INTERDEPARTMENTAL MESSAGE **STATE OF CONNECTICUT**

To	NAME, TITLE Denise Ruzicka, Director, Inland Water Resource Division	DATE April 14, 2011
	AGENCY, ADDRESS Department of Environmental Protection, 79 Elm Street, Hartford	
From	NAME, TITLE Mark W. Alexander, Transp. Assistant Planning Director	TELEPHONE 594-2931
	AGENCY, ADDRESS Department of Transportation, 2800 Berlin Turnpike, Newington	

RECEIVED
AUG 0 1 2011
LAND WATER RESOURCES DIVISION

Subject: **Project 171-305**
New Britain – Hartford Busway
New Britain, Newington, West Hartford and Hartford

In regards to your comments dated March 30, 2011 the following responses, along with supporting information, are attached for your review.

Any questions pertaining to this application may be directed to Laurie LaRocca at (860) 594-3388.

Attachments - Copy of Binder that went to DEP

cc: Jeff Caiola - Sharon Yurasevecz
Danielle Missell

L.LaRocca
bcc: Thomas J. Maziarz
Robbin L. Cabelus - Mark W. Alexander
Timothy M. Wilson - Richard B. Armstrong
Brian T. Cunningham
Michael Masayda
Antonio Morelli
Linda Perelli Wright

New Britain-Hartford Busway Project; ConnDOT Project No. 171-305

Response to DEP letter (Request for Additional Information) dated March 30, 2011

WQC-201005238/IW-201005239/FM-201005237/SCEL-201005240
New Britain to Hartford Busway
Piper Brook, Unnamed tributaries to Piper Brook, Bass Brook, Kane Brook, Trout Brook, South and North Branch of the Park River, Park River
New Britain, Newington, West Hartford and Hartford

DEP Comment #1: Contract No. 155-HO25 and 63-643 show increases into the existing stormwater drainage system. The application states that MDC has reviewed the pre- and post-development flows and detention system calculations and has indicated that the flow rates are acceptable. A copy of the MDC and City of Hartford approval must be provided for all connections into the existing drainage systems as well as approval and/or acknowledgement of all storm drainage surcharge areas. Under Contract No. 63-H137, concerning the Park River Conduit, MDC prohibits connecting to the combined system and if connecting to their separated system they would like no net increase in flow. This system requires approval from both the MDC and the City of Hartford. Note: the Letter dated October 18, 2010 from the City of Hartford is not sufficient. This letter doesn't address the surcharges and only concerns City of Hartford's drainage system. This letter only concerns the minimal increases in flow to City of Hartford's drainage system.

Response to Comment: *The Department is currently working on getting the approval letter from MDC and the City of Hartford. As discussed with your office, this can be included as a condition of the permit.*

DEP Comment #2: The applicant must demonstrate that the bio-retention basin located at the Elmwood Station (near station 308) will not have an adverse impact on the Trout Brook Flood Control Structure. Clear documentation must show that the excavation and construction of the bio-retention basin will not impact the existing concrete wall and that any water in the basin will not impact the wall or supporting soil.

Response to Comment: *Attached please find Response Letter dated March 14,2011 from SEA Consultants to the Department of Transportation indicating no adverse impacts on the Trout Brook Flood Control Structure.*

DEP Comment #3: Several of the calculations are missing for the determination of pre- and post development flows for the 100-year frequency storm event. Although tables have been provided, supporting calculations to the tables should be submitted for review. All contracts with the potential for increase in peak flows must provide supporting calculations. In addition, tables and calculations are also missing from Attachment H:

- Contract No. 63-H137 - calculations are missing
- Contract No. 88-H034-calculations are missing
- Contract No. 88-H035 - calculations are missing
- Contract No. 88-H039- calculations are missing for Newington Junction
- Contract No. 155-H025- calculations and tables are missing
- Contract No. 93-H046 - calculations are missing and tables are not included in 100 per cent Drainage Submission dated November 2009

-Contract No. 93-H052 - calculations are missing and tables are not included in Drainage Report Final Design dated July 2010

Response to Comment: *Attached please find requested calculations. Please note Contract 093-H052 (Amtrak Access Road) was designed for the 100-year storm per Amtrak Requirements. 2-yr and 10-yr outputs were not required and therefore not available.*

DEP Comment #4: The Professional Certification Form is not included or signed on several of the contracts. This must be completed by all Professional Engineers responsible for provided the engineering and supporting calculations.

- Contract No. 88-H035 not signed
- Contract No. 155-H025 not signed
- Contract No. 93-H052 missing signed Professional Certification Form
- Contract No. 93-H046 missing signed Professional Certification Form

Response to Comment: *Attached please find Professional Certification Forms. Additionally, all copies of the Professional Certification Forms have been signed by the Department.*

DEP Comment #5: Attachment H in the application is missing for the following projects including the checklist, work sheet engineering report mad Professional Certification Form:

- East Main Street Station *(included with H035 Attachment H)*
- East Street Station *(Included with H034 Attachment H)*
- Newington Station *(Included with H046 Attachment H)*
- Parkville Station *(Included with H025)*
- Sigourney Station *(Included with H137)*
- Flatbush Station (*Included with H025)*
- Contract No. 93-166 *Cedar Street Bridge*
- ContractNo. 63-643 *Included with H025 Attachment H*

Response to Comment: *Individual Attachment H's for the referenced station projects were not included because they do not have dedicated storm discharge points. The drainage for these stations ties directly into the Busway drainage and is accounted for in the line designers' calculations (see note in italics above). The Flatbush Bridge is incorporated with the Attachment H for H025. The Cedar Street Bridge is a replacement of an existing bridge, with no*

associated drainage changes or specific discharge points and therefore does not require an Attachment H (per coordination phone call with DEP 4/6/11). No attachments required.

DEP Comment #6: Water Quality Treatment is required for the following stormwater drainage systems:

- Contract No. 93-H046 System 1A - prior to discharging into the tributary of Piper Brook.
- Contract No. 93-H046 System 1C and System 2 - prior to discharging to Wetland 27A.
- Contract No. 93-H046 System 8 - prior to discharge into Trout brook.
- Contract No. 93-HO46 System 5 Drainage Ditch - construction details are required for the swale and the calculations must confirm the adequacy of pretreatment for treating the 2000 foot piped drainage system.
- Contract No. 155-HO25 System 3 - prior to discharge into Kane Brook. Ditch No. 2 is not sufficient for treatment.
- Contract No. 155-HO25 System 4 - prior to discharge into Kane Brook.
- Contract No. 63-H 137 - the plans show no proposed pre-treatment for the entire contract. This must be addressed.

Response to Comment: *See attached responses.*

DEP Comment #7: Construction details are required for the following:

- Contract No. 93-HO46 System 5 Drainage Ditch and for the swale

Response to Comment: *See attached plan sheets.*

DEP Comment #8: There is a surcharge located at Contract No. 155-HO25 System 3 CB Sta. 384+35 LT and System 4 CB Sta. 385+10 LT both adjacent to Kane Brook. This must be addressed to show no adverse impacts to the wetland or watercourse and no erosive potential to embankment slope and banks of Kane Brook

Response to Comment: *Per coordination phone conversation with DEP (4/6/11), the existing embankments are significantly vegetated with established plants, which will aid the proposed riprap aprons in preventing erosion. No attachment required.*

DEP Comment #9: Kane Station - Drainage Plan required

Response to Comment: *See attached plan.*

DEP Comment #10: Parkville Station - Construction details are required for the detention system. Pretreatment is required prior to the stormwater drainage system discharging to the underground detention system.

Response to Comment:
Detention Pond construction details are provided on sheet DRG-14 (see attached). The water quality treatment measures used before discharge into the pond are 2' Deep Sumps and an offline type system design (ie, trunk line of the drainage system running down the middle with CB's located off of the trunk line) for the entire system.
Three connections to the system are proposed from the station site. One connection carries flow from 9 yard drains, all proposed in grassed areas. A second connection carries flow from the vaulted arch roof leaders. We do not feel that pre-treatment is warranted in these cases. The third connection is from a single catch basin in the parking area collecting approximately 2600 square feet of pavement area. A 4-foot sump is proposed on this basin and we do not believe additional pretreatment is warranted.

DEP Comment #11: Contract No. 63-643 – Grading Plans required.

Response to Comment: *See attached grading plans.*

DEP Comment #12: Elmwood Station – Sedimentation Control Plan is required.

Response to Comment: *See attached plan.*

DEP Comment #13: The applicant should confirm that drainage system 13A and 13B and Channel No 5 was removed from contract No.88-H034 and Contract No. 93-H046 respectably. The plans do not show the system however, the calculations are including in the application package.

Response to Comment: *See attached printed email from Ammann & Whitney confirming these revisions as noted. 13A and 13B have been removed from H034, Channel 5 was removed from H046. Calculations have been revised accordingly.*

DEP Comment #14: Watershed maps are missing for following stormwater calculations and should be provided.

- Contract No. 93-H046
- Contract No. 88-H034

Response to Comment: *Watershed Maps Are Attached.*

DEP Comment #15: Final plates should be provided for the revised changes submitted on March 8, 2011. Although the plates were provided electronically for review, the final hard copy should be a part of the final application file.

Response to Comment: *Updated Plates are attached.*

Appendix A: *Appendix A includes specific pages of the Permit Application Attachment H that have been updated to be consistent with the drainage calculations submitted in response to March 30, 2011 review comments and as a follow-up to the drainage revision scroll plan submitted to DEP on 3/8/11 that illustrated minor drainage changes that have taken place since August 2010. These pages are meant to replace the originals submitted in August 2010.*

Response to Comments compiled by:
Baker Engineering

RESPONSE TO COMMENT #2 ATTACHMENTS

Baker

KLEINFELDER
Bright People. Right Solutions.

S E A
S E A CONSULTANTS INC

MEMORANDUM

DATE: March 14, 2011

TO: Mr. Brian Cunningham, CTDOT

FROM: Al Bisacky, P.E.

SUBJECT: Bio-Basin at Elmwood Station

S E A No.: 2008228

We are in receipt of a Request for Additional Information addressed to Mr. Mark Alexander for WQC-201005238/IW-201005239/FM-201005237/SCEL-201005240. The letter is dated March 14, 2011 and is signed by Ms. Denise Ruzicka, Director, Inland Water Resource Division (CTDEP).

One requested item (No. 6) pertains to work designed by S E A, the requested information is reproduced below:

> *"The applicant must demonstrate that the Bio-retention basin located at the Elmwood Station (near station 308) will not have an adverse impact on the Trout Brook Flood Control Structure. Clear documentation must show that the excavation of and construction of the bio-retention basin will not impact the existing concrete wall and that any water in the basin will not impact the wall or supporting soil."*

Our response to this request is as follows:

- *The excavation of and construction of the bio-retention basin will not impact the existing concrete wall because the* construction of the basin will result an insignificant and minimal decrease in loading on the wall. See the attached plan and section drawings which illustrate that the majority of the basin lies beyond the zone of influence for the wall. For that portion of the basin that falls within the influence line, the excavated soil will be replaced on an infrequent basis with a lesser volume of water, which has a lower specific gravity (weight) than the existing soil. This minimal (and negative) loading change on the wall will not result in an adverse impact to the flood control structure or its performance.

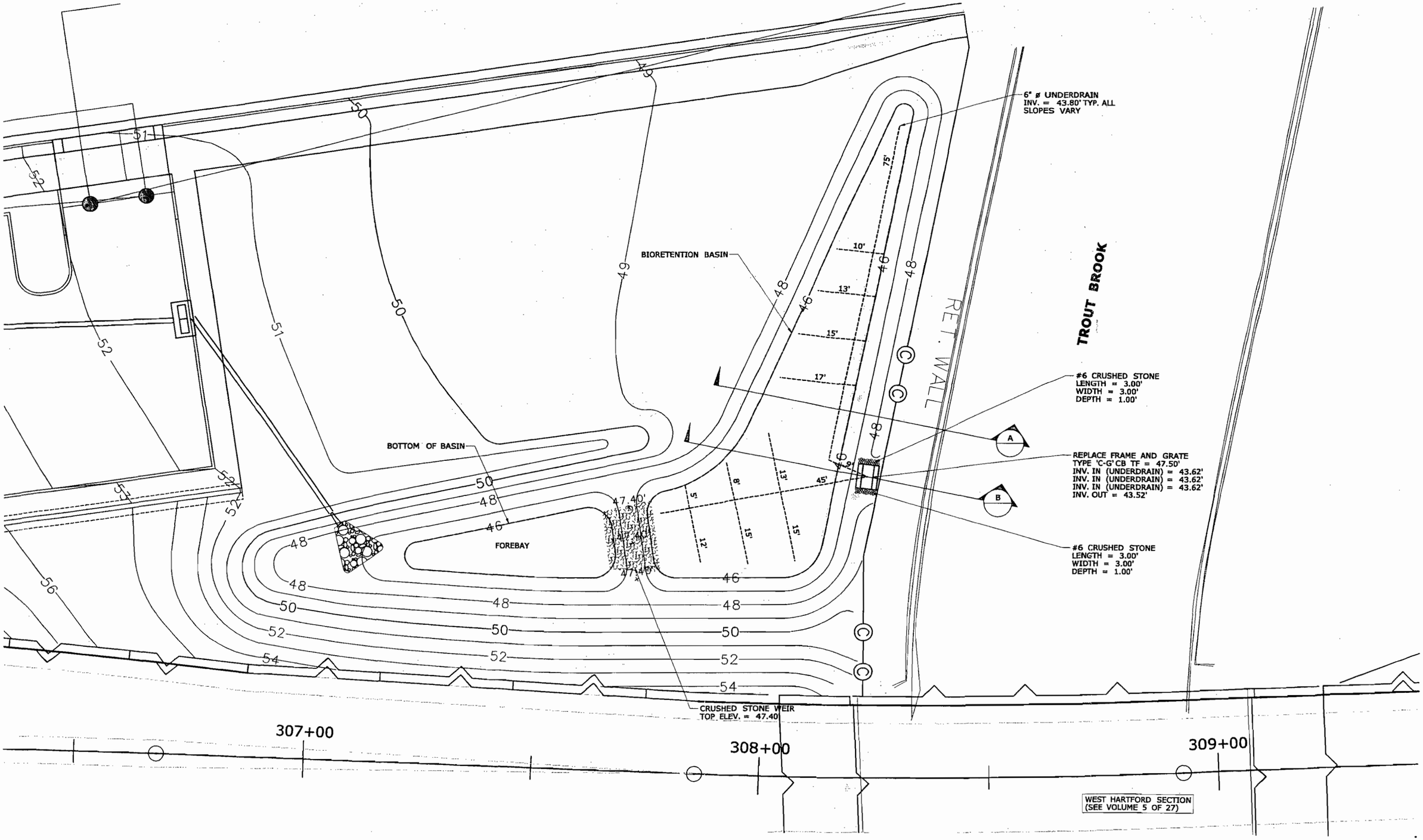
- *The (weight of the) water in the basin will not impact the wall because the majority of the basin lies beyond the zone of influence for the wall. For that portion of the basin that falls within the influence line, the lesser*

weight of the water will not result in an adverse impact to the flood control structure or its performance.

- *The water in the basin will not impact the supporting soil. The* bio-basin incorporates a robust underdrain system (see the attached construction details). This system comprises a one-foot thick layer of crushed stone and a redundant pipe collection network under the entire bottom of the main basin area. The stone is surrounded with filter fabric to prevent the migration of fines into it, which might otherwise potentially reduce its hydraulic capacity to transmit water to the underdrain pipe system. There are two independent pipe collection systems which are effectively interconnected via the stone bed. Both systems connect to the (existing) primary basin outlet which passes through the flood wall. The redundant collection systems decrease the potential that the capacity of the underdrain system will be reduced by clogging or damage to any one pipe.

  In the unlikely circumstance that a complete failure of the underdrain system occurs, water from the basin would infiltrate into the underlying soil, primarily in a vertical direction. The soil so subjected to infiltration lies beyond the wall loading influence line. The flood wall itself has two horizontal rows of weep holes (see the attached photograph). Any water that exfiltrates from the basin and travels towards and into the influence zone of the wall would be drained through these weep holes in exactly the same way all water that may be behind the wall currently does. Any water that exfiltrates from the basin *will not result in an adverse impact to the flood control structure or its performance*

In summary, the bio-basin will not have an adverse impact on the Trout Brook flood wall, either directly via increase loading surcharge, or via increased hydrostatic loading.



REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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-	-	-	-

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 3/14/2011

DESIGNER/DRAFTER: EAD

CHECKED BY: AGB

SCALE IN FEET 0 10 20

SCALE 1"=10'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\Elmwood Plan Sheet.dgn

SIGNATURE/ BLOCK:

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY ELMWOOD STATION

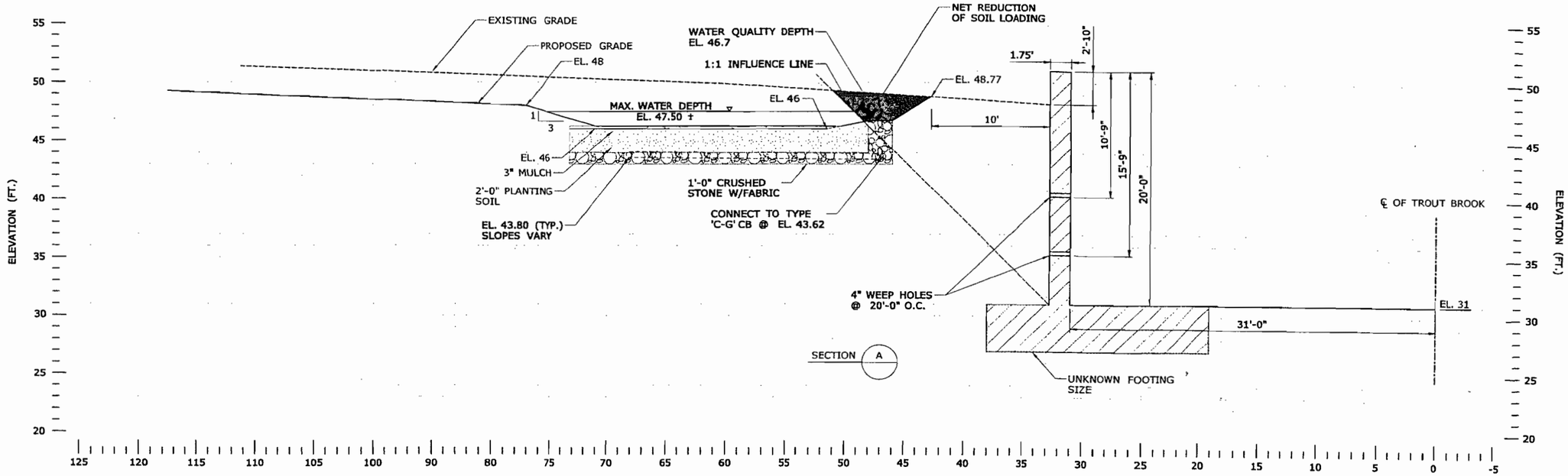
TOWN: WEST HARTFORD

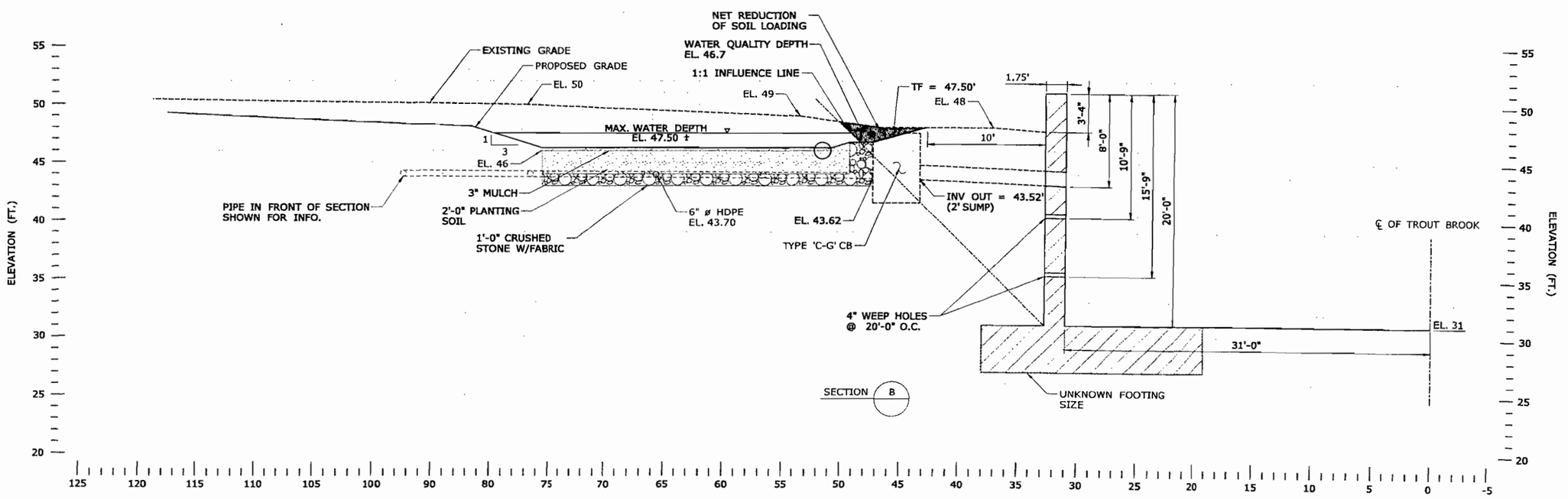
DRAWING TITLE: BIO-BASIN PLAN

PROJECT NO. 093-180

DRAWING NO.

SHEET NO.





REV.	DATE	REVISION DESCRIPTION	SHEET NO.

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Plotted: 3/14/2011

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CHECKED BY: AGB

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STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

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BLOCK:

PROJECT TITLE:
NEW BRITAIN - HARTFORD
BUSWAY
ELMWOOD STATION

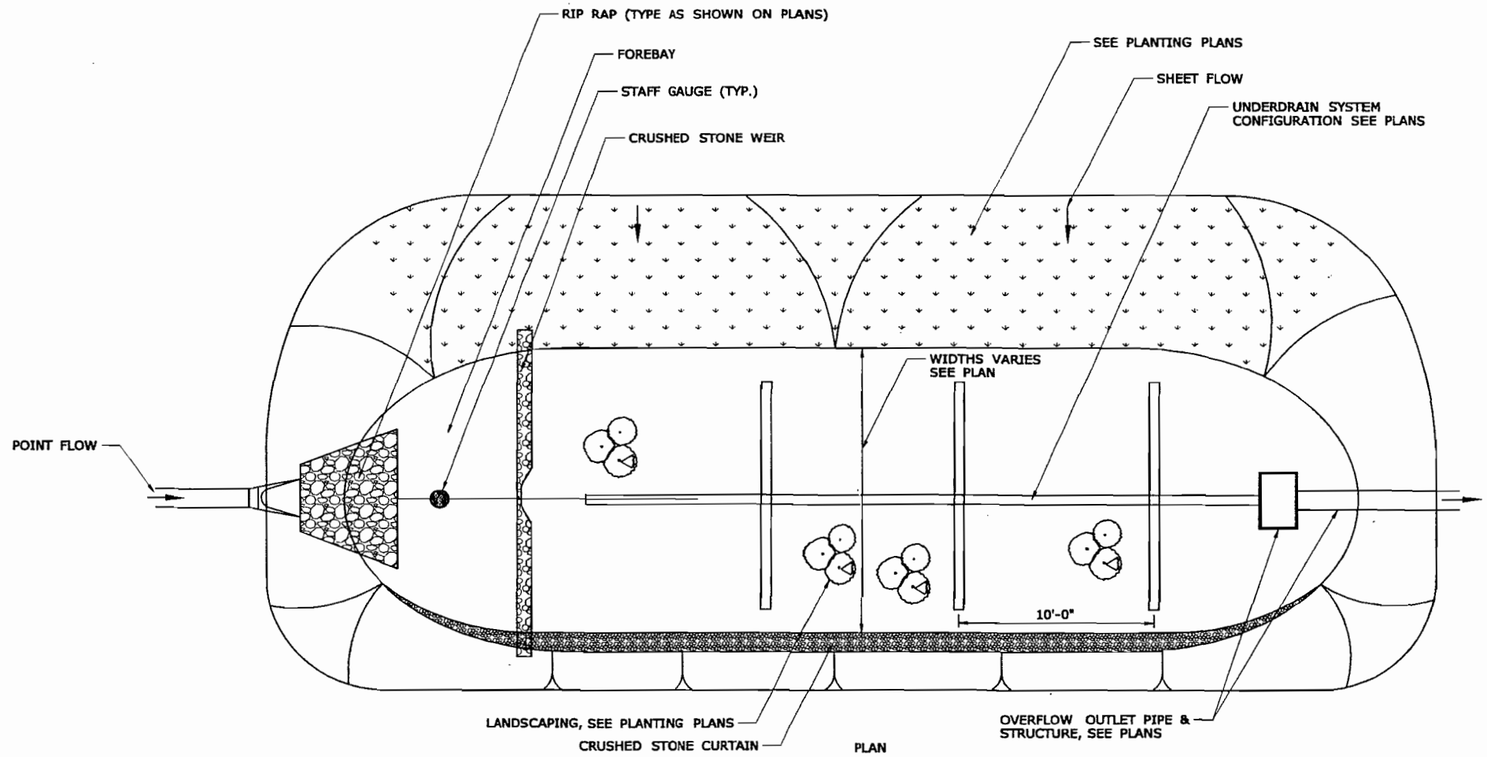
TOWN: WEST HARTFORD

DRAWING TITLE:
BIO-BASIN
RETAINING WALL

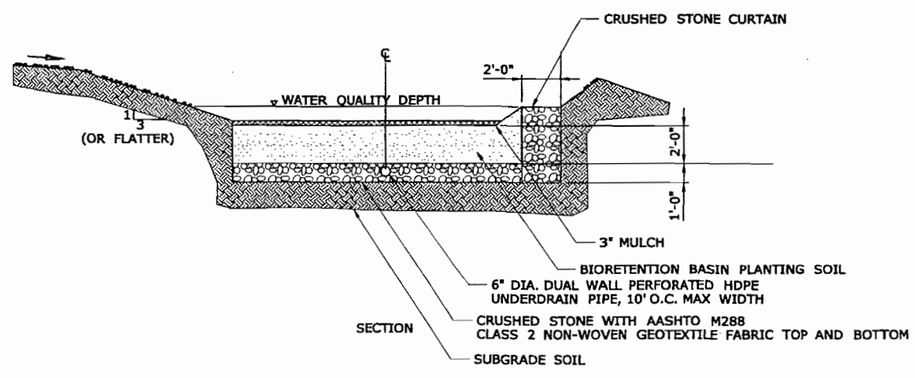
PROJECT NO. 088-178

DRAWING NO.

SHEET NO.



PLAN



SECTION

BIORETENTION BASIN

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted: 3/14/2011

DESIGNER/DRAFTER: EAD
CHECKED BY: AGB
SCALE AS NOTED

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

SIGNATURE/ BLOCK:

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: WEST HARTFORD DETAILS

DRAWING TITLE: BIORETENTION BASIN

PROJECT NO. 093-180

DRAWING NO.

SHEET NO.

4" WEEPHOLES
(TYP).

RESPONSE TO COMMENT #3 ATTACHMENTS

Baker

H - 137

TABLE 1

SUMMARY OF STARTING WATER SURFACE ELEVATION AT THE PARK RIVER CONDUIT GATES (NGVD)

5-YEAR DISCHARGE - 4100 CFS

GATE	FLAP GATE / PIPE INVERT ELEVATION (FT NGVD)	FLAP GATE SIZE DIAMETER (FT)	SLUICE GATE INVERT ELEVATION (FT NGVD)	SLUICE GATE SIZE LxW (FT)	GATE CHAMBER TOP OF FRAME ELEVATION (FT NGVD)	CALCULATED PARK RIVER ELEVATION (FT NGVD)	RECOMMENDED PARK RIVER ELEVATION (FT NGVD)
6	31.50	36"	36.50	3 x 3	42.71	19.46	19.46
7	26.50	54"	25.00	4.5 x 4.5	48.20	20.38	20.38
8	33.40	48"	29.70	4 x 4	46.90	20.38	20.38
9	32.25	24"	32.75	2 x 2	42.00	20.48	20.48
10	29.75	36"	29.75	3 x 3	42.20	20.64	20.64
11	29.25	42"	29.25	3.5 x 3.5	42.70	20.99	20.99
ARMORY PUMP STATION (36" PIPE FROM ARMORY)	15.00/16.13	7 x 8 (GATE 5)	15.00	6 x 7 (GATE 3)	45.00	19.46	19.46
ARMORY PUMP STATION (48 " PIPE FROM RAMPS)	15.00/15.00	7 x 8 (GATE 5)	15.00	6 x 7 (GATE 4)	45.00	19.46	19.46
GULLY BROOK AT PARK RIVER	N/A	N/A	14.97	N/A	N/A	14.68	17.30
GULLY BROOK AT GATE	25.77	36"	20.85	3 x 3	36.90	24.19	24.19

Notes:
Pumps in Armory Pump Station do not activate until elevation 23.5 feet NGVD
2 Year water surface elevation in CT River was calculated to be 17.3 feet NGVD
Water surface elevation for the DPW parking Lot was assumed to be the crown of the 42 inch pipe

TABLE 2
SUMMARY OF EXISTING AND PROPOSED DRAINAGE AREAS

	WATERSHED AREAS (ACRES)																	
LAND USE COVER	EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED
	GATE 6	GATE 6	GATE 8	GATE 8	GATE 9	GATE 9	GATE 10	GATE 10	GATE 11	GATE 11	ARMORY PUMP STATION 36"	ARMORY PUMP STATION 36"	ARMORY PUMP STATION 48"	ARMORY PUMP STATION 48"	GULLY BROOK	GULLY BROOK	TOTAL SUM OF SYSTEMS	TOTAL SUM OF SYSTEMS
PERVIOUS	2.932	3.830	4.563	4.651	0.000	0.000	1.404	1.404	6.176	5.590	1.324	1.324	7.447	7.397	1.157	1.232	25.004	25.429
IMPERVIOUS	4.678	5.347	7.244	9.536	2.550	3.434	2.773	3.461	13.082	15.285	13.727	13.727	5.598	5.373	16.651	16.813	66.303	72.977
SUM	7.610	9.177	11.807	14.187	2.550	3.434	4.177	4.865	19.257	20.876	15.051	15.051	13.045	12.770	17.808	18.045	91.307	98.406
% IMPERVIOUS	61%	58%	61%	67%	100%	100%	66%	71%	68%	73%	91%	91%	43%	42%	94%	93%	73%	74%

TABLE 3

SUMMARY OF EXISTING AND PROPOSED BUSWAY RELATED DRAINAGE AREAS

	WATERSHED AREAS (ACRES)																											
PARAMETER	EXISTING	PROPOSED	DELTA	EXISTING	PROPOSED	DELTA	EXISTING	PROPOSED	DELTA	EXISTING	PROPOSED	DELTA	EXISTING	PROPOSED	DELTA	EXISTING	PROPOSED	DELTA	EXISTING	PROPOSED	DELTA	EXISTING	PROPOSED	DELTA	EXISTING	PROPOSED	DELTA
	GATE 6	GATE 6		GATE 8	GATE 8		GATE 9	GATE 9		GATE 10	GATE 10		GATE 11	GATE 11[1]		ARMORY PUMP STATION 36"	ARMORY PUMP STATION 36"		ARMORY PUMP STATION 48"	PROPOSED ARMORY PUMP STATION 48"		GULLY BROOK[2]	GULLY BROOK[2]		CTDPW PARKING LOT TO 42" PIPE	CTDPW PARKING LOT TO 42" PIPE	
PERVIOUS	2.932	3.830	0.898	4.563	4.651	0.088	0.000	0.000	0.000	1.404	1.404	0.000	6.176	5.590	-0.585	1.324	1.324	0.000	7.447	7.397	-0.050	1.157	1.232	0.075	0.000	0.000	0.000
IMPERVIOUS	4.678	5.347	0.669	7.244	9.536	2.292	2.550	3.434	0.884	2.773	3.461	0.688	13.082	15.285	2.204	13.727	13.727	0.000	5.598	5.373	-0.225	16.651	16.813	0.162	2.763	2.763	0.000
SUM	7.610	9.177	1.567	11.807	14.187	2.379	2.550	3.434	0.884	4.177	4.865	0.688	19.257	20.876	1.618	15.051	15.051	0.000	13.045	12.770	-0.275	17.808	18.045	0.237	2.763	2.763	0.000
% IMPERVIOUS	61%	58%	-0.032	61%	67%	0.059	100%	100%	0.000	66%	71%	0.048	68%	73%	0.053	91%	91%	0.000	43%	42%	-0.008	91%	93%	-0.003	100%	100%	0.000
RUNOFF COEFFICIENT	0.61	0.55	-0.063	0.64	0.61	-0.032	0.90	0.90	0.000	0.56	0.60	0.049	0.62	0.68	0.057	0.84	0.84	0.000	0.43	0.44	0.016	0.88	0.87	-0.003	0.90	0.90	0.000
TIMES OF CONCENTRATION (min)	11.71	104.30	92.590	12.02	90.87	78.850	8.62	8.65	0.030	11.37	11.06	-0.310	31.06	32.54	1.480	18.08	18.07	-0.010	164.96	164.21	-0.750	13.23	134.94	121.710	10.00	5.00	-5.000
DURATION (HRS)	0.39	3.48		0.40	3.03		0.29	0.29		0.38	0.37		1.04	1.08		0.60	0.60		5.50	5.47		0.44	4.50		0.33	0.17	
2-YEAR INTENSITY	3.30	0.80		3.30	0.90		3.80	3.80		3.40	3.40		1.90	1.80		2.70	2.70		0.60	0.60		3.10	0.70		3.60	4.60	
10-YEAR INTENSITY	4.50	1.30		4.50	1.40		5.10	5.10		4.70	4.70		2.80	2.70		3.80	3.80		0.90	0.90		4.30	1.10		4.80	6.00	
100-YEAR INTENSITY	6.10	1.90		6.10	2.10		6.70	6.70		6.30	6.30		4.00	3.90		5.30	5.30		1.30	1.30		5.90	1.60		6.50	7.80	
2- YEAR DISCHARGE (CFS)[3]	15.57	4.02	-11.55	25.96	8.94	-17.02	12.83	15.60	2.77	7.99	10.62	2.63	22.00	27.39	5.39	32.76	32.77	0.01	3.49	4.38	0.89	48.06	11.33	-36.73	8.95	11.44	2.49
10- YEAR DISCHARGE (CFS)[3]	21.36	6.08	-15.28	35.90	13.56	-22.34	18.00	21.74	3.74	10.96	14.52	3.56	32.00	40.01	8.01	47.08	47.04	-0.04	5.31	6.17	0.86	66.16	16.99	-49.17	11.94	14.92	2.98
25- YEAR DISCHARGE (CFS)[3]	24.39	7.14	-17.25	41.06	15.97	-25.09	20.72	25.17	4.45	12.55	16.65	4.10	37.33	47.30	9.97	55.23	55.19	-0.04	6.03	6.88	0.85	76.79	19.62	-57.17	13.68	16.66	2.98
100- YEAR DISCHARGE (CFS)[3]	28.43	9.57	-18.85	46.12	18.14	-27.98	15.38	20.71	5.33	14.64	18.54	3.90	47.96	55.33	7.36	66.63	66.63	0.00	7.26	7.36	0.10	92.12	25.23	-66.89	16.17	19.40	3.23

1. Includes area and flow from Hartford South, an area that was entering a combined system that know will go to this gate

2. Does not include combined sewer flow and area

3. Discharge calculated at outlet from StormCAD

LOCHNER

Project 063H137 | Sheet 1 of 2
Subject Example CALCS. | Job No.
Calc. By MM Date 4/14/11
Checked By CG Date 4.14.2011

Reference

I. Example calculation to provide backup for Table 3 of the Final Drainage Report.

A. Existing gage 8

1. Knowns

a. Area = 11.807 acres

b. Runoff Coef. = 0.64

c. Tc = 12.02 min (from StormCAD)

D. Based on ConnDot IDF Curve, intensities for the 2, 10, 25, and 100 yr.

1. I_2 = 3.3 "/hr

2. I_{10} = 4.5 "/hr

3. I_{25} = 5.1 "/hr

4. I_{100} = 6.1 "/hr

2. Discharges calculated using Rational Method

$Q = CiA$

A. Q_2 = 11.807 x 0.64 x 3.3 = 24.44 cfs

on Table 3 25.96 reported based on StormCAD

3% Difference in flows ∴ insignificant

LOCHNER

Project 063H137 | Sheet 2 of 2
Subject Examp CALC. | Job No.
Calc. By MM Date 4/14/11
Checked By CG Date 4.14.2011

Reference

B. Q_{10} = 11.807 x 0.64 x 4.5 = 34.00 cfs

on Table 3 reported as 35.90 cfs

5% difference in flows ∴ ok

C. Q_{25} = 11.807 x 0.64 x 5.1 = 41.56 cfs

on Table 3 reported 41.06 cfs

-1% Difference in flows ∴ ok

d. Q_{100} = 11.807 x 0.64 x 6.1 = 46.09 cfs

H - 034

The following tables are a comparison of existing and proposed watershed area runoff coefficient. The purpose is to compare how the development will change the runoff flow of stormwater. The areas for existing and proposed will not change, and the time of concentration will also remain the same for each condition.

- See Section I - Storm Sewer Tabulation for time of concentration.
- See Appendix B for Existing Watershed Map.
- See Appendix C for Proposed Water Shed Map

System 1	Tc = 16.4 min.	I_2 = 2.7 in./hr.	I_{10} = 3.9 in./hr.	I_{60} = 5.5 in./hr.	
		Existing		**Proposed**	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-1 URS	2.97	0.77	2.29	0.9	2.67
East St. Sta.	3.16	0.44	1.39	0.75	2.37
SB F-1	0.29	0.37	0.107	0.9	0.261
SB F-2	0.11	0.38	0.042	0.9	0.099
CCSU-1	1.29	0.38	0.049	0.9	1.161
SB-3	0.14	0.39	0.055	0.9	0.126
NB-1	0.35	0.31	0.109	0.9	0.315
NB-2	0.11	0.30	0.033	0.9	0.099
		Total	4.516		7.10

System 2	Tc = 49.6 min.	I_2 = 1.4 in./hr.	I_{10} = 2.0 in./hr.	I_{100} = 3.1 in./hr.	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-8	0.57	0.35	0.200	0.9	0.513
SB-9	0.25	0.36	0.090	0.9	0.225
SB OFF-2	9.78	0.42	4.108	0.42	4.108
NB OFF-1	0.65	0.37	0.241	0.37	0.241
SB OFF-3	2.36	0.78	1.84	0.78	1.84
		Total	6.478		6.93

System 3	Tc = 5.1 min.	I_2 = 4.6 in./hr.	I_{10} = 5.9 in./hr.	I_{100} = 7.8 in./hr.	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-12	0.51	0.31	0.158	0.9	0.46
		Total	0.158		0.46

System 4	Tc = 11.5 min.	I_2 = 3.2 in./hr.	I_{10} = 4.5 in./hr.	I_{100} = 6.3 in./hr.	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB OFF-4	1.13	0.56	0.63	0.56	0.63
SB OFF-5	1.76	0.9	1.58	0.9	1.58
		Total	2.22		2.22

System 5	Tc = 10.1 min.	I_2 = 3.2 in./hr.	I_{10} = 4.8 in./hr	I_{100} = 6.8 in/hr.	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-15	0.16	0.31	0.050	0.9	0.14
SB-16	0.21	0.32	0.067	0.9	0.19
SB-16A	0.05	0.32	0.02	0.9	0.05
SB-16B	0.04	0.32	0.01	0.9	0.04
		Total	0.15		0.42

System 6	Tc = 5.2 min.	I_2 = 4.6 in./hr.	I_{10} = 5.9 in./hr	I_{100} = 7.7 in./hr.	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-18	0.28	0.3	0.084	0.9	0.25
NB-5	0	0	0	0	0
		Total	0.084		0.25

System 8	Tc = 10 min.	I_2 = 3.6 in./hr.	I_{10} = 4.8 in./hr	I_{100} = 6.5 in./hr	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB OFF-7	2.16	0.33	0.71	0.33	0.71
		Total	0.71		0.71

System 9	Tc = 5.1 min.	I_2 = 4.6 in./ hr.	I_{10} = 6 in./hr	I_{100} = 7.8 in./hr.	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-22	0.57	0.35	0.2	0.9	0.51
		Total	0.2		0.51

The following tables are a comparison of existing and proposed watershed area runoff coefficient. The purpose is to compare how the development will change the runoff flow of stormwater. The areas for existing and proposed will not change, and the time of concentration will also remain the same for each condition.

- See Section I - Storm Sewer Tabulation for time of concentration.
- See Appendix B for Existing Watershed Map.
- See Appendix C for Proposed Water Shed Map

System 1	Tc = 16.4 min.	I_2 = 2.7 in./hr.	I_{10} = 3.9 in./hr.	I_{60} = 5.5 in./hr.	
		Existing		**Proposed**	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-1 URS	2.97	0.77	2.29	0.9	2.67
East St. Sta.	3.16	0.44	1.39	0.75	2.37
SB F-1	0.29	0.37	0.107	0.9	0.261
SB F-2	0.11	0.38	0.042	0.9	0.099
CCSU-1	1.29	0.38	0.049	0.9	1.161
SB-3	0.14	0.39	0.055	0.9	0.126
NB-1	0.35	0.31	0.109	0.9	0.315
NB-2	0.11	0.30	0.033	0.9	0.099
		Total	4.516		7.10

System 2	Tc = 49.6 min.	I_2 = 1.4 in./hr.	I_{10} = 2.0 in./hr.	I_{100} = 3.1 in./hr.	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-8	0.57	0.35	0.200	0.9	0.513
SB-9	0.25	0.36	0.090	0.9	0.225
SB OFF-2	9.78	0.42	4.108	0.42	4.108
NB OFF-1	0.65	0.37	0.241	0.37	0.241
SB OFF-3	2.36	0.78	1.84	0.78	1.84
		Total	6.478		6.93

System 3	Tc = 5.1 min.	I_2 = 4.6 in./hr.	I_{10} = 5.9 in./hr.	I_{100} = 7.8 in./hr.	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-12	0.51	0.31	0.158	0.9	0.46
		Total	0.158		0.46

System 4	Tc = 11.5 min.	I_2 = 3.2 in./hr.	I_{10} = 4.5 in./hr.	I_{100} = 6.3 in./hr.	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB OFF-4	1.13	0.56	0.63	0.56	0.63
SB OFF-5	1.76	0.9	1.58	0.9	1.58
		Total	2.22		2.22

System 5	Tc = 10.1 min.	I_2 = 3.2 in./hr.	I_{10} = 4.8 in./hr	I_{100} = 6.8 in/hr.	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-15	0.16	0.31	0.050	0.9	0.14
SB-16	0.21	0.32	0.067	0.9	0.19
SB-16A	0.05	0.32	0.02	0.9	0.05
SB-16B	0.04	0.32	0.01	0.9	0.04
		Total	0.15		0.42

System 6	Tc = 5.2 min.	I_2 = 4.6 in./hr.	I_{10} = 5.9 in./hr	I_{100} = 7.7 in./hr.	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-18	0.28	0.3	0.084	0.9	0.25
NB-5	0	0	0	0	0
		Total	0.084		0.25

System 8	Tc = 10 min.	I_2 = 3.6 in./hr.	I_{10} = 4.8 in./hr	I_{100} = 6.5 in./hr	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB OFF-7	2.16	0.33	0.71	0.33	0.71
		Total	0.71		0.71

System 9	Tc = 5.1 min.	I_2 = 4.6 in./ hr.	I_{10} = 6 in./hr	I_{100} = 7.8 in./hr.	
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-22	0.57	0.35	0.2	0.9	0.51
		Total	0.2		0.51

System 10	Tc = 5.8 min.	I_2 = 44 in./hr.		I_{10} = 5.8 in./hr	I_{100} = 7.8 in./hr.
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-25	0.36	0.37	0.133	0.9	0.32
		Total	0.133		0.32

System 11	Tc = 32 min.	I_2 = 1.9 in./hr.		I_{10} = 2.7 in./hr	I_{100} = 4.0 in./hr.
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
Inlet	5.28	0.6	3.17	0.6	3.17
		Total	3.17		3.17

System 12	Tc = 5.2 min.	I_2 = 4.6 in./hr.		I_{10} = 5.9 in./hr	I_{100} = 7.8 in./hr.
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-27	0.33	0.37	1.122	0.9	0.3
NB-8	0.01	0.37	0.004	0.9	0.01
		Total	0.126		0.31

System 13	Tc = 5.4 min.	I_2 = 4.6 in./hr.		I_{10} = 5.9 in./hr	I_{100} = 7.8 in./hr.
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
FM-1	0.77	0.83	0.64	0.83	0.64
FM-2	1.78	0.9	1.61	0.9	1.61
		Total	2.25		2.25

System 10	Tc = 5.8 min.	I_2 = 44 in./hr.		I_{10} = 5.8 in./hr	I_{100} = 7.8 in./hr.
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-25	0.36	0.37	0.133	0.9	0.32
		Total	0.133		0.32

System 11	Tc = 32 min.	I_2 = 1.9 in./hr.		I_{10} = 2.7 in./hr	I_{100} = 4.0 in./hr.
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
Inlet	5.28	0.6	3.17	0.6	3.17
		Total	3.17		3.17

System 12	Tc = 5.2 min.	I_2 = 4.6 in./hr.		I_{10} = 5.9 in./hr	I_{100} = 7.8 in./hr.
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
SB-27	0.33	0.37	1.122	0.9	0.3
NB-8	0.01	0.37	0.004	0.9	0.01
		Total	0.126		0.31

System 13	Tc = 5.4 min.	I_2 = 4.6 in./hr.		I_{10} = 5.9 in./hr	I_{100} = 7.8 in./hr.
		Existing		Proposed	
Basin ID	Area (Ac)	C	Ac	C	Ac
FM-1	0.77	0.83	0.64	0.83	0.64
FM-2	1.78	0.9	1.61	0.9	1.61
		Total	2.25		2.25

System B	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Existing		Proposed	
Basin ID	Area (Ac)	C	AC	C	AC
SB-32	0.95	0.48	0.46	0.48	0.46
SB-31	0.22	0.57	0.08	0.9	0.20
NB-9	0.01	0.4	0.004	0.9	0.01
		Total	0.55		0.67

H - 035

Section II: Stormwater Management

Subsection 1. *Stormwater Runoff*

Pre and Post Development Peak Flow Rates

Piper Brook Watershed

	Peak Discharges (CFS)					
	Return Frequency					
	2 Year		10 Year		100 Year	
Drainage System	Pre-Development	Post-Development	Pre-Development	Post-Development	Pre-Development	Post-Development
1	3.3	1.9	4.4	2.6	7.5	4.4
3	6.6	1.4	10.0	5.8	19.0	23.6
4 (1)	5.9	9.0	8.4	12.0	14.4	20.2
5 (3)	7.5	6.7	10.0	8.8	17.0	18.2
6	10.2	10.2	14.3	14.3	25.5	25.5
7 (2)	7.1	6.1	9.5	8.1	16	13.8
8	3.6	3.9	4.5	4.9	7.3	7.9
9	0.7	0.7	0.9	0.8	1.5	1.4
10	2.0	0.8	2.5	1.0	4.1	1.7
Totals	46.9	40.7	64.5	58.3	112.3	116.7

Willow Brook Watershed

	Peak Discharges (CFS)					
	Return Frequency					
	2 Year		10 Year		100 Year	
Drainage System	Pre-Development	Post-Development	Pre-Development	Post-Development	Pre-Development	Post-Development
2	5.9	5.6	7.9	7.5	13.4	12.7
11	3.8	3.9	5.1	5.7	8.6	9.3
Totals	9.7	9.5	13	13.2	22	22

NOTES:

(1) Discharges to abutting Busway segment. See Contract No. 88-H034.

