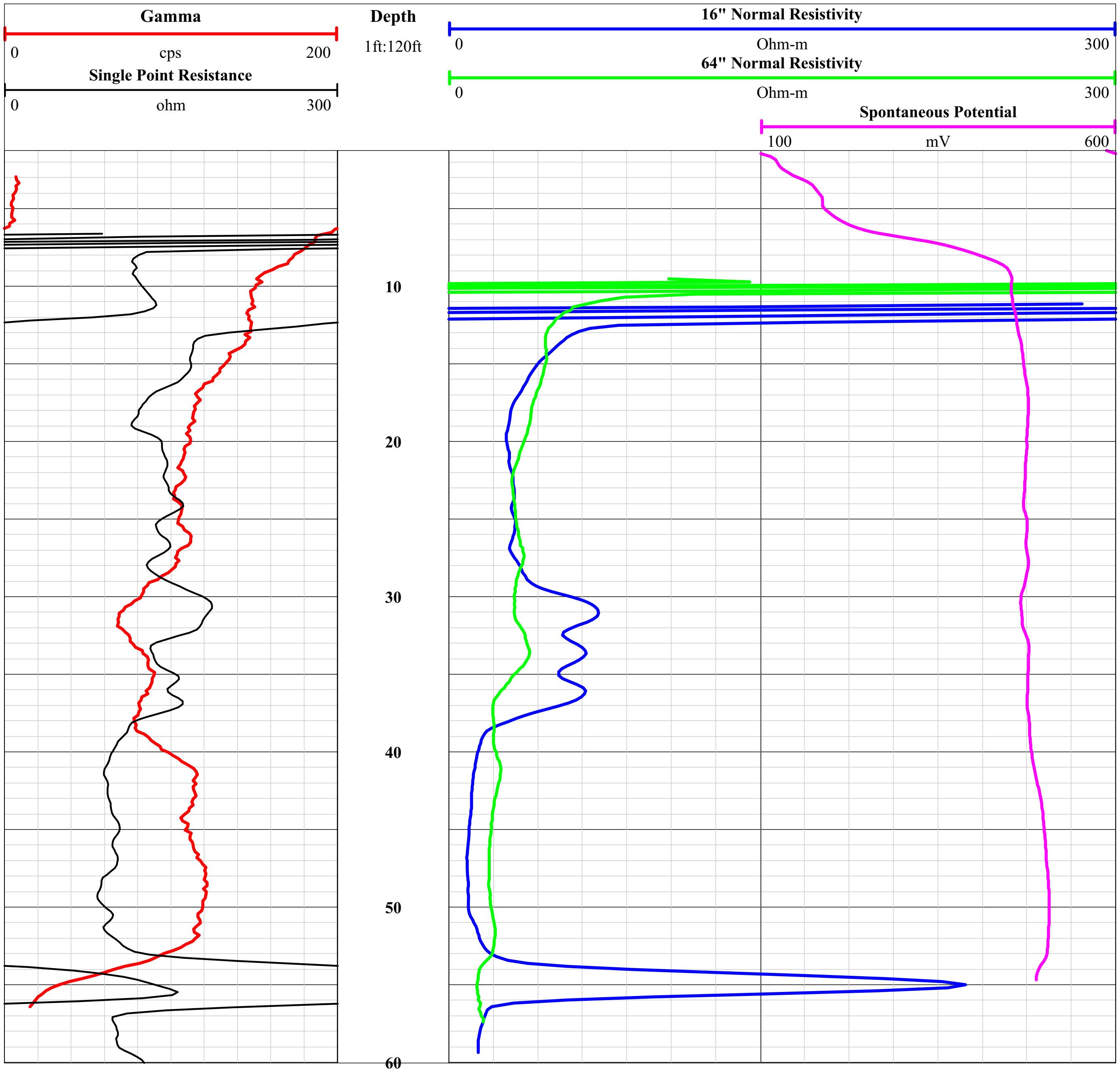
Geophysical Log

Client	McStain Neighborhoods	Boring No.	M-28	Total Depth	70.0'
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	4/19/2016



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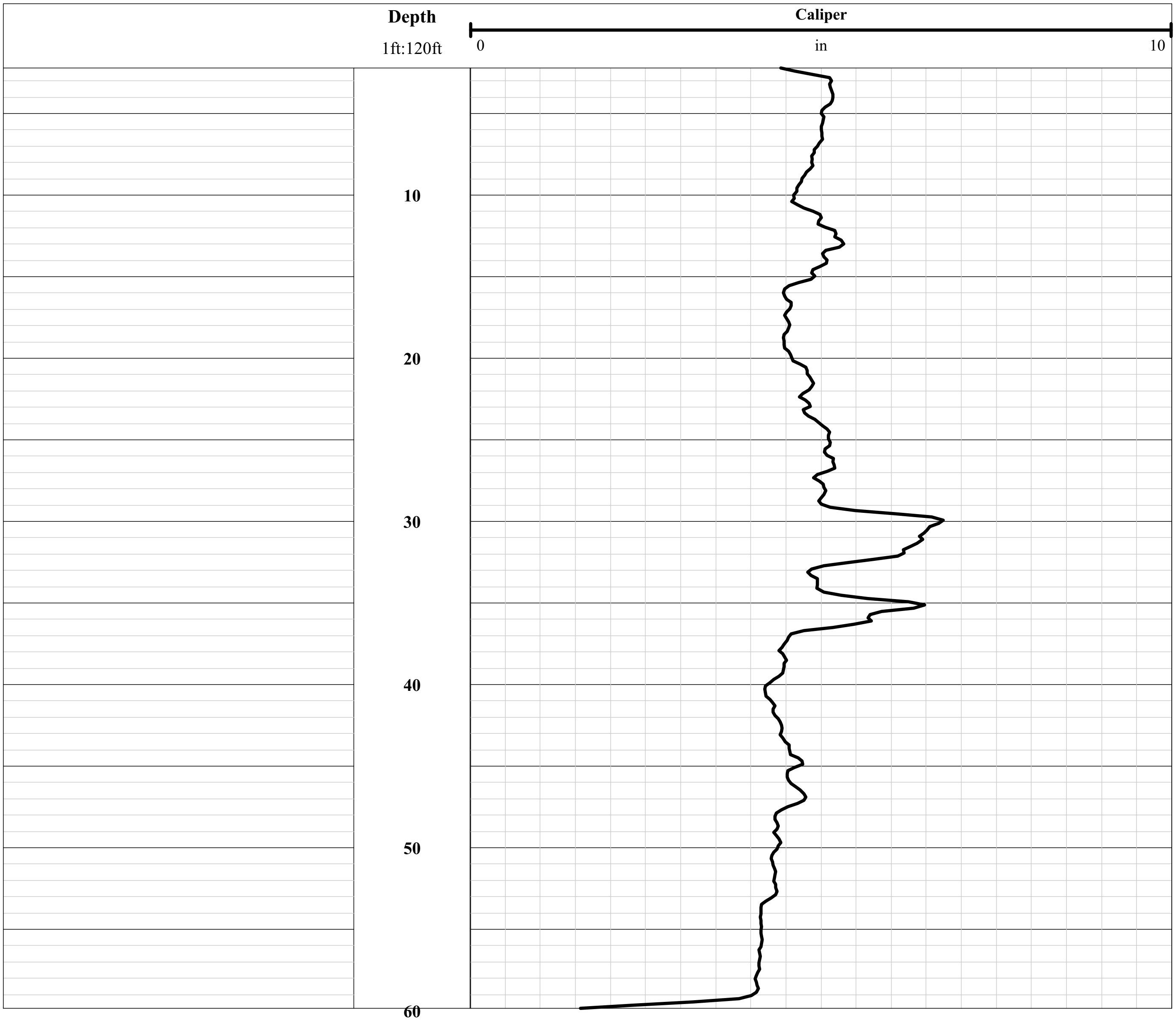
Geophysical Log

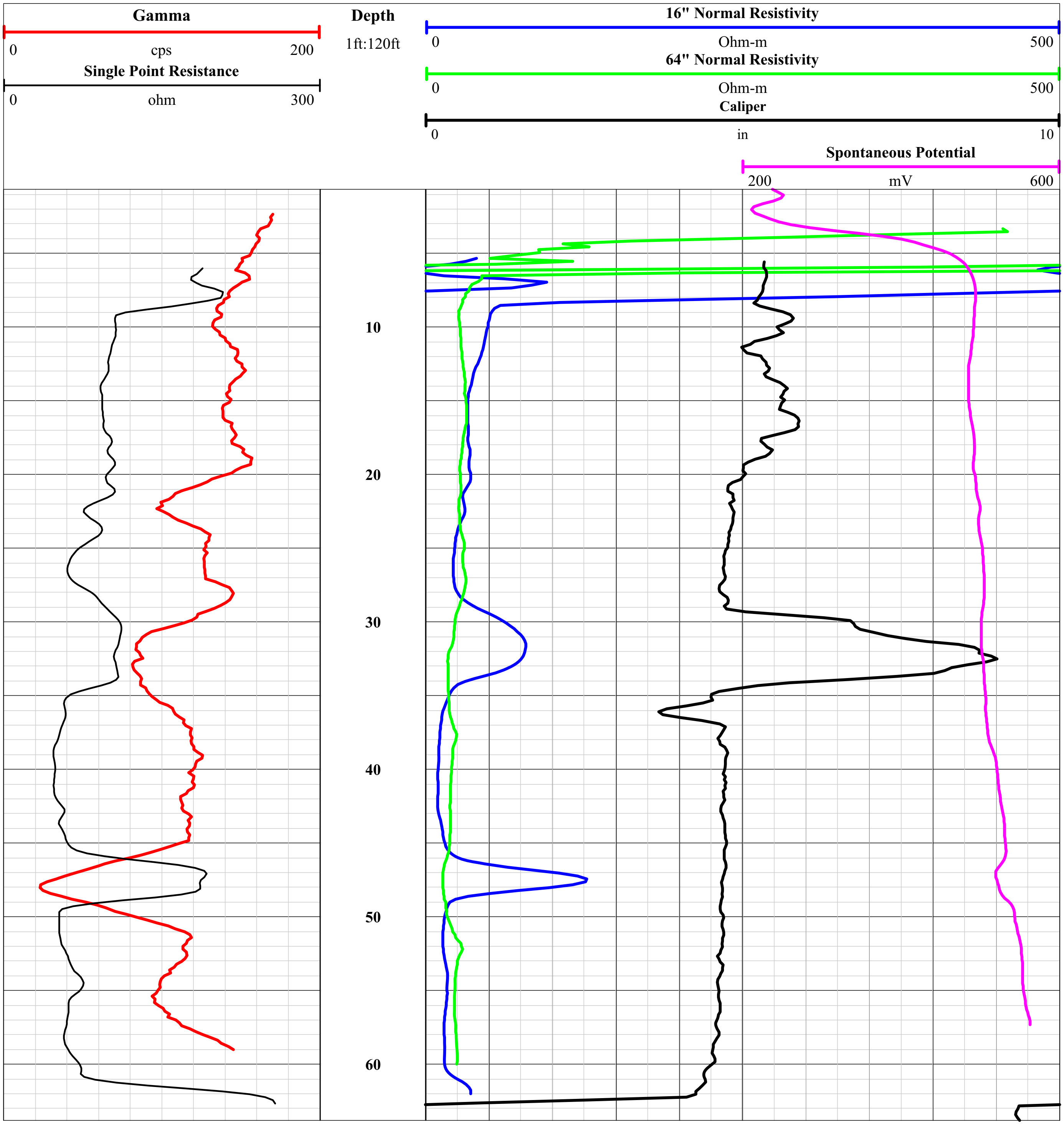
Client	McStain Neighborhoods	Boring No.	M-28	Total Depth	70.0’
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	4/19/2016



w e s t e r n e n v i r o n m e n t
a n d e c o l o g y i n c.

