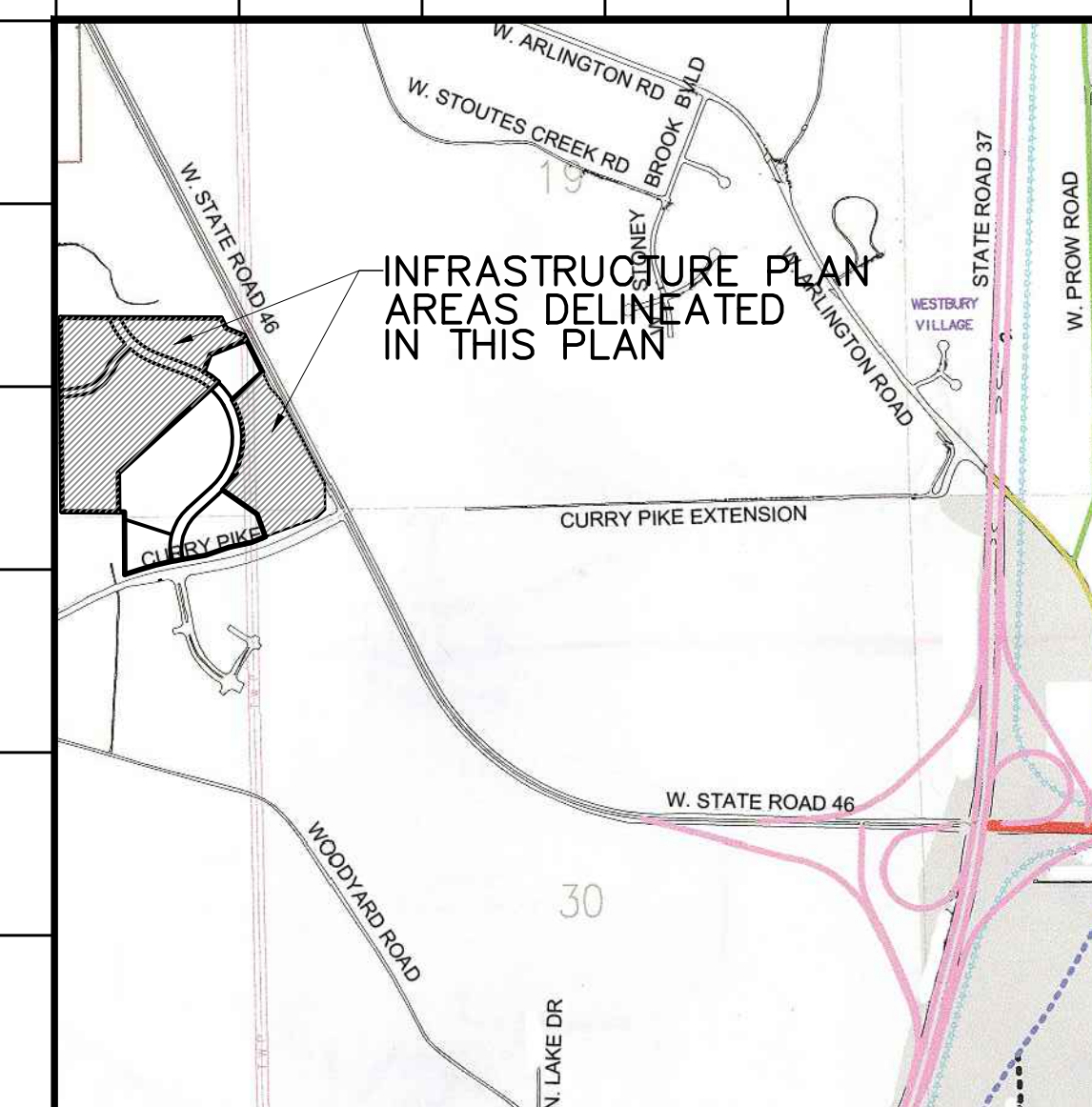


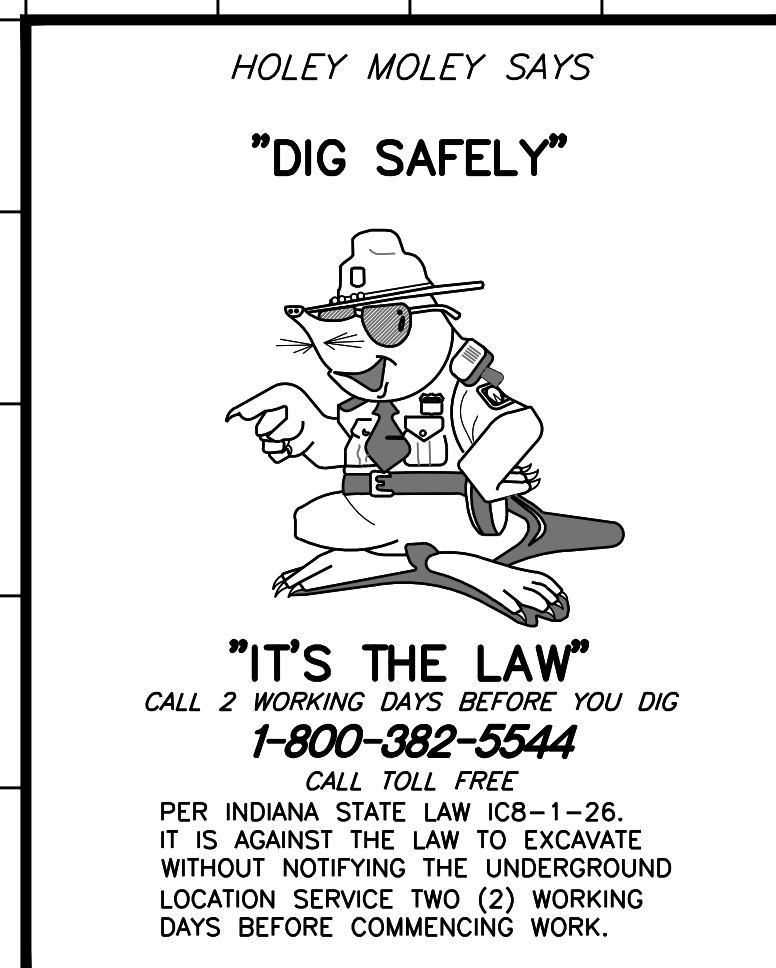
PROPOSED: INFRASTRUCTURE PLAN DEVELOPMENT TRACT B-2, PARCELS 2 & 3 OF THE NORTH PARK DEVELOPMENT TRACT PLAT



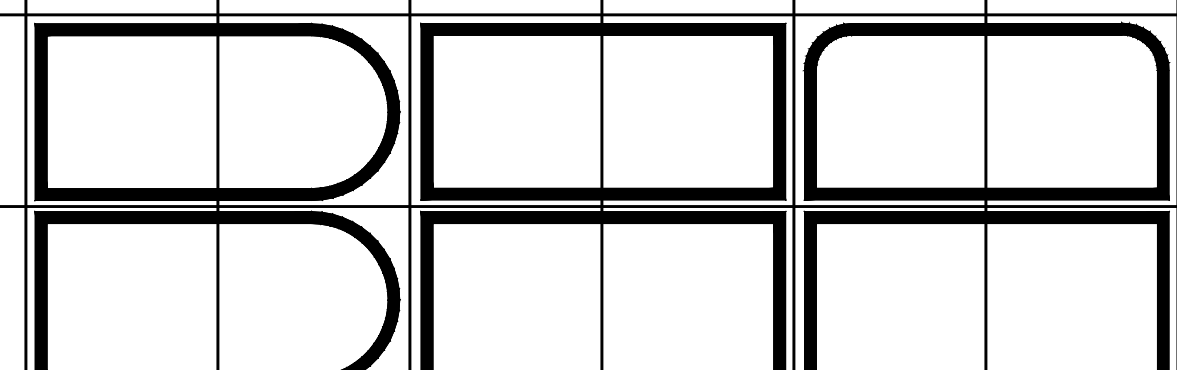
VICINITY/LOCATION MAP
SCALE: 1"=2000'

BLOOMINGTON, INDIANA

UTILITY CONTACT INFORMATION			
GAS VECTREN 205 S. MADISON ST. BLOOMINGTON, IN 47401 DOUG ANDERSON (812)330-4009	WATER CITY OF BLOOMINGTON UTILITIES 600 E. MILLER DR. BLOOMINGTON, IN 47402 NANCY AXSON (812)349-3689	ELECTRIC DUKE ENERGY 1619 W. DEFFENBAUGH ROAD KOKOMO, INDIANA 46902 JIM SHELDS (317)375-2071	SEWER SOUTH CENTRAL REGIONAL SEWER DISTRICT P.O. BOX 362 BLOOMINGTON, INDIANA 47402 RICK COPPOCK (812)334-8871
TELEPHONE AT&T P.O. BOX 56 BLOOMINGTON, IN 47402 BRENT McCABE (812)334-4521	CABLE TELEVISION COMCAST 2450 SOUTH HENDERSON STREET BLOOMINGTON, IN 47404 SCOTT TEMPLETON (812)355-7822	UNDERGROUND UTILITY LOCATION INDIANA UNDERGROUND PLANT PROTECTION 1-(800)382-5544	



INDEX	
SHEET NO.	SHEET NO.
1-2	INFRASTRUCTURE PLAN OVERVIEW WITH MATCHLINES FOR LOCATIONS
2A - 2B	DETAILS
3	ROAD R-1 PLAN AND PROFILE
4	SWPPP
5	SWPPP INFORMATION
6 & 7	SWPPP DETAILS
8	WATER MAIN PLAN & PROFILE

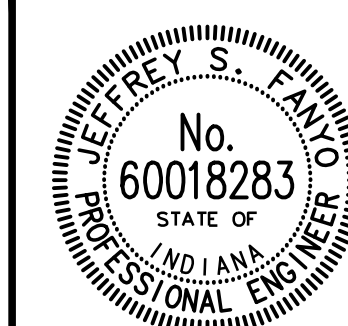


BYNUM FANYO & ASSOCIATES, INC.
528 North Walnut Street
Bloomington, Indiana 47404 (812) 332-8030

architecture
civil engineering
planning

OWNER/DEVELOPER
LOGAN LAND DEVELOPMENT LLC
1900 LIBERTY DRIVE
BLOOMINGTON, INDIANA 47403

THE CURRENT EDITION OF THE INDIANA DEPARTMENT OF
TRANSPORATION, MANUAL ON UNIFORM TRAFFIC CONTROL
DEVICES & CITY OF BLOOMINGTON UTILITIES STANDARD
SPECIFICATIONS IS TO BE USED WITH THESE PLANS



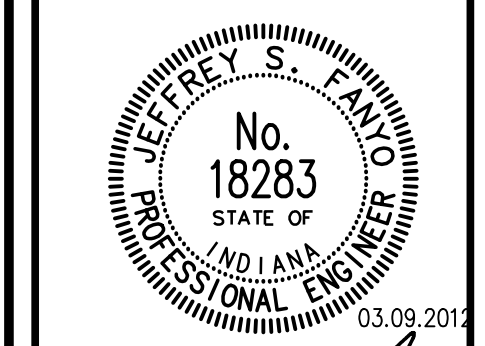
certified by:
Jeffrey S. Fanyo
JEFFREY S. FANYO, P.E.
IND. REG. NO. 18283

revisions
1-5-12 Monroe County Planning Comments
2-15-12 Monroe County Planning Comments
3-9-12 Monroe County Planning Comments
5-22-15 Parcel #1, Lot #4 Revisions
PROPOSED: INFRASTRUCTURE PLAN - DEVELOPMENT
TRACT B-2 OF THE NORTH PARK ADMINISTRATIVE SUBDIVISION
JOB No. 401044

revisions:
 09.19.2011 Removed Phasing, Added
 Legends, Added Temp. Turn-g-rounds,
 Added Road Staging. JR

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 CIVIL ENGINEERING
 PLANNING
 BLOOMINGTON, INDIANA
 (812) 339-2390 (Fax)

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 BYNUM FANYO & ASSOCIATES, INC.
 528 north walnut street
 (812) 332-8030



certified by *S. Fanyo*

Pr d
NORTH PARK
TRACT B-2 INFRASTRUCTURE PLAN
 B I d

title: INFRASTRUCTURE PLAN

designed by: JBT
 drawn by: JR
 checked by: JSF
 sheet no.: 1
 project no.: 4144

MATCHLINE H-1

LOT 2

SEE NORTH PARK: PARCEL 1 OF
 DEVELOPMENT TRACT B-2
 DEVELOPMENT PLAN FOR
 IMPROVEMENTS OF LOT 2

BOLTINGHOUSE, JAMES & TERESA
 INST. NO. 2005022591
 ZONING: AG/RR
 USE: RESIDENTIAL
 2408 N. SMITH PIKE
 BLOOMINGTON, IN 47404

64' 60" RIPARIAN BUFFER

NORTH LINTEL DRIVE

SEE NORTH PARK: PARCEL 1 OF
 DEVELOPMENT TRACT B-2
 DEVELOPMENT PLAN FOR
 IMPROVEMENTS OF LOT 1

SEE NORTH PARK: PARCEL 1 OF
 DEVELOPMENT TRACT B-2
 DEVELOPMENT PLAN FOR
 IMPROVEMENTS OF LOT 4

MATCHLINE V-1

CURRY PIKE

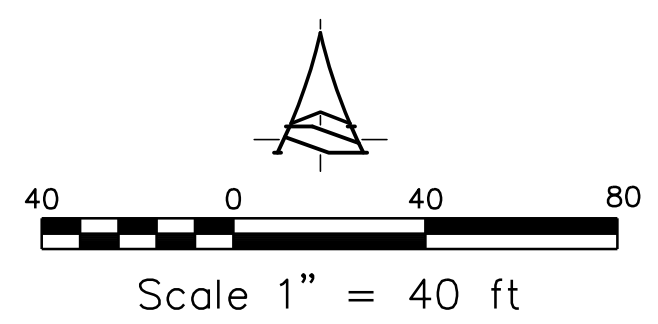
SITE LEGEND

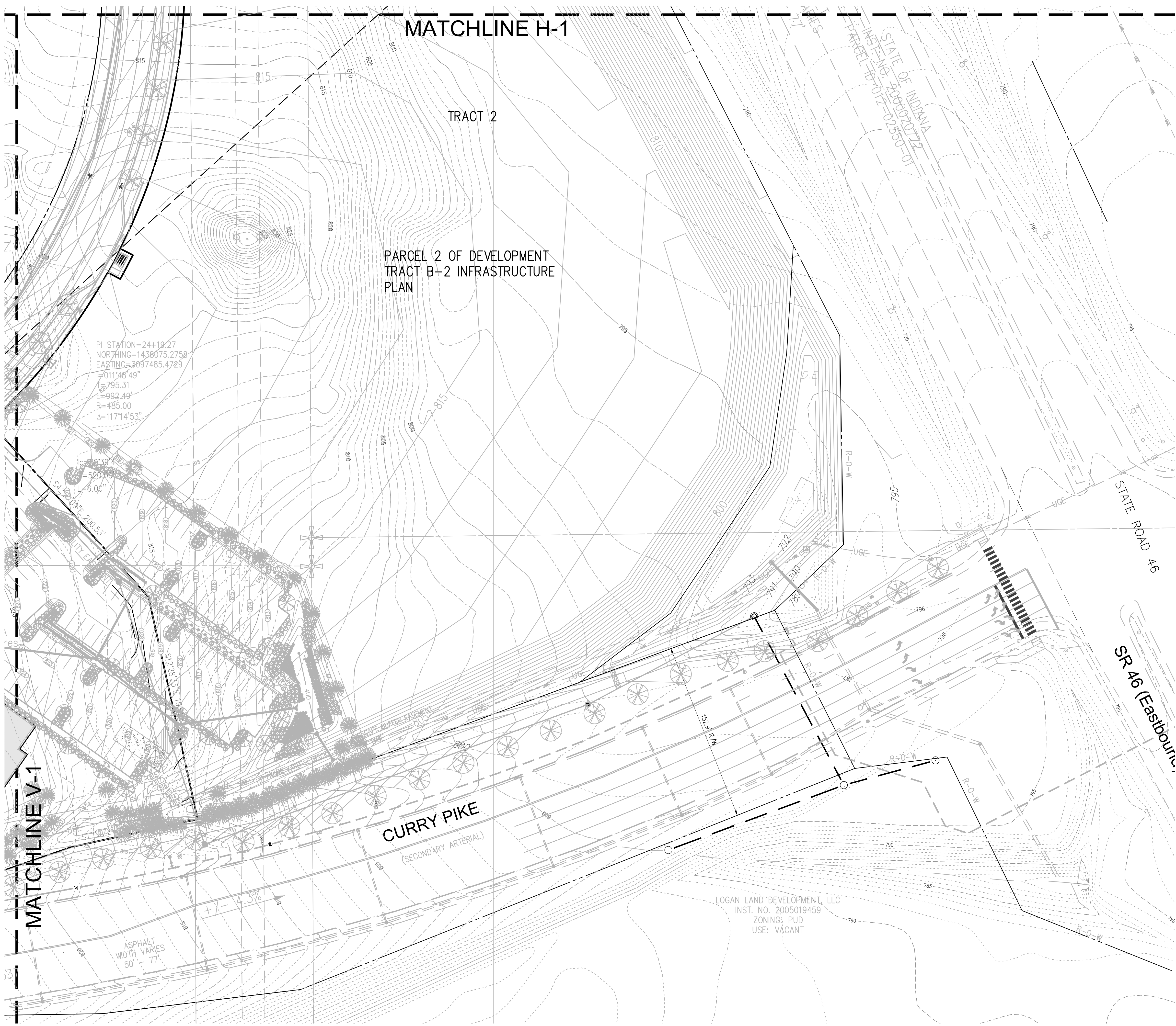
- (A2) PROPOSED BITUMINOUS PAVING
- (W) PROPOSED ASPHALT SIDEWALK
- (15) PROPOSED CONCRETE CURB AND GUTTER
- (F) PROPOSED CONCRETE SIDEWALK
- (R) PROPOSED ACCESSIBLE RAMP, TYPE "C"
- (36) PROPOSED STOP BAR
- (21) PROPOSED MARKING; PAINTED, SOLID, YELLOW, 4"
- (RT-1) PROPOSED "STOP" SIGN

UTILITY AND GRADING LEGEND

- PROPOSED DIP WATER LINE — X"-WL —
- PROPOSED WATER VALVE — [Symbol] —
- PROPOSED WATERLINE CAP AND VALVE — [Symbol] —
- PROPOSED FIRE HYDRANT (FH) — [Symbol] —
- PROPOSED WATER METER (TO BE SIZED BY THE CITY OF BLOOMINGTON UTILITIES) — [Symbol] —
- PROPOSED 8" PVC SANITARY SEWER AND SANITARY SEWER MANHOLE — LINE "S-X" —
- PROPOSED 6" SANITARY LATERAL AND SANITARY SEWER CLEAN-OUT — 6" SSL — C.O. —
- PROPOSED STORM PIPE, INLET AND END SECTION — [Symbol] —
- PROPOSED UNDERDRAIN: SDR-35 PERFORATED DRAIN PIPE — X"-UD —
- PROPOSED SOLID SDR-35 DRAIN PIPE TO POINT OF DISCHARGE — X"-UDS —
- PROPOSED SCHEDULE 40 PVC PIPE, ELECTRICAL GRADE (GREY) CONDUIT BURIED 36" BELOW FINISHED GRADE — X"-EC —
- PROPOSED CONTOUR — XXX —
- PROPOSED FLOW LINE — [Symbol] —

NOTE: ALL WATER CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF BLOOMINGTON UTILITY SPECIFICATIONS.
 NOTE: ALL SEWER CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE SOUTH CENTRAL REGIONAL SEWER DISTRICT SPECIFICATIONS.