(2) Discharges to City of New Britain municipal system. Runoff to existing City system anticipated to be less than existing conditions as proposed Station will have less paved areas than the development.

(3) Peak discharge for 10 Year Return Frequency for this system reduced with use of 120'-48" RCP for detention.

(4) The totals shown for Pre and Post development are conservative values for the impacts as the Time of Concentrations (Tc) vary. See following sheet for Tc's.

Storm Duration Computations

Piper Brook Watershed

Drainage System 1: Proposed Busway Drainage (Sta. 19+00 to 22+00)

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	0.92	10	0.33	3.3	4.4	7.5
Post-Development	0.54	10	0.33	1.9	2.6	4.4

Drainage System 3: Proposed Busway Drainage (Sta. 35+50 to 108+50)

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	4.74	50	1.70	6.6	10.0	19.0
Post-Development	7.41	30	1.00	1.4	5.8	23.6

Drainage System 4: Proposed Busway Drainage (Sta. 108+50 to 118+00)

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	2.10	15	0.50	5.9	8.4	14.4
Post-Development	2.49	10	0.33	9.0	12.0	20.2

Drainage System 5: Route 72 Eastbound Exit Ramp & Route 9 Southbound Entrance Ramp

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency (year)		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	2.09	10	0.33	7.5	10.0	17.0
Post-Development	2.29	10	0.33	6.7	8.8	18.2

Drainage System 6: Fairview Cemetery System

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	4.10	21	0.70	10.2	14.3	25.5
Post-Development	4.10	21	0.70	10.2	14.3	25.5

Drainage System 7: East Main Street System

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	1.97	10	0.33	7.1	9.5	16
Post-Development	1.70	10	0.33	6.1	8.1	13.8

Drainage System 8: Florence Street System

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	0.75	5	0.17	3.6	4.5	7.3
Post-Development	0.83	5	0.17	3.9	4.9	7.9

Drainage System 9: Columbus Boulevard System

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	0.15	5	0.17	0.7	0.9	1.5
Post-Development	0.14	5	0.17	0.7	0.8	1.4

Drainage System 10: DPW YARD System

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	0.42	5	0.17	2.0	2.5	4.1
Post-Development	0.17	5	0.17	0.8	1.0	1.7

Willow Brook Watershed

Drainage System 2: Proposed Busway Drainage (Sta. 22+00 to 28+85)

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	1.65	10	0.33	5.9	7.9	13.4
Post-Development	1.56	10	0.33	5.6	7.5	12.7

Drainage System 11: Busway over Route 9 Bridge Deck Drainage System

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency (year)		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	1.03	10	0.33	3.8	5.1	8.6
Post-Development	1.18	10	0.33	3.9	5.7	9.3

Section II: Stormwater Management

Subsection 1: Stormwater Runoff

Describe the location of the design point and why this location was chosen:

Contract No. 88-H035 involves the construction of approximately 10,000 linear feet of roadway for the Busway project. Stormwater runoff from this construction contract will impact the Piper Brook and the Willow Brook watersheds. The contract includes connections to several existing storm drainage systems and the construction of a new system for a segment of the Busway roadway. The impacts at specific discharge points vary. A common downstream point of each watershed was selected to evaluate the cumulative impacts of the proposed project contract.

The channel crossing of East Street was selected for Piper Brook. This point in immediately below the outet for the proposed Busway drainage system and downstream of the convergence of the various subdrainage systems. The outlet to the existing drainage basin north of South street was selected for the Willow Brook Watershed. This is the outlet for the Route 9 drainage systems that convey the discharges from two of the project systems.

The individual roadway drainage systems that convey stormwater flows associated with this segment of the Busway Project are listed by the watershed they discharge into and are described as follows:

Piper Brook Watershed

Drainage System 1

Drainage system 1 is located at the very beginning of the busway (Sta. 19+00 to Sta. 22+00) and includes three catch basins. Two of the catch basins are located along the busway gutter lines and a third catch basin conveys runoff from a grass lined channel. These catch basins connect to the City system. This was done to maintain the existing drainage patterns at this location.

Drainage System 3

Drainage system 3 includes the proposed busway trunk line, which begins just east of the proposed Busway Bridge over Route 9 to the high point on the bridge over Allen and East Street (Sta. 35+50 to Sta. 108+50). The system is comprised of catch basins located along the gutter lines of the busway and multi-use trail. There are also grass lined ditches located intermittently on the side of the busway that convey runoff from the busway. The drainage in this area is conveyed to a water quality basin located at the low point in the busway (Sta. 98+00). This water quality basin outfalls into Piper Brook.

Drainage System 4

Drainage system 4 includes the proposed busway drainage at the north end of the project (Sta. 108+50 to 118+00). This system outfalls into a proposed roadway drainage system to be constructed under Contract No 88-H034 and was designed to maintain the drainage patterns. See Contract No. 88-H034 for more information.

Drainage System 5

Drainage system 5 includes the drainage from the Route 72 and Route 9 ramps. There are four different outlet points in this system in order to maintain the existing watershed divides. The systems are connected to the Route 9/72 trunk line through four existing catch basins located along the Route 72 eastbound shoulder. Three of these catch basins are located on the west side of Route 71 along the and one catch basin is located to the east. The peak discharge for 10 Year Return Frequency for this system was reduced with 120'-48" RCP intoduced between catch basins for detention.

Drainage System 6

Drainage system 6 includes the proposed system at Fairview Cemetery. The system includes a catch basin at the low point in the Cemetery underpass and piping to convey runoff to a remnant of the old Piper Brook located at the northwest corner of Fairview Cemetery.

Drainage System 7

Drainage system 7 includes the drainage along East Main Street, which intersects the busway. Proposed catch basins will be connected to the existing City system along East Main Street so that the existing drainage pattern at this location is maintained.

Drainage System 8

Drainage system 8 includes the drainage along Florence Street, which intersects the Harvard Street. The drainage area for this system is approximately 1.24 acres in size. Two new catch basins will be constructed at low points in the vicinity of the proposed Florence Street/Harvard Street intersection. Stormwater runoff intercepted by those catch basins will be discharged into an existing City 48" RCP trunk line along Harvard Street.

Drainage System 9

Drainage system 9 includes the drainage along Columbus Boulevard. The drainage area for this system is approximately 0.16 acres in size. Two existing catch basins will be replaced by two new catch basins. Stormwater runoff intercepted by those catch basins will be discharged into an existing City storm drain system along Columbus Boulevard.

Drainage System 10

The existing drainage area at DPW Yard is approximately 0.47 acres in size. A portion of the existing drainage area will contribute to the proposed busway drainage system. Therefore, the proposed drainage area for DPW Yard system is reduced to 0.19 acres. Two existing catch basins will be replaced by three new catch basins along the multi-use trail curb line. Stormwater runoff intercept by those catch basins will be discharged in to an existing City storm drain system.

Willow Brook Watershed

Drainage System 2

Drainage system 2 includes the proposed busway just west of the bridge over Route 9 (Sta. 22+00 to 28+85) and includes some runoff from the Route 9 entrance ramp. This system is comprised of catch basins along the busway gutter line that outlet into a grass lined channel on the left side of the busway. The grass channel carries the runoff from the busway in this location into an existing catch basin on Route 9, which is conveyed into the Route 9 South trunk line system. This system was designed to maintain the existing drainage pattern at this location, which is currently conveyed into the Route 9 South trunk line.

Drainage System 11

Drainage system 11 includes the proposed Busway Bridge over Route 9 (Sta. 28+85 to 35+50). This system is comprised of bridge scuppers located along the busway gutter line that outlet into the existing Route 9 roadway drainage system.

NEW BRITAIN-HARTFORD BUSWAY
New Britain to Hartford
URS PROJECT NO. 36937230

URS

DESIGNED BY: LGAO DATE: 09/30/2009
CHECKED BY: DSHI DATE: 10/02/2009

Comparison of the Existing Condition and the Proposed Condition

SHEET 1 OF 1

Condition		Drainage Area (T) (acres)	Drainage Area Per (acres)	Drainage Area Imper (acres)	Cr	AC (acres)	Tc (min)	i 10yr (in/hr)	i 10yr (in/hr)	i 100yr (in/hr)	Discharge 2 yr (cfs)	Discharge 10 yr (cfs)	Discharge 100 yr (cfs)
System One													
Existing		1.78	1.14	0.64	0.52	0.92	10	3.6	4.8	6.5	3.3	4.4	7.5
Proposed		1.63	1.55	0.08	0.33	0.54	10	3.6	4.8	6.5	1.9	2.6	4.4
System Two													
Existing		3.42	2.38	1.04	0.48	1.65	10	3.6	4.8	6.5	5.9	7.9	13.4
Proposed		3.74	3.00	0.74	0.42	1.57	10	3.6	4.8	6.5	5.6	7.5	12.7
System Three													
Existing		9.30	3.55	5.75	0.51	4.74	50	1.4	2.1	3.2	6.6	10.0	19.0
Proposed		9.30	1.60	7.70	0.80	7.41	30	1.9	2.8	4.1	1.4	5.8	23.6
System Four													
Existing		3.89	2.14	1.75	0.54	2.10	15	2.8	4.0	5.5	5.9	8.4	14.4
Proposed		3.89	1.91	1.98	0.64	2.49	10	3.6	4.8	6.5	9.0	12.0	20.2
System Five													
Existing	5-1	1.16	0.60	0.56	0.59	0.68	10	3.6	4.8	6.5	2.5	3.3	5.6
	5-2	1.78	1.43	0.35	0.42	0.74	10	3.6	4.8	6.5	2.7	3.6	6.0
	5-3	0.80	0.62	0.18	0.44	0.35	10	3.6	4.8	6.5	1.3	1.7	2.8
	5-4	0.91	0.84	0.07	0.35	0.32	10	3.6	4.8	6.5	1.1	1.5	2.6
										Total	7.5	10.0	17.0
Post	5-1	0.82	0.33	0.49	0.66	0.54	10	3.6	4.8	6.5	1.9	2.6	4.4
	5-2	1.96	1.17	0.79	0.54	1.06	10	3.6	4.8	6.5	2.4	3.1	8.6
	5-3	0.44	0.12	0.32	0.74	0.32	10	3.6	4.8	6.5	1.2	1.6	2.6
	5-4	0.76	0.60	0.16	0.42	0.32	10	3.6	4.8	6.5	1.1	1.5	2.6
										Total	6.7	8.8	18.2
System Six													
Existing		13.62	13.62	0.00	0.30	4.09	21	2.5	3.5	5.0	10.2	14.3	25.5
Proposed		13.62	13.62	0.00	0.30	4.09	21	2.5	3.5	5.0	10.2	14.3	25.5
System Seven													
Existing		2.19	0.00	2.19	0.90	1.97	10	3.6	4.8	6.5	7.1	9.5	16.0
Proposed		1.89	0.00	1.89	0.90	1.70	10	3.6	4.8	6.5	6.1	8.1	13.8
System Eight													
Existing		1.24	0.60	0.63	0.61	0.75	5	4.8	6.0	7.8	3.6	4.5	7.3
Proposed		1.24	0.49	0.74	0.66	0.82	5	4.8	6.0	7.8	3.9	4.9	7.9

NEW BRITAIN-HARTFORD BUSWAY
New Britain to Hartford
URS PROJECT NO.36937230

URS

DESIGNED BY: LGAO DATE: 09/30/2009
CHECKED BY: DATE:
SHEET 1 OF 1

Comparison of the Existing Condition and the Proposed Condition

Condition	Drainage Area (T) (acres)	Drainage Area Per (acres)	Drainage Area Imper (acres)	Cr	AC (acres)	Tc (min)	i 10yr (in/hr)	i 10yr (in/hr)	i 100yr (in/hr)	Discharge 2 yr (cfs)	Discharge 10 yr (cfs)	Discharge 100 yr (cfs)
System Nine												
Existing	0.17	0.00	0.17	0.90	0.15	5	4.8	6.0	7.8	0.7	0.9	1.5
Proposed	0.16	0.00	0.16	0.90	0.14	5	4.8	6.0	7.8	0.7	0.8	1.4
System Ten												
Existing	0.47	0.00	0.47	0.90	0.42	5	4.8	6.0	7.8	2.0	2.5	4.1
Proposed	0.19	0.00	0.19	0.90	0.17	5	4.8	6.0	7.8	0.8	1.0	1.7

Bridge Deck Drainage System Over Route 9

Existing	EX-B	Combine Existing Downspout Pier 4	0.14	10	3.6	4.8	6.5	0.4	0.5	0.9
	EX-D	Combine Existing Downspout Pier 3	0.23	10	3.6	4.8	6.5	1.1	1.4	2.4
	EX-E	Combine Existing Downspout Pier 2	0.25	10	3.6	4.8	6.5	0.7	0.9	1.6
	EX-G	Combine Existing Downspout Pier 1	0.15	10	3.6	4.8	6.5	0.5	0.6	1.1
	EX-L	Combine Existing Abut 1	0.26	10	3.6	4.8	6.5	1.2	1.5	2.6
							Total	3.8	5.1	8.6
Post	PRO-B	Combine Pro Downspout Pier 4	0.16	10	3.6	4.8	6.5	0.6	0.8	1.0
	PRO-D	Combine Pro Downspout Pier 3	0.20	10	3.6	4.8	6.5	0.9	1.2	2.0
	PRO-E	Combine Pro Downspout Pier 2	0.30	10	3.6	4.8	6.5	0.9	1.2	2.0
	PRO-G	Combine Pro Downspout Pier 1	0.20	10	3.6	4.8	6.5	0.4	1.0	1.6
	PRO-L	Combine Pro Downspout Abut 1	0.32	10	3.6	4.8	6.5	1.2	1.6	2.6
							Total	3.9	5.7	9.3

System Piper Brook

Existing										47.0	64.5	112.3
Proposed										40.7	58.3	116.7

System Route 9 /72 Outlet into South Retention Pond

Existing										9.7	13.0	22.0
Proposed										9.6	13.2	22.0

H – 025

VN ENGINEERS, INC.
116 Washington Avenue
North Haven 06473
(203) 234-7862

Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	1	Of	3
Calculated By	JMB	Date	10/20/2009
Checked By		Date	
Scale	VN #27-114.2		
Revised By	JMB	Date	3/10/2011

PRE-DEVELOPMENT CONDITIONS
2 YR. STORM EVENT

I= 3.25 in/hr
(PER CTDOT DRAINAGE MANUAL pg 6.B-1)

SYSTEM # 1

C=	0.33	
I=	3.25	in/hr
A=	1.4	Acres

Q=C I A
Q= 1.50 cfs

SYSTEM # 2

C=	0.2	
I=	3.25	in/hr
A=	0.53	Acres

Q=C I A
Q= 0.34 cfs

SYSTEM # 3

C=	0.45	
I=	3.25	in/hr
A=	6.54	Acres

Q=C I A
Q= 9.56 cfs

SYSTEM # 4

C=	0.2	
I=	3.25	in/hr
A=	1.7	Acres

Q=C I A
Q= 1.11 cfs

SYSTEM # 5

C=	0.2	
I=	3.25	in/hr
A=	1.3	Acres

Q=C I A
Q= 0.85 cfs

SYSTEM # 6

C=	0.25	
I=	3.25	in/hr
A=	2.16	Acres

Q=C I A
Q= 1.76 cfs

SYSTEM # 7

C=	0.38	
I=	3.25	in/hr
A=	3.86	Acres

Q=C I A
Q= 4.77 cfs

SYSTEM #1

$$C = \frac{(0.81)(0.20)+(0.59)(0.50)}{1.4} = 0.33$$

SYSTEM #3

$$C = \frac{(3.37)(0.20)+(1.48)(0.50)+(1.69)(0.90)}{6.54} = 0.45$$

SYSTEM #6

$$C = \frac{(1.77)(0.20)+(0.39)(0.50)}{2.16} = 0.25$$

SYSTEM #7

$$C = \frac{(1.52)(0.20)+(2.4)(0.50)}{3.86} = 0.38$$

VN ENGINEERS, INC.
116 Washington Avenue
North Haven 06473
(203) 234-7862

Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	2	Of	3
Calculated By	JMB	Date	10/20/2009
Checked By		Date	
Scale	VN #27-114.2		
Revised By	JMB	Date	3/10/2011

PRE-DEVELOPMENT CONDITIONS
10 YR. STORM EVENT

I= 4.95 in/hr
(PER CTDOT DRAINAGE MANUAL pg 6.B-1)

SYSTEM #			
	C=	0.33	
	I=	4.95	in/hr
	A=	1.4	Acres
Q=C I A			
	Q=	2.29	cfs

SYSTEM #			
	C=	0.25	
	I=	4.95	in/hr
	A=	2.16	Acres
Q=C I A			
	Q=	2.67	cfs

SYSTEM #			
	C=	0.2	
	I=	4.95	in/hr
	A=	0.53	Acres
Q=C I A			
	Q=	0.52	cfs

SYSTEM #			
	C=	0.38	
	I=	4.95	in/hr
	A=	3.86	Acres
Q=C I A			
	Q=	7.26	cfs

SYSTEM #			
	C=	0.45	
	I=	4.95	in/hr
	A=	6.54	Acres
Q=C I A			
	Q=	14.57	cfs

SYSTEM #			
	C=	0.2	
	I=	4.95	in/hr
	A=	1.7	Acres
Q=C I A			
	Q=	1.68	cfs

SYSTEM #			
	C=	0.2	
	I=	4.95	in/hr
	A=	1.3	Acres
Q=C I A			
	Q=	1.29	cfs

VN ENGINEERS, INC.
116 Washington Avenue
North Haven 06473
(203) 234-7862

Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	3	Of	3
Calculated By	JMB	Date	10/20/2009
Checked By		Date	
Scale	VN #27-114.2		
Revised By	JMB	Date	3/10/2011

PRE-DEVELOPMENT CONDITIONS
100 YR. STORM EVENT

I= 7 in/hr
(PER CTDOT DRAINAGE MANUAL pg 6.B-1)

SYSTEM # 1
C= 0.33
I= 7 in/hr
A= 1.4 Acres
Q=C I A
Q= 3.23 cfs

SYSTEM # 2
C= 0.2
I= 7 in/hr
A= 0.53 Acres
Q=C I A
Q= 0.74 cfs

SYSTEM # 3
C= 0.45
I= 7 in/hr
A= 6.54 Acres
Q=C I A
Q= 20.60 cfs

SYSTEM # 4
C= 0.2
I= 7 in/hr
A= 1.7 Acres
Q=C I A
Q= 2.38 cfs

SYSTEM # 5
C= 0.2
I= 7 in/hr
A= 1.3 Acres
Q=C I A
Q= 1.82 cfs

SYSTEM # 6
C= 0.25
I= 7 in/hr
A= 2.16 Acres
Q=C I A
Q= 3.78 cfs

SYSTEM # 7
C= 0.38
I= 7 in/hr
A= 3.86 Acres
Q=C I A
Q= 10.27 cfs

VN ENGINEERS, INC.
116 Washington Avenue
North Haven 06473
(203) 234-7862

Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	1	Of	3
Calculated By	JMB	Date	10/20/2009
Checked By		Date	
Scale	VN #27-114.2		
Revised By	JMB	Date	3/8/2011

PRE-DEVELOPMENT CONDITIONS (FLATBUSH AVE.)
2 YR. STORM EVENT

I= 3.25 in/hr
(PER CTDOT DRAINAGE MANUAL pg 6.B-1)

SYSTEM #	2		
	C=	0.58	
	I=	3.25	in/hr
	A=	8.59	Acres
	Q=C I A		
	Q=	16.19	cfs

VN ENGINEERS, INC.
116 Washington Avenue
North Haven 06473
(203) 234-7862

Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	2	Of	3
Calculated By	JMB	Date	10/20/2009
Checked By		Date	
Scale	VN #27-114.2		
Revised By	JMB	Date	3/8/2011

PRE-DEVELOPMENT CONDITIONS (FLATBUSH AVE.)
10 YR. STORM EVENT

I= 4.95 in/hr
(PER CTDOT DRAINAGE MANUAL pg 6.B-1)

SYSTEM #	2		
	C=	0.58	
	I=	4.95	in/hr
	A=	8.59	Acres
	Q=C I A		
	Q=	24.66	cfs

VN ENGINEERS, INC.
116 Washington Avenue
North Haven 06473
(203) 234-7862

Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	3	Of	3
Calculated By	JMB	Date	10/20/2009
Checked By		Date	
Scale	VN #27-114.2		
Revised By	JMB	Date	3/8/2011

PRE-DEVELOPMENT CONDITIONS (FLATBUSH AVE.)
100 YR. STORM EVENT

I= 7 in/hr
(PER CTDOT DRAINAGE MANUAL pg 6.B-1)

SYSTEM #	2		
	C=	0.58	
	I=	7	in/hr
	A=	8.59	Acres
	Q=C I A		
	Q=	34.88	cfs

Appendix

Runoff Coefficients (C)

Description of Area	Coefficient
Business:	
Central business	0.70 - 0.95
District and local	0.50 - 0.70
Residential:	
Single family	0.35 - 0.45
Multi-units	0.40 - 0.75
1/2 acre lots or larger	0.25 - 0.40
Industrial:	
Light	0.50 - 0.80
Heavy	0.60 - 0.90
Parks, cemeteries	0.10 - 0.25
Playgrounds	0.20 - 0.35
Railroad yards	0.20 - 0.40
Unimproved	0.10 - 0.30
Asphaltic	0.70 - 0.95
Concrete	0.80 - 0.95
Roofs	0.75 - 0.95

Appendix B - Rainfall

RAINFALL – DURATION – FREQUENCY RELATIONSHIPS FOR CONNECTICUT

DURATION	RETURN FREQUENCY (Years)					
	2	5	10	25	50	100
Min	RAINFALL IN MM (INCHES)					
5	9.1(0.36)	11.4(0.45)	13.0(0.51)	15.2(0.60)	17.2(0.67)	18.5(0.73)
15	18.3(0.72)	22.6(0.89)	25.9(1.02)	30.5(1.20)	34.0(1.34)	37.6(1.48)
60	33.0(1.3)	43.2(1.7)	50.8(2.00)	58.4(2.30)	65.3(2.57)	71.1(2.80)
Hrs						
2	40.6(1.60)	54.6(2.15)	63.5(2.50)	72.4(2.85)	82.6(3.25)	91.4(3.60)
3	44.5(1.75)	61.0(2.40)	69.9(2.75)	82.6(3.25)	90.2(3.55)	101.6(4.00)
6	59.7(2.35)	74.9(2.95)	87.6(3.45)	101.6(4.00)	115.6(4.55)	127.0(5.00)
12	69.9(2.75)	90.2(3.55)	101.6(4.00)	123.2(4.85)	135.9(5.35)	152.4(6.00)
24	82.6(3.25)	106.7(4.20)	125.7(4.95)	146.1(5.75)	161.3(6.35)	177.8(7.00)
	24 HOUR RAINFALL BY COUNTY					
Fairfield	83.8(3.3)	109.2(4.3)	127.0(5.0)	144.8(5.7)	162.6(6.4)	182.9(7.2)
Hartford	81.3(3.2)	104.1(4.1)	119.4(4.7)	139.7(5.5)	157.5(6.2)	175.3(6.9)
Litchfield	81.3(3.2)	104.1(4.1)	119.4(4.7)	139.7(5.5)	157.5(6.2)	177.8(7.0)
Middlesex	83.8(3.3)	106.7(4.2)	127.0(5.0)	142.2(5.6)	160.0(6.3)	180.3(7.1)
New Haven	83.8(3.3)	106.7(4.2)	127.0(5.0)	142.2(5.6)	160.0(6.3)	180.3(7.1)
New London	86.4(3.4)	109.2(4.3)	127.0(5.0)	144.8(5.7)	160.0(6.3)	180.3(7.1)
Tolland	81.3(3.2)	104.1(4.1)	121.9(4.8)	139.7(5.5)	157.5(6.2)	175.3(6.9)
Windham	81.3(3.2)	106.7(4.2)	121.9(4.8)	139.7(5.5)	157.5(6.2)	175.3(6.9)

Sources:

1. "Rainfall Frequency Atlas of the United States", Technical Paper No. 40, U.S. Department of Commerce, Weather Bureau.
2. NOAA Technical Memorandum "NWS Hydro-35", June 1977, U.S. Department of Commerce, National Weather Service.

Table B-1

Stor . Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total. flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	286.0	0.06	1.40	0.90	0.05	1.14	5.0	24.2	2.2	2.48	4.57	2.02	15	0.50	65.00	63.57	66.35	65.93	72.19	72.22	Sta. 334+00 LT
2	1	245.0	0.00	1.27	0.00	0.00	1.03	0.0	22.1	2.3	2.35	4.58	2.60	15	0.50	66.23	65.00	66.94	66.45	71.64	72.19	Sta. 336+50
3	1	23.0	0.07	0.07	0.90	0.06	0.06	5.0	5.0	4.6	0.29	2.57	2.14	12	0.52	68.75	68.63	68.98	68.86	72.11	72.19	Sta. 334+00 RT
4	2	245.0	0.34	1.27	0.90	0.31	1.03	5.0	20.1	2.4	2.48	4.58	3.42	15	0.50	67.46	66.23	68.09	67.07	70.63	71.64	Sta. 339+00 LT
5	4	25.0	0.34	0.34	0.90	0.31	0.31	5.0	5.0	4.6	1.40	2.57	3.17	12	0.52	67.84	67.71	68.37	68.29	70.63	70.63	Sta. 339+00 RT
6	4	5.0	0.59	0.59	0.70	0.41	0.41	20.0	20.0	2.4	1.00	16.08	2.59	12	20.40	68.73	67.71	69.15	68.31	68.73	70.63	Sta 339+00 LT (F

System 1 | Number of lines: 6 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	286.0	0.06	1.40	0.90	0.05	1.14	5.0	22.9	3.3	3.73	4.57	3.04	15	0.50	65.00	63.57	66.88	65.93	72.19	72.22	Sta. 334+00 LT
2	1	245.0	0.00	1.27	0.00	0.00	1.03	0.0	21.4	3.4	3.47	4.58	2.82	15	0.50	66.23	65.00	67.82	67.12	71.64	72.19	Sta. 336+50
3	1	23.0	0.07	0.07	0.90	0.06	0.06	5.0	5.0	6.0	0.38	2.57	2.32	12	0.52	68.75	68.63	69.01	68.89	72.11	72.19	Sta. 334+00 RT
4	2	245.0	0.34	1.27	0.90	0.31	1.03	5.0	20.0	3.5	3.59	4.58	3.05	15	0.50	67.46	66.23	68.55	67.84	70.63	71.64	Sta. 339+00 LT
5	4	25.0	0.34	0.34	0.90	0.31	0.31	5.0	5.0	6.0	1.83	2.57	2.33	12	0.52	67.84	67.71	68.92	68.85	70.63	70.63	Sta. 339+00 RT
6	4	5.0	0.59	0.59	0.70	0.41	0.41	20.0	20.0	3.5	1.45	16.08	2.72	12	20.40	68.73	67.71	69.24	68.88	68.73	70.63	Sta 339+00 LT (F

System 1 | Number of lines: 6 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Stor... Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	286.0	0.06	1.40	0.90	0.05	1.14	5.0	22.0	4.8	5.48	4.57	4.47	15	0.50	65.00	63.57	67.99	65.93	72.19	72.22	Sta. 334+00 LT
2	1	245.0	0.00	1.27	0.00	0.00	1.03	0.0	21.0	4.9	5.03	4.58	4.10	15	0.50	66.23	65.00	69.99	68.51	71.64	72.19	Sta. 336+50
3	1	23.0	0.07	0.07	0.90	0.06	0.06	5.0	5.0	7.8	0.49	2.57	2.50	12	0.52	68.75	68.63	69.05	68.93	72.11	72.19	Sta. 334+00 RT
4	2	245.0	0.34	1.27	0.90	0.31	1.03	5.0	20.0	5.0	5.14	4.58	4.19	15	0.50	67.46	66.23	71.59	70.03	70.63	71.64	Sta. 339+00 LT
5	4	25.0	0.34	0.34	0.90	0.31	0.31	5.0	5.0	7.8	2.38	2.57	3.04	12	0.52	67.84	67.71	72.24	72.12	70.63	70.63	Sta. 339+00 RT
6	4	5.0	0.59	0.59	0.70	0.41	0.41	20.0	20.0	5.0	2.07	16.08	2.64	12	20.40	68.73	67.71	72.18	72.16	68.73	70.63	Sta 339+00 LT (F

System 1 | Number of lines: 6 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	3.0	0.09	0.62	0.90	0.08	0.56	5.0	16.3	2.7	1.52	47.36	1.66	30	1.33	61.24	61.20	61.82	61.83	69.38	69.00	Sta 351+98 LT
2	1	25.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	4.6	0.37	2.57	2.30	12	0.52	66.00	65.87	66.26	66.13	69.38	69.38	Sta 351+98 RT
3	1	135.0	0.00	0.44	0.00	0.00	0.40	0.0	9.4	3.6	1.42	40.71	2.03	30	0.99	62.57	61.24	62.97	61.94	70.05	69.38	Sta 350+57.7 LT
4	3	103.0	0.09	0.44	0.90	0.08	0.40	5.0	8.6	3.7	1.47	2.53	3.35	12	0.50	64.89	64.37	65.44	64.92	70.28	70.05	Sta 349+50 LT(2)
5	4	25.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	4.6	0.37	2.57	2.30	12	0.52	66.75	66.62	67.01	66.88	70.28	70.28	Sta 349+50 RT
6	4	246.0	0.13	0.26	0.90	0.12	0.23	5.0	5.6	4.4	1.03	2.52	3.05	12	0.50	67.12	65.89	67.57	66.34	70.87	70.28	Sta 347+00 LT
7	6	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	2.57	0.90	12	0.52	67.25	67.12	67.91	67.90	70.87	70.87	Sta. 347+00 RT

System 2 | Number of lines: 7 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	3.0	0.09	0.62	0.90	0.08	0.56	5.0	13.5	4.2	2.36	47.36	2.66	30	1.33	61.24	61.20	61.80	61.83	69.38	69.00	Sta 351+98 LT
2	1	25.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	6.0	0.49	2.57	2.49	12	0.52	66.00	65.87	66.30	66.16	69.38	69.38	Sta 351+98 RT
3	1	135.0	0.00	0.44	0.00	0.00	0.40	0.0	8.4	5.1	2.03	40.71	2.20	30	0.99	62.57	61.24	63.05	62.13	70.05	69.38	Sta 350+57.7 LT
4	3	103.0	0.09	0.44	0.90	0.08	0.40	5.0	7.8	5.3	2.08	2.53	3.60	12	0.50	64.89	64.37	65.58	65.06	70.28	70.05	Sta 349+50 LT(2)
5	4	25.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	6.0	0.49	2.57	2.49	12	0.52	66.75	66.62	67.05	66.91	70.28	70.28	Sta 349+50 RT
6	4	246.0	0.13	0.26	0.90	0.12	0.23	5.0	5.5	5.9	1.37	2.52	3.27	12	0.50	67.12	65.89	67.65	66.42	70.87	70.28	Sta 347+00 LT
7	6	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	2.57	0.99	12	0.52	67.25	67.12	68.04	68.03	70.87	70.87	Sta. 347+00 RT

System 2 | Number of lines: 7 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Stor. Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	3.0	0.09	0.62	0.90	0.08	0.56	5.0	11.5	6.3	3.50	47.36	3.60	30	1.33	61.24	61.20	61.87	61.83	69.38	69.00	Sta 351+98 LT
2	1	25.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	7.8	0.63	2.57	2.70	12	0.52	66.00	65.87	66.34	66.21	69.38	69.38	Sta 351+98 RT
3	1	135.0	0.00	0.44	0.00	0.00	0.40	0.0	7.6	7.1	2.81	40.71	2.34	30	0.99	62.57	61.24	63.13	62.39	70.05	69.38	Sta 350+57.7 LT
4	3	103.0	0.09	0.44	0.90	0.08	0.40	5.0	7.1	7.2	2.85	2.53	3.63	12	0.50	64.89	64.37	66.03	65.37	70.28	70.05	Sta 349+50 LT(2)
5	4	25.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	7.8	0.63	2.57	2.70	12	0.52	66.75	66.62	67.09	66.96	70.28	70.28	Sta 349+50 RT
6	4	246.0	0.13	0.26	0.90	0.12	0.23	5.0	5.4	7.7	1.80	2.52	3.48	12	0.50	67.12	65.89	67.75	66.51	70.87	70.28	Sta 347+00 LT
7	6	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	2.57	1.17	12	0.52	67.25	67.12	68.20	68.18	70.87	70.87	Sta. 347+00 RT

System 2 | Number of lines: 7 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	12.8	0.00	8.59	0.00	0.00	7.03	0.0	36.2	1.7	11.84	14.90	3.00	30	0.31	31.40	31.36	33.27	33.24	41.10	41.10	Exist. Flatbush
2	1	92.9	0.00	8.59	0.00	0.00	7.03	20.0	35.6	1.7	11.96	27.10	4.02	30	1.03	32.41	31.45	33.62	33.37	46.06	41.10	Exist. Flatbush
3	2	14.0	0.01	0.07	0.90	0.01	0.06	5.0	6.3	4.2	0.27	5.64	2.88	12	5.93	41.29	40.46	41.51	40.61	44.99	46.06	Exist. Flatbush
4	3	25.5	0.06	0.06	0.90	0.05	0.05	5.0	5.0	4.6	0.25	6.34	1.70	12	7.50	43.20	41.29	43.41	41.58	45.00	44.99	Exist. Flatbush
5	2	82.1	0.00	8.52	0.00	0.00	6.96	20.0	35.1	1.7	11.96	27.91	4.27	30	1.10	33.41	32.51	34.57	34.30	46.26	46.06	Exist. Flatbush
6	5	12.2	0.05	0.21	0.90	0.05	0.19	5.0	9.8	3.5	0.67	3.24	2.99	12	1.96	41.50	41.26	41.85	41.57	45.20	46.26	Exist. Flatbush
7	6	69.6	0.00	0.16	0.00	0.00	0.14	0.0	8.3	3.8	0.54	1.42	1.29	12	0.37	41.76	41.50	42.23	42.11	45.96	45.20	Exist. Flatbush
8	7	4.2	0.04	0.04	0.90	0.04	0.04	5.0	5.0	4.6	0.17	5.55	0.68	12	5.74	42.00	41.76	42.27	42.28	45.50	45.96	Exist. Flatbush
9	7	59.5	0.03	0.12	0.90	0.03	0.11	5.0	6.7	4.1	0.45	1.53	1.29	12	0.44	42.02	41.76	42.41	42.30	45.72	45.96	Exist. Flatbush
10	9	49.5	0.09	0.09	0.90	0.08	0.08	5.0	5.0	4.6	0.37	2.91	1.70	12	1.58	42.80	42.02	43.06	42.47	46.10	45.72	Exist. Flatbush
11	5	299.2	0.00	8.31	0.00	0.00	6.77	0.0	33.4	1.8	12.02	17.23	3.79	30	0.42	40.91	39.66	42.45	41.20	47.31	46.26	Exist. Flatbush
12	11	26.6	0.21	0.21	0.90	0.19	0.19	5.0	5.0	4.6	0.87	4.16	3.60	12	3.24	43.97	43.11	44.37	43.42	48.07	47.31	Exist. Flatbush
13	11	64.3	0.36	0.36	0.90	0.32	0.32	5.0	5.0	4.6	1.49	2.57	1.89	12	1.23	42.00	41.21	43.06	42.79	47.04	47.31	Exist. Flatbush
14	11	207.0	0.00	7.74	0.00	0.00	6.26	10.0	32.1	1.8	11.39	35.83	4.75	30	1.81	45.15	41.41	46.28	42.76	53.05	47.31	Exist. Flatbush
15	14	5.6	0.22	0.37	0.90	0.20	0.33	5.0	8.2	3.8	1.27	7.29	2.56	15	3.02	46.22	46.05	46.67	46.70	52.12	53.05	Exist. Flatbush
16	15	18.0	0.00	0.15	0.00	0.00	0.14	0.0	7.6	3.9	0.53	12.32	1.69	15	8.61	47.87	46.32	48.16	46.90	53.07	52.12	Exist. Flatbush
17	16	79.3	0.15	0.15	0.90	0.14	0.14	5.0	5.0	4.6	0.62	2.36	1.62	15	0.32	48.12	47.87	48.56	48.31	55.35	53.07	Exist. Flatbush
18	14	92.5	0.00	7.37	0.00	0.00	5.93	0.0	31.5	1.8	10.91	30.62	4.56	30	1.32	46.47	45.25	47.57	46.64	54.77	53.05	Exist. Flatbush
19	18	85.0	0.00	7.37	0.00	0.00	5.93	10.0	31.0	1.9	11.03	39.75	6.08	30	2.22	49.06	47.17	50.17	48.07	57.90	54.77	Exist. Flatbush
20	19	63.0	0.26	7.37	0.90	0.23	5.93	5.0	30.6	1.9	11.12	31.00	5.50	30	0.57	52.39	52.03	53.51	53.07	61.33	57.90	FB-Sta 22+00 RT
21	20	18.0	0.00	4.04	0.00	0.00	2.93	0.0	25.1	2.1	6.21	14.85	5.92	18	2.00	55.81	55.45	57.11	56.13	60.00	61.33	FB-Sta 21+87 RT

System 2 | Number of lines: 49 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
22	21	192.0	0.00	4.04	0.00	0.00	2.93	0.0	24.3	2.2	6.34	14.85	4.78	18	2.00	59.91	56.07	60.87	57.25	65.00	60.00	FB-Sta 19+91 RT
23	22	108.0	0.00	4.04	0.00	0.00	2.93	0.0	23.8	2.2	6.42	10.50	5.78	18	1.00	62.91	61.83	63.88	62.68	68.50	65.00	FB-Sta 54+00 RT
24	23	73.0	0.00	4.04	0.00	0.00	2.93	0.0	23.5	2.2	6.47	10.50	5.80	18	1.00	65.13	64.40	66.10	65.25	72.00	68.50	FB-Sta 53+27 RT
25	24	22.0	0.15	4.04	0.90	0.14	2.93	5.0	23.4	2.2	6.49	12.47	4.81	18	1.41	65.44	65.13	66.41	66.34	76.73	72.00	FB-Sta 53+15 RT
26	25	33.0	0.04	3.89	0.90	0.04	2.80	5.0	23.2	2.2	6.21	10.50	4.64	18	1.00	65.77	65.44	66.72	66.67	76.93	76.73	FB-Sta 53+15 LT
27	26	40.0	0.00	2.94	0.00	0.00	2.07	0.0	20.3	2.4	4.98	10.50	3.97	18	1.00	66.17	65.77	67.03	67.03	79.02	76.93	FB-Sta 53+60 LT
28	27	53.0	2.87	2.87	0.70	2.01	2.01	20.0	20.0	2.4	4.88	10.50	3.82	18	1.00	66.70	66.17	67.55	67.53	71.00	79.02	FB-Sta 53+97 LT
29	26	184.0	0.66	0.91	0.70	0.46	0.69	20.0	20.0	2.4	1.67	10.50	3.82	18	1.00	68.66	66.82	69.15	67.22	73.25	76.93	FB-Sta 51+27 LT
30	29	34.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	4.6	1.03	10.50	2.12	18	1.00	69.00	68.66	69.39	69.32	73.13	73.25	FB-Sta 51+27 RT
31	20	56.0	0.24	2.75	0.90	0.22	2.48	5.0	30.1	1.9	4.69	35.52	1.17	30	0.75	52.81	52.39	54.54	54.54	61.33	61.33	FB-Sta 22+00 LT
32	20	340.0	0.07	0.32	0.90	0.06	0.29	5.0	5.7	4.4	1.26	9.61	5.94	12	7.28	81.37	56.62	81.85	56.86	86.33	61.33	FB-Sta 18+58 RT
33	32	58.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	4.6	1.03	3.71	2.58	12	1.09	82.00	81.37	82.43	82.00	85.83	86.33	FB-Sta 18+70 LT
34	31	20.0	0.00	2.51	0.00	0.00	2.26	0.0	29.9	1.9	4.30	41.01	1.26	30	1.00	53.01	52.81	54.56	54.57	59.90	61.33	FB-Sta 21+85 LT
35	34	154.0	0.31	2.42	0.90	0.28	2.18	5.0	28.3	2.0	4.29	41.01	2.59	30	1.00	54.55	53.01	55.24	54.60	64.01	59.90	FB-Sta 20+31 LT
36	35	228.0	0.16	2.11	0.90	0.14	1.90	5.0	25.7	2.1	3.97	29.00	3.96	30	0.50	56.67	55.53	57.34	56.15	70.00	64.01	FB-Sta 17+90 LT
37	36	63.0	0.00	1.95	0.00	0.00	1.76	0.0	25.0	2.1	3.73	29.23	3.88	30	0.51	60.75	60.43	61.40	61.03	70.00	70.00	FB-Sta 17+29 LT
38	37	90.0	0.00	1.95	0.00	0.00	1.76	0.0	23.9	2.2	3.83	29.00	2.96	30	0.50	61.20	60.75	61.85	61.72	69.00	70.00	FB-Sta 16+26 LT
39	38	3.0	0.09	1.95	0.90	0.08	1.76	5.0	23.9	2.2	3.83	47.36	2.67	30	1.33	61.24	61.20	62.05	62.06	69.38	69.00	Sta 351+98 LT
40	39	4.0	0.70	1.86	0.90	0.63	1.67	5.0	23.9	2.2	3.66	22.62	4.15	24	1.00	63.29	63.25	64.11	63.79	70.76	69.38	FB-Sta 16+13 LT
41	40	222.0	0.00	1.14	0.00	0.00	1.03	0.0	6.2	4.2	4.36	12.08	4.56	15	3.50	71.09	63.32	71.93	64.32	78.50	70.76	FB-Sta 13+65 LT
42	41	11.0	0.47	1.02	0.90	0.42	0.92	5.0	5.9	4.3	3.99	6.46	3.79	15	1.00	71.20	71.09	72.15	72.15	79.13	78.50	FB-Sta 13+65 LT

System 2 | Number of lines: 49 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
43	42	64.0	0.08	0.55	0.90	0.07	0.50	5.0	5.5	4.4	2.20	3.56	3.12	12	1.00	71.84	71.20	72.60	72.40	79.63	79.13	FB-ta 13+70 RT
44	43	73.0	0.47	0.47	0.90	0.42	0.42	5.0	5.0	4.6	1.94	3.56	3.25	12	1.00	72.57	71.84	73.16	72.84	76.83	79.63	FB-Sta 104+70 R
45	41	47.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	4.6	0.50	3.56	0.71	12	1.00	71.56	71.09	72.30	72.30	77.03	78.50	FB-Sta. 106+50
46	40	40.0	0.01	0.02	0.90	0.01	0.02	5.0	13.9	3.0	0.05	6.46	1.45	15	1.00	67.00	66.60	67.09	66.68	71.00	70.76	Sta 16+13 LT (2)
47	46	18.0	0.01	0.01	0.90	0.01	0.01	5.0	5.0	4.6	0.04	8.05	1.47	15	1.56	67.96	67.68	68.04	67.74	70.76	71.00	Existing
48	34	4.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	4.6	0.37	3.56	2.61	12	1.00	54.55	54.51	54.81	54.73	61.00	59.90	FB-Sta 21+85 LT
49	27	73.0	0.07	0.07	0.90	0.06	0.06	5.0	5.0	4.6	0.29	7.12	3.29	12	4.00	75.92	73.00	76.15	73.14	82.03	79.02	FB-Sta. 54+39 LT