Geophysical Log

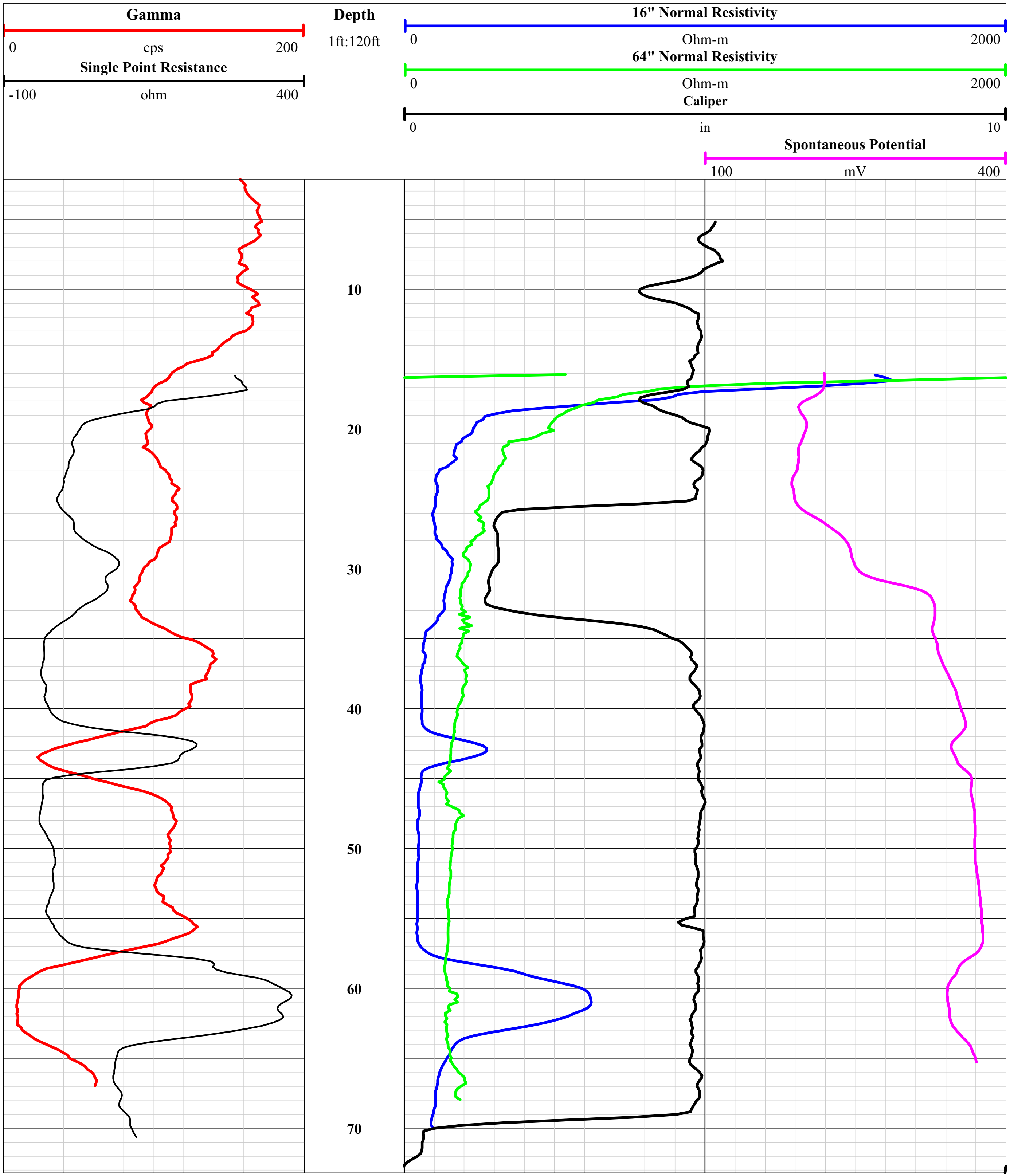
Client	McStain Neighborhoods	Boring No.	M-29	Total Depth	75.0’
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	4/20/2016



w e s t e r n e n v i r o n m e n t
a n d e c o l o g y i n c.

Geophysical Log

Client	McStain Neighborhoods	Boring No.	M-30	Total Depth	75.0’
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	4/20/2016



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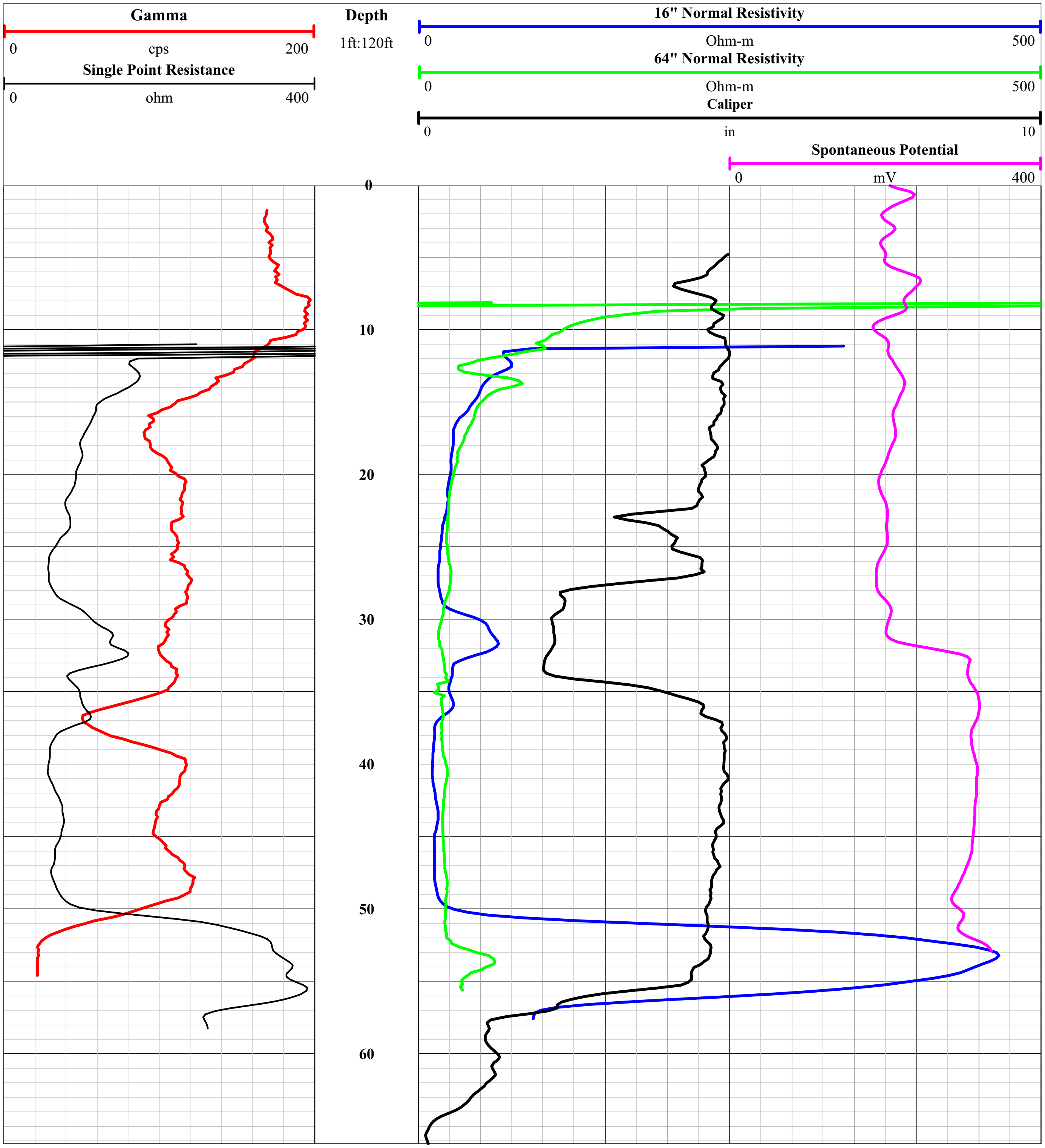
Geophysical Log

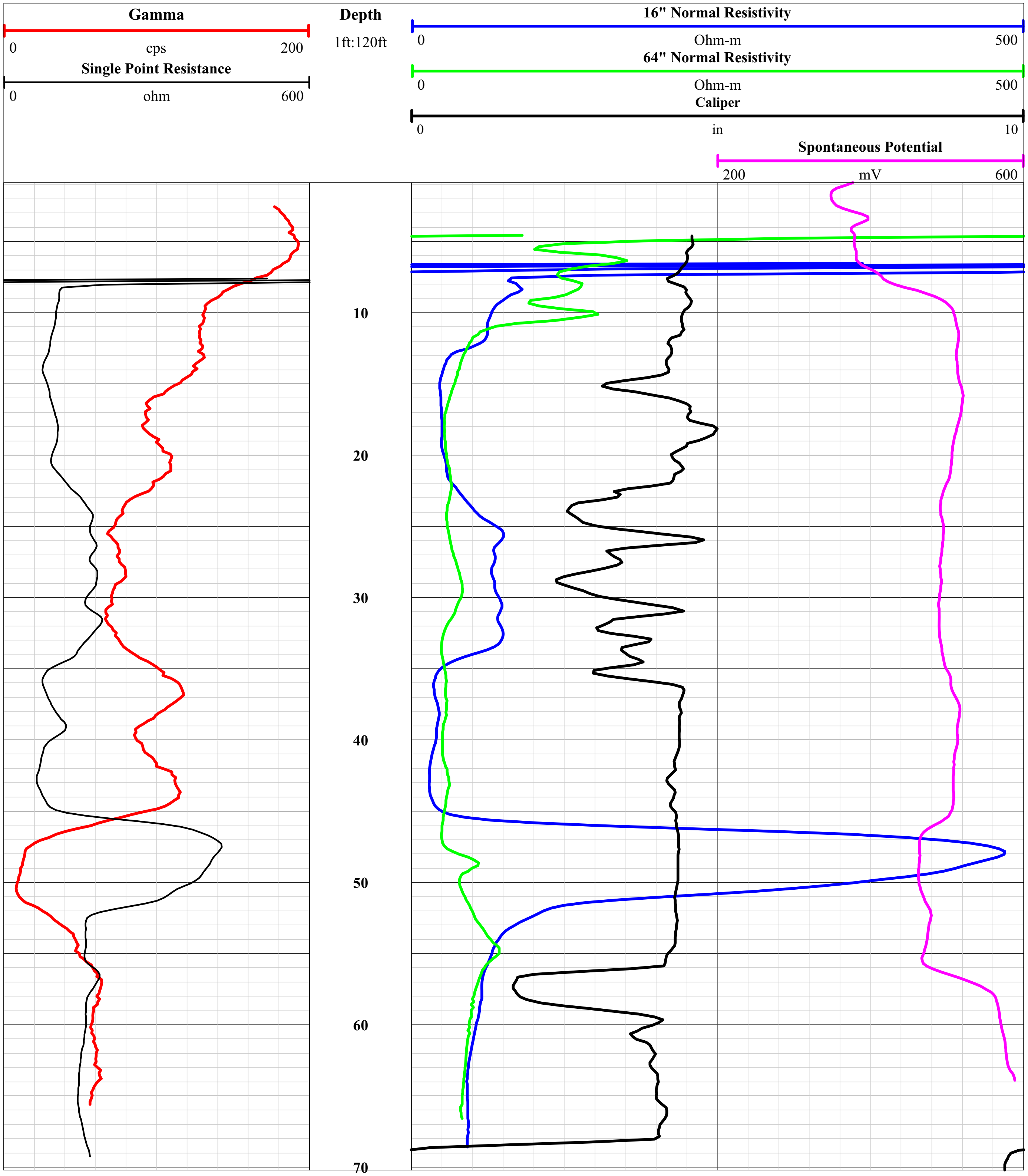
Client	McStain Neighborhoods	Boring No.	M-31	Total Depth	70.0’
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	4/21/2016



w e s t e r n e n v i r o n m e n t
a n d e c o l o g y i n c.