MATCHLINE H-1

TRACT 2

PARCEL 2 OF DEVELOPMENT TRACT B-2 INFRASTRUCTURE PLAN

PI STATION=24+19.27
 NORTHING=1438075.2758
 EASTING=3897485.4729
 I=011°48'49"
 L=795.31
 E=992.49'
 R=485.00
 Δ=117°14'53"

LOGAN LAND DEVELOPMENT, LLC
 INST. NO. 2005019459
 ZONING: PUD
 USE: VACANT

SITE LEGEND

(A2)	PROPOSED BITUMINOUS PAVING
(W)	PROPOSED ASPHALT SIDEPATH
(15)	PROPOSED CONCRETE CURB AND GUTTER
(F)	PROPOSED CONCRETE SIDEWALK
(R)	PROPOSED ACCESSIBLE RAMP, TYPE "C"
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(R1-1)	PROPOSED "STOP" SIGN

UTILITY AND GRADING LEGEND

PROPOSED DIP WATER LINE	—X"—WL—
PROPOSED WATER VALVE	⊕
PROPOSED WATERLINE CAP AND VALVE	⊕
PROPOSED FIRE HYDRANT (FH)	⊕
PROPOSED WATER METER (TO BE SIZED BY THE CITY OF BLOOMINGTON UTILITIES)	⊕
PROPOSED 8" PVC SANITARY SEWER AND SANITARY SEWER MANHOLE	—LINE "S"—X"—
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PROPOSED STORM PIPE, INLET AND END SECTION	⊕
PROPOSED UNDERDRAIN: SDR-35 PERFORATED DRAIN PIPE	—X"—UD—
PROPOSED SOLID SDR-35 DRAIN PIPE TO POINT OF DISCHARGE	—X"—UDS—
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PROPOSED CONTOUR	- - - - -
PROPOSED FLOW LINE	- - - - -

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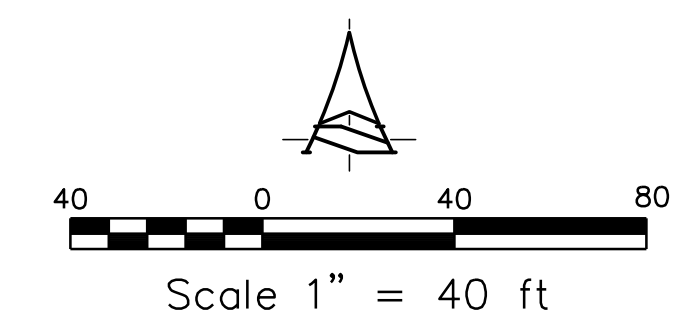
Revisions:
 09.19.2011 Removed Paving, Added Legends, Added Temp. Turn-a-rounds, Added Road Staging, JR
 01.29.2024 Revised lot 3 and removed trail/path alignment (along with corresponding easements) within/crossing parcels 1 and 2 (lots 3 and 4)

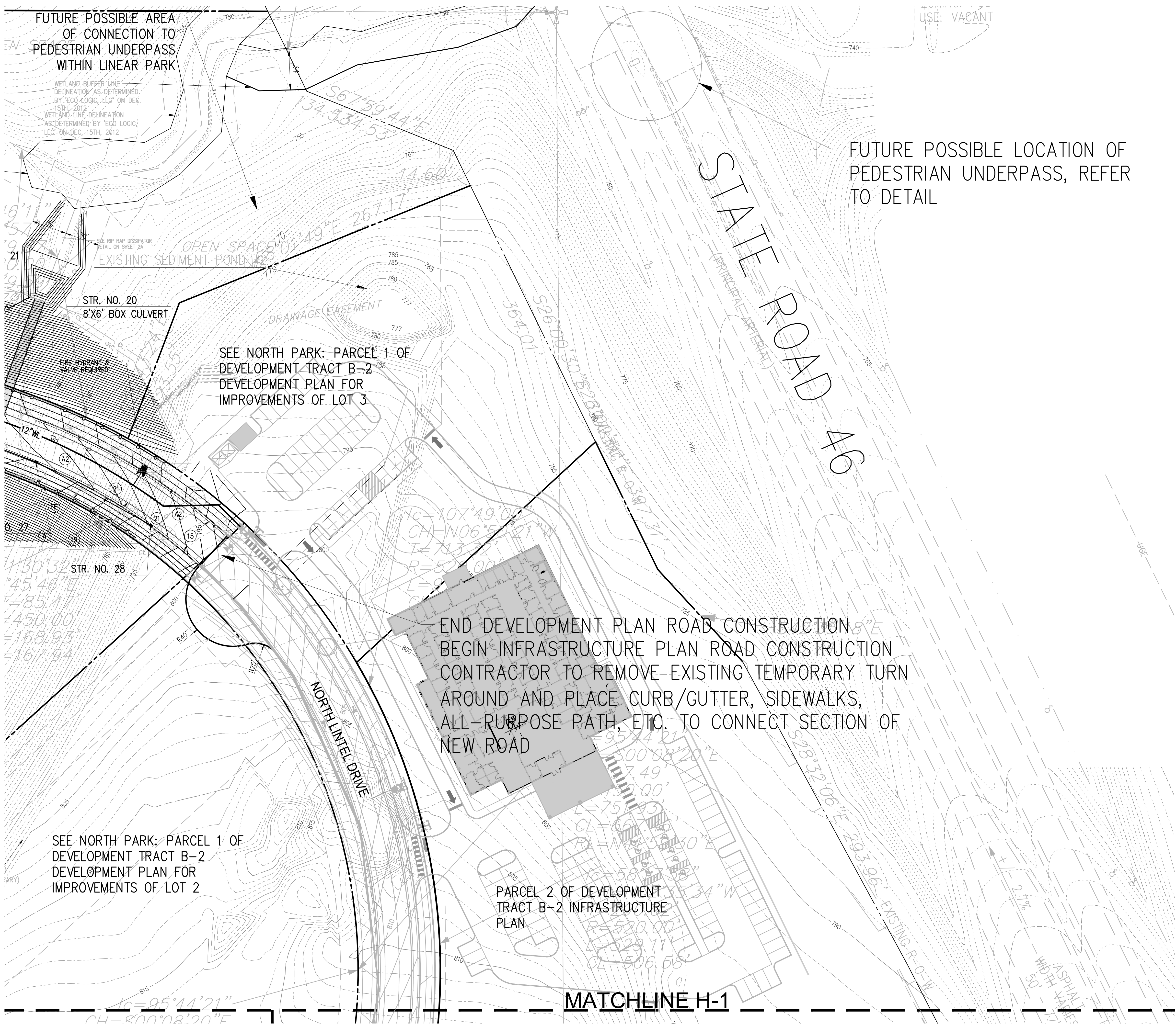
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 BRYNUM FANTO & ASSOCIATES, INC.
 ARCHITECTURE
 CIVIL ENGINEERING
 PLANNING
 Bloomington, Indiana
 (812) 339-2390 (Fax)
 528 north walnut street
 (812) 332-8030

No. 18283
 STATE OF INDIANA
 PROFESSIONAL ENGINEER
 03.09.2012
 certified by *[Signature]*

Proposed:
**NORTH PARK:
 TRACT B-2 INFRASTRUCTURE PLAN**
 Bloomington, Indiana

title: INFRASTRUCTURE PLAN
 designed by: JBT
 drawn by: JR
 checked by: JSF
 sheet no.: 2
 project no.: 401044





USE: VACANT

FUTURE POSSIBLE LOCATION OF PEDESTRIAN UNDERPASS, REFER TO DETAIL

FUTURE POSSIBLE AREA OF CONNECTION TO PEDESTRIAN UNDERPASS WITHIN LINEAR PARK

STR. NO. 20
8'X6' BOX CULVERT

SEE NORTH PARK: PARCEL 1 OF DEVELOPMENT TRACT B-2 DEVELOPMENT PLAN FOR IMPROVEMENTS OF LOT 3

SEE NORTH PARK: PARCEL 1 OF DEVELOPMENT TRACT B-2 DEVELOPMENT PLAN FOR IMPROVEMENTS OF LOT 2

PARCEL 2 OF DEVELOPMENT TRACT B-2 INFRASTRUCTURE PLAN

MATCHLINE H-1

SITE LEGEND

- (A2) PROPOSED BITUMINOUS PAVING
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UTILITY AND GRADING LEGEND

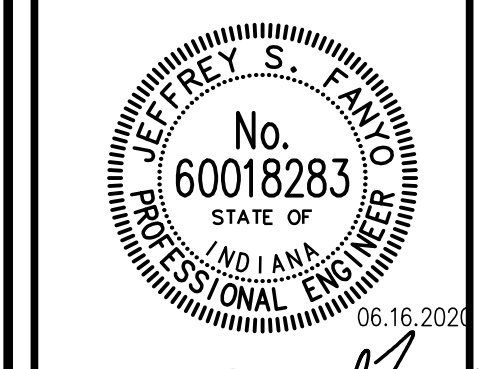
- PROPOSED ROCK-LINED CHUTE — RC —
- PROPOSED AWWA C900 DR 14 PVC WATER LINE — X"-WL —
- PROPOSED WATER VALVE
- PROPOSED WATERLINE CAP AND VALVE
- PROPOSED FIRE HYDRANT (FH)
- PROPOSED WATER METER (TO BE SIZED BY THE CITY OF BLOOMINGTON UTILITIES)
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(812) 339-2990 (Fax)

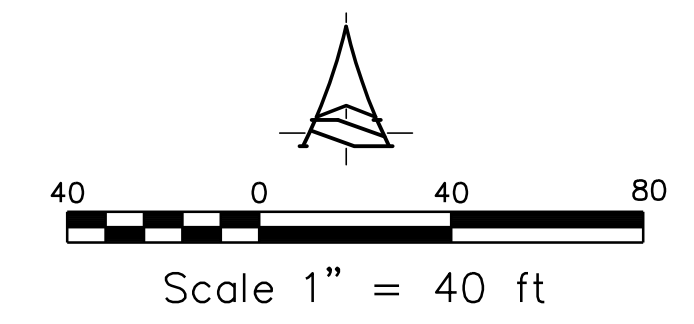


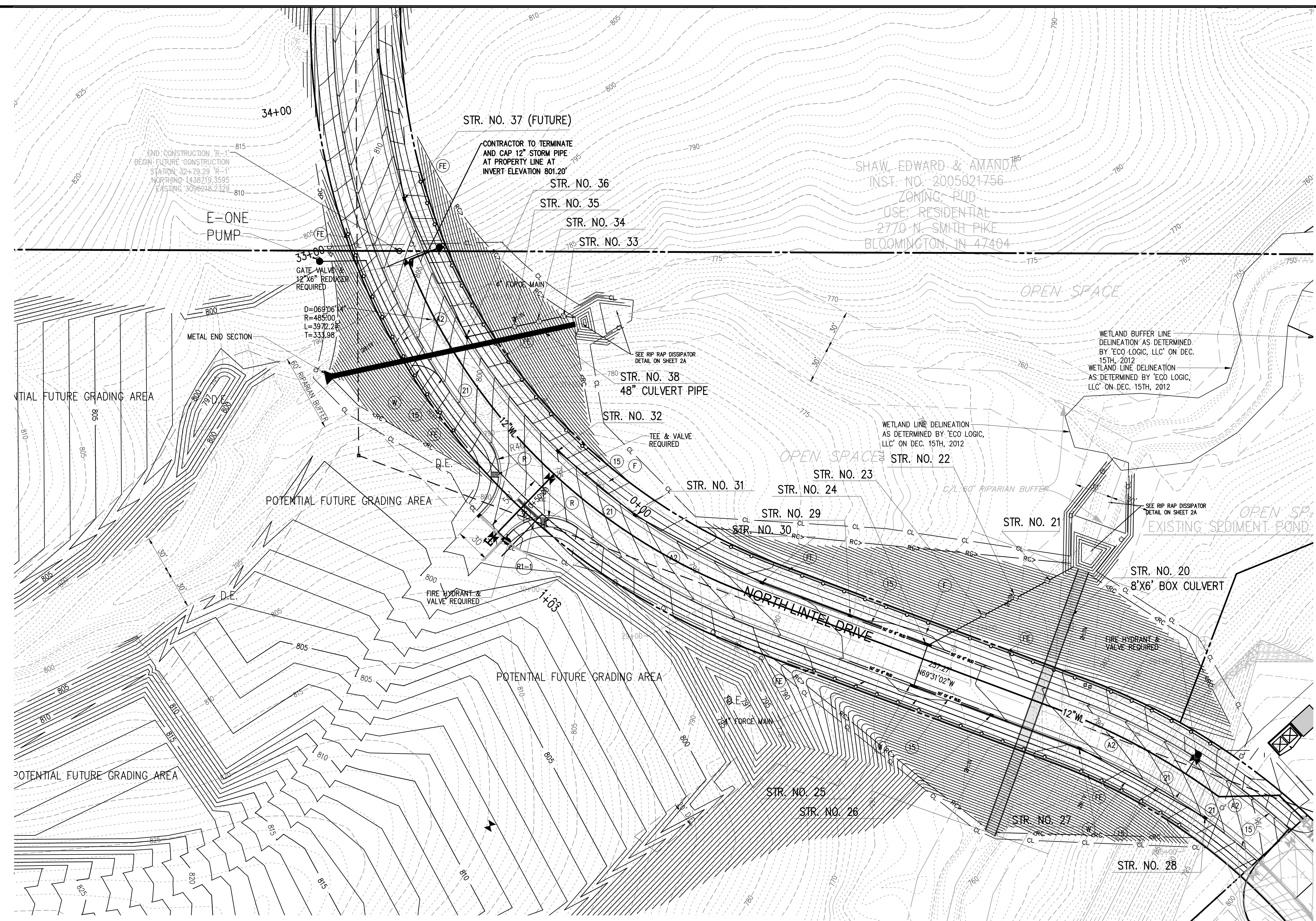
certified by *J. Fanto*

Proposed:
**NORTH PARK:
TRACT B-2 INFRASTRUCTURE PLAN**
Bloomington, Indiana

title: INFRASTRUCTURE PLAN

designed by: JBT
drawn by: JR
checked by: JSF
sheet no: 1
project no.: 401044





SITE LEGEND

(A2)	PROPOSED BITUMINOUS PAVING
(W)	PROPOSED ASPHALT SIDEPATH
(15)	PROPOSED CONCRETE CURB AND GUTTER
(F)	PROPOSED CONCRETE SIDEWALK
(R)	PROPOSED ACCESSIBLE RAMP, TYPE "C"
(36)	PROPOSED STOP BAR
(21)	PROPOSED MARKING; PAINTED, SOLID, WHITE, 4"
(R1-1)	PROPOSED "STOP" SIGN
(FE)	PROPOSED 54" TALL CHAIN LINK FENCE WITH BLACK VINYL COATING SHOULD BE INSTALLED 2' FROM THE MULTI-USE PATH/SIDEWALK. THE CHAIN LINK FENCE SHOULD HAVE A TOP RAIL, FINALS CUT OFF, CHAIN LINK FABRIC MOUNTED ON THE FIELD SIDE OF THE FENCE AND CHAIN LINK FABRIC WITHOUT A SPIKED TOP. FENCE MATERIAL AND INSTALLATION SHALL CONFORM TO INDOT SPECIFICATIONS. REFER TO DETAIL.

UTILITY AND GRADING LEGEND

PROPOSED ROCK-LINED CHUTE	RC
PROPOSED ANWA C900 DR14 PVC WATER LINE	X-WL
PROPOSED WATER VALVE	WV
PROPOSED WATERLINE CAP AND VALVE	WV-CV
PROPOSED FIRE HYDRANT (FH)	FH
PROPOSED WATER METER (TO BE SIZED BY THE CITY OF BLOOMINGTON UTILITIES)	WM
PROPOSED 8" PVC SANITARY SEWER AND SANITARY SEWER MANHOLE	LINE "S-X"
PROPOSED 6" SANITARY LATERAL AND SANITARY SEWER CLEAN-OUT	6" SSL C.O.
PROPOSED STORM PIPE, INLET AND END SECTION	SP
PROPOSED UNDERDRAIN: SDR-35 PERFORATED DRAIN PIPE	X-UD
PROPOSED SOLID SDR-35 DRAIN PIPE TO POINT OF DISCHARGE	X-UDS
PROPOSED ROAD UNDERDRAIN: REFER TO DETAIL	6" RUD
PROPOSED SCHEDULE 40 PVC PIPE, ELECTRICAL GRADE (GREY) CONDUIT BURIED 36" BELOW FINISHED GRADE	X-EC
PROPOSED CONTOUR	XXX
PROPOSED FLOW LINE	FL

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STORM STRUCTURE DATA TABLE

STR. NO.	INLET / *CASTING	TOP OF CASTING @ FLOWLINE	PIPE TYPE	PIPE LENGT H (FT)	PIPE SIZE (IN)	INVERT IN	INVERT OUT	COMMENTS
20	Box Culvert		Reinforced Concrete	217	8' x 6'	Up=755.50	Dn=751.79	
21	4' Diameter Storm Manhole	761.00	Aluminumized CMP	21	15	757.14	753.39	
22	4' Diameter Storm Manhole	771.00	Aluminumized CMP	24	15	766.99	761.50	
23	4' Diameter Storm Manhole	781.10	Aluminumized CMP	25	15	775.67	770.67	
24	Two InDOT Type C / EJ 7565	787.40	Aluminumized CMP	45	15	782.44	782.44	Connect both inlets with 15" pipe.
25	Two InDOT Type C / EJW 7565	787.40	Aluminumized CMP	34	15	784.61	784.61	Connect both inlets with 15" pipe.
26	InDOT Type C / EJW 7565	787.86	Aluminumized CMP	60	12	785.21	785.21	
27	InDOT Type C / EJW 7565	788.70	Aluminumized CMP	70	12	786.05	786.05	
28	InDOT Type B / EJW 7565	792.23	Aluminumized CMP	109	12	782.00	789.58	
29	InDOT Type C / EJW 7565	787.65	Aluminumized CMP	60	15	784.79	784.79	
30	InDOT Type C / EJW 7565	788.36	Aluminumized CMP	70	15	785.46	785.46	
31	InDOT Type C / EJW 7565	791.48	Aluminumized CMP	109	12	788.83	788.83	
32	InDOT Type B / EJW 7565	795.02	Aluminumized CMP	75	12	792.37	792.37	
33	4' Diameter Storm Manhole	774.90	Aluminumized CMP	6	12	772.50	771.33	
34	4' Diameter Storm Manhole	784.00	Aluminumized CMP	15	12	780.20	775.20	
35	4' Diameter Storm Manhole	793.50	Aluminumized CMP	15	12	787.90	782.90	
36	InDOT Type C / EJW 7565	801.16	Aluminumized CMP	35	12	796.20	794.20	Extend 12" pipe north to property line and cap as shown for future connection. Invert at property line to be 801.20.
38	Culvert Pipe		Aluminumized CMP	193	48	Up=778.80	Dn=771.49	Install galvanized metal end section on upstream end of pipe.

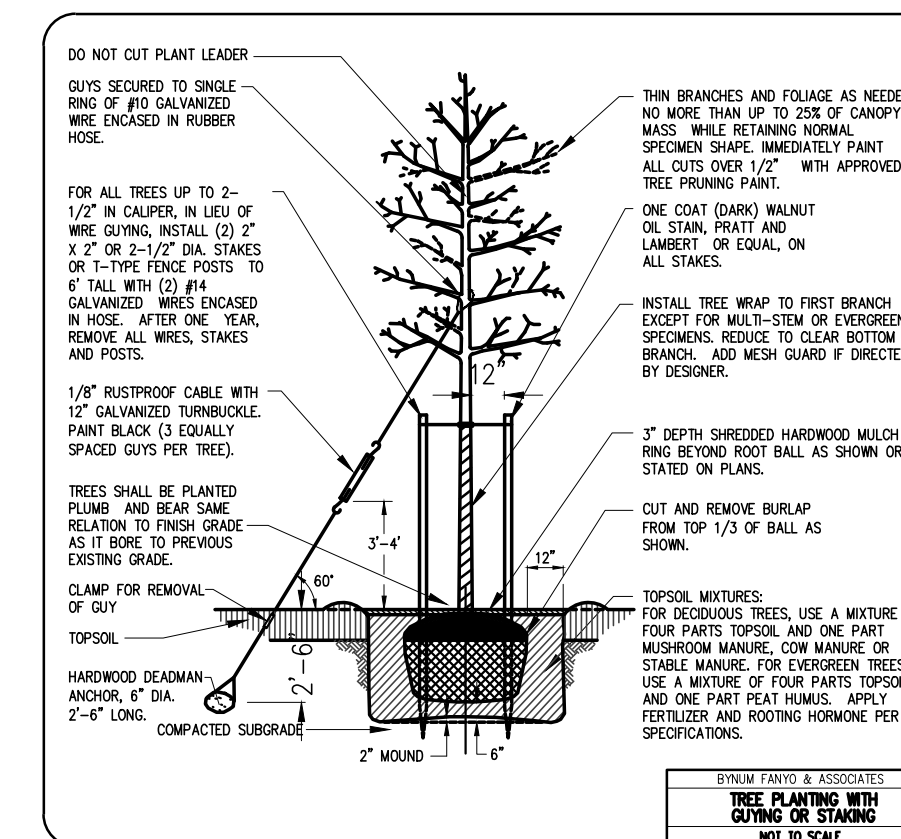
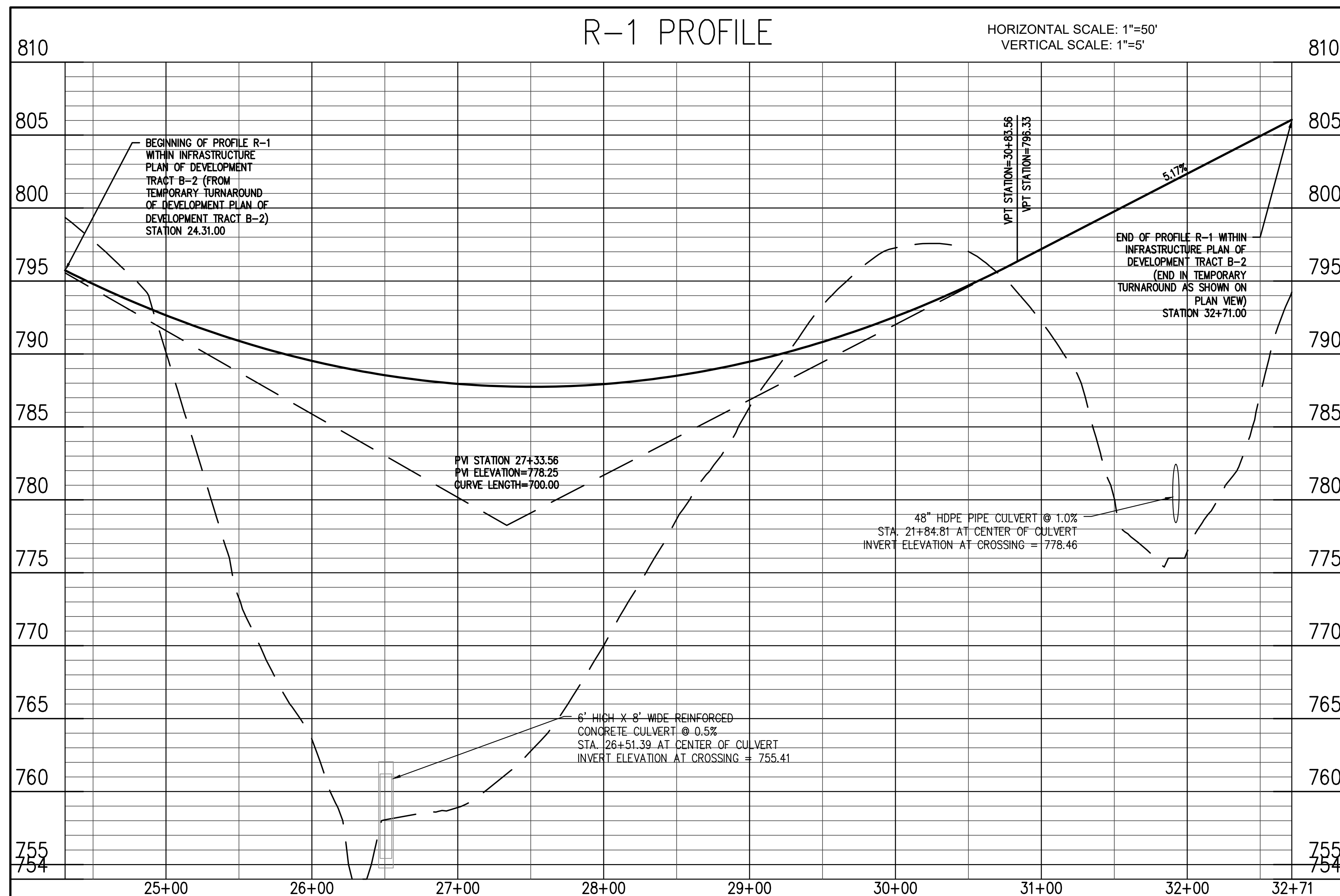
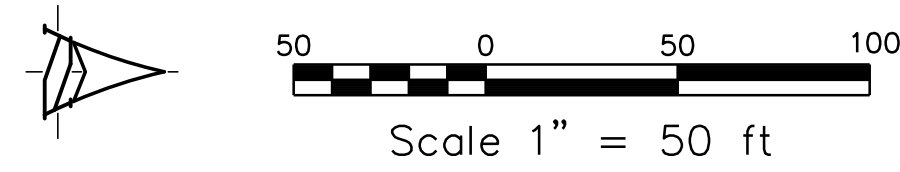
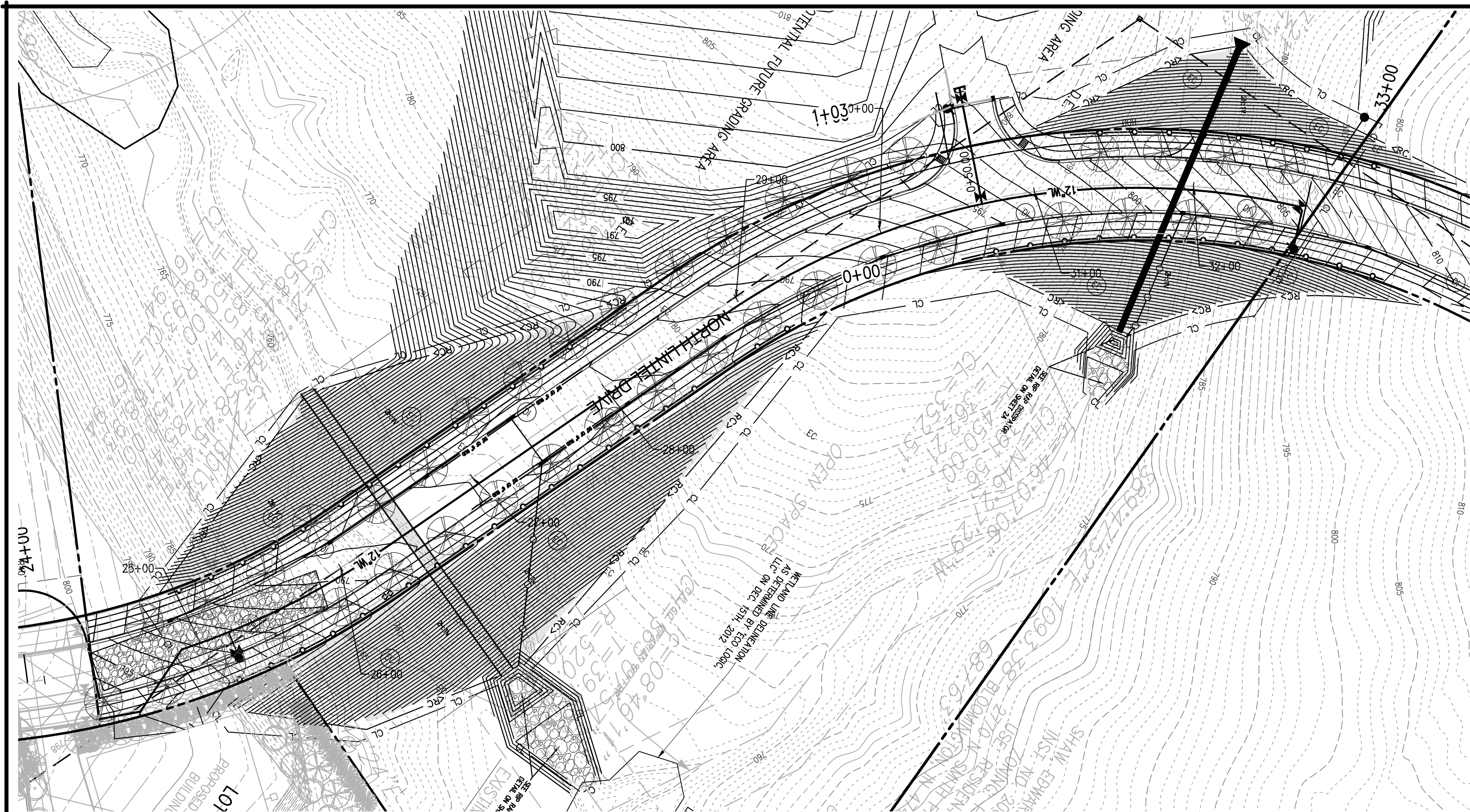
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Proposed:
**NORTH PARK:
 TRACT B-2 INFRASTRUCTURE PLAN**
 Bloomington, Indiana