System 2 | Number of lines: 49 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	12.8	0.00	8.59	0.00	0.00	7.03	0.0	28.2	2.9	20.39	14.90	5.04	30	0.31	31.40	31.36	33.36	33.24	41.10	41.10	Exist. Flatbush
2	1	92.9	0.00	8.59	0.00	0.00	7.03	20.0	27.8	2.9	20.54	27.10	5.24	30	1.03	32.41	31.45	34.08	33.59	46.06	41.10	Exist. Flatbush
3	2	14.0	0.01	0.07	0.90	0.01	0.06	5.0	6.0	5.7	0.36	5.64	3.15	12	5.93	41.29	40.46	41.54	40.63	44.99	46.06	Exist. Flatbush
4	3	25.5	0.06	0.06	0.90	0.05	0.05	5.0	5.0	6.0	0.32	6.34	1.82	12	7.50	43.20	41.29	43.44	41.62	45.00	44.99	Exist. Flatbush
5	2	82.1	0.00	8.52	0.00	0.00	6.96	20.0	27.5	2.9	20.50	27.91	4.86	30	1.10	33.41	32.51	35.21	34.85	46.26	46.06	Exist. Flatbush
6	5	12.2	0.05	0.21	0.90	0.05	0.19	5.0	8.6	5.1	0.96	3.24	3.34	12	1.96	41.50	41.26	41.92	41.63	45.20	46.26	Exist. Flatbush
7	6	69.6	0.00	0.16	0.00	0.00	0.14	0.0	7.6	5.3	0.76	1.42	1.60	12	0.37	41.76	41.50	42.30	42.13	45.96	45.20	Exist. Flatbush
8	7	4.2	0.04	0.04	0.90	0.04	0.04	5.0	5.0	6.0	0.22	5.55	0.61	12	5.74	42.00	41.76	42.38	42.38	45.50	45.96	Exist. Flatbush
9	7	59.5	0.03	0.12	0.90	0.03	0.11	5.0	6.3	5.6	0.61	1.53	1.39	12	0.44	42.02	41.76	42.50	42.39	45.72	45.96	Exist. Flatbush
10	9	49.5	0.09	0.09	0.90	0.08	0.08	5.0	5.0	6.0	0.49	2.91	1.82	12	1.58	42.80	42.02	43.10	42.56	46.10	45.72	Exist. Flatbush
11	5	299.2	0.00	8.31	0.00	0.00	6.77	0.0	26.3	3.0	20.45	17.23	4.17	30	0.42	40.91	39.66	43.92	42.16	47.31	46.26	Exist. Flatbush
12	11	26.6	0.21	0.21	0.90	0.19	0.19	5.0	5.0	6.0	1.13	4.16	2.28	12	3.24	43.97	43.11	44.44	44.37	48.07	47.31	Exist. Flatbush
13	11	64.3	0.36	0.36	0.90	0.32	0.32	5.0	5.0	6.0	1.94	2.57	2.47	12	1.23	42.00	41.21	44.76	44.31	47.04	47.31	Exist. Flatbush
14	11	207.0	0.00	7.74	0.00	0.00	6.26	10.0	25.5	3.1	19.27	35.83	5.18	30	1.81	45.15	41.41	46.62	44.17	53.05	47.31	Exist. Flatbush
15	14	5.6	0.22	0.37	0.90	0.20	0.33	5.0	7.5	5.3	1.78	7.29	1.60	15	3.02	46.22	46.05	47.21	47.21	52.12	53.05	Exist. Flatbush
16	15	18.0	0.00	0.15	0.00	0.00	0.14	0.0	7.0	5.4	0.73	12.32	1.71	15	8.61	47.87	46.32	48.21	47.27	53.07	52.12	Exist. Flatbush
17	16	79.3	0.15	0.15	0.90	0.14	0.14	5.0	5.0	6.0	0.81	2.36	1.74	15	0.32	48.12	47.87	48.63	48.38	55.35	53.07	Exist. Flatbush
18	14	92.5	0.00	7.37	0.00	0.00	5.93	0.0	25.1	3.1	18.41	30.62	5.60	30	1.32	46.47	45.25	47.90	47.04	54.77	53.05	Exist. Flatbush
19	18	85.0	0.00	7.37	0.00	0.00	5.93	10.0	24.7	3.1	18.56	39.75	7.15	30	2.22	49.06	47.17	50.50	48.37	57.90	54.77	Exist. Flatbush
20	19	63.0	0.26	7.37	0.90	0.23	5.93	5.0	24.4	3.2	18.67	31.00	6.46	30	0.57	52.39	52.03	53.84	53.43	61.33	57.90	FB-Sta 22+00 RT
21	20	18.0	0.00	4.04	0.00	0.00	2.93	0.0	23.5	3.2	9.42	14.85	7.11	18	2.00	55.81	55.45	57.31	56.32	60.00	61.33	FB-Sta 21+87 RT

System 2 | Number of lines: 49 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
22	21	192.0	0.00	4.04	0.00	0.00	2.93	0.0	23.0	3.3	9.55	14.85	5.93	18	2.00	59.91	56.07	61.09	57.52	65.00	60.00	FB-Sta 19+91 RT
23	22	108.0	0.00	4.04	0.00	0.00	2.93	0.0	22.6	3.3	9.62	10.50	6.58	18	1.00	62.91	61.83	64.10	62.96	68.50	65.00	FB-Sta 54+00 RT
24	23	73.0	0.00	4.04	0.00	0.00	2.93	0.0	22.4	3.3	9.67	10.50	6.59	18	1.00	65.13	64.40	66.32	65.54	72.00	68.50	FB-Sta 53+27 RT
25	24	22.0	0.15	4.04	0.90	0.14	2.93	5.0	22.4	3.3	9.69	12.47	5.48	18	1.41	65.44	65.13	67.28	67.09	76.73	72.00	FB-Sta 53+15 RT
26	25	33.0	0.04	3.89	0.90	0.04	2.80	5.0	22.2	3.3	9.27	10.50	5.24	18	1.00	65.77	65.44	67.91	67.65	76.93	76.73	FB-Sta 53+15 LT
27	26	40.0	0.00	2.94	0.00	0.00	2.07	0.0	20.2	3.5	7.23	10.50	4.09	18	1.00	66.17	65.77	69.23	69.04	79.02	76.93	FB-Sta 53+60 LT
28	27	53.0	2.87	2.87	0.70	2.01	2.01	20.0	20.0	3.5	7.05	10.50	3.99	18	1.00	66.70	66.17	69.67	69.44	71.00	79.02	FB-Sta 53+97 LT
29	26	184.0	0.66	0.91	0.70	0.46	0.69	20.0	20.0	3.5	2.41	10.50	2.02	18	1.00	68.66	66.82	69.42	69.27	73.25	76.93	FB-Sta 51+27 LT
30	29	34.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	6.0	1.35	10.50	1.53	18	1.00	69.00	68.66	69.62	69.64	73.13	73.25	FB-Sta 51+27 RT
31	20	56.0	0.24	2.75	0.90	0.22	2.48	5.0	24.0	3.2	7.87	35.52	1.60	30	0.75	52.81	52.39	55.37	55.35	61.33	61.33	FB-Sta 22+00 LT
32	20	340.0	0.07	0.32	0.90	0.06	0.29	5.0	5.6	5.8	1.68	9.61	6.49	12	7.28	81.37	56.62	81.92	56.90	86.33	61.33	FB-Sta 18+58 RT
33	32	58.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	6.0	1.35	3.71	2.85	12	1.09	82.00	81.37	82.49	82.10	85.83	86.33	FB-Sta 18+70 LT
34	31	20.0	0.00	2.51	0.00	0.00	2.26	0.0	23.9	3.2	7.21	41.01	1.47	30	1.00	53.01	52.81	55.43	55.43	59.90	61.33	FB-Sta 21+85 LT
35	34	154.0	0.31	2.42	0.90	0.28	2.18	5.0	22.7	3.3	7.14	41.01	2.84	30	1.00	54.55	53.01	55.49	55.46	64.01	59.90	FB-Sta 20+31 LT
36	35	228.0	0.16	2.11	0.90	0.14	1.90	5.0	20.8	3.4	6.52	29.00	4.58	30	0.50	56.67	55.53	57.52	56.34	70.00	64.01	FB-Sta 17+90 LT
37	36	63.0	0.00	1.95	0.00	0.00	1.76	0.0	20.3	3.5	6.11	29.23	4.49	30	0.51	60.75	60.43	61.58	61.21	70.00	70.00	FB-Sta 17+29 LT
38	37	90.0	0.00	1.95	0.00	0.00	1.76	0.0	19.5	3.6	6.24	29.00	3.42	30	0.50	61.20	60.75	62.04	62.00	69.00	70.00	FB-Sta 16+26 LT
39	38	3.0	0.09	1.95	0.90	0.08	1.76	5.0	19.5	3.6	6.24	47.36	2.68	30	1.33	61.24	61.20	62.42	62.42	69.38	69.00	Sta 351+98 LT
40	39	4.0	0.70	1.86	0.90	0.63	1.67	5.0	19.5	3.6	5.96	22.62	4.78	24	1.00	63.29	63.25	64.36	63.95	70.76	69.38	FB-Sta 16+13 LT
41	40	222.0	0.00	1.14	0.00	0.00	1.03	0.0	6.0	5.7	5.86	12.08	5.26	15	3.50	71.09	63.32	72.06	64.64	78.50	70.76	FB-Sta 13+65 LT
42	41	11.0	0.47	1.02	0.90	0.42	0.92	5.0	5.7	5.8	5.32	6.46	4.50	15	1.00	71.20	71.09	72.32	72.28	79.13	78.50	FB-Sta 13+65 LT

System 2 | Number of lines: 49 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
43	42	64.0	0.08	0.55	0.90	0.07	0.50	5.0	5.4	5.9	2.91	3.56	3.70	12	1.00	71.84	71.20	73.03	72.60	79.63	79.13	FB-ta 13+70 RT
44	43	73.0	0.47	0.47	0.90	0.42	0.42	5.0	5.0	6.0	2.53	3.56	3.23	12	1.00	72.57	71.84	73.56	73.25	76.83	79.63	FB-Sta 104+70 R
45	41	47.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	6.0	0.65	3.56	0.82	12	1.00	71.56	71.09	72.56	72.55	77.03	78.50	FB-Sta. 106+50
46	40	40.0	0.01	0.02	0.90	0.01	0.02	5.0	11.8	4.5	0.08	6.46	1.63	15	1.00	67.00	66.60	67.11	66.70	71.00	70.76	Sta 16+13 LT (2)
47	46	18.0	0.01	0.01	0.90	0.01	0.01	5.0	5.0	6.0	0.05	8.05	1.58	15	1.56	67.96	67.68	68.05	67.75	70.76	71.00	Existing
48	34	4.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	6.0	0.49	3.56	0.63	12	1.00	54.55	54.51	55.48	55.48	61.00	59.90	FB-Sta 21+85 LT
49	27	73.0	0.07	0.07	0.90	0.06	0.06	5.0	5.0	6.0	0.38	7.12	3.56	12	4.00	75.92	73.00	76.18	73.16	82.03	79.02	FB-Sta. 54+39 LT

System 2 | Number of lines: 49 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	12.8	0.00	8.59	0.00	0.00	7.03	0.0	25.1	4.5	31.60	14.90	7.30	30	0.31	31.40	31.36	33.73	33.24	41.10	41.10	Exist. Flatbush
2	1	92.9	0.00	8.59	0.00	0.00	7.03	20.0	24.9	4.5	31.76	27.10	6.47	30	1.03	32.41	31.45	35.31	33.99	46.06	41.10	Exist. Flatbush
3	2	14.0	0.01	0.07	0.90	0.01	0.06	5.0	5.8	7.6	0.48	5.64	3.43	12	5.93	41.29	40.46	41.58	40.66	44.99	46.06	Exist. Flatbush
4	3	25.5	0.06	0.06	0.90	0.05	0.05	5.0	5.0	7.8	0.42	6.34	1.95	12	7.50	43.20	41.29	43.48	41.67	45.00	44.99	Exist. Flatbush
5	2	82.1	0.00	8.52	0.00	0.00	6.96	20.0	24.6	4.5	31.62	27.91	6.44	30	1.10	33.41	32.51	37.07	35.91	46.26	46.06	Exist. Flatbush
6	5	12.2	0.05	0.21	0.90	0.05	0.19	5.0	7.8	7.0	1.33	3.24	3.69	12	1.96	41.50	41.26	41.99	41.71	45.20	46.26	Exist. Flatbush
7	6	69.6	0.00	0.16	0.00	0.00	0.14	0.0	7.0	7.3	1.04	1.42	1.59	12	0.37	41.76	41.50	42.49	42.35	45.96	45.20	Exist. Flatbush
8	7	4.2	0.04	0.04	0.90	0.04	0.04	5.0	5.0	7.8	0.28	5.55	0.51	12	5.74	42.00	41.76	42.56	42.57	45.50	45.96	Exist. Flatbush
9	7	59.5	0.03	0.12	0.90	0.03	0.11	5.0	6.0	7.5	0.81	1.53	1.42	12	0.44	42.02	41.76	42.63	42.54	45.72	45.96	Exist. Flatbush
10	9	49.5	0.09	0.09	0.90	0.08	0.08	5.0	5.0	7.8	0.63	2.91	1.93	12	1.58	42.80	42.02	43.14	42.68	46.10	45.72	Exist. Flatbush
11	5	299.2	0.00	8.31	0.00	0.00	6.77	0.0	23.8	4.6	31.28	17.23	6.37	30	0.42	40.91	39.66	46.28	42.16	47.31	46.26	Exist. Flatbush
12	11	26.6	0.21	0.21	0.90	0.19	0.19	5.0	5.0	7.8	1.47	4.16	1.88	12	3.24	43.97	43.11	47.47	47.36	48.07	47.31	Exist. Flatbush
13	11	64.3	0.36	0.36	0.90	0.32	0.32	5.0	5.0	7.8	2.53	2.57	3.22	12	1.23	42.00	41.21	48.02	47.25	47.04	47.31	Exist. Flatbush
14	11	207.0	0.00	7.74	0.00	0.00	6.26	10.0	23.2	4.7	29.28	35.83	5.97	30	1.81	45.15	41.41	49.36	46.86	53.05	47.31	Exist. Flatbush
15	14	5.6	0.22	0.37	0.90	0.20	0.33	5.0	6.9	7.3	2.42	7.29	1.97	15	3.02	46.22	46.05	50.25	50.23	52.12	53.05	Exist. Flatbush
16	15	18.0	0.00	0.15	0.00	0.00	0.14	0.0	6.5	7.4	0.99	12.32	0.81	15	8.61	47.87	46.32	50.34	50.33	53.07	52.12	Exist. Flatbush
17	16	79.3	0.15	0.15	0.90	0.14	0.14	5.0	5.0	7.8	1.05	2.36	0.86	15	0.32	48.12	47.87	50.39	50.34	55.35	53.07	Exist. Flatbush
18	14	92.5	0.00	7.37	0.00	0.00	5.93	0.0	22.9	4.7	27.88	30.62	5.68	30	1.32	46.47	45.25	50.80	49.79	54.77	53.05	Exist. Flatbush
19	18	85.0	0.00	7.37	0.00	0.00	5.93	10.0	22.7	4.7	28.04	39.75	5.71	30	2.22	49.06	47.17	51.82	50.88	57.90	54.77	Exist. Flatbush
20	19	63.0	0.26	7.37	0.90	0.23	5.93	5.0	22.5	4.7	28.15	31.00	7.16	30	0.57	52.39	52.03	54.26	53.90	61.33	57.90	FB-Sta 22+00 RT
21	20	18.0	0.00	4.04	0.00	0.00	2.93	0.0	22.5	4.8	13.93	14.85	8.72	18	2.00	55.81	55.45	57.39	56.60	60.00	61.33	FB-Sta 21+37 RT

System 2 | Number of lines: 49 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
22	21	192.0	0.00	4.04	0.00	0.00	2.93	0.0	22.1	4.8	14.05	14.85	8.10	18	2.00	59.91	56.07	61.29	57.86	65.00	60.00	FB-Sta 19+91 RT
23	22	108.0	0.00	4.04	0.00	0.00	2.93	0.0	21.8	4.8	14.12	10.50	7.99	18	1.00	62.91	61.83	65.28	63.33	68.50	65.00	FB-Sta 54+00 RT
24	23	73.0	0.00	4.04	0.00	0.00	2.93	0.0	21.7	4.8	14.16	10.50	8.02	18	1.00	65.13	64.40	67.23	65.90	72.00	68.50	FB-Sta 53+27 RT
25	24	22.0	0.15	4.04	0.90	0.14	2.93	5.0	21.6	4.8	14.18	12.47	8.02	18	1.41	65.44	65.13	68.55	68.15	76.73	72.00	FB-Sta 53+15 RT
26	25	33.0	0.04	3.89	0.90	0.04	2.80	5.0	21.6	4.8	13.55	10.50	7.67	18	1.00	65.77	65.44	69.91	69.36	76.93	76.73	FB-Sta 53+15 LT
27	26	40.0	0.00	2.94	0.00	0.00	2.07	0.0	20.2	5.0	10.36	10.50	5.87	18	1.00	66.17	65.77	72.73	72.34	79.02	76.93	FB-Sta 53+60 LT
28	27	53.0	2.87	2.87	0.70	2.01	2.01	20.0	20.0	5.0	10.09	10.50	5.71	18	1.00	66.70	66.17	73.65	73.16	71.00	79.02	FB-Sta 53+97 LT
29	26	184.0	0.66	0.91	0.70	0.46	0.69	20.0	20.0	5.0	3.45	10.50	1.95	18	1.00	68.66	66.82	73.01	72.82	73.25	76.93	FB-Sta 51+27 LT
30	29	34.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	7.8	1.75	10.50	0.99	18	1.00	69.00	68.66	73.16	73.15	73.13	73.25	FB-Sta 51+27 RT
31	20	56.0	0.24	2.75	0.90	0.22	2.48	5.0	19.5	5.1	12.57	35.52	2.56	30	0.75	52.81	52.39	56.20	56.15	61.33	61.33	FB-Sta 22+00 LT
32	20	340.0	0.07	0.32	0.90	0.06	0.29	5.0	5.4	7.7	2.21	9.61	7.08	12	7.28	81.37	56.62	82.00	56.95	86.33	61.33	FB-Sta 18+58 RT
33	32	58.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	7.8	1.75	3.71	3.19	12	1.09	82.00	81.37	82.56	82.20	85.83	86.33	FB-Sta 18+70 LT
34	31	20.0	0.00	2.51	0.00	0.00	2.26	0.0	19.4	5.1	11.50	41.01	2.34	30	1.00	53.01	52.81	56.35	56.33	59.90	61.33	FB-Sta 21+85 LT
35	34	154.0	0.31	2.42	0.90	0.28	2.18	5.0	18.5	5.2	11.31	41.01	2.53	30	1.00	54.55	53.01	56.50	56.42	64.01	59.90	FB-Sta 20+31 LT
36	35	228.0	0.16	2.11	0.90	0.14	1.90	5.0	17.1	5.4	10.21	29.00	5.05	30	0.50	56.67	55.53	57.74	56.61	70.00	64.01	FB-Sta 17+90 LT
37	36	63.0	0.00	1.95	0.00	0.00	1.76	0.0	16.7	5.4	9.53	29.23	5.13	30	0.51	60.75	60.43	61.79	61.41	70.00	70.00	FB-Sta 17+29 LT
38	37	90.0	0.00	1.95	0.00	0.00	1.76	0.0	16.1	5.5	9.67	29.00	3.71	30	0.50	61.20	60.75	62.34	62.32	69.00	70.00	FB-Sta 16+26 LT
39	38	3.0	0.09	1.95	0.90	0.08	1.76	5.0	16.1	5.5	9.68	47.36	3.20	30	1.33	61.24	61.20	62.70	62.70	69.38	69.00	Sta 351+98 LT
40	39	4.0	0.70	1.86	0.90	0.63	1.67	5.0	16.1	5.5	9.23	22.62	5.49	24	1.00	63.29	63.25	64.62	64.14	70.76	69.38	FB-Sta 16+13 LT
41	40	222.0	0.00	1.14	0.00	0.00	1.03	0.0	5.7	7.6	7.78	12.08	6.55	15	3.50	71.09	63.32	72.20	65.03	78.50	70.76	FB-Sta 13+65 LT
42	41	11.0	0.47	1.02	0.90	0.42	0.92	5.0	5.5	7.6	7.02	6.46	5.72	15	1.00	71.20	71.09	72.45	72.35	79.13	78.50	FB-Sta 13+65 LT

System 2 | Number of lines: 49 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
43	42	64.0	0.08	0.55	0.90	0.07	0.50	5.0	5.3	7.7	3.82	3.56	4.86	12	1.00	71.84	71.20	73.58	72.84	79.63	79.13	FB-ta 13+70 RT
44	43	73.0	0.47	0.47	0.90	0.42	0.42	5.0	5.0	7.8	3.30	3.56	4.20	12	1.00	72.57	71.84	74.60	73.98	76.83	79.63	FB-Sta 104+70 R
45	41	47.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	7.8	0.84	3.56	1.07	12	1.00	71.56	71.09	72.92	72.89	77.03	78.50	FB-Sta. 106+50
46	40	40.0	0.01	0.02	0.90	0.01	0.02	5.0	10.2	6.5	0.12	6.46	1.81	15	1.00	67.00	66.60	67.14	66.72	71.00	70.76	Sta 16+13 LT (2)
47	46	18.0	0.01	0.01	0.90	0.01	0.01	5.0	5.0	7.8	0.07	8.05	1.71	15	1.56	67.96	67.68	68.07	67.76	70.76	71.00	Existing
48	34	4.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	7.8	0.63	3.56	0.80	12	1.00	54.55	54.51	56.49	56.49	61.00	59.90	FB-Sta 21+85 LT
49	27	73.0	0.07	0.07	0.90	0.06	0.06	5.0	5.0	7.8	0.49	7.12	1.70	12	4.00	75.92	73.00	76.22	73.66	82.03	79.02	FB-Sta. 54+39 LT

System 2 | Number of lines: 49 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	4.0	0.00	6.54	0.00	0.00	5.59	0.0	33.6	1.8	9.88	41.01	2.01	30	1.00	39.04	39.00	45.61	45.61	44.00	40.00	Sta 384+35 LT
2	1	36.0	0.15	6.54	0.90	0.14	5.59	5.0	33.4	1.8	9.93	96.51	3.54	30	17.33	45.28	39.04	46.33	45.68	64.46	44.00	Sta 384+35 LT
3	2	11.0	0.00	6.39	0.00	0.00	5.46	0.0	33.3	1.8	9.70	30.29	3.56	30	0.55	45.34	45.28	46.67	46.67	65.04	64.46	Sta 384+35
4	3	10.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	4.6	0.58	2.52	2.61	12	0.50	61.00	60.95	61.32	61.28	64.51	65.04	Sta 384+35 RT
5	3	230.0	0.00	6.25	0.00	0.00	5.33	0.0	31.5	1.8	9.82	29.00	3.92	30	0.50	46.49	45.34	47.54	47.02	65.74	65.04	Sta 382+00
6	5	195.0	0.00	6.25	0.00	0.00	5.33	0.0	30.0	1.9	10.13	29.07	4.37	30	0.50	47.47	46.49	48.53	47.87	66.34	65.74	Sta 380+00
7	6	10.0	0.18	6.07	0.90	0.16	5.17	5.0	29.9	1.9	9.84	29.00	3.55	30	0.50	47.52	47.47	48.87	48.87	65.79	66.34	Sta 380+00 LT
8	6	10.0	0.18	0.18	0.90	0.16	0.16	5.0	5.0	4.6	0.74	2.52	2.79	12	0.50	62.25	62.20	62.62	62.57	65.80	66.34	Sta 380+00 RT
9	7	245.0	0.00	5.89	0.00	0.00	5.01	0.0	28.0	2.0	9.93	29.06	3.84	30	0.50	48.75	47.52	49.80	49.32	66.79	65.79	Sta 377+50 LT
10	9	245.0	0.15	5.89	0.90	0.14	5.01	5.0	26.1	2.1	10.36	29.06	4.43	30	0.50	49.98	48.75	51.06	50.13	67.27	66.79	Sta. 375+00 LT
11	10	295.0	0.00	5.59	0.00	0.00	4.74	0.0	23.9	2.2	10.36	29.05	4.37	30	0.50	51.46	49.98	52.54	51.40	68.44	67.27	Sta 372+00 LT
12	11	9.0	0.00	5.59	0.00	0.00	4.74	0.0	23.8	2.2	10.38	30.57	3.71	30	0.56	51.51	51.46	52.87	52.88	68.74	68.44	Sta 372+00 RT
13	10	25.0	0.15	0.15	0.90	0.14	0.14	5.0	5.0	4.6	0.62	2.57	2.68	12	0.52	63.75	63.62	64.09	63.95	67.27	67.27	Sta 375+00 RT
14	12	345.0	0.00	5.59	0.00	0.00	4.74	0.0	21.3	2.3	11.09	28.96	4.26	30	0.50	53.33	51.61	54.44	53.24	68.29	68.74	Sta 368+50 RT
15	14	145.0	0.00	5.59	0.00	0.00	4.74	0.0	20.2	2.4	11.42	29.10	4.57	30	0.50	54.06	53.33	55.19	54.79	67.86	68.29	Sta 367+00
16	15	10.0	0.30	5.29	0.90	0.27	4.47	5.0	20.2	2.4	10.79	29.00	3.87	30	0.50	54.19	54.14	55.55	55.55	67.29	67.86	Sta 367+00 LT
17	16	220.0	0.00	3.51	0.00	0.00	3.16	0.0	15.3	2.8	8.90	29.00	3.44	30	0.50	55.29	54.19	56.32	56.11	67.95	67.29	Sta 364+75 LT (
18	17	220.0	0.00	3.51	0.00	0.00	3.16	0.0	13.6	3.0	9.46	29.00	4.22	30	0.50	56.39	55.29	57.42	56.65	68.56	67.95	Sta 362+50 LT (
19	18	10.0	0.47	0.47	0.90	0.42	0.42	5.0	5.0	4.6	1.94	4.57	3.57	15	0.50	63.17	63.12	63.74	63.69	68.00	68.56	Sta 362+50 LT
20	16	13.0	1.48	1.48	0.70	1.04	1.04	20.0	20.0	2.4	2.51	7.71	3.82	18	0.54	60.00	59.93	60.61	60.52	64.00	67.29	Sta 367+00 LT (C
21	18	217.0	0.00	3.04	0.00	0.00	2.74	0.0	12.5	3.1	8.58	15.96	5.18	24	0.50	57.97	56.89	59.01	57.93	67.90	68.56	Sta. 360+28 LT

System 3 | Number of lines: 35 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
22	21	123.0	0.28	3.04	0.90	0.25	2.74	5.0	11.8	3.2	8.80	16.06	4.49	24	0.50	58.59	57.97	59.65	59.37	67.29	67.90	Sta. 359+00 LT
23	22	25.0	0.28	0.28	0.90	0.25	0.25	5.0	5.0	4.6	1.16	2.57	3.18	12	0.52	63.38	63.25	63.85	63.72	67.29	67.29	Sta. 359+00 RT
24	22	255.0	0.00	2.48	0.00	0.00	2.23	0.0	10.3	3.4	7.66	15.96	3.34	24	0.50	59.86	58.59	60.98	60.62	68.05	67.29	Sta. 356+40 (MH)
25	24	47.0	0.00	1.95	0.00	0.00	1.76	0.0	10.0	3.5	6.12	22.62	3.60	24	1.00	60.33	59.86	61.21	61.26	68.45	68.05	Sta. 355+67 LT
26	25	32.0	0.13	0.26	0.90	0.12	0.23	5.0	5.6	4.4	1.03	2.52	3.05	12	0.50	64.19	64.03	64.64	64.48	68.32	68.45	Sta. 355+50 LT(2
27	26	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	2.57	0.90	12	0.52	64.32	64.19	64.98	64.97	68.32	68.32	Sta. 355+50 RT
28	24	16.0	0.53	0.53	0.90	0.48	0.48	5.0	5.0	4.6	2.19	4.57	3.68	15	0.50	63.45	63.37	64.06	63.98	70.00	68.05	Sta. 356+40 LT
29	25	85.0	0.15	1.69	0.90	0.14	1.52	5.0	9.3	3.6	5.48	16.09	2.67	24	0.51	60.76	60.33	61.84	61.82	70.26	68.45	X-Crowley Parkin
30	29	20.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	4.6	1.03	0.88	2.96	8	1.25	67.11	66.86	67.87	67.53	69.71	70.26	X-Crowley Parkin
31	29	81.0	0.15	1.29	0.90	0.14	1.16	5.0	8.8	3.7	4.29	13.40	5.64	18	3.85	65.38	62.26	66.17	62.84	70.68	70.26	X-Dunkin Donuts
32	31	40.0	0.51	0.65	0.90	0.46	0.59	5.0	8.6	3.7	2.18	4.62	3.50	12	3.98	66.97	65.38	67.60	66.37	71.07	70.68	X-Dunkin Donuts
33	32	159.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	4.6	0.58	2.63	1.71	12	1.30	69.03	66.97	69.35	67.86	72.93	71.07	X-Dunkin Donuts
34	31	49.0	0.49	0.49	0.90	0.44	0.44	5.0	5.0	4.6	2.02	5.83	3.33	12	6.35	68.49	65.38	69.09	66.39	70.49	70.68	X-MIJI Realty
35	15	10.0	0.30	0.30	0.90	0.27	0.27	5.0	5.0	4.6	1.24	4.83	2.29	18	0.50	62.88	62.83	63.40	63.35	67.29	67.86	Sta 367+00 RT

System 3 | Number of lines: 35 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	4.0	0.00	6.54	0.00	0.00	5.59	0.0	29.3	2.8	15.86	41.01	3.23	30	1.00	39.04	39.00	45.62	45.61	44.00	40.00	Sta 384+35 LT
2	1	36.0	0.15	6.54	0.90	0.14	5.59	5.0	29.2	2.8	15.92	96.51	4.61	30	17.33	45.28	39.04	46.61	45.78	64.46	44.00	Sta 384+35 LT
3	2	11.0	0.00	6.39	0.00	0.00	5.46	0.0	29.1	2.9	15.55	30.29	4.37	30	0.55	45.34	45.28	47.01	47.01	65.04	64.46	Sta 384+35
4	3	10.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	6.0	0.75	2.52	2.80	12	0.50	61.00	60.95	61.38	61.33	64.51	65.04	Sta 384+35 RT
5	3	230.0	0.00	6.25	0.00	0.00	5.33	0.0	27.9	2.9	15.57	29.00	4.68	30	0.50	46.49	45.34	47.82	47.47	65.74	65.04	Sta 382+00
6	5	195.0	0.00	6.25	0.00	0.00	5.33	0.0	26.9	3.0	15.91	29.07	5.11	30	0.50	47.47	46.49	48.80	48.27	66.34	65.74	Sta 380+00
7	6	10.0	0.18	6.07	0.90	0.16	5.17	5.0	26.8	3.0	15.44	29.00	4.31	30	0.50	47.52	47.47	49.21	49.20	65.79	66.34	Sta 380+00 LT
8	6	10.0	0.18	0.18	0.90	0.16	0.16	5.0	5.0	6.0	0.97	2.52	3.00	12	0.50	62.25	62.20	62.68	62.63	65.80	66.34	Sta 380+00 RT
9	7	245.0	0.00	5.89	0.00	0.00	5.01	0.0	25.5	3.1	15.39	29.06	4.39	30	0.50	48.75	47.52	50.14	49.80	66.79	65.79	Sta 377+50 LT
10	9	245.0	0.15	5.89	0.90	0.14	5.01	5.0	24.2	3.2	15.84	29.06	5.12	30	0.50	49.98	48.75	51.31	50.52	67.27	66.79	Sta. 375+00 LT
11	10	295.0	0.00	5.59	0.00	0.00	4.74	0.0	22.7	3.3	15.54	29.05	5.11	30	0.50	51.46	49.98	52.78	51.71	68.44	67.27	Sta 372+00 LT
12	11	9.0	0.00	5.59	0.00	0.00	4.74	0.0	22.6	3.3	15.56	30.57	4.43	30	0.56	51.51	51.46	53.16	53.17	68.74	68.44	Sta 372+00 RT
13	10	25.0	0.15	0.15	0.90	0.14	0.14	5.0	5.0	6.0	0.81	2.57	2.89	12	0.52	63.75	63.62	64.14	64.01	67.27	67.27	Sta 375+00 RT
14	12	345.0	0.00	5.59	0.00	0.00	4.74	0.0	20.9	3.4	16.24	28.96	4.92	30	0.50	53.33	51.61	54.68	53.63	68.29	68.74	Sta 368+50 RT
15	14	145.0	0.00	5.59	0.00	0.00	4.74	0.0	20.2	3.5	16.54	29.10	5.31	30	0.50	54.06	53.33	55.42	55.06	67.86	68.29	Sta 367+00
16	15	10.0	0.30	5.29	0.90	0.27	4.47	5.0	20.1	3.5	15.62	29.00	4.49	30	0.50	54.19	54.14	55.84	55.83	67.29	67.86	Sta 367+00 LT
17	16	220.0	0.00	3.51	0.00	0.00	3.16	0.0	12.7	4.4	13.77	29.00	3.81	30	0.50	55.29	54.19	56.72	56.52	67.95	67.29	Sta 364+75 LT (
18	17	220.0	0.00	3.51	0.00	0.00	3.16	0.0	11.5	4.5	14.36	29.00	4.90	30	0.50	56.39	55.29	57.66	56.99	68.56	67.95	Sta 362+50 LT (
19	18	10.0	0.47	0.47	0.90	0.42	0.42	5.0	5.0	6.0	2.53	4.57	3.82	15	0.50	63.17	63.12	63.84	63.79	68.00	68.56	Sta 362+50 LT
20	16	13.0	1.48	1.48	0.70	1.04	1.04	20.0	20.0	3.5	3.63	7.71	4.27	18	0.54	60.00	59.93	60.73	60.66	64.00	67.29	Sta 367+00 LT (C
21	18	217.0	0.00	3.04	0.00	0.00	2.74	0.0	10.6	4.7	12.83	15.96	5.65	24	0.50	57.97	56.89	59.33	58.25	67.90	68.56	Sta. 360+28 LT

System 3 | Number of lines: 35 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
22	21	123.0	0.28	3.04	0.90	0.25	2.74	5.0	10.2	4.8	13.06	16.06	5.14	24	0.50	58.59	57.97	59.98	59.63	67.29	67.90	Sta. 359+00 LT
23	22	25.0	0.28	0.28	0.90	0.25	0.25	5.0	5.0	6.0	1.51	2.57	3.40	12	0.52	63.38	63.25	63.93	63.80	67.29	67.29	Sta. 359+00 RT
24	22	255.0	0.00	2.48	0.00	0.00	2.23	0.0	9.1	5.0	11.13	15.96	3.73	24	0.50	59.86	58.59	61.56	61.00	68.05	67.29	Sta. 356+40 (MH)
25	24	47.0	0.00	1.95	0.00	0.00	1.76	0.0	8.8	5.0	8.84	22.62	3.13	24	1.00	60.33	59.86	61.85	61.84	68.45	68.05	Sta. 355+87 LT
26	25	32.0	0.13	0.26	0.90	0.12	0.23	5.0	5.5	5.9	1.37	2.52	3.27	12	0.50	64.19	64.03	64.72	64.56	68.32	68.45	Sta. 355+50 LT(2
27	26	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	2.57	0.99	12	0.52	64.32	64.19	65.11	65.10	68.32	68.32	Sta. 355+50 RT
28	24	16.0	0.53	0.53	0.90	0.48	0.48	5.0	5.0	6.0	2.86	4.57	3.93	15	0.50	63.45	63.37	64.17	64.09	70.00	68.05	Sta. 356+40 LT
29	25	85.0	0.15	1.69	0.90	0.14	1.52	5.0	8.3	5.2	7.83	16.09	3.14	24	0.51	60.76	60.33	62.09	62.04	70.26	68.45	X-Crowley Parkin
30	29	20.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	6.0	1.35	0.88	3.86	8	1.25	67.11	66.86	68.12	67.53	69.71	70.26	X-Crowley Parkin
31	29	81.0	0.15	1.29	0.90	0.14	1.16	5.0	7.9	5.2	6.07	13.40	6.30	18	3.85	65.38	62.26	66.32	62.97	70.68	70.26	X-Dunkin Donuts
32	31	40.0	0.51	0.65	0.90	0.46	0.59	5.0	7.8	5.3	3.08	4.62	4.42	12	3.98	66.97	65.38	67.71	66.50	71.07	70.68	X-Dunkin Donuts
33	32	159.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	6.0	0.75	2.63	1.92	12	1.30	69.03	66.97	69.40	68.08	72.93	71.07	X-Dunkin Donuts
34	31	49.0	0.49	0.49	0.90	0.44	0.44	5.0	5.0	6.0	2.64	5.83	3.97	12	6.35	68.49	65.38	69.18	66.57	70.49	70.68	X-MIJI Realty
35	15	10.0	0.30	0.30	0.90	0.27	0.27	5.0	5.0	6.0	1.62	4.83	2.46	18	0.50	62.88	62.83	63.48	63.43	67.29	67.86	Sta 367+00 RT

System 3 | Number of lines: 35 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	4.0	0.00	6.54	0.00	0.00	5.59	0.0	26.5	4.4	24.49	41.01	4.99	30	1.00	39.04	39.00	45.62	45.61	44.00	40.00	Sta 384+35 LT
2	1	36.0	0.15	6.54	0.90	0.14	5.59	5.0	26.3	4.4	24.55	96.51	6.06	30	17.33	45.28	39.04	46.94	46.01	64.46	44.00	Sta 384+35 LT
3	2	11.0	0.00	6.39	0.00	0.00	5.46	0.0	26.3	4.4	23.98	30.29	5.56	30	0.55	45.34	45.28	47.37	47.35	65.04	64.46	Sta 384+35
4	3	10.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	7.8	0.98	2.52	3.01	12	0.50	61.00	60.95	61.43	61.38	64.51	65.04	Sta 384+35 RT
5	3	230.0	0.00	6.25	0.00	0.00	5.33	0.0	25.5	4.5	23.81	29.00	5.05	30	0.50	46.49	45.34	48.66	47.98	65.74	65.04	Sta 382+00
6	5	195.0	0.00	6.25	0.00	0.00	5.33	0.0	24.8	4.5	24.15	29.07	5.69	30	0.50	47.47	46.49	49.30	48.78	66.34	65.74	Sta 380+00
7	6	10.0	0.18	6.07	0.90	0.16	5.17	5.0	24.7	4.5	23.43	29.00	4.77	30	0.50	47.52	47.47	50.20	50.17	65.79	66.34	Sta 380+00 LT
8	6	10.0	0.18	0.18	0.90	0.16	0.16	5.0	5.0	7.8	1.26	2.52	3.21	12	0.50	62.25	62.20	62.75	62.70	65.80	66.34	Sta 380+00 RT
9	7	245.0	0.00	5.89	0.00	0.00	5.01	0.0	23.8	4.6	23.12	29.06	4.71	30	0.50	48.75	47.52	51.52	50.74	66.79	65.79	Sta 377+50 LT
10	9	245.0	0.15	5.89	0.90	0.14	5.01	5.0	22.9	4.7	23.55	29.06	4.88	30	0.50	49.98	48.75	52.30	51.57	67.27	66.79	Sta. 375+00 LT
11	10	295.0	0.00	5.59	0.00	0.00	4.74	0.0	21.9	4.8	22.80	29.05	4.75	30	0.50	51.46	49.98	53.74	52.92	68.44	67.27	Sta 372+00 LT
12	11	9.0	0.00	5.59	0.00	0.00	4.74	0.0	21.8	4.8	22.82	30.57	4.65	30	0.56	51.51	51.46	54.17	54.14	68.74	68.44	Sta 372+00 RT
13	10	25.0	0.15	0.15	0.90	0.14	0.14	5.0	5.0	7.8	1.05	2.57	3.11	12	0.52	63.75	63.62	64.19	64.07	67.27	67.27	Sta 375+00 RT
14	12	345.0	0.00	5.59	0.00	0.00	4.74	0.0	20.6	5.0	23.44	28.96	4.96	30	0.50	53.33	51.61	55.52	54.50	68.29	68.74	Sta 368+50 RT
15	14	145.0	0.00	5.59	0.00	0.00	4.74	0.0	20.1	5.0	23.71	29.10	5.45	30	0.50	54.06	53.33	55.98	55.63	67.86	68.29	Sta 367+00
16	15	10.0	0.30	5.29	0.90	0.27	4.47	5.0	20.1	5.0	22.38	29.00	4.56	30	0.50	54.19	54.14	56.76	56.73	67.29	67.86	Sta 367+00 LT
17	16	220.0	0.00	3.51	0.00	0.00	3.16	0.0	10.8	6.4	20.20	29.00	4.12	30	0.50	55.29	54.19	57.79	57.30	67.95	67.29	Sta 364+75 LT (
18	17	220.0	0.00	3.51	0.00	0.00	3.16	0.0	9.9	6.6	20.77	29.00	4.70	30	0.50	56.39	55.29	58.29	57.82	68.56	67.95	Sta 362+50 LT (
19	18	10.0	0.47	0.47	0.90	0.42	0.42	5.0	5.0	7.8	3.30	4.57	4.05	15	0.50	63.17	63.12	63.96	63.91	68.00	68.56	Sta 362+50 LT
20	16	13.0	1.48	1.48	0.70	1.04	1.04	20.0	20.0	5.0	5.20	7.71	4.68	18	0.54	60.00	59.93	60.90	60.83	64.00	67.29	Sta 367+00 LT (C
21	18	217.0	0.00	3.04	0.00	0.00	2.74	0.0	9.3	6.7	18.34	15.96	5.84	24	0.50	57.97	56.89	60.32	58.89	67.90	68.56	Sta. 360+28 LT

System 3 | Number of lines: 35 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
22	21	123.0	0.28	3.04	0.90	0.25	2.74	5.0	8.9	6.8	18.55	16.06	5.91	24	0.50	58.59	57.97	61.23	60.40	67.29	67.90	Sta. 359+00 LT
23	22	25.0	0.28	0.28	0.90	0.25	0.25	5.0	5.0	7.8	1.96	2.57	3.60	12	0.52	63.38	63.25	64.03	63.91	67.29	67.29	Sta. 359+00 RT
24	22	255.0	0.00	2.48	0.00	0.00	2.23	0.0	8.1	7.0	15.56	15.96	4.95	24	0.50	59.86	58.59	63.41	62.20	68.05	67.29	Sta. 356+40 (MH)
25	24	47.0	0.00	1.95	0.00	0.00	1.76	0.0	7.9	7.0	12.31	22.62	3.92	24	1.00	60.33	59.86	64.07	63.93	68.45	68.05	Sta. 355+87 LT
26	25	32.0	0.13	0.26	0.90	0.12	0.23	5.0	5.4	7.7	1.80	2.52	3.48	12	0.50	64.19	64.03	64.82	64.65	68.32	68.45	Sta. 355+50 LT(2
27	26	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	2.57	1.17	12	0.52	64.32	64.19	65.27	65.25	68.32	68.32	Sta. 355+50 RT
28	24	16.0	0.53	0.53	0.90	0.48	0.48	5.0	5.0	7.8	3.72	4.57	4.14	15	0.50	63.45	63.37	64.31	64.23	70.00	68.05	Sta. 356+40 LT
29	25	85.0	0.15	1.69	0.90	0.14	1.52	5.0	7.5	7.1	10.82	16.09	3.44	24	0.51	60.76	60.33	64.56	64.36	70.26	68.45	X-Crowley Parkin
30	29	20.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	7.8	1.75	0.88	5.02	8	1.25	67.11	66.86	68.52	67.53	69.71	70.26	X-Crowley Parkin
31	29	81.0	0.15	1.29	0.90	0.14	1.16	5.0	7.2	7.2	8.34	13.40	5.35	18	3.85	65.38	62.26	66.48	64.65	70.68	70.26	X-Dunkin Donuts
32	31	40.0	0.51	0.65	0.90	0.46	0.59	5.0	7.1	7.2	4.22	4.62	5.60	12	3.98	66.97	65.38	67.84	66.59	71.07	70.68	X-Dunkin Donuts
33	32	159.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	7.8	0.98	2.63	2.19	12	1.30	69.03	66.97	69.45	68.34	72.93	71.07	X-Dunkin Donuts
34	31	49.0	0.49	0.49	0.90	0.44	0.44	5.0	5.0	7.8	3.44	5.83	4.78	12	6.35	68.49	65.38	69.28	66.74	70.49	70.68	X-MIJI Realty
35	15	10.0	0.30	0.30	0.90	0.27	0.27	5.0	5.0	7.8	2.10	4.83	2.63	18	0.50	62.88	62.83	63.57	63.52	67.29	67.86	Sta 367+00 RT

System 3 | Number of lines: 35 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	12.0	0.00	1.70	0.00	0.00	1.53	0.0	19.1	2.5	3.82	7.43	2.16	18	0.50	39.06	39.00	45.63	45.61	44.00	40.00	Sta 385+10 LT
2	1	55.0	0.03	1.70	0.90	0.03	1.53	5.0	18.7	2.5	3.86	26.54	3.28	18	20.00	50.06	39.06	50.81	45.69	64.19	44.00	Sta 385+33 LT
3	2	162.0	0.07	1.67	0.90	0.06	1.50	5.0	17.7	2.6	3.91	7.43	4.26	18	0.50	52.61	51.80	53.38	52.57	64.45	64.19	Sta 387+00 LT
4	3	17.0	0.00	1.60	0.00	0.00	1.44	0.0	17.6	2.6	3.76	7.64	2.25	18	0.53	52.70	52.61	54.01	53.99	64.24	64.45	Sta 387+00
5	4	85.0	0.00	1.60	0.00	0.00	1.44	0.0	17.1	2.7	3.82	7.47	2.59	18	0.51	53.13	52.70	54.17	54.09	63.97	64.24	Sta 387+90
6	5	205.0	0.00	1.43	0.00	0.00	1.29	0.0	15.7	2.8	3.58	7.44	3.27	18	0.50	54.16	53.13	54.88	54.37	63.36	63.97	Sta 390+00
7	6	14.0	0.27	0.27	0.90	0.24	0.24	5.0	5.0	4.6	1.12	2.52	3.11	12	0.50	59.25	59.18	59.72	59.65	62.91	63.36	Sta 390+00 LT
8	6	245.0	0.00	0.95	0.00	0.00	0.86	0.0	13.4	3.0	2.59	7.44	2.97	18	0.50	55.39	54.16	56.00	55.13	64.09	63.36	Sta 392+50
9	8	10.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	4.6	0.37	2.52	2.29	12	0.50	60.00	59.95	60.26	60.21	63.52	64.09	Sta 392+50 LT
10	8	245.0	0.00	0.77	0.00	0.00	0.69	0.0	10.7	3.4	2.34	7.44	3.04	18	0.50	56.62	55.39	57.20	56.20	64.73	64.09	Sta 395+00
11	10	245.0	0.00	0.77	0.00	0.00	0.69	0.0	8.2	3.8	2.64	7.44	3.38	18	0.50	57.85	56.62	58.47	57.38	64.09	64.73	Sta 397+50
12	11	10.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	4.6	0.45	2.52	2.43	12	0.50	60.00	59.95	60.29	60.24	63.52	64.09	Sta 397+50 LT
13	11	10.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	4.6	0.37	2.52	2.29	12	0.50	60.00	59.95	60.26	60.21	63.52	64.09	Sta 397+50 RT
14	11	245.0	0.00	0.57	0.00	0.00	0.51	0.0	5.1	4.6	2.33	7.44	3.02	18	0.50	59.08	57.85	59.66	58.67	63.36	64.09	Sta 400+00
15	14	10.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	4.6	1.36	2.52	3.27	12	0.50	59.38	59.33	59.91	59.85	62.79	63.36	Sta 400+00 LT
16	6	15.0	0.21	0.21	0.90	0.19	0.19	5.0	5.0	4.6	0.87	2.43	2.84	12	0.47	59.25	59.18	59.66	59.59	62.79	63.36	Sta. 390+00 RT
17	8	10.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	4.6	0.37	2.52	2.29	12	0.50	60.00	59.95	60.26	60.21	63.52	64.09	Sta 392+50 RT
18	14	10.0	0.24	0.24	0.90	0.22	0.22	5.0	5.0	4.6	0.99	2.52	2.54	12	0.50	59.38	59.33	59.86	59.85	62.79	63.36	Sta 400+00 RT
19	5	15.0	0.17	0.17	0.90	0.15	0.15	5.0	5.0	4.6	0.70	2.60	2.80	12	0.53	59.50	59.42	59.86	59.78	63.40	63.97	Sta 387+90 RT