Geophysical Log

Client	McStain Neighborhoods	Boring No.	M-32	Total Depth	70.0'
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	4/21/2016



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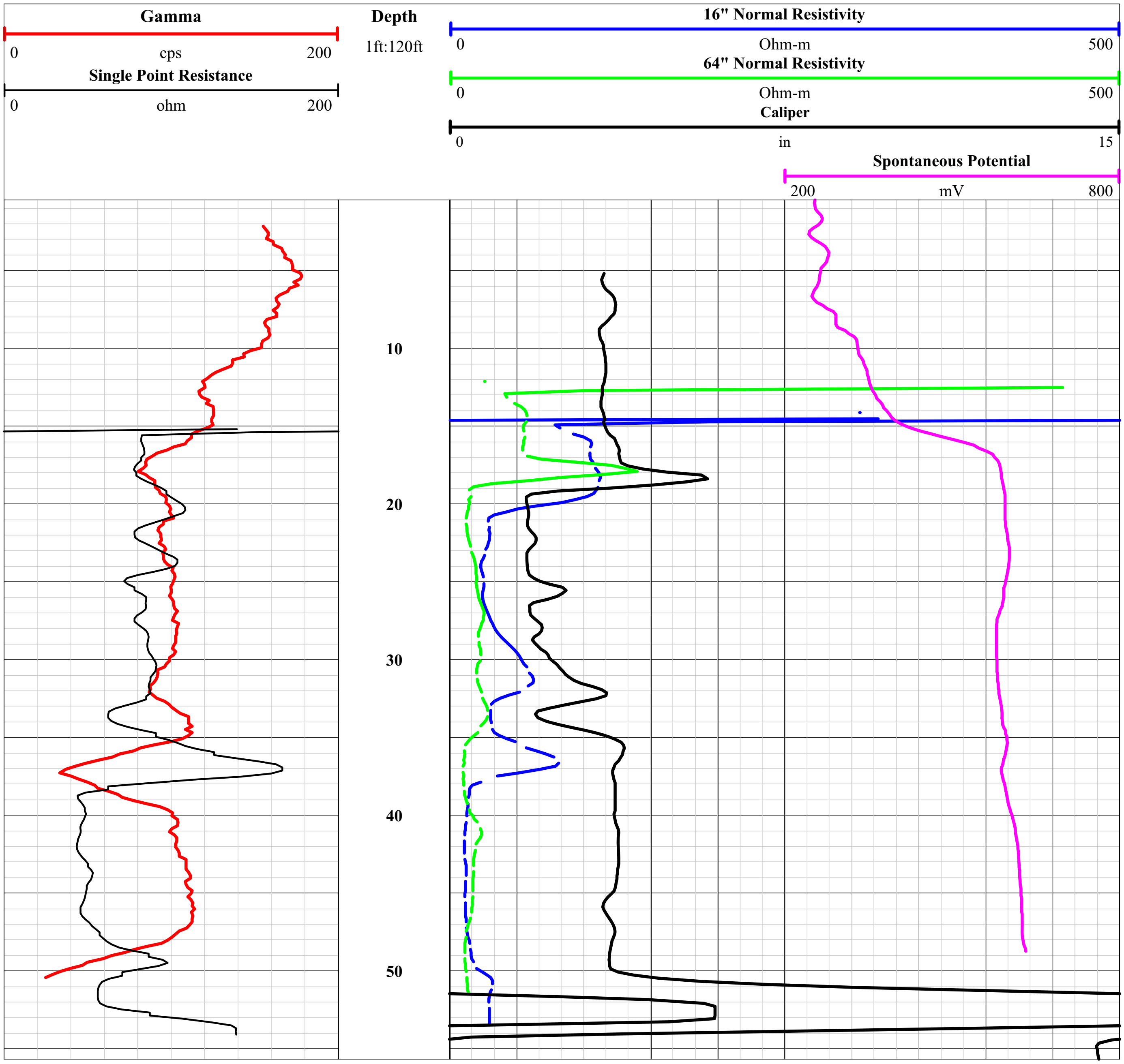
Geophysical Log

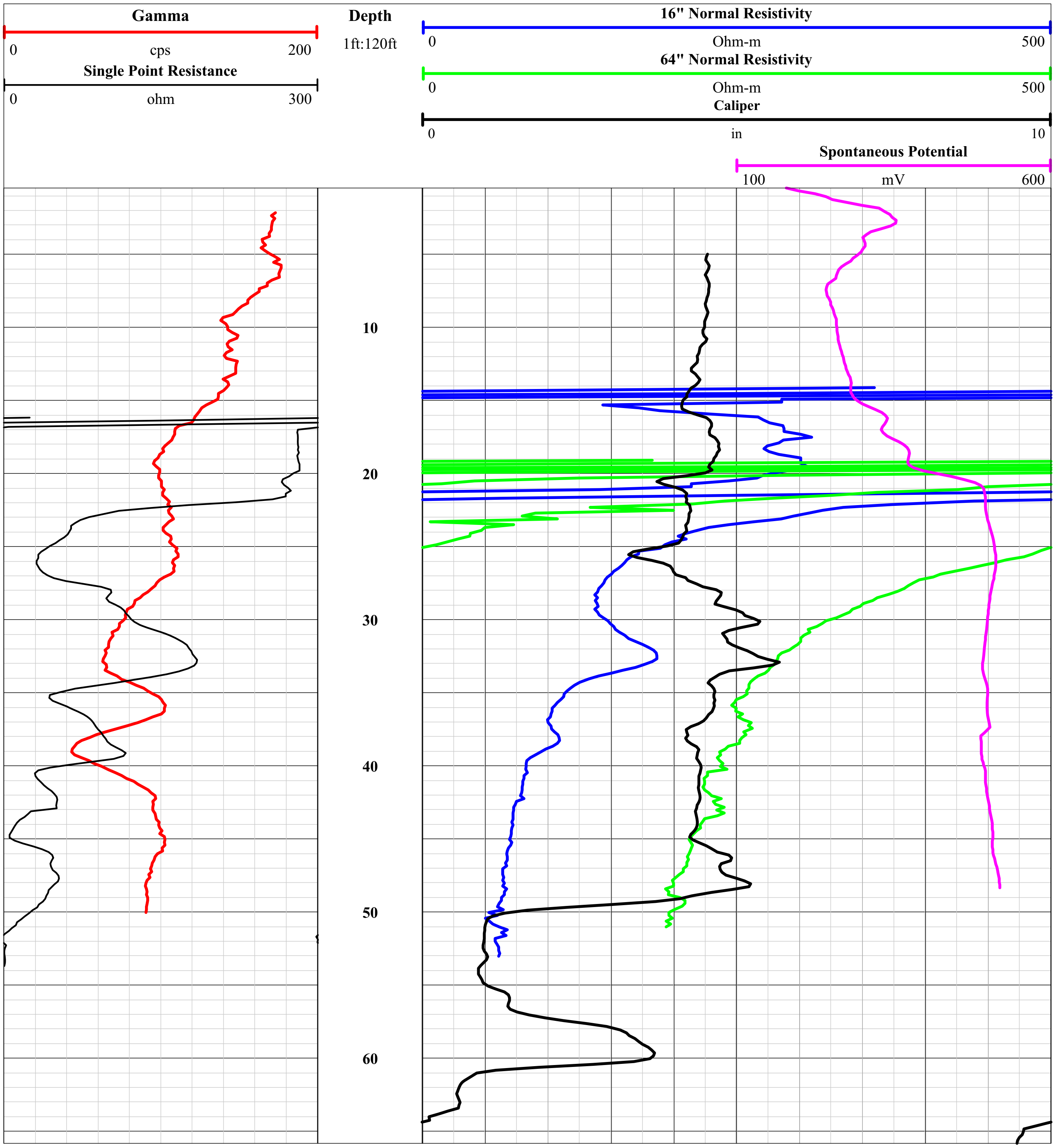
Client	McStain Neighborhoods	Boring No.	M-33	Total Depth	70.0’
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	4/21/2016



w e s t e r n   e n v i r o n m e n t
a n d   e c o l o g y   i n c.

Geophysical Log

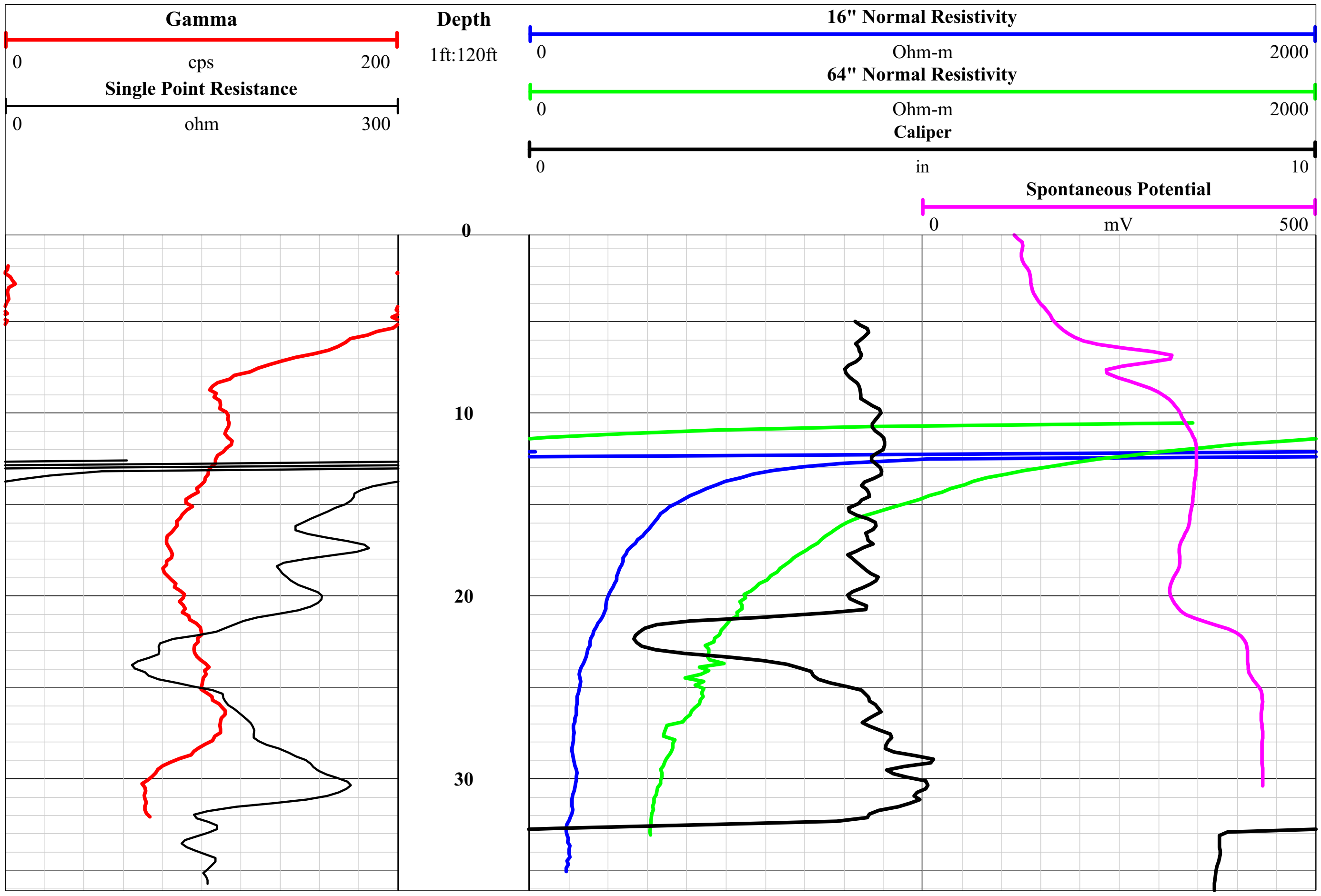
Client	McStain Neighborhoods	Boring No.	M-34	Total Depth	70.0’
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	4/22/2016



w e s t e r n e n v i r o n m e n t
a n d e c o l o g y i n c.