title: INFRASTRUCTURE PLAN
 designed by: JBT
 drawn by: JR
 checked by: JSF
 sheet no: 2
 project no.: 401044



PLANT LIST

LARGE CANOPY DECIDUOUS STREET TREES

LEGEND	KEY	BOTANICAL NAME	COMMON NAME	QTY	SIZE & CONDITION
		ACER RUBRUM	AUTUMN FLAME RED MAPLE	8	2" CAL., B & B (SPACED)
		TAXODIUM DISTICHUM	BALD CYPRESS	8	40' O.C. AND 3' BEHIND
		QUERCUS MACROCARPA	BUR OAK	8	BACK OF CURB)
		GLEDTISIA TRICANTHOS	HONEY LOCUST	8	
		ACER NIGRUM	BLACK MAPLE	8	

revisions:

ARCHITECTURE
CIVIL ENGINEERING
PLANNING

BFB
BYNUM FANTO & ASSOCIATES, INC.
528 north walnut street
(812) 332-8030

blomington, Indiana
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No. 60018283
STATE OF INDIANA
PROFESSIONAL ENGINEER






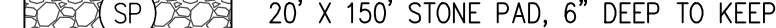




certified by *J. M. Fanto*

Proposed:
**NORTH PARK:
 TRACT B-2 INFRASTRUCTURE PLAN**
 Bloomington, Indiana

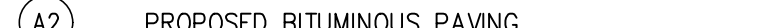








title: INFRASTRUCTURE PLAN (ROAD R-1)

designed by: DJB
 drawn by: DJB
 checked by: JSF
 sheet no: 3
 project no.: 401044







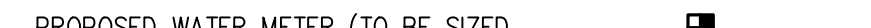
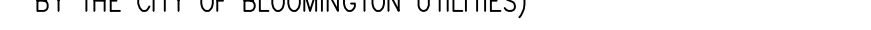


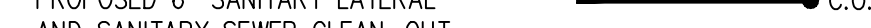




EROSION CONTROL LEGEND

-  SILTATION FENCE (TEMPORARY)
-  CONSTRUCTION LIMITS
-  ROCK-LINED CHUTE (PERMANENT)
-  MULCH SEEDING - SEE SPECIFICATIONS (TEMPORARY)
-  20' X 150' STONE PAD, 6" DEEP TO KEEP FROM TRACKING MUD OFF SITE (TEMPORARY)
-  CHECK DAM (TEMPORARY)
-  CONCRETE WASHOUT AREA (TEMPORARY)
-  EROSION CONTROL BLANKET (PERMANENT)
-  DROP INLET PROTECTION (TEMPORARY)
-  GRAVEL INLET PROTECTION (TEMPORARY)

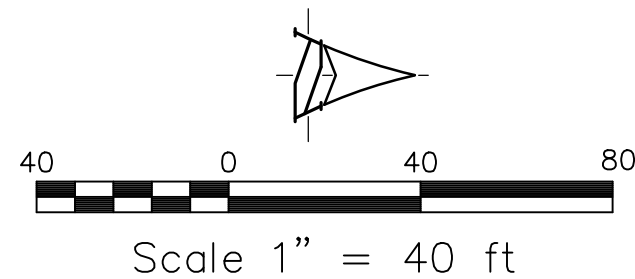
SITE LEGEND

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-  PROPOSED ASPHALT SIDEPATH
-  PROPOSED CONCRETE CURB AND GUTTER
-  PROPOSED CONCRETE SIDEWALK
-  PROPOSED ACCESSIBLE RAMP, TYPE "G"
-  PROPOSED STOP BAR
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-  PROPOSED "STOP" SIGN
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UTILITY AND GRADING LEGEND

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-  PROPOSED AWWA C900 DR14 PVC WATER LINE
-  PROPOSED WATER VALVE
-  PROPOSED WATERLINE CAP AND VALVE
-  PROPOSED FIRE HYDRANT (FH)
-  PROPOSED WATER METER (TO BE SIZED BY THE CITY OF BLOOMINGTON UTILITIES)
-  PROPOSED 8" PVC SANITARY SEWER AND SANITARY SEWER MANHOLE
-  PROPOSED 6" SANITARY LATERAL AND SANITARY SEWER CLEAN-OUT
-  PROPOSED STORM PIPE, INLET AND END SECTION
-  PROPOSED UNDERDRAIN: SDR-35 PERFORATED DRAIN PIPE
-  PROPOSED SOLID SDR-35 DRAIN PIPE TO POINT OF DISCHARGE
-  PROPOSED ROAD UNDERDRAIN: REFER TO DETAIL
-  PROPOSED SCHEDULE 40 PVC PIPE, ELECTRICAL GRADE (GREY) CONDUIT BURIED 36" BELOW FINISHED GRADE
-  PROPOSED CONTOUR
-  PROPOSED FLOW LINE

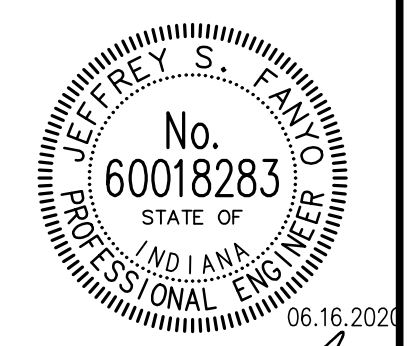
NOTE: ALL WATER CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF BLOOMINGTON UTILITY SPECIFICATIONS.
 NOTE: ALL SEWER CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE SOUTH CENTRAL REGIONAL SEWER DISTRICT SPECIFICATIONS.



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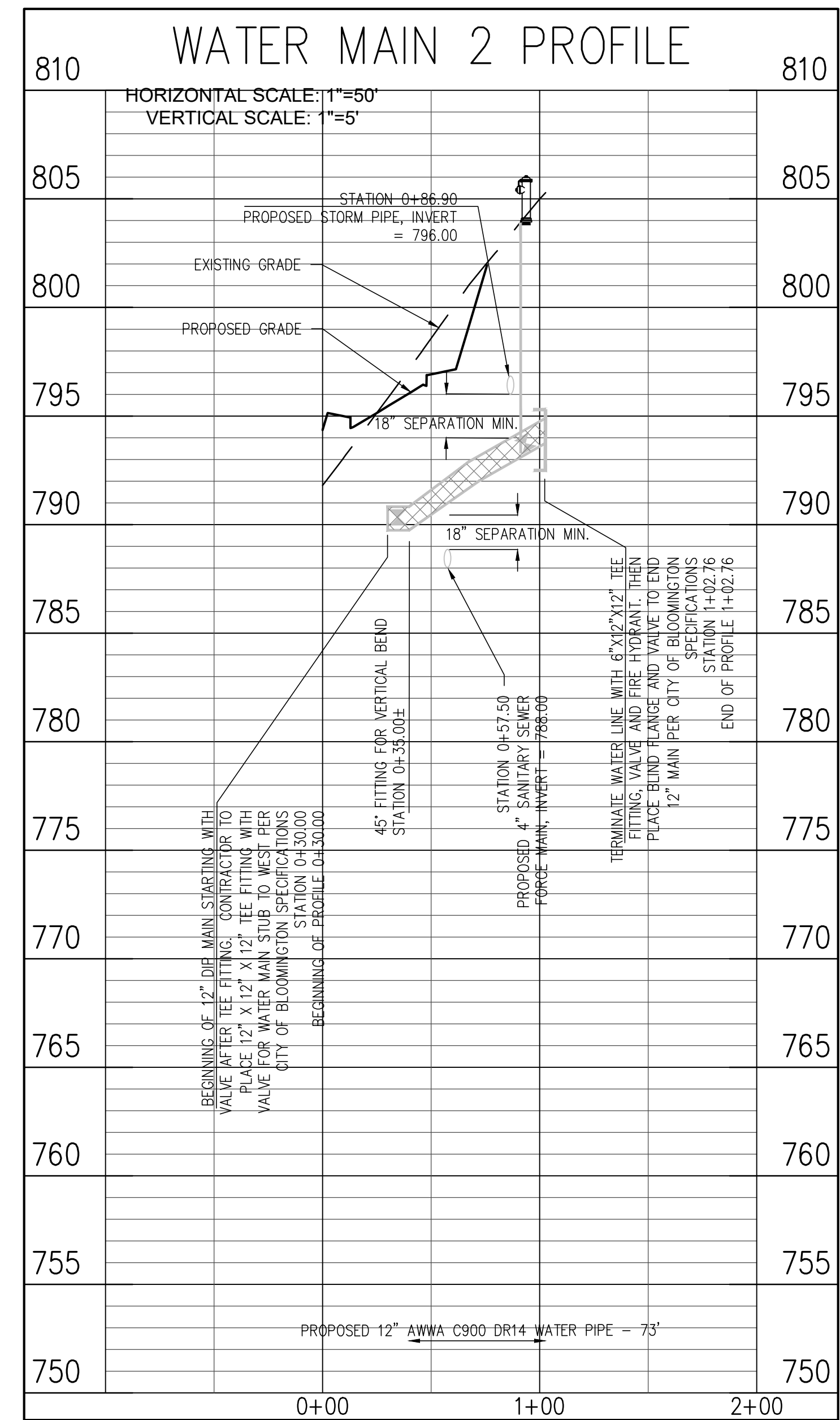
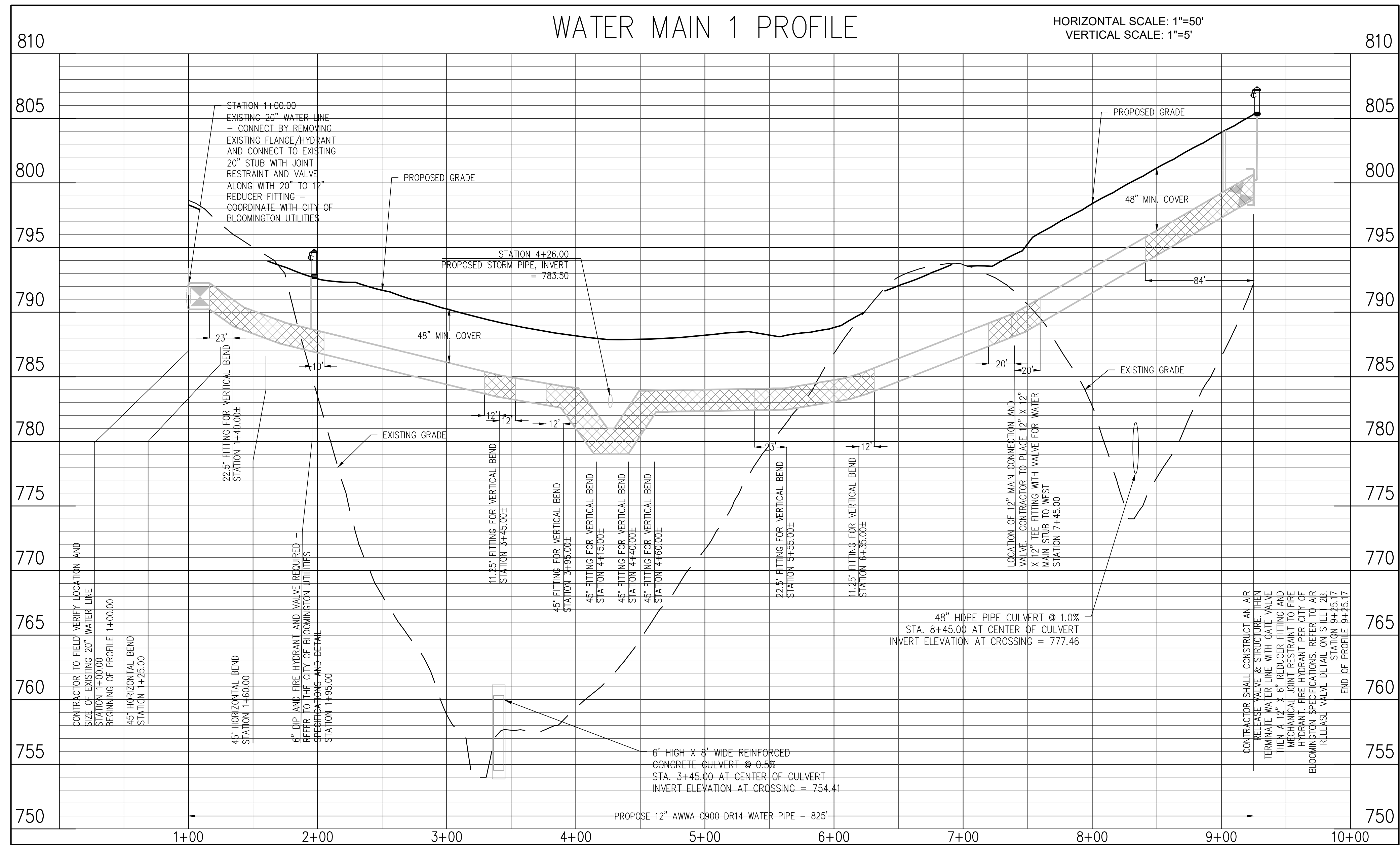
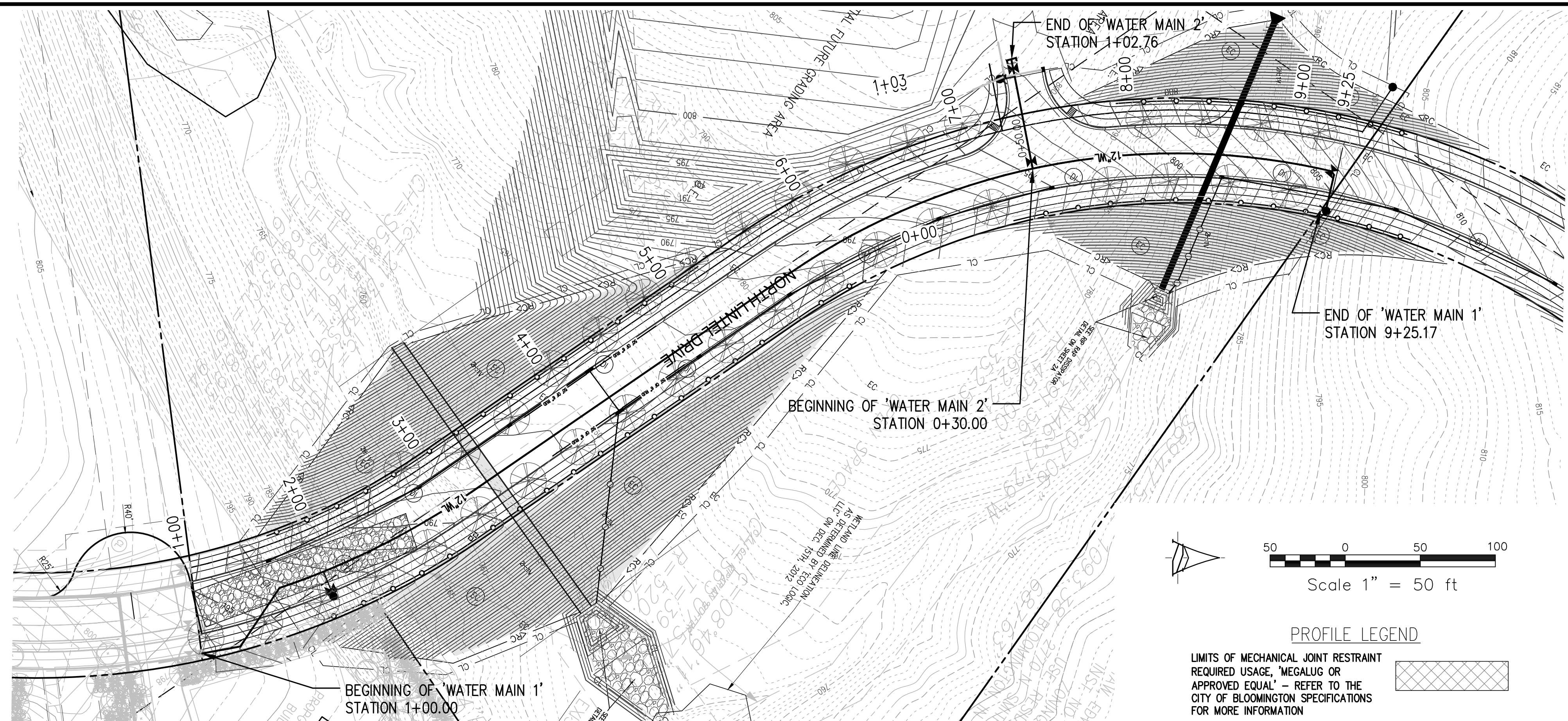
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 BYNUM FANTO & ASSOCIATES, INC.
 528 north walnut street
 (812) 332-8030



certified by: *[Signature]*

Proposed:
**NORTH PARK:
 TRACT B-2 INFRASTRUCTURE PLAN**
 Bloomington, Indiana

title: SWPPP
 designed by: JBT
 drawn by: JR
 checked by: JSF
 sheet no: 4
 project no.: 401044



revisions:

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528 north walnut street
(812) 332-8030

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(812) 339-2990 (Fax)