System 4 | Number of lines: 19 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(In/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	12.0	0.00	1.70	0.00	0.00	1.53	0.0	15.4	4.0	6.11	7.43	3.46	18	0.50	39.06	39.00	45.65	45.61	44.00	40.00	Sta 385+10 LT
2	1	55.0	0.03	1.70	0.90	0.03	1.53	5.0	15.2	4.0	6.15	26.54	4.36	18	20.00	50.06	39.06	51.01	45.82	64.19	44.00	Sta 385+33 LT
3	2	162.0	0.07	1.67	0.90	0.06	1.50	5.0	14.5	4.1	6.18	7.43	4.70	18	0.50	52.61	51.80	53.65	52.85	64.45	64.19	Sta 387+00 LT
4	3	17.0	0.00	1.60	0.00	0.00	1.44	0.0	14.4	4.1	5.94	7.64	3.36	18	0.53	52.70	52.61	54.39	54.34	64.24	64.45	Sta 387+00
5	4	85.0	0.00	1.60	0.00	0.00	1.44	0.0	14.0	4.2	6.01	7.47	3.40	18	0.51	53.13	52.70	54.85	54.57	63.97	64.24	Sta 387+90
6	5	205.0	0.00	1.43	0.00	0.00	1.29	0.0	13.0	4.3	5.55	7.44	3.17	18	0.50	54.16	53.13	55.58	55.05	63.36	63.97	Sta 390+00
7	6	14.0	0.27	0.27	0.90	0.24	0.24	5.0	5.0	6.0	1.46	2.52	3.32	12	0.50	59.25	59.18	59.80	59.73	62.91	63.36	Sta 390+00 LT
8	6	245.0	0.00	0.95	0.00	0.00	0.86	0.0	11.3	4.6	3.91	7.44	2.92	18	0.50	55.39	54.16	56.27	55.83	64.09	63.36	Sta 392+50
9	8	10.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	6.0	0.49	2.52	2.48	12	0.50	60.00	59.95	60.30	60.25	63.52	64.09	Sta 392+50 LT
10	8	245.0	0.00	0.77	0.00	0.00	0.69	0.0	9.3	4.9	3.42	7.44	3.19	18	0.50	56.62	55.39	57.33	56.62	64.73	64.09	Sta 395+00
11	10	245.0	0.00	0.77	0.00	0.00	0.69	0.0	7.5	5.3	3.70	7.44	3.80	18	0.50	57.85	56.62	58.58	57.53	64.09	64.73	Sta 397+50
12	11	10.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	6.0	0.59	2.52	2.61	12	0.50	60.00	59.95	60.33	60.28	63.52	64.09	Sta 397+50 LT
13	11	10.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	6.0	0.49	2.52	2.48	12	0.50	60.00	59.95	60.30	60.25	63.52	64.09	Sta 397+50 RT
14	11	245.0	0.00	0.57	0.00	0.00	0.51	0.0	5.1	6.0	3.06	7.44	3.27	18	0.50	59.08	57.85	59.75	58.83	63.36	64.09	Sta 400+00
15	14	10.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	6.0	1.78	2.52	3.48	12	0.50	59.38	59.33	60.00	59.95	62.79	63.36	Sta 400+00 LT
16	6	15.0	0.21	0.21	0.90	0.19	0.19	5.0	5.0	6.0	1.13	2.43	3.04	12	0.47	59.25	59.18	59.73	59.66	62.79	63.36	Sta. 390+00 RT
17	8	10.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	6.0	0.49	2.52	2.48	12	0.50	60.00	59.95	60.30	60.25	63.52	64.09	Sta 392+50 RT
18	14	10.0	0.24	0.24	0.90	0.22	0.22	5.0	5.0	6.0	1.29	2.52	2.59	12	0.50	59.38	59.33	59.97	59.96	62.79	63.36	Sta 400+00 RT
19	5	15.0	0.17	0.17	0.90	0.15	0.15	5.0	5.0	6.0	0.92	2.60	3.02	12	0.53	59.50	59.42	59.91	59.83	63.40	63.97	Sta 387+90 RT

System 4 | Number of lines: 19 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	12.0	0.00	1.70	0.00	0.00	1.53	0.0	12.8	6.0	9.23	7.43	5.22	18	0.50	39.06	39.00	45.70	45.61	44.00	40.00	Sta 385+10 LT
2	1	55.0	0.03	1.70	0.90	0.03	1.53	5.0	12.6	6.1	9.28	26.54	5.78	18	20.00	50.06	39.06	51.22	46.09	64.19	44.00	Sta 385+33 LT
3	2	162.0	0.07	1.67	0.90	0.06	1.50	5.0	12.1	6.2	9.25	7.43	5.23	18	0.50	52.61	51.80	54.56	53.30	64.45	64.19	Sta 387+00 LT
4	3	17.0	0.00	1.60	0.00	0.00	1.44	0.0	12.0	6.2	8.88	7.64	5.02	18	0.53	52.70	52.61	55.35	55.23	64.24	64.45	Sta 387+00
5	4	85.0	0.00	1.60	0.00	0.00	1.44	0.0	11.8	6.2	8.95	7.47	5.06	18	0.51	53.13	52.70	56.36	55.74	63.97	64.24	Sta 387+90
6	5	205.0	0.00	1.43	0.00	0.00	1.29	0.0	11.0	6.4	8.17	7.44	4.63	18	0.50	54.16	53.13	58.07	56.83	63.36	63.97	Sta 390+00
7	6	14.0	0.27	0.27	0.90	0.24	0.24	5.0	5.0	7.8	1.89	2.52	3.52	12	0.50	59.25	59.18	59.90	59.83	62.91	63.36	Sta 390+00 LT
8	6	245.0	0.00	0.95	0.00	0.00	0.86	0.0	9.8	6.6	5.64	7.44	3.19	18	0.50	55.39	54.16	59.28	58.57	64.09	63.36	Sta 392+50
9	8	10.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	7.8	0.63	2.52	2.66	12	0.50	60.00	59.95	60.34	60.29	63.52	64.09	Sta 392+50 LT
10	8	245.0	0.00	0.77	0.00	0.00	0.69	0.0	8.3	6.9	4.80	7.44	2.72	18	0.50	56.62	55.39	60.00	59.48	64.73	64.09	Sta 395+00
11	10	245.0	0.00	0.77	0.00	0.00	0.69	0.0	6.9	7.3	5.04	7.44	2.85	18	0.50	57.85	56.62	60.58	60.01	64.09	64.73	Sta 397+50
12	11	10.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	7.8	0.77	2.52	1.11	12	0.50	60.00	59.95	60.80	60.80	63.52	64.09	Sta 397+50 LT
13	11	10.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	7.8	0.63	2.52	0.90	12	0.50	60.00	59.95	60.81	60.81	63.52	64.09	Sta 397+50 RT
14	11	245.0	0.00	0.57	0.00	0.00	0.51	0.0	5.1	7.8	3.99	7.44	2.26	18	0.50	59.08	57.85	61.10	60.75	63.36	64.09	Sta 400+00
15	14	10.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	7.8	2.31	2.52	2.95	12	0.50	59.38	59.33	61.23	61.18	62.79	63.36	Sta 400+00 LT
16	6	15.0	0.21	0.21	0.90	0.19	0.19	5.0	5.0	7.8	1.47	2.43	3.24	12	0.47	59.25	59.18	59.81	59.74	62.79	63.36	Sta. 390+00 RT
17	8	10.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	7.8	0.63	2.52	2.66	12	0.50	60.00	59.95	60.34	60.29	63.52	64.09	Sta 392+50 RT
18	14	10.0	0.24	0.24	0.90	0.22	0.22	5.0	5.0	7.8	1.68	2.52	2.14	12	0.50	59.38	59.33	61.21	61.19	62.79	63.36	Sta 400+00 RT
19	5	15.0	0.17	0.17	0.90	0.15	0.15	5.0	5.0	7.8	1.19	2.60	3.24	12	0.53	59.50	59.42	59.98	59.90	63.40	63.97	Sta 387+90 RT

System 4 | Number of lines: 19 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	13.0	0.02	1.30	0.90	0.02	1.17	5.0	12.3	3.2	3.69	6.46	4.19	15	1.00	56.63	56.50	57.40	57.44	65.32	61.10	Sta.412+80 LT
2	1	11.0	0.00	1.28	0.00	0.00	1.15	0.0	12.2	3.2	3.65	6.46	3.47	15	1.00	56.74	56.63	57.69	57.69	65.74	65.32	Sta.412+80
3	2	11.0	0.16	0.16	0.90	0.14	0.14	5.0	5.0	4.6	0.66	2.63	2.76	12	0.55	62.00	61.94	62.35	62.28	65.75	65.74	Sta 412+80 RT
4	2	175.0	0.00	0.63	0.00	0.00	0.57	0.0	7.2	4.0	2.28	4.61	2.52	15	0.51	57.63	56.74	58.34	58.05	64.39	65.74	Sta.411+00
5	2	176.0	0.00	0.49	0.00	0.00	0.44	0.0	10.8	3.4	1.48	2.52	3.34	12	0.50	61.88	61.00	62.43	61.55	66.89	65.74	Sta.414+60
6	5	145.0	0.00	0.23	0.00	0.00	0.21	0.0	8.7	3.7	0.77	2.53	1.85	12	0.50	62.61	61.88	63.01	62.76	68.02	66.89	Sta.416+10
7	6	85.0	0.00	0.10	0.00	0.00	0.09	0.0	6.0	4.3	0.39	2.53	1.42	12	0.51	63.04	62.61	63.33	63.22	68.69	68.02	Sta.417+00
8	4	10.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	2.52	2.55	12	0.50	60.00	59.95	60.31	60.26	63.82	64.39	Sta.411+00 LT
9	4	203.0	0.00	0.50	0.00	0.00	0.45	0.0	5.1	4.5	2.05	4.69	2.86	15	0.53	58.70	57.63	59.27	58.61	63.11	64.39	Sta.408+92
10	9	10.0	0.27	0.27	0.90	0.24	0.24	5.0	5.0	4.6	1.12	2.52	2.89	12	0.50	59.00	58.95	59.48	59.46	62.54	63.11	Sta.408+92 LT
11	9	10.0	0.23	0.23	0.90	0.21	0.21	5.0	5.0	4.6	0.95	2.52	2.44	12	0.50	59.00	58.95	59.48	59.47	62.54	63.11	Sta 408+92 RT
12	5	16.0	0.10	0.10	0.90	0.09	0.09	9.0	9.0	3.7	0.33	2.52	0.47	12	0.50	61.96	61.88	62.76	62.76	66.24	66.89	Sta 414+60 LT
13	5	32.0	0.16	0.16	0.90	0.14	0.14	5.0	5.0	4.6	0.66	2.52	1.00	12	0.50	62.04	61.88	62.76	62.75	66.24	66.89	Sta 414+60 RT
14	6	16.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	2.52	1.26	12	0.50	62.69	62.61	63.19	63.19	67.37	68.02	Sta 416+10 LT
15	7	31.0	0.10	0.10	0.90	0.09	0.09	5.0	5.0	4.6	0.41	2.56	1.77	12	0.52	63.20	63.04	63.49	63.46	68.04	68.69	Sta 417+00 RT

System 5 - Sta. 405+05 to 412+

Number of lines: 15

Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	13.0	0.02	1.30	0.90	0.02	1.17	5.0	10.6	4.7	5.50	6.46	5.56	15	1.00	56.63	56.50	57.57	57.44	65.32	61.10	Sta.412+80 LT
2	1	11.0	0.00	1.28	0.00	0.00	1.15	0.0	10.5	4.7	5.43	6.46	4.42	15	1.00	56.74	56.63	58.05	57.97	65.74	65.32	Sta.412+80
3	2	11.0	0.16	0.16	0.90	0.14	0.14	5.0	5.0	6.0	0.86	2.63	2.99	12	0.55	62.00	61.94	62.40	62.33	65.75	65.74	Sta 412+80 RT
4	2	175.0	0.00	0.63	0.00	0.00	0.57	0.0	6.7	5.5	3.14	4.61	2.56	15	0.51	57.63	56.74	58.97	58.56	64.39	65.74	Sta.411+00
5	2	176.0	0.00	0.49	0.00	0.00	0.44	0.0	9.5	4.9	2.16	2.52	3.61	12	0.50	61.88	61.00	62.59	61.71	66.89	65.74	Sta.414+60
6	5	145.0	0.00	0.23	0.00	0.00	0.21	0.0	7.8	5.2	1.09	2.53	1.91	12	0.50	62.61	61.88	63.16	62.97	68.02	66.89	Sta.416+10
7	6	85.0	0.00	0.10	0.00	0.00	0.09	0.0	5.8	5.8	0.52	2.53	1.41	12	0.51	63.04	62.61	63.41	63.34	68.69	68.02	Sta.417+00
8	4	10.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	2.52	2.75	12	0.50	60.00	59.95	60.36	60.31	63.82	64.39	Sta.411+00 LT
9	4	203.0	0.00	0.50	0.00	0.00	0.45	0.0	5.1	6.0	2.68	4.69	2.70	15	0.53	58.70	57.63	59.51	59.10	63.11	64.39	Sta.408+92
10	9	10.0	0.27	0.27	0.90	0.24	0.24	5.0	5.0	6.0	1.46	2.52	2.28	12	0.50	59.00	58.95	59.74	59.73	62.54	63.11	Sta.408+92 LT
11	9	10.0	0.23	0.23	0.90	0.21	0.21	5.0	5.0	6.0	1.24	2.52	1.88	12	0.50	59.00	58.95	59.76	59.76	62.54	63.11	Sta 408+92 RT
12	5	16.0	0.10	0.10	0.90	0.09	0.09	9.0	9.0	5.0	0.45	2.52	0.57	12	0.50	61.96	61.88	63.00	62.99	66.24	66.89	Sta 414+60 LT
13	5	32.0	0.16	0.16	0.90	0.14	0.14	5.0	5.0	6.0	0.86	2.52	1.11	12	0.50	62.04	61.88	62.99	62.97	66.24	66.89	Sta 414+60 RT
14	6	16.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	2.52	1.28	12	0.50	62.69	62.61	63.31	63.31	67.37	68.02	Sta 416+10 LT
15	7	31.0	0.10	0.10	0.90	0.09	0.09	5.0	5.0	6.0	0.54	2.56	1.83	12	0.52	63.20	63.04	63.55	63.52	68.04	68.69	Sta 417+00 RT

System 5 - Sta. 405+05 to 412+

Number of lines: 15

Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	13.0	0.02	1.30	0.90	0.02	1.17	5.0	10.1	6.5	7.63	6.46	6.48	15	1.00	56.63	56.50	57.84	57.60	65.32	61.10	Sta.412+80 LT
2	1	11.0	0.00	1.28	0.00	0.00	1.15	0.0	10.1	6.5	7.52	6.46	6.13	15	1.00	56.74	56.63	58.33	58.18	65.74	65.32	Sta.412+80
3	2	11.0	0.16	0.16	0.90	0.14	0.14	5.0	5.0	7.8	1.12	2.63	3.21	12	0.55	62.00	61.94	62.46	62.40	65.75	65.74	Sta 412+80 RT
4	2	175.0	0.00	0.63	0.00	0.00	0.57	0.0	6.3	7.4	4.21	4.61	3.43	15	0.51	57.63	56.74	60.06	59.31	64.39	65.74	Sta.411+00
5	2	176.0	0.00	0.49	0.00	0.00	0.44	0.0	9.3	6.7	2.95	2.52	3.76	12	0.50	61.88	61.00	63.21	62.00	66.89	65.74	Sta.414+60
6	5	145.0	0.00	0.23	0.00	0.00	0.21	0.0	7.2	7.2	1.49	2.53	1.90	12	0.50	62.61	61.88	63.85	63.59	68.02	66.89	Sta.416+10
7	6	85.0	0.00	0.10	0.00	0.00	0.09	0.0	5.6	7.6	0.69	2.53	0.89	12	0.51	63.04	62.61	63.97	63.95	68.69	68.02	Sta.417+00
8	4	10.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	2.52	2.76	12	0.50	60.00	59.95	60.42	60.40	63.82	64.39	Sta.411+00 LT
9	4	203.0	0.00	0.50	0.00	0.00	0.45	0.0	5.1	7.8	3.50	4.69	2.85	15	0.53	58.70	57.63	60.89	60.30	63.11	64.39	Sta.408+92
10	9	10.0	0.27	0.27	0.90	0.24	0.24	5.0	5.0	7.8	1.89	2.52	2.41	12	0.50	59.00	58.95	61.08	61.05	62.54	63.11	Sta.408+92 LT
11	9	10.0	0.23	0.23	0.90	0.21	0.21	5.0	5.0	7.8	1.61	2.52	2.05	12	0.50	59.00	58.95	61.10	61.08	62.54	63.11	Sta 408+92 RT
12	5	16.0	0.10	0.10	0.90	0.09	0.09	9.0	9.0	6.8	0.61	2.52	0.78	12	0.50	61.96	61.88	63.64	63.64	66.24	66.89	Sta 414+60 LT
13	5	32.0	0.16	0.16	0.90	0.14	0.14	5.0	5.0	7.8	1.12	2.52	1.43	12	0.50	62.04	61.88	63.65	63.62	66.24	66.89	Sta 414+60 RT
14	6	16.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	2.52	1.16	12	0.50	62.69	62.61	63.95	63.94	67.37	68.02	Sta 416+10 LT
15	7	31.0	0.10	0.10	0.90	0.09	0.09	5.0	5.0	7.8	0.70	2.56	0.98	12	0.52	63.20	63.04	64.00	63.99	68.04	68.69	Sta 417+00 RT

System 5 - Sta. 405+05 to 412+

Number of lines: 15

Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	338.0	0.00	2.16	0.00	0.00	1.87	0.0	35.4	1.7	3.19	7.43	3.54	18	0.50	43.75	42.06	44.43	42.93	54.50	49.00	Sta.421+25 LT
2	1	346.0	0.00	2.16	0.00	0.00	1.87	0.0	32.8	1.8	3.35	7.43	3.39	18	0.50	45.48	43.75	46.18	44.77	60.00	54.50	Sta.424+75 LT
3	2	7.0	0.00	2.16	0.00	0.00	1.87	0.0	32.7	1.8	3.35	7.94	2.60	18	0.57	45.52	45.48	46.53	46.53	60.65	60.00	Sta.424+75 LT
4	3	20.0	0.42	2.16	0.90	0.38	1.87	5.0	32.6	1.8	3.36	7.43	2.49	18	0.50	45.62	45.52	46.65	46.64	60.28	60.65	Sta 425+00 LT
5	4	10.0	0.00	1.74	0.00	0.00	1.49	0.0	32.5	1.8	2.69	7.43	1.76	18	0.50	45.67	45.62	46.86	46.85	60.85	60.28	Sta 425+00
6	5	10.0	0.06	0.06	0.90	0.05	0.05	5.0	5.0	4.6	0.25	2.52	2.03	12	0.50	56.50	56.45	56.71	56.66	60.28	60.85	Sta 425+00 RT
7	5	245.0	0.00	1.68	0.00	0.00	1.43	0.0	30.2	1.9	2.71	7.47	2.79	18	0.51	46.91	45.67	47.54	46.92	57.25	60.85	Sta 427+50
8	7	95.0	0.00	1.55	0.00	0.00	1.34	0.0	29.3	1.9	2.59	7.54	3.03	18	0.52	47.40	46.91	48.02	47.83	55.70	57.25	Sta 428+50(2)
9	8	244.0	0.29	1.28	0.90	0.26	1.10	5.0	26.4	2.1	2.26	7.43	2.86	18	0.50	48.62	47.40	49.19	48.28	53.01	55.70	Sta 430+98 LT
10	9	29.0	0.14	0.14	0.70	0.10	0.10	20.0	20.0	2.4	0.24	2.56	0.63	12	0.52	49.02	48.87	49.44	49.44	50.00	53.01	Sta 705+09 LT
11	9	25.0	0.34	0.34	0.90	0.31	0.31	5.0	5.0	4.6	1.40	4.66	2.91	15	0.52	49.00	48.87	49.48	49.44	52.41	53.01	Sta 430+91 RT
12	9	131.0	0.00	0.51	0.00	0.00	0.44	0.0	23.8	2.2	0.95	4.58	2.32	15	0.50	49.53	48.87	49.92	49.44	54.00	53.01	Sta 706+50
13	12	192.0	0.17	0.51	0.90	0.15	0.44	5.0	20.1	2.4	1.05	4.57	2.54	15	0.50	50.49	49.53	50.90	50.07	55.70	54.00	Sta 434+30 LT
14	13	5.0	0.12	0.34	0.70	0.08	0.28	20.0	20.0	2.4	0.68	2.76	1.53	12	0.60	50.52	50.49	51.06	51.06	55.00	55.70	Sta 434+30
15	14	20.0	0.22	0.22	0.90	0.20	0.20	5.0	5.0	4.6	0.91	2.52	2.15	12	0.50	50.62	50.52	51.11	51.10	55.28	55.00	Sta 434+30 RT
16	8	18.0	0.27	0.27	0.90	0.24	0.24	5.0	5.0	4.6	1.12	2.52	3.11	12	0.50	51.38	51.29	51.85	51.76	52.88	55.70	Sta 428+50 RT
17	7	27.0	0.13	0.13	0.70	0.09	0.09	5.0	5.0	4.6	0.42	2.56	2.38	12	0.52	50.00	49.86	50.28	50.13	55.00	57.25	Sta 427+50 LT

System 6 | Number of lines: 17 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	338.0	0.00	2.16	0.00	0.00	1.87	0.0	30.6	2.8	5.17	7.43	4.54	18	0.50	43.75	42.06	44.73	42.93	54.50	49.00	Sta.421+25 LT
2	1	346.0	0.00	2.16	0.00	0.00	1.87	0.0	28.8	2.9	5.35	7.43	4.22	18	0.50	45.48	43.75	46.36	44.96	60.00	54.50	Sta.424+75 LT
3	2	7.0	0.00	2.16	0.00	0.00	1.87	0.0	28.8	2.9	5.35	7.94	3.10	18	0.57	45.52	45.48	46.92	46.91	60.65	60.00	Sta.424+75 LT
4	3	20.0	0.42	2.16	0.90	0.38	1.87	5.0	28.7	2.9	5.36	7.43	3.04	18	0.50	45.62	45.52	47.12	47.08	60.28	60.65	Sta 425+00 LT
5	4	10.0	0.00	1.74	0.00	0.00	1.49	0.0	28.6	2.9	4.28	7.43	2.42	18	0.50	45.67	45.62	47.40	47.39	60.85	60.28	Sta 425+00
6	5	10.0	0.06	0.06	0.90	0.05	0.05	5.0	5.0	6.0	0.32	2.52	2.20	12	0.50	56.50	56.45	56.74	56.69	60.28	60.85	Sta 425+00 RT
7	5	245.0	0.00	1.68	0.00	0.00	1.43	0.0	27.0	3.0	4.27	7.47	2.88	18	0.51	46.91	45.67	47.93	47.50	57.25	60.85	Sta 427+50
8	7	95.0	0.00	1.55	0.00	0.00	1.34	0.0	26.4	3.0	4.05	7.54	3.07	18	0.52	47.40	46.91	48.31	48.19	55.70	57.25	Sta 428+50(2)
9	8	244.0	0.29	1.28	0.90	0.26	1.10	5.0	24.4	3.1	3.46	7.43	3.51	18	0.50	48.62	47.40	49.33	48.39	53.01	55.70	Sta 430+98 LT
10	9	29.0	0.14	0.14	0.70	0.10	0.10	20.0	20.0	3.5	0.34	2.56	0.56	12	0.52	49.02	48.87	49.69	49.69	50.00	53.01	Sta 705+09 LT
11	9	25.0	0.34	0.34	0.90	0.31	0.31	5.0	5.0	6.0	1.83	4.66	2.37	15	0.52	49.00	48.87	49.70	49.69	52.41	53.01	Sta 430+91 RT
12	9	131.0	0.00	0.51	0.00	0.00	0.44	0.0	22.6	3.3	1.43	4.58	2.49	15	0.50	49.53	48.87	50.01	49.69	54.00	53.01	Sta 706+50
13	12	192.0	0.17	0.51	0.90	0.15	0.44	5.0	20.1	3.5	1.52	4.57	2.80	15	0.50	50.49	49.53	50.98	50.21	55.70	54.00	Sta 434+30 LT
14	13	5.0	0.12	0.34	0.70	0.08	0.28	20.0	20.0	3.5	0.99	2.76	1.70	12	0.60	50.52	50.49	51.20	51.20	55.00	55.70	Sta 434+30
15	14	20.0	0.22	0.22	0.90	0.20	0.20	5.0	5.0	6.0	1.19	2.52	2.16	12	0.50	50.62	50.52	51.24	51.22	55.28	55.00	Sta 434+30 RT
16	8	18.0	0.27	0.27	0.90	0.24	0.24	5.0	5.0	6.0	1.46	2.52	3.32	12	0.50	51.38	51.29	51.93	51.84	52.88	55.70	Sta 428+50 RT
17	7	27.0	0.13	0.13	0.70	0.09	0.09	5.0	5.0	6.0	0.55	2.56	2.58	12	0.52	50.00	49.86	50.32	50.17	55.00	57.25	Sta 427+50 LT

System 6 | Number of lines: 17 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	338.0	0.00	2.16	0.00	0.00	1.87	0.0	27.3	4.3	8.04	7.43	5.22	18	0.50	43.75	42.06	45.66	43.14	54.50	49.00	Sta.421+25 LT
2	1	346.0	0.00	2.16	0.00	0.00	1.87	0.0	26.1	4.4	8.23	7.43	4.66	18	0.50	45.48	43.75	47.83	45.70	60.00	54.50	Sta.424+75 LT
3	2	7.0	0.00	2.16	0.00	0.00	1.87	0.0	26.1	4.4	8.23	7.94	4.66	18	0.57	45.52	45.48	48.21	48.17	60.65	60.00	Sta.424+75 LT
4	3	20.0	0.42	2.16	0.90	0.38	1.87	5.0	26.0	4.4	8.24	7.43	4.67	18	0.50	45.62	45.52	48.67	48.55	60.28	60.65	Sta 425+00 LT
5	4	10.0	0.00	1.74	0.00	0.00	1.49	0.0	26.0	4.4	6.58	7.43	3.72	18	0.50	45.67	45.62	49.34	49.30	60.85	60.28	Sta 425+00
6	5	10.0	0.06	0.06	0.90	0.05	0.05	5.0	5.0	7.8	0.42	2.52	2.37	12	0.50	56.50	56.45	56.78	56.73	60.28	60.85	Sta 425+00 RT
7	5	245.0	0.00	1.68	0.00	0.00	1.43	0.0	24.9	4.5	6.48	7.47	3.67	18	0.51	46.91	45.67	50.49	49.56	57.25	60.85	Sta 427+50
8	7	95.0	0.00	1.55	0.00	0.00	1.34	0.0	24.5	4.6	6.12	7.54	3.47	18	0.52	47.40	46.91	51.05	50.73	55.70	57.25	Sta 428+50(2)
9	8	244.0	0.29	1.28	0.90	0.26	1.10	5.0	23.1	4.7	5.16	7.43	2.92	18	0.50	48.62	47.40	51.88	51.29	53.01	55.70	Sta 430+98 LT
10	9	29.0	0.14	0.14	0.70	0.10	0.10	20.0	20.0	5.0	0.49	2.56	0.63	12	0.52	49.02	48.87	52.31	52.30	50.00	53.01	Sta 705+09 LT
11	9	25.0	0.34	0.34	0.90	0.31	0.31	5.0	5.0	7.8	2.38	4.66	1.94	15	0.52	49.00	48.87	52.28	52.25	52.41	53.01	Sta 430+91 RT
12	9	131.0	0.00	0.51	0.00	0.00	0.44	0.0	21.8	4.8	2.10	4.58	1.71	15	0.50	49.53	48.87	52.40	52.26	54.00	53.01	Sta 706+50
13	12	192.0	0.17	0.51	0.90	0.15	0.44	5.0	20.0	5.0	2.18	4.57	1.78	15	0.50	50.49	49.53	52.63	52.41	55.70	54.00	Sta 434+30 LT
14	13	5.0	0.12	0.34	0.70	0.08	0.28	20.0	20.0	5.0	1.42	2.76	1.80	12	0.60	50.52	50.49	52.71	52.70	55.00	55.70	Sta 434+30
15	14	20.0	0.22	0.22	0.90	0.20	0.20	5.0	5.0	7.8	1.54	2.52	1.97	12	0.50	50.62	50.52	52.77	52.74	55.28	55.00	Sta 434+30 RT
16	8	18.0	0.27	0.27	0.90	0.24	0.24	5.0	5.0	7.8	1.89	2.52	3.52	12	0.50	51.38	51.29	52.03	51.94	52.88	55.70	Sta 428+50 RT
17	7	27.0	0.13	0.13	0.70	0.09	0.09	5.0	5.0	7.8	0.71	2.56	0.93	12	0.52	50.00	49.86	50.90	50.89	55.00	57.25	Sta 427+50 LT

System 6 | Number of lines: 17 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	115.0	0.00	3.86	0.00	0.00	3.19	0.0	32.0	1.8	5.82	16.06	2.49	24	0.50	45.13	44.55	46.33	46.28	54.91	56.80	Sta.449+25
2	1	4.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	4.6	1.03	2.52	3.05	12	0.50	50.00	49.98	50.45	50.43	54.24	54.91	Sta.449+25 RT
3	1	240.0	0.00	2.71	0.00	0.00	2.15	0.0	30.3	1.9	4.06	7.43	4.17	18	0.50	46.86	45.66	47.63	46.52	51.46	54.91	Sta.446+82
4	3	8.0	0.24	0.24	0.90	0.22	0.22	5.0	5.0	4.6	0.99	8.30	0.76	18	0.62	46.91	46.86	47.92	47.92	50.86	51.46	Sta.446+82 LT
5	3	82.0	0.00	2.07	0.00	0.00	1.58	0.0	29.8	1.9	3.01	4.57	3.97	15	0.50	47.52	47.11	48.26	47.85	52.03	51.46	Sta.445+95
6	5	140.0	0.00	1.64	0.00	0.00	1.19	0.0	28.6	2.0	2.33	4.57	2.63	15	0.50	48.22	47.52	48.91	48.70	54.80	52.03	Sta 444+50
7	6	268.0	0.04	1.08	0.90	0.04	0.80	5.0	25.4	2.1	1.68	6.46	3.95	15	1.00	52.06	49.38	52.58	49.82	60.06	54.80	Sta.441+78 LT
8	7	5.0	0.15	0.21	0.70	0.11	0.16	20.0	20.0	2.4	0.39	3.19	2.52	12	0.80	55.40	55.36	55.67	55.60	59.00	60.06	Sta.441+78
9	8	19.0	0.06	0.06	0.90	0.05	0.05	5.0	5.0	4.6	0.25	2.58	1.42	12	0.53	55.50	55.40	55.74	55.73	59.74	59.00	Sta.441+78 RT
10	7	250.0	0.05	0.10	0.90	0.05	0.09	5.0	7.6	3.9	0.35	3.56	2.58	12	1.00	56.00	53.50	56.25	53.71	60.45	60.06	Sta.439+25 LT
11	10	41.0	0.05	0.05	0.90	0.05	0.05	5.0	5.0	4.6	0.21	3.56	1.43	12	1.00	56.41	56.00	56.60	56.33	59.91	60.45	Sta.439+25 RT
12	3	10.0	0.40	0.40	0.90	0.36	0.36	5.0	5.0	4.6	1.65	7.43	1.30	18	0.50	46.91	46.86	47.90	47.90	50.86	51.46	Sta 446+82 RT
13	7	19.0	0.73	0.73	0.70	0.51	0.51	25.0	25.0	2.1	1.09	6.95	2.22	15	1.16	52.28	52.06	52.71	52.76	58.00	60.06	Sta 716+00 LT
14	6	26.0	0.56	0.56	0.70	0.39	0.39	20.0	20.0	2.4	0.95	2.52	1.25	12	0.50	48.35	48.22	49.24	49.22	52.07	54.80	Sta 444+50 LT
15	5	17.0	0.43	0.43	0.90	0.39	0.39	5.0	5.0	4.6	1.78	2.59	2.26	12	0.53	47.61	47.52	48.71	48.67	57.00	52.03	Sta 445+95 LT
16	1	37.0	0.50	0.90	0.90	0.45	0.81	5.0	6.0	4.3	3.49	7.53	2.17	18	0.51	45.32	45.13	46.53	46.51	62.50	54.91	Aetna Parking Lot
17	16	125.0	0.40	0.40	0.90	0.36	0.36	5.0	5.0	4.6	1.65	3.56	4.11	12	1.00	55.50	54.25	56.05	54.73	60.50	62.50	Aetna Parking Lot

System 7 | Number of lines: 17 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	115.0	0.00	3.86	0.00	0.00	3.19	0.0	29.8	2.8	8.96	16.06	3.69	24	0.50	45.13	44.55	46.40	46.28	54.91	56.80	Sta.449+25
2	1	4.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	6.0	1.35	2.52	3.26	12	0.50	50.00	49.98	50.52	50.50	54.24	54.91	Sta.449+25 RT
3	1	240.0	0.00	2.71	0.00	0.00	2.15	0.0	28.6	2.9	6.19	7.43	4.64	18	0.50	46.86	45.66	47.87	46.77	51.46	54.91	Sta.446+82
4	3	8.0	0.24	0.24	0.90	0.22	0.22	5.0	5.0	6.0	1.29	8.30	0.73	18	0.62	46.91	46.86	48.60	48.60	50.86	51.46	Sta.446+82 LT
5	3	82.0	0.00	2.07	0.00	0.00	1.58	0.0	28.3	2.9	4.57	4.57	3.72	15	0.50	47.52	47.11	48.76	48.40	52.03	51.46	Sta.445+95
6	5	140.0	0.00	1.64	0.00	0.00	1.19	0.0	27.5	2.9	3.50	4.57	2.85	15	0.50	48.22	47.52	49.46	49.07	54.80	52.03	Sta 444+50
7	6	268.0	0.04	1.08	0.90	0.04	0.80	5.0	25.2	3.1	2.46	6.46	4.45	15	1.00	52.06	49.38	52.69	49.92	60.06	54.80	Sta.441+78 LT
8	7	5.0	0.15	0.21	0.70	0.11	0.16	20.0	20.0	3.5	0.56	3.19	2.82	12	0.80	55.40	55.36	55.72	55.64	59.00	60.06	Sta.441+78
9	8	19.0	0.06	0.06	0.90	0.05	0.05	5.0	5.0	6.0	0.32	2.58	1.18	12	0.53	55.50	55.40	55.84	55.84	59.74	59.00	Sta.441+78 RT
10	7	250.0	0.05	0.10	0.90	0.05	0.09	5.0	7.0	5.4	0.49	3.56	2.84	12	1.00	56.00	53.50	56.30	53.75	60.45	60.06	Sta.439+25 LT
11	10	41.0	0.05	0.05	0.90	0.05	0.05	5.0	5.0	6.0	0.27	3.56	1.52	12	1.00	56.41	56.00	56.63	56.39	59.91	60.45	Sta.439+25 RT
12	3	10.0	0.40	0.40	0.90	0.36	0.36	5.0	5.0	6.0	2.16	7.43	1.22	18	0.50	46.91	46.86	48.59	48.59	50.86	51.46	Sta 446+82 RT
13	7	19.0	0.73	0.73	0.70	0.51	0.51	25.0	25.0	3.1	1.59	6.95	2.27	15	1.16	52.28	52.06	52.88	52.91	58.00	60.06	Sta 716+00 LT
14	6	26.0	0.56	0.56	0.70	0.39	0.39	20.0	20.0	3.5	1.38	2.52	1.75	12	0.50	48.35	48.22	49.71	49.67	52.07	54.80	Sta 444+50 LT
15	5	17.0	0.43	0.43	0.90	0.39	0.39	5.0	5.0	6.0	2.32	2.59	2.95	12	0.53	47.61	47.52	49.13	49.06	57.00	52.03	Sta 445+95 LT
16	1	37.0	0.50	0.90	0.90	0.45	0.81	5.0	5.8	5.8	4.67	7.53	2.64	18	0.51	45.32	45.13	46.93	46.86	62.50	54.91	Aetna Parking Lot
17	16	125.0	0.40	0.40	0.90	0.36	0.36	5.0	5.0	6.0	2.16	3.56	4.47	12	1.00	55.50	54.25	56.12	54.81	60.50	62.50	Aetna Parking Lot

System 7 | Number of lines: 17 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	115.0	0.00	3.86	0.00	0.00	3.19	0.0	28.3	4.2	13.48	16.06	5.05	24	0.50	45.13	44.55	46.61	46.28	54.91	56.80	Sta.449+25
2	1	4.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	7.8	1.75	2.52	3.47	12	0.50	50.00	49.98	50.61	50.59	54.24	54.91	Sta.449+25 RT
3	1	240.0	0.00	2.71	0.00	0.00	2.15	0.0	27.5	4.3	9.24	7.43	5.23	18	0.50	46.86	45.66	49.02	47.16	51.46	54.91	Sta.446+82
4	3	8.0	0.24	0.24	0.90	0.22	0.22	5.0	5.0	7.8	1.68	8.30	0.95	18	0.62	46.91	46.86	49.86	49.85	50.86	51.46	Sta.446+82 LT
5	3	82.0	0.00	2.07	0.00	0.00	1.58	0.0	27.3	4.3	6.80	4.57	5.54	15	0.50	47.52	47.11	50.35	49.44	52.03	51.46	Sta.445+95
6	5	140.0	0.00	1.64	0.00	0.00	1.19	0.0	26.7	4.4	5.18	4.57	4.22	15	0.50	48.22	47.52	51.93	51.03	54.80	52.03	Sta 444+50
7	6	268.0	0.04	1.08	0.90	0.04	0.80	5.0	25.2	4.5	3.58	6.46	3.07	15	1.00	52.06	49.38	53.12	52.35	60.06	54.80	Sta.441+78 LT
8	7	5.0	0.15	0.21	0.70	0.11	0.16	20.0	20.0	5.0	0.80	3.19	3.14	12	0.80	55.40	55.36	55.78	55.70	59.00	60.06	Sta.441+78
9	8	19.0	0.06	0.06	0.90	0.05	0.05	5.0	5.0	7.8	0.42	2.58	1.10	12	0.53	55.50	55.40	55.95	55.94	59.74	59.00	Sta.441+78 RT
10	7	250.0	0.05	0.10	0.90	0.05	0.09	5.0	6.5	7.4	0.66	3.56	3.11	12	1.00	56.00	53.50	56.35	53.79	60.45	60.06	Sta.439+25 LT
11	10	41.0	0.05	0.05	0.90	0.05	0.05	5.0	5.0	7.8	0.35	3.56	1.63	12	1.00	56.41	56.00	56.66	56.46	59.91	60.45	Sta.439+25 RT
12	3	10.0	0.40	0.40	0.90	0.36	0.36	5.0	5.0	7.8	2.81	7.43	1.59	18	0.50	46.91	46.86	49.84	49.83	50.86	51.46	Sta 446+82 RT
13	7	19.0	0.73	0.73	0.70	0.51	0.51	25.0	25.0	4.5	2.30	6.95	1.88	15	1.16	52.28	52.06	53.61	53.59	58.00	60.06	Sta 716+00 LT
14	6	26.0	0.56	0.56	0.70	0.39	0.39	20.0	20.0	5.0	1.97	2.52	2.51	12	0.50	48.35	48.22	52.46	52.38	52.07	54.80	Sta 444+50 LT
15	5	17.0	0.43	0.43	0.90	0.39	0.39	5.0	5.0	7.8	3.02	2.59	3.84	12	0.53	47.61	47.52	51.20	51.07	57.00	52.03	Sta 445+95 LT
16	1	37.0	0.50	0.90	0.90	0.45	0.81	5.0	5.6	7.6	6.17	7.53	3.49	18	0.51	45.32	45.13	47.46	47.33	62.50	54.91	Aetna Parking Lot
17	16	125.0	0.40	0.40	0.90	0.36	0.36	5.0	5.0	7.8	2.81	3.56	4.86	12	1.00	55.50	54.25	56.21	54.92	60.50	62.50	Aetna Parking Lot

System 7 | Number of lines: 17 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Appendix B - Rainfall

RAINFALL – DURATION – FREQUENCY RELATIONSHIPS FOR CONNECTICUT

DURATION	RETURN FREQUENCY (Years)					
	2	5	10	25	50	100
Min	RAINFALL IN MM (INCHES)					
5	9.1(0.36)	11.4(0.45)	13.0(0.51)	15.2(0.60)	17.2(0.67)	18.5(0.73)
15	18.3(0.72)	22.6(0.89)	25.9(1.02)	30.5(1.20)	34.0(1.34)	37.6(1.48)
60	33.0(1.3)	43.2(1.7)	50.8(2.00)	58.4(2.30)	65.3(2.57)	71.1(2.80)
Hrs						
2	40.6(1.60)	54.6(2.15)	63.5(2.50)	72.4(2.85)	82.6(3.25)	91.4(3.60)
3	44.5(1.75)	61.0(2.40)	69.9(2.75)	82.6(3.25)	90.2(3.55)	101.6(4.00)
6	59.7(2.35)	74.9(2.95)	87.6(3.45)	101.6(4.00)	115.6(4.55)	127.0(5.00)
12	69.9(2.75)	90.2(3.55)	101.6(4.00)	123.2(4.85)	135.9(5.35)	152.4(6.00)
24	82.6(3.25)	106.7(4.20)	125.7(4.95)	146.1(5.75)	161.3(6.35)	177.8(7.00)
	24 HOUR RAINFALL BY COUNTY					
Fairfield	83.8(3.3)	109.2(4.3)	127.0(5.0)	144.8(5.7)	162.6(6.4)	182.9(7.2)
Hartford	81.3(3.2)	104.1(4.1)	119.4(4.7)	139.7(5.5)	157.5(6.2)	175.3(6.9)
Litchfield	81.3(3.2)	104.1(4.1)	119.4(4.7)	139.7(5.5)	157.5(6.2)	177.8(7.0)
Middlesex	83.8(3.3)	106.7(4.2)	127.0(5.0)	142.2(5.6)	160.0(6.3)	180.3(7.1)
New Haven	83.8(3.3)	106.7(4.2)	127.0(5.0)	142.2(5.6)	160.0(6.3)	180.3(7.1)
New London	86.4(3.4)	109.2(4.3)	127.0(5.0)	144.8(5.7)	160.0(6.3)	180.3(7.1)
Tolland	81.3(3.2)	104.1(4.1)	121.9(4.8)	139.7(5.5)	157.5(6.2)	175.3(6.9)
Windham	81.3(3.2)	106.7(4.2)	121.9(4.8)	139.7(5.5)	157.5(6.2)	175.3(6.9)

Sources:

1. "Rainfall Frequency Atlas of the United States", Technical Paper No. 40, U.S. Department of Commerce, Weather Bureau.
2. NOAA Technical Memorandum "NWS Hydro-35", June 1977, U.S. Department of Commerce, National Weather Service.

Table B-1

VN ENGINEERS, INC.
116 Washington Avenue
NORTH HAVEN, CT 06473
(203) 234-7862

JOB [illegible] BUS WAY
SHEET NO. 1 OF
CALCULATED BY JMB DATE 10/19/09
CHECKED BY DATE
SCALE

WATERSHED	FLOW (STORM SEWER)	AREA
1	2.68 cfs	0.50 AC
2	5.45 - 2.68 = 2.77 cfs	1.20 - 0.5 = 0.50 AC
STATION	1.76 cfs (per [illegible] REPORT BY SEA)	0.54 AC

FLOW CHECK

	STORM SEWER	HYDROCAD	
SYSTEM #5	5.45 cfs	2.33 (#1) + 3.33 (#2) = 5.68 cfs	✓ OK
	1.76 cfs (BY OTHERS)	1.84 cfs	✓ OK

3. Station Analysis and Summaries

3.0. Parkville Station

3.0.1. Existing Condition

The site previously had industrial uses and an auto repair business. The site and surrounding areas studied are approximately 93.0% impervious.

The site generally drains to Francis Avenue on the west and Park Street on the north. These flows are collected by a drainage system within the streets. (See Exhibit 3.8-A). Two catch basins are located on Francis Avenue that collect site flows. The southern catch basin is Design Point A. The tributary area to this catch basin is approximately 1.07 acres. The northern catch basin on Francis Avenue is Design Point B. The tributary area to this catch basin is approximately 0.58 acres.

Both catch basins connect to an existing 30-inch storm drain pipe within Francis Avenue that drains to a 66-inch reinforced concrete pipe in Park Street. A catch basin on Park Street tied to this system is Design Point C. The tributary area to this catch basin is approximately 0.77 acres. This system ultimately discharges to the Park River Conduit. URS, Contract No. 155-H025, analyzed this existing system to determine its capacity. The discharge to the Park Street system is summarized, as follows:

Storm Frequency	Q_{PRE} (cfs)
2-year	9.85
10-year	12.84
25-year	14.34
100-year	16.70

3.0.2. Proposed Condition

To the extent possible, the site has been graded so that the majority of the stormwater runoff from the site may be collected and discharged to the detention system designed by the Hartford South section designer, Contract No. 155-H025.

