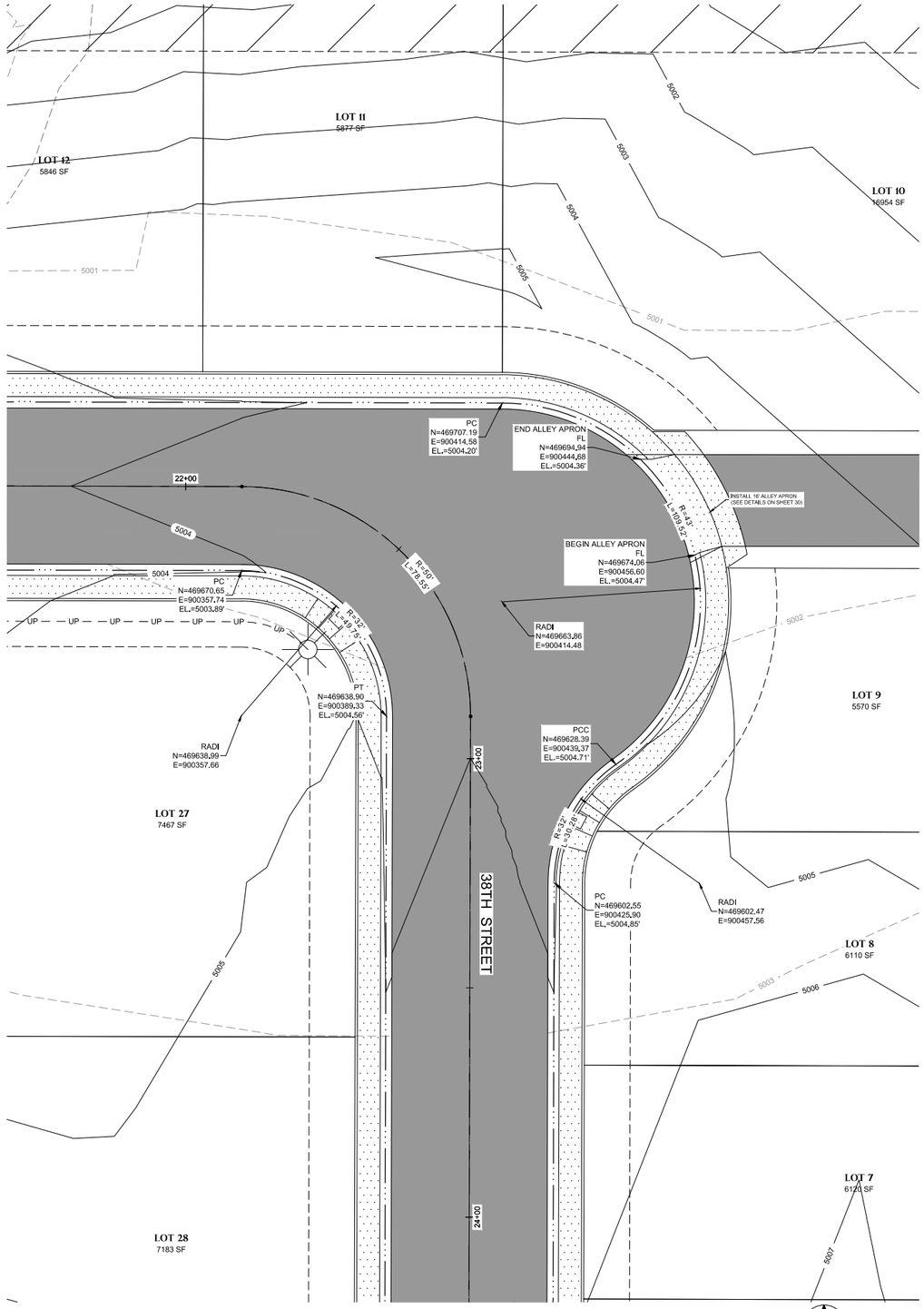
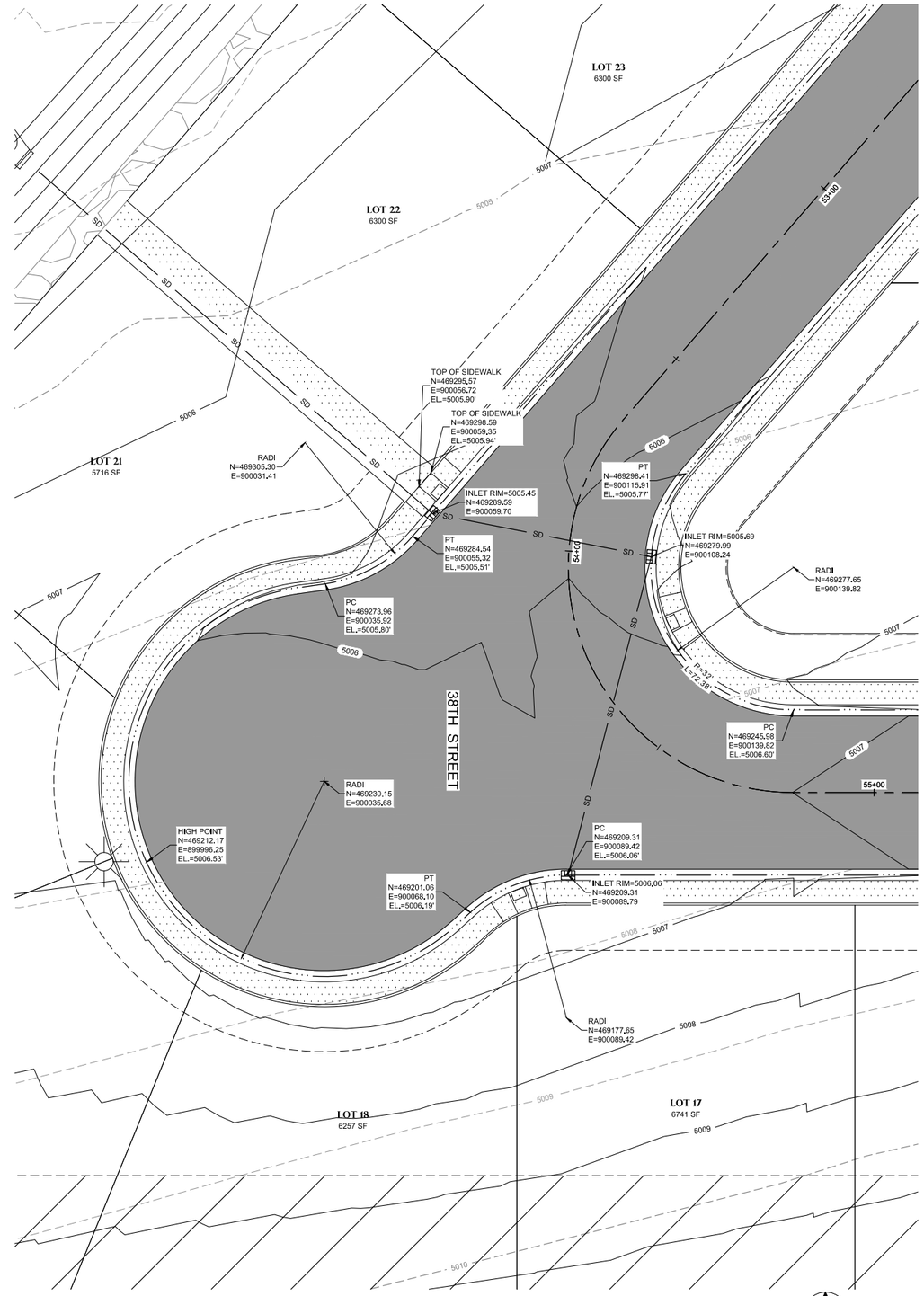


HORIZON AVE. BUMPOUT GRADING LAYOUT

0 7.5 15 30 45



GO AROUND LOOP BUMPOUT GRADING LAYOUT

0 7.5 15 30 45

Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE:	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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PARK COUNTY, CODY, WYOMING

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BUMPOUT GRADING LAYOUT PLAN

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" ON 22x34 SHEET or 1/2" ON 11x17 SHEET, THEN DRAWING IS NOT TO SCALE

DATE: June 16, 2020
PROJECT: 190598
SHEET: 15 OF 33

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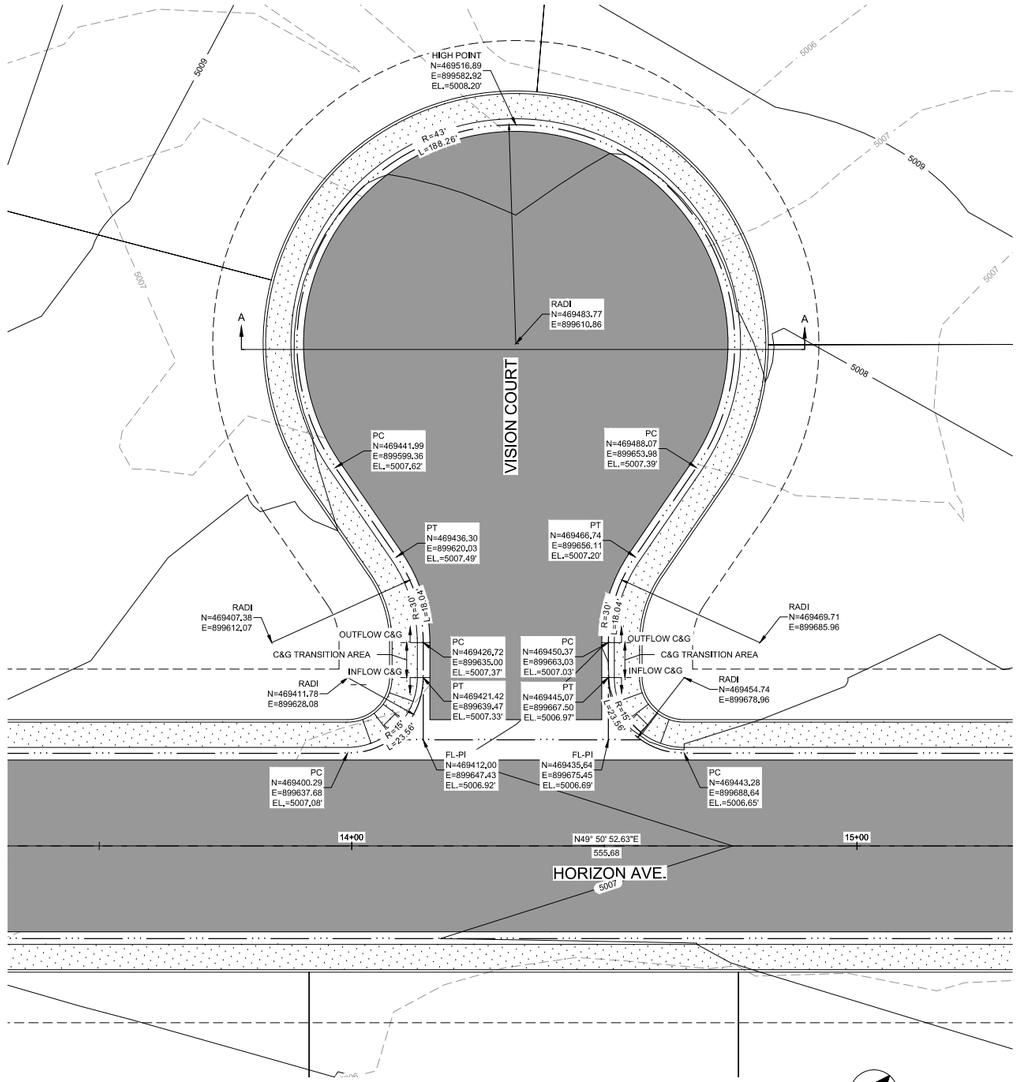
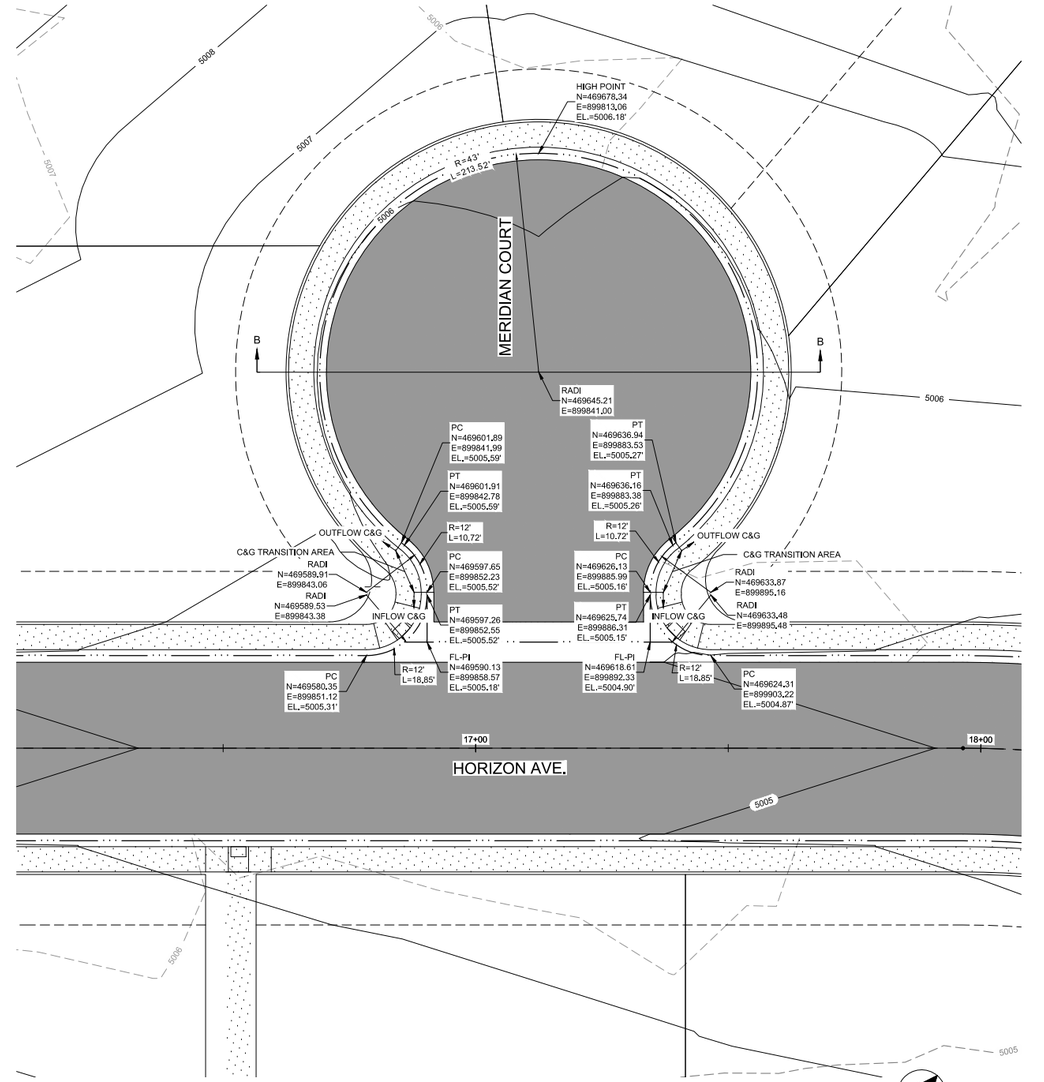
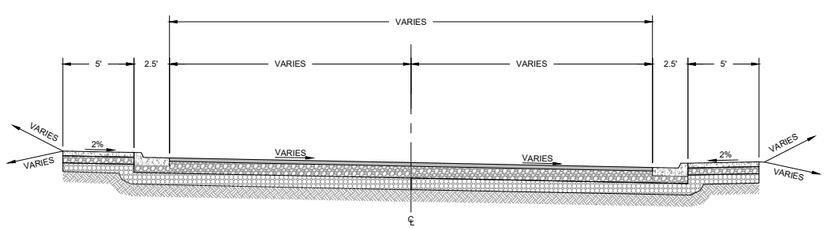


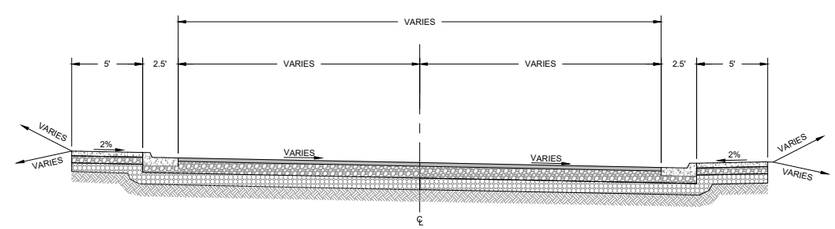
VISION COURT
GRADING LAYOUT



MERIDIAN COURT
GRADING LAYOUT



VISION COURT
SECTION A-A



MERIDIAN COURT
SECTION B-B

Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE:	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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MERIDIAN • NAMPA • SPOKANE

PARK COUNTY, CODY, WYOMING
THE LANDING MAJOR SUBDIVISION
VISION AND MERIDIAN COURT GRADING LAYOUT PLAN

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" ON 22x34 SHEET or 1/2" ON 11x17 SHEET, THEN DRAWING IS NOT TO SCALE

DATE: June 18, 2020
PROJECT: 190598
SHEET: 16 OF 33

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NOTES:

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2. 6' MINIMUM BURY DEPTH OF WATER MAIN IS FROM FINISHED GRADE.
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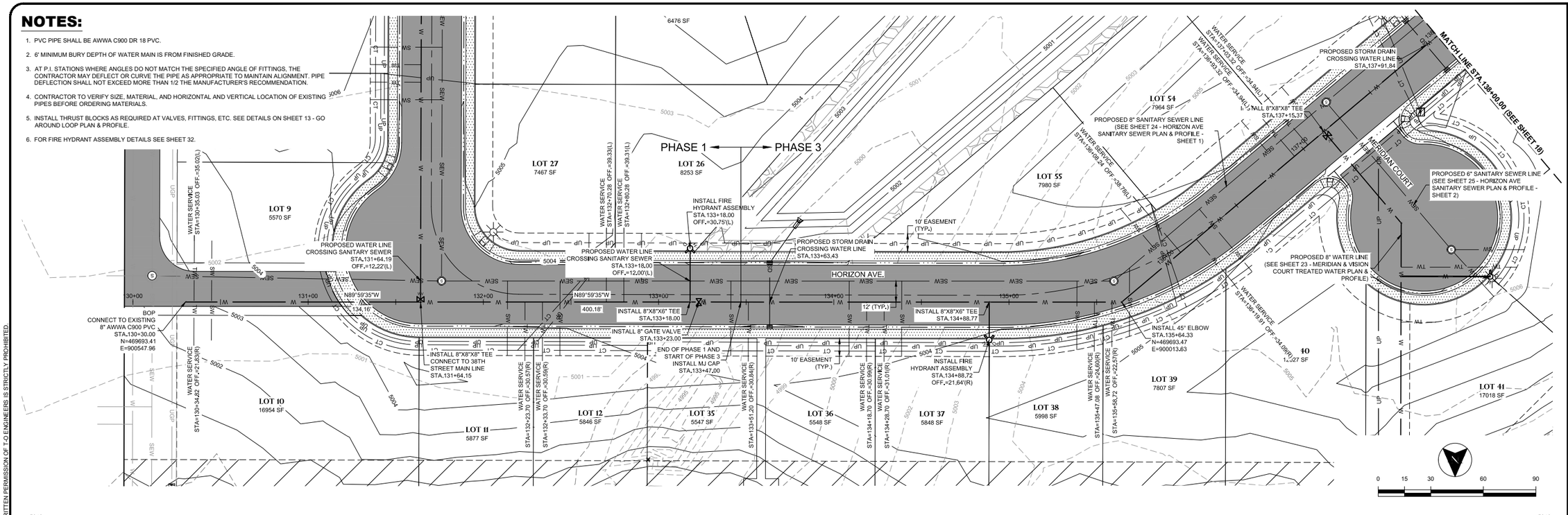
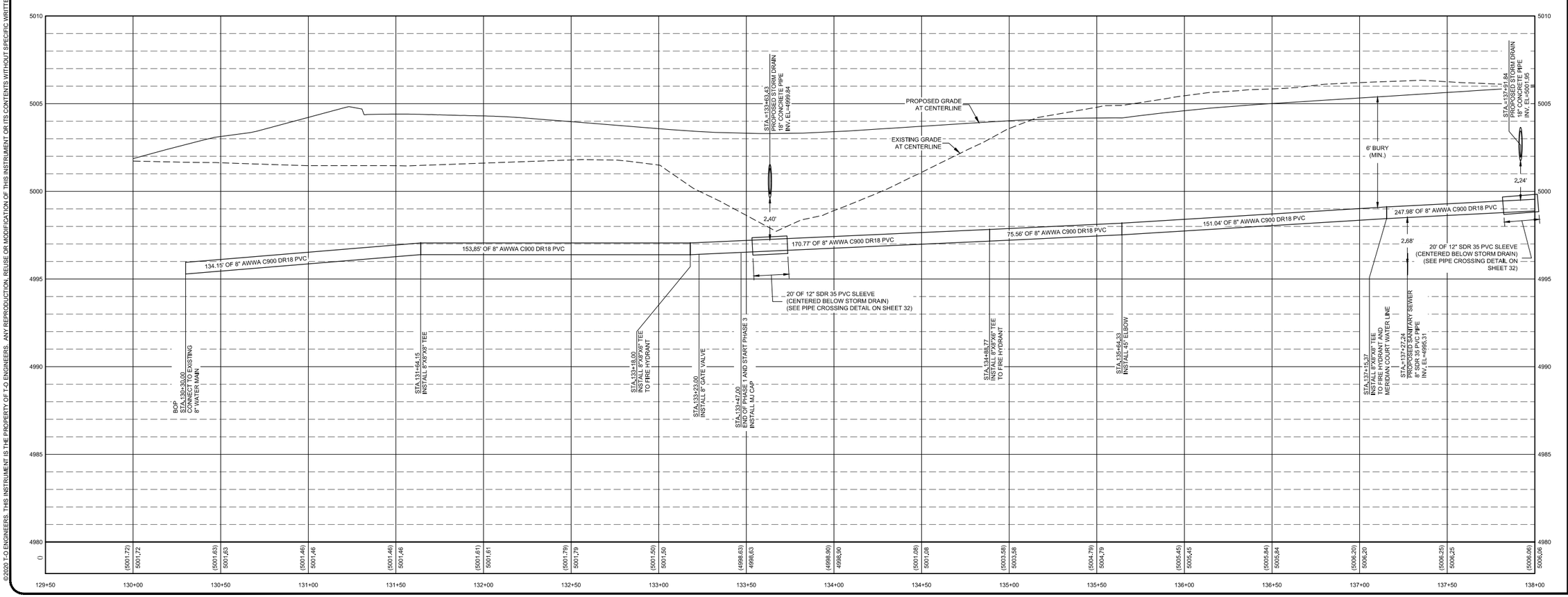
6. FOR FIRE HYDRANT ASSEMBLY DETAILS SEE SHEET 32.





Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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THE LANDING MAJOR SUBDIVISION

HORIZON AVE TREATED WATER PLAN & PROFILE - SHEET 1

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" ON 22x34 SHEET or 1/2" ON 11x17 SHEET, THEN DRAWING IS NOT TO SCALE

DATE: June 17, 2020
PROJECT: 190598
SHEET: 17 OF 33

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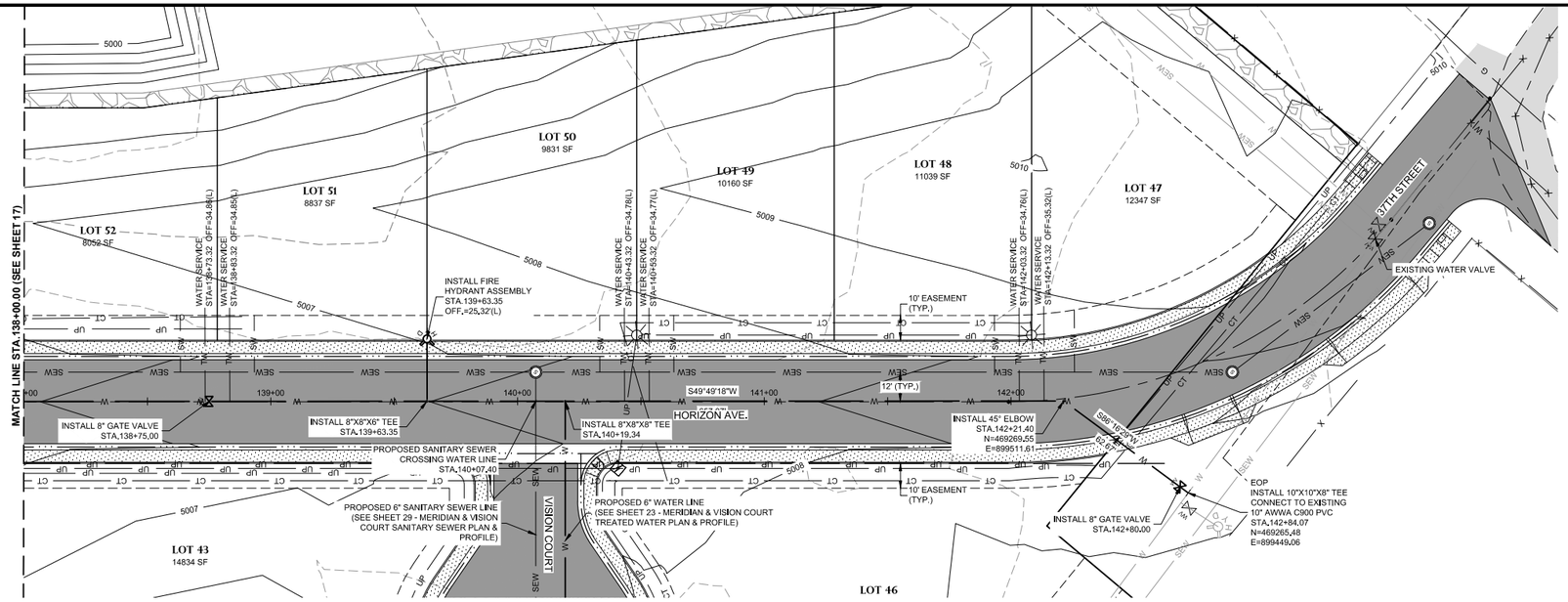

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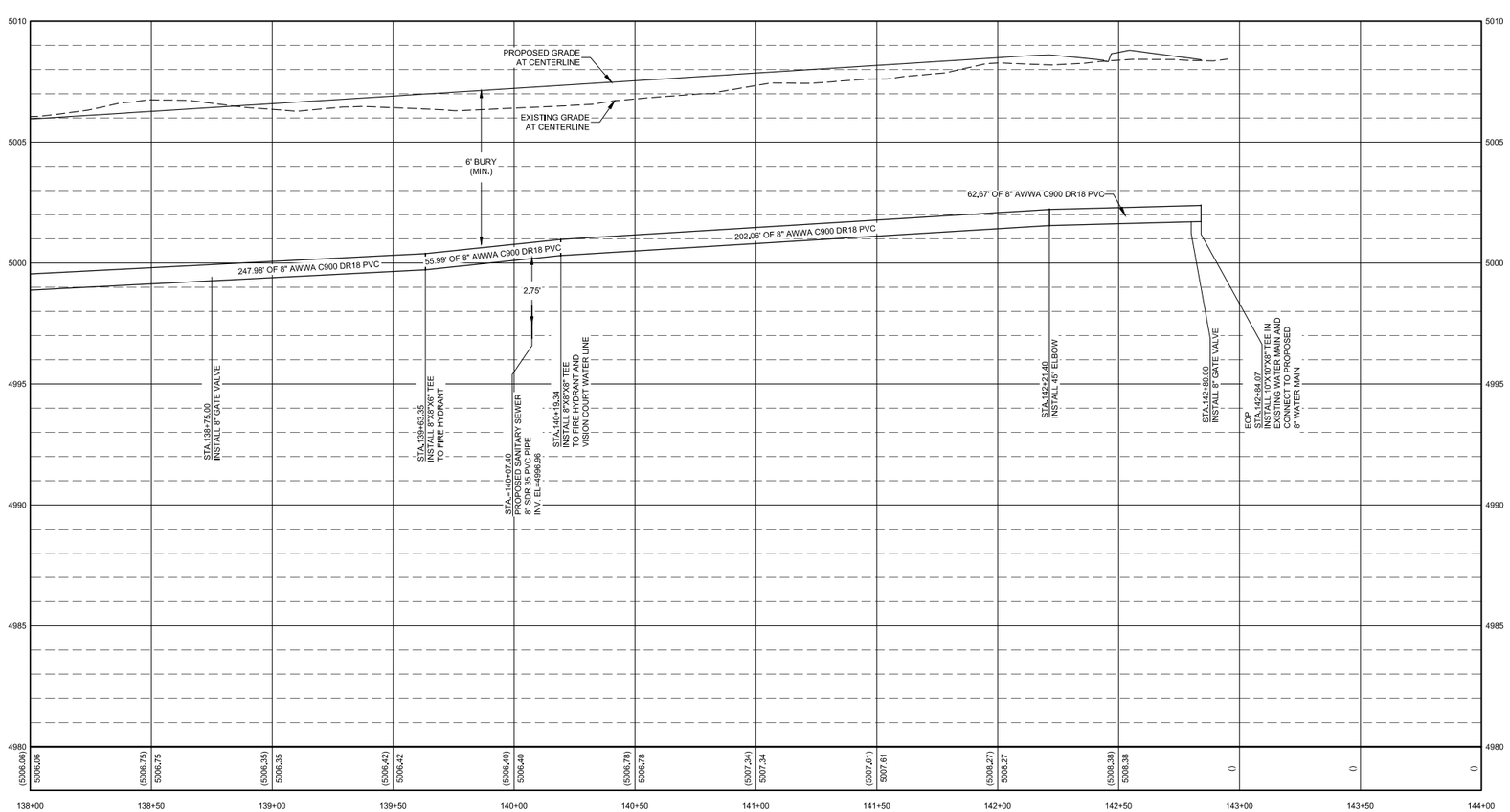

Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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HORIZON AVE TREATED WATER PLAN & PROFILE - SHEET 2

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" ON 22x34 SHEET or 1/2" ON 11x17 SHEET, THEN DRAWING IS NOT TO SCALE

DATE: June 16, 2020
PROJECT: 190598
SHEET: 18 OF 33

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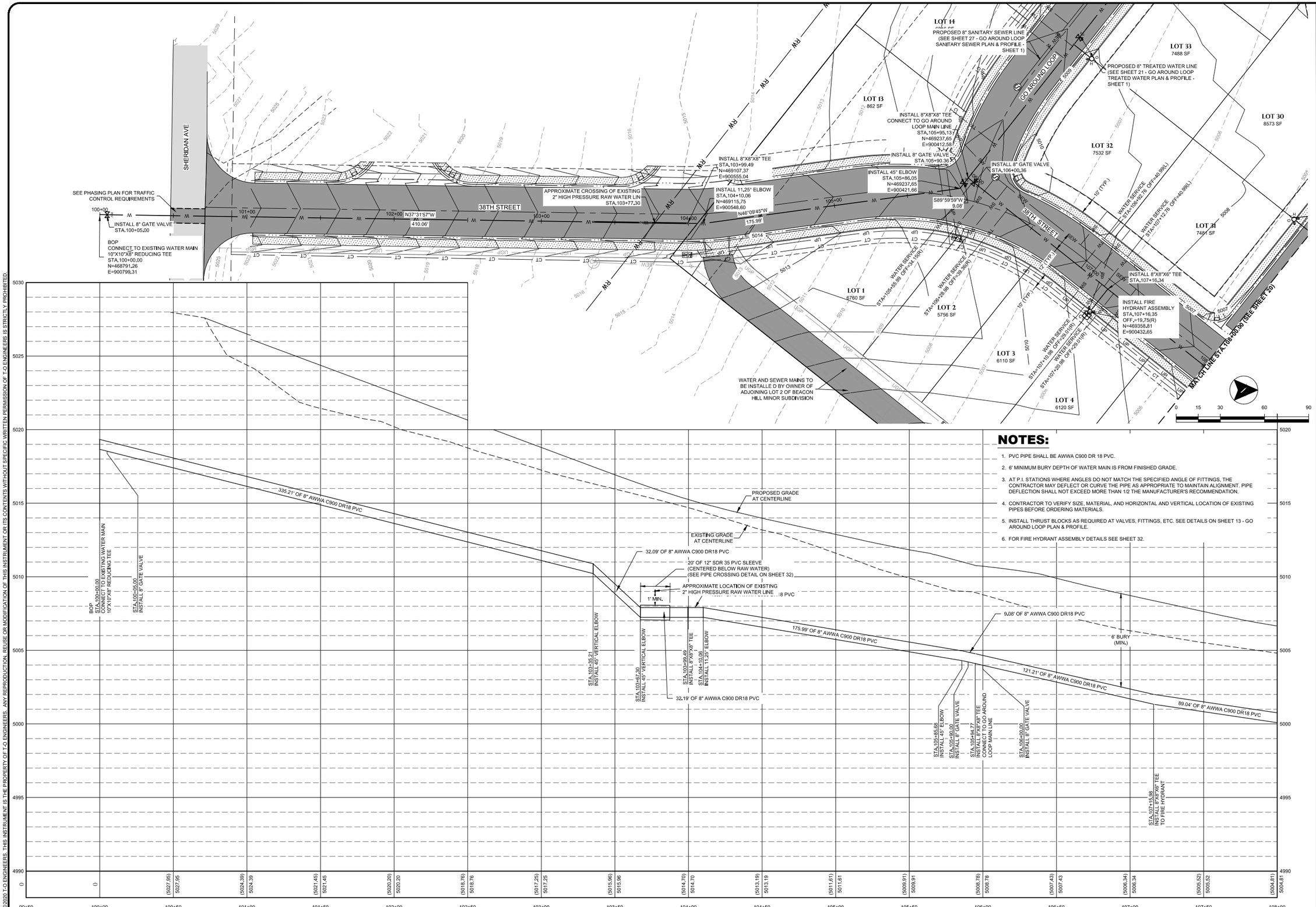

NOTES:

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6. FOR FIRE HYDRANT ASSEMBLY DETAILS SEE SHEET 32.

Professional Engineer JOSHUA MORRIS 16694 Date 6/18/2020 WYOMING

BORDER SIZE:	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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38TH STREET TREATED WATER PLAN & PROFILE - SHEET 1

ATTENTION: 0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" ON 22x34 SHEET or 1/2" ON 11x17 SHEET, THEN DRAWING IS NOT TO SCALE

DATE: June 18, 2020
PROJECT: 190598
SHEET: 19 OF 33

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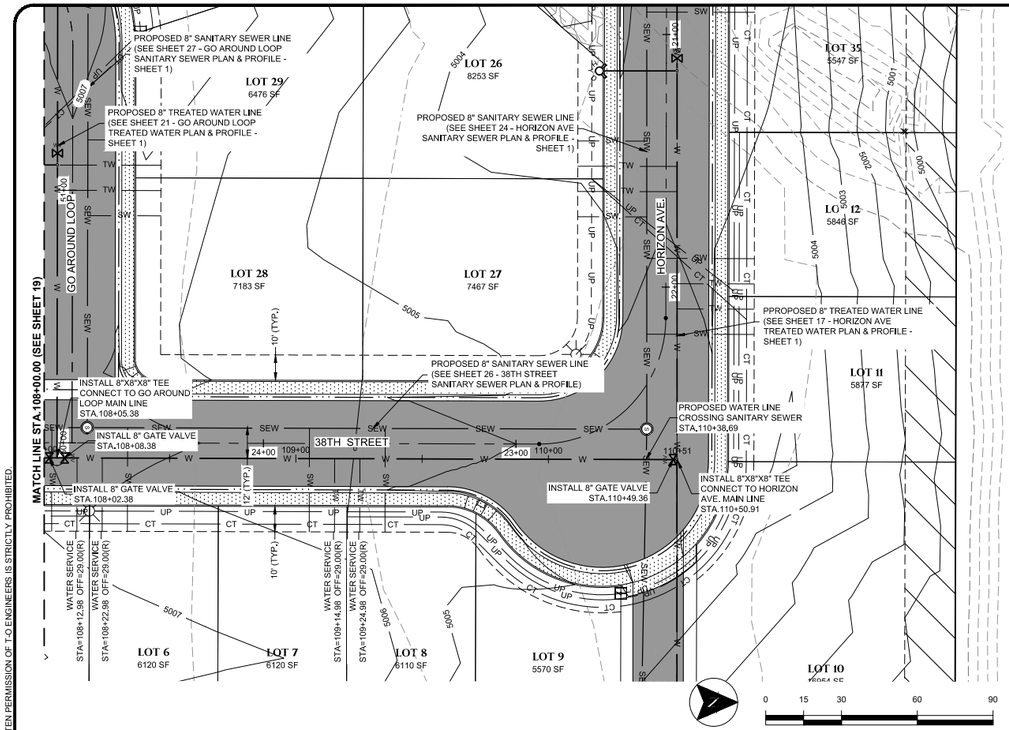

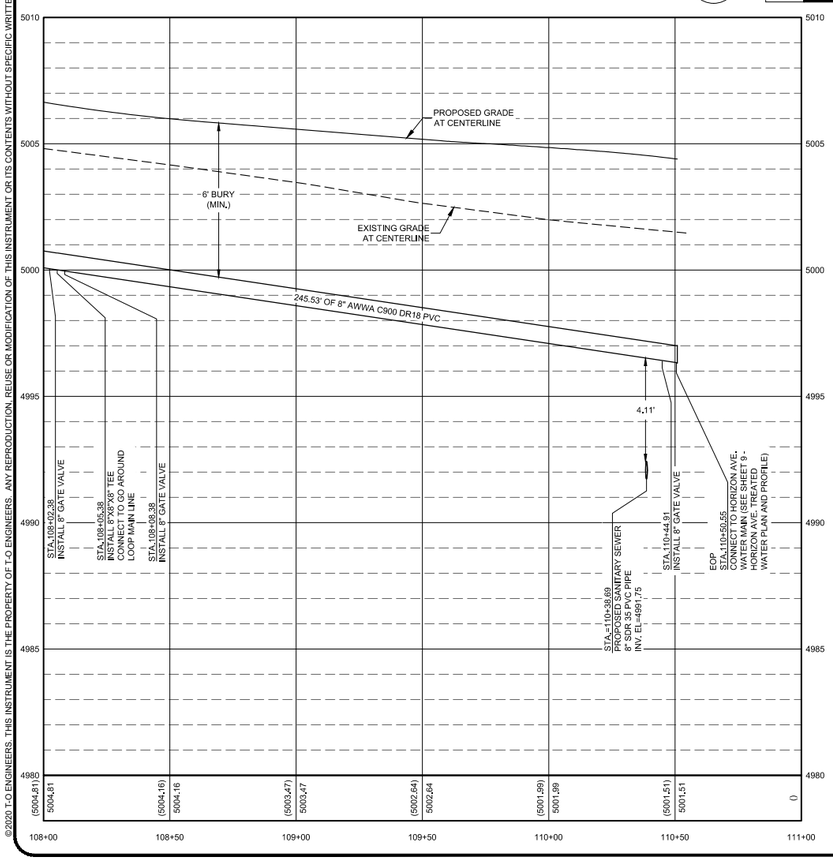

NOTES:

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6. FOR FIRE HYDRANT ASSEMBLY DETAILS SEE SHEET 32.