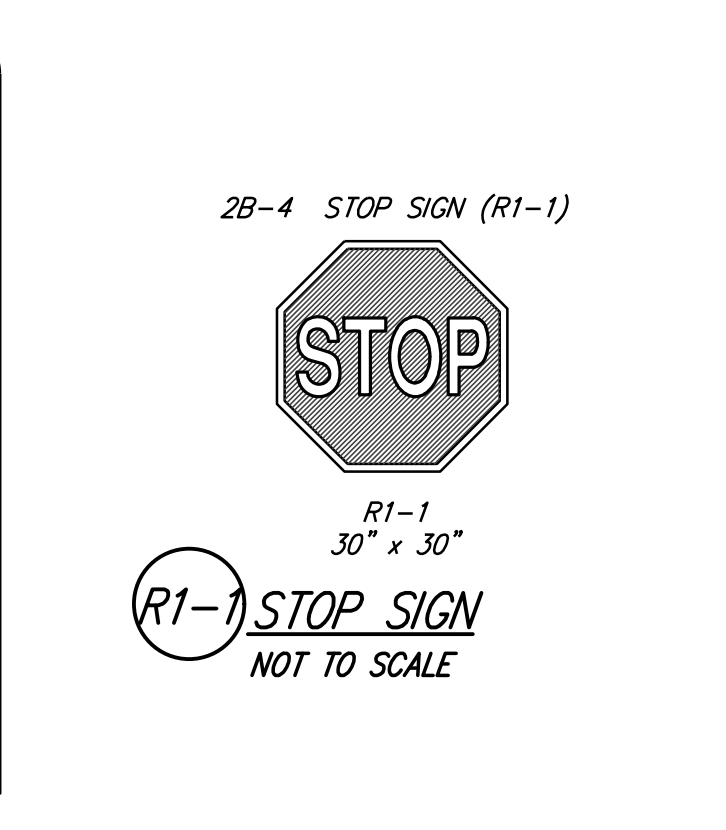
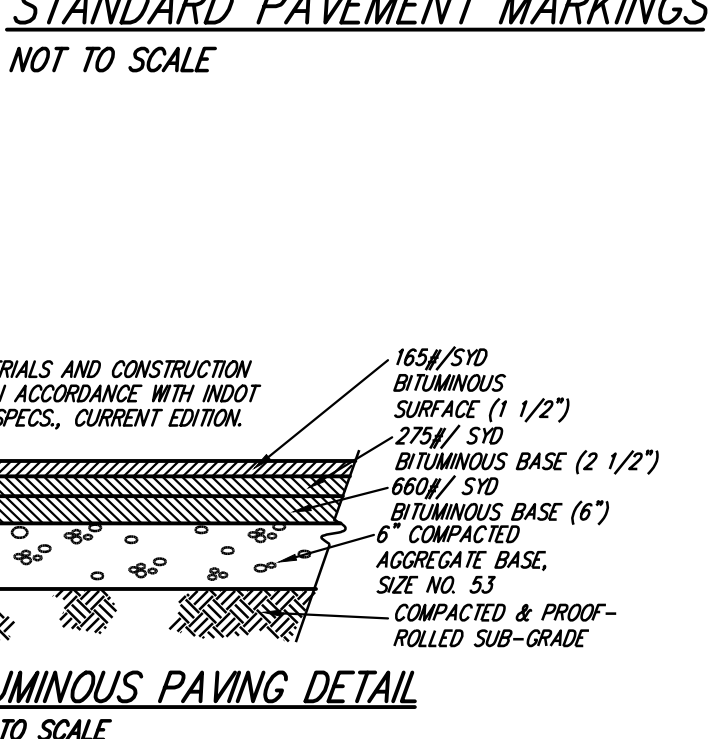
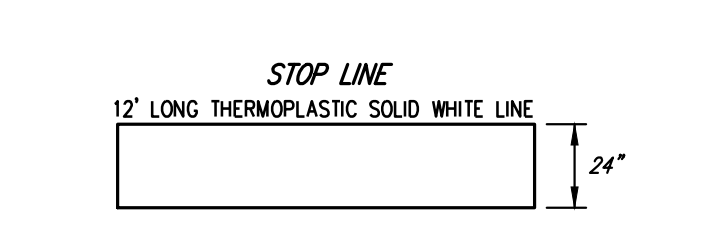
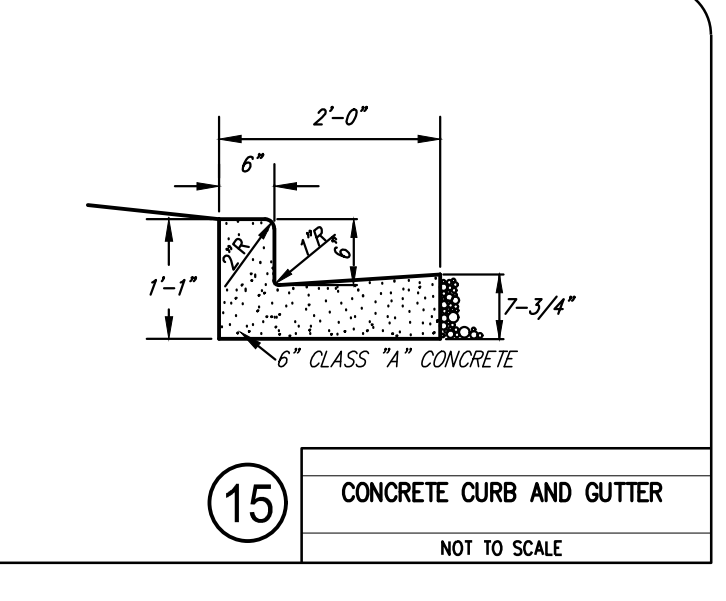
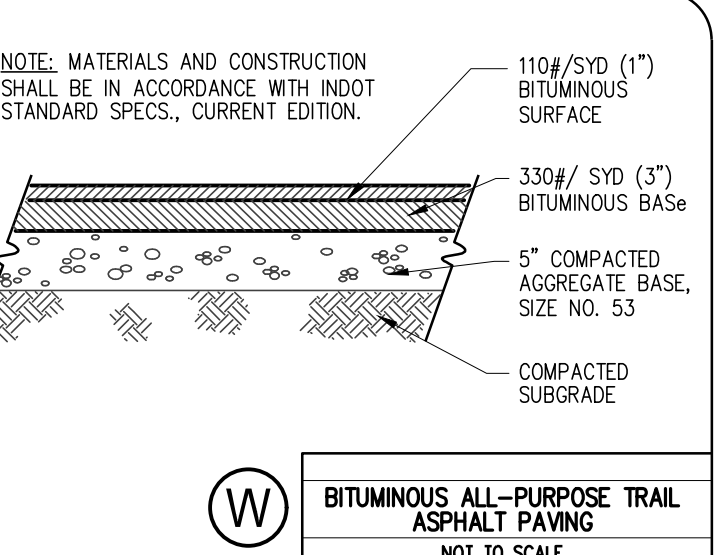
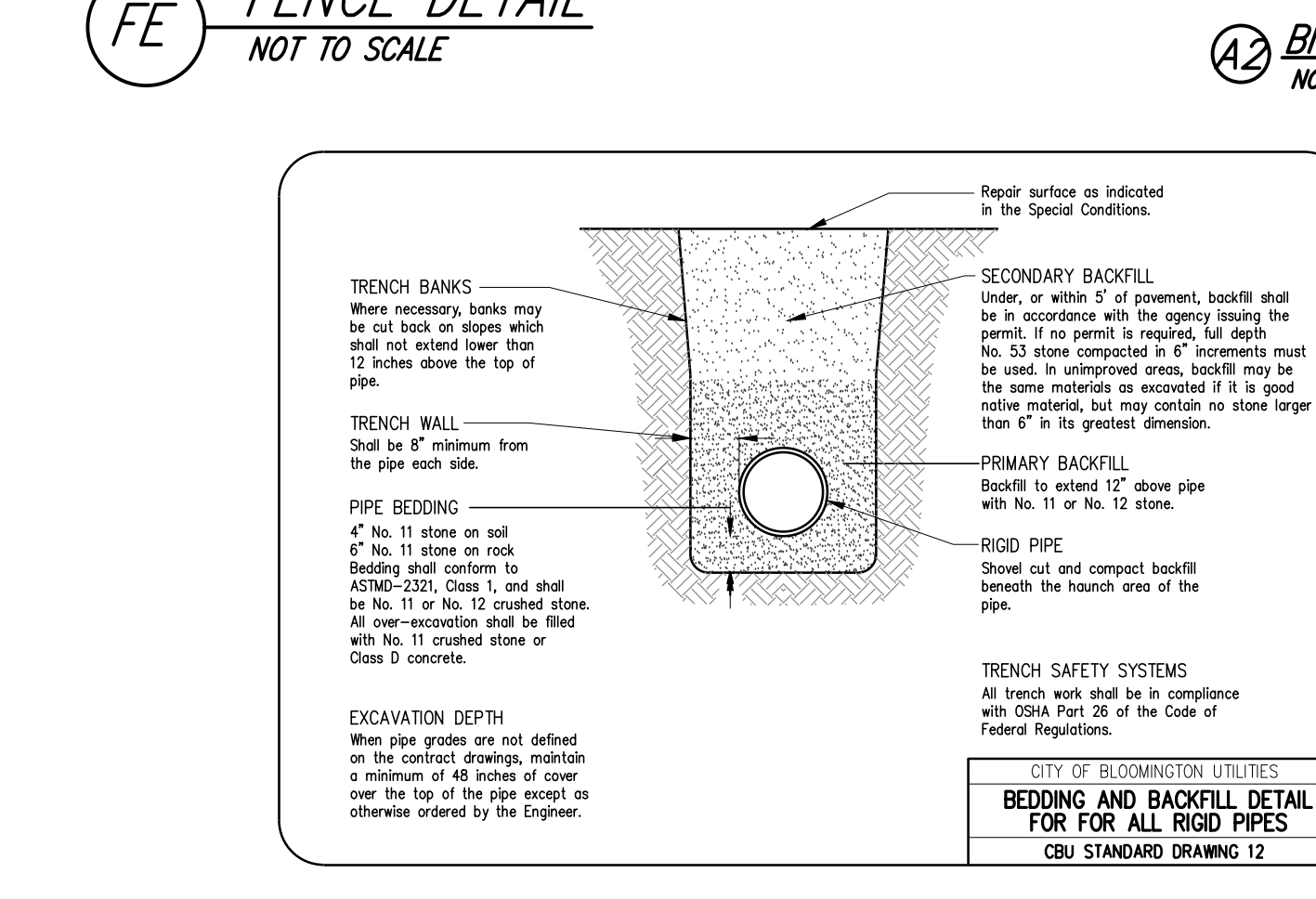
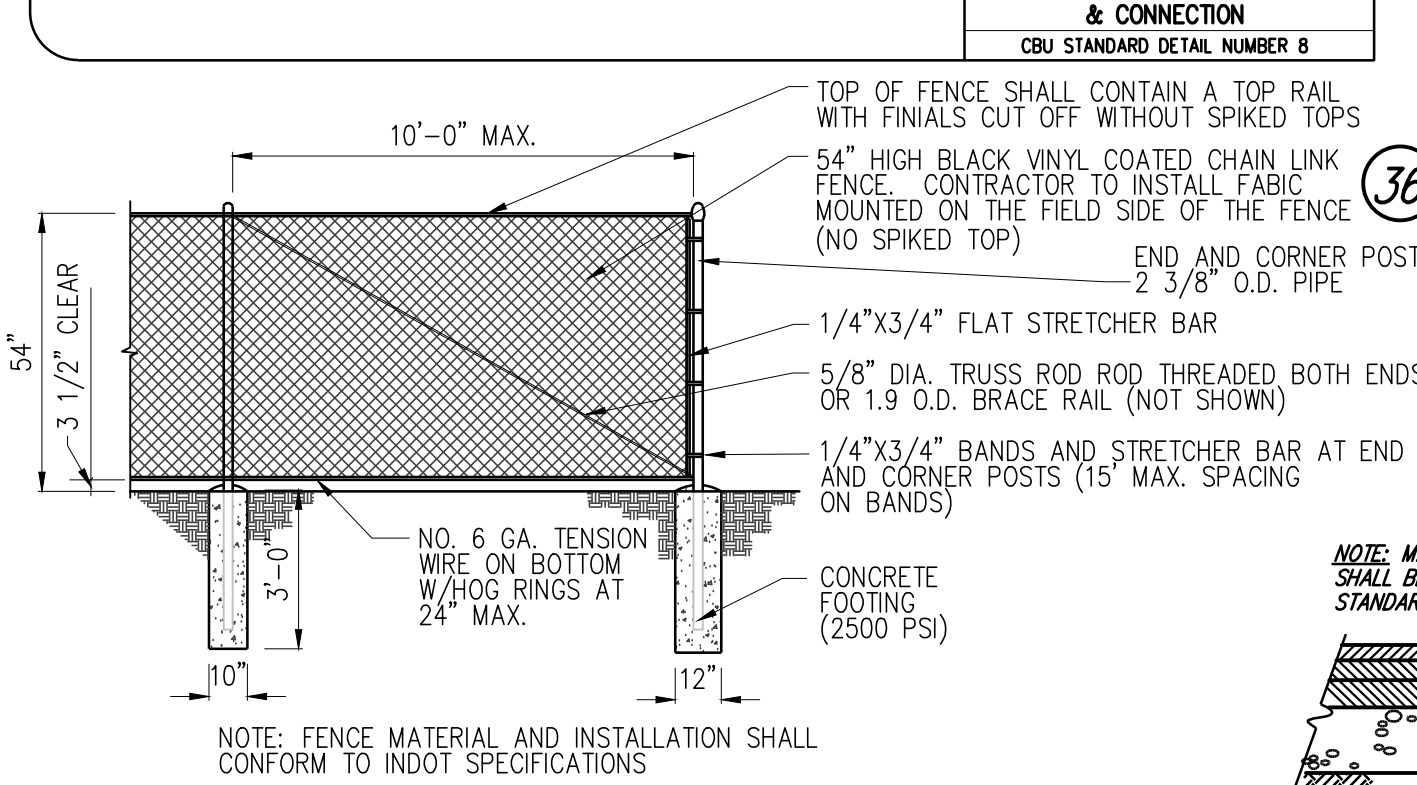
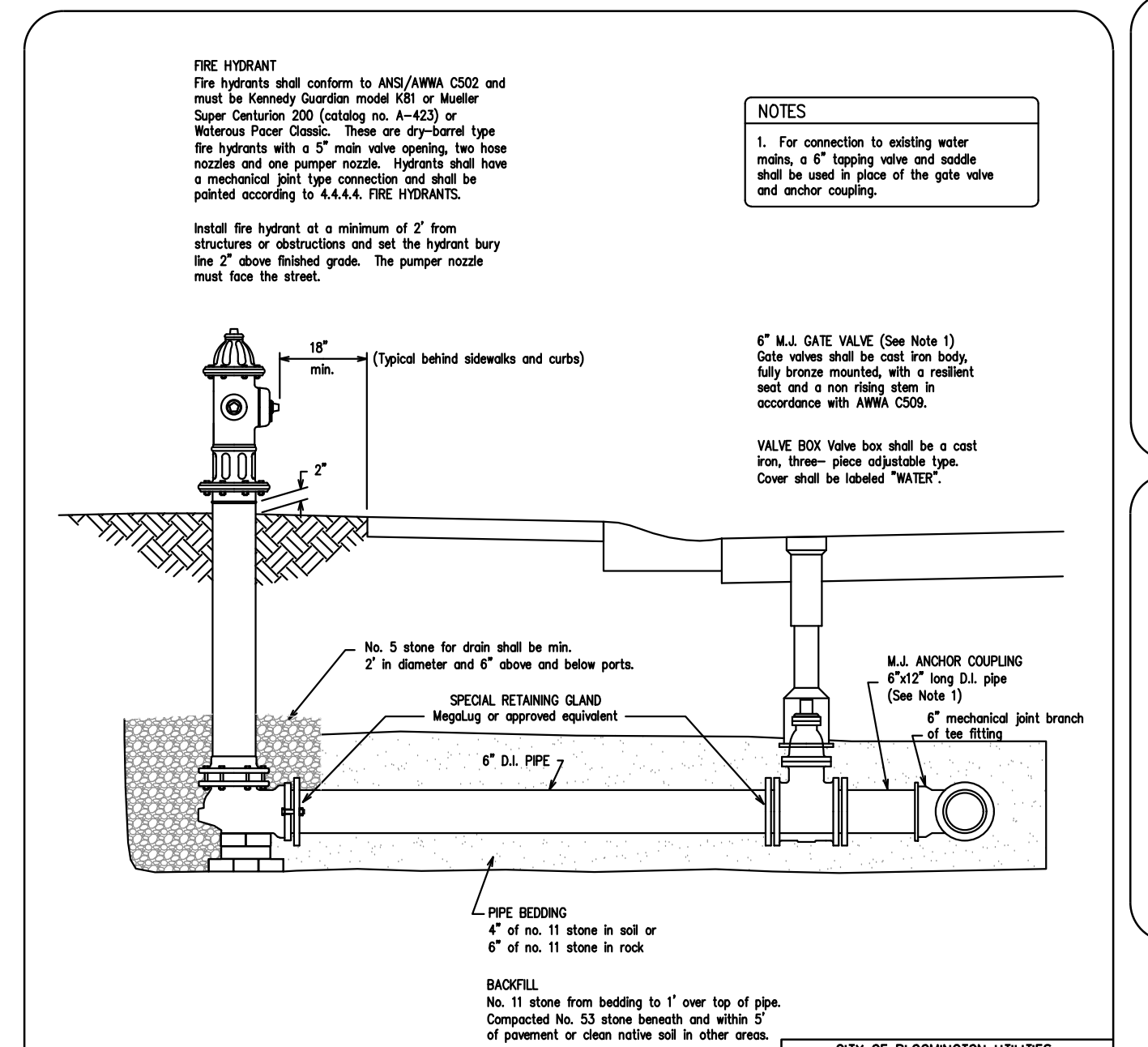
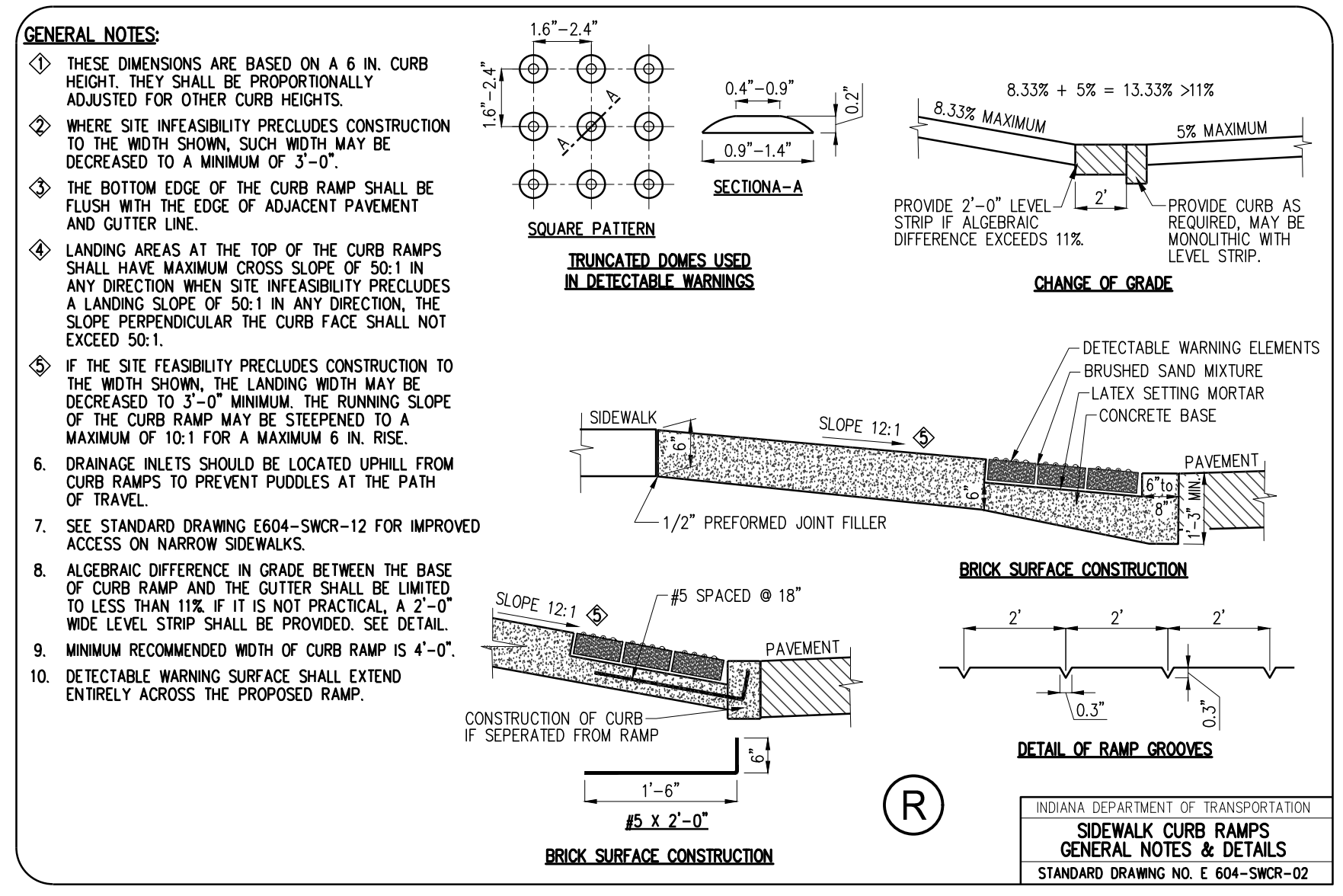
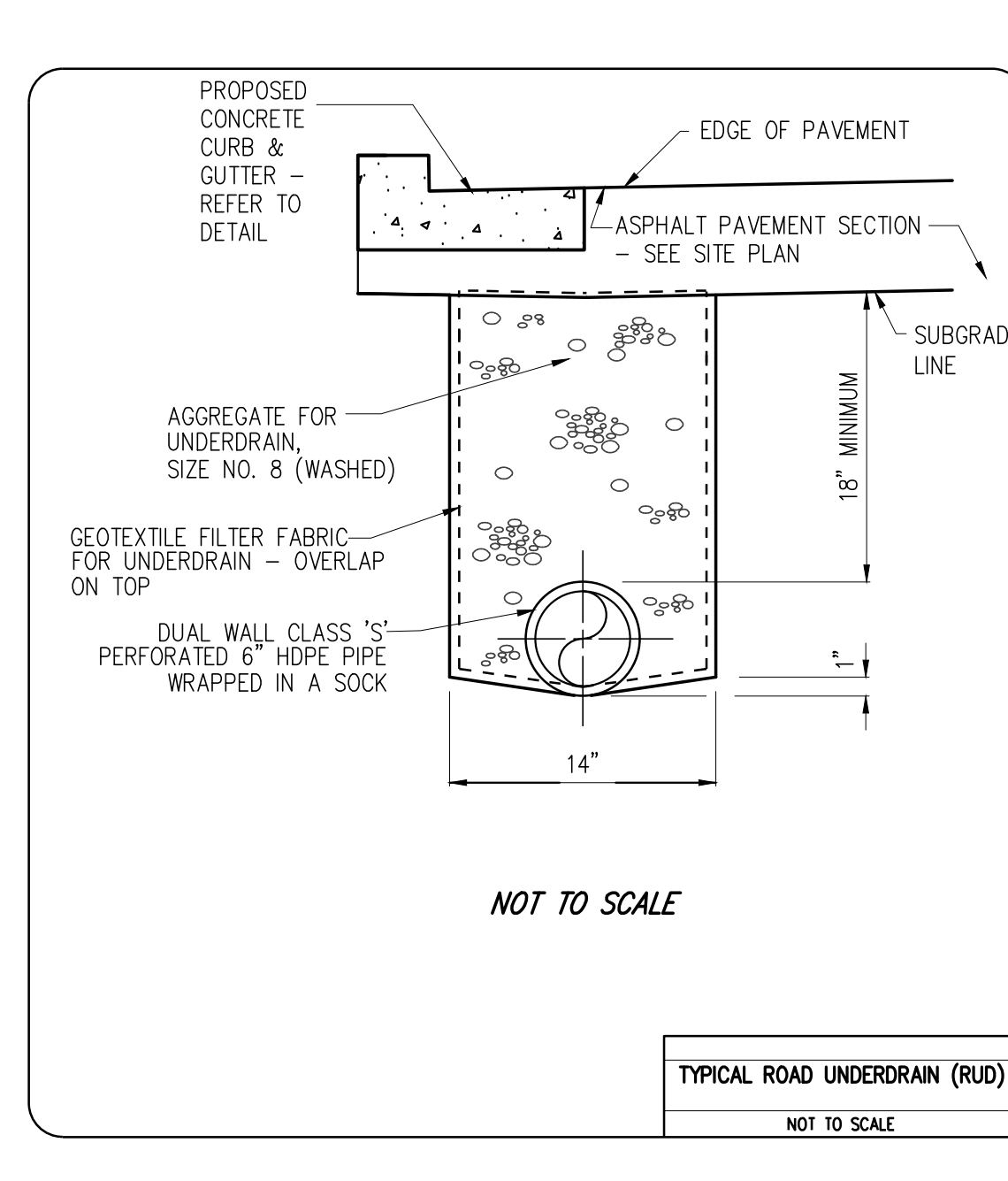
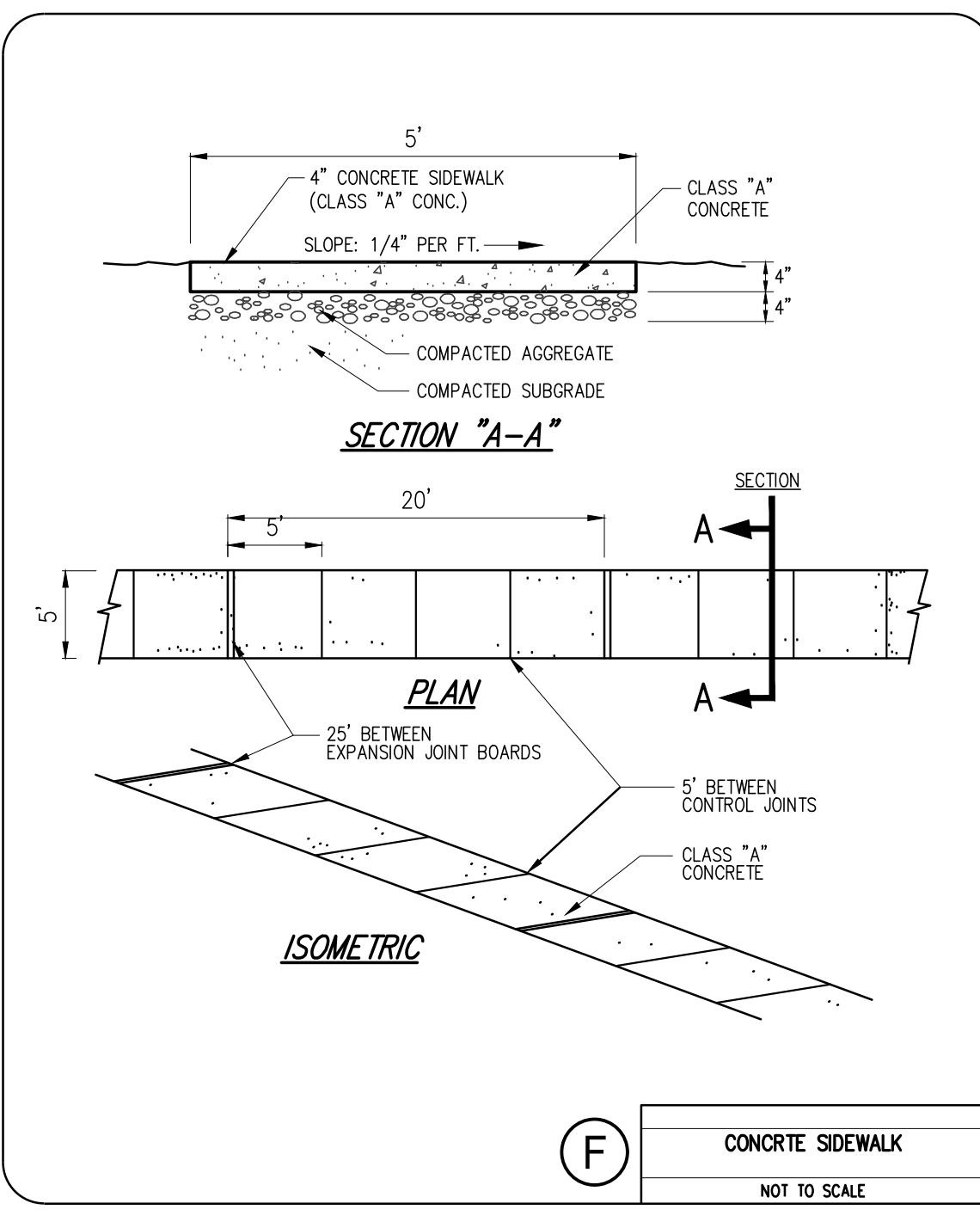
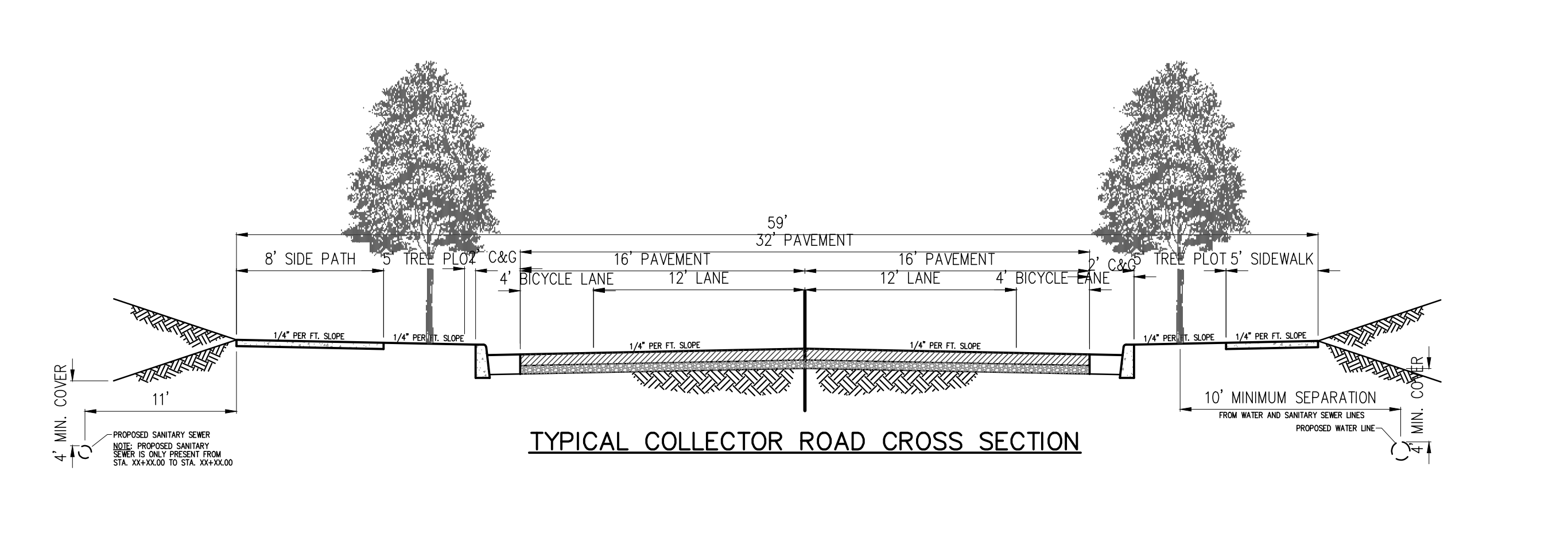
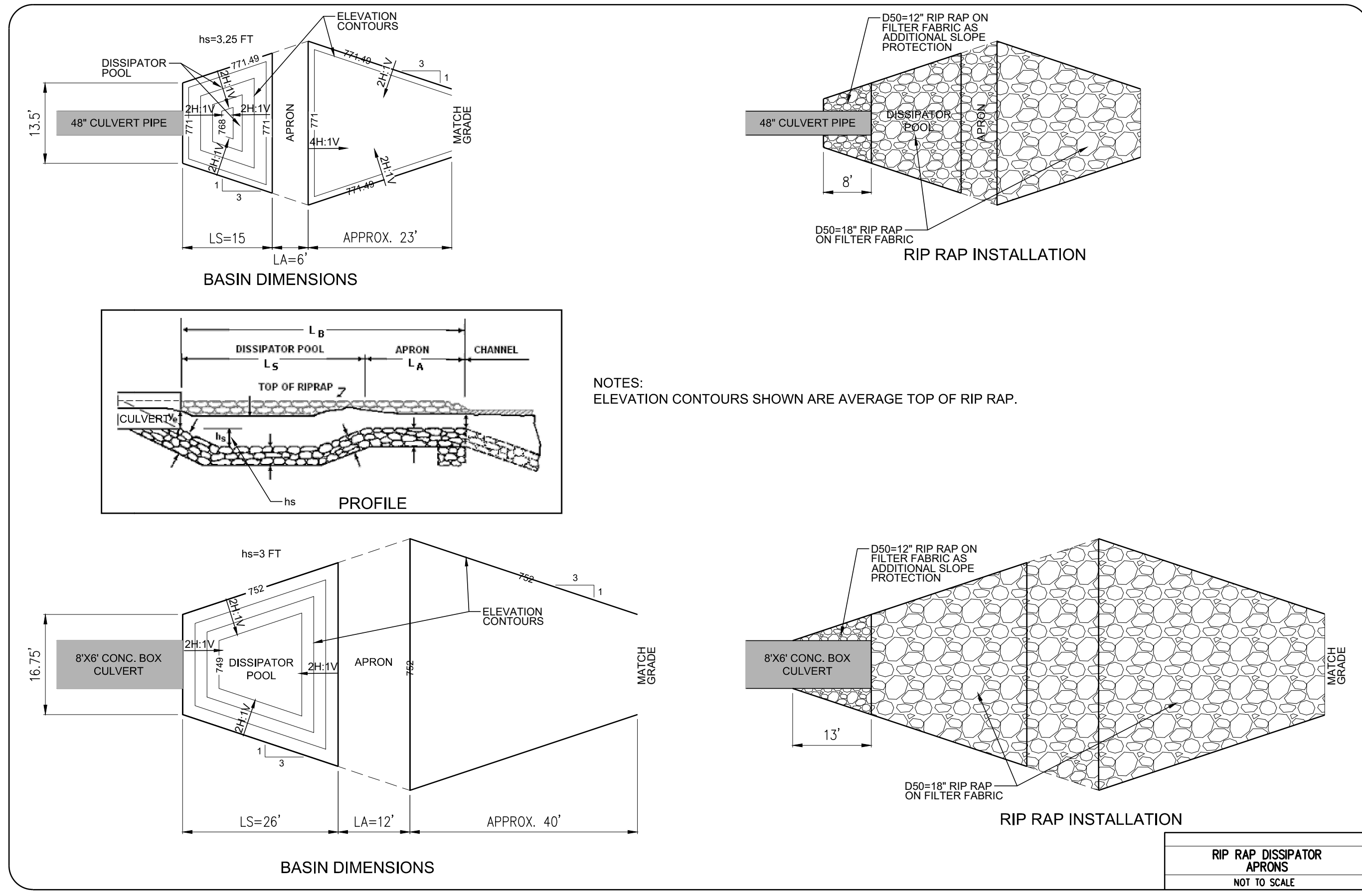
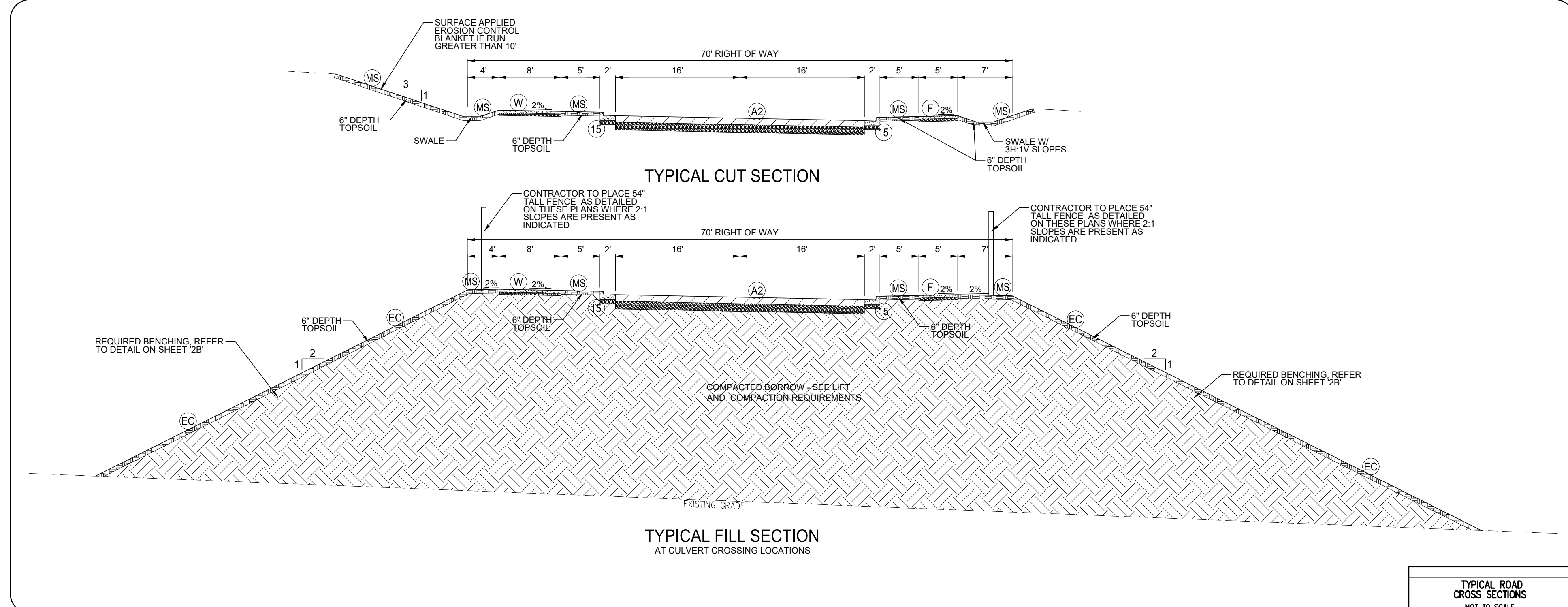
certified by: *[Signature]*