The proposed site design will significantly increase the amount of pervious area on the site. (See Exhiblt 3.8-B.) The proposed site and surrounding drainage areas are approximately 67.5% impervious. The areas delineated match the limits of the existing drainage area.

The plaza area and terraced site areas facing Francis Avenue are proposed to be collected and discharged to the detention system by way of several yard drains and area drains. These drains are proposed within the site to collect nuisance flows and prevent significant discharges over the terraced walls, stairs, and handicap ramps.

The pipe system consists of 12-inch plastic pipes. The drainage areas, basin locations, and connection points are shown in Exhibit 3.8-C. The site drainage area tributary to the detention system totals approximately 0.38 acres and the discharge is summarized, as follows

Storm Frequency	Q_{POST} (cfs)
2-year	0.96
10-year	1.27
25-year	1.43
100-year	1.67

Many of the inlets proposed on the station site are for collection of nuisance flow and to minimize the stormwater runoff from flowing over the terraced walls, stairs, and handicap ramps. As the flow rates are small through many of the pipes, the CTDOT minimum velocity criteria are not always met. To the extent feasible, pipe slopes have been increased and diameters reduced to achieve the highest velocity possible. This design balances the velocity goals with the site uses to develop the most efficient station site.

The majority of the parking area is proposed to be collected by a catch basin located within the parking area drive. This catch basin will have a 4 foot sump and discharge the detention system, as well (See Exhibit 3.8-B). The site drainage area tributary here totals approximately 0.09 acres and the discharge is summarized, as follows:

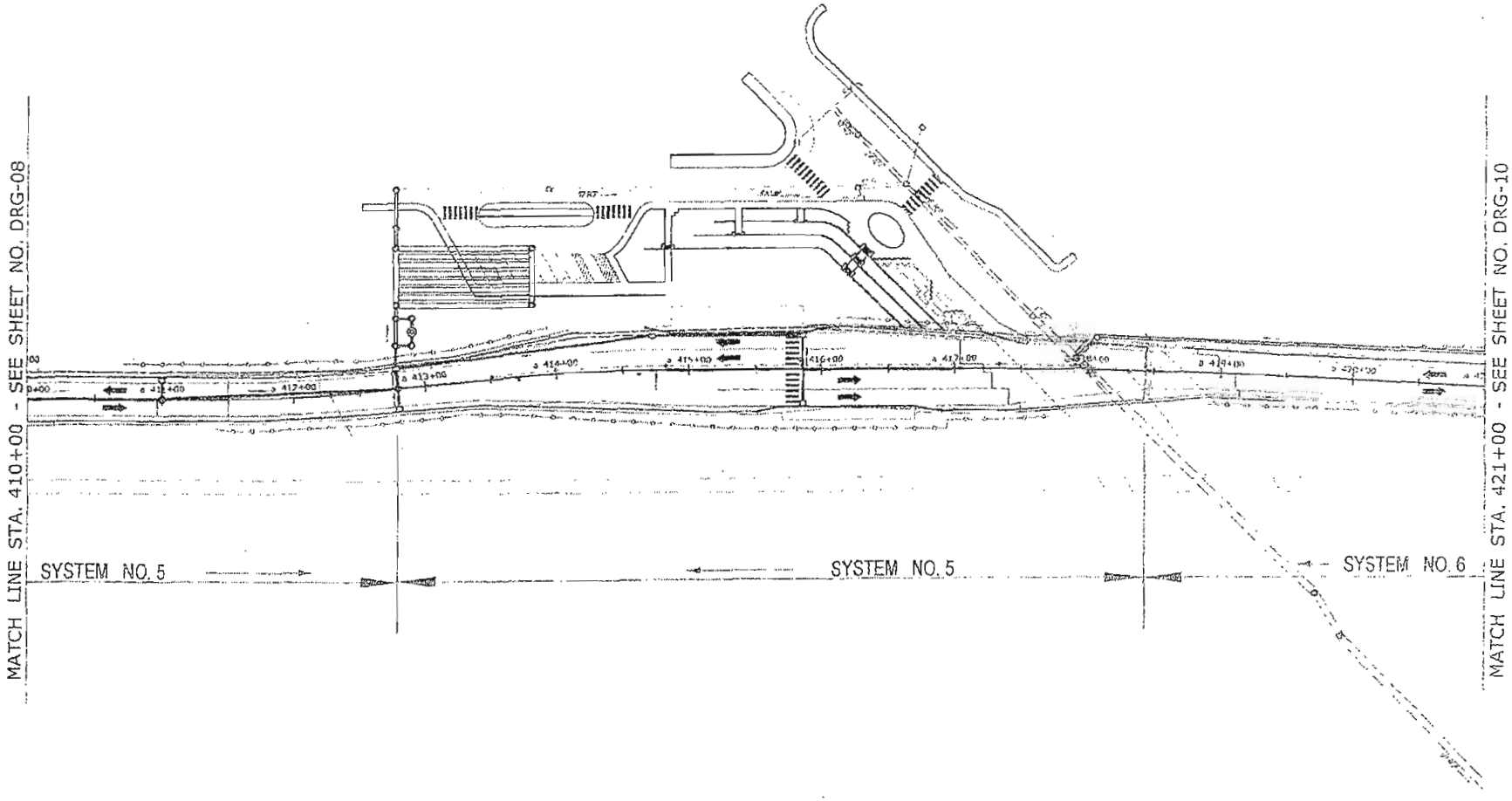
Storm Frequency	Q_{POST} (cfs)
2-year	0.37
10-year	0.48
25-year	0.54
100-year	0.63

Portions of the proposed parking area drive along with sidewalks and terraced areas will drain toward the existing Park Street system. The tributary area to the catch basins within this system, Design Points A, B, and C, are 0.89, 0.14, and 0.28 acres respectively. The discharge to these catch basins is summarized, as follows:

Storm Frequency	Q_{PRE} (cfs)	Q_{POST} (cfs)	ΔQ (cfs)
2-year	9.85	4.41	-5.44
10-year	12.84	5.75	-7.09
25-year	14.34	6.42	-7.92
100-year	16.70	7.48	-9.22

BRT Station Preliminary Drainage Design
DOT Report

Label	Node Upstream Downstream	Upstream Inlet C	Upstream CA (acres)	Ground Upstream Downstream	HGL Upstream Downstream	System Rational Flow (ft^3/s)	Length (ft)	Velocity (Average) (ft/s)	System Intensity (in/hr)
CO-2	YD-2	0.343	0.01	59.8	56.72	0.04	60	1.46	6
	YD-1			60.1	56.41				
CO-5	YD-10	0.331	0.02	62.5	58.47	0.11	46	3.17	6
	YD-11			62.5	57.5				
CO-6	YD-11	0.372	0.03	62.5	57.49	0.2	44	3.56	5.952
	YD-12			62.5	56.66				
CO-7	YD-12	0.715	0.06	62.5	56.68	0.33	56	4.14	5.91
	YD-13			62.8	55.95				
CO-8	YD-13	0.9	0.19	62.8	55.79	1.04	39	3.74	5.573
	YD-14			61.8	55.65				
CO-12	CB-1	0.881	0.08	61	57.12	0.49	23	2.52	6
	OF-2			61.5	57				
CO-14	YD-21	0.424	0.02	61.6	55.95	0.13	12	2.03	5.603
	YD-13			62.8	55.95				
CO-15	AD-1	0.9	0.01	68.1	64.05	0.09	25	2.28	6
	AD-2			68.38	63.81				
CO-16	AD-2	0.9	0.04	68.38	63.77	0.22	43	3.03	5.963
	AD-3			68.08	63.37				
CO-17	AD-3	0.9	0.06	68.08	63.3	0.36	46	8.09	5.916
	YD-13			62.8	58.11				
CO-20	YD-1	0.3	0.01	60.1	56.34	0.07	54	1.7	5.863
	YD-3			60.5	56.06				
CO-21	YD-3	0.358	0.02	60.5	55.99	0.1	49	1.85	5.736
	YD-21			61.6	55.95				
CO-22	YD-14	0.457	0.23	61.8	55.54	1.27	13	6.88	5.521
	OF-2			62.8	55.07				



SEMI FINAL DESIGN REVIEW

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

J. Barnhard
C. Campbell
SCALE IN FEET
0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

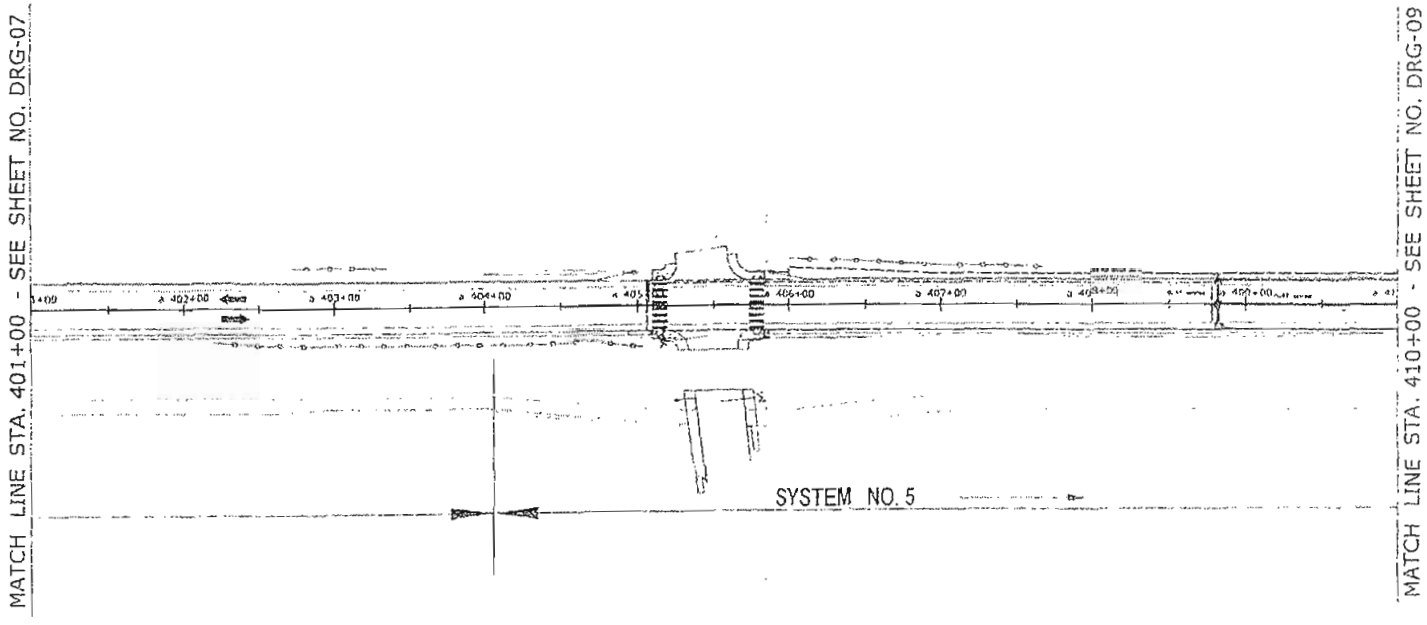
VN ENGINEERS, INC. / URS CORPORATION AES
Robert Comez, P.E.
VN ENGINEERS, INC.

NEW BRITAIN - HARTFORD
BUSWAY

HARTFORD

DRAINAGE PLAN

155-H025
DRG-09



SEMI FINAL DESIGN REVIEW

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

I. Bambara
C. Lanshear
SCALE IN FEET
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

VN ENGINEERS, INC. / URS CORPORATION AES
Robert Gomez, P.E.

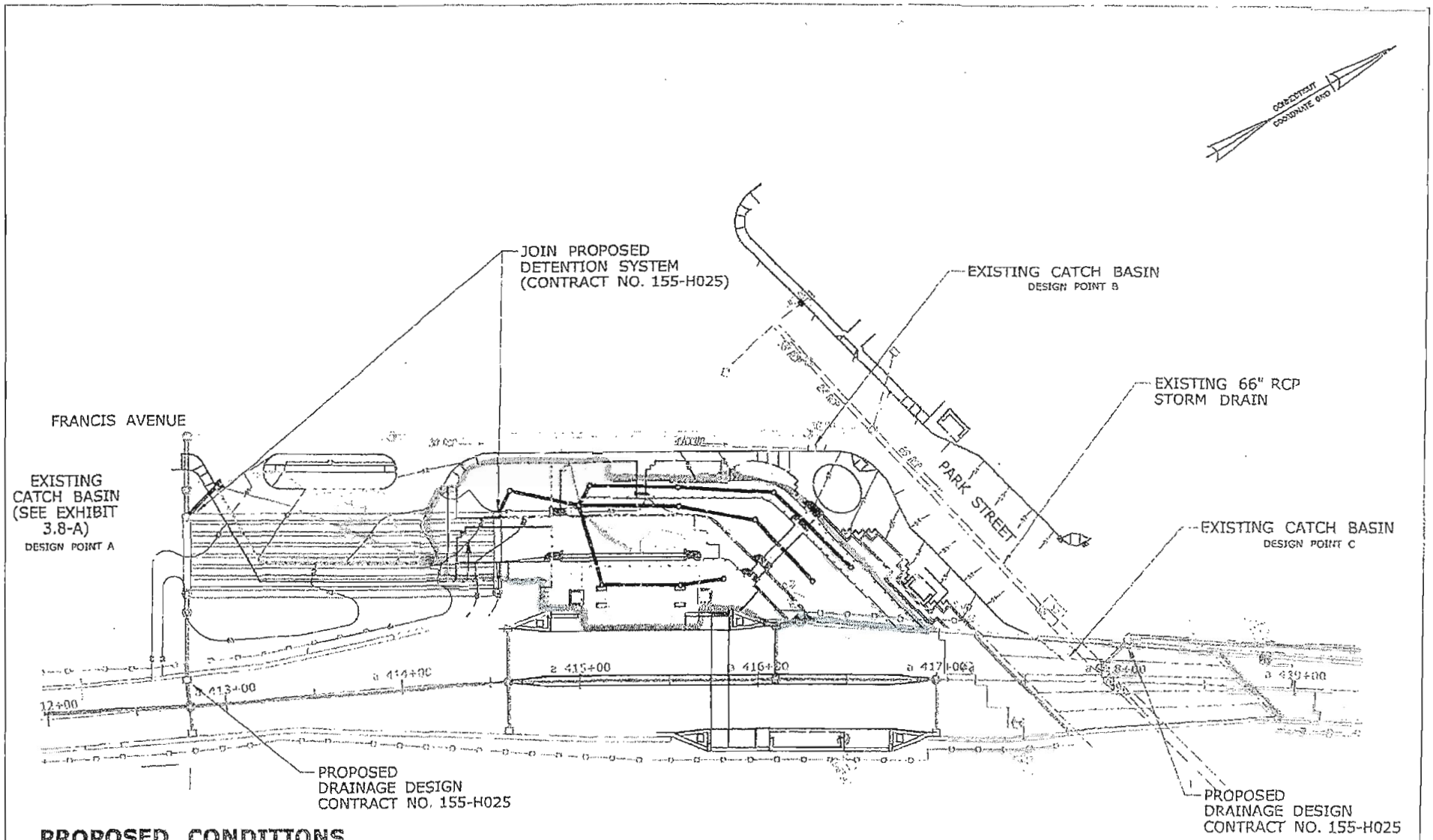
VN ENGINEERS INC.

NEW BRITAIN - HARTFORD
BUSWAY

HARTFORD

DRAINAGE PLAN

155-H025
DRG-08

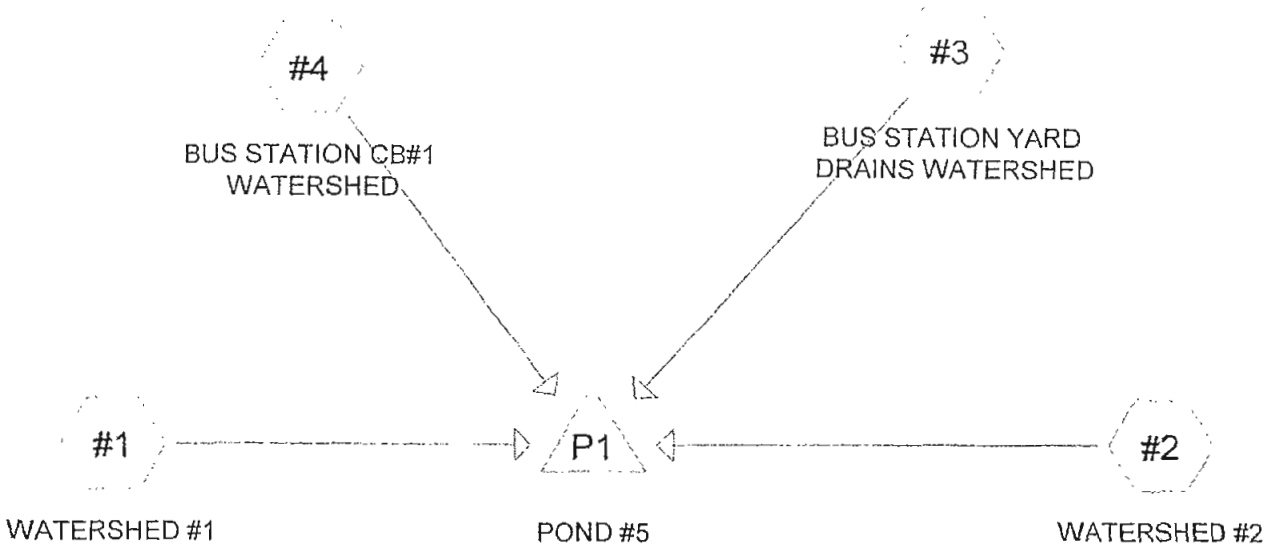


PROPOSED CONDITIONS

SCALE 1" = 50'

100 50 0 100

STATE PROJECT NO.: 88-H039 COUNTY: HARTFORD CITY/TOWN: HARTFORD	APPLICATION BY: STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING SCALE 1"=50'	DATE: OCTOBER 2009 SITE: PARKVILLE STATION EXHIBIT: 3.8-B



Subcat Reach Pond Link

Drainage Diagram for SYSTEM #5_2 YR (Revised 06-08-10)
Prepared by {enter your company name here} 6/9/2010
HydroCAD® 8.00 s/n 002010 © 2006 HydroCAD Software Solutions LLC

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment #1: WATERSHED #1 Runoff Area=0.500 ac Runoff Depth>3.02"
Flow Length=386' Slope=0.0030 '/' Tc=6.7 min CN=98 Runoff=1.52 cfs 0.126 af

Subcatchment #2: WATERSHED #2 Runoff Area=0.800 ac Runoff Depth>3.01"
Flow Length=980' Slope=0.0075 '/' Tc=10.0 min CN=98 Runoff=2.18 cfs 0.201 af

Subcatchment #3: BUS STATION YARD DRAINS WATERSHED Runoff Area=0.380 ac Runoff Depth>1.65"
Flow Length=113' Tc=1.1 min CN=83 Runoff=0.81 cfs 0.052 af

Subcatchment #4: BUS STATION CB#1 WATERSHED Runoff Area=0.090 ac Runoff Depth>3.02"
Flow Length=126' Slope=0.0150 '/' Tc=1.3 min CN=98 Runoff=0.31 cfs 0.023 af

Pond P1: POND #5 Peak Elev=52.53' Storage=0.173 af Inflow=4.27 cfs 0.401 af
Outflow=0.53 cfs 0.396 af

Total Runoff Area = 1.770 ac Runoff Volume = 0.401 af Average Runoff Depth = 2.72"
12.99% Pervious Area = 0.230 ac 87.01% Impervious Area = 1.540 ac

Subcatchment #1: WATERSHED #1

Runoff = 1.52 cfs @ 12.10 hrs, Volume= 0.126 af, Depth> 3.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.25"

Area (ac)	CN	Description
0.500	98	Paved parking & roofs
0.500		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	75	0.0030	0.61		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
4.7	311	0.0030	1.11		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
6.7	386	Total			

Subcatchment #2: WATERSHED #2

Runoff = 2.18 cfs @ 12.14 hrs, Volume= 0.201 af, Depth> 3.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.25"

Area (ac)	CN	Description
0.800	98	Paved parking & roofs
0.800		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	75	0.0075	0.88		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
8.6	905	0.0075	1.76		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
10.0	980	Total			

Subcatchment #3: BUS STATION YARD DRAINS WATERSHED

Runoff = 0.81 cfs @ 12.02 hrs, Volume= 0.052 af, Depth> 1.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.25"

Area (ac)	CN	Description
0.230	74	>75% Grass cover, Good, HSG C
0.150	98	Paved parking & roofs
0.380	83	Weighted Average
0.230		Pervious Area

0.150 Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0380	1.56		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
0.1	28	0.0380	3.96		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
0.5	35	0.0260	1.13		**Shallow Concentrated Flow, SHALLOW CONC. FLOW (GRASS)** Short Grass Pasture Kv= 7.0 fps
1.1	113	Total			

Subcatchment #4: BUS STATION CB#1 WATERSHED

Runoff = 0.31 cfs @ 12.02 hrs, Volume= 0.023 af, Depth> 3.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.25"

Area (ac)	CN	Description
0.090	98	Paved parking & roofs
0.090		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.08		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
0.5	76	0.0150	2.49		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
1.3	126	Total			

Pond P1: POND #5

Inflow Area = 1.770 ac, Inflow Depth > 2.72"
Inflow = 4.27 cfs @ 12.10 hrs, Volume= 0.401 af
Outflow = 0.53 cfs @ 12.85 hrs, Volume= 0.396 af, Atten= 88%, Lag= 44.9 min
Primary = 0.53 cfs @ 12.85 hrs, Volume= 0.396 af

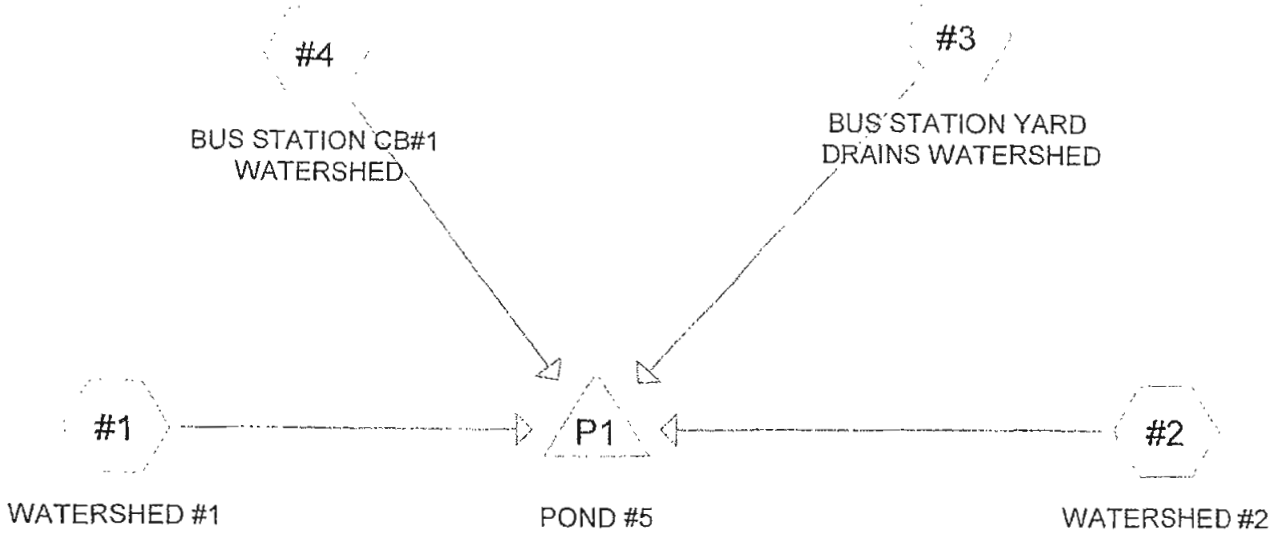
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 52.53' @ 12.85 hrs Surf.Area= 0.128 ac Storage= 0.173 af

Plug-Flow detention time= 152.9 min calculated for 0.395 af (98% of inflow)
Center-of-Mass det. time= 143.5 min (910.2 - 766.6)

Volume	Invert	Avail.Storage	Storage Description
#1	50.75'	0.404 af	**48.0"D x 140.00'L Horizontal Cylinder** x 10

Device	Routing	Invert	Outlet Devices
#1	Primary	50.75'	**4.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	53.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	53.75'	**48.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.53 cfs @ 12.85 hrs HW=52.53' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 0.53 cfs @ 6.11 fps)
├─**2=Orifice/Grate** (Controls 0.00 cfs)
└─**3=Orifice/Grate** (Controls 0.00 cfs)



Subcat Reach Pond Link

Drainage Diagram for SYSTEM #5_10 YR (Revised 06-08-10)
Prepared by {enter your company name here} 6/9/2010
HydroCAD® 8.00 s/n 002010 © 2006 HydroCAD Software Solutions LLC

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment #1: WATERSHED #1 Runoff Area=0.500 ac Runoff Depth>4.71"
Flow Length=386' Slope=0.0030 '/' Tc=6.7 min CN=98 Runoff=2.33 cfs 0.196 af

Subcatchment #2: WATERSHED #2 Runoff Area=0.800 ac Runoff Depth>4.71"
Flow Length=980' Slope=0.0075 '/' Tc=10.0 min CN=98 Runoff=3.35 cfs 0.314 af

Subcatchment #3: BUS STATION YARD DRAINS WATERSHED Runoff Area=0.380 ac Runoff Depth>3.13"
Flow Length=113' Tc=1.1 min CN=83 Runoff=1.54 cfs 0.099 af

Subcatchment #4: BUS STATION CB#1 WATERSHED Runoff Area=0.090 ac Runoff Depth>4.71"
Flow Length=126' Slope=0.0150 '/' Tc=1.3 min CN=98 Runoff=0.48 cfs 0.035 af

Pond P1: POND #5 Peak Elev=53.45' Storage=0.291 af Inflow=6.72 cfs 0.645 af
Outflow=0.89 cfs 0.622 af

Total Runoff Area = 1.770 ac Runoff Volume = 0.645 af Average Runoff Depth = 4.37"
12.99% Pervious Area = 0.230 ac 87.01% Impervious Area = 1.540 ac

Subcatchment #1: WATERSHED #1

Runoff = 2.33 cfs @ 12.10 hrs, Volume= 0.196 af, Depth> 4.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=4.95"

Area (ac)	CN	Description
0.500	98	Paved parking & roofs
0.500		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	75	0.0030	0.61		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
4.7	311	0.0030	1.11		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
6.7	386	Total			

Subcatchment #2: WATERSHED #2

Runoff = 3.35 cfs @ 12.14 hrs, Volume= 0.314 af, Depth> 4.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=4.95"

Area (ac)	CN	Description
0.800	98	Paved parking & roofs
0.800		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	75	0.0075	0.88		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
8.6	905	0.0075	1.76		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
10.0	980	Total			

Subcatchment #3: BUS STATION YARD DRAINS WATERSHED

Runoff = 1.54 cfs @ 12.02 hrs, Volume= 0.099 af, Depth> 3.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=4.95"

Area (ac)	CN	Description
0.230	74	>75% Grass cover, Good, HSG C
0.150	98	Paved parking & roofs
0.380	83	Weighted Average
0.230		Pervious Area

0.150 Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0380	1.56		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
0.1	28	0.0380	3.96		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
0.5	35	0.0260	1.13		**Shallow Concentrated Flow, SHALLOW CONC. FLOW (GRASS)** Short Grass Pasture Kv= 7.0 fps
1.1	113	Total			

Subcatchment #4: BUS STATION CB#1 WATERSHED

Runoff = 0.48 cfs @ 12.02 hrs, Volume= 0.035 af, Depth> 4.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=4.95"

Area (ac)	CN	Description
0.090	98	Paved parking & roofs
0.090		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.08		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
0.5	76	0.0150	2.49		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
1.3	126	Total			

Pond P1: POND #5

Inflow Area = 1.770 ac, Inflow Depth > 4.37"
Inflow = 6.72 cfs @ 12.09 hrs, Volume= 0.645 af
Outflow = 0.89 cfs @ 12.78 hrs, Volume= 0.622 af, Atten= 87%, Lag= 41.2 min
Primary = 0.89 cfs @ 12.78 hrs, Volume= 0.622 af

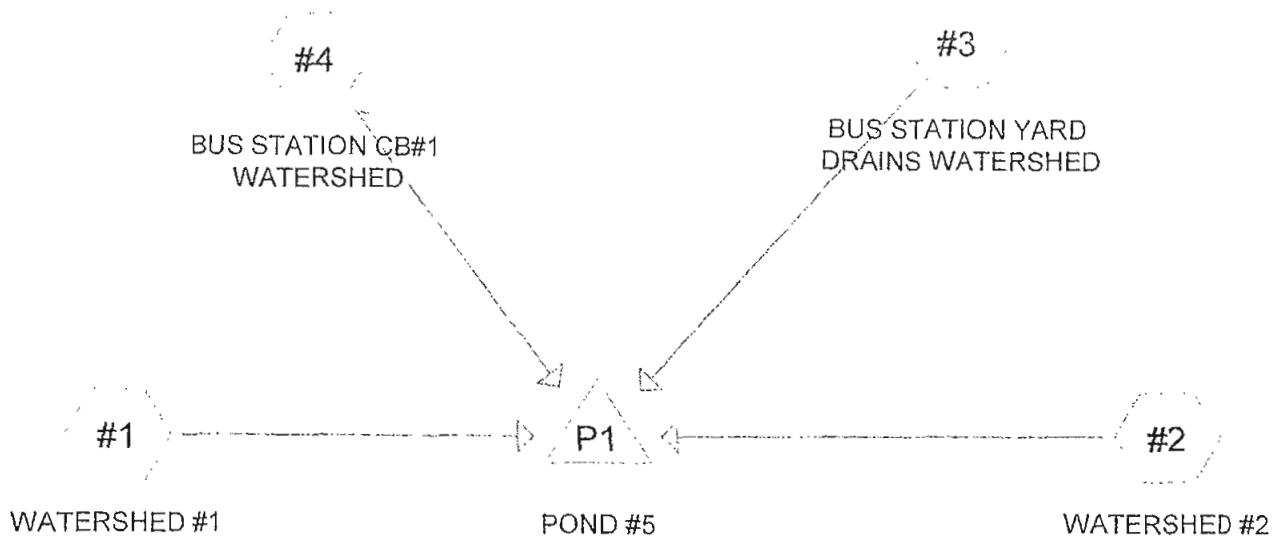
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 53.45' @ 12.78 hrs Surf.Area= 0.120 ac Storage= 0.291 af

Plug-Flow detention time= 192.1 min calculated for 0.620 af (96% of inflow)
Center-of-Mass det. time= 170.7 min (929.5 - 758.8)

Volume	Invert	Avail.Storage	Storage Description
#1	50.75'	0.404 af	**48.0"D x 140.00'L Horizontal Cylinder** x 10

Device	Routing	Invert	Outlet Devices
#1	Primary	50.75'	**4.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	53.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	53.75'	**48.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.89 cfs @ 12.78 hrs HW=53.45' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 0.67 cfs @ 7.67 fps)
├─**2=Orifice/Grate** (Orifice Controls 0.23 cfs @ 2.58 fps)
└─**3=Orifice/Grate** (Controls 0.00 cfs)



Subcat Reach Pond Link

Drainage Diagram for SYSTEM #5_25 YR (Revised 06-08-10)
Prepared by {enter your company name here} 6/9/2010
HydroCAD® 8.00 s/n 002010 © 2006 HydroCAD Software Solutions LLC

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment #1: WATERSHED #1 Runoff Area=0.500 ac Runoff Depth>5.51"
Flow Length=386' Slope=0.0030 '/' Tc=6.7 min CN=98 Runoff=2.71 cfs 0.230 af

Subcatchment #2: WATERSHED #2 Runoff Area=0.800 ac Runoff Depth>5.51"
Flow Length=980' Slope=0.0075 '/' Tc=10.0 min CN=98 Runoff=3.90 cfs 0.367 af

Subcatchment #3: BUS STATION YARD DRAINS WATERSHED Runoff Area=0.380 ac Runoff Depth>3.86"
Flow Length=113' Tc=1.1 min CN=83 Runoff=1.89 cfs 0.122 af

Subcatchment #4: BUS STATION CB#1 WATERSHED Runoff Area=0.090 ac Runoff Depth>5.51"
Flow Length=126' Slope=0.0150 '/' Tc=1.3 min CN=98 Runoff=0.56 cfs 0.041 af

Pond P1: POND #5 Peak Elev=53.90' Storage=0.341 af Inflow=7.87 cfs 0.760 af
Outflow=1.28 cfs 0.725 af

Total Runoff Area = 1.770 ac Runoff Volume = 0.760 af Average Runoff Depth = 5.15"
12.99% Pervious Area = 0.230 ac 87.01% Impervious Area = 1.540 ac

Subcatchment #1: WATERSHED #1

Runoff = 2.71 cfs @ 12.10 hrs, Volume= 0.230 af, Depth> 5.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.75"

Area (ac)	CN	Description
0.500	98	Paved parking & roofs
0.500		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	75	0.0030	0.61		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
4.7	311	0.0030	1.11		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
6.7	386	Total			

Subcatchment #2: WATERSHED #2

Runoff = 3.90 cfs @ 12.14 hrs, Volume= 0.367 af, Depth> 5.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.75"

Area (ac)	CN	Description
0.800	98	Paved parking & roofs
0.800		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	75	0.0075	0.88		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
8.6	905	0.0075	1.76		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
10.0	980	Total			

Subcatchment #3: BUS STATION YARD DRAINS WATERSHED

Runoff = 1.89 cfs @ 12.02 hrs, Volume= 0.122 af, Depth> 3.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.75"

Area (ac)	CN	Description
0.230	74	>75% Grass cover, Good, HSG C
0.150	98	Paved parking & roofs
0.380	83	Weighted Average
0.230		Pervious Area

0.150		Impervious Area			

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0380	1.56		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
0.1	28	0.0380	3.96		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
0.5	35	0.0260	1.13		**Shallow Concentrated Flow, SHALLOW CONC. FLOW (GRASS)** Short Grass Pasture Kv= 7.0 fps
1.1	113	Total			

Subcatchment #4: BUS STATION CB#1 WATERSHED

Runoff = 0.56 cfs @ 12.02 hrs, Volume= 0.041 af, Depth> 5.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.75"

Area (ac)	CN	Description
0.090	98	Paved parking & roofs
0.090		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.08		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
0.5	76	0.0150	2.49		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
1.3	126	Total			

Pond P1: POND #5

Inflow Area = 1.770 ac, Inflow Depth > 5.15"
Inflow = 7.87 cfs @ 12.09 hrs, Volume= 0.760 af
Outflow = 1.28 cfs @ 12.65 hrs, Volume= 0.725 af, Atten= 84%, Lag= 33.7 min
Primary = 1.28 cfs @ 12.65 hrs, Volume= 0.725 af

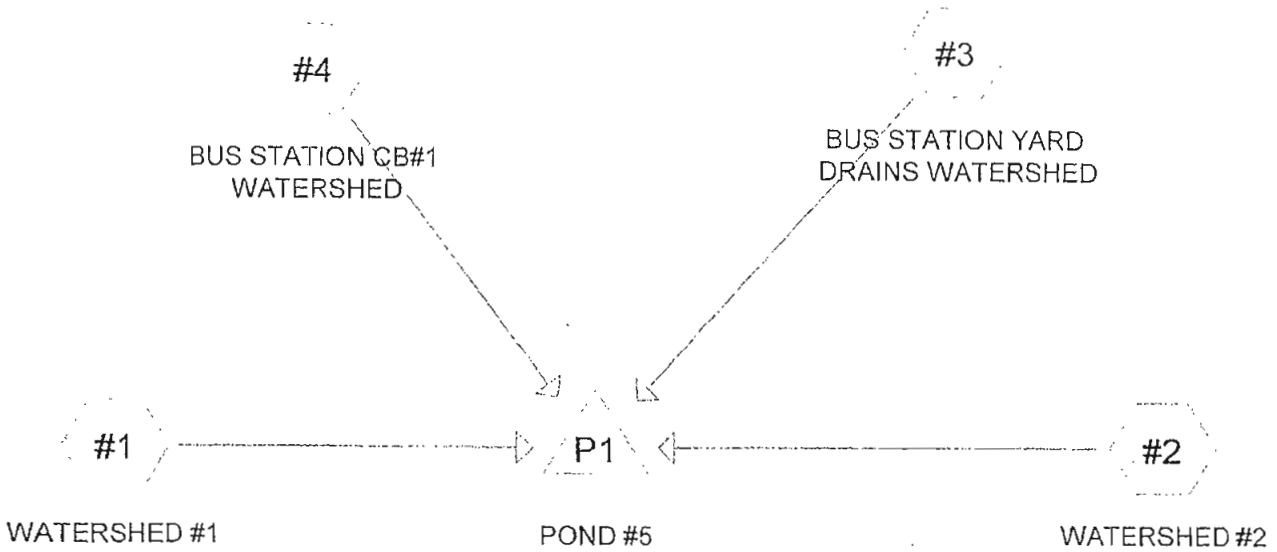
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 53.90' @ 12.65 hrs Surf.Area= 0.105 ac Storage= 0.341 af

Plug-Flow detention time= 191.4 min calculated for 0.725 af (95% of inflow)
Center-of-Mass det. time= 164.2 min (920.4 - 756.3)

Volume	Invert	Avail.Storage	Storage Description
#1	50.75'	0.404 af	**48.0"D x 140.00'L Horizontal Cylinder** x 10

Device	Routing	Invert	Outlet Devices
#1	Primary	50.75'	**4.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	53.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	53.75'	**48.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.28 cfs @ 12.65 hrs HW=53.90' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.73 cfs @ 8.31 fps)
- **2=Orifice/Grate** (Orifice Controls 0.36 cfs @ 4.12 fps)
- **3=Orifice/Grate** (Orifice Controls 0.20 cfs @ 1.31 fps)



Subcat Reach Pond Link

Drainage Diagram for SYSTEM #5_100 YR (Revised 06-08-10)
Prepared by {enter your company name here} 6/9/2010
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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment #1: WATERSHED #1 Runoff Area=0.500 ac Runoff Depth>6.76"
Flow Length=386' Slope=0.0030 '/' Tc=6.7 min CN=98 Runoff=3.30 cfs 0.282 af

Subcatchment #2: WATERSHED #2 Runoff Area=0.800 ac Runoff Depth>6.75"
Flow Length=980' Slope=0.0075 '/' Tc=10.0 min CN=98 Runoff=4.76 cfs 0.450 af

Subcatchment #3: BUS STATION YARD DRAINS WATERSHED Runoff Area=0.380 ac Runoff Depth>5.03"
Flow Length=113' Tc=1.1 min CN=83 Runoff=2.44 cfs 0.159 af

Subcatchment #4: BUS STATION CB#1 WATERSHED Runoff Area=0.090 ac Runoff Depth>6.76"
Flow Length=126' Slope=0.0150 '/' Tc=1.3 min CN=98 Runoff=0.68 cfs 0.051 af

Pond P1: POND #5 Peak Elev=54.30' Storage=0.379 af Inflow=9.66 cfs 0.942 af
Outflow=3.85 cfs 0.891 af

Total Runoff Area = 1.770 ac Runoff Volume = 0.942 af Average Runoff Depth = 6.38"
12.99% Pervious Area = 0.230 ac 87.01% Impervious Area = 1.540 ac

Subcatchment #1: WATERSHED #1

Runoff = 3.30 cfs @ 12.09 hrs, Volume= 0.282 af, Depth> 6.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=7.00"

Area (ac)	CN	Description
0.500	98	Paved parking & roofs
0.500		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	75	0.0030	0.61		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
4.7	311	0.0030	1.11		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
6.7	386	Total			

Subcatchment #2: WATERSHED #2

Runoff = 4.76 cfs @ 12.14 hrs, Volume= 0.450 af, Depth> 6.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=7.00"

Area (ac)	CN	Description
0.800	98	Paved parking & roofs
0.800		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	75	0.0075	0.88		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
8.6	905	0.0075	1.76		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
10.0	980	Total			

Subcatchment #3: BUS STATION YARD DRAINS WATERSHED

Runoff = 2.44 cfs @ 12.02 hrs, Volume= 0.159 af, Depth> 5.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=7.00"

Area (ac)	CN	Description
0.230	74	>75% Grass cover, Good, HSG C
0.150	98	Paved parking & roofs
0.380	83	Weighted Average
0.230		Pervious Area

0.150 Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0380	1.56		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
0.1	28	0.0380	3.96		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
0.5	35	0.0260	1.13		**Shallow Concentrated Flow, SHALLOW CONC. FLOW (GRASS)** Short Grass Pasture Kv= 7.0 fps
1.1	113	Total			

Subcatchment #4: BUS STATION CB#1 WATERSHED

Runoff = 0.68 cfs @ 12.02 hrs, Volume= 0.051 af, Depth> 6.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=7.00"

Area (ac)	CN	Description
0.090	98	Paved parking & roofs
0.090		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.08		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.25"
0.5	76	0.0150	2.49		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
1.3	126	Total			

Pond P1: POND #5

Inflow Area = 1.770 ac, Inflow Depth > 6.38"
Inflow = 9.66 cfs @ 12.09 hrs, Volume= 0.942 af
Outflow = 3.85 cfs @ 12.40 hrs, Volume= 0.891 af, Atten= 60%, Lag= 18.4 min
Primary = 3.85 cfs @ 12.40 hrs, Volume= 0.891 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 54.30' @ 12.40 hrs Surf.Area= 0.081 ac Storage= 0.379 af

Plug-Flow detention time= 172.5 min calculated for 0.889 af (94% of inflow)
Center-of-Mass det. time= 141.9 min (895.0 - 753.1)

Volume	Invert	Avail.Storage	Storage Description
#1	50.75'	0.404 af	**48.0"D x 140.00'L Horizontal Cylinder** x 10

Device	Routing	Invert	Outlet Devices
#1	Primary	50.75'	**4.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	53.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	53.75'	**48.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=3.83 cfs @ 12.40 hrs HW=54.30' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.77 cfs @ 8.85 fps)
- **2=Orifice/Grate** (Orifice Controls 0.45 cfs @ 5.12 fps)
- **3=Orifice/Grate** (Orifice Controls 2.62 cfs @ 2.52 fps)

Revised 04-06-11
JMB

Connecticut Department of Transportation
New Britain-Hartford Busway
Hartford-South (Contract No. 155-H025); Flatbush Avenue (Contract No. 63-643)

CT DEP IWRD Application
Attachment H: Engineering Documentation
Part 2: Hydrologic and Hydraulic Consistency Worksheet

Section II: Stormwater Management

Subsection 1. *Stormwater Runoff*

Drainage System 1: Proposed Busway Drainage (Sta. 332+00 to 343+50)

	10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
			2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	--	24	1.5	2.29	3.23
Post-Development (1)	22.9	0.38	2.48	3.73	5.48

NOTES: 1. System discharges into adjacent Busway Contract No. 93-H034 at Sta. 332+00.

Drainage System 2: Proposed Busway Drainage (Sta. 343+50 to 351+98)

		10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	2-1 (Proposed Busway Drainage)	--	24	1.22	1.86	2.63
	2-2 (Flatbush Avenue Station)	5	0.08	9.18	11.98	15.57
	2-3 (Flatbush Avenue System)	--	24	14.4	22.71	32.12
Post-Development	2-1 (Proposed Busway Drainage) (1)	~~8~~ 13.5	~~0.13~~ 0.23	~~1.79~~ 1.52	~~2.52~~ 2.36	~~3.44~~ 3.50
	2-2 (Flatbush Avenue Station) (2)	8	0.13	4.17	5.30	6.24
	2-3 (Flatbush Avenue System) (3)	27	0.45	11.22	19.72	30.40

REVISED

NOTES: 1. System discharges into Flatbush Avenue Project (Contract No. 63-643, 155-H030) at Sta. 351+98.
2. Flatbush Station discharges into proposed busway system at Sta. 350+57.
3. Flatbush Avenue system ties into existing MDC system at Sta. 22+68.

Drainage System 3: Proposed Busway Drainage (Sta. 351+98 to 384+50)

	10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
			2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	--	24	3.75	5.72	8.09
Post-Development (1)	29.5	0.49	9.83	15.80	24.43

NOTES: 1. System discharges into Kane Brook at Sta. 384+50.

Drainage System 4: Proposed Busway Drainage (Sta. 384+50 to 404+00)

	10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
			2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	--	24	1.11	1.68	2.38
Post-Development (1)	15.4	0.26	3.82	6.11	9.23

NOTES: 1. System discharges into Kane Brook at Sta. 385+00.

Drainage System 5: Proposed Busway Drainage (Sta. 404+00 to 418+00)

		10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	5-1 (Proposed Busway Drainage)	--	24	0.85	1.29	1.82
	5-2 (Parkville Station)	5	0.08	9.85	12.84	16.69
Post-Development	5-1 (Proposed Busway Drainage) (1), (2)	10.8	0.18	3.73	5.45	7.59
	5-2 (Parkville Station)	5	0.08	4.40	5.75	7.47

NOTES: 1. System discharges into existing MDC drainage system on Francis Avenue (Left of Sta. 412+75).
2. The Busway drainage system will outlet into a proposed underground detention system located to the left of the Busway at Sta. 412+75 just prior to discharging into the existing MDC system.

Drainage System 6: Proposed Busway Drainage (Sta. 418+00 to 439+25)

	10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
			2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	--	24	1.76	2.67	3.78
Post-Development (1)	31.2	0.52	3.14	5.11	7.43

NOTES: 1. System discharges into existing MDC drainage system on Park Road (Sta. 418+00)

Drainage System 7: Proposed Busway Drainage (Sta. 439+25 to 450+00)

	10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
			2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	--	24	3.30	5.02	7.11
Post-Development (1)	29.8	0.5	4.32	6.62	9.91

NOTES: 1. System discharges into adjacent Busway project at Sta. 405+00 (Contract No. 63+H137)

Section II: Stormwater Management (continued)

Describe the location of the design point and why this location was chosen:

Please see preceding attached sheet.