Geophysical Log

Client	McStain Neighborhoods	Boring No.	M-36	Total Depth	40.0’
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	4/22/2016



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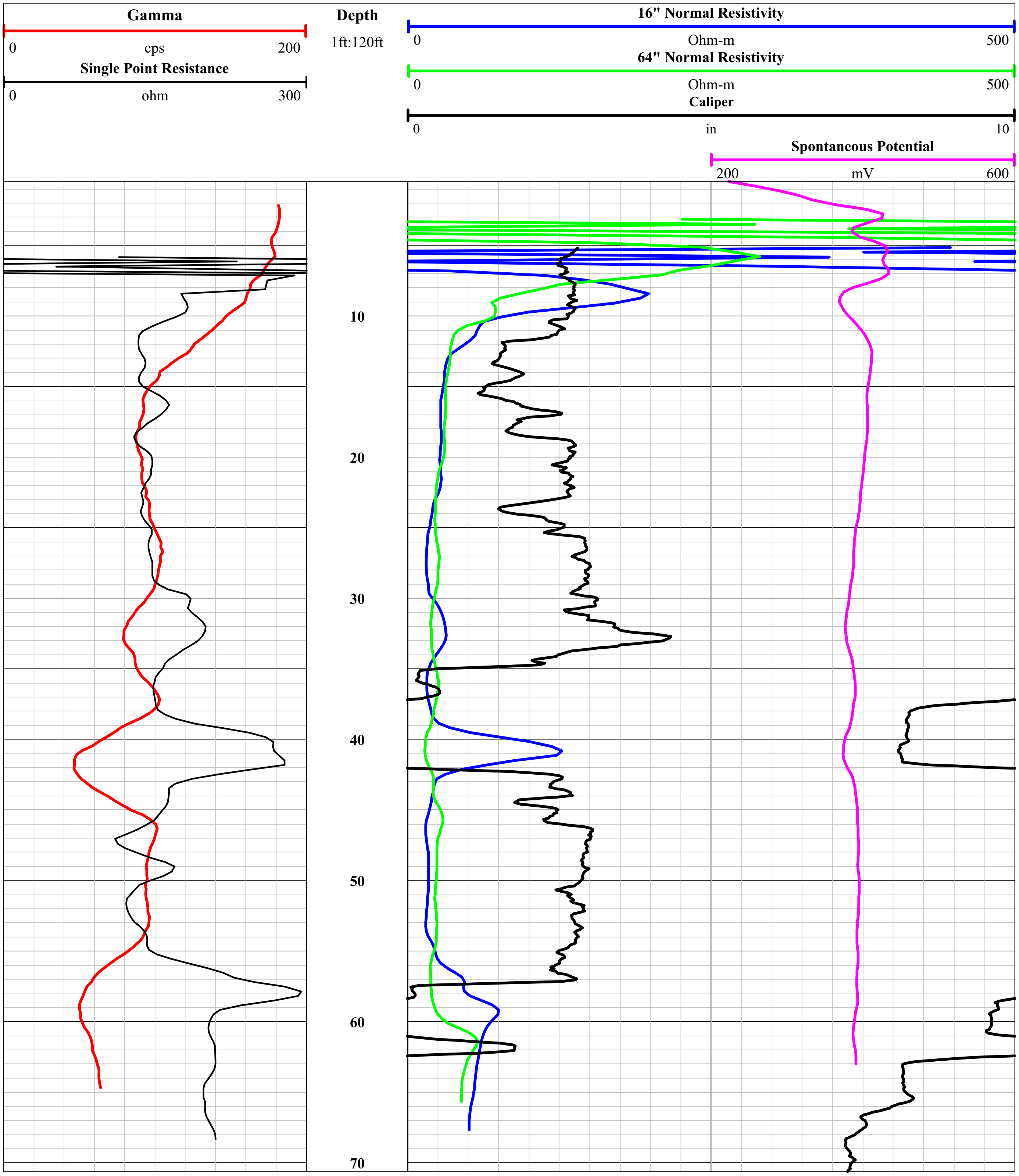
Geophysical Log

Client	McStain Neighborhoods	Boring No.	M-37	Total Depth	75.0'
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	6/3/2016



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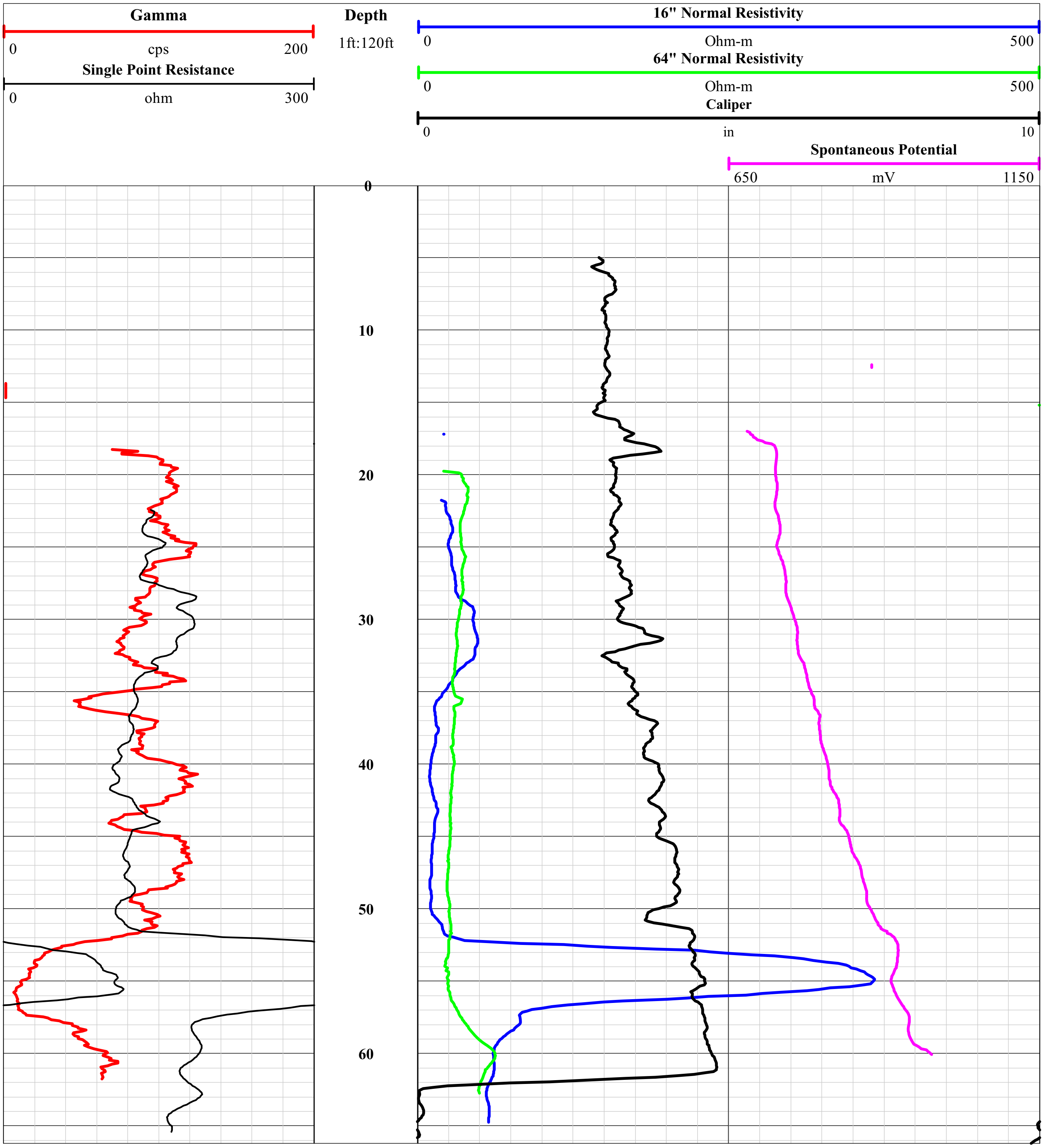
Geophysical Log

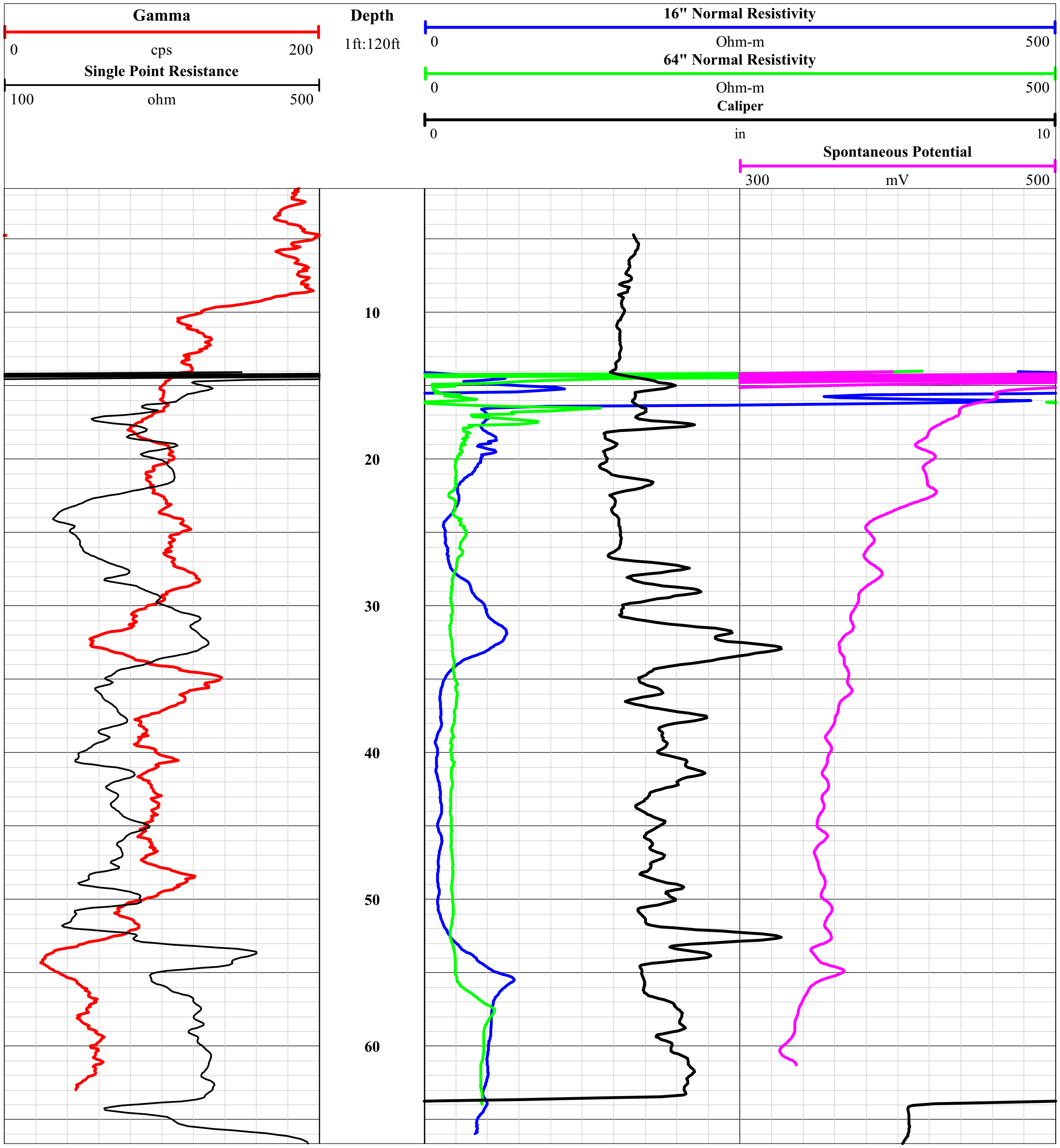
Client	McStain Neighborhoods	Boring No.	M-38	Total Depth	70.0’
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	6/2/2016