Professional Engineer JOSHUA MORRIS 16694 Date 6/18/2020 WYOMING

BORDER SIZE	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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THE LANDING MAJOR SUBDIVISION

38TH STREET TREATED WATER PLAN & PROFILE - SHEET 2

ATTENTION: 0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" ON 22x34 SHEET or 1/2" ON 11x17 SHEET, THEN DRAWING IS NOT TO SCALE

DATE: June 16, 2020
PROJECT: 190598
SHEET: 20 OF 33

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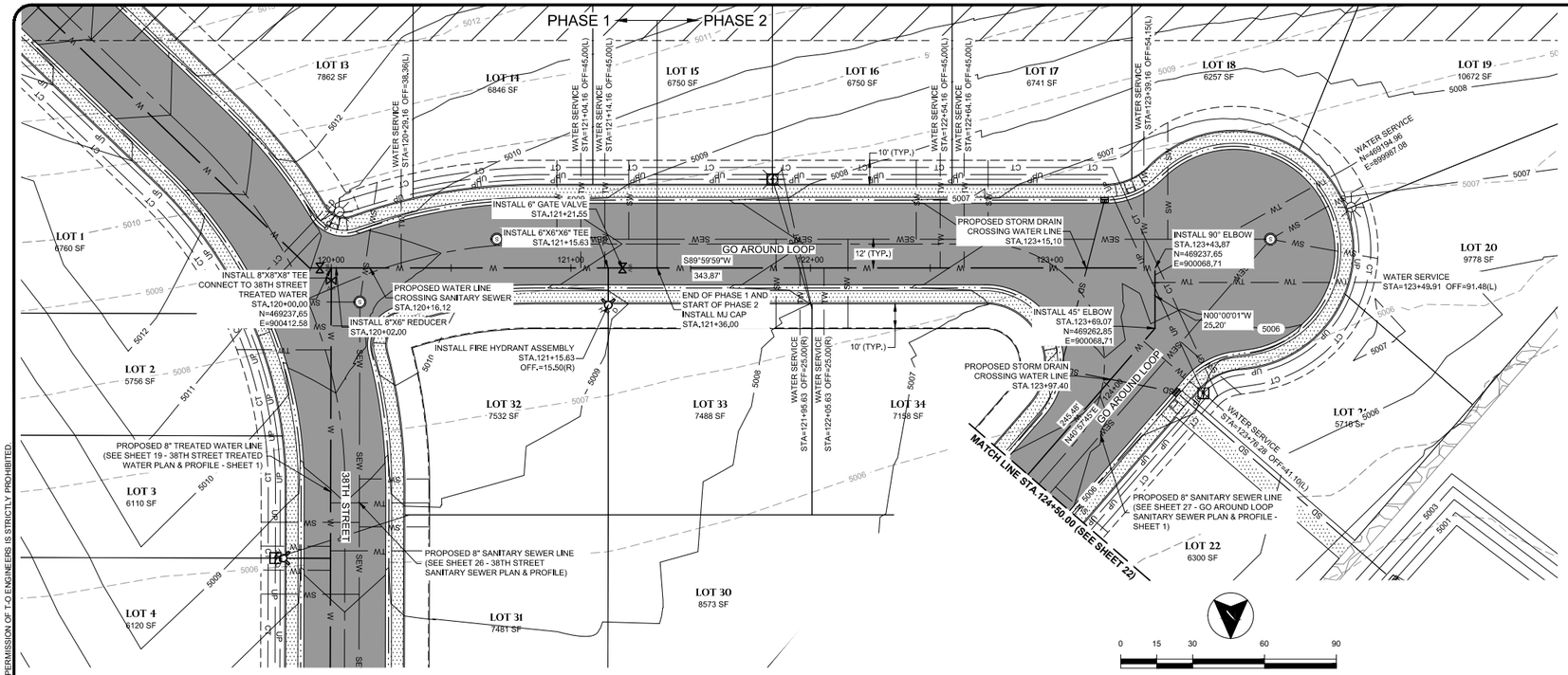

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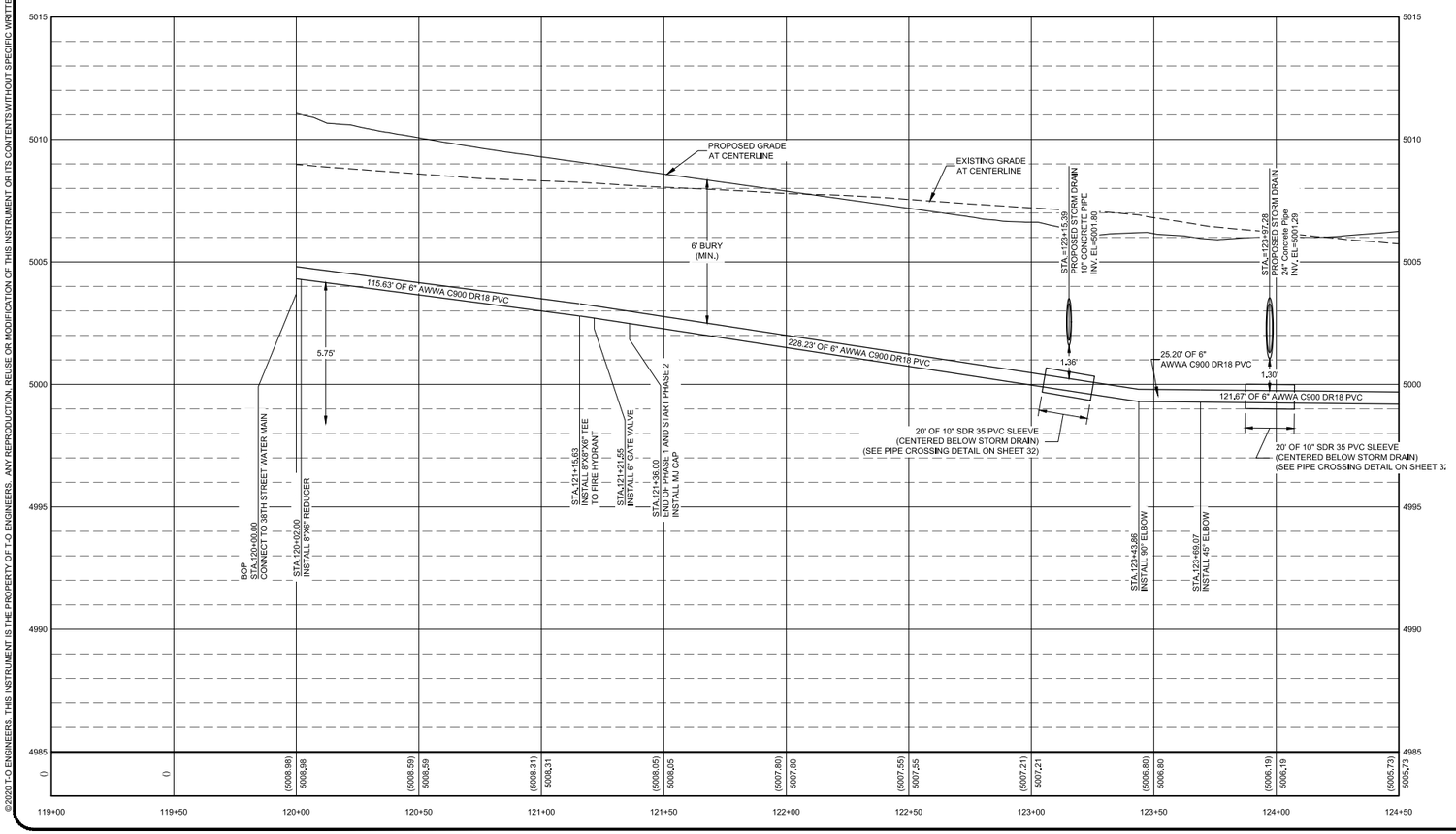

Professional Engineer JOSHUA MORRIS 16694 Date 6/18/2020 WYOMING

BORDER SIZE	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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PARK COUNTY, CODY, WYOMING

THE LANDING MAJOR SUBDIVISION

GO AROUND LOOP TREATED WATER PLAN & PROFILE - SHEET 1

ATTENTION: 0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" ON 22x34 SHEET or 1/2" ON 11x17 SHEET, THEN DRAWING IS NOT TO SCALE

DATE: June 16, 2020
PROJECT: 190598
SHEET: 21 OF 33

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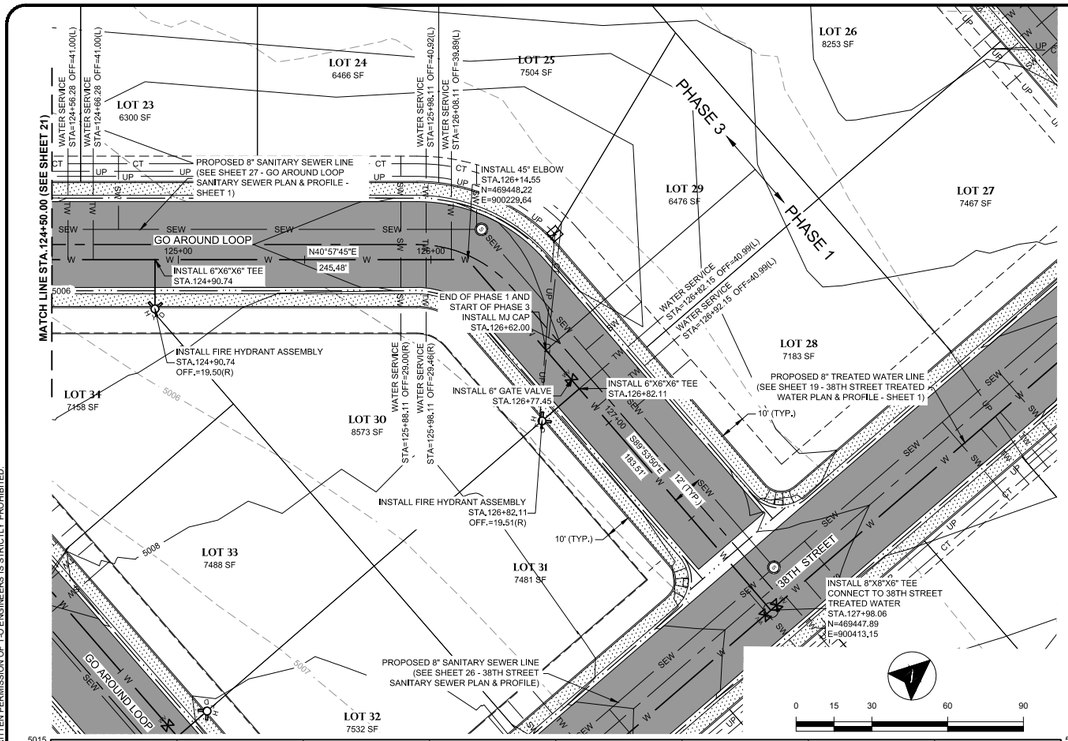

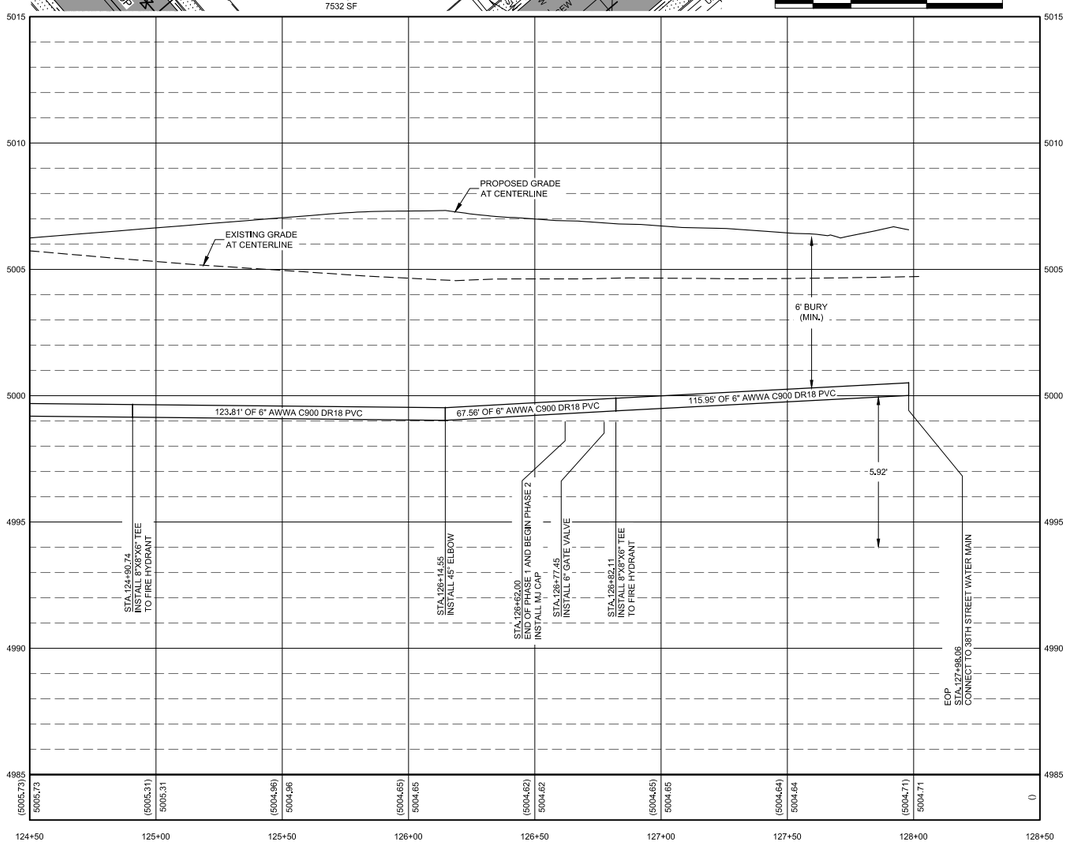

NOTES:

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6. FOR FIRE HYDRANT ASSEMBLY DETAILS SEE SHEET 32.

Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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CONSULTING ENGINEERS, SURVEYORS & PLANNERS
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PARK COUNTY, CODY, WYOMING

THE LANDING MAJOR SUBDIVISION

GO AROUND LOOP TREATED WATER PLAN & PROFILE - SHEET 2

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" ON 22x34 SHEET or 1/2" ON 11x17 SHEET, THEN DRAWING IS NOT TO SCALE

DATE: June 16, 2020
PROJECT: 190598
SHEET: 22 OF 33

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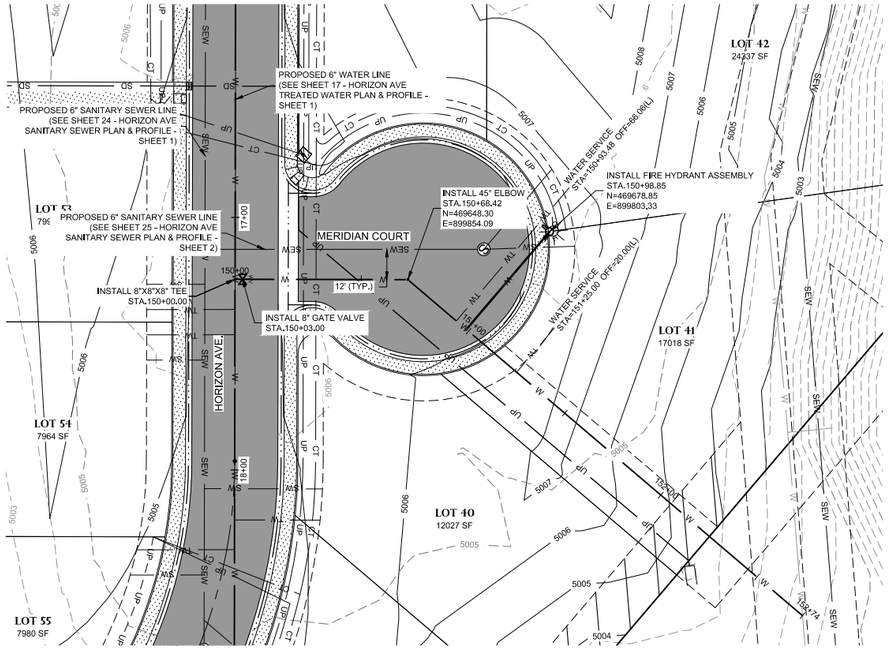
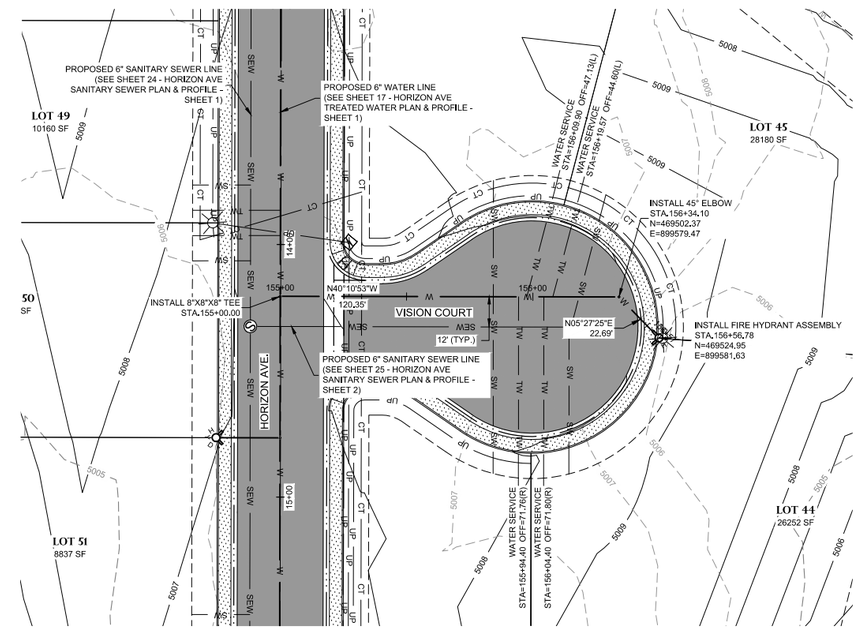