2. ***Stormwater Detention Facilities***

Does the proposed project include the construction of any stormwater detention facilities?

☒ Yes ☐ No If no, skip to subsection 3 ***(Storm Drainage Systems)***.

If yes, has the DEP determined whether a dam construction permit is required? ☐ Yes ☒ No

The pre and post development peak flow rates at the downstream design point are as follows:

Return Frequency (Year)	Peak Discharges (CFS)		
	Pre-Development	Post-Development (without detention)	Post-Development (with detention)
2	0	4.35	0.33
10	0	7.08	0.97
100	0	8.39	2.77

The above peak discharges were computed utilizing the: **24** hour duration storm. This duration storm was selected because:

A 24-hour storm duration was used to calculated the above peak discharges as required by the Connecticut Department of Transportation.

Describe the location of the design point and why this location was chosen:

The design point for the detention basin is located under the proposed Parkville Station. This location was chosen as this is where the proposed Busway drainage system will connect to the existing MDC system along Francis Avenue. Additionally, the proposed Parkville Station was designed with the intentions that the detention basin would be located under the site.

H – 039

Newington junction

NEW BRITAIN – HARTFORD BUSWAY

HARTFORD, CT

PERMITTING DRAINAGE DESIGN SUBMISSION

January 20, 2010

NEWINGTON JUNCTION STATION

State Project No. 88-H039

S E A

S E A CONSULTANTS INC.
Scientists/Engineers/Architects

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1. Introduction

1.0. Project Description

This project involves the design of eleven transit stations along an exclusive bus rapid transit (BRT) line. The BRT alignment and stations are within New Britain, Newington, West Hartford, and Hartford, Connecticut. Each site involves the design and construction of pedestrian and vehicular facilities for the busway operation. The site locations are typically urban sites that have been previously developed.

1.1. Purpose of Report

This report presents the preliminary drainage design for the BRT station sites. It provides information regarding the coordination with the proposed mainline drainage systems and data for use in preparing permitting applications.

1.2. Data Collection

In accordance with the Connecticut Department of Transportation Drainage Manual, the communities were solicited for input on existing drainage issues and concerns about the station drainage designs. Letters were sent to the Department of Public Works Directors and Town/City engineers in New Britain, Newington, West Hartford, and Hartford. A response was not received from Hartford. A request will be sent again. The following summarizes the responses received from the other communities.

The Town Engineer for Newington, Anthony Ferraro, responded via letter on November 5, 2008. Mr. Ferraro stated that there are no known drainage issues at either station proposed in Newington (Cedar Street and Newington Junction). His letter also contained information related to the proposed developments adjacent to the Cedar Street Station (National ACME site owned by the Town and the parcel south of the Stop & Shop supermarket owned by Rich Hayes). Mr. Ferraro noted that Mr. Hayes has offered drainage easements to his site (supermarket parcel) so that any needed detention basins for the developments can be combined.

2. Analysis Methodology

2.0. Design Criteria

The drainage design of the station sites was prepared in accordance with the 2000 Connecticut Department of Transportation Drainage Manual. Additional criteria of the Connecticut Department of Environmental Protection 2004 Stormwater Quality Manual was also considered.

The storm drainage systems were designed for the 10-year storm event. The rational method was used to calculate peak flows within the station sites. The hydraulic grade lines (HGLs) and pipe capacities were analyzed with StormCAD software. The Intensity/Duration/Frequency (IDF) curves used in the hydrologic analyses was from the Connecticut Department of Transportation Drainage Manual (Table B-2.1).

The inlets within the station sites were designed in accordance with the above mentioned manuals. A clogging factor of 50 percent was assumed for all basins located within a sag.

The CTDOT Drainage Manual specifies a minimum pipe velocity of 3 feet per second. When feasible, this velocity was achieved. However, given the nature of the site designs and the desire to eliminate nuisance flows to reduce icing conditions, not all pipes were able to be designed to meet this criterion. In general, this condition only exists in the upper reaches of the drainage systems.

For station sites where proposed drainage will be discharged into systems designed by others, drainage reports and calculations were provided to S E A Consultants for use in the station designs. References to these designs are included herein.

2.1. Design Methodology

StormCAD V8 XM software by Bentley was utilized to conduct the drainage calculations for this report. In addition, the rational method was used to compare the existing drainage at and surrounding the site to the proposed drainage design. Design points were selected around the site to accurately represent the change in flow from existing to proposed. Weighted C values were chosen to represent surface types. HydroCad software was also used to determine ponding depth and flow calculations.

2.2. Assumptions

Drainage areas were delineated using project area mapping provided by the Department.

Runoff coefficients were determined based on land cover. Two types were identified within the station limits paved are grassed areas. The runoff coefficients were determined as 0.9 and 0.3, respectively. Due to the small size of the station sites and small proposed drainage collection areas, the time of concentration of all on-site drainage sub-areas was assumed to be five minutes. Detailed time of concentration calculations were performed for off-site areas draining to the site systems, when applicable.

Tailwater elevations were determined based on available data. Where this information was unavailable, conservative assumptions were made as outlined in the following report sections.

3. Station Analysis and Summaries

3.0. Newington Junction Station

3.0.1. Existing Condition

The Newington Junction station site is approximately 3.3 acres of commercial development with drainage generally from west to east. The majority of the existing site has no structural collection devices; rather runoff sheet flows toward the railroad tracks and to a swale that drains along the railroad tracks to the south. This swale continues to a low point several hundred feet away. It appears this drainage is conveyed to Piper Brook by a 1.7′ x 2.3′ brick arch culvert located near busway Station 230+75.

Two existing 24-inch storm drain pipes traverse the site at the southern end. This system carries flow from the Willard Avenue and West Hill Road watershed. There are two existing catch basins located within the former Mobil gas station property that connect to this existing storm drain system. The outlet to Piper Brook is approximately 325 feet south of the site (Exhibit 3.4-A).

3.0.2. Proposed Condition

The proposed drainage conditions are divided into two collection systems. The first is a modification of the drainage at Willard Avenue and a new connection to this system designed for collection of the proposed runoff from the local drop-offs and sidewalks. Two catch basins are located along Willard Avenue at the intersection of West Hill Road and the station site entrance. The tributary area to each will be increased from 0.22 to 0.26 acres. In both the existing and proposed condition, these basins drain to the closed conduit traversing the site and outleting in Piper Brook (See exhibit 3.4-B).

The station site runoff is collected by a closed conduit system that discharges to the existing Piper Brook drain line. Offsite areas on the north of the site drain toward the site parking lot and will be collected in a series of catch basins. This drainage system discharges to a water quality swale located at the southern end of the site. The proposed drainage area to this point totals approximately 0.69 acres. The discharge is summarized as follows:

Storm Frequency	Q_{POST} (cfs)
2-year	2.32
10-year	3.05
25-year	3.39
100-year	3.85

The water quality swale carries the runoff from this system in addition to 0.22 acres from the adjacent slope and discharges over a check dam to a riprap lined channel. The check dam has been sized to pass the 10-year peak storm event flow to the

channel. Modified rip rap is proposed in the channel based on an average velocity of 2.30 fps.

The southern end of the station plaza and the adjacent lawn area drains by surface flow to a swale paralleling the busway and discharges to the riprap channel. The swale collects 0.38 acres and has been sized to accommodate the 10-year peak flow from this area.

The flow in the riprap channel is collected by a flared end inlet. This structure is proposed to connect to the existing dual 24-inch system. The exact location of this manhole and hydraulic condition is unknown. An elevation of the HGL was assumed to be one foot below ground surface at 69.00. The discharge at this location is summarized, as follows:

Storm Frequency	Q_{POST} (cfs)
2-year	4.16
10-year	4.49
25-year	4.66
100-year	4.92

The proposed drainage design by Contract No. 93-H046 includes a manhole with a 12-inch RCP stub at Sta. 243+09 for connection of a portion of the station drainage. The invert of the pipe at the station catch basin is 66.07. A tailwater elevation of one foot below the manhole frame elevation was used for design. This elevation is 69.84 ft. This system connects to the same drainage system tributary to Piper Brook as the drainage discussed above.

The site drainage area that is collected by the site catch basins and yard drain system totals approximately 0.75 acres at the connection to the mainline. The discharge is summarized, as follows:

Storm Frequency	Q_{POST} (cfs)
2-year	1.74
10-year	2.47
25-year	2.73
100-year	3.38

3.0.3. Environmental Issues and Stormwater Treatment

No Department flagged wetland areas are located within the station site boundaries. However, a flagged wetland area (No. 16) identified on Exhibit 3.4-C, is located within the alignment of the mainline busway near the Newington Junction Station. This area will be impacted by the West Hartford Section Contract (No. 93-H046).

The station design has incorporated primary stormwater treatment within the station limits. A water quality swale is proposed at the southern end of the site. This swale is designed to temporarily store the water quality volume of 1,800 cubic feet and promote infiltration. The design includes a forebay that will store 25% of this water quality volume.

The station drainage system that ties to the mainline pipe network will be not be directed to the water quality swale. This drainage will be combined with the mainline drainage system and discharged without treatment to the existing drainage system.

3.0.4. Soil Erosion and Sedimentation Control

The soil erosion and sedimentation control design complies with the Department of Environmental Protection 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. The design contains provisions for silt fences along with inlet protection.

4. Appendix A: Design Checklist

Project No.	88-H039
Roadway	Newington Junction
Town	Newington
Date	1/22/2010
Designed By	SEA CONSULTANTS
Signature of Engineer	[illegible]

Drainage Design Checklist (Plans 50% Complete)

Allow a 6-8 week review time

See ***Note*** below.

Semi-Final Design Checklist (Plans 60% to 70% Complete)

Allow a 5-6 week review time

Note: A separate, earlier drainage submission (at approximately 50% completion) may be required if the drainage design is particularly complicated, requires significant right of way and/or otherwise might jeopardize the schedule of the project. **This checklist MUST accompany both of these submissions.**

Indicate which submission this checklist is for and include the following information:

☐ *Drainage Design Submission* ☒ *Semi-Final Design Submission*

a. Draft Drainage Report

1. Disposition of Preliminary Design/Drainage Design Submission comments with written responses justifying comments not incorporated.
   ☒ Included ☐ Not Included ☐ Not Applicable
2. A condition survey of the existing drainage pipes and structures that are to remain in use should be investigated for structural adequacy and documented. (See Section 3.6.3.)
   ☐ Included ☒ Not Included ☐ Not Applicable
3. The condition of existing ditches that are to remain in use should be field inspected, analyzed and results documented to verify their stability and the need for cleaning and reshaping.
   ☐ Included ☐ Not Included ☒ Not Applicable
4. The condition of the outlet at the existing discharge points should be investigated and documented to ensure no erosion or sediment problems exist. If outlet protection is required, it should be incorporated into the project and computations submitted.
   ☐ Included ☒ Not Included ☐ Not Applicable

5. A condition survey report including items 2, 3, and 4 above. (See Appendix A and B, Chapter 4)
   ☐ Included ☐ Not Included ☒ Not Applicable
6. Drainage design computations should include gutter flow analysis, storm sewer design, and hydraulic gradeline (HGL). The hydraulic gradeline should be analyzed to ensure 0.3m (1 ft) freeboard is maintained at drainage structures. This analysis should consider all friction, entrance, junction, exit and bend losses. Designer to verify that the proposed drainage will not adversely impact the existing downstream storm system or property owners. (See Chapter 11, Storm Drainage Systems.)
   ☐ Included ☒ Not Included ☐ Not Applicable
7. Drainage computations should identify structures by station and offset rather than by a numerical identifier. If station and offset is not feasible for the computations then include an index with the location of the structure corresponding to its numerical identifier. The watershed map should be prepared accordingly.
   ☒ Included ☐ Not Included ☐ Not Applicable
8. Existing drainage systems shall be analyzed for hydraulic adequacy to meet the proposed conditions and, if found inadequate, an upgrade will be designed in conformance with the criteria established in the Drainage Manual.
   ☐ Included ☐ Not Included ☒ Not Applicable
9. All roadway drainage systems should be brought to a suitable outlet.
   ☒ Included ☐ Not Included ☐ Not Applicable
10. If upgrading of pipes downstream of the project is necessary, then additional rights may need to be acquired.
    ☐ Included ☐ Not Included ☒ Not Applicable
11. The need for temporary drainage should be addressed. Temporary drainage computations should be prepared in accordance with criteria in the Drainage Manual. (See Section 3.6.11.)
    ☐ Included ☐ Not Included ☒ Not Applicable
12. Proposed swales, ditches and channels should be designed in accordance with HEC-15 for discharges 1.42 m^3/s (50 ft^3/s) and less or HEC-11 for discharges in excess of 1.42 m^3/s (50 ft^3/s). (See Chapter 7, Channels.)
    ☒ Included ☐ Not Included ☐ Not Applicable
13. Minor and small cross culvert design computations with culvert data sheet. (See Chapter 8, Culverts.)
    ☐ Included ☐ Not Included ☒ Not Applicable
14. Topographic mapping with watershed area delineated for each inlet and/or cross culverts as required to perform the drainage calculations. The flow path used in the time of concentration calculation and coefficient of imperviousness should be shown for each area. (See Chapter 6, Hydrology.)
    ☒ Included ☐ Not Included ☐ Not Applicable
15. Diversion identified.
    ☐ Included ☐ Not Included ☒ Not Applicable
16. All plans, computations and reports identify the responsible engineers who prepared and checked the work.
    ☒ Included ☐ Not Included ☐ Not Applicable

b. Plans, Profiles and Cross Sections

1. The existing and proposed storm drainage shown to their outlets.
   ☒ Included ☐ Not Included ☐ Not Applicable
2. Size and type of existing drainage pipes/structures and disposition of pipes/structures to be abandoned.
   ☐ Included ☐ Not Included ☒ Not Applicable
3. Properties affected by diversions should be shown on the plans so that proper rights can be acquired.
   ☐ Included ☐ Not Included ☒ Not Applicable
4. Drainage Rights and Easements.
   ☐ Included ☐ Not Included ☒ Not Applicable
5. Outlet Protection shown on plans and details provided.
   ☒ Included ☐ Not Included ☐ Not Applicable
6. Intersection grading plans to ensure inlets are located at the low points to alleviate ponding/icing conditions. Top of frame elevation should be shown.
   ☒ Included ☐ Not Included ☐ Not Applicable
7. In areas where cross culverts are being extended, replaced, or where outlet protection is proposed a profile or cross section of the natural ground should be provided to show how the inverts will tie into the existing topography.
   ☐ Included ☐ Not Included ☒ Not Applicable
8. The top of frame and invert elevations for each storm drainage structure shown. Proposed drainage structures shall be identified by station and offset on cross sections.
   ☒ Included ☐ Not Included ☐ Not Applicable
9. Existing and proposed drainage patterns (flow arrows) of pipes, ditches, channel and swales.
   ☒ Included ☐ Not Included ☐ Not Applicable
10. Details for any special drainage structures not found in the Standard Drawings.
    ☒ Included ☐ Not Included ☐ Not Applicable
11. The direction of flow should be shown by arrows to 61m (200 ft.) beyond any drainage outlet, or shown to terminate by dissipation or entrance into a watercourse or body of water.
    ☒ Included ☐ Not Included ☐ Not Applicable

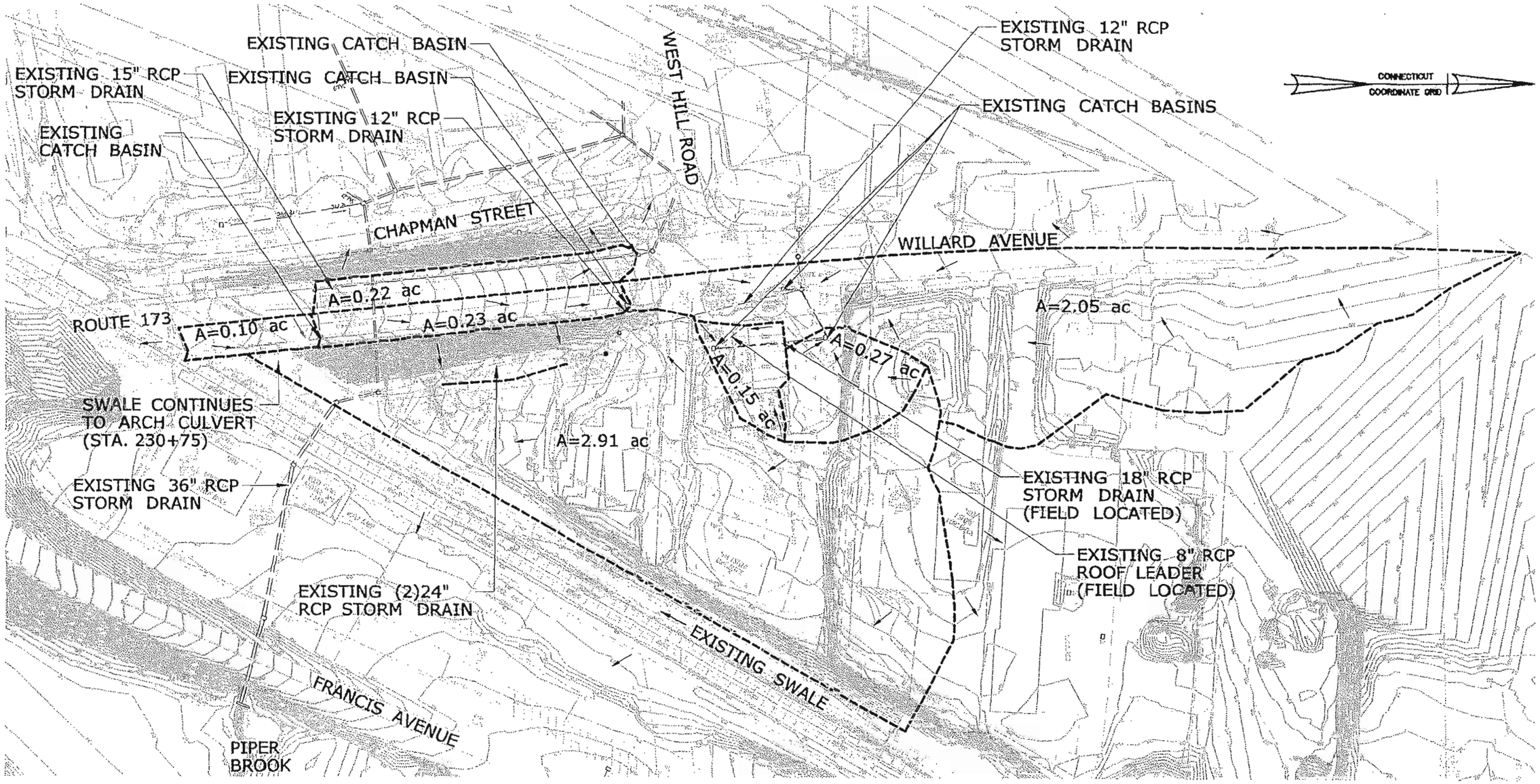
c. Structures with drainage areas > 2.59 km^2 (1 mi^2)

1. Draft hydraulic design report.
   ☐ Included ☐ Not Included ☒ Not Applicable
2. Draft scour report when the proposed structure spans the waterway.
   ☐ Included ☐ Not Included ☒ Not Applicable
3. Draft floodway report.
   ☐ Included ☐ Not Included ☒ Not Applicable
4. Draft SCEL report.
   ☐ Included ☐ Not Included ☒ Not Applicable
5. Draft scour report if required.
   ☐ Included ☐ Not Included ☒ Not Applicable

Provide justification for items **Not Included**. Justification should correspond to letter and number.

a.2/a.4/a.6: MANHOLE ON EXISTING SYSTEM FOR PROPOSED CONNECTION NOT FOUND BY SURVEY. TEST PIT TO BE COMPLETED (COORDINATION BY AMANN & WHITNEY). OUTLET OF SYSTEM ANALYZED AND INSPECTED AS PART OF CONTRACT H0416.

5. Appendix B: Watershed Mapping and Exhibits

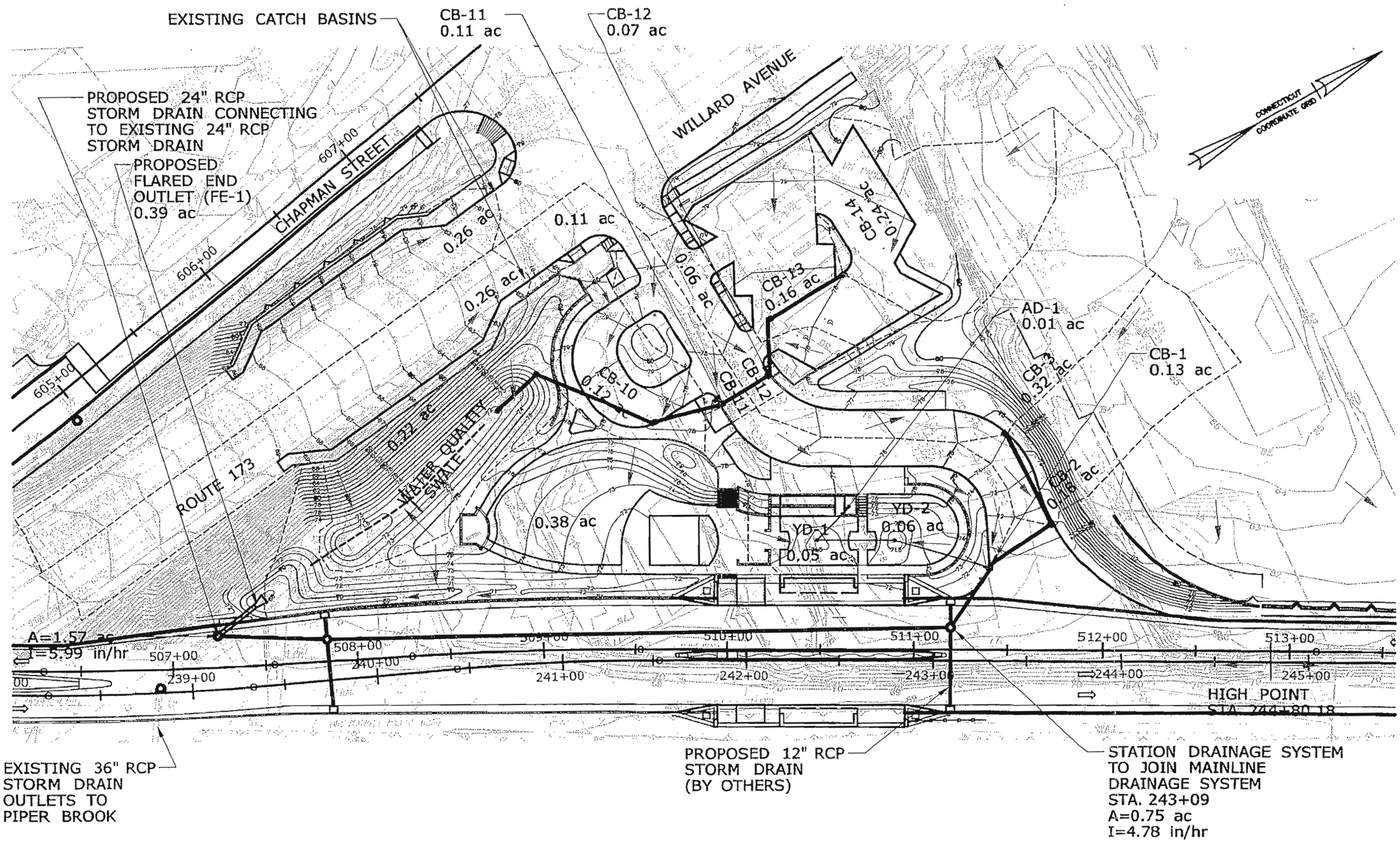


EXISTING CONDITIONS

SCALE 1" = 100'

200 100 0 200

STATE PROJECT NO.: 88-H039 COUNTY: HARTFORD CITY/TOWN: NEWINGTON	APPLICATION BY: STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING SCALE: 1=100	DATE: JANUARY 2010 SITE: NEWINGTON JUNCTION STATION EXHIBIT: 3.4-A

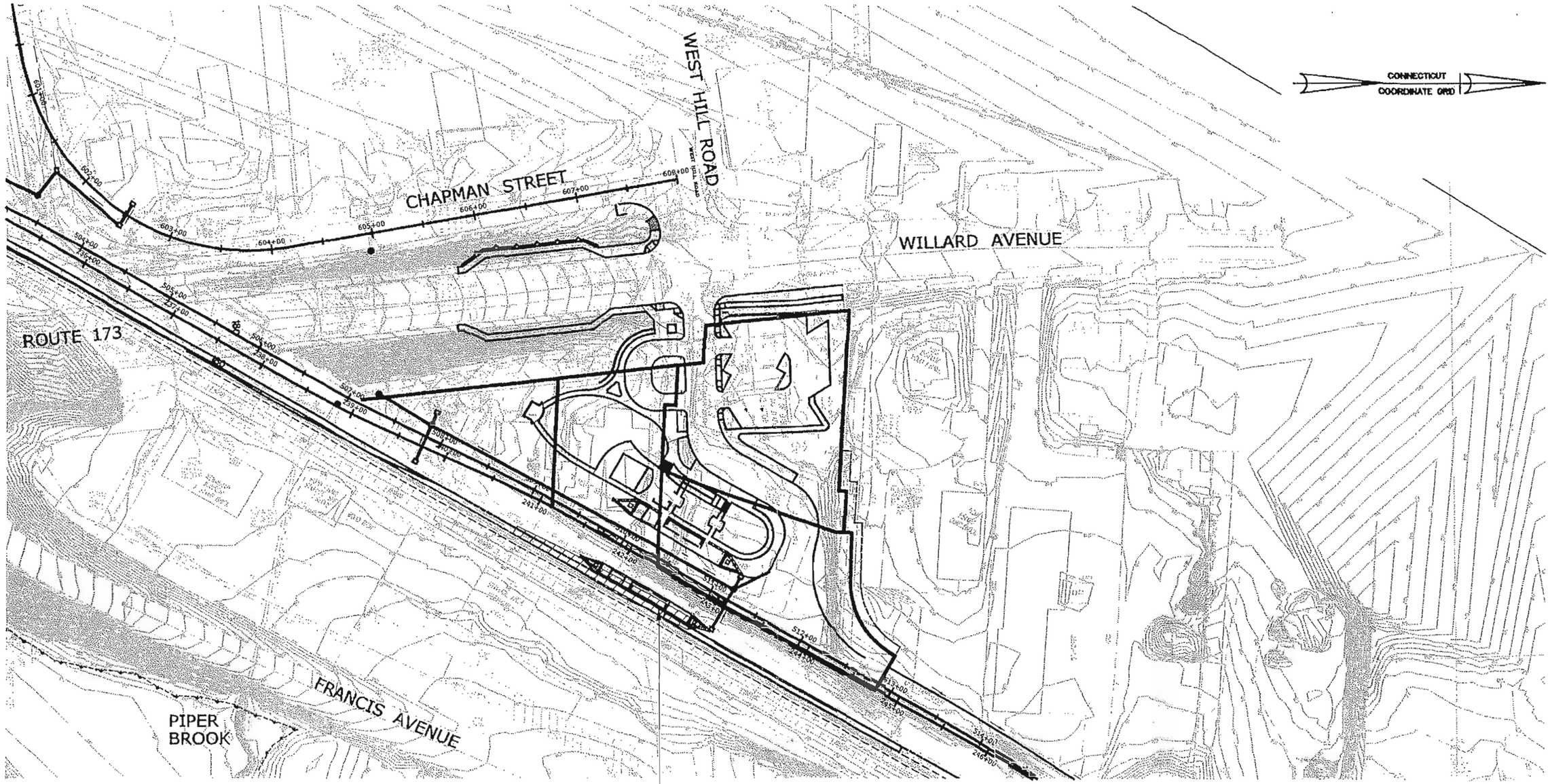


PROPOSED CONDITIONS

SCALE 1" = 50'

100 50 0 100

STATE PROJECT NO.: 88-H039	APPLICATION BY: STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: JANUARY 2010
COUNTY: HARTFORD			SITE: NEWINGTON JUNCTION STATION
CITY/TOWN: NEWINGTON		SCALE: 1=50	EXHIBIT: 3.4-B



IMPACTED WETLAND
(BY OTHERS)
AREA 2511 SQFT
PROJECT WETLAND #16

PROPOSED IMPACT

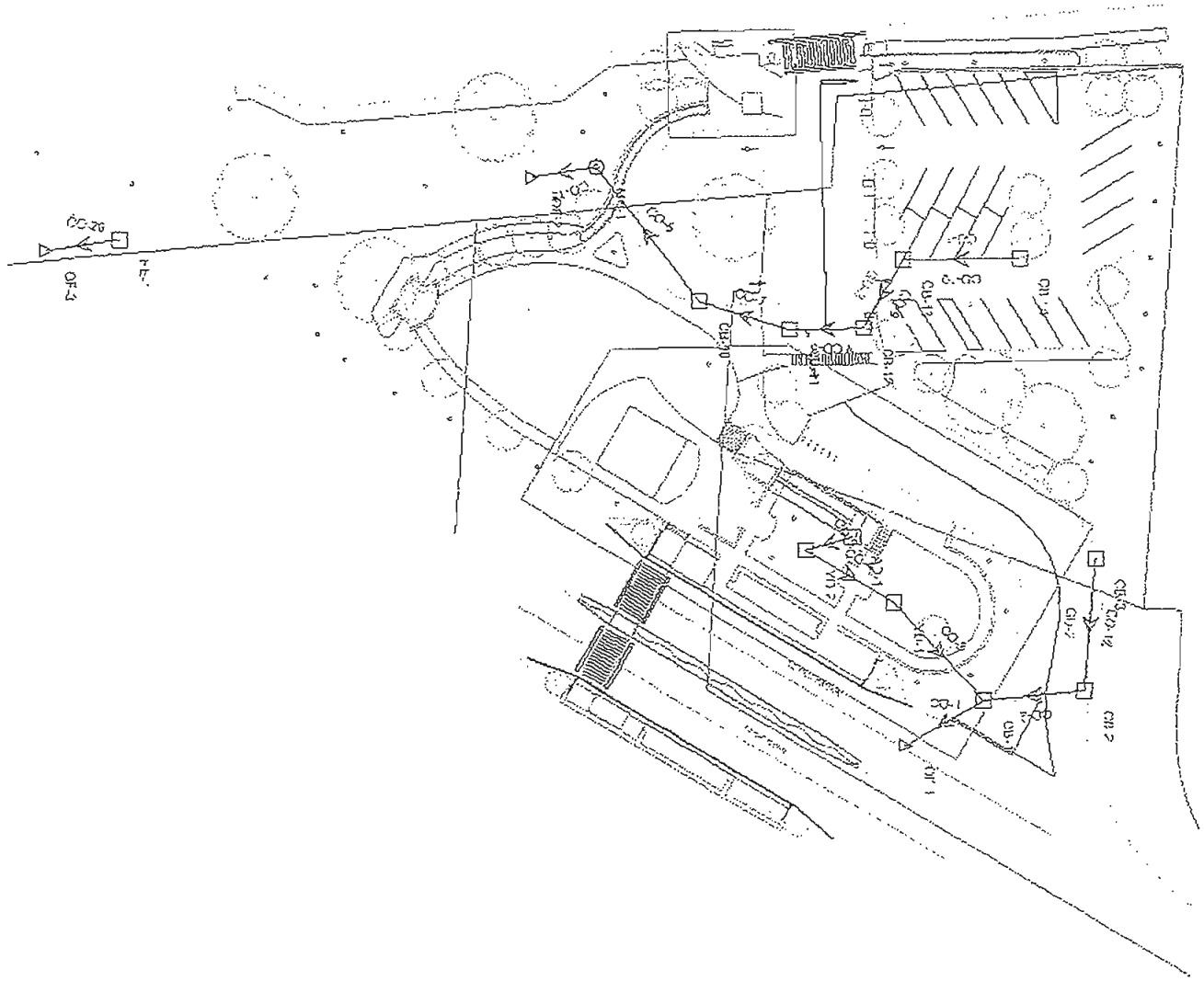
SCALE 1" = 100'

200 100 0 200

STATE PROJECT NO.: 88-H039 COUNTY: HARTFORD CITY/TOWN: NEWINGTON	APPLICATION BY: STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING SCALE: 1=100	DATE: JANUARY 2010 SITE: NEWINGTON JUNCTION STATION EXHIBIT: 3.4-C

6. Appendix C: Hydrologic and Hydraulic Calculations

Newington Junction



BRT Station Preliminary Drainage Design
DOT Report

Label	Node Upstream Downstream	Upstream Inlet C	Upstream CA (acres)	Ground Upstream Downstream	HGL Upstream Downstream	System Rational Flow (ft³/s)	Length (ft)	Velocity (Average) (ft/s)	System Intensity (in/hr)
CO-1	CB-1	0.777	0.51	70.8	70.02	2.48	37	3.16	4.801
	OF-1			70.47	69.84				
CO-2	CB-2	0.833	0.37	71.5	70.32	2.22	41	2.82	5.975
	CB-1			70.8	70.16				
CO-3	YD-1	0.517	0.06	71.65	70.18	0.32	53	0.93	5.086
	CB-1			70.8	70.16				
CO-4	YD-2	0.576	0.03	71.65	70.2	0.18	41	0.5	5.363
	YD-1			71.65	70.19				
CO-5	AD-1	0.776	0.01	75.08	70.2	0.04	20	0.12	6
	YD-2			71.65	70.2				
CO-6	CB-10	0.872	0.53	77.6	73.62	3.1	68	3.95	5.838
	MH-1			77	73.11				
CO-7	CB-11	0.849	0.43	77.3	73.96	2.52	38	3.21	5.878
	CB-10			77.6	73.77				
CO-8	CB-12	0.877	0.33	77.3	74.15	1.96	30	2.5	5.918
	CB-11			77.3	74.05				
CO-9	CB-13	0.856	0.17	77.6	74.22	1.03	32	3.83	5.946
	CB-12			77.3	74.2				
CO-10	CB-14	0.555	0.10	78	74.24	0.6	47	2.88	6
	CB-13			77.6	74.24				
CO-20	FE-1	0.394	0.24	70	68.87	1.43	30	9.32	6
	OF-3			70	69				
CO-12	CB-3	0.743	0.21	74	70.3	1.24	53	7.12	6
	CB-2			71.5	70.33				
CO-13	MH-1	(N/A)	0.53	77	72.96	3.06	26	3.9	5.771
	OF-2			72	72.67				

BRT Station Preliminary Drainage Design
Catchment Area Summary

Label	Scaled Area (acres)	Rational C	Catchment CA (acres)	Time of Concentration (min)	Outflow Node	Catchment Rational Flow (ft^3/s)
CM-2	0.04	0.9	0.04	5	CB-1	0.24
CM-3	0.009	0.3	0.003	5	CB-1	0.02
CM-4	0.02	0.3	0.01	5	CB-1	0.03
CM-5	0.06	0.9	0.055	5	CB-1	0.33
CM-6	0.007	0.9	0.007	5	AD-1	0.04
CM-7	0.002	0.3	0.001	5	AD-1	0
CM-8	0.04	0.3	0.01	5	YD-1	0.07
CM-9	0.02	0.9	0.02	5	YD-1	0.12
CM-11	0.02	0.3	0.01	5	YD-2	0.04
CM-12	0.02	0.9	0.018	5	YD-2	0.11
CM-18	0.134	0.3	0.04	5	CB-14	0.24
CM-19	0.08	0.9	0.07	5	CB-14	0.41
CM-20	0.004	0.3	0.001	5	CB-14	0.01
CM-21	0.003	0.3	0.001	5	CB-13	0.01
CM-22	0.00	0.3	0.00	5	CB-13	0
CM-23	0.146	0.9	0.132	5	CB-13	0.8
CM-24	0.002	0.3	0.001	5	CB-13	0
CM-25	0.005	0.3	0.001	5	CB-13	0.01
CM-26	0.00	0.3	0.00	5	CB-12	0
CM-27	0.051	0.9	0.046	5	CB-12	0.28
CM-28	0.01	0.3	0.003	5	CB-11	0.02
CM-29	0.10	0.9	0.09	5	CB-11	0.57
CM-30	0.01	0.3	0.00	5	CB-10	0.01
CM-31	0.11	0.9	0.10	5	CB-10	0.6
CM-32	0.22	0.3	0.065	5	FE-1	0.39
CM-33	0.14	0.3	0.04	5	FE-1	0.25
CM-34	0.13	0.3	0.04	5	FE-1	0.24
CM-35	0.094	0.9	0.085	5	FE-1	0.51
CM-38	0.016	0.9	0.015	5	CB-14	0.09
CM-39	0.01	0.9	0.009	5	CB-14	0.05
CM-42	0.083	0.3	0.025	5	CB-3	0.15
CM-43	0.07	0.9	0.063	5	CB-3	0.38
CM-44	0.164	0.9	0.147	5	CB-3	0.89
CM-45	0.021	0.9	0.019	5	CB-2	0.11
CM-47	0.02	0.3	0.006	5	CB-2	0.04
CM-48	0.141	0.9	0.127	5	CB-2	0.77
CM-49	0.015	0.9	0.014	5	CB-12	0.08
CM-50	0.019	0.3	0.006	5	FE-1	0.04

BRT Station Preliminary Drainage Design
Conduit Summary

Label	Start Node	Stop Node	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Section Size (in)	Flow (ft^3/s)	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Capacity (Full Flow)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Velocity (Average) (ft/s)
CO-1	CB-1	OF-1	66.07	65.83	12 inch	2.48	37	0.006	2.87	70.8	70.47	3.73	3.64	3.16
CO-2	CB-2	CB-1	67.33	66.17	12 inch	2.22	41	0.028	5.99	71.5	70.8	3.17	3.63	2.82
CO-3	YD-1	CB-1	67.59	66.49	8 inch	0.32	53	0.021	2.26	71.65	70.8	3.39	3.64	0.93
CO-4	YD-2	YD-1	67.9	67.69	8 inch	0.18	41	0.005	1.12	71.65	71.65	3.08	3.29	0.5
CO-5	AD-1	YD-2	68.1	68	8 inch	0.04	20	0.005	1.11	75.08	71.65	6.31	2.98	0.12
CO-6	CB-10	MH-1	72.49	72.15	12 inch	3.1	68	0.005	2.52	77.6	77	4.11	3.85	3.95
CO-7	CB-11	CB-10	72.78	72.59	12 inch	2.52	38	0.005	2.52	77.3	77.6	3.52	4.01	3.21
CO-8	CB-12	CB-11	73.03	72.88	12 inch	1.96	30	0.005	2.52	77.3	77.3	3.27	3.42	2.5
CO-9	CB-13	CB-12	73.43	73.13	12 inch	1.03	32	0.009	3.45	77.6	77.3	3.17	3.17	3.83
CO-10	CB-14	CB-13	73.83	73.53	12 inch	0.6	47	0.006	2.85	78	77.6	3.17	3.07	2.88
CO-20	FE-1	OF-3	68	66.75	24 inch	4.49	30	0.042	46.18	70	70	0	1.25	9.32
CO-12	CB-3	CB-2	69.83	67.43	12 inch	1.24	53	0.045	7.58	74	71.5	3.17	3.07	7.12
CO-13	MH-1	OF-2	72.05	71.92	12 inch	3.06	26	0.005	2.52	77	72	3.95	-0.92	3.9

BRT Station Preliminary Drainage Design
Catch Basin Summary

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Inlet C	Inlet	Depth (In) (ft)	Depth (Out) (ft)	Flow (Total Intercepted) (ft^3/s)	Bypassed Rational Flow (ft^3/s)	Hydraulic Grade In (ft)	Hydraulic Grade Out (ft)	Gutter Depth (in)	Gutter Spread (ft)
CB-1	70.8	64.07	0.777	Combination Type C Single Grate - Grate Type A - Other Curb	6.09	5.95	0.5	0.13	70.16	70.02	1.2	4.9
CB-2	71.5	65.33	0.833	Combination Type C Double Grate - Type I - Grate Type A - Plain Curb	5	4.99	0.98	0.12	70.33	70.32	1.5	6.1
YD-1	71.65	65.59	0.517	Yard Drain	4.6	4.59	0.19	0	70.19	70.18	1.4	120.4
YD-2	71.65	65.09	0.576	Yard Drain	5.11	5.11	0.15	0	70.2	70.2	1.3	105.6
AD-1	75.08	66.1	0.776	Area Drain	4.1	4.1	0.04	0	70.2	70.2	0.7	3.1
CB-10	77.6	70.49	0.872	Grate Type C-L Single Grate - Grate Type A	3.28	3.13	0.61	0	73.77	73.62	1.5	6.3
CB-11	77.3	70.78	0.849	Combination Type C Single Grate - Grate Type A - Other Curb	3.27	3.18	0.59	0	74.05	73.96	-1.4	2.5
CB-12	77.3	71.03	0.877	Combination Type C Single Grate - Grate Type A - Other Curb	3.17	3.12	0.95	0	74.2	74.15	-1	3.8
CB-13	77.6	71.43	0.856	Grate Type C-L Single Grate - Grate Type A	2.81	2.79	0.43	0.59	74.24	74.22	1.1	9.1
CB-14	78	71.83	0.555	Combination Type C Single Grate - Grate Type A - Other Curb	2.41	2.41	0.6	0.2	74.24	74.24	1.3	5.4
FE-1	70	68	0.394	Combination Type C Double Grate - Type I - Grate Type A - Plain Curb	0.87	0.87	4.49	0	68.87	68.87	0	0
CB-3	74	66.83	0.743	Combination Type C Double Grate - Type I - Grate Type A - Plain Curb	3.47	3.47	1.24	0.18	70.3	70.3	1.6	6.7

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Scientist/Engineers/Architects
200 Corporate Place
Rocky Hill, Connecticut 06067

PROJECT:	New Britain - Hartford Bus Rapid Transit Stations : Newington Junction		
PROJECT NO.	08-H030	SHEET NO.	1 OF 3
CALCULATED BY	KSR	DATE	9/23/2009
CHECKED BY		DATE	

Water Quality Swale Sizing

See attached plan and cross section

Total Drainage Area (Acres)

Proposed = 0.91
Impervious Area = 0.50 | Percent Impervious = 54.9 %

Water Quality Volume (WQV)

P = 1 inch of rainfall
a Percent proposed impervious cover, (I)
I = 54.9 %
b Volumetric runoff coefficient, R
R = 0.05+0.009 (I)
R = 0.54
c A = 0.91 acres
d WQV = (1")R(A)/12
WQV = 0.04 ac-ft
1,799 cf

References
CT DEP Stormwater Quality Manual 2004 edition
Chapter 7, Chapter 11

I = percent impervious cover

R = volumetric runoff coefficient = 0.05+0.009(I)

A = total site area in acres
WQV= water quality volume (ac-ft)

1 acre - ft = 43,560 cf

Volume Required for Forebay

Volume of Forebay = 25 % * WQV
= 450 cf

Volume Provided in Water Quality Swale

Volume of WQS = 2,042 cf * Volume calculated using HydroCad. See attached for calculations.

The swale has a capacity of 2042 cf. The required capacity is 1,799 cf. The design has adequate capacity for the water quality volume.

Volume Provided in Forebay

Volume of Forbay = 540 cf * Volume calculated using HydroCad. See attached for calculations.

The forebay has a capacity of 540 cf. The required capacity is 450 cf. The design has adequate capacity for 25% of the water quality volume.

Depth of Flow Over Check Dam

Given:
Q = 3.06 cfs
V = 2 ft/s (assumed velocity)
w= 15 ft (width of check dam)
Equation:
Q = AV

Depth of Flow = 0.10 ft
1.22 inches

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PROJECT:	New Britain - Hartford Bus Rapid Transit Stations : Newington Junction			
PROJECT NO.	08-H030	SHEET NO.	2 OF	9
CALCULATED BY	KSR	DATE	8/21/2009	
CHECKED BY	AGB	DATE	8/28/2009	

Grass Swale Sizing

See attached plan and cross section

Required Depth of Swale

Given:

Q =	1.8 cfs	*Designed for the 10 yr Storm
Side Slope A =	3 :1	
Side Slope B =	4 :1	
b =	2 ft	(bottom width of channel)
Slope =	1.00 %	
Roughness Coefficient =	0.022	for short grass

Depth =	0.24 ft	
=	3 inches	*Required depth calculated using FlowMaster. See attached for calculations.
Required Freeboard =	12 inches	
Total Depth Required =	15 inches	

Depth Provided in Swale

Depth = 12.00 inches

The designed swale provides the depth for the flow of 1.5 cfs. The swale only provides 9 inches of freeboard.

Velocity in Swale

Velocity 10 YR Storm =	2.18 ft/s	*Velocities calculated using FlowMaster. See attached for calculations.
Velocity 25 YR Storm =	2.25 ft/s	

Connecticut Guideline for Soil Erosion and Sedimentation Control, 2002 Figure VW-1 Maximum Permissible Velocities

Figure VW-1 Maximum Permissible Velocity (ft/sec)

Soil Texture	Channel Vegetation Condition			
	Poor	Fair	Good	Stable Cover[1]
Sand, silt loam, sandy loam, loamy sand, loam and muck	2.0	2.5	3.5	6.0
Silty clay loam, sandy clay loam, clay, clay loam, sandy clay, silty clay	3.0	4.0	5.0	8.0

[1] For channels with geosynthetic turf reinforcement, permissible velocities shall be designed on a product-specific basis and for long duration flows (>24 hours).

Source: USDA-NRCS

The swale is of sand, silt loam, sandy loam ,loamy sand, loam and muck with a fair vegetative conditions. The velocity in the swale is 2.18 ft/s for the 10 year storm and 2.25 ft/s for the 25 year storm. Both velocities are less than the maximum permissible velocity. No additional stabilization is required.