No. 60018283
STATE OF INDIANA
PROFESSIONAL ENGINEER
06.16.2020

Proposed:
**NORTH PARK:
TRACT B-2 INFRASTRUCTURE PLAN**
Bloomington, Indiana

title: WATER MAIN
EXTENSION PLAN &
PROFILE

designed by: DJB
drawn by: DJB
checked by: JSF
sheet no: 8
project no.: 401044



revisions:

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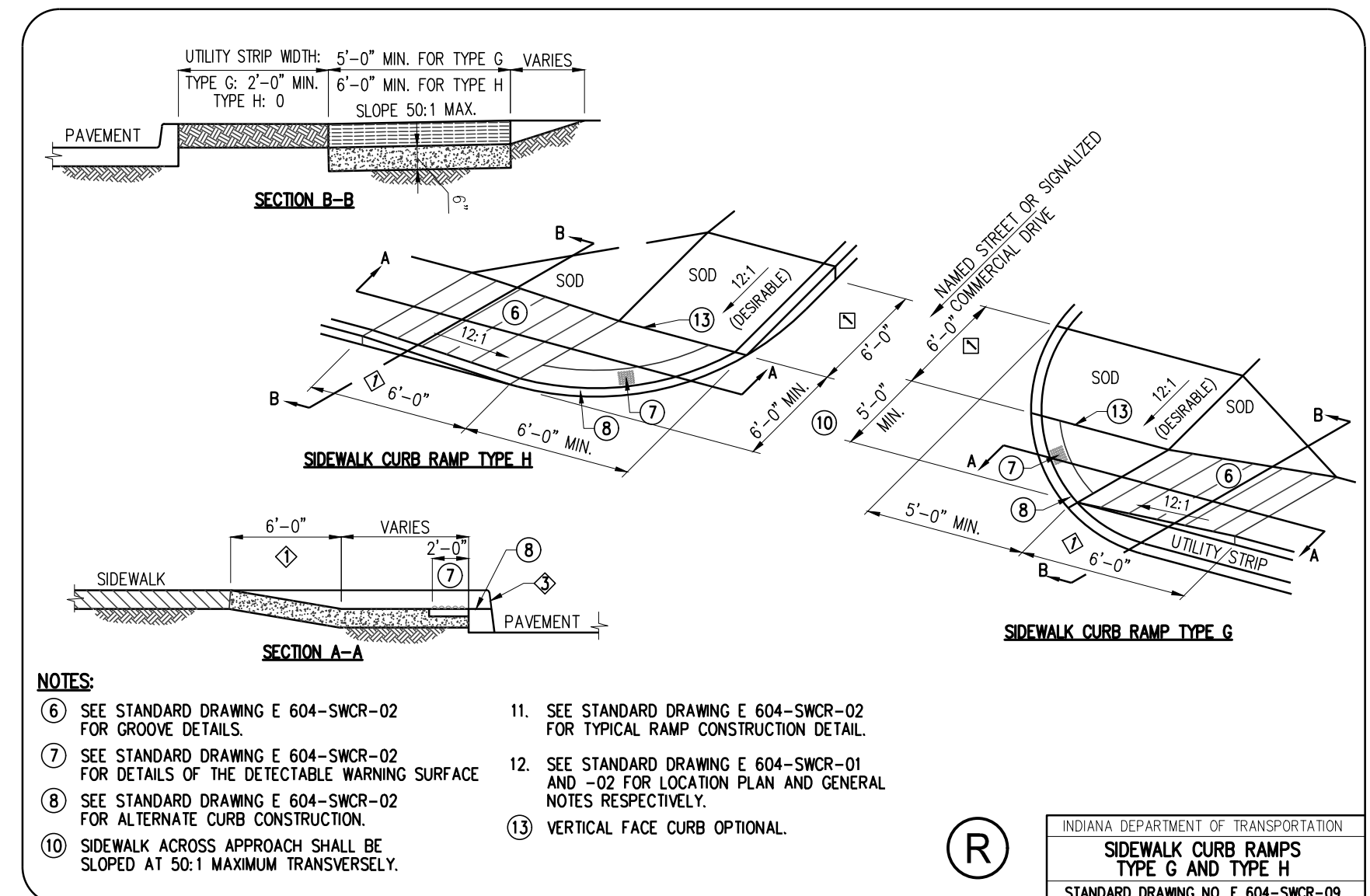
Professional Engineer
No. 60018283
STATE OF INDIANA
Professional Engineer
06.16.2020