MERIDIAN COURT



VISION COURT

NOTES:

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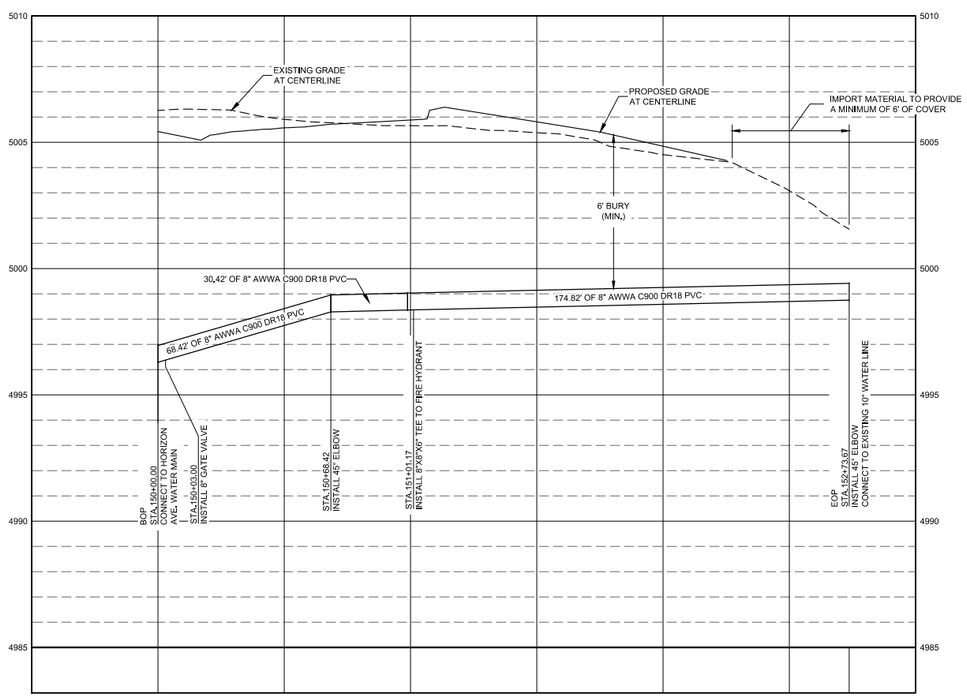

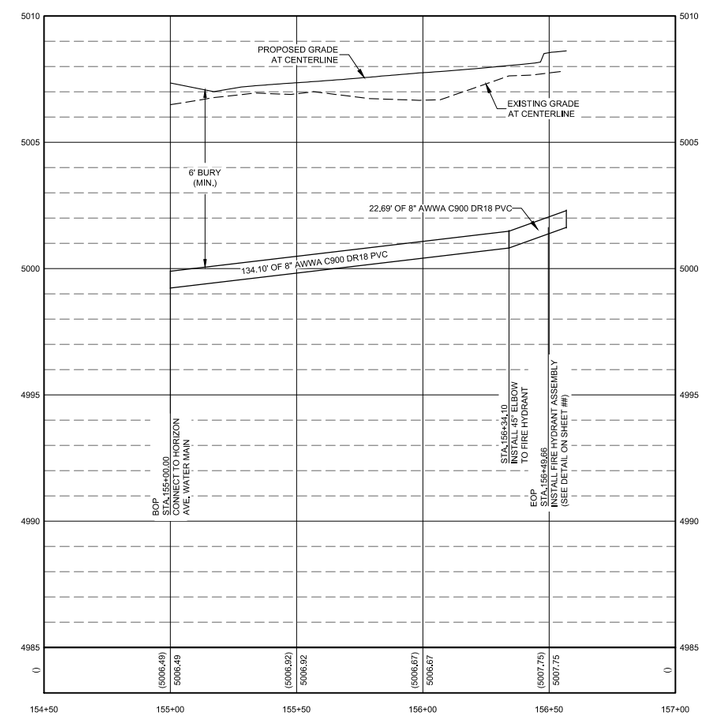

Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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THE LANDING MAJOR SUBDIVISION

MERIDIAN & VISION COURT TREATED WATER PLAN & PROFILE

ATTENTION:
0 1/2 1
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DATE: June 17, 2020
PROJECT: 190598
SHEET: 23 OF 33

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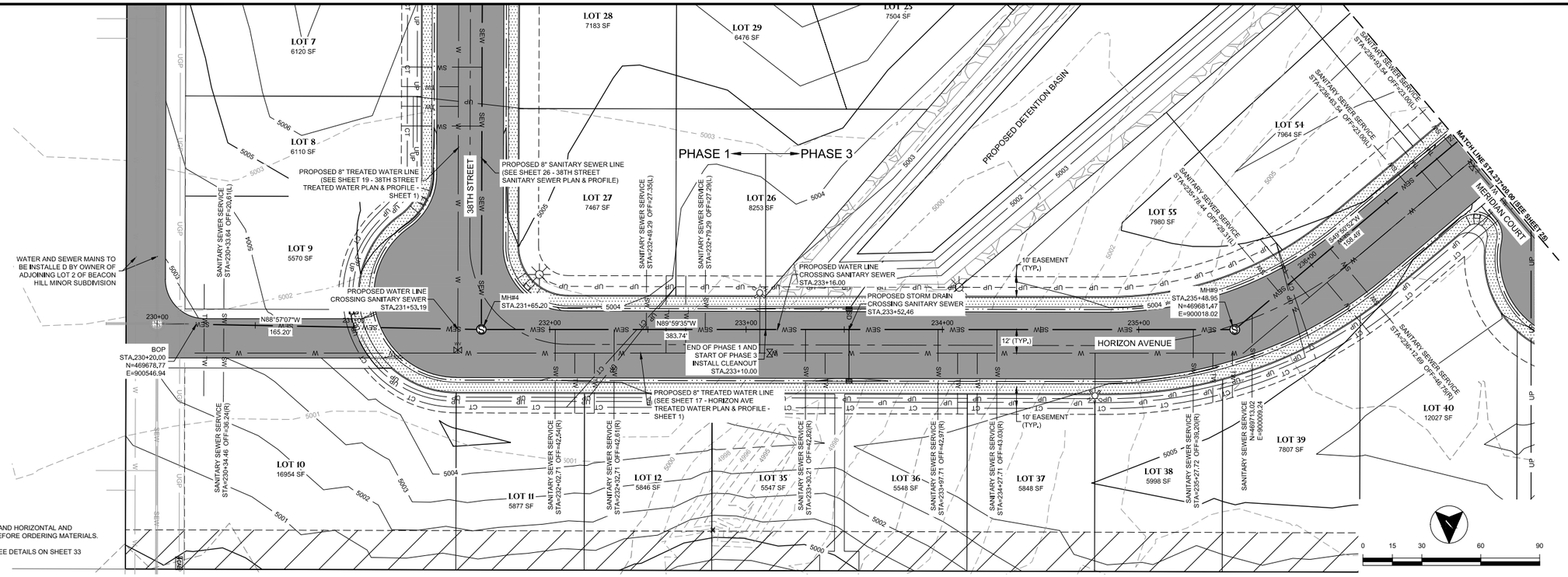
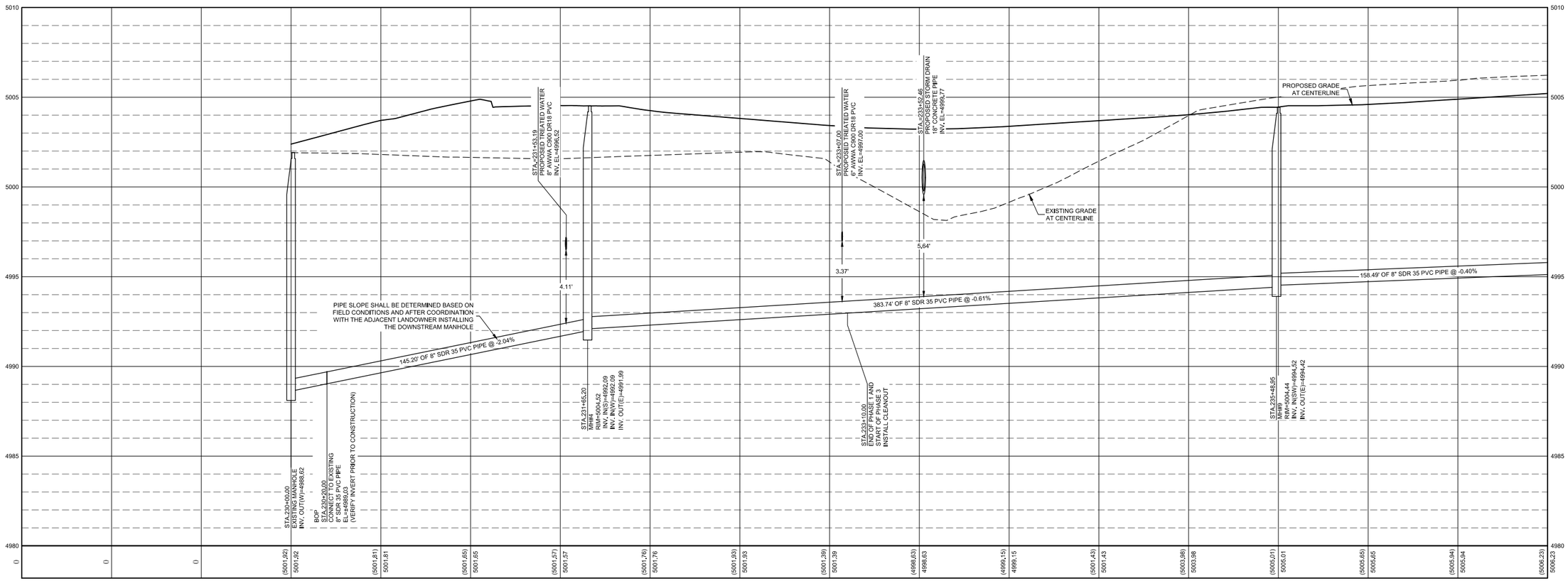


NOTES:

1. PVC PIPE SHALL BE SDR 35 PVC.
2. CONTRACTOR TO VERIFY SIZE, MATERIAL, AND HORIZONTAL AND VERTICAL LOCATION OF EXISTING PIPES BEFORE ORDERING MATERIALS.
3. FOR MORE INFORMATION ON MANHOLES SEE DETAILS ON SHEET 33



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Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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HORIZON AVE SANITARY SEWER PLAN & PROFILE - SHEET 1

ATTENTION:
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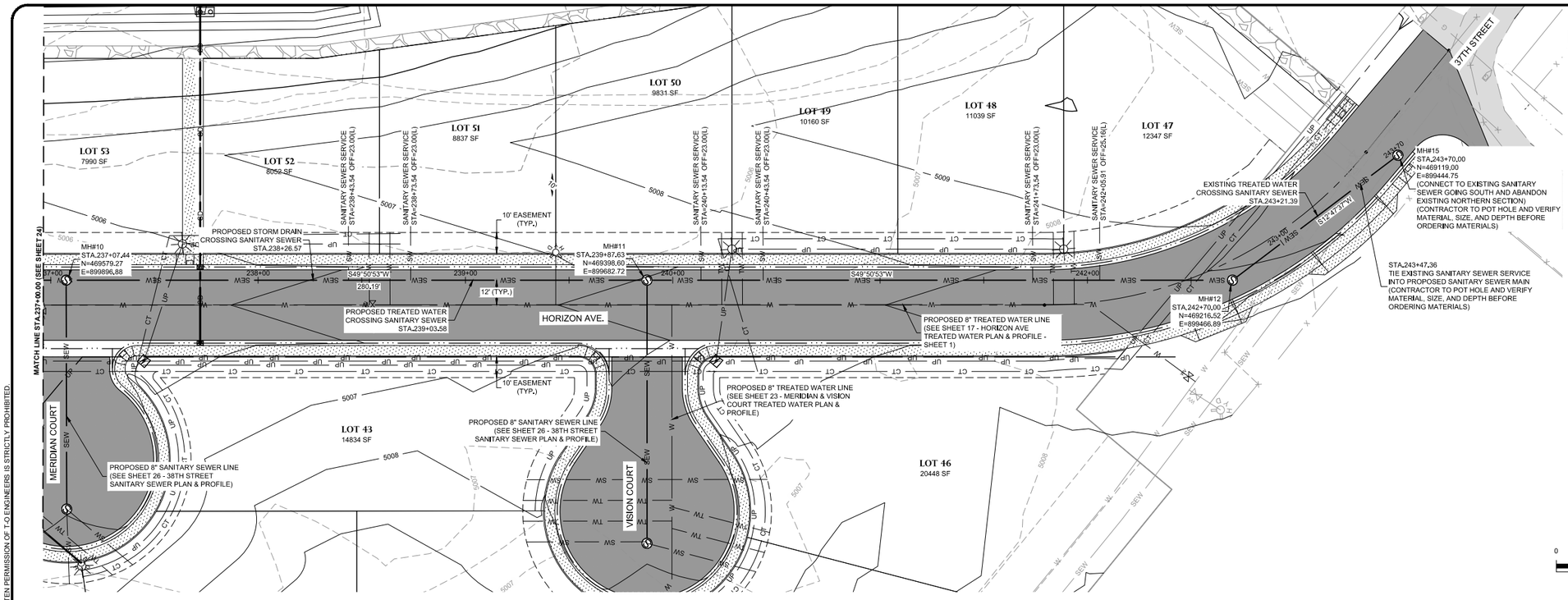
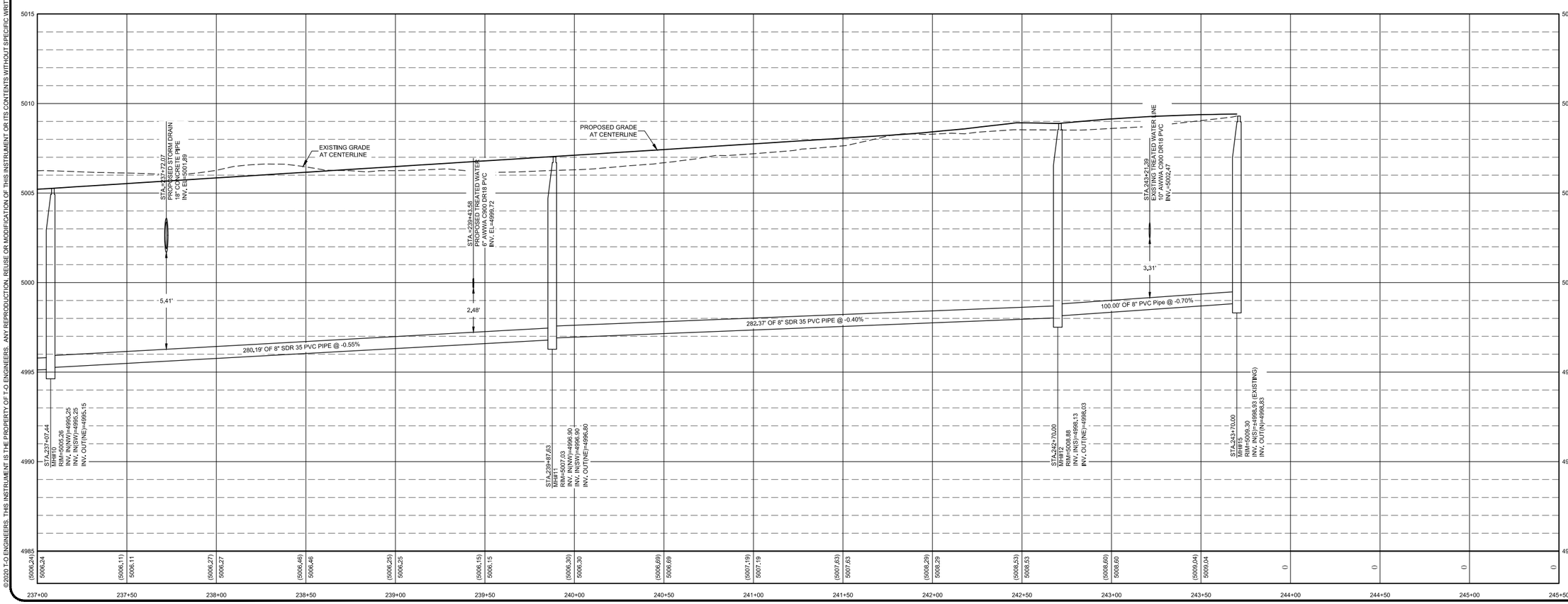
DATE: June 18, 2020
PROJECT: 190598
SHEET: 24 OF 33



NOTES:

1. PVC PIPE SHALL BE SDR 35 PVC.
2. CONTRACTOR TO VERIFY SIZE, MATERIAL, AND HORIZONTAL AND VERTICAL LOCATION OF EXISTING PIPES BEFORE ORDERING MATERIALS.
3. FOR MORE INFORMATION ON MANHOLES SEE DETAILS ON SHEET 33



Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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HORIZON AVE SANITARY SEWER PLAN & PROFILE - SHEET 2

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DATE: June 16, 2020
PROJECT: 190598
SHEET: 25 OF 33