w e s t e r n e n v i r o n m e n t
a n d e c o l o g y i n c.

Geophysical Log

Client	McStain Neighborhoods	Boring No.	M-39	Total Depth	75.0’
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	6/2/2016



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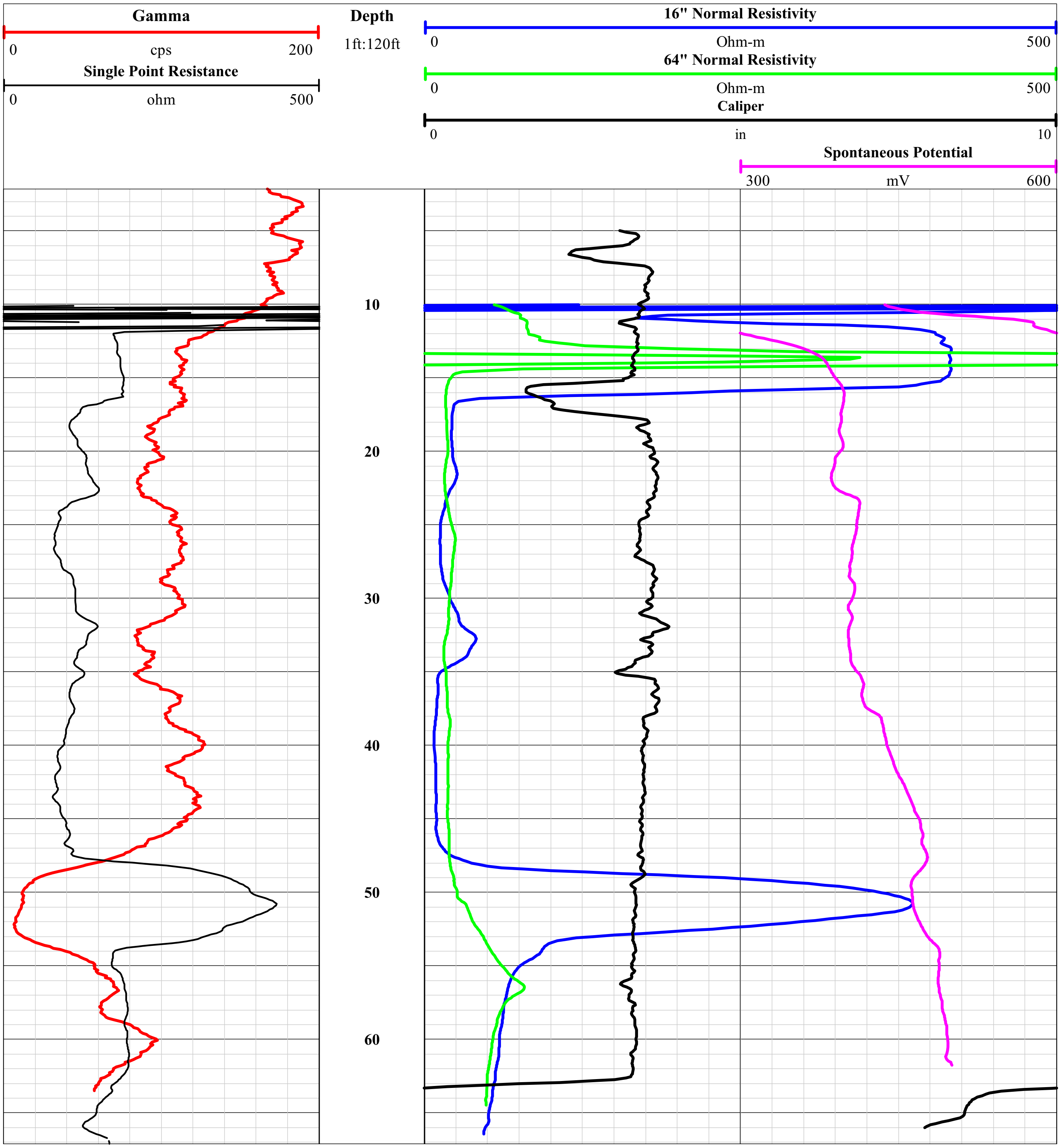
Geophysical Log

Client	McStain Neighborhoods	Boring No.	M-40	Total Depth	70.0'
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	6/1/2016



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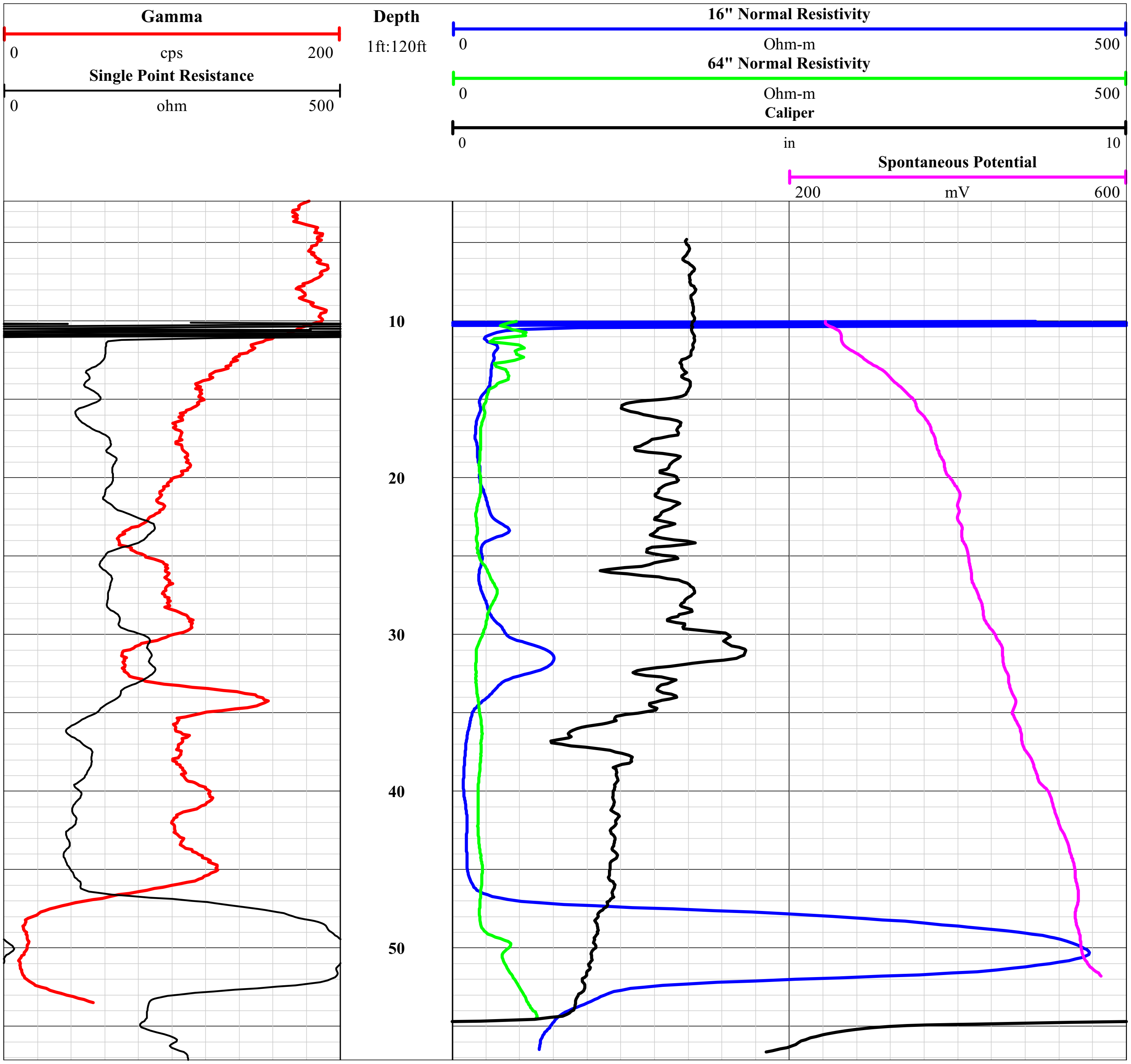
and ecology inc.