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PROJECT NO.	88-H039	SHEET NO.	3 OF 13
CALCULATED BY	KSR	DATE	8/21/2009
CHECKED BY	AGB	DATE	8/28/2009

Riprap Sizing

See attached plan and cross section

Average Velocity in Main Channel

Given:

Q =	4.56 cfs	
L=	48 ft	
b=	10 ft	
Depth =	0.20 ft	*Depth calculated using FlowMaster. See attached for calculations.
Slope =	10.4 %	
Roughness Coefficient =	0.060	for Riprap

Equation:

Q = A*V

Velocity = 2.28 ft/s

ConnDOT Drainage Manual, October 2000

Figure 7-27.1 Angle of Repose of Riprap in Terms of Mean Size and Shape of Stone

Angle of Repose = 42.2 degrees

Figure 7-26 Bank Angle Correction Factor (K_1) Nomograph

K_1 = 0.72

Equation 7.36

$$D_{50} = 0.001\, V_a^3 / (d_{avg.}^{1/2} K_1^{3/2})$$

D_{50} = Median Riprap Size (ft.)
V_a = Average velocity in main channel (ft./sec)
$d_{avg.}$ = Average depth in main channel (ft.)
K_1 = Bank angle correction term

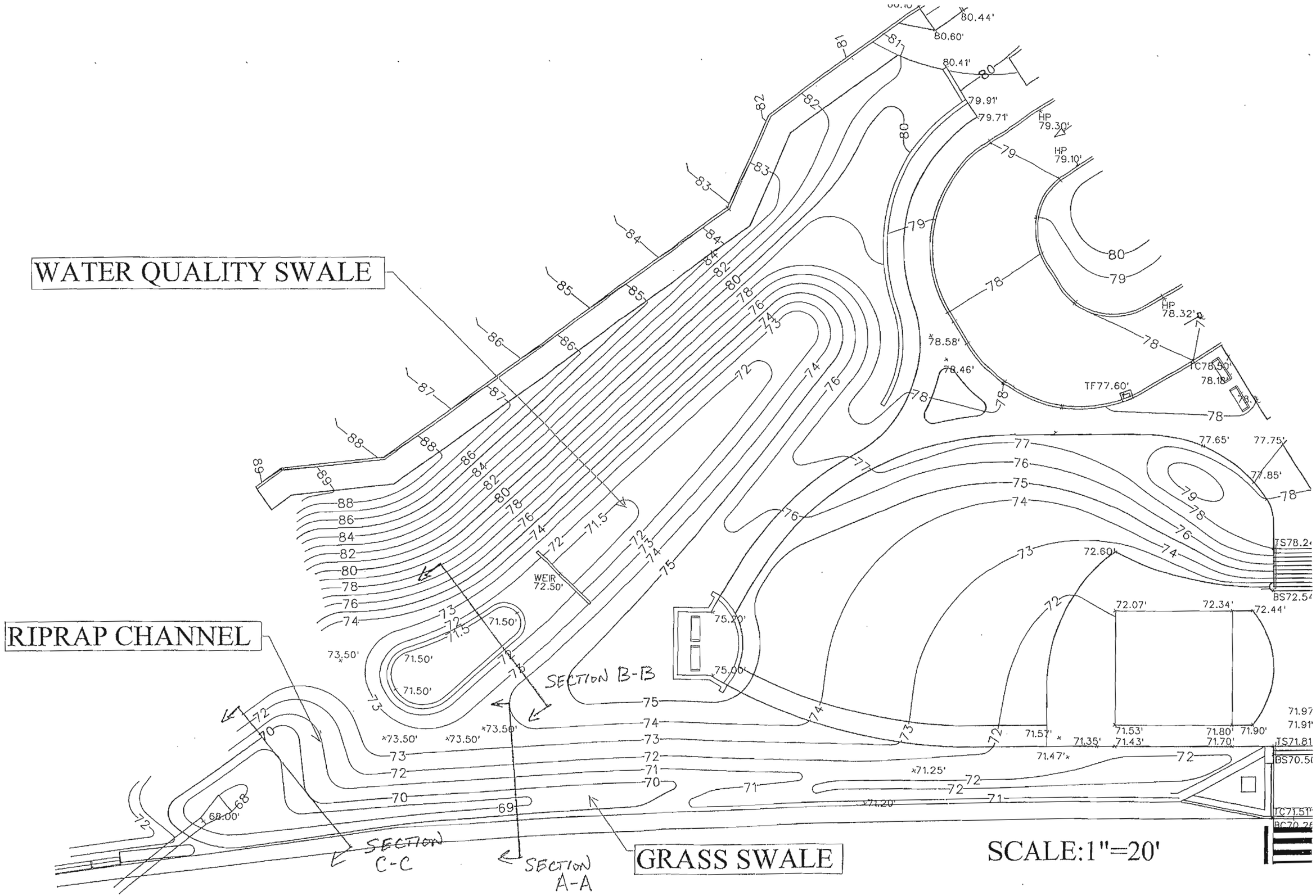
D_{50} = 0.04 ft

Connecticut Guideline for Soil Erosion and Sedimentation Control, 2002

Type of riprap required:

Modified	D50 < 0.42 ft
Intermediate	0.42 ft < D50 < 0.67
Standard	0.67 < D50 < 1.25 ft
Special Design	1.25 ft < D50

With a velocity of 2.28 ft/s, the D_{50} required from the ConnDOT Drainage Manual is 0.04 ft. The Connecticut Guideline for Soil Erosion and Sedimentation Control figure RR-2 indicates that modified riprap is required.


WATER QUALITY SWALE
RIPRAP CHANNEL
GRASS SWALE
SCALE:1"=20'
SECTION B-B
SECTION C-C
SECTION A-A
WEIR 72.50'
80.44'
80.60'
80.41'
79.91'
79.71'
HP 79.30'
HP 79.10'
HP 78.32'
78.58'
78.46'
TF77.60'
TC78.50'
78.18'
77.65'
77.75'
77.85'
72.60'
72.07'
72.34'
72.44'
75.20'
75.00'
71.50'
73.50'
71.57'
71.35'
71.53'
71.43'
71.80'
71.70'
71.90'
71.47'
71.25'
71.20'
68.00'
71.97
71.91'
TS71.81
BS70.5
TS78.2
BS72.5

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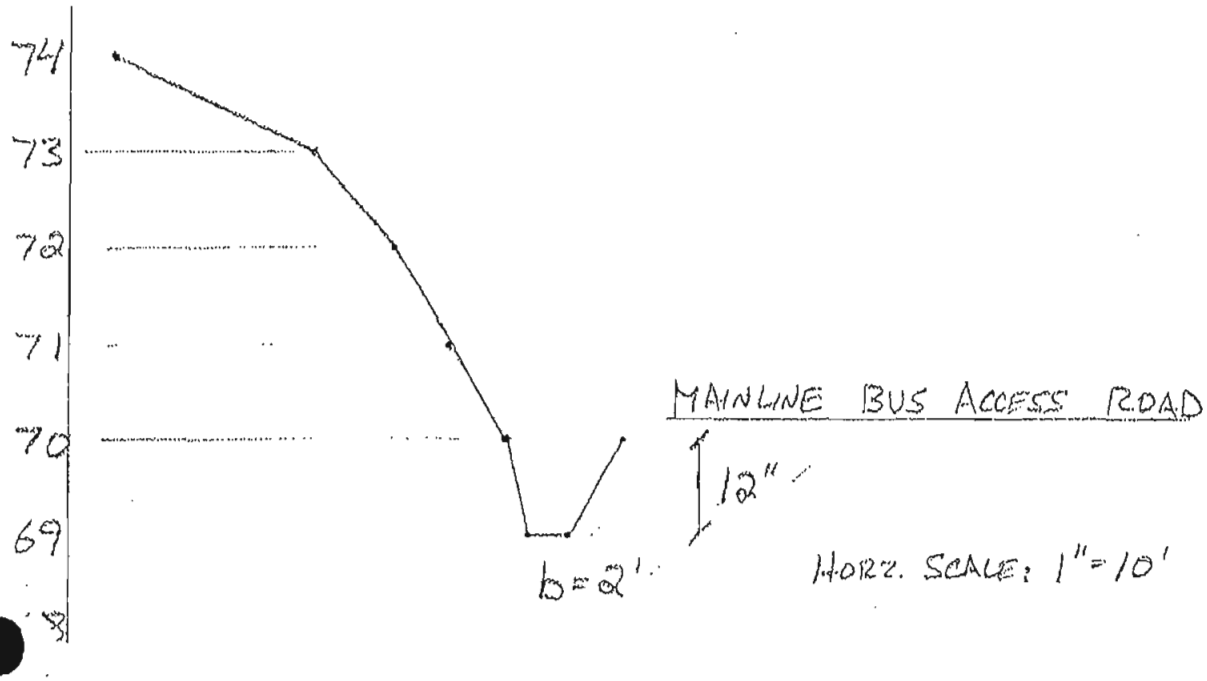
CLIENT: CT DOT	JOB NO: H039	PAGE:
PROJECT: BRT	COMPTD BY: KRV	DATE: 9/23/2009
DETAIL: NEWINGTON JUNCTION	OK'D BY: KL	DATE: [illegible]

X-SECTION A-A GRASS SWALE



S E A

S E A CONSULTANTS INC.
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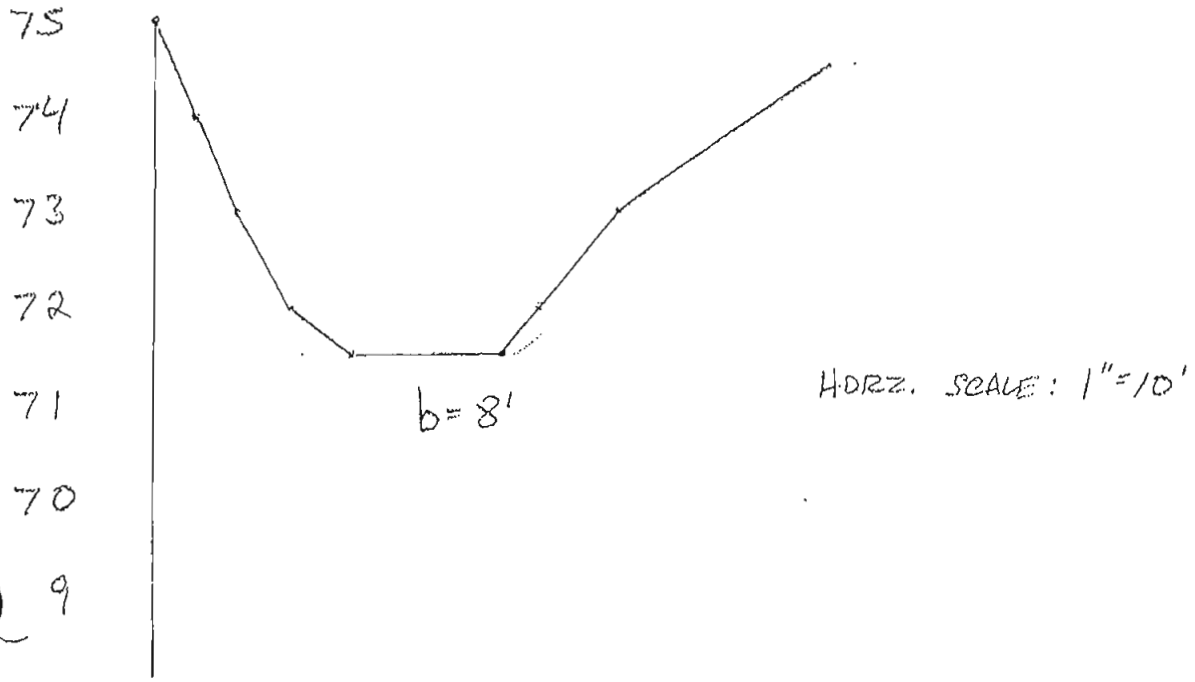
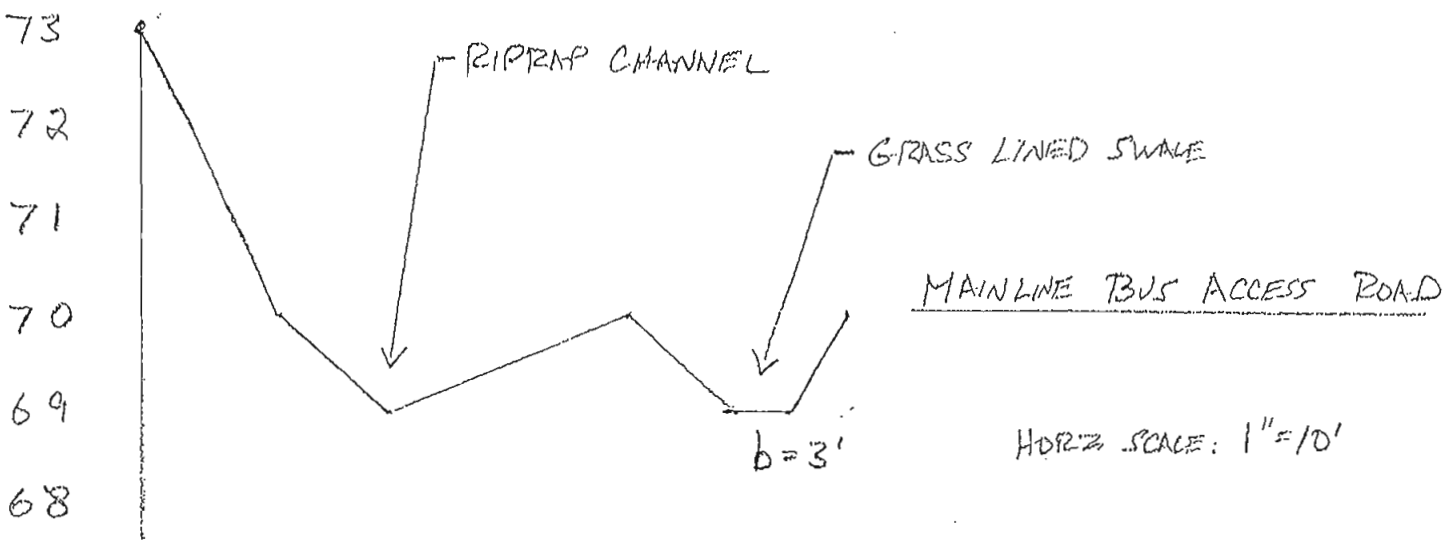
CLIENT: CT DOT	JOB NO: H039	PAGE:
PROJECT: BRT	COMPTD BY: KRV	DATE: 9/23/2009
DETAIL: NEWINGTON JUNCTION	OK'D BY: K. [illegible]	DATE:

X-SECTION B-B WATER QUALITY SWALE



X-SECTION C-C RIPRAP CHANNEL



Summary for Pond 1P: WQ - Total Volume

[43] Hint: Has no inflow (Outflow=Zero)

Routing by Stor-Ind method
Peak Elev= 0.00' @ 0.00 hrs Surf.Area= 0 sf Storage= 0 cf

Plug-Flow detention time= (not calculated)
Center-of-Mass det. time= (not calculated)

Volume	Invert	Avail.Storage	Storage Description
#1	71.50'	2,042 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
71.50	332	0	0
73.00	2,390	2,042	2,042

Summary for Pond 2P: WQ Forebay

[43] Hint: Has no inflow (Outflow=Zero)

Routing by Stor-Ind method
Peak Elev= 0.00' @ 0.00 hrs Surf.Area= 0 sf Storage= 0 cf

Plug-Flow detention time= (not calculated)
Center-of-Mass det. time= (not calculated)

Volume	Invert	Avail.Storage	Storage Description
#1	71.50'	540 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
71.50	154	0	0
72.50	925	540	540

Grass Swale Cales (10 yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.022	
Channel Slope	0.01000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	1.50	ft^3/s

Results

Normal Depth	0.24	ft
Flow Area	0.69	ft^2
Wetted Perimeter	3.76	ft
Hydraulic Radius	0.18	ft
Top Width	3.89	ft
Critical Depth	0.23	ft
Critical Slope	0.01289	ft/ft
Velocity	2.18	ft/s
Velocity Head	0.07	ft
Specific Energy	0.32	ft
Froude Number	0.89	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.24	ft
Critical Depth	0.23	ft
Channel Slope	0.01000	ft/ft

Grass Swale Calcs (10 yr)

GVF Output Data

Critical Slope	0.01289	ft/ft

Grass Swale Calcs (25 yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.022	
Channel Slope	0.01000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	1.68	ft^3/s

Results

Normal Depth	0.26	ft
Flow Area	0.75	ft^2
Wetted Perimeter	3.87	ft
Hydraulic Radius	0.19	ft
Top Width	3.80	ft
Critical Depth	0.24	ft
Critical Slope	0.01266	ft/ft
Velocity	2.25	ft/s
Velocity Head	0.08	ft
Specific Energy	0.34	ft
Froude Number	0.90	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.26	ft
Critical Depth	0.24	ft
Channel Slope	0.01000	ft/ft

Grass Swale Calcs (25 yr)

GVF Output Data

Critical Slope	0.01266	ft/ft

Riprap Channel

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.069	
Channel Slope	0.10400	ft/ft
Bottom Width	10.00	ft
Discharge	4.56	ft³/s

Results

Normal Depth	0.20	ft
Flow Area	1.98	ft²
Wetted Perimeter	10.40	ft
Hydraulic Radius	0.19	ft
Top Width	10.00	ft
Critical Depth	0.19	ft
Critical Slope	0.12752	ft/ft
Velocity	2.30	ft/s
Velocity Head	0.08	ft
Specific Energy	0.28	ft
Froude Number	0.91	
Flow Type	Subcritical	

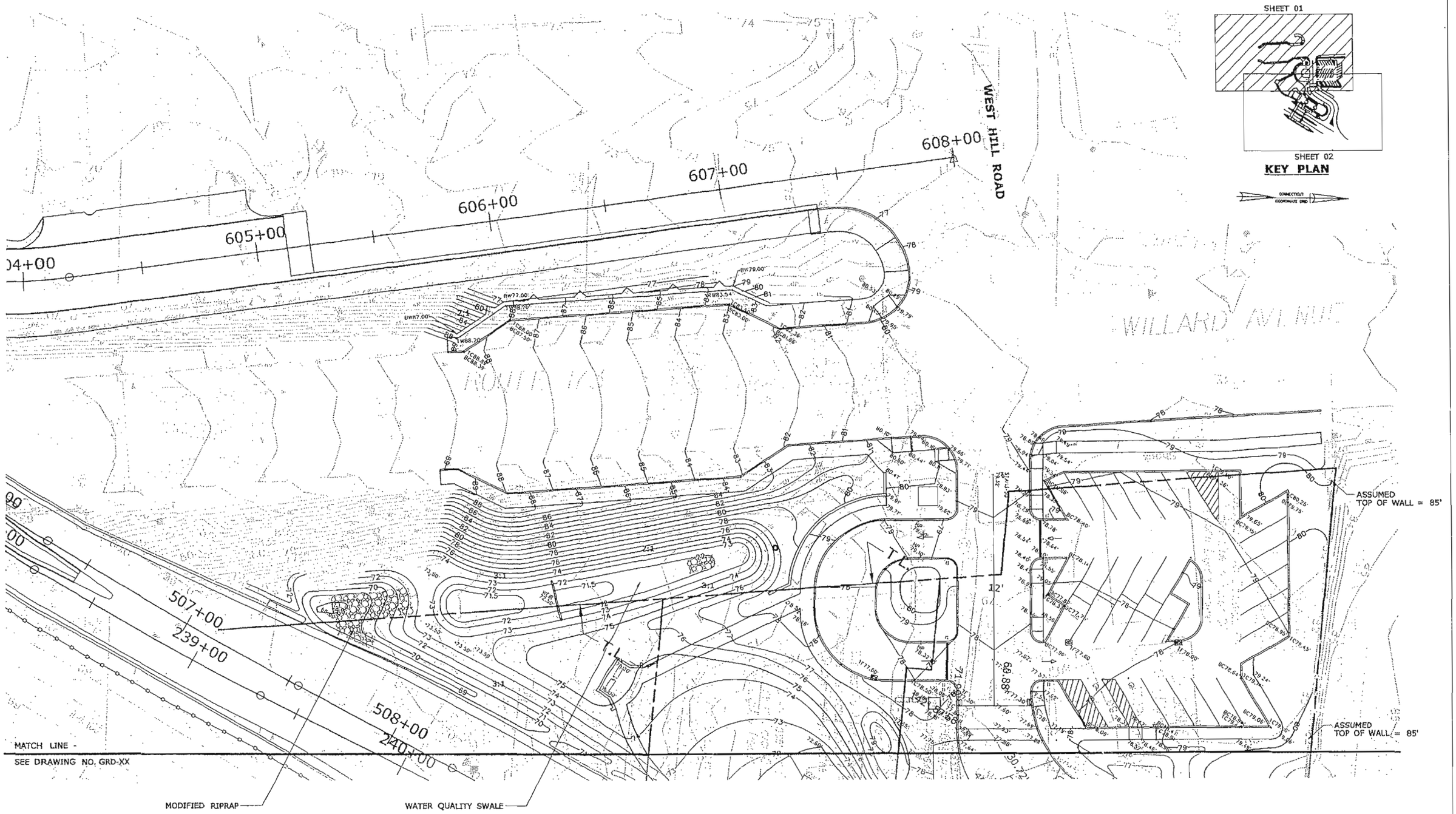
GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.20	ft
Critical Depth	0.19	ft
Channel Slope	0.10400	ft/ft
Critical Slope	0.12752	ft/ft

7. Appendix D: Drainage, Grading, and Soil Erosion and Sedimentation Control Plans



ENVIRONMENTAL PERMIT REVIEW

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
1	NOV. 09	DESIGN COORDINATION REVISIONS	-

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 11/3/2009

DESIGNER/DRAFTER: KRV

CHECKED BY: -

SCALE IN FEET 0 20 40

SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD.HSII.GRD.88H039.A.NEWINGTON JUNCTION.dgn

SIGNATURE/BLOCK: OFFICE OF ENGINEERING

APPROVED BY: DATE:

PROJECT TITLE: NEW BRTAIN - HARTFORD BUS RAPID TRANSIT STATIONS

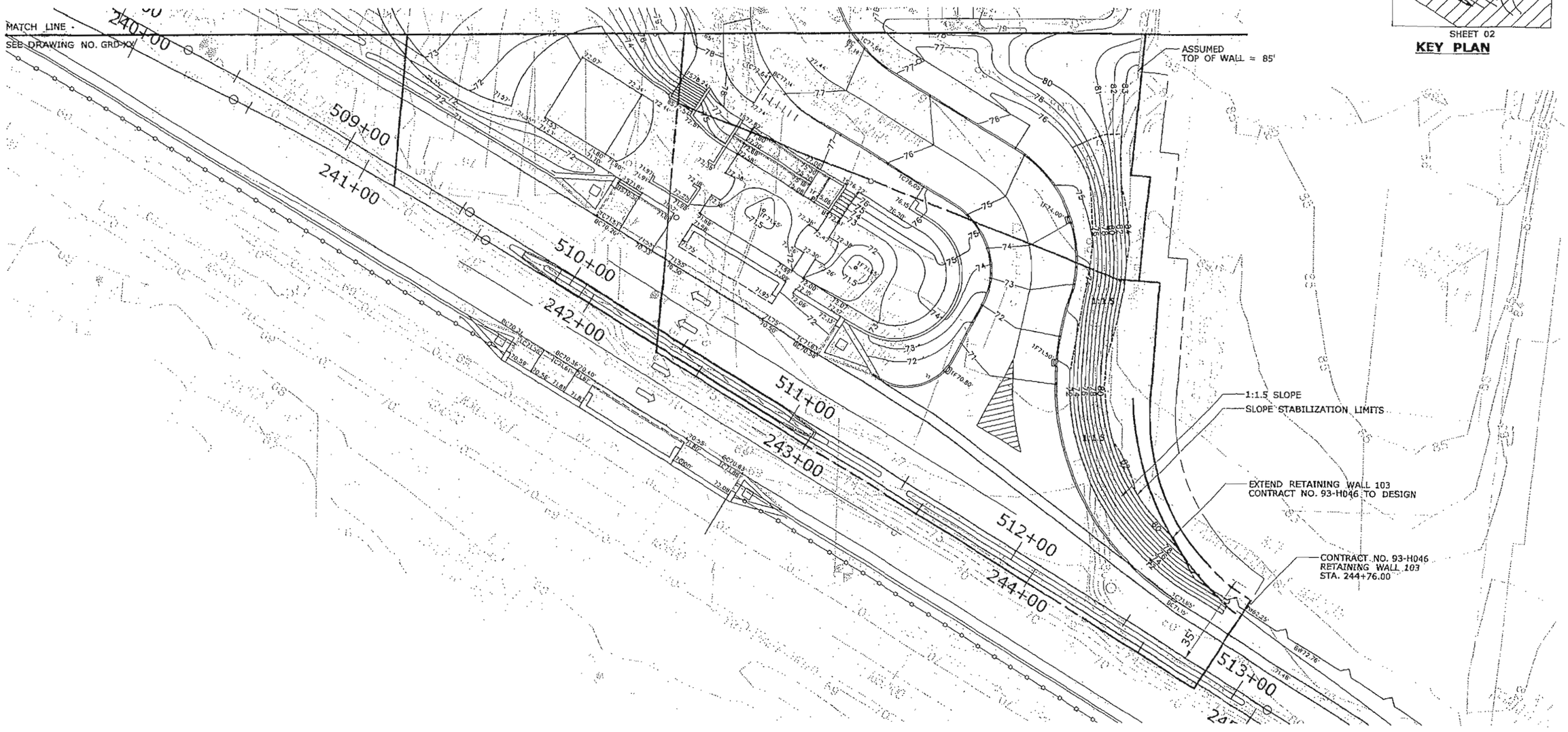
TOWN: NEWINGTON

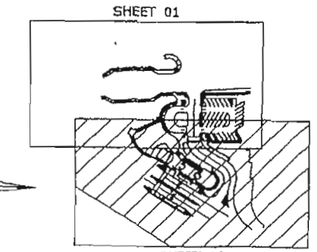
DRAWING TITLE: NEWINGTON JUNCTION GRADING PLAN

PROJECT NO. 88-H039

DRAWING NO. GRD-XX

SHEET NO. S





KEY PLAN

ENVIRONMENTAL PERMIT REVIEW

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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1	NOV. 09	DESIGN COORDINATION REVISIONS	-

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Plotted Date: 11/3/2009

DESIGNER/DRAFTER: KRV

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SCALE IN FEET 0 20 40

SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD.HSH.GRD.88H039..B.NEWINGTON JUNCTION.dgn

SIGNATURE/BLOCK:

OFFICE OF ENGINEERING

APPROVED BY: DATE:

PROJECT TITLE:

NEW BRITAIN - HARTFORD
BUS RAPID TRANSIT STATIONS

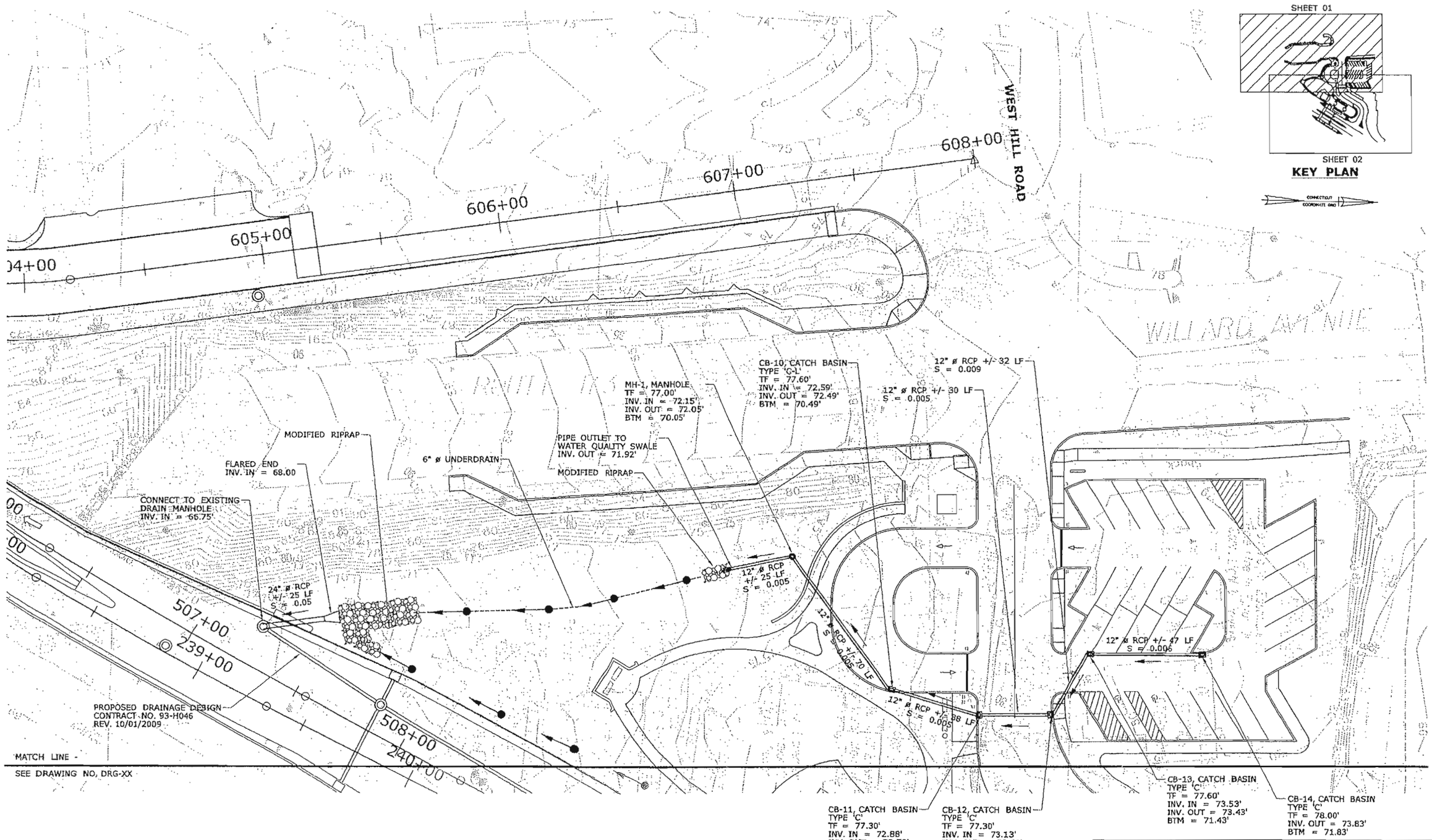
TOWN: NEWINGTON

DRAWING TITLE: NEWINGTON JUNCTION GRADING PLAN

PROJECT NO. 88-H039

DRAWING NO. GRD-XX

SHEET NO. S



ENVIRONMENTAL PERMIT REVIEW

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SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD_MSH_DRG_88H039_A_NEWINGTON JUNCTION.dgn

SIGNATURE/BLOCK:
OFFICE OF ENGINEERING
APPROVED BY: DATE:

PROJECT TITLE:
NEW BRTAIN - HARTFORD
BUS RAPID TRANSIT STATIONS

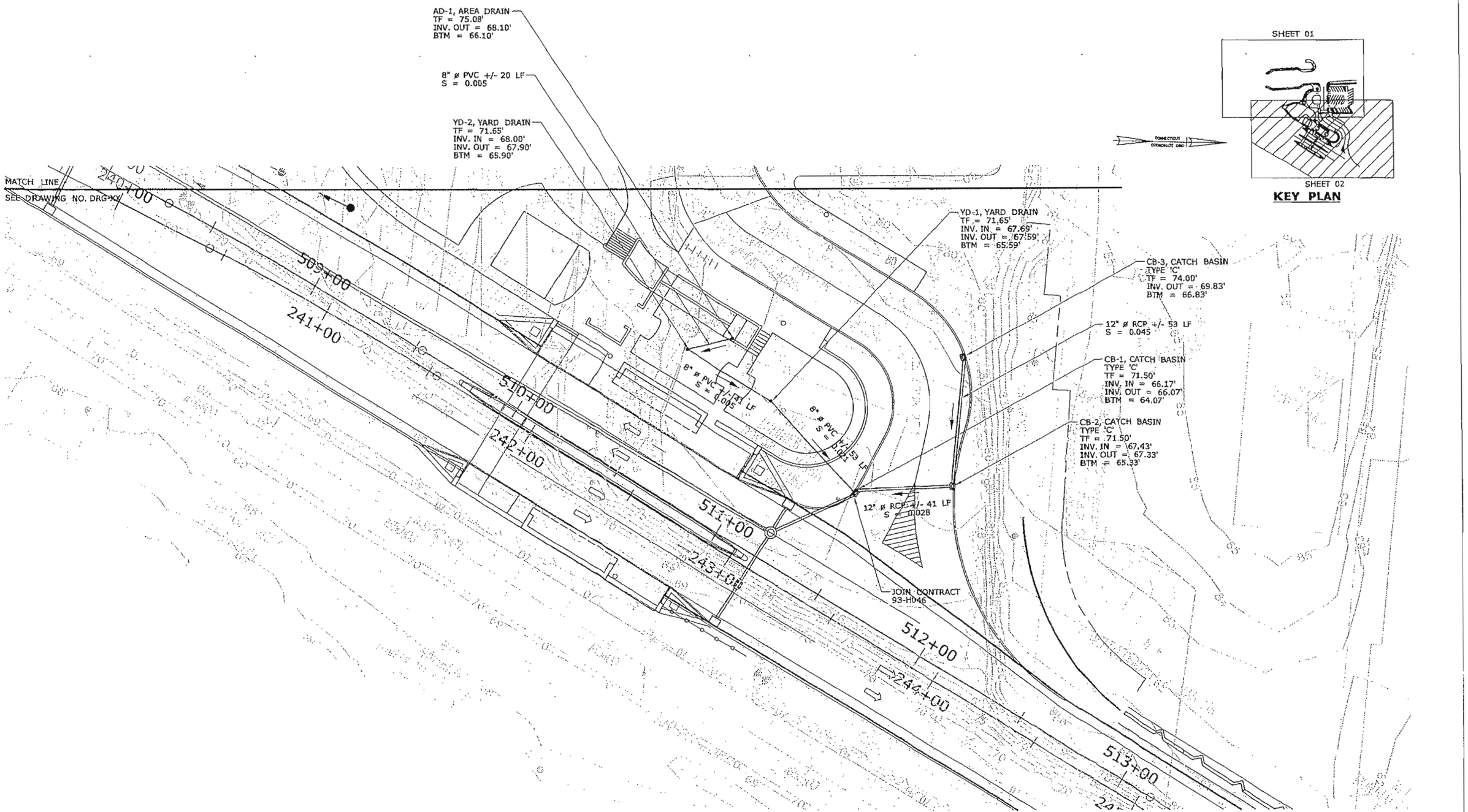
TOWN: NEWINGTON

DRAWING TITLE:
NEWINGTON JUNCTION
DRAINAGE PLAN

PROJECT NO. 88-H039

DRAWING NO. DRG-XX

SHEET NO. S



ENVIRONMENTAL PERMIT REVIEW

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 1/21/2010

DESIGNER/DRAFTER: KRV

CHECKED BY: -

SCALE IN FEET 0 20 40

SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD-MSH-DRG-88H039-B-NEWINGTON JUNCTION.dgn

SIGNATURE/BLOCK: OFFICE OF ENGINEERING

APPROVED BY: DATE:

PROJECT TITLE: NEW BRITAIN - HARTFORD BUS RAPID TRANSIT STATIONS

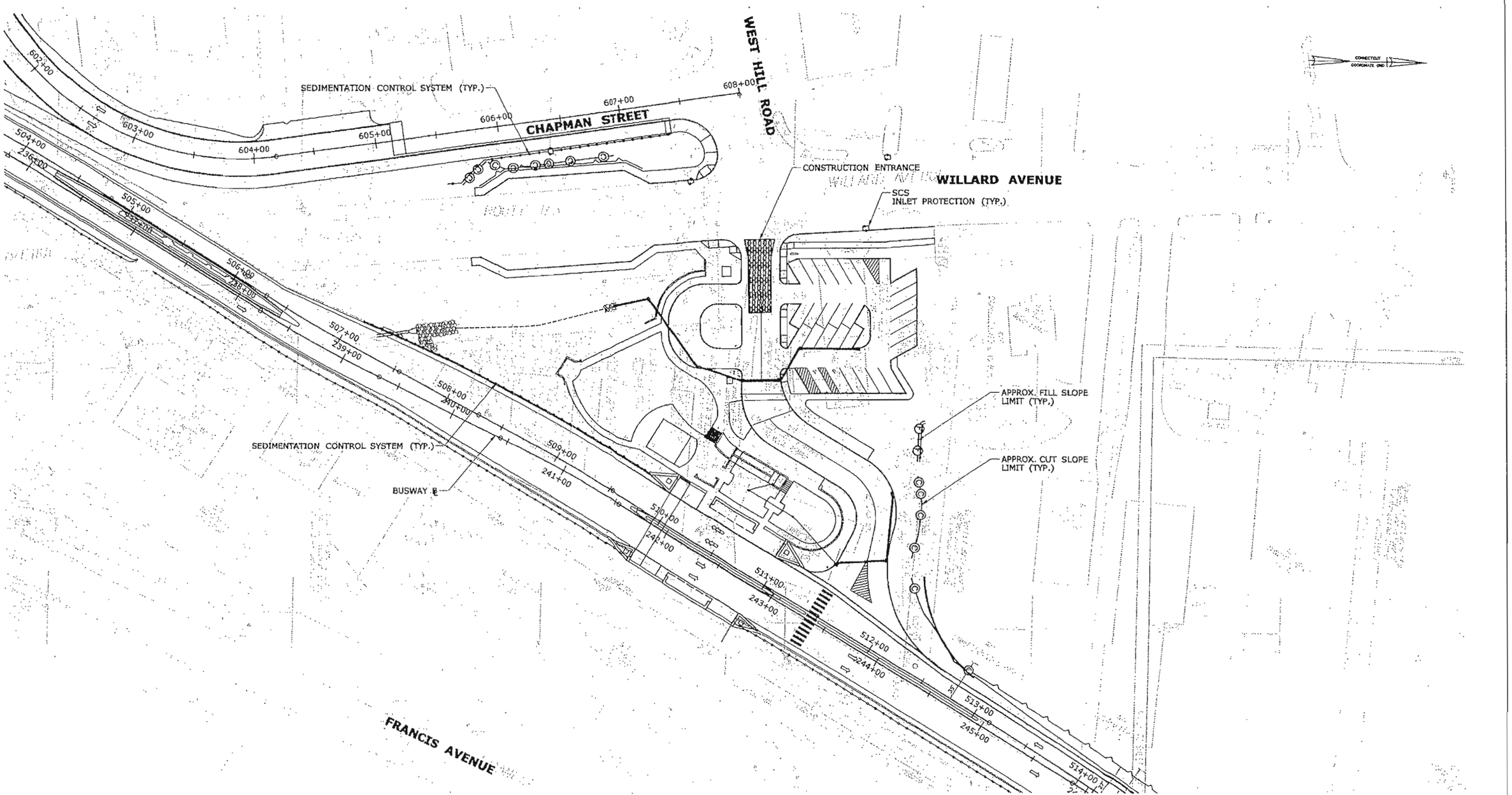
TOWN: NEWINGTON

DRAWING TITLE: NEWINGTON JUNCTION DRAINAGE PLAN

PROJECT NO. 88-H039

DRAWING NO. DRG-XX

SHEET NO. S



ENVIRONMENTAL PERMIT REVIEW

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 10/22/2009

DESIGNER/DRAFTER: KRV
CHECKED BY: -

SCALE IN FEET
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SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD.MSII.SED.88H039.NEWINGTON JUNCTION.dgn

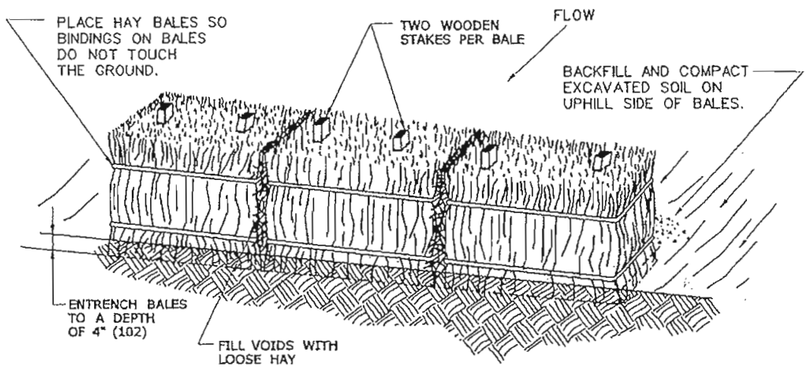
SIGNATURE/BLOCK:
OFFICE OF ENGINEERING
APPROVED BY: DATE:

PROJECT TITLE:
NEW BRTAIN - HARTFORD
BUS RAPID TRANSIT STATIONS

TOWN: NEWINGTON

DRAWING TITLE:
NEWINGTON JUNCTION
SEDIMENTATION CONTROL

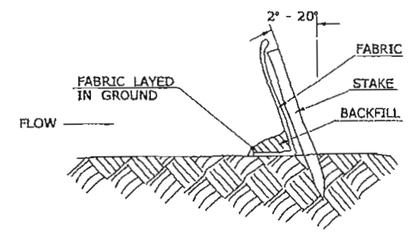
PROJECT NO. 88-H039
DRAWING NO. SED-XX
SHEET NO. S

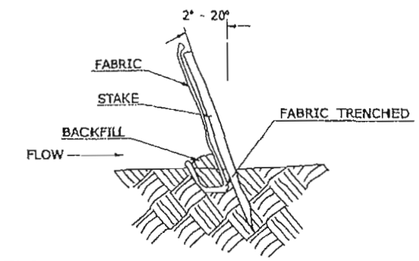


HAY BALE SYSTEM

GENERAL NOTES:

1. HAY BALES SHALL NOT BE USED IN A WATERCOURSE.
2. HAY BALES SHALL BE ENTRENCHED 4" (102) AND TIGHTLY BUTTED TOPGETHER. REMOVE HEAVY BRUSH AND FILL ALL VOIDS WITH LOOSE HAY.
3. WOOD STAKES SHALL HAVE A MINIMUM CROSS-SECTION SIZE OF AT LEAST 1" (102) x 1" (102) AND MINIMUM LENGTH OF 4 FT.(1219)
4. CLEAN OUT ACCUMULATED SEDIMENT WHEN ONE-HALF (1/2) OF THE ORIGINAL HEIGHT OF THE HAY BALE FENCE, AS INSTALLED, BECOMES FILLED WITH SEDIMENT OR AS DIRECTED BY THE ENGINEER.
5. NOT TO BE USED IN THE VICINITY OF URBAN AND RESIDENTIAL AREAS.





END VIEW

BACKFILLING GEOTEXTILE TOE

TRENCHING GEOTEXTILE TOE

GEOTEXTILE FENCE SYSTEM

GENERAL NOTES:

1. GEOTEXTILE FENCE SHOULD BE PLACED SO THE FENCE LEANS TOWARD THE SOURCE OF SEDIMENT.
2. MAXIMUM SPACING FOR WOODEN STAKES OR STEEL POSTS IS 10.0' (3048).
3. WOOD STAKES SHALL HAVE A MINIMUM CROSS-SECTION SIZE OF 1.5" (457) X 1.5" (457) AND MINIMUM LENGTH OF 4 FT. (1219) STEEL POSTS SHALL BE AT LEAST 0.5 LB. PER FOOT WITH A MINIMUM LENGTH OF 4 FT. (1219).
4. WOODEN STAKES OR STEEL POSTS SHALL BE DRIVEN TO A MINIMUM OF 1' (305) INTO THE GROUND.
5. 6" (152) OF GEOTEXTILE SHALL BE BURIED BY BACKFILLING OR TRENCHING AND AT LEAST 2.5' (762) IN HEIGHT OF GEOTEXTILE SHALL BE EXPOSED.
6. FABRIC SHALL BE JOINED ONLY AT A SUPPORT POST WITH A MINIMUM OF 6" (152) OVERLAP AND SECURITY SEALED.
7. UPON RE-ESTABLISHMENT OF GROUND COVER IN DISTURBED AREAS AND WHEN DIRECTED BY THE ENGINEER, OR UPON FINAL INSPECTION FENCE AND ANY SEDIMENT SHALL BE REMOVED. AT NO TIME WILL THE FENCE REMAIN IN PLACE AFTER PROJECT COMPLETION.
8. GEOTEXTILE FENCE SHALL NOT BE USED IN A WATER COARSE.
9. ONLY GEOTEXTILE FROM THE DEPARTMENTS APPROVED PRODUCT LIST SHALL BE USED.
10. BACKFILLING OF GEOTEXTILE SHALL ONLY BE USED WHEN GROUND IS FROZEN OR WHERE OTHER OBSTRUCTIONS ARE ENCOUNTERED THAT PROHIBITE TRENCHING, IE, STUMPS OR ROCKS.
11. CLEAN OUT ACCUMULATION SEDIMENT WHEN ONE-HALF (1/2) OF THE ORIGINAL HEIGHT OF THE GEOTEXTILE FENCE, AS INSTALLED , BECOMES FILLED WITH SEDIMENT OR AS DIRECTED BY THE ENGINEER.