certified by: *[Signature]*

Proposed:
NORTH PARK:
TRACT B-2 INFRASTRUCTURE PLAN
Bloomington, Indiana

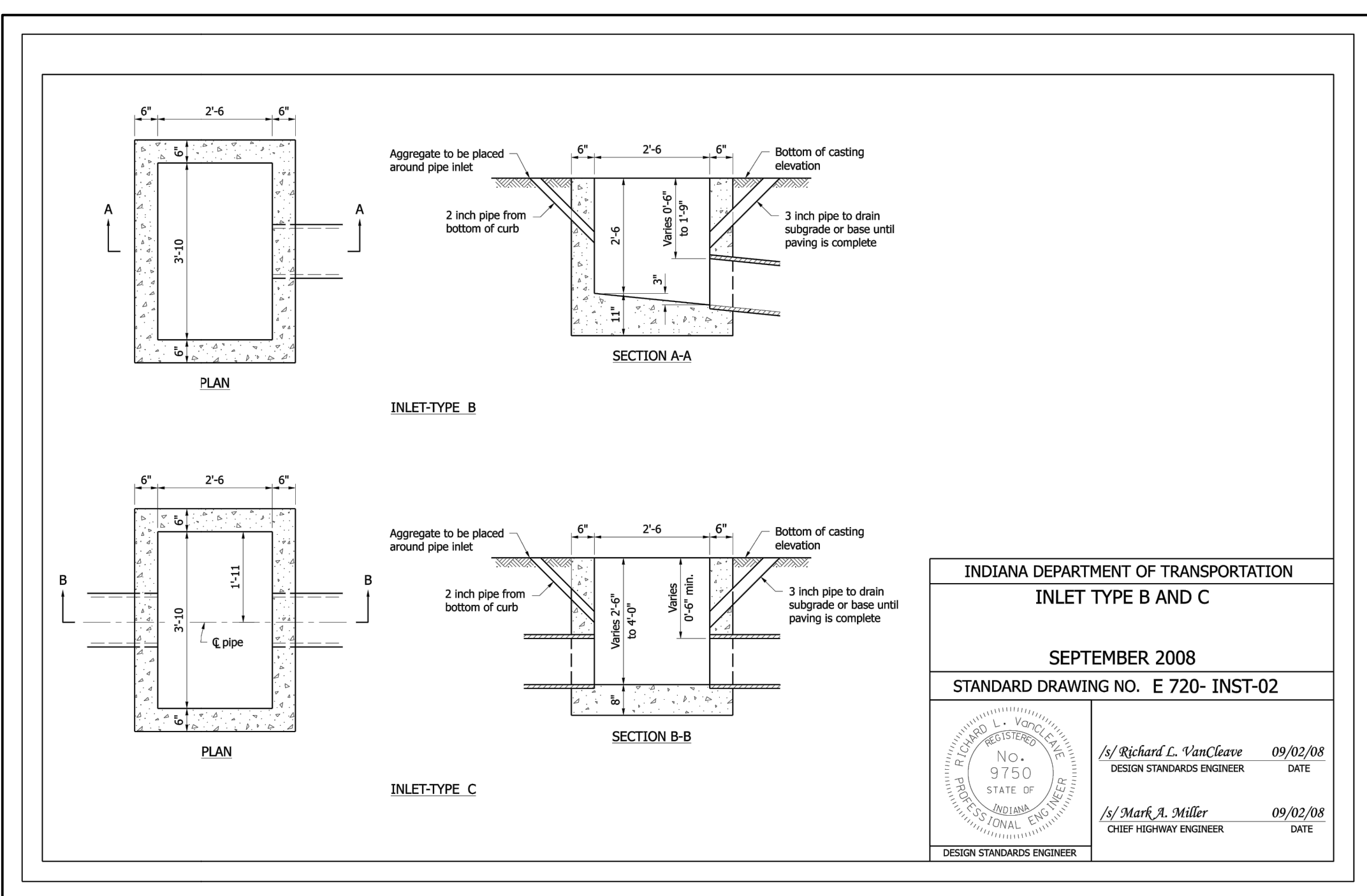
title: DETAILS

designed by: JBT
drawn by: JR
checked by: JSF
sheet no: 2A
project no.: 401044



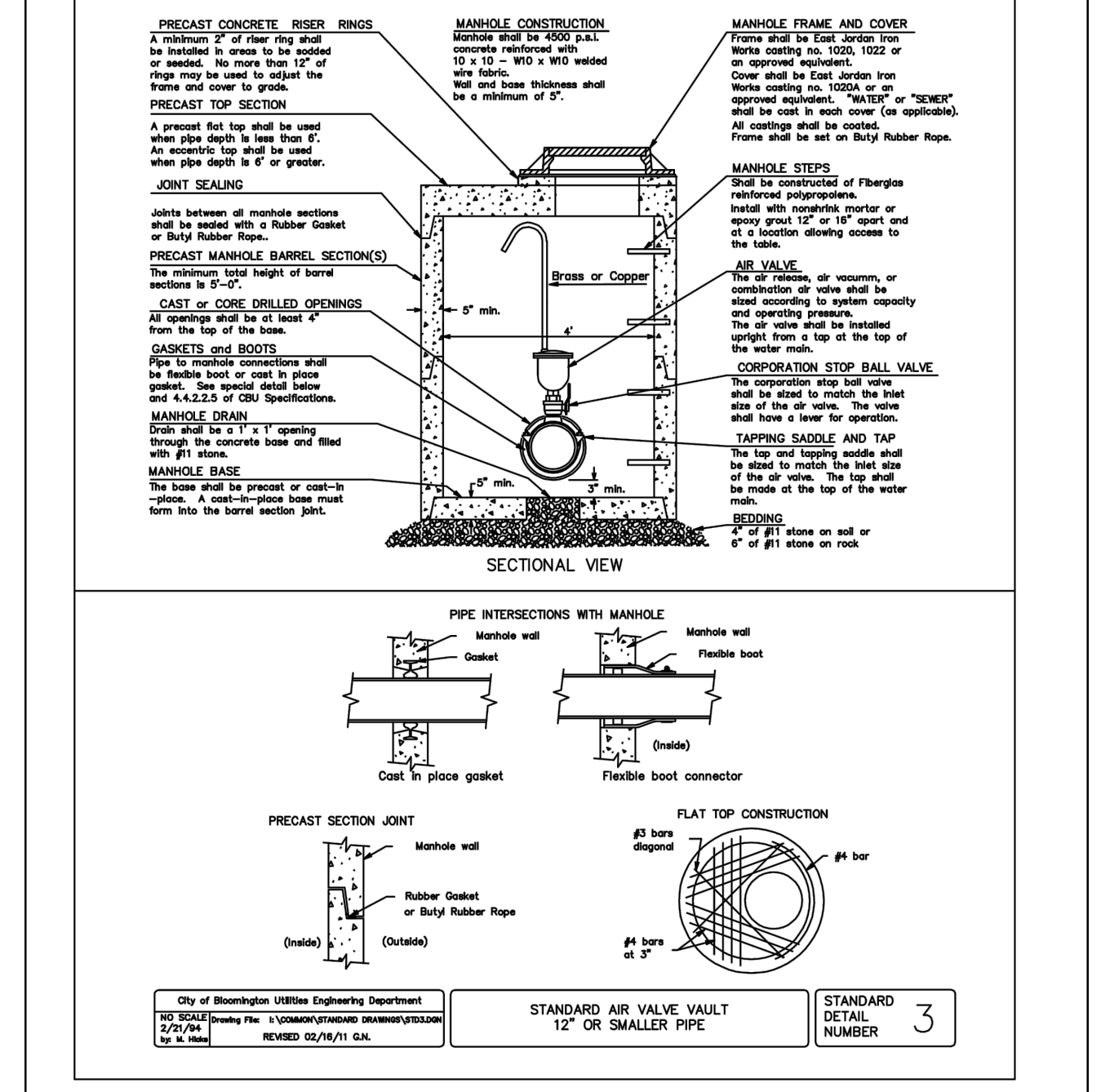
INDIANA DEPARTMENT OF TRANSPORTATION
STANDARD DRAWING NO. E 604-SWCR-09

SIDEWALK CURB RAMP TYPE G AND TYPE H



INDIANA DEPARTMENT OF TRANSPORTATION
STANDARD DRAWING NO. E 720-INST-02

INLET TYPE B AND C



City of Bloomington Utilities Engineering Department
STANDARD AIR RELEASE VALVE VAULT
12" OR SMALLER PIPE
STANDARD DETAIL NUMBER 3
CITY OF BLOOMINGTON UTILITIES
STANDARD AIR RELEASE VALVE VAULT
CUB STANDARD DRAWING 3

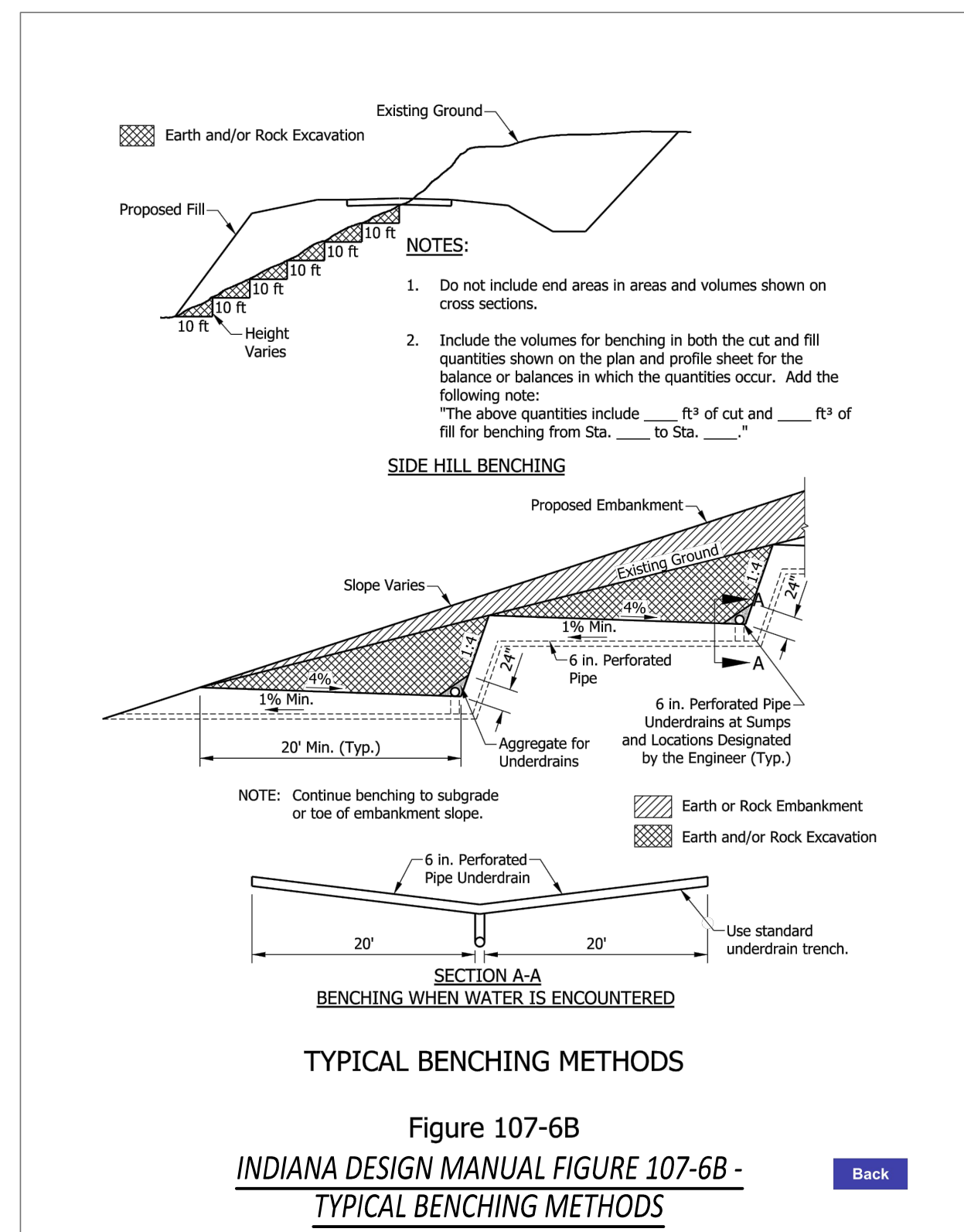
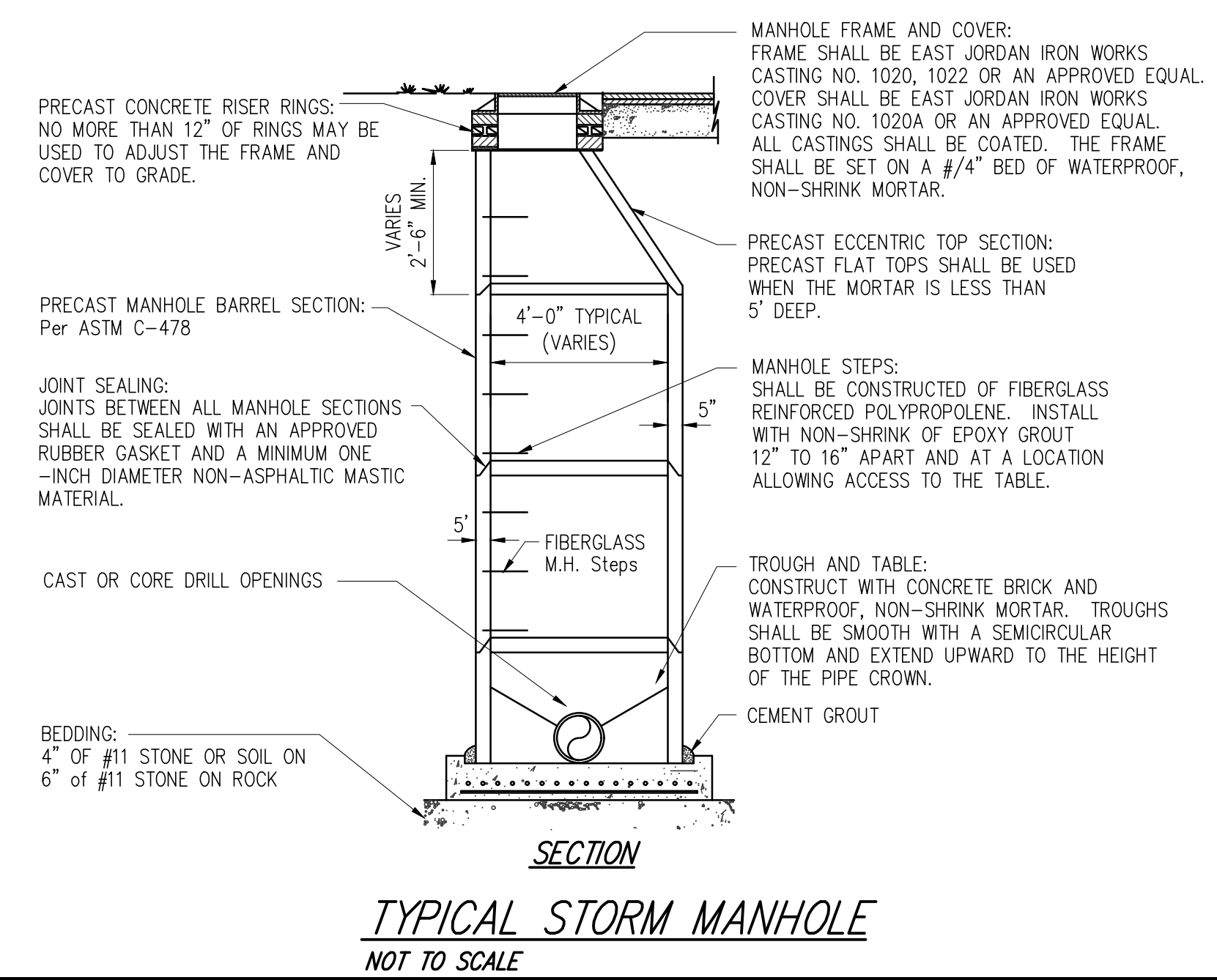


Figure 107-6B
INDIANA DESIGN MANUAL FIGURE 107-6B -
TYPICAL BENCHING METHODS



TYPICAL STORM MANHOLE
NOT TO SCALE

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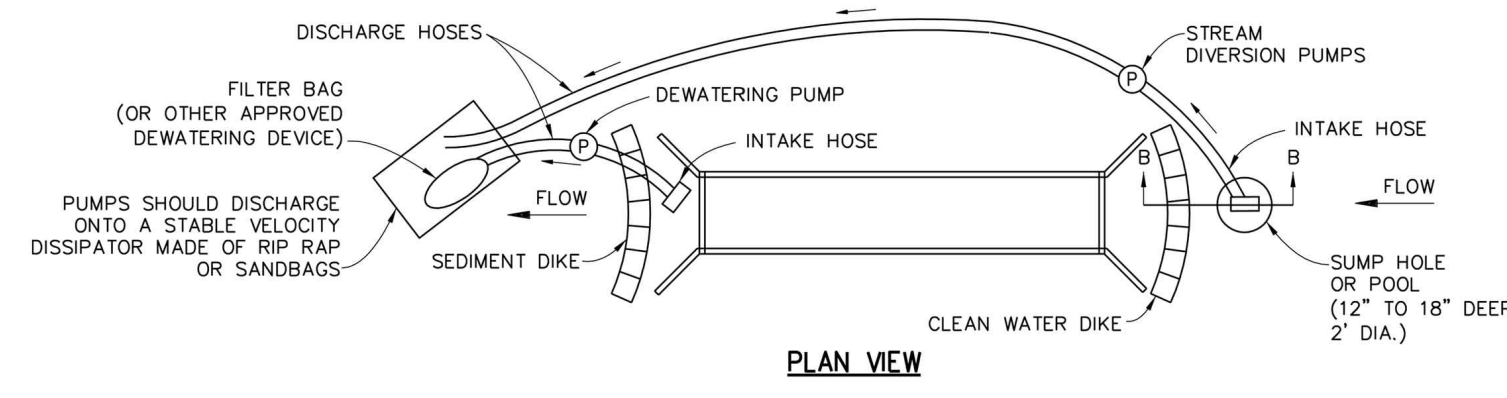
Professional Engineer
No. 60018283
STATE OF INDIANA
Professional Engineer
06.16.2020

Proposed:
NORTH PARK
TRACT B-2 INFRASTRUCTURE PLAN
Bloomington, Indiana

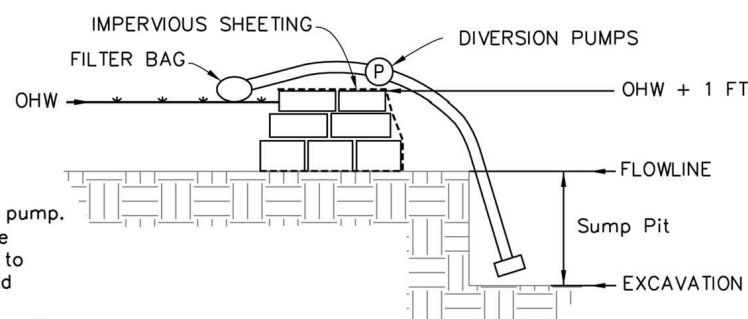
title: DETAILS

designed by: JBT
drawn by: JR
checked by: JSF
sheet no: 2B
project no.: 401044

PUMP-AROUND PRACTICE FOR WATERWAY CONSTRUCTION

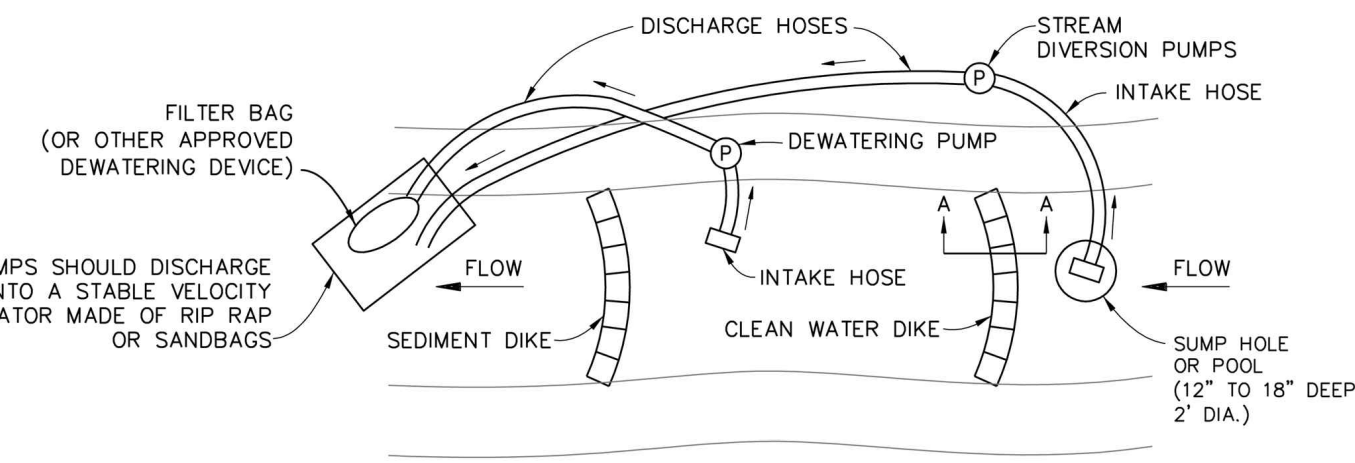


PLAN VIEW

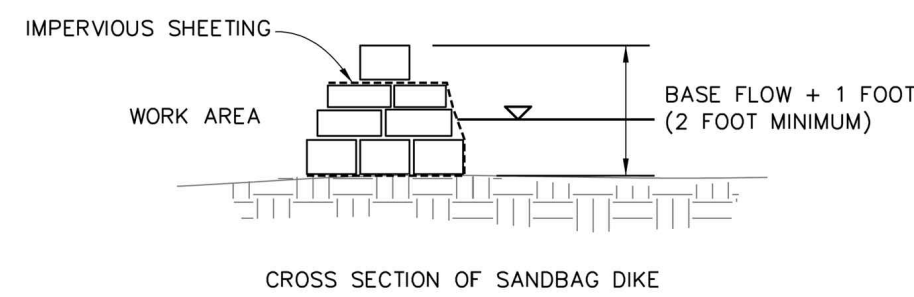


CROSS SECTION OF SANDBAG DIKE SECTION B-B

PUMP-AROUND PRACTICE FOR CULVERT CONSTRUCTION



PLAN VIEW



CROSS SECTION A-A

NOTE:
IF SUMP HOLE IS NEEDED, CAREFULLY CONSIDER AND USE MEASURES TO MINIMIZE IMPACTS TO THE STREAM BOTTOM AND TO MINIMIZE SEDIMENT FROM BEING PUMPED FROM STREAM BOTTOM. USE SUMP HOLE TEMPORARY LININGS OR PROTECTIVE INTAKE AREAS TO PREVENT STREAM IMPACTS AND SEDIMENT UPTAKE

DEWATERING

Dewatering of the project area shall be performed using a mechanical pump. A dewatering (filter) bag shall be securely connected to the end of the discharge hose. The suction hose shall be floated as long as possible to prevent the pump from pulling sediment from the bottom of the pooled area.