Geophysical Log

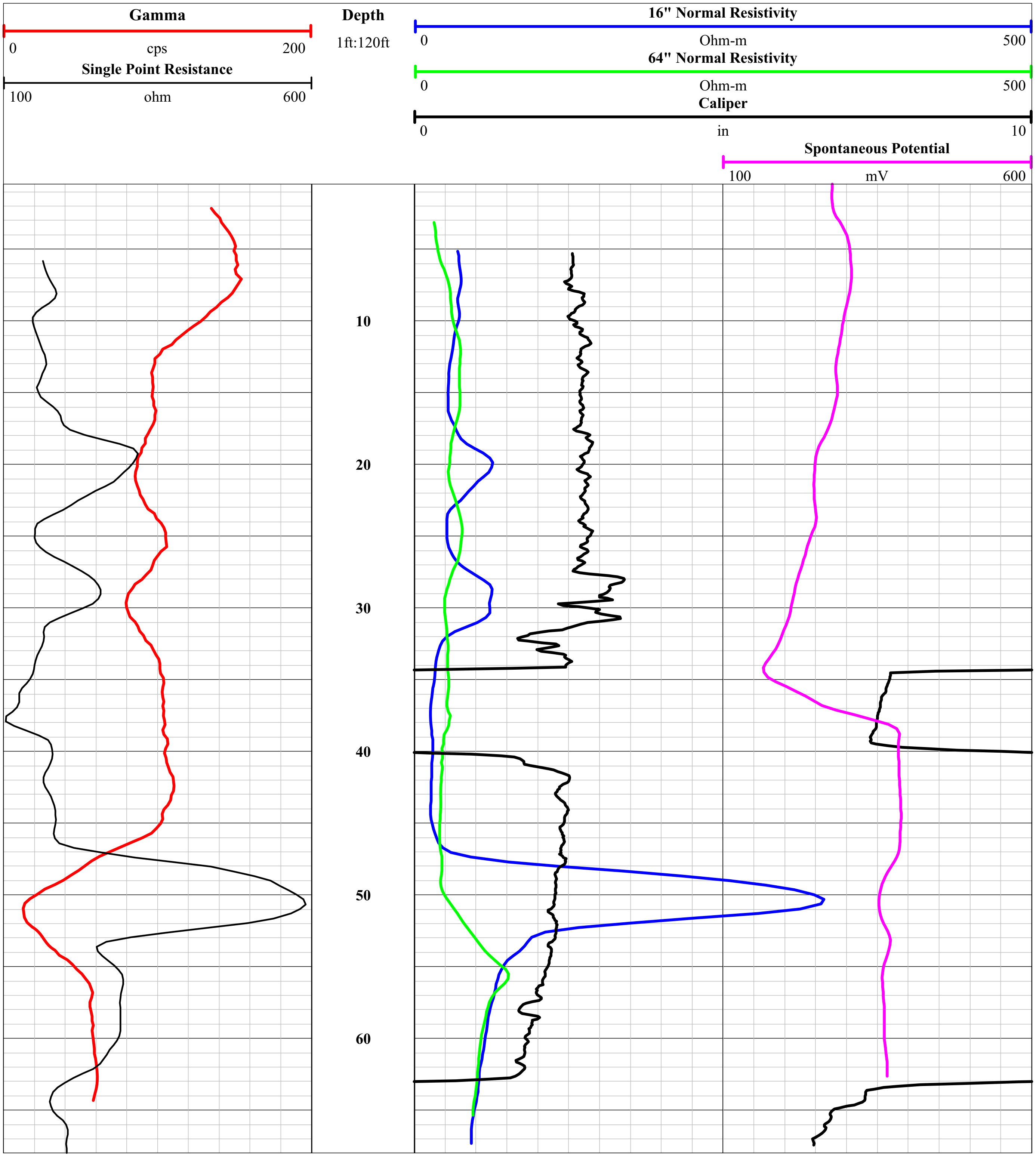
Client	McStain Neighborhoods	Boring No.	M-41	Total Depth	65.0'
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	6/1/2016



western environment and ecology inc.

Geophysical Log

Client	McStain Neighborhoods	Boring No.	M-42	Total Depth	70.0’
Project Number	45-021-01	Project Location	Section 13, Township 1N, Range 69W	Date Logged	6/3/2016



APPENDIX C

Lithologic Descriptions

BORE LOGS: Schmidt Property - Mine Subsidence Investigation

HOLE NUMBER: Melody 1	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 100'
DATE: 6/9/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR**____ **MUD**_X__

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown to grey
25	SANDY CLAY SOIL, light brown to grey
30	SANDY CLAY SOIL, light brown to grey
35	SANDY CLAY SOIL, light brown to grey
40	CLAYSTONE, medium grey
45	CLAYSTONE, medium grey
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey, with traces of COAL
60	COAL MAIN SEAM INTERVAL
	* LOST CIRCULATION AT 60' *
	TOTAL DRILL DEPTH 100'

HOLE NUMBER: Melody 2	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 80'
DATE: 6/9/00	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY, GRAVEL
30	SANDY CLAY, GRAVEL
35	SANDY CLAY, GRAVEL
40	CLAYSTONE, medium grey
45	SANDY CLAYSTONE, light brown
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	CLAYSTONE, medium grey
65	SANDSTONE & CLAYSTONE, medium grey
70	SANDSTONE & CLAYSTONE, medium grey
75	SANDSTONE & CLAYSTONE, medium grey
80	CLAYSTONE, medium grey, with COAL
	* LOST CIRCULATION AT 80' *
	TOTAL DRILL DEPTH 100'

HOLE NUMBER: Melody 3	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 100'
DATE: 6/9/00	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown
30	SANDY CLAY SOIL, light brown
35	SANDSTONE, light brown
40	SAND/CLAYSTONE, light brown to medium grey, with traces of COAL
45	SAND/CLAYSTONE, medium grey
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	CLAYSTONE, medium grey
65	CLAYSTONE, medium grey
70	CLAYSTONE, dark grey
75	CLAYSTONE, dark grey
80	CLAYSTONE, dark grey
85	CLAYSTONE, dark grey
90	COAL MAIN SEAM
95	SANDSTONE, light grey
100	SANDSTONE, light grey
105	SANDSTONE, light grey
110	SANDSTONE, light grey
115	SANDSTONE, light grey
120	SANDSTONE, light grey
	TOTAL DRILL DEPTH 120'

HOLE NUMBER: Melody 4	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 120'
DATE: 6/9/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD__X_**

DEPTH	SAMPLE DESCRIPTION
5	CLAY SOIL, light brown
10	CLAY SOIL, light brown
15	CLAY SOIL, light brown
20	CLAY SOIL, light brown
25	SANDY SOIL, GRAVEL
30	SANDY CLAYSTONE, light brown to medium grey
35	SANDY CLAYSTONE, light brown to medium grey
40	SANDY CLAYSTONE, light brown to medium grey
45	CLAYSTONE, light grey
50	CLAYSTONE, light grey
55	CLAYSTONE, light grey
60	CLAYSTONE, light grey
65	CLAYSTONE, medium grey
70	CLAYSTONE, medium grey
75	CLAYSTONE, medium grey, with traces of COAL
80	CLAYSTONE, medium grey, with traces of COAL
85	CLAYSTONE, medium grey, with increasing amounts of COAL to 100'
90	CLAYSTONE, medium grey, with increasing amounts of COAL to 100'
95	CLAYSTONE, medium grey, with increasing amounts of COAL to 100'
100	CLAYSTONE, medium grey, with increasing amounts of COAL to 100'
105	SANDSTONE, medium grey
110	CLAYSTONE, medium grey
115	CLAYSTONE, medium grey
120	CLAYSTONE, medium grey
	TOTAL DRILL DEPTH 120'

HOLE NUMBER: Melody 5	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 100'
DATE: 6/12/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	CLAY SOIL, light brown
10	CLAY SOIL, light brown
15	CLAY SOIL, light brown
20	CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown to grey
30	SANDY CLAY SOIL, light brown to grey
35	SANDY CLAY, GRAVEL
40	CLAYSTONE, medium grey
45	CLAYSTONE, medium grey
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	SANDY CLAYSTONE, light grey
65	SANDY CLAYSTONE, light grey
	* LOST CIRCULATION AT 65' *
	TOTAL DRILL DEPTH 100'

HOLE NUMBER: Melody 6	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 120'
DATE: 6/12/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, GRAVEL
20	SANDY CLAY SOIL, GRAVEL
25	SANDY SOIL, light brown
30	CLAYSTONE, light brown
35	CLAYSTONE, light brown
40	CLAYSTONE, medium grey, with traces of COAL
45	SANDY CLAYSTONE, medium grey
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	CLAYSTONE, medium grey
65	CLAYSTONE, dark grey
70	CLAYSTONE, dark grey
75	CLAYSTONE, dark grey
80	CLAYSTONE, medium grey
85	COAL MAIN SEAM INTERVAL
90	COAL
95	SANDSTONE, light grey
100	SANDSTONE, light grey
105	SANDSTONE, light grey
110	SANDSTONE, light grey
115	SANDSTONE, light grey
120	SANDSTONE, light grey
	TOTAL DRILL DEPTH 120'

HOLE NUMBER: Melody 7	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 100'
DATE: 6/12/200	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown
30	SANDY CLAY, GRAVEL
35	SANDY CLAY, GRAVEL
40	CLAYSTONE, light grey
45	CLAYSTONE, light grey
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	CLAYSTONE, medium grey
65	CLAYSTONE, medium grey
	* LOST CIRCULATION AT 65' *
	TOTAL DRILL DEPTH 100'

HOLE NUMBER: Melody 8	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 100'
DATE: 6/12/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY, GRAVEL
30	SANDY CLAY, GRAVEL
35	CLAYSTONE, light brown to grey
40	CLAYSTONE, light brown to grey
45	CLAYSTONE, medium grey
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	CLAYSTONE, medium grey
65	COAL MAIN SEAM
70	CLAYSTONE, medium grey
75	CLAYSTONE, medium grey
80	CLAYSTONE, medium grey
	* PARTIAL LOSS OF CIRCULATION AT 80' *
	TOTAL DRILL DEPTH 100'

HOLE NUMBER: Melody 9	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 100'
DATE: 6/13/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR**____ **MUD**_X__

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown
30	SANDY CLAY SOIL, light brown
35	SANDY CLAY SOIL, light brown
40	CLAYSTONE, medium gray
45	CLAYSTONE, medium gray
50	CLAYSTONE, medium gray
55	CLAYSTONE, medium gray
60	CLAYSTONE, medium gray
	* LOST CIRCULATION AT 60' *
	TOTAL DRILL DEPTH 100'

HOLE NUMBER: Melody 10	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 100'
DATE: 6/13/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown
30	SANDY CLAY, GRAVEL
35	SANDY CLAY, GRAVEL
40	CLAYSTONE, medium grey
45	CLAYSTONE, medium grey
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	CLAYSTONE, medium grey
65	CLAYSTONE, medium grey
70	CLAYSTONE, medium grey, with traces of COAL
75	CLAYSTONE, medium grey, with traces of COAL
80	CLAYSTONE, medium grey
	TOTAL DRILL DEPTH 100'

HOLE NUMBER: Melody 11	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 100'
DATE: 6/13/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD__X_**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	CLAY SOIL, light tan
30	SAND & GRAVEL, light brown to grey
35	SAND & GRAVEL, light brown to grey
40	CLAYSTONE, light brown to grey
45	CLAYSTONE, medium grey
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	CLAYSTONE, medium grey
65	SANDY CLAYSTONE, light grey
70	CLAYSTONE, with COAL MAIN SEAM INTERVAL
75	CLAYSTONE, with COAL
80	SANDSTONE, light grey
85	SANDSTONE, light grey
90	SANDSTONE, light grey
95	SANDSTONE, light grey
100	SANDSTONE, light grey
	TOTAL DRILL DEPTH 100'

HOLE NUMBER: Melody 12	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 80'
DATE: 6/13/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown
30	SANDY CLAY SOIL, light brown
35	GRAVEL
40	CLAYSTONE, medium grey
45	CLAYSTONE, medium grey
50	CLAYSTONE, medium grey
55	COAL MAIN SEAM
60	SANDSTONE, light gray
65	SANDSTONE, light brown to grey
70	SANDSTONE, medium grey
75	SANDSTONE, medium grey
80	SANDSTONE, medium grey
	TOTAL DRILL DEPTH 80'

HOLE NUMBER: Melody 13	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 75'
DATE: 6/14/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown
30	SANDY CLAY, GRAVEL
35	SANDY CLAY, GRAVEL
40	SANDY CLAYSTONE, light brown to grey, with GRAVEL
45	SANDY CLAYSTONE, light brown to grey, with GRAVEL
50	SANDY CLAYSTONE, light brown to grey, with GRAVEL
	* LOST CIRCULATION AT 55' *
	TOTAL DRILL DEPTH 75'