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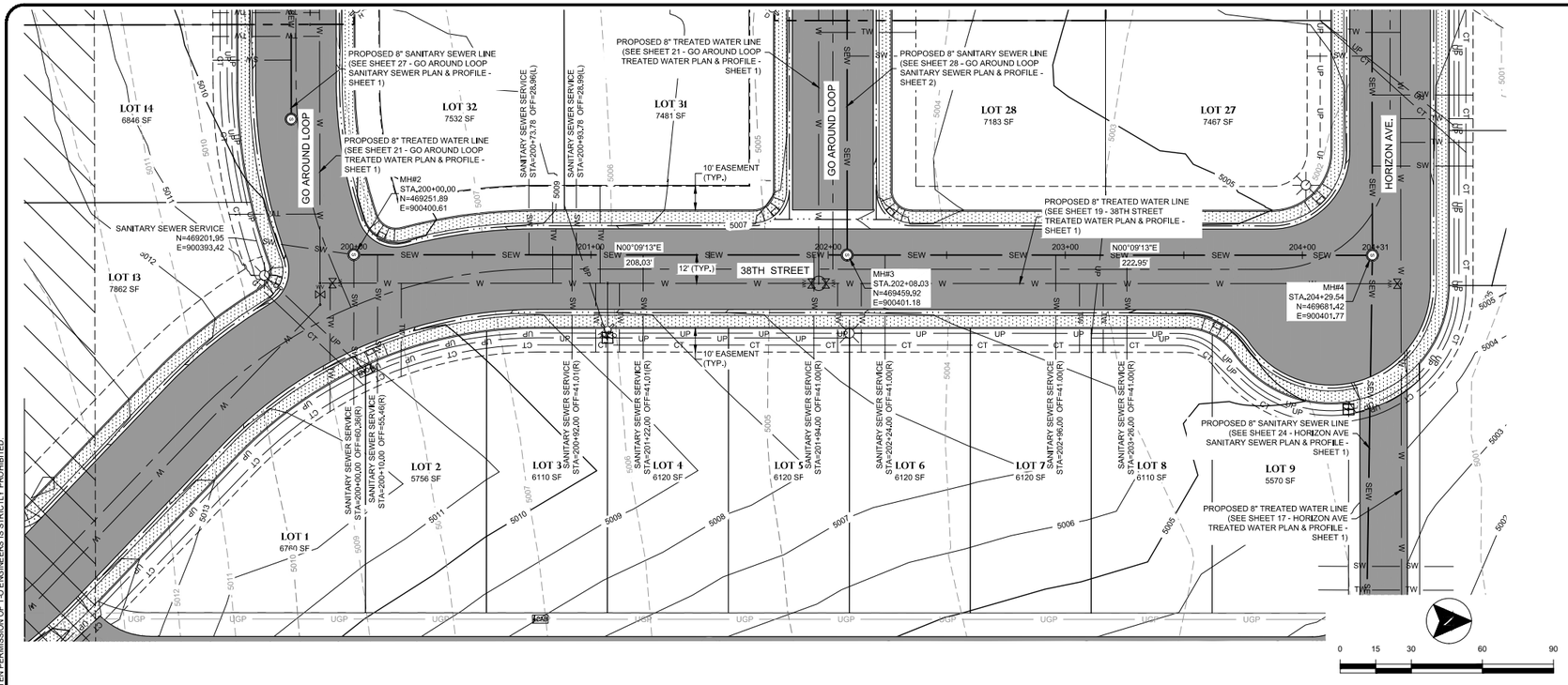

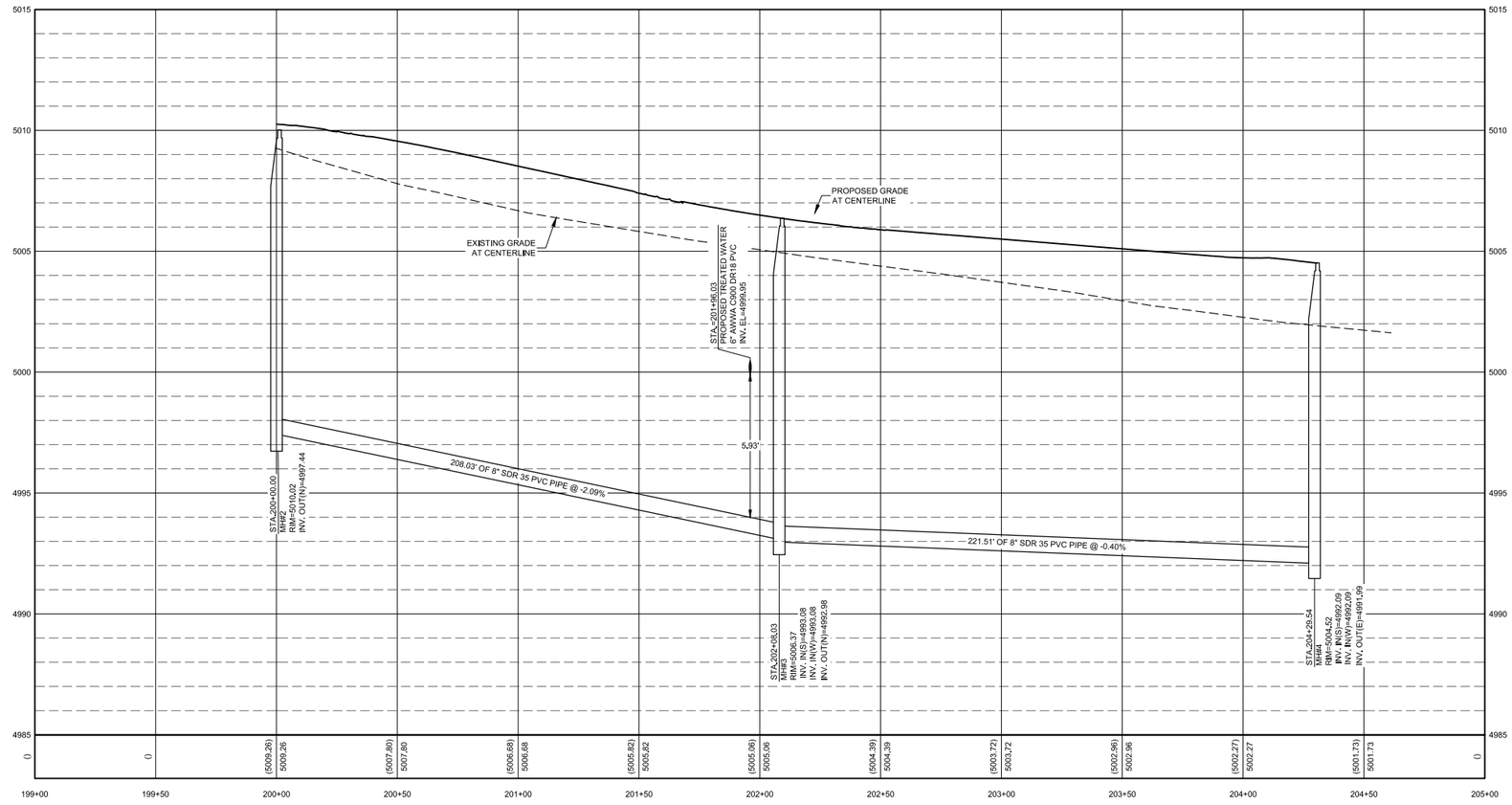

NOTES:

1. PVC PIPE SHALL BE SDR 35 PVC.
2. CONTRACTOR TO VERIFY SIZE, MATERIAL, AND HORIZONTAL AND VERTICAL LOCATION OF EXISTING PIPES BEFORE ORDERING MATERIALS.
3. FOR MORE INFORMATION ON MANHOLES SEE DETAILS ON SHEET 33

Professional Engineer JOSHUA MORRIS 16694 Date 6/18/2020 WYOMING

BORDER SIZE	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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38TH STREET SANITARY SEWER PLAN & PROFILE

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PROJECT: 190598
SHEET: 26 OF 33

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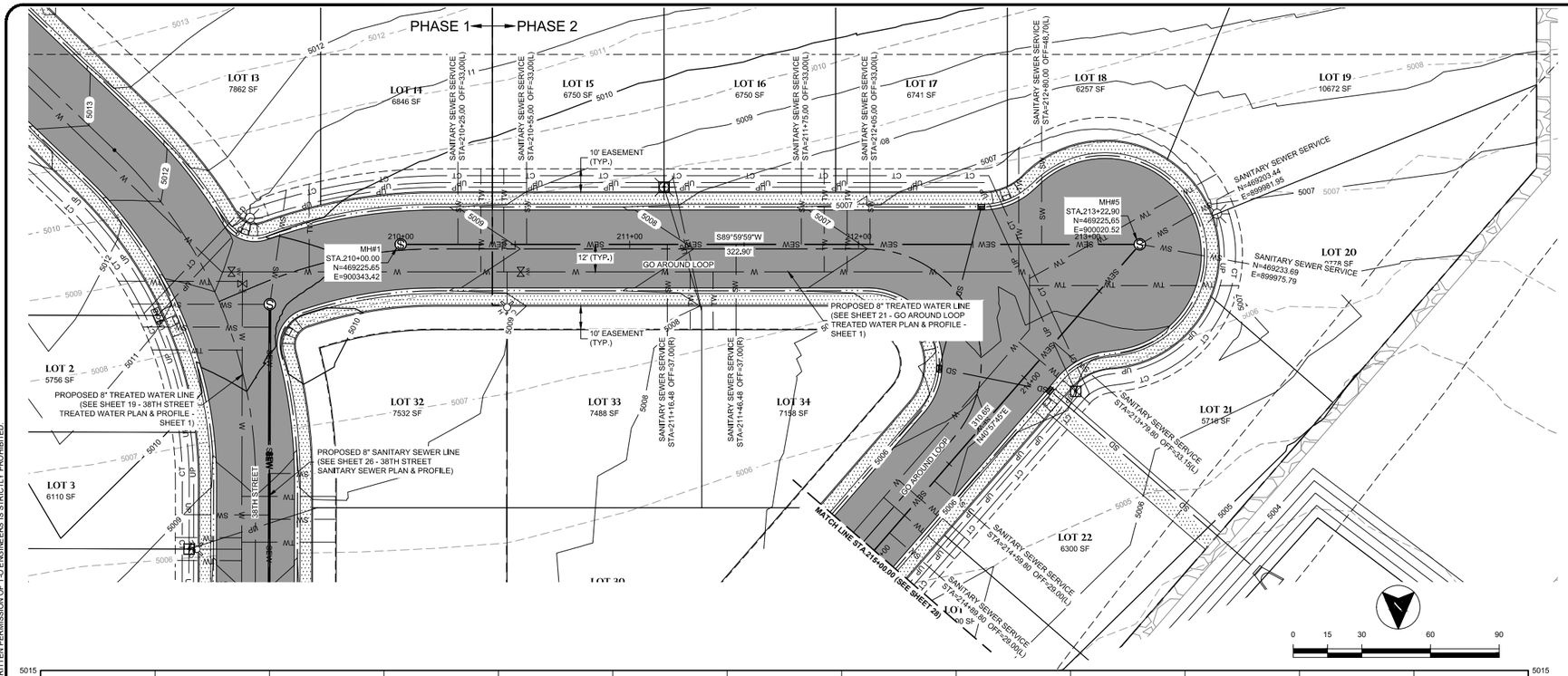

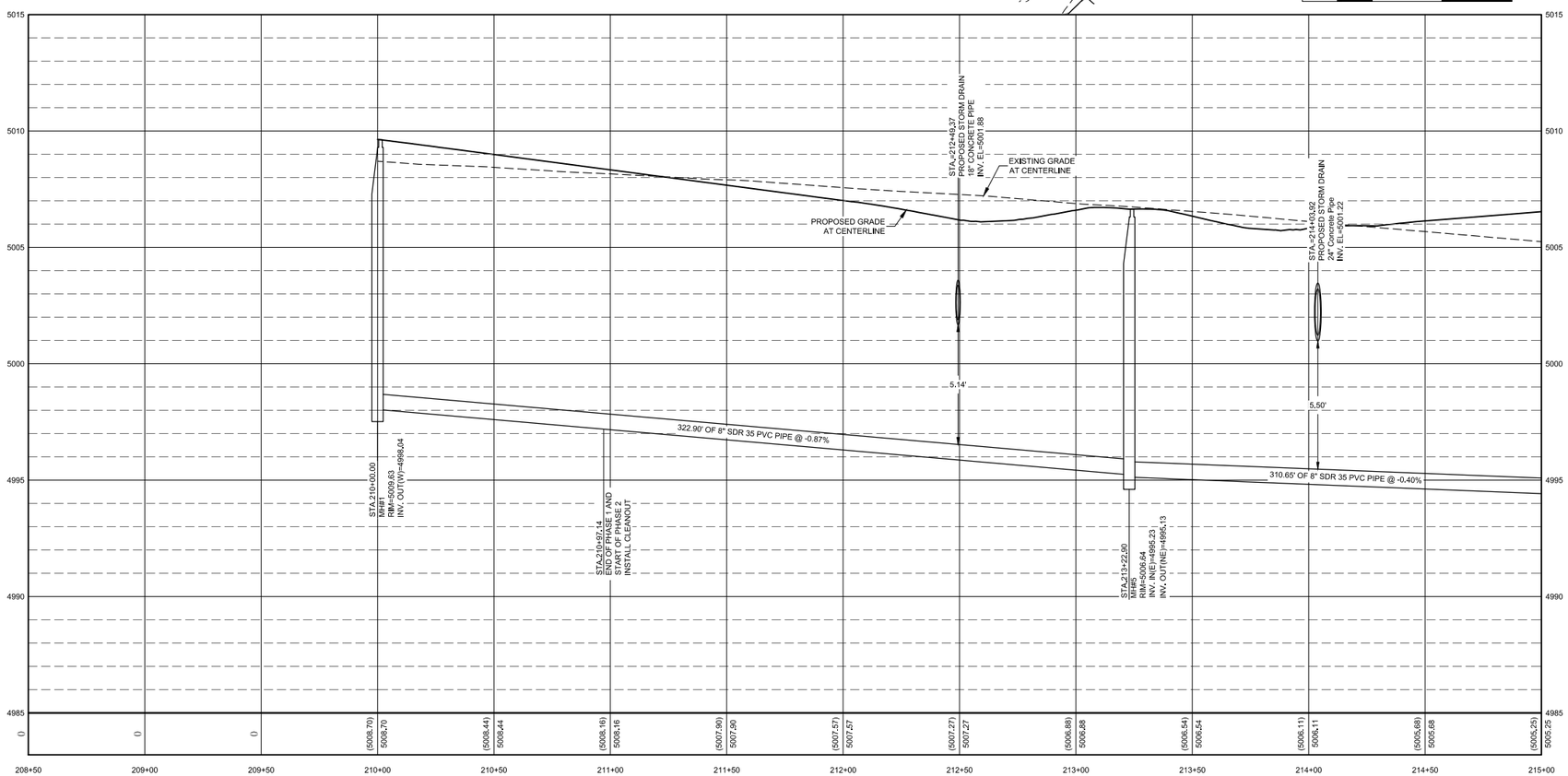

NOTES:

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Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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GO AROUND LOOP SANITARY SEWER PLAN & PROFILE - SHEET 1

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PROJECT: 190598
SHEET: 27 OF 33

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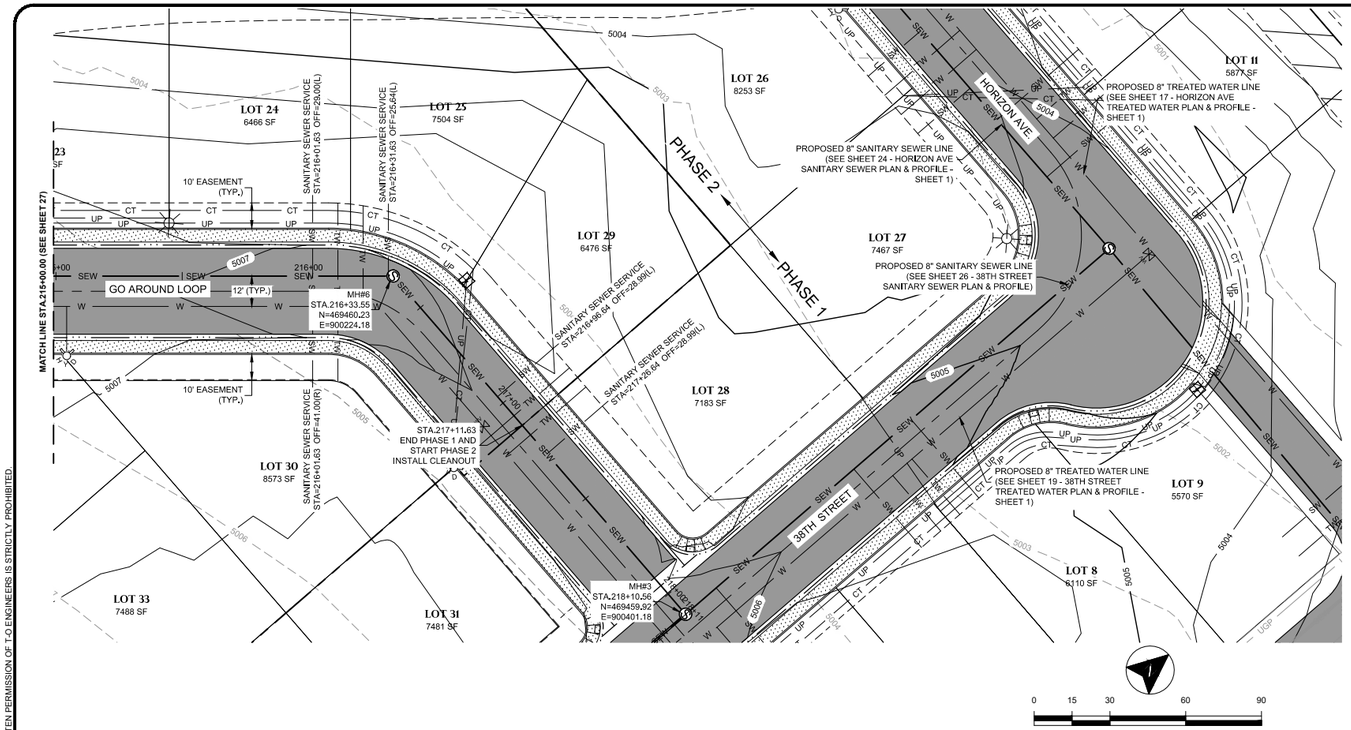