The dewatering bag may be of the single-use or reusable variety and shall be constructed of non-woven, polypropylene geotextile material. Each type and size of dewatering bag can handle varying rates of flow. The bag shall have the following minimum specifications:

Permeability	Grab Tensile	Weight	Apparent Opening Size
1.4 sec-1	205 lbs	8 oz/yd ²	80 US Sieve

The dewatering bag shall be placed on a flat surface. Placing the dewatering bag on top of an aggregate base or straw bales will help to increase to flow through the fabric by providing a larger surface area of discharge. Water shall not be pumped from the project area at a rate faster than the manufacturer's maximum recommended flow rate of the dewatering bag. Dewatering bags shall be placed in a location in which runoff will pass through additional sediment control measures prior to entering the storm sewer.

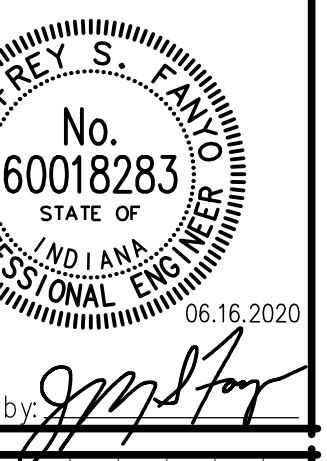
Following completion of dewatering, the sediment accumulated within the dewatering bag shall be removed from the bag and placed in an upland area.

CULVERT CROSSING NOTES

1. ALL WORK ON THIS PROJECT SHOULD BE DONE WHEN STREAM FLOWS AND THE EXPECTANCY OF RAIN ARE LOW. IDEALLY, DISTURBED AREAS OUTSIDE THE STREAM BANKS SHOULD BE SEEDED AND STABILIZED BEFORE THE NEXT EXPECTED RAIN EVENT.
2. THE WORK AREA IN AND WITHIN 20 FT OF THE CREEK SHOULD BE CONSIDERED AND TREATED AS HIGHLY SENSITIVE. DO NOT TRACK VEHICLES OR HEAVY EQUIPMENT WITHIN THE TOP OF BANKS OF THE CREEK OR ALLOW EARTH FILL OR SEDIMENT TO ENTER STREAM FLOW.
3. THE CURRENT EDITION OF THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT'S INDIANA STORM WATER QUALITY MANUAL (ISWQM) IS BY THIS REFERENCE A PART OF THESE PLANS. FIELD DESIGN BY THE CONTRACTOR OF ANY EROSION CONTROL MEASURE SHALL FOLLOW THE GUIDELINES DESCRIBED THEREIN. IF A PARTICULAR EROSION CONTROL MEASURE DOES NOT APPEAR IN THE ISWQM THEN THE LATEST EDITION OF THE INDIANA DEPARTMENT OF TRANSPORTATION'S INDIANA DESIGN MANUAL MAY BE REFERENCED.
4. INSTALL THE COMPONENTS OF THE PUMP-AROUND MEASURE AS NEEDED FOR ANY WORK WITHIN THE STREAM.
5. LOOSE EARTH FROM EXCAVATIONS SHALL BE STOCKPILED ABOVE SILT FENCE AWAY FROM THE STREAM.

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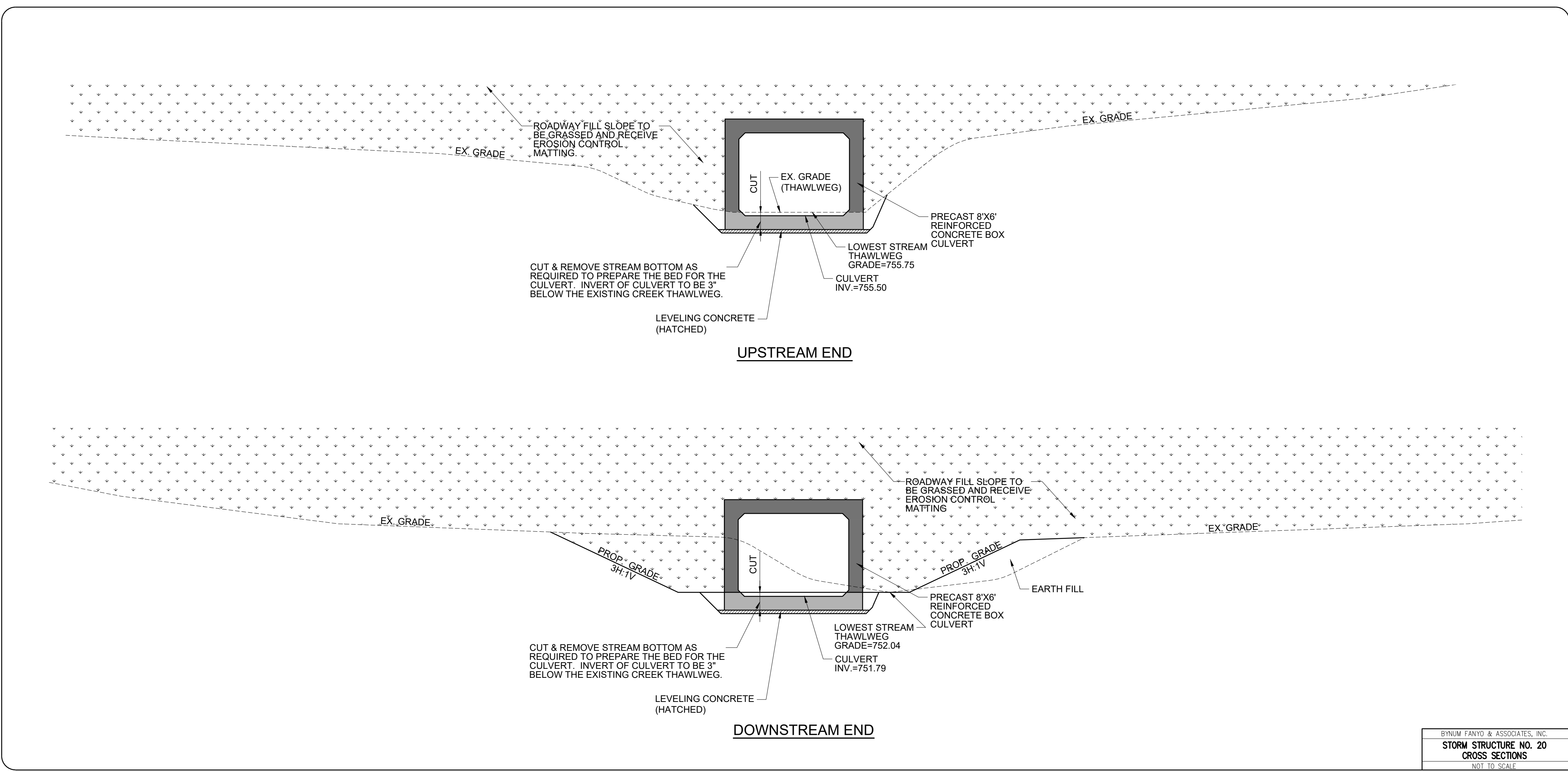
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BYNUM FANTO & ASSOCIATES, INC.
528 north walnut street
Bloomington, Indiana
(812) 332-2990 (Fax)



Proposed:
**NORTH PARK:
TRACT B-2 INFRASTRUCTURE PLAN**
Bloomington, Indiana

title: CULVERT DETAILS

designed by: JBT
drawn by: JR
checked by: JSF
sheet no: 2C
project no.: 401044



BYNUM FANTO & ASSOCIATES, INC.
STORM STRUCTURE NO. 20
CROSS SECTIONS
NOT TO SCALE

RUNOFF CONTROL

Temporary Diversion (RR)



A temporary diversion is a storm water control measure consisting of a temporary ridge, excavated channel, or combination of a channel and supporting ridge constructed on a predetermined grade across a slope to collect storm water runoff and divert it to a treatment device or stable outlet.

Purpose

- To temporarily direct storm water runoff in a controlled manner to a desired location.
- To protect work areas from storm water runoff.
- To manipulate watershed areas for sizing of sediment controls/measures.

Specifications

Contributing Drainage Area

Three acres maximum. (Larger drainage areas may be accommodated, but may require additional design considerations.)

Capacity

Peak runoff from a two-year frequency, 24-hour duration storm event.

Ridge

- Side slope – A ratio of 2:1 or flatter (3:1 or flatter if mowed).
- Top width – two feet minimum.
- Freeboard – six inches minimum.
- Settlement – 10 percent of fill height.
- Stabilized if in place more than 15 working days.

TEMPORARY DIVERSION

Channel

- Shape – parabolic, trapezoidal, or V-shaped.
- Side slopes – ratio of 2:1 or flatter (3:1 or flatter if mowed).
- Depth – 18 inches minimum.
- Grade – positive towards outlet, but not exceeding one percent.
- Stabilized for design flow.

Outlet

Stable, with sediment-laden water diverted to a sediment trap or basin.

Installation

- Lay out the diversion by setting grade and alignment to fit site needs and topography, maintaining a stable, positive channel grade towards the outlet.
- Remove and properly dispose of brush, trees, and other debris from the foundation area.
- Construct the diversion to dimensions and grades shown in the construction plans.
- Construct the diversion ridge in six to eight-inch lifts. Compact each lift by driving wheels of construction equipment along the ridge. Overfill and compact the ridge to design height plus 10 percent to allow for settlement. (The compacted ridge must be at or above design grade at all points, while the channel must be at design grade. Leave sufficient area along the diversion to permit cleanout and regrading.)

Stabilize outlets prior to or during construction of the diversion, diverting sediment-laden storm water flow to a temporary sediment trap (see Temporary Sediment Trap on page 183) or a temporary dry sediment basin (see Temporary Dry Sediment Basin on page 191).

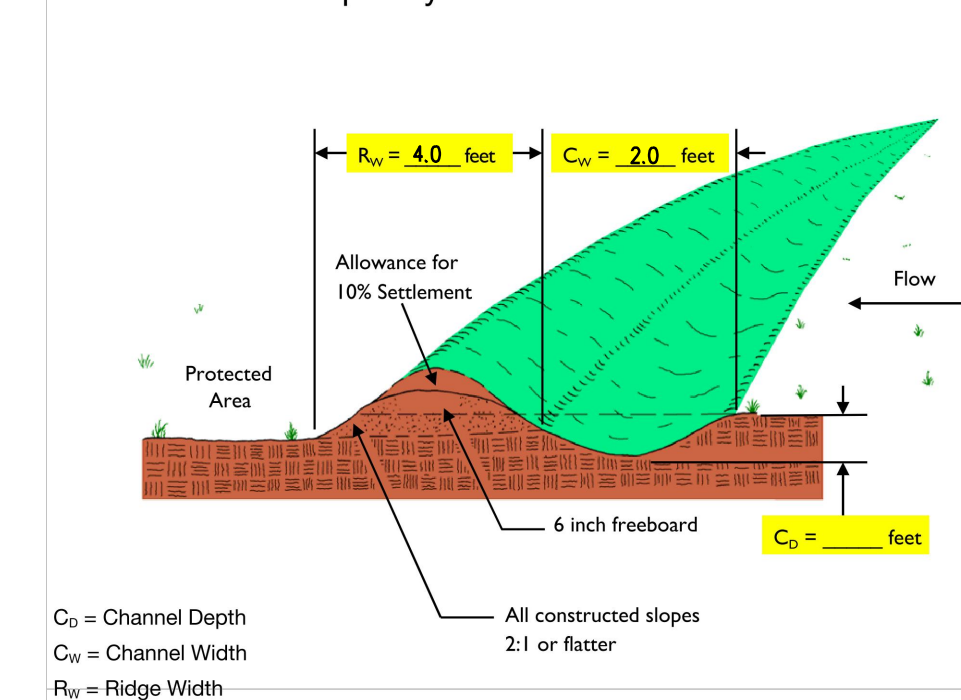
Note: Temporary diversions are also used in conjunction with temporary slope drains (see Temporary Slope Drain on page 103) or other appropriate sediment control measures.

Maintenance

- Inspect within 24 hours of each rain event and at least once every seven calendar days.
- Remove sediment from channel to maintain positive grade.
- Check outlets and make necessary repairs immediately.
- Adjust ridge height to prevent overtopping.

TEMPORARY DIVERSION

Temporary Diversion Worksheet



PRACTICE 3.16 RIPRAP

PURPOSE

- To protect slopes, streambanks, channels, or similar areas subject to erosion by water.

REQUIREMENTS

Rock: Hard, angular, and weather-resistant, having a specific gravity of at least 2.5.
Gradation: Well-graded stone, 50% (by weight) larger than the specified d_{50} ; however, the largest pieces should not exceed two times the specified d_{50} and no more than 15% of the pieces (by weight) should be less than 3 in.
Filter: Use geotextile fabric for stabilization and filtration or sand/gravel layer placed under all permanent riprap installations.
Slope: 2:1 or flatter, unless approved in the erosion and sediment control plan.
Minimum thickness: Two times the specified d_{50} stone diameter.

INSTALLATION (Exhibit 3.16-B)

- Remove brush, trees, stumps, and other debris.
- Excavate only deep enough for both filter and riprap; over-excavation increases the amount of spoil considerably (Practice 3.32).
- Compact any fill material to the density of the surrounding undisturbed soil.

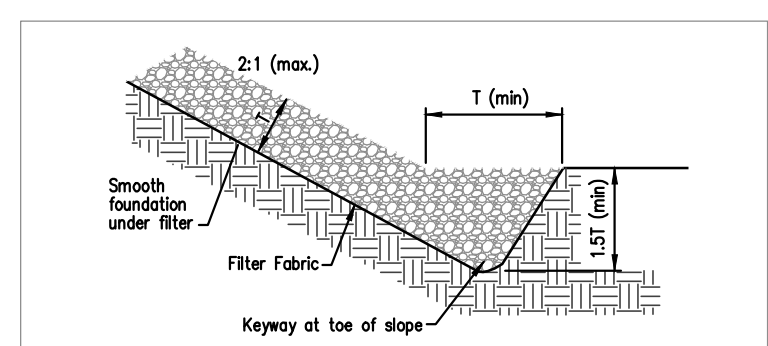


Exhibit 3.16-B. Riprap riprap installation on a slope.

- Cut a keyway in stable material at the base of the slope to reinforce the toe; keyway depth should be 1 1/2 times the design thickness of the riprap and should extend horizontal distance equal to the design thickness.
- Smooth the graded foundation.

FILTER PLACEMENT:

- If using geotextile fabric, place it on the smoothed foundation, overlap the edges at least 12 in., and secure with anchor pins spaced every 3 ft. along the overlap. (For large riprap, consider a 4-in. layer of sand to protect the fabric.)
- If using a sand/gravel filter, spread the well-graded aggregate in a uniform layer to the required thickness (6 in. minimum); if two or more layers are specified, place the layer of smaller gradation first, and avoid mixing the layers.

RIPRAP PLACEMENT:

- Immediately after installing the filter, add the riprap to full thickness in one operation. Do not dump through chutes or use any method that causes segregation of rock sizes or that will dislodge or damage the underlying filter material.)
- If fabric is damaged, remove the riprap and repair by adding another layer of fabric, overlapping the damaged area by 12 in.
- Place smaller rock in voids to form a dense, uniform, well-graded mass. (Selective loading at the quarry and some hand placement may be needed to ensure an even distribution of rock material.)
- Blend the rock surface smoothly with the surrounding area to eliminate protrusions or overflows.

MAINTENANCE

- Inspect periodically for displaced rock material, slumping, and erosion at edges, especially downstream or downslope. (Properly designed and installed riprap usually requires very little maintenance if promptly repaired.)



PRACTICE 3.17 EROSION CONTROL BLANKET (SURFACE-APPLIED)

Erosion control blanket is biodegradable organic or synthetic mulch incorporated into a polypropylene or similar netting material; it is an alternative to mulch and normally used on slopes or in concentrated flow channels.

PURPOSE

- To prevent erosion by protecting the soil from rainfall impact, overland water flow, concentrated runoff, or wind.
- To provide temporary surface stabilization.
- To anchor mulch in critical areas, including slopes.
- To reduce soil crusting.
- To conserve moisture and increase seed germination and seeding growth.

REQUIREMENTS

Material: An organic (straw, excelsior, woven paper, coconut, fiber, etc.) such as Hanes Components Cocoon Erosion Control Blanket with biodegradable netting.
Expected life: 2 years maximum.
Anchoring: Use of staples or stakes to prevent movement or displacement.

INSTALLATION (Exhibit 3.34-B)

- Select the type and weight of erosion control blanket to fit the site conditions (e.g., slope, channel, flow velocity).
- Install any practices needed to control erosion and runoff, such as temporary or permanent diversion, sediment basin or trap, silt fence, and straw bale dam (Practices 3.21, 3.22, 3.72, 3.73, 3.74, 3.75).
- Grade the site as specified in the construction plan.
- Add topsoil where appropriate (Practice 3.02).
- Prepare the seedbed, fertilize (and lime, if needed), and seed the area immediately after grading (Practice 3.12).
- Following manufacturer's directions, lay the blankets on the seeded area such that they are in continuous contact with the soil and that the upslope or upstream ones overlap the lower ones by at least 8 inches.
- Tuck the uppermost edge of the upper blankets into a check slot (silt trench), backfill with soil and tamp down.
- Anchor the blankets as specified by the manufacturer. This typically involves driving 6–8 inch metal staples into the ground in a pattern determined by the site conditions.

MAINTENANCE

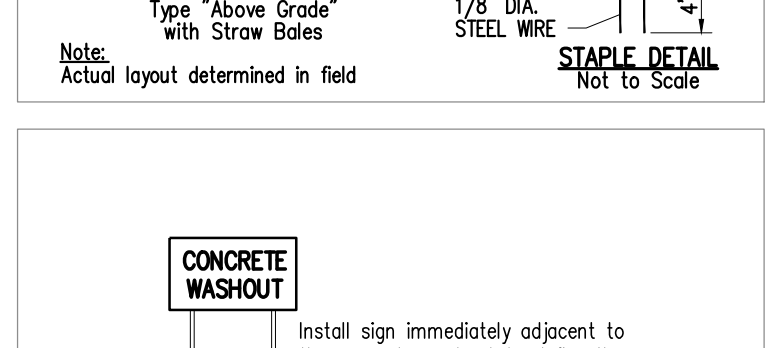
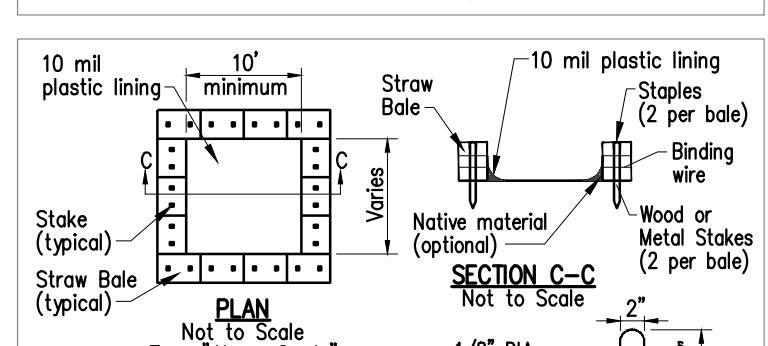
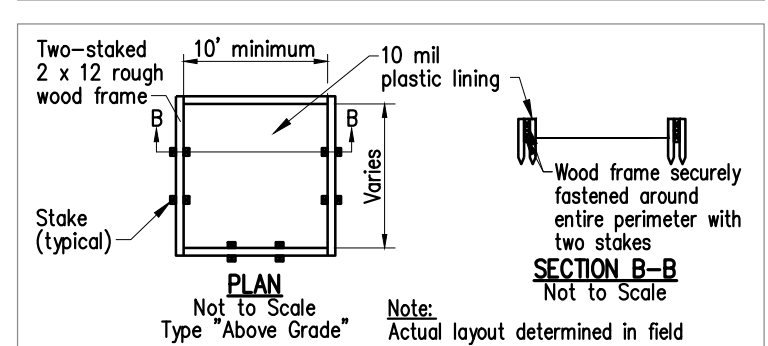
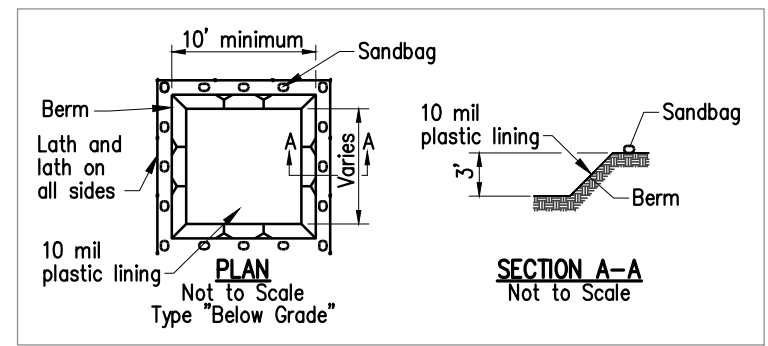
- During vegetative establishment, inspect after storm events for any erosion below the blanket.
- If any area shows erosion, pull back that portion of the blanket covering it, add soil, re-seed the area, and re-apply and staple the blanket.
- After vegetative establishment, check the treated area periodically.



TEMPORARY CONCRETE WASHOUT AREA

REQUIREMENTS

Capacity: Temporary washout facilities shall be constructed above or below grade at the option of the contractor. Temporary washout facilities shall be constructed and maintained in sufficient quality and size to contain all liquid and concrete waste generated by washout operations.
Type: Below grade concrete washout facilities are typical. Above grade facilities are used if excavation is not practical.
Location: Facilities shall be located a minimum of 50' from storm drain inlets, open drainage facilities, and water courses.
Plastic Lining Material: Minimum 10 mil polyethylene sheeting and should be free of holes, tears or other defects.
Straw Bale Dimensions: Approximately 14i n. x 18 in. x 36 in.
Bale Anchoring: Two 3/8-in. long (minimum) steel rebars or 2 x 2-in. hardwood stakes driven through each side.
Signage: Install signage to identify the location of the concrete washout.