HOLE NUMBER: Melody 14	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 100'
DATE: 6/14/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown
30	SANDY CLAY SOIL, light brown
35	SANDY CLAY, GRAVEL
40	SANDY CLAY, GRAVEL
45	CLAYSTONE, medium grey
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	CLAYSTONE, medium grey
65	CLAYSTONE, medium grey, with COAL
70	SANDSTONE, light grey
75	SANDSTONE, light grey
80	SANDSTONE, light grey
85	SANDSTONE, light grey
90	SANDSTONE, light grey
95	SANDSTONE, light grey
100	SANDSTONE, light grey
	TOTAL DRILL DEPTH 100'

HOLE NUMBER: Melody 15	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 80'
DATE: 6/14/00	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown
30	SANDY CLAY, GRAVEL
35	SANDY CLAY, GRAVEL
40	CLAYSTONE, medium grey
45	CLAYSTONE, medium grey
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	CLAYSTONE, medium grey
65	CLAYSTONE, medium grey
	* LOST CIRCULATION AT 65' *
	TOTAL DRILL DEPTH 80'

HOLE NUMBER: Melody 16	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 80'
DATE: 6/14/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown
30	SANDY CLAY SOIL, light brown
35	SANDY CLAY, GRAVEL
40	CLAYSTONE, medium grey
45	CLAYSTONE, medium grey
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	CLAYSTONE, medium grey
65	SANDSTONE, medium grey
70	CLAYSTONE, light brown, with COAL
75	SANDSTONE, light grey
80	SANDSTONE, light grey
	TOTAL DRILL DEPTH 80'

HOLE NUMBER: Melody 17	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 75'
DATE: 6/15/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY, GRAVEL
30	SANDY CLAY, GRAVEL
35	SANDY CLAY, GRAVEL
40	SANDY CLAYSTONE, medium grey
45	SANDY CLAYSTONE, medium grey
50	SANDY CLAYSTONE, medium grey
55	SANDY CLAYSTONE, medium grey
	* LOST CIRCULATION AT 55 *
	TOTAL DRILL DEPTH 75'

HOLE NUMBER: Melody 18	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 75'
DATE: 6/16/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown
30	SANDY CLAY SOIL, light brown
35	SANDY CLAY, GRAVEL
40	SANDY CLAY, GRAVEL
45	CLAYSTONE, light brown, with COAL
	* LOST CIRCULATION AT 50' *
	TOTAL DRILL DEPTH 80'

HOLE NUMBER: Melody 19	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 100'
DATE: 8/21/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY, GRAVEL
30	SANDY CLAY, GRAVEL
35	SANDY CLAY, GRAVEL
40	SANDY CLAY, GRAVEL
45	SANDY CLAY, GRAVEL
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	CLAYSTONE, medium grey
65	SANDY CLAYSTONE, medium grey
70	SANDY CLAYSTONE, medium grey
75	SANDY CLAYSTONE, medium grey
80	SANDSTONE, light grey
85	SANDSTONE, light grey
90	SANDSTONE, light grey
95	SANDSTONE, light grey
100	SANDSTONE, light grey
	TOTAL DRILL DEPTH 100'

HOLE NUMBER: Melody 20	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 120'
DATE: 8/21/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown
30	SANDY CLAY, GRAVEL
35	SANDY CLAY, GRAVEL
40	SANDY CLAY, GRAVEL
45	CLAYSTONE, medium grey
50	CLAYSTONE, medium grey
55	CLAYSTONE, medium grey
60	CLAYSTONE, medium grey
65	SANDY CLAYSTONE, light grey
70	SANDY CLAYSTONE, light grey
75	SANDY CLAYSTONE, light grey
80	SANDY CLAYSTONE, light grey
85	SANDY CLAYSTONE, light grey
90	SANDY CLAYSTONE, light grey
95	SANDY CLAYSTONE, light grey
100	SANDSTONE, light grey
105	SANDSTONE, light grey
110	SANDSTONE, light grey
115	SANDSTONE, light grey
120	SANDSTONE, light grey
	TOTAL DRILL DEPTH 120'

HOLE NUMBER: Melody 21	**LOCATION**: Schmidt Property	**STATE**: Colorado
DRILLED BY: N.R. Bideau Drilling	**LOGGED BY**: Michael Dannecker	**TOTAL DEPTH**: 120'
DATE: 8/22/2000	**BIT SIZE**: 5 1/8"	**DRILLED WITH**: **AIR____ MUD_X__**

DEPTH	SAMPLE DESCRIPTION
5	SANDY CLAY SOIL, light brown
10	SANDY CLAY SOIL, light brown
15	SANDY CLAY SOIL, light brown
20	SANDY CLAY SOIL, light brown
25	SANDY CLAY SOIL, light brown
30	SANDY CLAY, GRAVEL
35	SANDY CLAY, GRAVEL
40	SANDY CLAY, GRAVEL
45	SANDY CLAY, GRAVEL
50	SANDY CLAY, GRAVEL
55	SANDY CLAY, GRAVEL
60	CLAYSTONE, medium grey
65	CLAYSTONE, medium grey
70	CLAYSTONE, medium grey
75	CLAYSTONE, medium grey
80	SANDY CLAYSTONE, medium grey
85	SANDY CLAYSTONE, medium grey
90	SANDY CLAYSTONE, medium grey
95	SANDY CLAYSTONE, medium grey
100	SANDSTONE, light grey
105	SANDSTONE, light grey
110	SANDSTONE, light grey
115	SANDSTONE, light grey
120	SANDSTONE, light grey
	TOTAL DRILL DEPTH 120'

Project Number: 45-021-01 | Hole Number: **M-28** | Location: N 40.055176˚, W -105.064066˚ | State: Colorado
Client: McStain Neighborhoods | Logged by: G. Sherman | Total Depth: 70'
Date: 4/19/2016 | Bit Size: 5 1/8 inches | Drilled with: Mud

Depth	Sample Description
5	Sandy Clay Soil, dark brown
10	Sandy Clay Soil, light brown
15	Sandy Clay Soil, light brown
20	Sandy Clay Soil, light brown
25	Sandy Clay Soil, light brown
30	Sandy Clay Soil, light brown with Gravel
35	Sandy Clay Soil, light brown with Gravel
40	Sandy Clay Soil, light brown with Gravel
45	Claystone, medium grey
50	Claystone, medium grey
55	Claystone, medium grey
60	Coal
65	Sandstone, medium grey with Coal
70	Sandstone, medium grey Total Depth: 70.0 Feet

Project Number: 45-021-01 | Hole Number: **M-29** | Location: N 40.055006˚, W-105.063305˚ | State: Colorado
Client: McStain Neighborhoods | Logged by: B. Calonge | Total Depth: 75'
Date: 4/20/2016 | Bit Size: 5 1/8 inches | Drilled with: Mud

Depth	Sample Description
5	Sandy Clay Soil, dark brown
10	Sandy Clay Soil, light brown
15	Sandy Clay Soil, light brown
20	Sandy Clay Soil, light brown
25	Sandy Clay Soil, light brown
30	Sandy Clay Soil, light brown with Gravel
35	Sandy Clay Soil, light brown with Gravel
40	Sandy Clay Soil, light brown with Gravel
45	Claystone, medium grey
50	Claystone, medium grey
55	Coal
60	Sandstone, medium grey
65	Sandstone, medium grey
70	Sandstone, medium grey, with Coal
75	Sandstone, medium grey Total Depth: 75.0 Feet

Project Number: 45-021-01 | Hole Number: **M-30** | Location: N 40.054712˚, W-105.062502˚ State: Colorado
Client: McStain Neighborhoods | Logged by: B. Calonge | Total Depth: 75'
Date: 4/20/2016 | Bit Size: 5 1/8 inches | Drilled with: Mud

Depth	Sample Description
5	Sandy Clay Soil, dark brown
10	Sandy Clay Soil, light brown
15	Sandy Clay Soil, light brown
20	Sandy Clay Soil, light brown
25	Sandy Clay Soil, light brown
30	Sandy Clay Soil, light brown
35	Sandy Clay Soil, light brown with Gravel
40	Sandy Clay Soil, light brown with Gravel
45	Claystone, medium grey
50	Claystone, medium grey
55	Claystone, medium grey
60	Claystone, medium grey
65	Coal
70	Sandstone, medium grey
75	Sandstone, medium grey Total Depth: 75.0 Feet

Project Number: 45-021-01 | Hole Number: **M-31** | Location: N 40.054576˚, W-105.061780˚ State: Colorado
Client: McStain Neighborhoods | Logged by: B. Calonge | Total Depth: 70'
Date: 4/41/2016 | Bit Size: 5 1/8 inches | Drilled with: Mud

Depth	Sample Description
5	Sandy Clay Soil, dark brown
10	Sandy Clay Soil, light brown
15	Sandy Clay Soil, light brown
20	Sandy Clay Soil, light brown
25	Sandy Clay Soil, light brown
30	Sandy Clay Soil, light brown
35	Sandy Clay Soil, light brown with Gravel
40	Claystone, medium grey
45	Claystone, medium grey
50	Claystone, medium grey
55	Claystone, medium grey
60	Coal
65	Sandstone, medium grey
70	Sandstone, medium grey Total Depth: 75.0 Feet

Project Number: 45-021-01 | Hole Number: **M-32** | Location: N 40.054333˚, W-105.060931˚ | State: Colorado
Client: McStain Neighborhoods | Logged by: B. Calonge | Total Depth: 70'
Date: 4/21/2016 | Bit Size: 5 1/8 inches | Drilled with: Mud

Depth	Sample Description
5	Sandy Clay Soil, dark brown
10	Sandy Clay Soil, light brown
15	Sandy Clay Soil, light brown
20	Sandy Clay Soil, light brown
25	Sandy Clay Soil, light brown
30	Sandy Clay Soil, light brown with Gravel
35	Sandy Clay Soil, light brown with Gravel
40	Claystone, medium grey
45	Claystone, medium grey
50	Coal
55	Coal
60	Sandstone, medium grey
65	Sandstone, medium grey
70	Sandstone, medium grey Total Depth: 70.0 Feet

Project Number: 45-021-01 | Hole Number: **M-33** | Location: N 40.053520˚, W -105.060348˚ State: Colorado
Client: McStain Neighborhoods | Logged by: B. Calonge | Total Depth: 70'
Date: 4/21/2016 | Bit Size: 5 1/8 inches | Drilled with: Mud

Depth	Sample Description
5	Sandy Clay Soil, dark brown
10	Sandy Clay Soil, light brown
15	Sandy Clay Soil, light brown
20	Sandy Clay Soil, light brown
25	Sandy Clay Soil, light brown
30	Sandy Clay Soil, light brown with Gravel
35	Sandy Clay Soil, light brown with Gravel
40	Claystone, medium grey
45	Claystone, medium grey
50	Claystone, medium grey Void, Lost Circulation: 52.0 Feet
55	No Circulation Bottom of void: 56.0 feet
60	No Circulation
65	No Circulation
70	No Circulation Total Depth: 70.0 Feet

Project Number: 45-021-01 Hole Number: **M-34** Location: N 40.053076˚, W -105.059954˚ State: Colorado
Client: McStain Neighborhoods Logged by: B. Calonge Total Depth: 70'
Date: 4/22/2016 Bit Size: 5 1/8 inches Drilled with: Mud

Depth	Sample Description
5	Sandy Clay Soil, dark brown
10	Sandy Clay Soil, light brown
15	Sandy Clay Soil, light brown
20	Sandy Clay Soil, light brown
25	Sandy Clay Soil, light brown
30	Sandy Clay Soil, light brown
35	Sandy Clay Soil, light brown with Gravel
40	Sandy Clay Soil, light brown with Gravel
45	Claystone, medium grey, with Coal
50	Coal Lost Circulation: 52.0 Feet
55	No Circulation
60	No Circulation
65	No Circulation
70	No Circulation Total Depth: 70.0 Feet