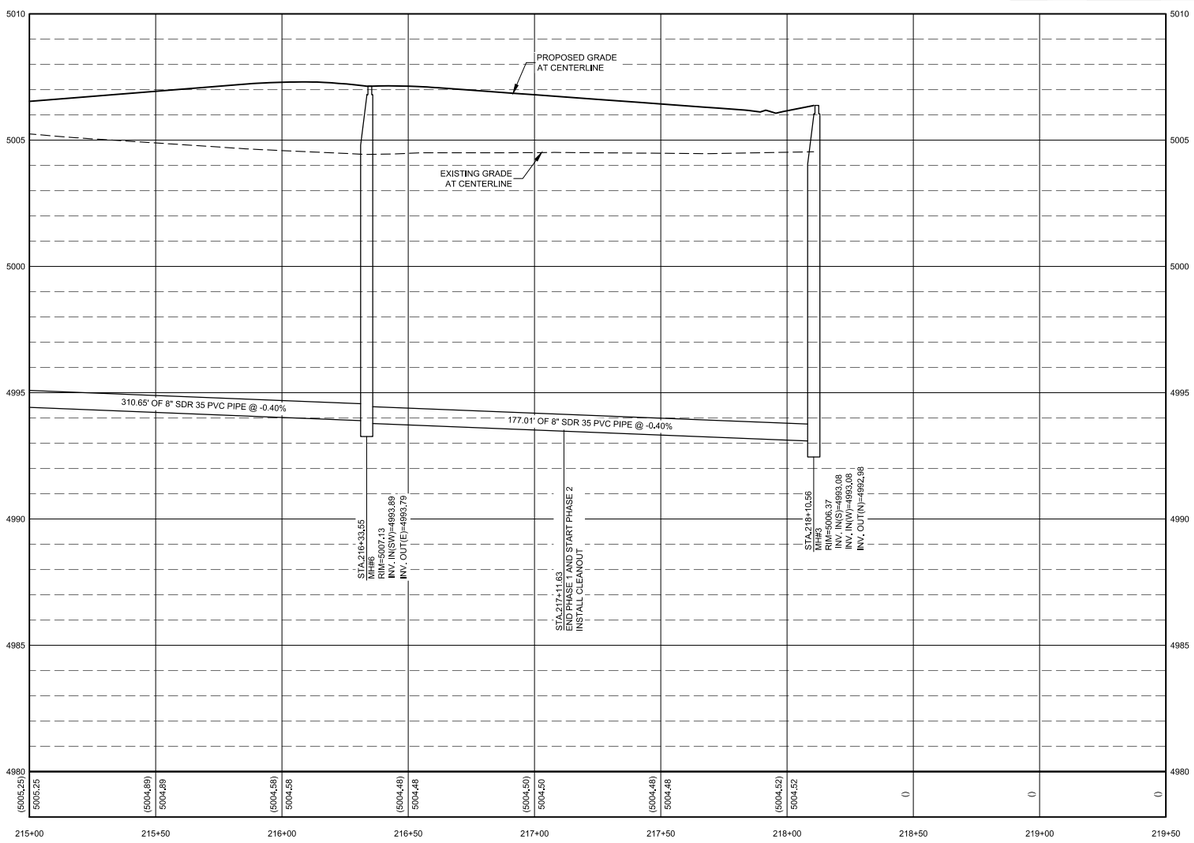

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Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE	22"X34"
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APPROVED	JAM

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GO AROUND LOOP SANITARY SEWER PLAN & PROFILE - SHEET 2

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PROJECT: 190598
SHEET: 28 OF 33

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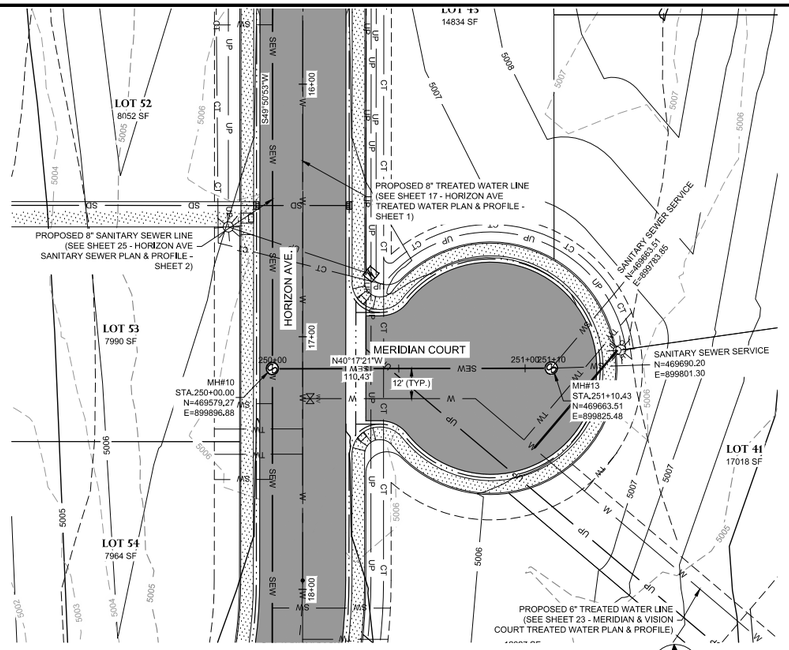
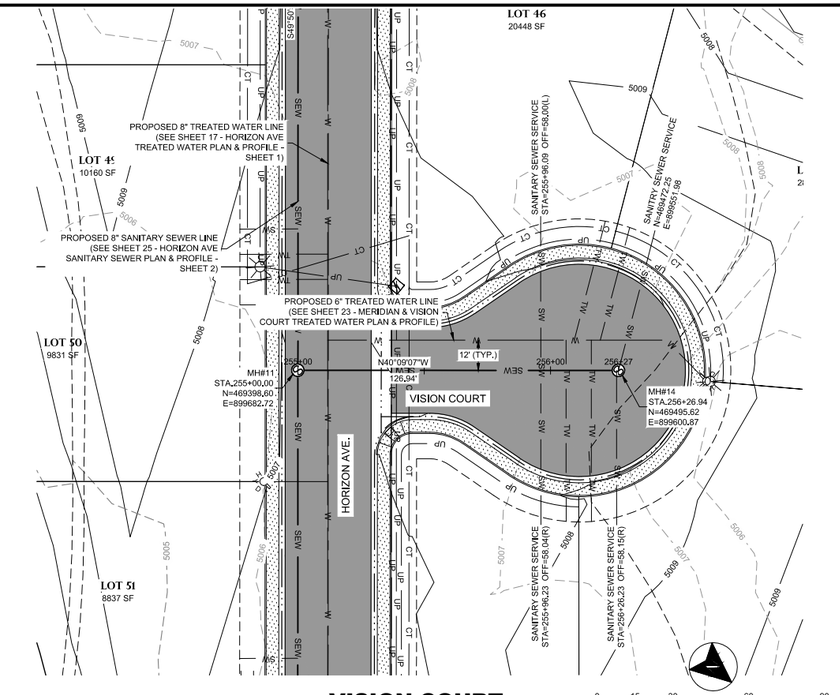
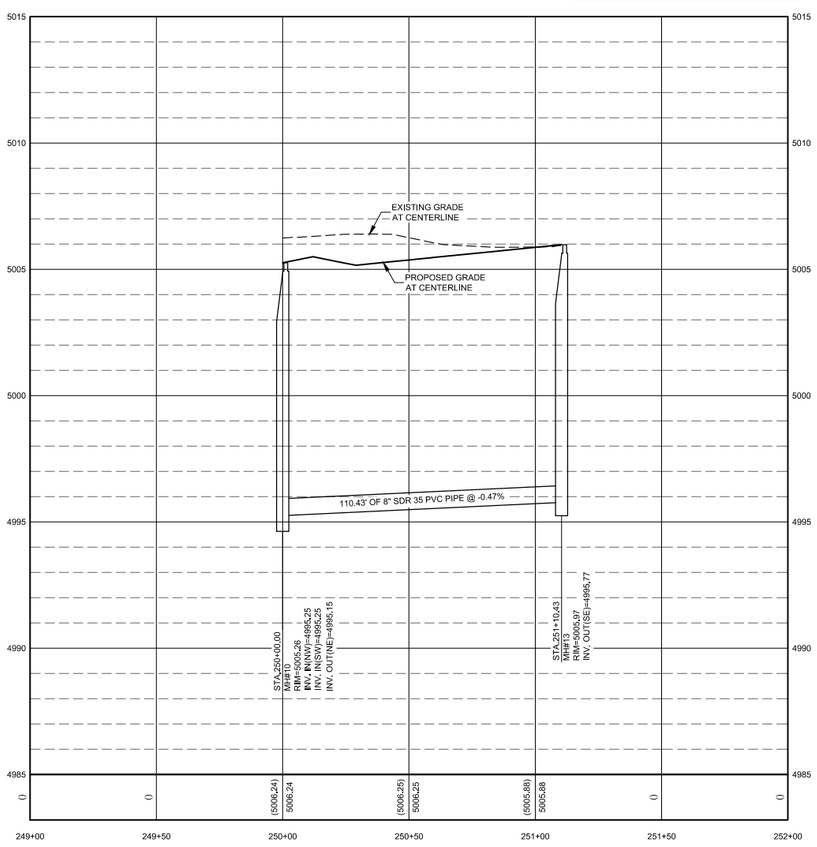
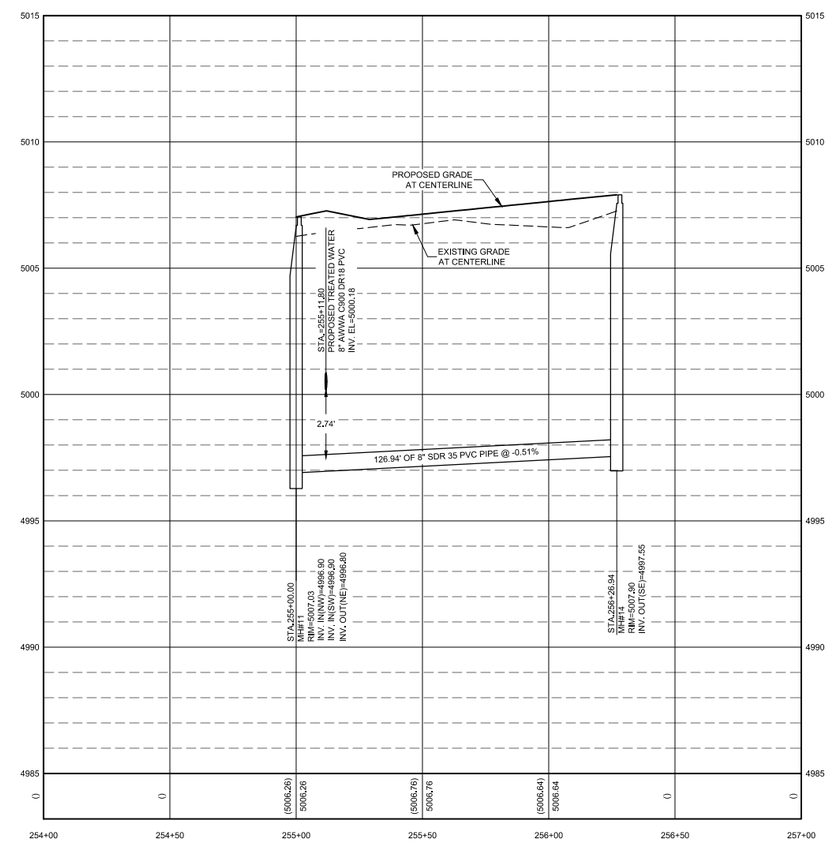


MERIDIAN COURT



VISION COURT





NOTES:

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3. FOR MORE INFORMATION ON MANHOLES SEE DETAILS ON SHEET 33

Professional Engineer JOSHUA MORRIS 16694 Date 6/18/2020 WYOMING

BORDER SIZE	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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THE LANDING MAJOR SUBDIVISION

MERIDIAN & VISION COURT SANITARY SEWER PLAN & PROFILE

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DATE: June 17, 2020
PROJECT: 190598
SHEET: 29 OF 33

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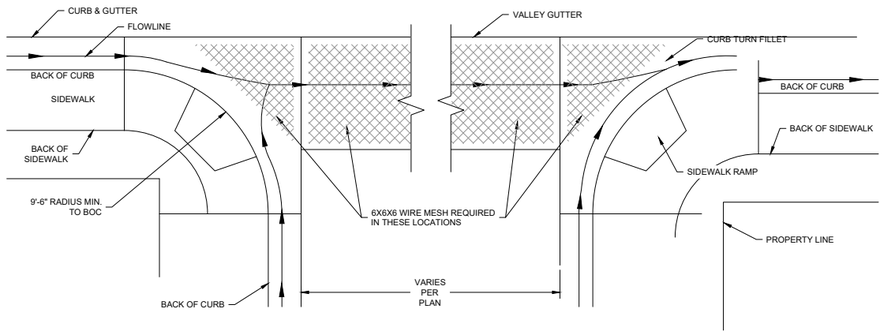
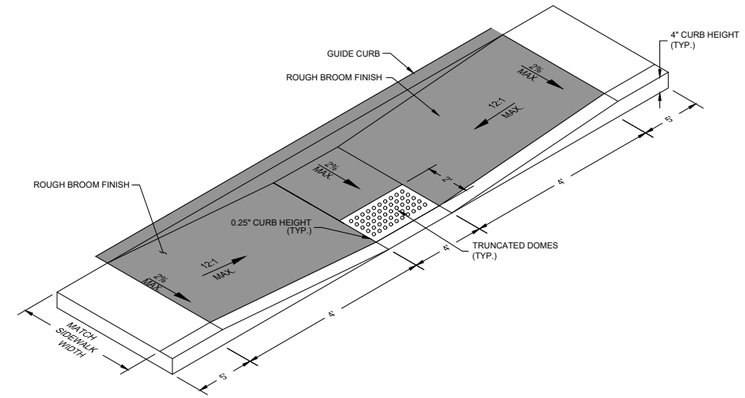
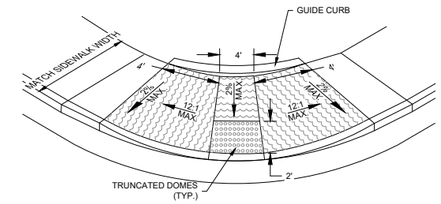


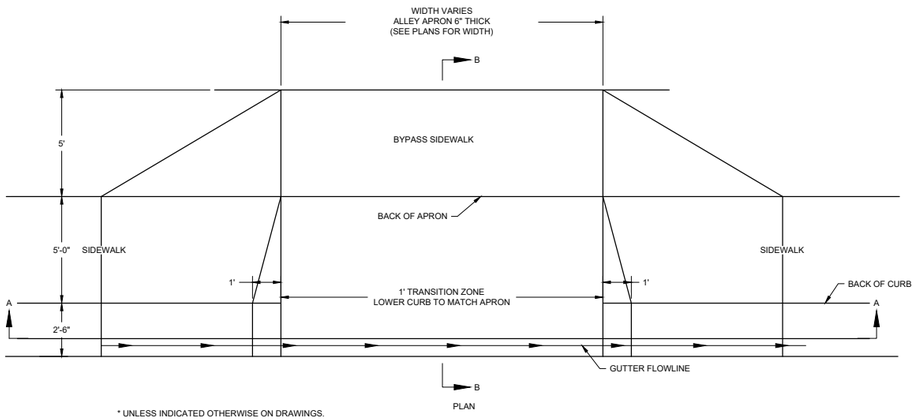
STREET CORNER DETAIL NTS 1/30



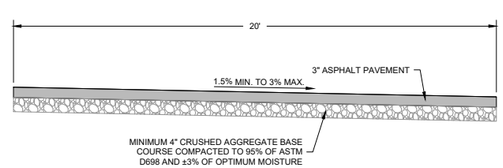
SIDEWALK RAMP AT STRAIGHT SECTION NTS 2/30



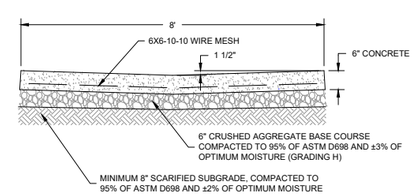
SIDEWALK RAMP AT CURVE SECTION NTS 3/30



ALLEY APRON DETAIL NTS 5/30



TYPICAL ALLEY SECTION NTS 6/30



6' VALLEY GUTTER SECTION NTS 7/30

Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE:	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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ROADWAY SECTIONS AND DETAILS - SHEET 1

ATTENTION:
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DATE: June 18, 2020
PROJECT: 190598
SHEET: 30 OF 33

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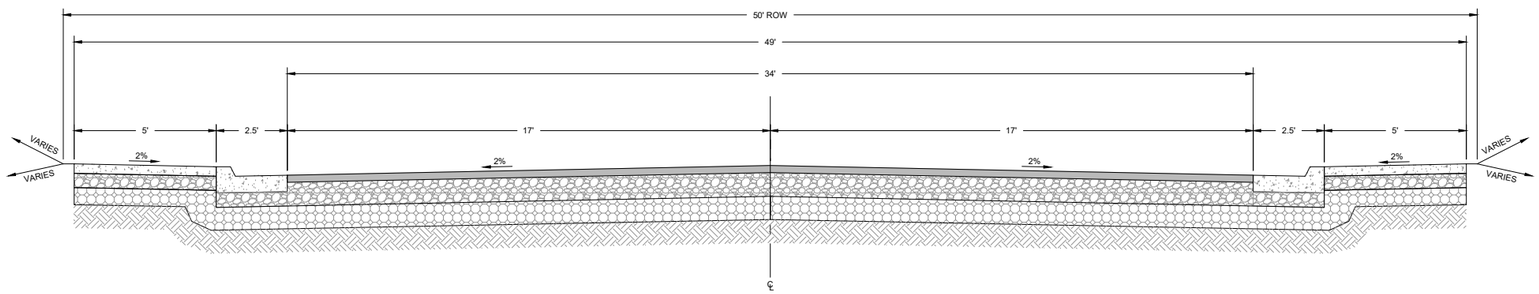
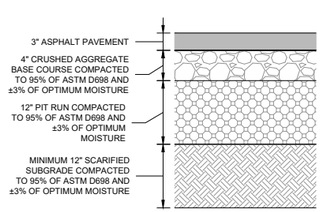
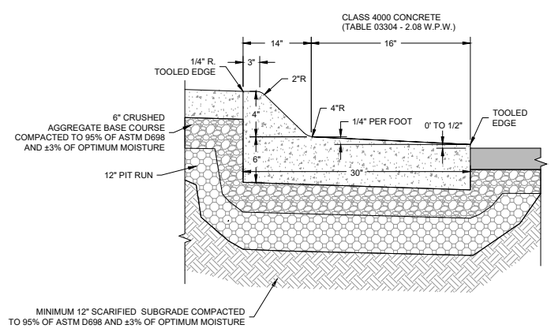


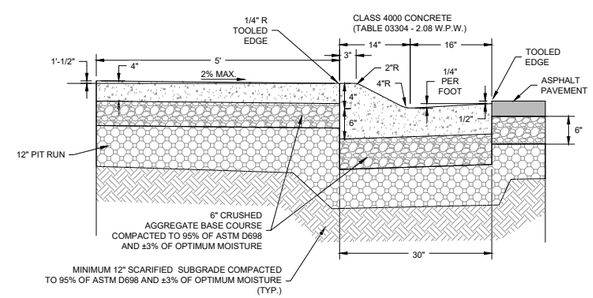
TYPICAL STREET SECTION NTS 1/31



TYPICAL PAVEMENT SECTION NTS 3/31



OUTFLOW CURB AND GUTTER DETAIL NTS 4/31



NOTES:

1. 1/2" EXPANSION JOINT MATERIAL SHALL BE PLACED AT P.C., P.T., AND CURB TURNS.
2. CONTRACTION JOINTS SHALL COMPLY WITH WPWSS SECTION 02520.
3. CONTRACTION JOINTS SHALL BE CONSTRUCTED BY SAWING OR SCORING. WHEN SCORING, A TOOL SHALL BE USED WHICH WILL LEAVE CORNERS ROUNDED AND DESTROY AGGREGATE INTERLOCK FOR SPECIFIED MINIMUM DEPTH.
4. NO CURB AND GUTTER SHALL BE PLACED WITHOUT A FINAL FORM OF INSPECTION THE ENGINEER.
5. CLASS 4000 CONCRETE SHALL BE USED, WPWSS SECTION 3304, PART 2.08.