INSTALLATION

- Temporary concrete washout facilities shall be constructed as shown in the above details, and as described below. All temporary washout facilities shall have a minimum 10' width, 3' depth, and sufficient length to contain all runoff.
- Straw bales shall be arranged such that they create a basin with a minimum width of 10' and length sufficient to contain all liquid and concrete waste generated.
- The straw bales shall be securely staked using steel rebar or 2 in. x 2 in. hardwood stakes. (Two per bale).
- The basin shall be lined with 10 mil plastic sheeting which is attached to the straw bales using 4" steel wire staples. (Two per bale).

MAINTENANCE

- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and disposed of.
- Washout facilities must be cleaned, or new facilities must be constructed ready for use once the washout is 75% full.
- At the conclusion of concrete construction activities the temporary concrete washout area shall be removed and returned to its original condition.



PRACTICE 3.11 TEMPORARY SEEDING

REQUIREMENTS

Site and seedbed preparation: Graded and fertilizer applied.
Plant Species: Selected on the basis of quick germination, growth, and time of year to be seeded (see Exhibit 3.11-B).
Mulch: Clean grain, straw, hay, wood, fibre, etc., to protect seedbed and encourage plant growth.
Seeding Frequency: As often as possible following construction activity. Daily seedings of rough graded areas when the soil is loose and moist is usually most effective.

APPLICATION (Exhibit 3.11-B)

- Install practices needed to control erosion, sedimentation, and water runoff, such as temporary and permanent diversions, sediment traps or basins, silt fences, and straw bale dams (Practices 3.21, 3.22, 3.72, 3.73, 3.74, and 3.75).
- Grade the site as specified in the construction plan.

SEEDBED PREPARATION:

- Test soil to determine its nutrient levels. (Contact your county SWDC or Cooperative Extension office for assistance and soils information, and fertilizer as recommended by the soil test. If testing is not done, consider applying 400–600 lbs./acre of 12–12 analysis, or equivalent, fertilizer.
- Work the fertilizer into the soil 2–4 in. deep with a disk or rake operated across the slope.

SEEDING:

- Select a seeding mixture and rate from Exhibit 3.11-B, and plant at depth and on dates shown, including available soil testing services.)
- Apply seed uniformly with a drill or cultipacker-seeder or by broadcasting, and cover to the depth shown in Exhibit 3.11-B.
- If drilling or broadcasting, firm the seedbed with a roller or cultipacker.
- Mulch seeded areas to increase seeding success. Anchor all mulch by crimping or tackifying. Use of netting or erosion control blankets is possible, but may not be cost-effective for temporary seeding.

Exhibit 3.11-B. Temporary Seeding Recommendations

Seed Species*	Rate/acre	Planting Depth	Optimum dates**
Wheat or rye	150 lbs.	1 to 1 1/2 in.	9/15 to 10/30
Spring oats	100 lbs.	1 in.	3/1 to 4/15
Annual ryegrass	40 lbs.	1/4 in.	8/1 to 9/1
			9/15 to 10/30

- * Perennial species may be used as temporary cover, especially if the area to be seeded will remain idle for more than a year (Practice 3.12).
- ** Seeding done outside the optimum dates increases the chances of seeding failure.

MAINTENANCE

- Inspect periodically after planting to see that vegetative stands are adequately established; reseed if necessary.
- Check for erosion damage after storm events and repair; reseed and mulch if necessary.
- Topdress fall seeded wheat or rye seedings with 50 lbs./acre of nitrogen in February or March if nitrogen deficiency is apparent. (Exhibit 3.11-B shows only wheat/rye fall seeded.)



TEMPORARY DROP INLET PROTECTION EXCAVATED DROP INLET PROTECTION



PURPOSE TO CAPTURE SEDIMENT AT THE APPROACH TO A STORM DRAIN INLET, ALLOWING FULL USE OF THE STORM DRAIN SYSTEM DURING THE CONSTRUCTION PERIOD.

SPECIFICATIONS

CONTRIBUTING DRAINAGE AREA: ONE ACRE MAXIMUM
CAPACITY: RUNOFF FROM A TWO-YEAR FREQUENCY, 24-HOUR STORM EVENT ENTERING A STORM DRAIN WITHOUT BYPASS FLOW.
POOL AREA: LESS THAN 1 PERCENT SLOPE.
SIDE SLOPES: 2:1 RATIO OR FLATTER.
EXCAVATED DEPTH: ONE TO TWO FEET MEASURED FROM THE TOP OF THE STORM DRAIN INLET.
STORM WATER/SEDIMENT STORAGE VOLUME (EXCAVATED VOLUME) – MINIMUM OF 950 CUBIC FEET.
DEWATERING SYSTEM: KEEP HOLES IN THE DROP INLET STRUCTURE.
GEOTEXTILE FABRIC OR HARDWARE CLOTH WRAPPED AROUND THE SIDES OF THE DROP INLET STRUCTURE.
FILTER AGGREGATE PLACED AROUND THE DROP INLET STRUCTURE.
MATERIALS: GEOTEXTILE FABRIC OR HARDWARE CLOTH.
NOOT CA NO. 8 AGGREGATE IS ACCEPTABLE IF NO. 5 AGGREGATE IS NOT AVAILABLE. THE USE OF NO. 8 AGGREGATE MAY RESULT IN MORE FREQUENT OVERTOPPING OF THE STRUCTURE AND WILL INCREASE THE FREQUENCY OF STRUCTURE MAINTENANCE.

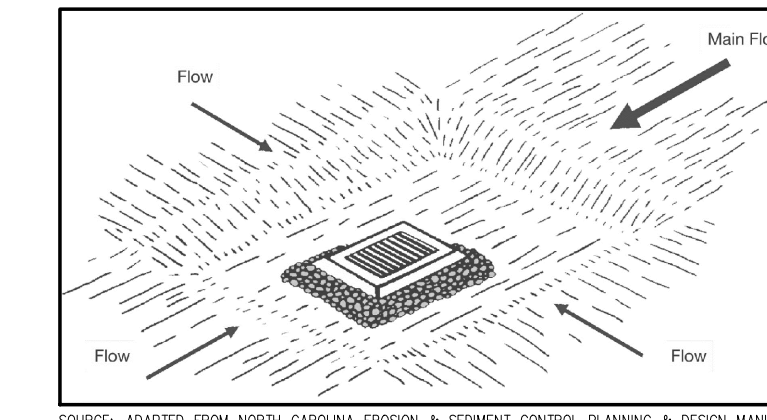
INSTALLATION

- CLEAR THE AREA OF ALL DEBRIS.
- EXCAVATE THE POOL AREA WITH A ONE TO TWO-FOOT DEPTH AND 2:1 SIDE SLOPES OR FLATTER. ORIENT THE LONGEST DIMENSION TOWARD THE LARGEST FLOW (SEE EXHIBIT 1).
- STOOPLE OR SPREAD EXCAVATED SOIL SO IT WILL NOT BLOCK STORM WATER FLOW OR WASH BACK INTO THE EXCAVATION. IF NECESSARY, SOIL MAY BE PLACED TO FORM A DIKE ON THE DOWN-SLOPE SIDE OF THE EXCAVATION TO PREVENT BY-PASS FLOW. THE DIKE SHOULD BE AT LEAST SIX INCHES HIGHER THAN THE TOP ELEVATION OF THE STORM DRAIN INLET GRATE.
- INSTALL KEEP HOLES IN THE DROP INLET STRUCTURE SO THE POOL DRAINS SLOWLY.
- COVER THE KEEP HOLES WITH GEOTEXTILE FABRIC OR HARDWARE CLOTH AND AT LEAST 12 INCHES OF AGGREGATE (NOOT CA NO. 5) TO RETAIN THE SEDIMENT (SEE EXCAVATED DROP INLET DETAIL).

MAINTENANCE

- INSPECT DAILY.
- REMOVE SEDIMENT WHEN POOL AREA IS APPROXIMATELY ONE-HALF FULL OF SEDIMENT.
- REMOVE AND REPLACE AGGREGATE IF SEDIMENT HINDERS DRAINAGE.
- ONCE CONTRIBUTING DRAINAGE AREA HAS BEEN PERMANENTLY STABILIZED, REMOVE SEDIMENT, SEAL KEEP HOLES FULL BASH WITH SOIL, COMPACT AND GRADE TO FINISHED ELEVATION, AND STABILIZE.

EXHIBIT 1



PRACTICE 3.13 DORMANT AND FROST SEEDING

PURPOSES

- To provide early germination and soil stabilization in the spring.
- To reduce seedbed runoff to downstream areas.
- To improve the visual aesthetics of the construction area.
- To repair previous seedings.

REQUIREMENTS

Site and seedbed preparation: Graded and seeded, and lime and fertilizer applied.
Plant species: Selected on the basis of soil type, adaptability to the region, and planned use of the area (see Exhibits 3.13-B and 3.13-C).

APPLICATION (Exhibit 3.13-B and C)

- Grade the area to be seeded.
- Install needed erosion/water runoff control practices, such as temporary or permanent diversions, sediment basins, silt fences, or straw bale dams (Practices 3.21, 3.22, 3.72, 3.73, 3.74, and 3.75).

FOR DORMANT SEEDING

Site and seedbed preparation and mulching can be done months ahead of actual seeding or if the existing ground cover is adequate, seeding can be directly into it.

SEEDING:

- Test soil to determine its nutrient levels. (Contact your county SWDC or Cooperative Extension office for assistance and soils information, and fertilizer as recommended by the soil test. If testing is not done, consider applying 400–600 lbs./acre of 12–12 analysis or equivalent, fertilizer.
- Apply mulch upon completion of grading (Practice 3.15).
- Select an appropriate seed species or mixture from Exhibit 3.13-B or Exhibit 3.13-C, and broadcast on top of the mulch and/or into existing ground cover at rate shown.

FOR FROST SEEDING

Seed is broadcast over the prepared seedbed and incorporated into the soil by natural freeze-thaw action.
Seeding dates: Feb. 28–Mar. 28 (north of US 40), Feb. 15–Mar. 15 (south of US 40).
Broadcast Fertilizer as recommended by a soil test; if testing was not done consider applying 400–600 lbs./acre of 12–12 analysis or equivalent, fertilizer.
Apply mulch upon completion of grading (Practice 3.15).
Select an appropriate seed species or mixture from Exhibit 3.13-B or Exhibit 3.13-C, and broadcast on top of the mulch and/or into existing ground cover at rate shown. Do not work the seed into the soil.

Exhibit 3.13-B. Temporary Dormant or Frost Seeding Recommendations

Seed species*	Rate per acre
Wheat or rye	150lbs.
Spring oats	100 lbs.
Annual ryegrass	60 lbs.

Exhibit 3.13-C. Permanent Dormant or Frost Seeding Recommendations

This table provides several seeding options. Additional seed species and mixtures are available commercially. When selecting a mixture, consider site conditions, including soil properties, slope aspect and the tolerance of each species to shade and droughtiness.

Seed species*

Seed species*	Rate per acre	Optimum soil pH
1. Perennial ryegrass	50 to 75 lbs.	5.6 to 7.0
+ white or ladino clover*	1 1/2 to 3 lbs.	
2. Kentucky bluegrass	30 lbs.	5.5 to 7.5
+ switchgrass	5 lbs.	
+ timothy	6 lbs.	
+ perennial ryegrass	15 lbs.	
+ white or ladino clover*	1 1/2 to 3 lbs.	
3. Perennial ryegrass	22 to 45 lbs.	5.6 to 7.0
+ prairie switchgrass	22 to 45 lbs.	
4. Prairie switch grass	50 to 75 lbs.	5.5 to 7.5
+ white or ladino clover*	1 1/2 to 3 lbs.	
5. Steep Banks and Cuts, Low Maintenance Areas (NOT MOWED):		
2. Prairie switch grass	50 to 75 lbs.	5.5 to 7.5
+ white or ladino clover*	1 1/2 to 3 lbs.	
+ red clover*	15 to 30 lbs.	5.5 to 7.5
(Recommended north of US 40.)		
4. Orchardgrass	30 to 45 lbs.	5.6 to 7.0
+ red clover*	15 to 30 lbs.	
+ ladino clover*	1 1/2 to 3 lbs.	

LAWNS AND HIGH MAINTENANCE AREAS

1. Bluegrass	160 to 210 lbs.	5.5 to 7.5
2. Perennial ryegrass (turf-type)	70 to 90 lbs.	5.6 to 7.0
+ bluegrass	105 to 135 lbs.	5.6 to 7.0
3. Prairie switch grass (turf-type)	195 to 250 lbs.	5.6 to 7.5
+ bluegrass	30 to 45 lbs.	
CHANNELS AND AREAS OF CONCENTRATED FLOW		
1. Perennial ryegrass	150 to 225 lbs.	5.6 to 7.0
+ white or ladino clover*	1 1/2 to 3 lbs.	
2. Kentucky bluegrass	30 lbs.	5.5 to 7.5
+ switchgrass	5 lbs.	
+ timothy	6 lbs.	
+ perennial ryegrass	15 lbs.	
+ white or ladino clover*	1 1/2 to 3 lbs.	
3. Prairie switch grass	150 to 225 lbs.	5.5 to 7.5
+ white or ladino clover*	1 1/2 to 3 lbs.	
+ perennial bluegrass	22 to 30 lbs.	
+ kentucky bluegrass	22 to 30 lbs.	

CHANNELS AND AREAS OF CONCENTRATED FLOW

1. Perennial ryegrass	100 to 150 lbs.	5.6 to 7.0
+ white or ladino clover*	1 to 2 lbs.	
2. Kentucky bluegrass	20 lbs.	5.5 to 7.5
+ switchgrass	3 lbs.	
+ timothy	4 lbs.	
+ perennial ryegrass	10 lbs.	
+ white or ladino clover*	1 to 2 lbs.	
3. Prairie switch grass	100 to 150 lbs.	5.5 to 7.5
+ ladino or white clover*	1 to 2 lbs.	
4. Prairie switch grass	100 to 150 lbs.	5.5 to 7.5
+ Perennial ryegrass	15 to 20 lbs.	
+ Kentucky bluegrass	15 to 20 lbs.	



OUTLET PROTECTION & GRADE STABILIZATION

Rock-Lined Chute



A *rock-lined chute* is a storm water conveyance measure, consisting of a defined channel lined with riprap, that is used to convey water down a steep grade in a non-erosive manner.

Purpose

- To establish a stable grade and prevent erosion and head cutting at the outlet of a conveyance channel.
- To establish an in-channel, stable grade transition and provide for flatter channel grade in the upper and lower reaches of the conveyance channel, thereby reducing flow velocity and reducing potential for in-channel erosion and head cutting at the point of transition.

Specifications

Contributing Drainage Area

50 acres maximum (designed by a qualified individual/professional engineer; larger watersheds may be accommodated but may require additional design considerations).

Capacity

Peak runoff from 10-year frequency, 24-hour storm event.

Foundation

Stable, relatively homogeneous, mineral soil with low piping potential.

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ROCK-LINED CHUTE

- Side slopes – 2:1 ratio or flatter.
- Top width – four foot minimum.

Inlet and Outlet Aprons

- Excavated below design elevation to allow for thickness of filter medium and riprap.
- Aligned straight with channel flow.
- Set at zero grade.
- Transition section consisting of properly sized riprap at the toe of the structure to prevent erosion of the outlet and the channel bed.
- Plunge pool constructed in the outlet apron.

Thickness of Riprap Layer

Two times the d_{50} stone diameter or 12 inches, whichever is greater.

Materials

- Riprap
 - Hard, angular, highly weather resistant.
 - Specific gravity of at least 2.5.
 - Size and gradation that will withstand velocities of channel flow design.
 - Well-graded mixture of stone with 50 percent of the stone pieces, by weight, larger than the d_{50} size and the diameter of the largest stone equal to 1.5 times the d_{50} size.
- Geotextile fabric or well-graded aggregate [INDOT CA No. 9, 11, or 12 (see Appendix D)].
- Concrete grout (optional).
- Drainage tile
 - To prevent seepage of up-slope groundwater.
 - Offset from center of channel.
 - Minimum of two feet of soil cover over the tile.
 - Animal guard placed on pipe outlet section (as needed).

Installation

- Divert surface water runoff around the structure during construction so that the site can be properly dewatered for foundation preparation, construction of headwalls, apron drains, and other structural appurtenances.

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ROCK-LINED CHUTE

- Excavate foundation and apron subgrades below design elevation to allow for thickness of the filter medium and riprap.
- Compact any fill used in subgrade preparation to the density of the surrounding undisturbed soil material.
- Smooth the subgrade enough to protect geotextile fabric from tearing.
- Place geotextile fabric or aggregate bedding material (for stabilization and filtration) on the compacted and smoothed foundation. If more than one piece of geotextile fabric is needed, the upstream piece should overlap the downstream piece by at least 12 inches.
- Install riprap to the lines and elevations shown in the construction plans. If the channel is poorly defined, the final cross section should be nearly level with the middle, slightly depressed or lower than the outer edges of the chute. If the channel is well defined, the filter medium and riprap should extend to the top of the channel banks.
- If the geotextile fabric tears when placing the riprap, repair immediately by laying and stapling a piece of fabric over the damaged area, overlapping the undamaged areas by at least 12 inches.
- Blend riprap smoothly to the surrounding grade.

Maintenance

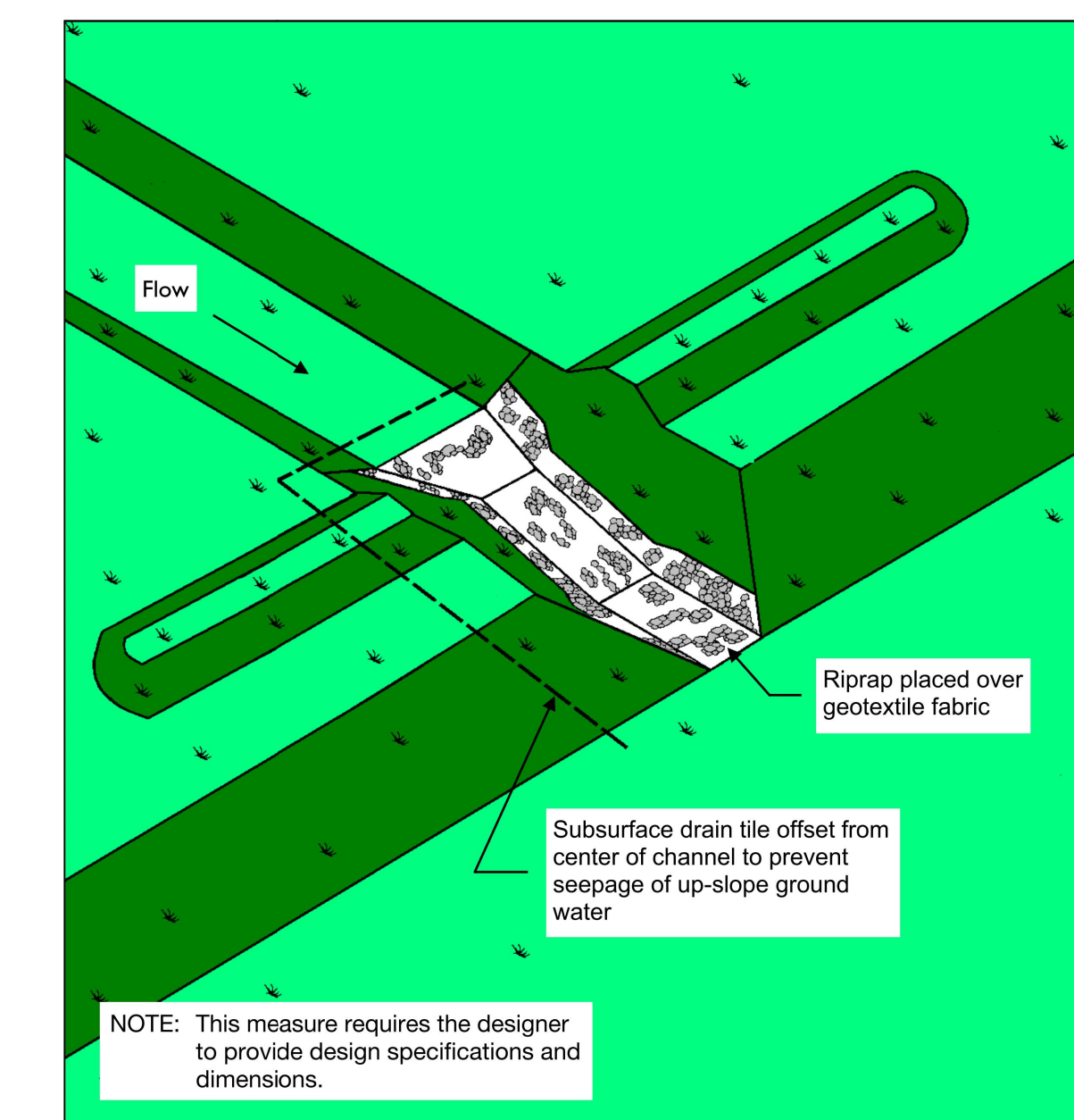
- Inspect within 24 hours of a rain event and at least once every seven calendar days.
- Inspect riprap-lined chutes for stone displacement, erosion along sides of chute, scouring around aprons, and piping or undercutting; make needed repairs immediately, using appropriate size stone and ensuring placement at finished grade.

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ROCK-LINED CHUTE

Exhibit 1



Source: Adapted from U.S. Department of Agriculture, Natural Resources Conservation Service

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revisions:

ARCHITECTURE
CIVIL ENGINEERING
PLANNING

BBB
BYNUM FANTO & ASSOCIATES, INC.

528 north walnut street
Bloomington, Indiana
(812) 332-8030
(812) 339-2990 (Fax)



certified by *J. Fanto*

Proposed:
**NORTH PARK:
TRACT B-2 INFRASTRUCTURE PLAN**
Bloomington, Indiana

title: SWPPP DETAILS

designed by: JBT
drawn by: JR
checked by: JSF
sheet no.: 7
project no.: 401044