Project Number: 45-021-01 | Hole Number: **M-35** | Location: N 40.052799˚, W-105.059454˚ | State: Colorado
Client: McStain Neighborhoods | Logged by: B. Calonge | Total Depth: 70'
Date: 4/22/2016 | Bit Size: 5 1/8 inches | Drilled with: Mud

Depth	Sample Description	
5	Sandy Clay Soil, dark brown	
10	Sandy Clay Soil, light brown	
15	Sandy Clay Soil, light brown	
20	Sandy Clay Soil, light brown	
25	Sandy Clay Soil, light brown	
30	Sandy Clay Soil, light brown	
35	Sandy Clay Soil, light brown with Gravel	
40	Sandy Clay Soil, light brown with Gravel	
45	Claystone, medium grey	
50	Claystone, medium grey	Lost Circulation: 52.0 Feet
55	No Circulation	
60	No Circulation	
65	No Circulation	
70	No Circulation	Total Depth: 70.0 Feet

Project Number: 45-021-01
Client: McStain Neighborhoods
Date: 4/22/2016

Hole Number: **M-36**
Logged by: B. Calonge
Bit Size: 5 1/8 inches

Location: N 40.052455˚, W -105.058738˚ State: Colorado
Total Depth: 40'
Drilled with: Mud

Depth	Sample Description	
5	Sandy Clay Soil, dark brown	
10	Sandy Clay Soil, light brown	
15	Sandy Clay Soil, light brown	
20	Sandy Clay Soil, light brown	
25	Sandy Clay Soil, light brown	
30	Sandy Clay Soil, light brown	
35	Sandy Clay Soil, light brown	
40	Sandy Clay Soil, light brown with Gravel	Refusal: 40.0 Feet
		Total Depth: 40.0 Feet

Project Number: 45-021-01 | Hole Number: **M-37** | Location: N 40.055176˚, W -105.064066˚ | State: Colorado
Client: McStain Neighborhoods | Logged by: B. Calonge | Total Depth: 75'
Date: 6/3/2016 | Bit Size: 5 1/8 inches | Drilled with: Mud

Depth	Sample Description	
5	Sandy Clay Soil, dark brown	
10	Sandy Clay Soil, light brown	
15	Sandy Clay Soil, light brown	
20	Sandy Clay Soil, light brown	
25	Sandy Clay Soil, light brown	
30	Sandy Clay Soil, light brown with Gravel	
35	Sandy Clay Soil, light brown with Gravel	
40	Sandy Clay Soil, light brown with Gravel	
45	Claystone, medium grey	
50	Claystone with coal	
55	Coal	
60	Sandstone, medium grey	
65	Sandstone, medium grey	Lost Circulation: 63.0 Feet
70	No Circulation	
75	No Circulation	Total Depth: 75.0 Feet

Project Number: 45-021-01 | Hole Number: **M-38** | Location: N 40.055006˚, W-105.063305˚ | State: Colorado
Client: McStain Neighborhoods | Logged by: B. Calonge | Total Depth: 70'
Date: 6/2/2016 | Bit Size: 5 1/8 inches | Drilled with: Mud

Depth	Sample Description
5	Sandy Clay Soil, dark brown
10	Sandy Clay Soil, light brown
15	Sandy Clay Soil, light brown
20	Sandy Clay Soil, light brown
25	Sandy Clay Soil, light brown
30	Sandy Clay Soil, light brown
35	Sandy Clay Soil, light brown with Gravel
40	Claystone, medium grey
45	Claystone, medium grey
50	Claystone, medium grey
55	Claystone with coal
60	Coal
65	Sandstone, medium grey
70	Sandstone, medium grey Total Depth: 70.0 Feet

Project Number: 45-021-01 | Hole Number: **M-39** | Location: N 40.054712˚, W-105.062502˚ State: Colorado
Client: McStain Neighborhoods | Logged by: B. Calonge | Total Depth: 70'
Date: 6/2/2016 | Bit Size: 5 1/8 inches | Drilled with: Mud

Depth	Sample Description
5	Sandy Clay Soil, dark brown
10	Sandy Clay Soil, light brown
15	Sandy Clay Soil, light brown
20	Sandy Clay Soil, light brown
25	Sandy Clay Soil, light brown
30	Sandy Clay Soil, light brown
35	Sandy Clay Soil, light brown with Gravel
40	Sandy Clay Soil, light brown with Gravel
45	Claystone, medium grey
50	Claystone, medium grey Lost Circulation: 47.0 feet
55	No Circulation
60	No Circulation
65	No Circulation
70	No Circulation Total Depth: 75.0 Feet

Project Number: 45-021-01 | Hole Number: **M-40** | Location: N 40.054576˚, W-105.061780˚ State: Colorado
Client: McStain Neighborhoods | Logged by: B. Calonge | Total Depth: 70'
Date: 6/1/2016 | Bit Size: 5 1/8 inches | Drilled with: Mud

Depth	Sample Description
5	Sandy Clay Soil, dark brown
10	Sandy Clay Soil, light brown
15	Sandy Clay Soil, light brown
20	Sandy Clay Soil, light brown
25	Sandy Clay Soil, light brown
30	Sandy Clay Soil, light brown
35	Sandy Clay Soil, light brown with Gravel
40	Claystone, medium grey
45	Claystone, medium grey
50	Coal
55	Coal
60	Sandstone, medium grey
65	Sandstone, medium grey
70	Sandstone, medium grey Total Depth: 70.0 Feet

Project Number: 45-021-01 Hole Number: **M-41** Location: N 40.054333˚, W-105.060931˚ State: Colorado
Client: McStain Neighborhoods Logged by: B. Calonge Total Depth: 65'
Date: 6/1/2016 Bit Size: 5 1/8 inches Drilled with: Mud

Depth	Sample Description
5	Sandy Clay Soil, dark brown
10	Sandy Clay Soil, light brown
15	Sandy Clay Soil, light brown
20	Sandy Clay Soil, light brown
25	Sandy Clay Soil, light brown
30	Sandy Clay Soil, light brown
35	Sandy Clay Soil, light brown with Gravel
40	Claystone, medium grey
45	Claystone, medium grey with coal
50	Coal
55	Coal
60	Sandstone, medium grey
65	Sandstone, medium grey Total Depth: 65.0 Feet

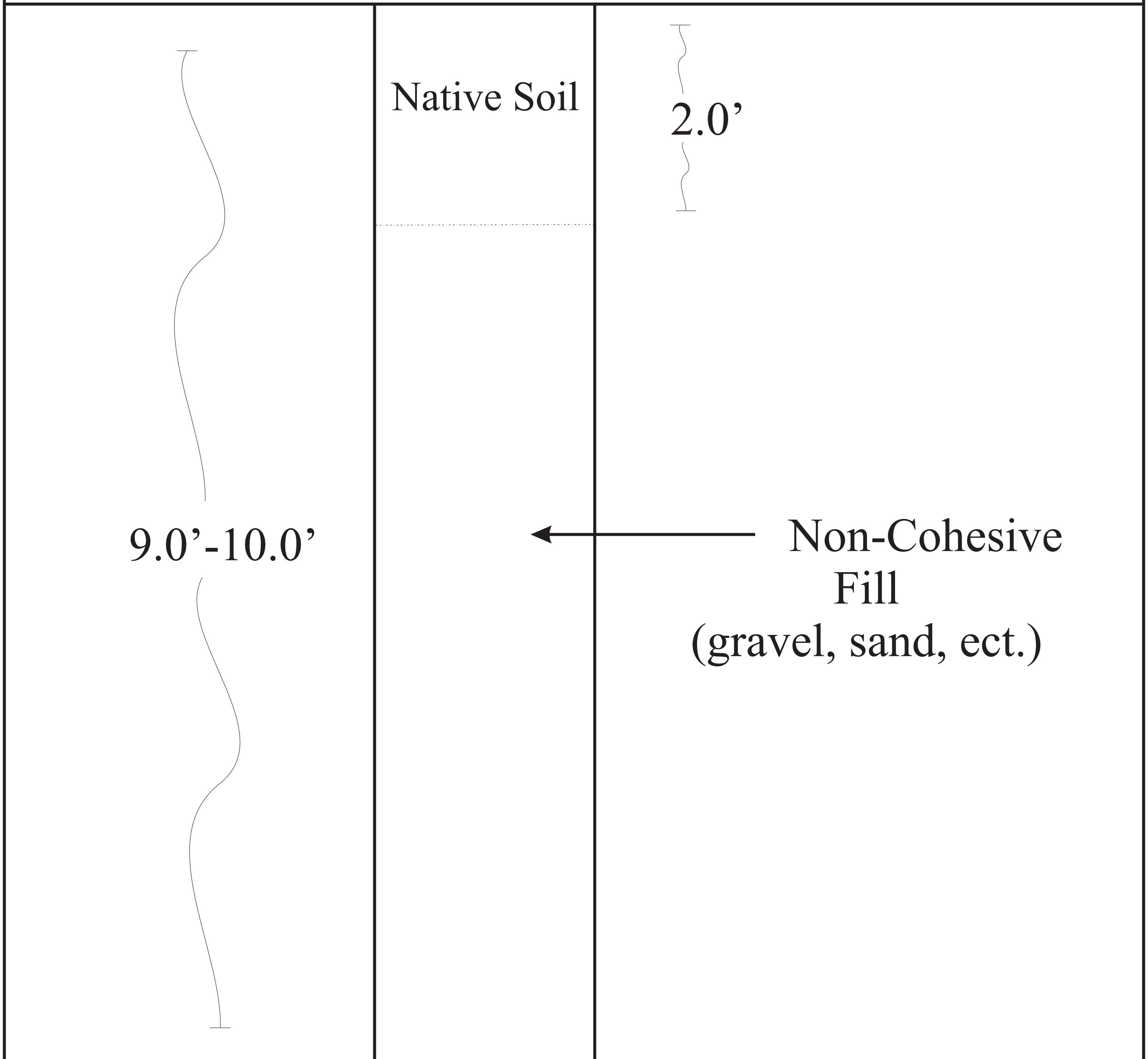
Project Number: 45-021-01 | Hole Number: **M-42** | Location: N 40.053520˚, W -105.060348˚ State: Colorado
Client: McStain Neighborhoods | Logged by: B. Calonge | Total Depth: 70'
Date: 6/3/2016 | Bit Size: 5 1/8 inches | Drilled with: Mud

Depth	Sample Description
5	Sandy Clay Soil, dark brown
10	Sandy Clay Soil, light brown
15	Sandy Clay Soil, light brown
20	Sandy Clay Soil, light brown
25	Sandy Clay Soil, light brown with Gravel
30	Sandy Clay Soil, light brown with Gravel
35	Claystone, medium grey
40	Claystone, medium grey
45	Claystone, medium grey
50	Claystone, medium grey with coal
55	Coal
60	Sandstone, medium grey
65	Sandstone, medium grey
70	Sandstone, medium grey Total Depth: 70.0 Feet

APPENDIX D

Strain Isolation Trench

Strain Isolation Trench



W e s t e r n e n v i r o n m e n t
a n d e c o l o g y, i n c.
2217 West Powers Avenue
Littleton, Colorado 80120

Strain Isolation Trench
Lost Creek Farms
Erie, Colorado