ROLLOVER CURB AND SIDEWALK DETAIL NTS 5/31

Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE: 22"X34"
DESIGNED: LP
DRAWN: KES / RS
CHECKED: JAM
APPROVED: JAM

REVISIONS

NO.	DESCRIPTION	DATE

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PARK COUNTY, CODY, WYOMING
THE LANDING MAJOR SUBDIVISION
ROADWAY SECTIONS AND DETAILS - SHEET 2

ATTENTION:
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DATE: June 18, 2020
PROJECT: 190598
SHEET: 31 OF 33

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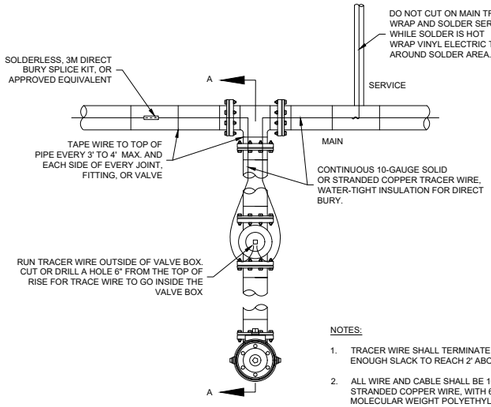
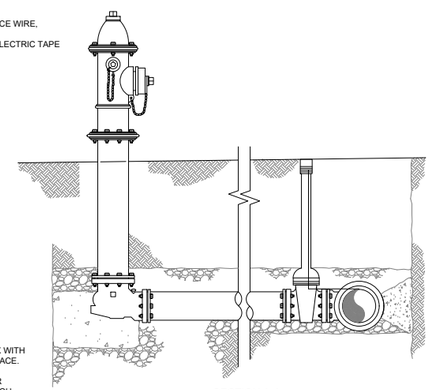


PLAN VIEW

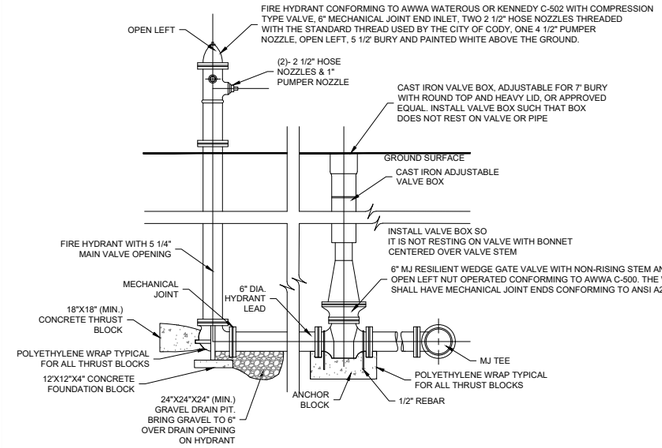
NOTES:

1. TRACER WIRE SHALL TERMINATE INSIDE VALVE BOX WITH ENOUGH SLACK TO REACH 2' ABOVE GROUND SURFACE.
2. ALL WIRE AND CABLE SHALL BE 10-GAUGE SOLID OR STRANDED COPPER WIRE, WITH 600 VOLT RATED HIGH MOLECULAR WEIGHT POLYETHYLENE (HMWPE) INSULATION.

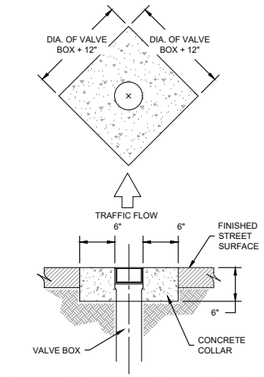


SECTION A-A

TRACER WIRE DETAIL NTS 1/32

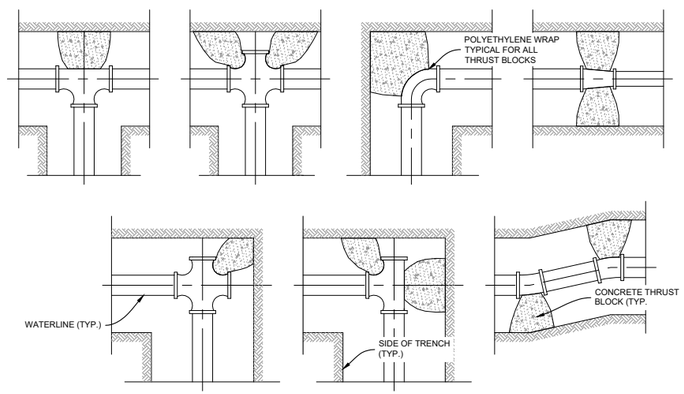


FIRE HYDRANT, VALVE, AND THRUST BLOCK DETAIL NTS 2/32



FINAL ADJUSTMENT OF THE VALVE BOX AND THE PLACEMENT OF THE CONCRETE COLLAR WILL BE MADE AFTER THE PAVING OF THE STREET HAS BEEN COMPLETED.

GATE VALVE SURFACE PAD DETAIL NTS 3/32

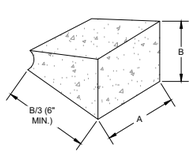


CONCRETE THRUST BLOCKS

MINIMUM DIMENSIONS FOR THRUST BLOCKING										
FITTING SIZE	TEES & PLUGS		90° BENDS		45° BENDS & WYES		REDUCERS & 22 1/2° BENDS		11 1/4° BENDS	
	A	B	A	B	A	B	A	B	A	B
4"	1'-7"	1'-2"	1'-9"	1'-6"	1'-8"	0'-10"	1'-7"	0'-6"	0'-6"	0'-6"
6"	2'-0"	1'-11"	2'-5"	2'-2"	1'-10"	1'-7"	1'-9"	0'-10"	1'-0"	0'-6"
8"	2'-8"	2'-6"	3'-2"	3'-0"	2'-5"	2'-1"	1'-9"	1'-6"	1'-0"	1'-0"
10"	3'-4"	3'-3"	4'-0"	3'-10"	3'-0"	2'-9"	2'-2"	1'-11"	1'-6"	1'-0"
12"	4'-0"	3'-10"	4'-8"	4'-8"	3'-8"	3'-3"	2'-7"	2'-3"	2'-0"	1'-0"
14"	5'-5"	3'-10"	6'-6"	4'-11"	4'-9"	3'-5"	3'-5"	2'-5"	2'-0"	1'-6"
20"	5'-0"	5'-0"	6'-0"	6'-0"	5'-0"	4'-0"	3'-6"	3'-0"	3'-0"	2'-0"
24"	6'-0"	6'-0"	7'-0"	7'-0"	5'-0"	5'-0"	4'-6"	3'-0"	3'-0"	3'-0"
30"	7'-6"	7'-6"	8'-0"	8'-0"	6'-3"	6'-3"	4'-9"	4'-6"	3'-3"	3'-3"

NOTES:

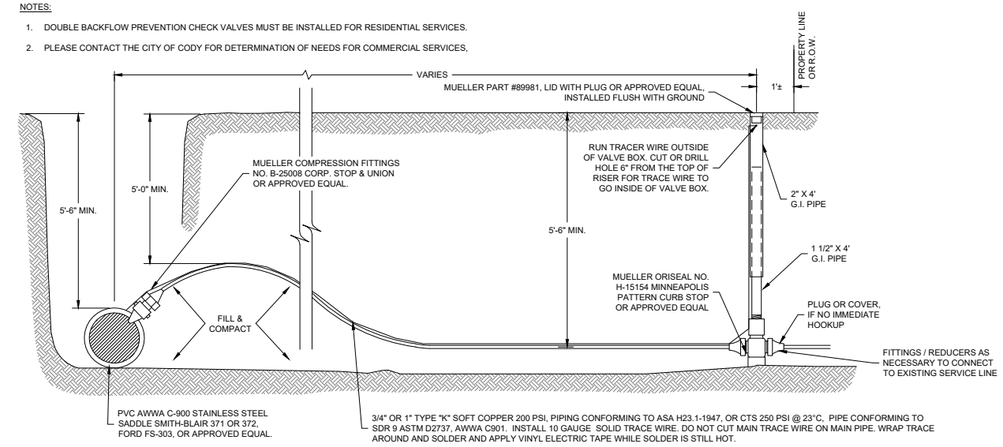
1. FITTINGS TO BE SEPARATED FROM BLOCKS WITH AN APPROVED BOND BREAKER, SUCH AS POLY WRAP.
2. ALL BLOCKS TO BEAR AGAINST UNDISTURBED MATERIAL.
3. DESIGN IS BASED ON 150 PSI MAIN PRESSURE AND 2000 PSF SOIL BEARING CAPACITY.



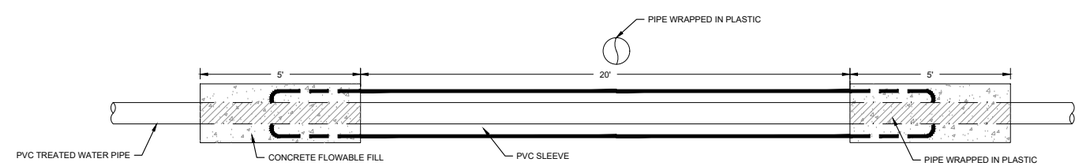
THRUST BLOCK DETAILS NTS 4/32

NOTES:

1. DOUBLE BACKFLOW PREVENTION CHECK VALVES MUST BE INSTALLED FOR RESIDENTIAL SERVICES.
2. PLEASE CONTACT THE CITY OF CODY FOR DETERMINATION OF NEEDS FOR COMMERCIAL SERVICES,

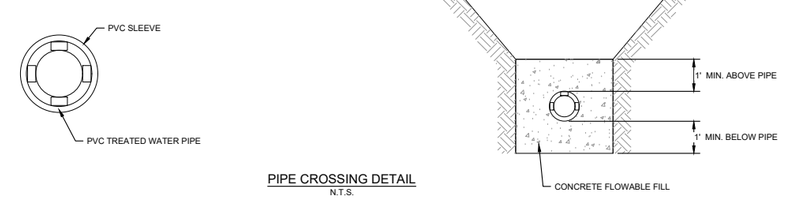


TREATED WATER SERVICE DETAIL NTS 5/32



NOTES:

1. 10' MIN. SLEEVING MUST OCCUR



PIPE CROSSING DETAIL
N.T.S.

SLEEVED CROSSING DETAIL NTS 6/32

Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE:	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

REVISIONS

NO.	DESCRIPTION	DATE

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CONSULTING ENGINEERS, SURVEYORS & PLANNERS
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CODY, WY 82414
PHONE: (307) 587-3411 WWW.T-O-ENGINEERS.COM
BOISE • CODY • COEUR D'ALENE • HEBER CITY
MERIDIAN • NAMPA • SPOKANE

PARK COUNTY, CODY, WYOMING

THE LANDING MAJOR SUBDIVISION

DETAILS SHEET 1

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" ON 22x34 SHEET or 1/2" ON 11x17 SHEET, THEN DRAWING IS NOT TO SCALE

DATE: June 16, 2020
PROJECT: 190598
SHEET: 32 OF 33

K:\190598\3_Acad\dwg\Sheets\32 DETAILS SHEET 1.dwg, 6/18/2020 9:26:51 AM, Kent Schuebel, AutoCAD PDF (General Documentation).pc3
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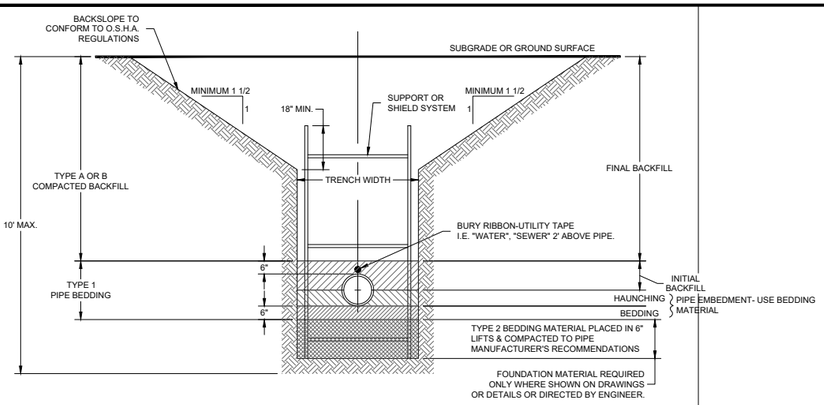
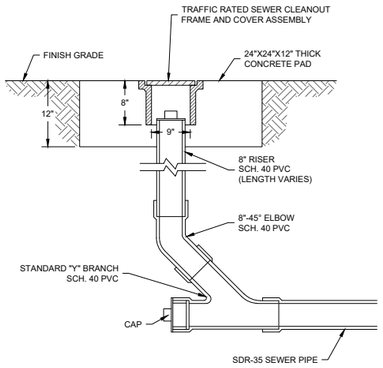
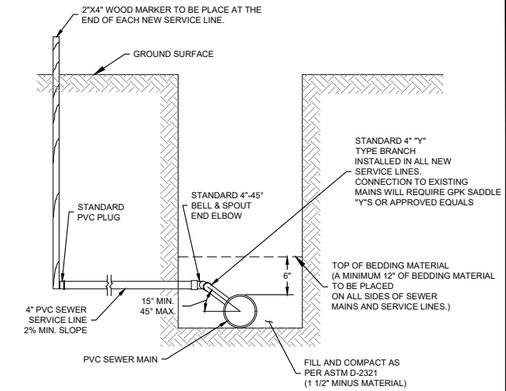


NOTE:
IF SUPPORT OR SHIELD SYSTEM IS NOT USED, MAXIMUM ALLOWABLE SLOPE FOR ALL TRENCHES LESS THAN 20 FT. DEEP WILL BE 1 1/2H : 1V.
COMPLY W/ALL APPLICABLE SAFETY REQUIREMENTS

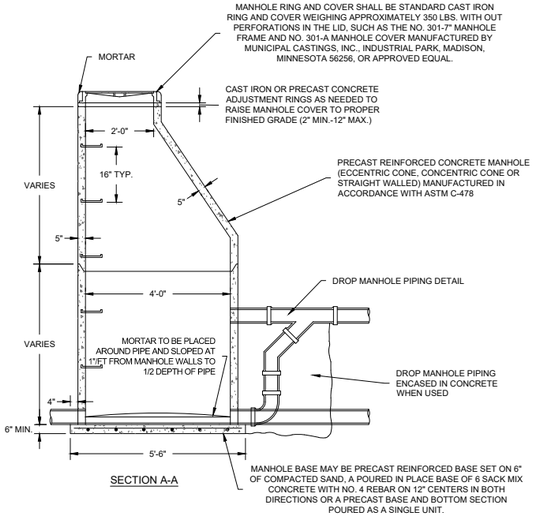
TYPICAL TRENCH DETAIL NTS 1/33



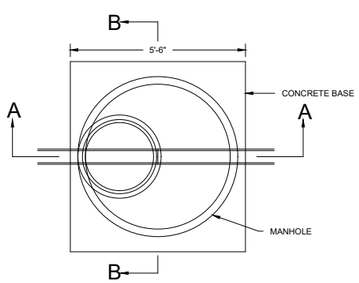
CLEANOUT DETAIL NTS 2/33



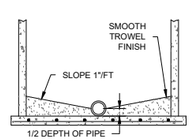
SANITARY SEWER SERVICE DETAIL NTS 3/33



SECTION A-A



PLAN VIEW



SECTION B-B

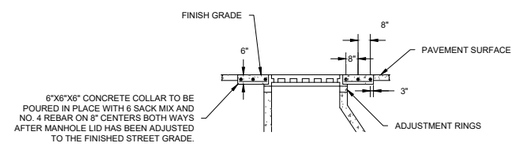
NOTES:

1. ALL STEPS WITHIN THE MANHOLES SHALL BE CAST IRON OR STEEL REINFORCED POLYURETHANE STEPS.
2. ALL JOINTS IN THE MANHOLE WALLS SHALL BE SEALED WITH EITHER A RUBBER GASKET OR BITUMINOUS BASE SEALANT.

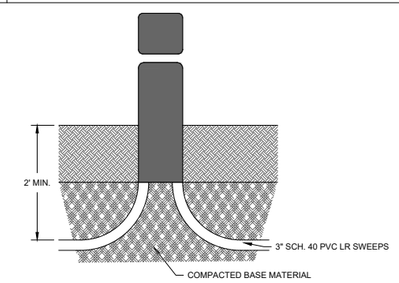
NOTES:

1. ALL JOINTS BETWEEN MANHOLE SECTIONS, MANHOLE RING AND TOP SECTIONS, AND AROUND SEWER PIPE SHALL BE WATER TIGHT. JOINTING MATERIAL SHALL BE "RAM-NEK" OR APPROVED EQUAL.
2. ALL STEPS SHALL HAVE A MINIMUM OF 12" TO A MAXIMUM OF 16" SPACING, AND SHALL EXTEND OUT A MINIMUM OF 5" THE MANHOLE WALL. STEPS SHALL BE A MINIMUM OF 10" WIDE. THESE REQUIREMENTS ARE IN COMPLIANCE WITH OSHA DIRECTIVE 29 CFT 191027.
3. STEPS SHALL BE STEEL REINFORCED POLYURETHANE STEPS.
4. A MAXIMUM OF 12" OF ADJUSTING RINGS SHALL BE USED TO MATCH GRADE.

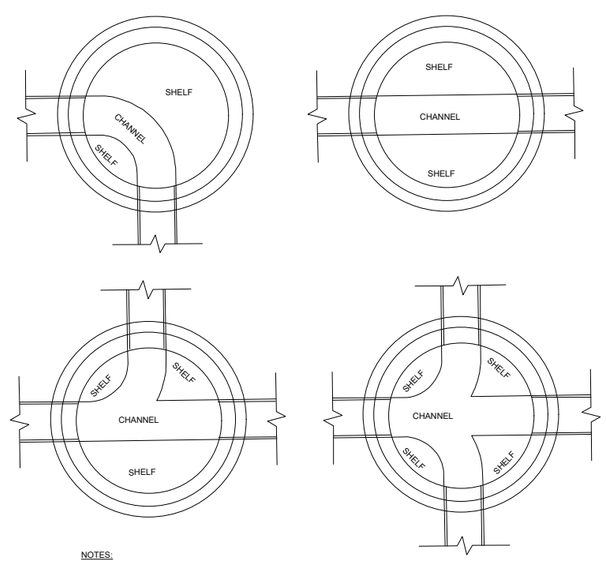
MANHOLE DETAILS NTS 4/33



MANHOLE COLLAR FOR PAVED ROADWAYS DETAIL NTS 5/33



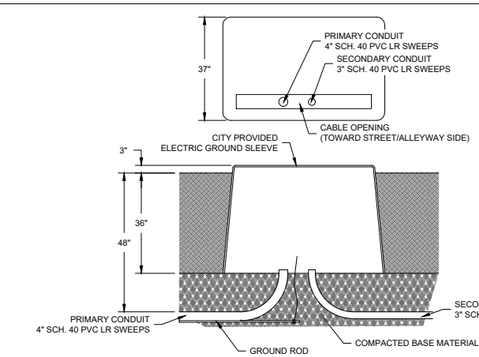
ELECTRICAL PEDESTAL DETAIL NTS 7/33



NOTES:

1. SLOPE ALL SHELVES TO CHANNEL AT 1" PER FOOT .
2. SEE PLAN-PROFILE SHEETS FOR SLOPE OF CHANNEL.

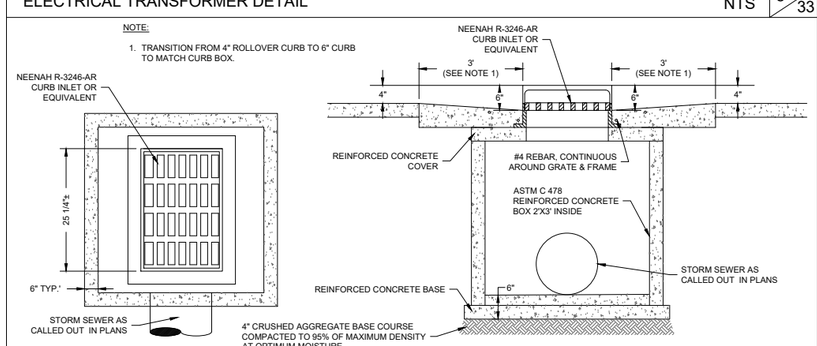
MANHOLE CHANNEL DETAILS NTS 6/33



ELECTRICAL TRANSFORMER DETAIL NTS 8/33

NOTE:

1. TRANSITION FROM 4" ROLLOVER CURB TO 6" CURB TO MATCH CURB BOX.



CURB BOX DETAIL R-3034-B NTS 9/33

Professional Engineer
JOSHUA MORRIS
16694
Date 6/18/2020
WYOMING

BORDER SIZE	22"X34"
DESIGNED	LP
DRAWN	KES / RS
CHECKED	JAM
APPROVED	JAM

NO.	DESCRIPTION	DATE

REVISIONS

T-O ENGINEERS
CONSULTING ENGINEERS, SURVEYORS & PLANNERS
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PARK COUNTY, CODY, WYOMING
THE LANDING MAJOR SUBDIVISION
UTILITY DETAILS

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" ON 22x34 SHEET or 1/2" ON 11x17 SHEET, THEN DRAWING IS NOT TO SCALE

DATE: June 16, 2020
PROJECT: 190598
SHEET: 33 OF 33

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Drainage Report for the Landing Subdivision

Prepared For:
Kip B. Thiel Construction

Prepared By:
Josh Morris, PE

T-O Engineers, Inc.

T-O ENGINEERS

The Landing Major Subdivision

City of Cody, Park County, Wyoming

Design Engineer Professional

Civil Engineering

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1.	Introduction	PG. 1
2.	Criteria	PG. 1
3.	Existing Conditions	PG. 1-2
4.	Proposed Conditions	PG 2-3
5.	Detention Basin Design	PG. 3-4
6.	Maintenance	PG. 4
7.	Summary	PG. 4

Attachments

1. Existing Drainage Map
2. Historical Peak Discharge Rates
3. Developed Drainage Map
4. Developed Peak Discharge Rates
5. Detention Basin Overflow Design
6. Percolation Trench Design
7. Storm Sewer and Gutter Flow

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Introduction

The Landing Subdivision is a new residential development to be constructed in Cody, WY. The subdivision will be located to the north-west of the intersection of Sheridan Ave. and Beacon Hill Road (County Rd. 3CX) and north-east of the intersection of Cherokee Rd. and 37th St. in the City of Cody, Park County, Wyoming. The current property is 17.58 acres and will be subdivided into 58 residential lots of varying acreage. An open space of 2.30 acres will be in the center of the subdivision.

1. Criteria

This drainage report was prepared in conformance with the City of Cody Storm Water Management Policy (SWMP) dated March 2003. The Rational Method was used to estimate peak runoff and to estimate storm water runoff volumes for retention. The Civil Engineering Reference Manual, 14th Ed. was referenced to estimate ditch and gutter flow. The NOAA Atlas 2, Frequency Analysis of the Western United States, published 1973, was used for storm intensity factors.

2. Existing Conditions

The site to be subdivided is 17.58 acres of agriculture pasture and native brush. The north property boundary terminates at a rapid drop-off (~15-20% slope) that currently sheet flows off into several catch ditches at the bottom of the hill. The existing property is broken down into three sub-basins as shown on the attached Existing Drainage Map in **Attachment 1**. Historical peak flow rates for the sub-basins are summarized in Table 1. Calculations are included in **Attachment 2**.

Table 1 – Existing Peak Discharge

Sub-Basin	Q_h (CFS)	t_c (Min.)
Existing Sub-Basin 1	2.50	31
Existing Sub-Basin 2	0.78	27
Existing Sub-Basin 3	1.26	30

The property includes an irrigation waste ditch that historically collected irrigation wastewater from properties to the south and the property itself. This irrigation waste ditch was also the historical collection point for historical Sub-Basin 1 and discharged onto the property to the north. In recent years a berm and infiltration structure was constructed at the end of the this irrigation waste ditch to block historical storm and irrigation flows onto the neighboring property. Since this berm is relatively recent and historical flows would flow to the north it is assumed that this discharge point can remain unchanged with development.

Based on correspondence with Cody Canal Irrigation District (CCID) it is assumed that irrigation waste flows will have a peak of 2.0 cfs.

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3. Proposed Conditions

Since all the details are not yet known many assumptions are required to estimate the developed drainage conditions for the site. The following assumptions are inherent to developed drainage design:

- The new subdivision will be constructed in three phases. The overall drainage design will be designed for the entire subdivision without phasing.
- All 55 lots will be developed. The average size home is assumed to have a 1,500 square foot footprint with a 576 square foot garage. Each home is assumed to have an attached 576 square foot driveway.
- Approximately 4.04 acres of asphalt streets and sidewalk will be constructed throughout the subdivision.
- Previously developed property or property that is being developed to the south will have implemented storm water management.
- The proposed subdivision will consist of 3 sub-basins. See **Attachment 3** for the Developed Sub-Basin map.
- The design storm for runoff calculations shall be a 10-year, t_c event with intensity factors referenced from NOAA Atlas 2 tables.
- All runoff from Sub-Basins 1 will be detained onsite, in a detention basin with a percolation trench sized to accommodate a 100-year, 2-hour storm using the Rational Method. Due to concerns from the downstream landowners the detention basin will not include an outlet for releasing flow, instead an infiltration trench will be constructed down the center. The detention volume will be determined using the Rational Method. See Section 4 of this report for more information on the detention basin design.
- No detention for Sub-Basin 2 and Sub-Basin 3 is anticipated, since minimal impermeable area (assumed to be back yards or a gravel alley) will be added and the developed peak discharge form a 10-year, t_c storm for both combined sub-basins is less than the historical peak discharge.

Table 2 includes developed peak discharge calculations for a 10 year, t_c design storm for each of the developed sub-basins. It also lists the historical discharge as a point of reference to confirm that developed peak discharge is less than historical peak discharge. See **Attachment 4** for developed discharge rates.

Table 2 – Proposed Peak Discharge

Sub-Basin	Q_d(CFS)	t_c (Min.)	Q_h(CFS)
Developed Sub-Basin 1	0[1]	30	2.50
Developed Sub-Basin 2	0.65	15	0.78
Developed Sub-Basin 3	1.13	15	1.26

1. **Assumes entire volume for developed sub-basin is detained on-site.**

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4. Detention Basin Design

Due to the potential for major property damage the detention basin will be designed for a 100 year, 2 hour design storm per the City of Cody SWMP. A design storm of this magnitude has an intensity rate of 0.85 in/hour, per NOAA Atlas 2.

The flowrates for a 100-year, 2-hour design storm were calculated for the post-development land conditions. The volumes produced by these flowrates were used for the volume calculation. Since all runoff for Developed Sub-Basin 1 will be detained onsite, the Modified Rational Method was unnecessary. The Rational Method was used to determine the developed flowrate with a storm intensity factor of 0.85 in/hr. The flow rate for Developed Sub-Basin 1 is calculated to be 6.6 cfs. Additionally, since the irrigation wastewater will not be rerouted it is assumed that an additional 2 CFS may flow into the detention basin during the same 100-year, 2-hour storm. Therefore, the detention volume assumes a total flowrate of 8.6 CFS, which equates to a volume of 61,780 CF.

The detention basin will include the following design features:

- The detention basin will be sized to accommodate the 61,780 CF with 1 foot of freeboard, which is greater than the 100-year, 2-hour design storm. The pond depth when at full capacity is estimated to be less than 3 feet.
- The side slopes will be 4:1.
- The discharge from the detention basin will occur only after a volume equivalent of a 100-year, 2-hour storm event has been reached. When the detention basin reaches maximum capacity the overflow will be directed to the north via an emergency spillway between Lot 35 and Lot 36, which is approximately 65 feet west of the historic discharge point. The emergency spillway will consist of a 4 foot wide concrete channel centered between Lot 35 and Lot 36 that will flare out to a 20 foot wide rock lined channel ahead of the property line to ensure a point discharge is not released onto the northern property. The 4-foot-wide concrete channel will be constructed within a 5-foot right-of-way to ensure that the spillway is not inadvertently blocked by the adjacent homeowners in the future. The emergency spillway will have capacity to discharge overflow from a 100-year, 2-hour design storm. See **Attachment 5** for the overflow design calculations.
- The detention basin will include incorporation of a percolation trench that is 10 feet wide by 12 inches deep. Percolation rate measurements are included in **Attachment 6**. The assumed percolation rate for the trench is assumed to be half of the average value for all four measured percolation rates. Additionally, since the percolation trench does not rely on a drilled or driven shaft, a dug hole that is deeper than it is wide, or subsurface piping it is not regulated as a Class V Injection Well based on information from https://www.epa.gov/uic/stormwater-drainage-wells. Therefore, an Underground Injection Control Class V Permit By Rule Coverage application is not required with the Wyoming DEQ.

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5. Storm Sewer

Three small storm sewer networks will be constructed for the development to intercept gutter flows and direct stormwater to the detention basin. The storm sewer networks were designed to handle flows from the 10-year design storm.

The first storm sewer system will be constructed in the southwest corner of Go Around Loop and will consist of 3 inlets, 1 on each corner of the intersection, that will tie together and run through the walking path right-of-way to discharge into the detention basin. The storm sewer in Go Around Loop will consist of an 18-inch RCP pipe that combines into a 24-inch RCP pipe after the second inlet. This storm sewer network has the capacity to handle a 100-year design storm.

The second storm sewer system will be constructed adjacent to the detention basin on Horizon Ave. and will consist of 1 inlet on either side of the street that discharges into the detention basin. This storm sewer system will consist of one 18-inch RCP line between the first and second inlet and a 24-inch RCP line after the second inlet that discharges into the detention basin. Due to the limiting factors of the flowrate through the inlets this storm sewer does not have the capacity to handle a 100-year design storm. Due to this the typical section along Horizon Ave. will be adjusted to a 3% cross slope on the right side (south side) between stations 20+25 and 21+00 to create a direct overflow that will lead into the detention basin. It is assumed that this 3% cross-slope will result in a curb that is lower by 2-inches than the curb on the north side. This lowered section of curb will act as a weir that can convey the excess discharge from a 100-year storm into the detention basin.

The third storm sewer system will be located approximately midway along Horizon Ave. and will include one inlet on each side of the street. The storm sewer will discharge into the detention basin by running through the walking path right-of-way. These inlets are assumed to work as weirs on continuous and will intercept only a portion of the gutter flow.

See **Attachment 7** for storm sewer design, sizing, and inlet calculations.

6. Maintenance

A maintenance agreement will be prepared for the detention basin.

7. Summary

The Landing Subdivision site and grading plan includes the construction of a detention basin to collect the increased runoff from the surface improvements. The detention basin will gather storm runoff which will be allowed to discharge by percolation.

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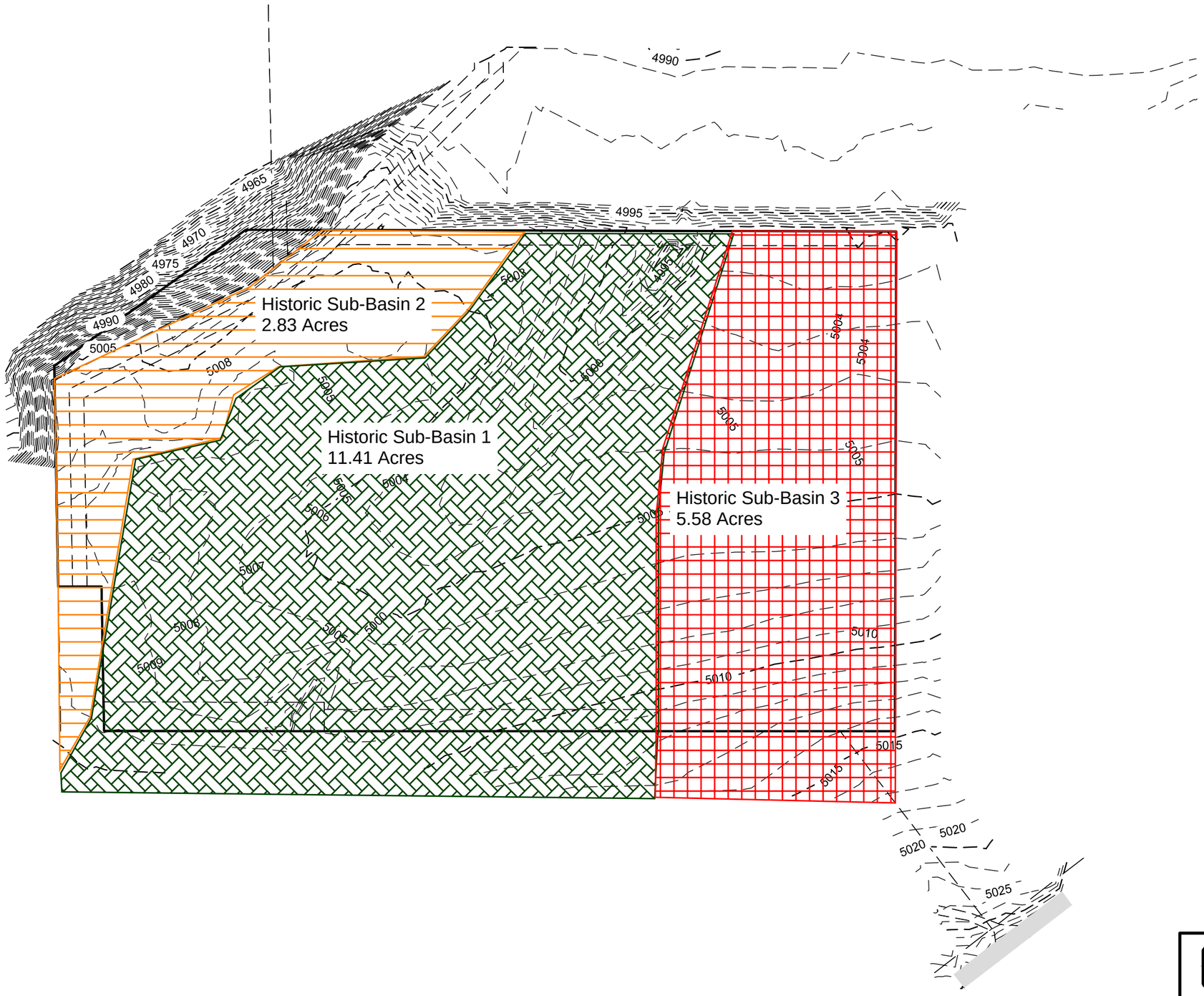
Attachment 1



0 37.5 75 150 225

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CODY, WY 82414
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Attachment 2

Per City of Cody - Storm Water Management Policy
we need to calculate the historical runoff discharge of storm water prior to development

Attachment 2 - Historical Runoff - Sub-Basin 1

		Project	The Landing Subdivision		
	User Entered Data	Project No.	190598	Date:	5/13/2020
	Calculated				

Weighted Runoff Coefficient

Sub-Basin Acres 11.41 AC

Subarea	Acres	Runoff C	Land Use	Weighted Value
1	11.41	0.15	Undeveloped Ag. Land	1.71
				0.00
				0.00
				0.00
				0.00

Weighted C	**0.150**

Time of Concentration

Longest distance water travels	900	ft
Average slope	1.5	%
Type of Terrain	Average Grass	

t_c	31	min	Appendix C

Peak Rate of Discharge

t_c=	31		
C=	0.150		
I=	1.4633	in/hr	10 yr, tc (32 min)
A=	11.41		
Q=CIA	**2.50**	CFS	

Historical Volume, 25 yr. 2 hr

C_h=	0.150		10yr, 2hr		100 yr, 2hr	
I=	0.66	in/HR		0.53		0.85 in/HR
V_h=	**8133.05**	Cu. FT				
Qhist	1.13			0.91		1.45 cfs

Per City of Cody - Storm Water Management Policy
we need to calculate the historical runoff discharge of storm water prior to development

Attachment 2 - Historical Runoff - Sub-Basin 2

		Project	The Landing Subdivision		
	User Entered Data	Project No.	190598	Date:	5/13/2020
	Calculated				

Weighted Runoff Coefficient

Sub Basin 2 Acreage 2.83 AC

Subarea	Acres	Runoff C	Land Use	Weighted Value	
1	0.15	0.5	Gravel Road	0.07	0.4
2	2.68	0.15	Undeveloped Ag. Land	0.40	0.15

Weighted C	**0.168**

Time of Concentration

Longest distance water travels	550	ft
Average slope	0.9	%
Type of Terrain	Average Grass	

t_c	27	min	Appendix C

Peak Rate of Discharge

t_c=	27		
C=	0.168		
I=	1.63		10 yr, tc (27 min)
A=	2.83		
Q=CIA	**0.78**	CFS	

Historical Volume, 25 yr. 2 hr

C_h=	0.168		10 yr, 2hr	100 yr, 2 hr	
I=	0.66	in/HR		0.53	0.85 in/HR
V_h=	**2261.59**	Cu. FT			
Q=	0.31	CFS		0.25	0.40 cfs