REVISED: 9/10/09

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 10/28/2009

DESIGNER/DRAFTER: -

CHECKED BY: -

NTS

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD_MSH_DET_88H039_SED_CONTROL1.dgn

SIGNATURE/ BLOCK:

OFFICE OF ENGINEERING

APPROVED BY: DATE:

PROJECT TITLE:

NEW BRITAIN - HARTFROD BUS RAPID TRANSIT STATIONS

TOWN:

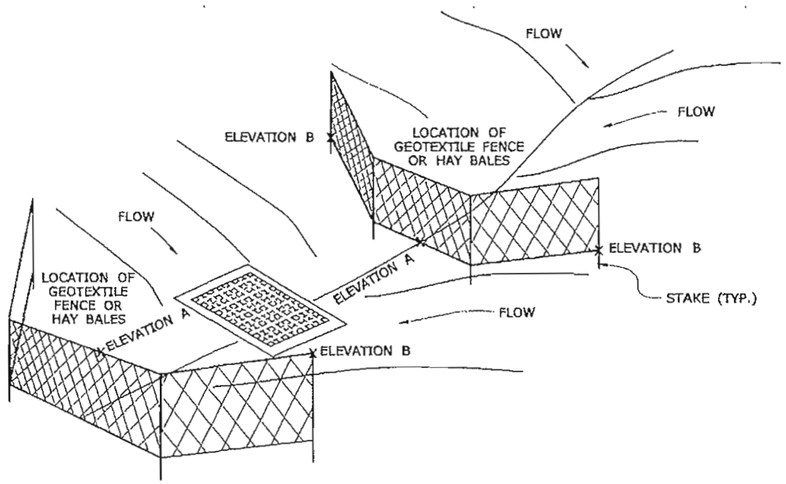
DRAWING TITLE:

SEDIMENTATION CONTROL SYSTEM DETAILS

PROJECT NO. 88-H039

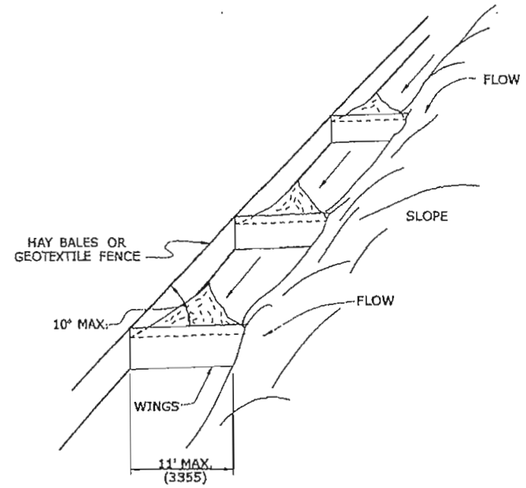
DRAWING NO. DET-XX

SHEET NO. S



TREATMENT FOR A CATCH BASIN ON A SLOPE

(SEE NOTE 4)

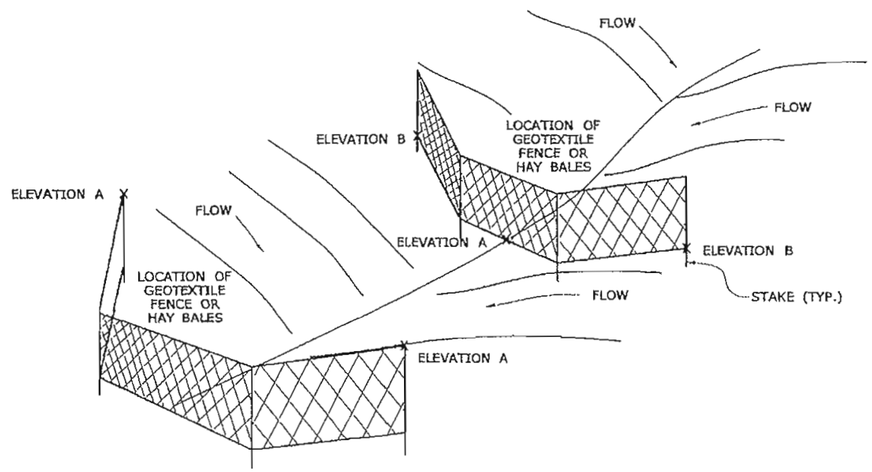


TREATMENT AT TOE OF SLOPE

(SEE NOTE 3)

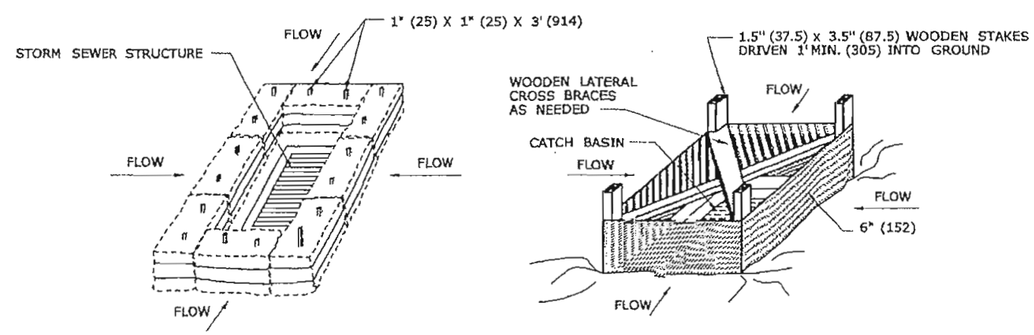
GENERAL NOTES:

1. THE CONTRACTOR SHALL MAINTAIN THE EARTHEN BERM AS DIRECTED BY THE ENGINEER.
2. WHEN USING A SEDIMENTATION CONTROL SYSTEM ALONG THE TOE OF SLOPE, ADD WINGS TO PREVENT SEDIMENT FROM MOVING ALONG THE FENCE AND OFF THE SITE. MINIMUM SPACING FOR WINGS IS 25' (7620).
3. CATCH BASIN ON SLOPE SHOULD NOT BE RINGED. THE SPACING OF SEDIMENTATION CONTROL SYSTEM SHALL VARY WITH SLOPE.
4. ELEVATION B = A + 12" (305) MIN.



CHECK DAM

(SEE NOTE 4)



HAY BALE AT CATCH BASIN

GEOTEXTILE FENCE AT CATCH BASIN

TREATMENT FOR A CATCH BASIN IN A DEPRESSION

REVISED 9/10/09

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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Plotted Date: 10/28/2009

DESIGNER/DRAFTER: -

CHECKED BY: -

NTS

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD.HS11.DET.88H039.SED.CONTROL2.dgn

SIGNATURE/BLOCK:

OFFICE OF ENGINEERING

APPROVED BY: DATE:

PROJECT TITLE:

NEW BRITAIN - HARTFORD BUS RAPID TRANSIST STATIONS

TOWN:

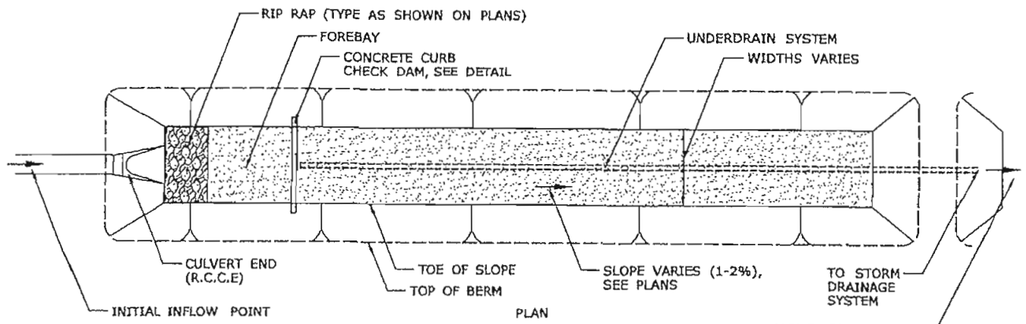
DRAWING TITLE:

SEDIMENTATION CONTROL TREATMENT DETAILS

PROJECT NO. 88-H039

DRAWING NO. DET-XX

SHEET NO. S



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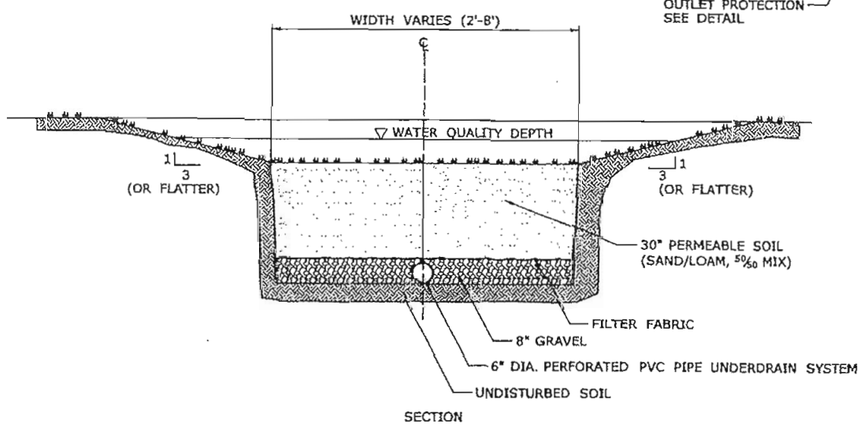
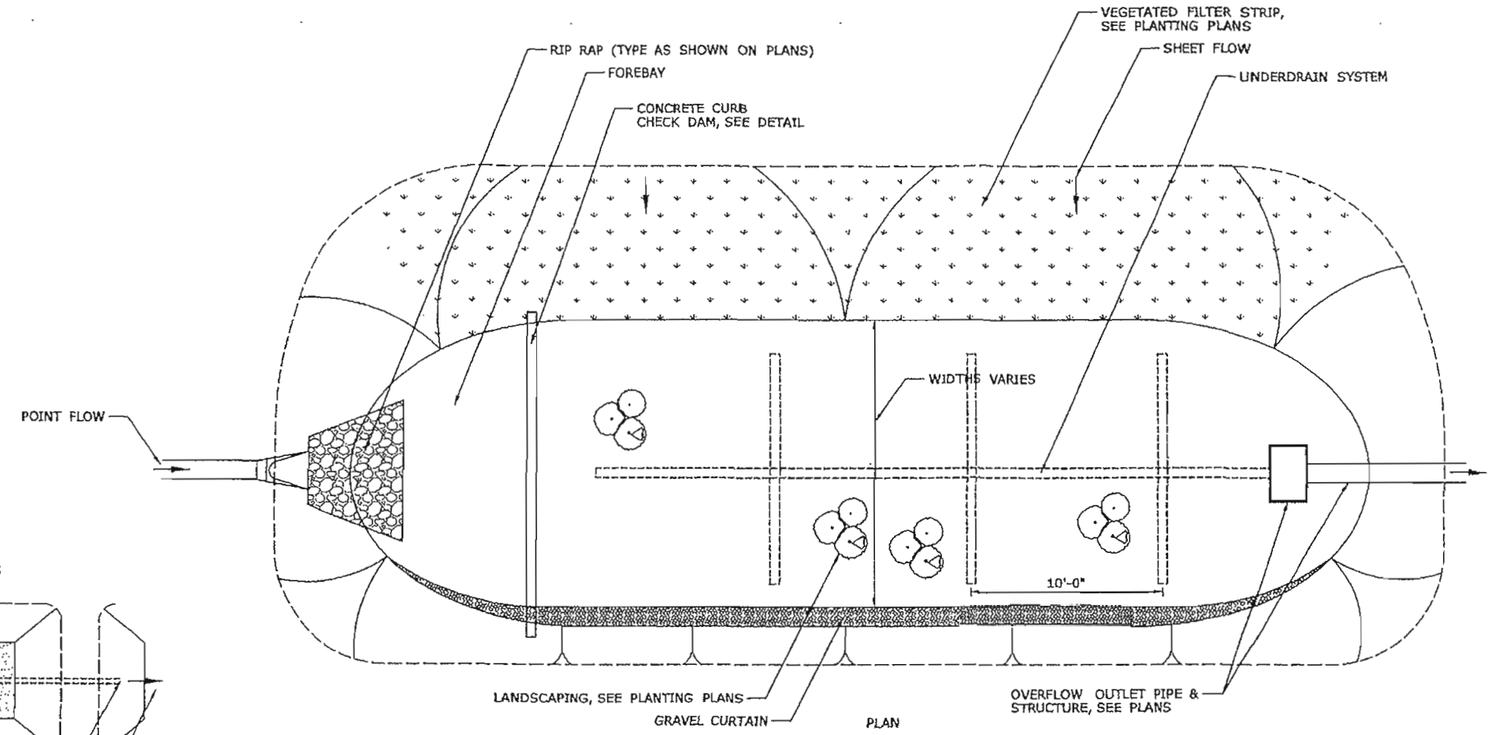
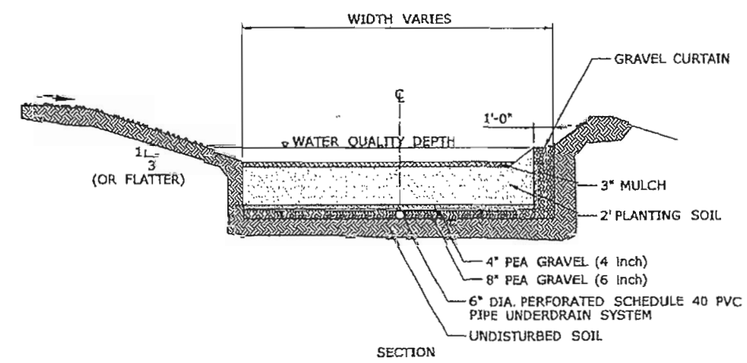


SECTION

DRY SWALE



PLAN



SECTION

BIORETENTION BASIN

PRELIMINARY DESIGN REVIEW

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted: 1/21/2010

DESIGNER/DRAFTER: KRV
CHECKED BY: -
SCALE AS NOTED

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUS RAPID TRANSIT STATIONS

TOWN:

DRAWING TITLE: DETAILS - DRAINAGE

PROJECT NO. 88-H039
DRAWING NO. DET-XX
SHEET NO. S

8. Appendix E: CTDOT Preliminary Design Comment Responses

Station: Newington Junction Reviewer: Hydraulics & Drainage Reviewer Date: 9/29/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-10-05

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

memorandum

subject: Project No. 88-H039 (171-305 P.E.)
New Britain-Hartford Busway
Newington Junction Station
Preliminary Design Review

date: September 29, 2009

to: Mr. Richard B. Armstrong
Trans. Principal Engineer
Consultant Design
Bureau of Engineering
and Construction

from: Michael B. Masayda
Trans. Principal Engineer
Hydraulics and Drainage
Bureau of Engineering
and Construction

No.	Comment	Inc.	Not Inc.
1	The location of the drainage structures that are proposed for the busway mainline, as depicted on the station plan, do not match the locations shown for adjacent Project No. 93-H046. More coordination is required between the two projects to ensure that drainage systems and connection points are accurately presented on the plans.		
2	Proposed drainage that is depicted on the plans between the station and the mainline busway project should be differentiated from each other to define the respective project limits.		
3	Intersection grading plans should be developed for the station driveways that intersect the roadway or busway to ensure that catch basins will be located at low points and avoid potential ponding or icing conditions.		
4	Plans for adjacent Project No. 93-H046 show the busway drainage is designed with an offline drainage system. Treated stormwater will be carried in the trunkline and connected by manholes. It is recommended that the "treated" runoff coming from the station's stormwater quality swale discharge to the busway's main trunkline system rather than directly to an existing manhole.		
5	The station drainage will outlet to a grass lined stormwater quality swale and then discharge to an existing manhole that is labeled "*Manhole Not Found*". a. Discharging the station runoff to an existing drainage structure that could not be found is undesirable. Additional survey should be performed to verify the location of the manhole. b. Determine the ownership and maintenance responsibilities for the existing drainage system that traverses the property and that will also intercept drainage from the station and busway. Permission to discharge and a maintenance agreement between the owner and the Department may be required.		

No.	Comment	Inc.	Not Inc.
6	The storm drainage calculations show that several catch basins will intercept less than 0.5 cfs. Consider regrading these subareas to allow runoff to discharge onto the pavement rather than collecting in a low spot that will require an inlet. See also the inlet at CB 4 which will intercept 0.6 cfs. The catch basin is not located in a low point and is proposed 50 feet upgrade from CB 13 which intercepts 1.0 cfs.		

Yolanda Antoniak/ya:sd
cc: Joseph J. Obara
Chong Lung Chow
088-H039H

Station: Newington Junction Reviewer: Hydraulics & Drainage Reviewer Date: 9/29/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-10-05

Reviewer Comment 1)

The location of the drainage structures that are proposed for the busway mainline, as depicted on the station plan, do not match the locations shown for adjacent Project No. 93-H046. More coordination is required between the two projects to ensure that drainage systems and connection points are accurately presented on the plans.

S E A Response: *Coordination between designers has occurred regarding the proposed drainage system. Continued efforts between all parties will continue through final design.*

Reviewer Comment 2)

Proposed drainage that is depicted on the plans between the station and the mainline busway project should be differentiated from each other to define the respective project limits.

S E A Response: *Additional call-outs have been added to the drainage plan sheets.*

Reviewer Comment 3)

Intersection grading plans should be developed for the station driveways that intersect the roadway or busway to ensure that catch basins will be located at low points and avoid potential ponding or icing conditions.

S E A Response: *Intersection grading plans will be developed during final design.*

Reviewer Comment 4)

Plans for adjacent Project No. 93-H046 show the busway drainage is designed with an offline drainage system. Treated stormwater will be carried in the trunkline and connected by manholes. It is recommended that the "treated" runoff coming from the station's stormwater quality swale discharge to the busway's main trunkline system rather than directly to an existing manhole.

S E A Response: *The station drainage and mainline busway drainage are both tributary to the existing storm drain system that traverses the proposed site. Independent connections are proposed for the station and busway systems.*

Reviewer Comment 5a)

The station drainage will outlet to a grass lined stormwater quality swale and then discharge to an existing manhole that is labeled "*Manhole Not Found*".

a. Discharging the station runoff to an existing drainage structure that could not be found is undesirable. Additional survey should be performed to verify the location of the manhole.

S E A Response: *Additional survey has been requested.*

Reviewer Comment 5b)

b. Determine the ownership and maintenance responsibilities for the existing drainage system that traverses the property and that will also intercept drainage from the station and busway. Permission to discharge and a maintenance agreement between the owner and the Department may be required.

S E A Response: *Ownership of the drainage system will be researched.*

Reviewer Comment 6)

The storm drainage calculations show that several catch basins will intercept less than 0.5 cfs. Consider regrading these subareas to allow runoff to discharge onto the pavement rather than collecting in a low spot that will require an inlet.

See also the inlet at CB 4 which will intercept 0.6 cfs. The catch basin is not located in a low point and is proposed 50 feet upgrade from CB 13 which intercepts 1.0 cfs.

S E A Response: *The drainage inlets have been located to collect site runoff and minimize the likelihood of icing conditions and unsafe pedestrian areas.*

CB 14 is intercepting 0.6 cfs out of the 0.81 cfs that is tributary to the inlet. This bypass of 0.2 cfs is added to the catchment flow at CB 13 of 0.82 cfs for a total Q of 1.02 cfs. However, CB 13 is only able to intercept 0.43 cfs with the remainder bypassing to CB 12 where it is completely captured. Ponding spreads at these inlets vary from 5 to 9 feet. We believe these inlets are appropriately designed and located.

Station: Newington Junction Reviewer: Environmental Planning Reviewer Date: 9/3/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-09-29

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

memorandum

subject: Preliminary Design Submission
88-H039 / 171-306
Newington Junction Station
New Britain – Hartford Busway

date: September 3, 2009

to
Brian Cunningham
Transportation Supervising Engineer
Consultant Design - Highways
Bureau of Engineering and Construction

from
Paul Corrente
Transportation Supervising Planner
Environmental Planning Division
Bureau of Policy and Planning

ext.

Type of Review:

☐ Schematic ☒ Preliminary Design ☐ Semi-Final Design ☐ Final Design ☐ Permit ☐ Other:

My staff has reviewed the above mentioned project and the water resource compliance section of this office offers the following comments:

Comment #	Loc. or Sheet#	Comment	Inc.	Not Inc. (if not, WHY)
1	General	• Please consider the use of a geogrid system or erosion control blankets in lieu of sloped pavers for stabilization as this system would be more cost effective.		
5	CIV-XX	• The CIV plan sheets shall include the Station markings, toe of slope, drainage, cut and fills, and E&S controls, etc... • Please coordinate with the project designers of Project 93-H046 regarding the transition points connecting concrete curbing, RW, etc...between the busway and platform stations.		
7	DRG	• Please coordinate with the designers of Project 93-H046. • Drainage from the busway should be transitioned into the water quality swale. Please investigate. • The angle in which the drainage discharges into the water quality swale should always flow in the direction of the swale. Provide a flared end and MH in order to discharge in the proper direction. • Since the station will have limited access, the drainage design should consider alternative pipes. Determination should be based on overall cost savings. • Ensure there is access to maintain the water quality swale. • Water quality swale details will be required.		
8	LDS	• Remove Meadow Mix from the project. • The water quality basin will require a wetland seed mix and conservation seed mix for the side slopes.		

If you have any questions regarding these comments, please contact Mr. Paul Corrente at 860-594-2932.

Andrew Piraneo/ap
cc: Paul Corrente – Andrew Piraneo
Mark Alexander – Kim Lasay – Amanda Freitas
Dave Mancini – Bob Reilly
Laurie LaRocca
Mike Masayda - Chong Lung Chow – Yolanda Antoniak
Jacob Argiro

Station: Newington Junction Reviewer: Environmental Planning Reviewer Date: 9/3/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-09-29

Reviewer Comment 1).

- Please consider the use of a geogrid system or erosion control blankets in lieu of sloped pavers for stabilization as this system would be more cost effective.

S E A Response: *Alternative slope stabilization measures will be considered.*

Reviewer Comment 5a).

- The CIV plan sheets shall include the Station markings, toe of slope, drainage, cut and fills, and E&S controls, etc...

S E A Response: *Applicable detail will be added to the plans.*

Reviewer Comment 5b).

- Please coordinate with the project designers of Project 93-H046 regarding the transition points connecting concrete curbing, RW, etc... between the busway and platform stations.

S E A Response: *Coordination between designers has occurred regarding the proposed design. Continued efforts between applicable parties will continue through final design.*

Reviewer Comment 7a).

- Please coordinate with the designers of Project 93-H046.

S E A Response: *Coordination between designers has occurred regarding the proposed drainage system. Continued efforts between applicable parties will continue through final design.*

Reviewer Comment 7b).

- Drainage from the busway should be transitioned into the water quality swale. Please investigate.

S E A Response: *The site area is too small to provide treatment of the busway runoff within the station footprint.*

Reviewer Comment 7c).

- The angle in which the drainage discharges into the water quality swale should always flow in the direction of the swale. Provide a flared end and MH in order to discharge in the proper direction.

S E A Response: *A manhole has been added, as requested.*

Reviewer Comment 7d).

- Since the station will have limited access, the drainage design should consider alternative pipes. Determination should be based on overall cost savings.

S E A Response: *Alternate pipe materials will be considered during final design.*

Reviewer Comment 7e).

- Ensure there is access to maintain the water quality swale.

S E A Response: *Appropriate access has been provided to the swale.*

Reviewer Comment 7f).

- Water quality swale details will be required.

S E A Response: *Details have been added to the plan set.*

Reviewer Comment 8a).

- Remove Meadow Mix from the project.

S E A Response: *An alternative seed mix will be proposed during final design upon coordination with the appropriate parties at the Department.*

Reviewer Comment 8b).

- The water quality basin will require a wetland seed mix and conservation seed mix for the side slopes.

S E A Response: *Appropriate seed mixes will be proposed during final design upon coordination with the appropriate parties at the Department.*

Station: Newington Junction Reviewer: Environmental Planning Reviewer Date: 9/14/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-10-07

From: Jacob Argiro [mailto:Jargiro@cmeengineering.com]
Sent: Monday, September 14, 2009 11:00 AM
To: Al Bisacky
Cc: Elizabeth Sommer; Cunningham, Brian T
Subject: FW: Newington Junction Station

OEP-Wetlands comments on Newington Junction are below.

From: Lesay, Kimberly C [mailto:Kimberly.Lesay@ct.gov]
Sent: Monday, September 14, 2009 10:55 AM
To: Jacob Argiro
Cc: Cunningham, Brian T; Corrente, Paul N; Piraneo, Andrew; Alexander, Mark W
Subject: Newington Junction Station

I have reviewed the PD plans and offer the following general comments:

There are numerous utilities in the area, including sanitary sewer line. The depth of these should be plotted onto the profile plans and cross sections as developed.

- The stability of all ultimate outfalls for drainage must be confirmed and capacity of pipes as well.

It is my understanding you are already in receipt of comments from our Stormwater Section. Thank you - Kim

Kimberly Lesay

Environmental Planning Division

Department of Transportation

2800 Berlin Turnpike

PO Box 317546

Newington, CT 06131-7546

phone (860) 594-2933

fax (860) 594-3028

Kimberly.Lesay@po.state.ct.us

Station: Newington Junction Reviewer: Environmental Planning Reviewer Date: 9/14/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-10-07

Reviewer Comment 1)

There are numerous utilities in the area, including sanitary sewer line. The depth of these should be plotted onto the profile plans and cross sections as developed.

S E A Response: *Utility coordination and required relocations will be examined in detail during final design.*

Reviewer Comment 2)

The stability of all ultimate outfalls for drainage must be confirmed and capacity of pipes as well.

S E A Response: *The stability of the outfalls is outside the scope of the station drainage design and will be completed by the 93-H046 designer.*

9. Appendix F: HARTFORD – NEW BRITAIN BUSWAY TABLE

Stormwater Drainage Receiving Waters
New Britain-Hartford Busway
State Project #302-008

Drainage System Number/ Description (Station)	Wetland Impact Site Number	Receiving Waters (Name)	Outlet Protection Type	# of Catch Basins	Maximum Flows (Q) (cfs)	Contributing Drainage Area (sq. mi)	Treatment	Notes
Newington Junction Station (outlet into existing 36-inch RCP storm drain)	16 (Impact by Contract No. 88-H046)	Piper Brook	N/A	11 total inlets	10 Year Peak = 6.96	0.004 sq. mi (2.64 acres)	Primary Treatment within Water Quality Swale	

H – 046

PRE/POST CONDITION DRAINAGE

This report provides supporting documentation for Department of Environmental Protection (DEP) Attachment-H for a portion of the New Britain – Hartford Busway located in the towns of Newington and West Hartford (Sta. 203+00 to Sta. 332+00). The busway will be a dedicated Bus Rapid Transit (BRT) facility along a 9.4-mile corridor between downtown New Britain and downtown Hartford. The corridor for the busway follows and abandoned railroad right-of-way from New Britain to Newington Junction and lies mainly within the Amtrak right-of-way, essentially parallel to the active rail line, north of Newington Junction. The busway will be two lanes wide (one in each direction).

Summary: (REVISED MARCH 2011)

Pre Condition Flows (in cfs);

System No.	2 YR Storm Event	10 YR Storm Event	100 YR Storm Event
#1 (A / B / C)	4.65 / 0.29 / 0.39	6.97 / 0.40 / 0.55	10.07 / 0.57 / 0.74
#2	~~4.69~~ 3.40	~~6.49~~ 4.70	~~8.70~~ 6.30
#3 (Does not include Bus Station flows)	~~0.69~~ 15.58	~~0.97~~ 21.93	~~1.38~~ 31.17
#4	~~0.23~~ 0.25	~~0.33~~ 0.36	~~0.46~~ 0.50
#5	0.55	0.82	1.21
#6 (Does not include AAR or New Britain Ave.flows)	0.55	0.82	1.21
#7	0.56	0.80	1.10
#8 (Does not include AAR or SPN. 155-H025 flows)	0.69	1.01	1.45

Post Condition Flows

System No.	2 YR Storm Event	10 YR Storm Event	100 YR Storm Event
#1 (A / B / C)	~~9.03~~ / 2.09 / 2.06 8.97	~~14.01~~ / 2.78 / 2.96 13.94	~~20.71~~ / 3.66 / 4.12 20.65
#2	~~5.26~~ 3.37	~~7.90~~ 5.09	~~11.60~~ 7.49
#3 (Does not include Bus Station flows)	~~2.76~~ 17.11	~~4.43~~ 25.71	~~6.75~~ 38.20
#4	~~1.47~~ 1.68	~~2.06~~ 2.32	~~2.81~~ 3.13
#5	~~2.78~~ 2.73	~~4.46~~ 4.41	~~6.90~~ 6.84
#6 (Does not include AAR or New Britain Ave.flows)	~~3.44~~ 3.27	~~5.59~~ 5.38	~~8.58~~ 8.36
#7	~~2.94~~ 3.01	~~4.34~~ 4.41	~~6.14~~ 6.20
#8 (Includes SPN. 155-H025 flows, Does not include AAR flows)	5.81	9.42	14.55

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Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	1	Of	3
Calculated By	JMB	Date	11/2/2009
Checked By		Date	
Scale	VN #27-117.2		
Revised By	JMB	Date	3/10/2011

PRE-DEVELOPMENT CONDITIONS
2 YR. STORM EVENT

I= (PER CTDOT DRAINAGE MANUAL Table B-2.1)

SYSTEM # 1

	A	B	C	
C=	0.42	0.2	0.2	
I=	1.8	2.7	3	in/hr
A=	6.15	0.53	0.65	Acres
		Q=C I A		
Q=	4.65	0.29	0.39	cfs

SYSTEM # 6

C= 0.2
I= 1.7 in/hr
A= 1.63 Acres

Q=C I A
Q= 0.55 cfs

SYSTEM # 2

C= 0.5
I= 3.4 in/hr
A= 2 Acres

Q=C I A
Q= 3.40 cfs

SYSTEM # 7

C= 0.2
I= 2.8 in/hr
A= 1 Acres

Q=C I A
Q= 0.56 cfs

SYSTEM # 3

C= 0.47
I= 2.7 in/hr
A= 12.28 Acres

Q=C I A
Q= 15.58 cfs

SYSTEM # 8

C= 0.2
I= 1.9 in/hr
A= 1.81 Acres

Q=C I A
Q= 0.69 cfs

SYSTEM # 4

C= 0.2
I= 2.7 in/hr
A= 0.47 Acres

Q=C I A
Q= 0.25 cfs

SYSTEM # 5

C= 0.22
I= 1.4 in/hr
A= 1.78 Acres

Q=C I A
Q= 0.55 cfs

3.5

SYSTEM #1A

$$C = \frac{(1.61)(0.20)+(4.54)(0.50)}{6.15} = 0.42$$

SYSTEM #3

$$C = \frac{(1.28)(0.20)+(11.0)(0.50)}{12.28} = 0.47$$

SYSTEM #5

$$C = \frac{(1.67)(0.20)+(0.11)(0.50)}{1.78} = 0.22$$

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Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	2	Of	3
Calculated By	JMB	Date	11/2/2009
Checked By		Date	
Scale	VN #27-117.2		
Revised By	JMB	Date	3/10/2011

PRE-DEVELOPMENT CONDITIONS
10 YR. STORM EVENT

I= (PER CTDOT DRAINAGE MANUAL Table B-2.1)

SYSTEM # 1

	A	B	C	
C=	0.42	0.2	0.2	
I=	2.7	3.8	4.2	in/hr
A=	6.15	0.53	0.65	Acres
		Q=C I A		
Q=	6.97	0.40	0.55	cfs

SYSTEM # 2

C= 0.5
I= 4.7 in/hr
A= 2 Acres

Q=C I A
Q= 4.70 cfs

SYSTEM # 3

C= 0.47
I= 3.8 in/hr
A= 12.28 Acres

Q=C I A
Q= 21.93 cfs

SYSTEM # 4

C= 0.2
I= 3.8 in/hr
A= 0.47 Acres

Q=C I A
Q= 0.36 cfs

SYSTEM # 5

C= 0.22
I= 2.1 in/hr
A= 1.78 Acres

Q=C I A
Q= 0.82 cfs

SYSTEM # 6

C= 0.2
I= 2.5 in/hr
A= 1.63 Acres

Q=C I A
Q= 0.82 cfs

SYSTEM # 7

C= 0.2
I= 4 in/hr
A= 1 Acres

Q=C I A
Q= 0.80 cfs

SYSTEM # 8

C= 0.2
I= 2.8 in/hr
A= 1.81 Acres

Q=C I A
Q= 1.01 cfs

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Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	3	Of	3
Calculated By	JMB	Date	11/2/2009
Checked By		Date	
Scale	VN #27-117.2		
Revised By	JMB	Date	3/10/2011

PRE-DEVELOPMENT CONDITIONS
100 YR. STORM EVENT

I= (PER CTDOT DRAINAGE MANUAL Table B-2.1)

SYSTEM # 1

	A	B	C	
C=	0.42	0.2	0.2	
I=	3.9	5.4	5.7	in/hr
A=	6.15	0.53	0.65	Acres
		Q=C I A		
Q=	10.07	0.57	0.74	cfs

SYSTEM # 2

C= 0.5
I= 6.3 in/hr
A= 2 Acres

Q=C I A
Q= 6.30 cfs

SYSTEM # 3

C= 0.47
I= 5.4 in/hr
A= 12.28 Acres

Q=C I A
Q= 31.17 cfs

SYSTEM # 4

C= 0.2
I= 5.3 in/hr
A= 0.47 Acres

Q=C I A
Q= 0.50 cfs

SYSTEM # 5

C= 0.22
I= 3.1 in/hr
A= 1.78 Acres

Q=C I A
Q= 1.21 cfs

SYSTEM # 6

C= 0.2
I= 3.7 in/hr
A= 1.63 Acres

Q=C I A
Q= 1.21 cfs

SYSTEM # 7

C= 0.2
I= 5.5 in/hr
A= 1 Acres

Q=C I A
Q= 1.10 cfs

SYSTEM # 8

C= 0.2
I= 4 in/hr
A= 1.81 Acres

Q=C I A
Q= 1.45 cfs

Appendix

Runoff Coefficients (C)

Description of Area	Coefficient
Business:	
Central business	0.70 - 0.95
District and local	0.50 - 0.70
Residential:	
Single family	0.35 - 0.45
Multi-units	0.40 - 0.75
1/2 acre lots or larger	0.25 - 0.40
Industrial:	
Light	0.50 - 0.80
Heavy	0.60 - 0.90
Parks, cemeteries	0.10 - 0.25
Playgrounds	0.20 - 0.35
Railroad yards	0.20 - 0.40
Unimproved	0.10 - 0.30
Asphaltic	0.70 - 0.95
Concrete	0.80 - 0.95
Roofs	0.75 - 0.95

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Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	1	Of	4
Calculated By	JMB	Date	11/2/2009
Checked By	CJR	Date	11/09/09
Scale	VN #27-117.2		

PRE-DEVELOPMENT CONDITIONS
TIME OF CONCENTRATION CALCULATIONS

(per CTDOT Drianage Manual Section 6 Appendix C)

SYSTEM # 1A

Sheet Flow
- length= 50 ft
- slope= 0.006 ft/ft
- P= 3.25 in/hr
- n= 0.1
- Tt= 6.77 min.

Shallow Concentrated Flow
- Velocity= 1.20 ft/sec
- length= 1900 ft
- Tt= 26.46 min.

Total Tt= 33.23 min.

SYSTEM # 1B

Sheet Flow
- length= 50 ft
- slope= 0.003 ft/ft
- P= 3.25 in/hr
- n= 0.1
- Tt= 8.4 min.

Shallow Concentrated Flow
- Velocity= 0.91 ft/sec
- length= 450 ft
- Tt= 8.22 min.

Total Tt= 16.62 min.

SYSTEM # 1C

Sheet Flow
- length= 50 ft
- slope= 0.006 ft/ft
- P= 3.25 in/hr
- n= 0.1
- Tt= 6.53 min.

Shallow Concentrated Flow
- Velocity= 1.25 ft/sec
- length= 525 ft
- Tt= 7.00 min.

Total Tt= 13.54 min.

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Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	2	Of	4
Calculated By	JMB	Date	11/2/2009
Checked By	CJL	Date	11/6/09
Scale	VN #27-117.2		

PRE-DEVELOPMENT CONDITIONS
TIME OF CONCENTRATION CALCULATIONS

(per CTDOT Drianage Manual Section 6 Appendix C)

SYSTEM # 2

Sheet Flow			Shallow Concentrated Flow		
length=	50	ft	Velocity=	1.14	ft/sec
slope=	0.005	ft/ft	length=	300	ft
P=	3.25	in/hr			
n=	0.1				
Tt=	7.03	min.	Tt=	4.38	min.

Total Tt= 11.41 min.

SYSTEM # 3

Sheet Flow			Shallow Concentrated Flow		
length=	50	ft	Velocity=	0.88	ft/sec
slope=	0.003	ft/ft	length=	450	ft
P=	3.25	in/hr			
n=	0.1				
Tt=	8.62	min.	Tt=	8.49	min.

Total Tt= 17.11 min.

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Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	3	Of	4
Calculated By	JMB	Date	11/2/2009
Checked By	CTC	Date	11/09/09
Scale	VN #27-117.2		

PRE-DEVELOPMENT CONDITIONS
TIME OF CONCENTRATION CALCULATIONS

(per CTDOT Drianage Manual Section 6 Appendix C)

SYSTEM # 4

Sheet Flow
- length= 50 ft
- slope= 0.003 ft/ft
- P= 3.25 in/hr
- n= 0.1
- Tt= 8.62 min.

Shallow Concentrated Flow
- Velocity= 0.88 ft/sec
- length= 475 ft
- Tt= 8.96 min.

Total Tt= 17.58 min.

SYSTEM # 5

Sheet Flow
- length= 50 ft
- slope= 0.003 ft/ft
- P= 3.25 in/hr
- n= 0.1
- Tt= 8.62 min.

Shallow Concentrated Flow
- Velocity= 0.88 ft/sec
- length= 2250 ft
- Tt= 42.43 min.

Total Tt= 51.06 min.

SYSTEM # 6

Sheet Flow
- length= 50 ft
- slope= 0.004 ft/ft
- P= 3.25 in/hr
- n= 0.1
- Tt= 8.11 min.

Shallow Concentrated Flow
- Velocity= 0.95 ft/sec
- length= 1730 ft
- Tt= 30.21 min.

Total Tt= 38.31 min.

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Job.	NEW BRITIAN-HARTFORD BUSWAY		
Sheet No.	4	Of	4
Calculated By	JMB	Date	11/2/2009
Checked By	CSC	Date	11/6/09
Scale	VN #27-117.2		

PRE-DEVELOPMENT CONDITIONS
TIME OF CONCENTRATION CALCULATIONS

(per CTDOT Drianage Manual Section 6 Appendix C)

SYSTEM # 7

Sheet Flow			Shallow Concentrated Flow		
length=	50	ft	Velocity=	1.49	ft/sec
slope=	0.009	ft/ft	length=	850	ft
P=	3.25	in/hr			
n=	0.1				
Tt=	5.68	min.	Tt=	9.52	min.

Total Tt= 15.21 min.

SYSTEM # 8

Sheet Flow			Shallow Concentrated Flow		
length=	50	ft	Velocity=	1.25	ft/sec
slope=	0.006	ft/ft	length=	1800	ft
P=	3.25	in/hr			
n=	0.1				
Tt=	6.53	min.	Tt=	24.00	min.

Total Tt= 30.54 min.

		RAINFALL INTENSITY (in/hr)					
DURATION (min)	DURATION (hr)	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
5	0.08	4.6	5.5	6.0	6.7	7.3	7.8
6	0.10	4.4	5.2	5.8	6.5	7.0	7.5
7	0.12	4.2	5.0	5.5	6.2	6.8	7.2
8	0.13	4.0	4.8	5.3	6.0	6.5	7.0
9	0.15	3.8	4.6	5.1	5.7	6.2	6.7
10	0.17	3.6	4.3	4.8	5.5	6.0	6.5
11	0.18	3.4	4.2	4.7	5.3	5.8	6.3
12	0.20	3.3	4.0	4.5	5.1	5.6	6.1
13	0.22	3.1	3.8	4.3	5.0	5.4	5.9
14	0.23	3.0	3.7	4.2	4.8	5.3	5.7
15	0.25	2.8	3.5	4.0	4.6	5.1	5.5
16	0.27	2.8	3.5	3.9	4.5	5.0	5.4
17	0.28	2.7	3.4	3.8	4.4	4.9	5.4
18	0.30	2.7	3.3	3.8	4.4	4.8	5.3
19	0.32	2.6	3.2	3.7	4.3	4.7	5.2
20	0.33	2.5	3.2	3.6	4.2	4.6	5.1
21	0.35	2.5	3.1	3.5	4.1	4.5	5.0
22	0.37	2.4	3.0	3.4	4.0	4.4	4.9
23	0.38	2.3	2.9	3.4	3.9	4.3	4.8
24	0.40	2.3	2.9	3.3	3.8	4.2	4.7
25	0.42	2.2	2.8	3.2	3.7	4.2	4.6
26	0.43	2.2	2.7	3.1	3.7	4.1	4.5
27	0.45	2.1	2.7	3.0	3.6	4.0	4.4
28	0.47	2.0	2.6	3.0	3.5	3.9	4.3
29	0.48	2.0	2.5	2.9	3.4	3.8	4.2
30	0.50	1.9	2.4	2.8	3.3	3.7	4.1

Rainfall Intensity/Duration/Frequency Relationship for Connecticut (English Units)
Table B-2.1

		RAINFALL INTENSITY (in/hr)					
DURATION	DURATION	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
31	0.52	1.9	2.4	2.8	3.3	3.6	4.0
32	0.53	1.9	2.4	2.7	3.2	3.6	4.0
33	0.55	1.8	2.4	2.7	3.2	3.6	3.9
34	0.57	1.8	2.3	2.7	3.2	3.5	3.9
35	0.58	1.8	2.3	2.6	3.1	3.5	3.8
36	0.60	1.8	2.3	2.6	3.1	3.4	3.8
37	0.62	1.7	2.2	2.6	3.0	3.4	3.7
38	0.63	1.7	2.2	2.5	3.0	3.4	3.7
39	0.65	1.7	2.2	2.5	3.0	3.3	3.7
40	0.67	1.7	2.1	2.5	2.9	3.3	3.6
41	0.68	1.6	2.1	2.4	2.9	3.2	3.6
42	0.70	1.6	2.1	2.4	2.8	3.2	3.5
43	0.72	1.6	2.1	2.4	2.8	3.1	3.5
44	0.73	1.6	2.0	2.3	2.8	3.1	3.4
45	0.75	1.5	2.0	2.3	2.7	3.1	3.4
46	0.77	1.5	2.0	2.3	2.7	3.0	3.3
47	0.78	1.5	1.9	2.2	2.6	3.0	3.3
48	0.80	1.5	1.9	2.2	2.6	2.9	3.2
49	0.82	1.5	1.9	2.2	2.6	2.9	3.2
50	0.83	1.4	1.8	2.1	2.5	2.8	3.2
51	0.85	1.4	1.8	2.1	2.5	2.8	3.1
52	0.87	1.4	1.8	2.1	2.5	2.8	3.1
53	0.88	1.4	1.8	2.0	2.4	2.7	3.0
54	0.90	1.3	1.7	2.0	2.4	2.7	3.0
55	0.92	1.3	1.7	2.0	2.3	2.6	2.9
56	0.93	1.3	1.7	1.9	2.3	2.6	2.9
57	0.95	1.3	1.6	1.9	2.3	2.5	2.8
58	0.97	1.2	1.6	1.9	2.2	2.5	2.8
59	0.98	1.2	1.6	1.8	2.2	2.5	2.7
60	1.00	1.2	1.5	1.8	2.1	2.4	2.7

Rainfall Intensity/Duration/Frequency Relationship for Connecticut (English Units)
Table B-2.1 continued

		RAINFALL INTENSITY (in/hr)					
DURATION	DURATION	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
61	1.02	1.2	1.5	1.8	2.1	2.4	2.7
62	1.03	1.2	1.5	1.8	2.1	2.4	2.6
63	1.05	1.2	1.5	1.8	2.1	2.4	2.6
64	1.07	1.1	1.5	1.7	2.1	2.3	2.6
65	1.08	1.1	1.5	1.7	2.1	2.3	2.6
66	1.10	1.1	1.5	1.7	2.0	2.3	2.6
67	1.12	1.1	1.5	1.7	2.0	2.3	2.5
68	1.13	1.1	1.4	1.7	2.0	2.3	2.5
69	1.15	1.1	1.4	1.7	2.0	2.2	2.5
70	1.17	1.1	1.4	1.6	2.0	2.2	2.5
71	1.18	1.1	1.4	1.6	2.0	2.2	2.4
72	1.20	1.1	1.4	1.6	1.9	2.2	2.4
73	1.22	1.1	1.4	1.6	1.9	2.2	2.4
74	1.23	1.1	1.4	1.6	1.9	2.1	2.4
75	1.25	1.0	1.4	1.6	1.9	2.1	2.4
76	1.27	1.0	1.4	1.6	1.9	2.1	2.4
77	1.28	1.0	1.3	1.6	1.9	2.1	2.3
78	1.30	1.0	1.3	1.5	1.8	2.1	2.3
79	1.32	1.0	1.3	1.5	1.8	2.1	2.3
80	1.33	1.0	1.3	1.5	1.8	2.0	2.3
81	1.35	1.0	1.3	1.5	1.8	2.0	2.3
82	1.37	1.0	1.3	1.5	1.8	2.0	2.2
83	1.38	1.0	1.3	1.5	1.8	2.0	2.2
84	1.40	1.0	1.3	1.5	1.8	2.0	2.2
85	1.42	1.0	1.3	1.5	1.7	2.0	2.2
86	1.43	1.0	1.3	1.5	1.7	2.0	2.2
87	1.45	1.0	1.2	1.4	1.7	1.9	2.2
88	1.47	0.9	1.2	1.4	1.7	1.9	2.1
89	1.48	0.9	1.2	1.4	1.7	1.9	2.1
90	1.50	0.9	1.2	1.4	1.7	1.9	2.1

Rainfall Intensity/Duration/Frequency Relationship for Connecticut (English Units)
Table B-2.1 continued

		RAINFALL INTENSITY (in/hr)					
DURATION	DURATION	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
91	1.52	0.9	1.2	1.4	1.7	1.9	2.1
92	1.53	0.9	1.2	1.4	1.7	1.9	2.1
93	1.55	0.9	1.2	1.4	1.7	1.9	2.1
94	1.57	0.9	1.2	1.4	1.6	1.8	2.1
95	1.58	0.9	1.2	1.4	1.6	1.8	2.0
96	1.60	0.9	1.2	1.4	1.6	1.8	2.0
97	1.62	0.9	1.2	1.3	1.6	1.8	2.0
98	1.63	0.9	1.1	1.3	1.6	1.8	2.0
99	1.65	0.9	1.1	1.3	1.6	1.8	2.0
100	1.67	0.9	1.1	1.3	1.6	1.8	2.0
101	1.68	0.9	1.1	1.3	1.6	1.8	2.0
102	1.70	0.9	1.1	1.3	1.6	1.7	1.9
103	1.72	0.9	1.1	1.3	1.5	1.7	1.9
104	1.73	0.8	1.1	1.3	1.5	1.7	1.9
105	1.75	0.8	1.1	1.3	1.5	1.7	1.9
106	1.77	0.8	1.1	1.3	1.5	1.7	1.9
107	1.78	0.8	1.1	1.3	1.5	1.7	1.9
108	1.80	0.8	1.1	1.2	1.5	1.7	1.9
109	1.82	0.8	1.1	1.2	1.5	1.7	1.9
110	1.83	0.8	1.1	1.2	1.5	1.7	1.8
111	1.85	0.8	1.1	1.2	1.5	1.6	1.8
112	1.87	0.8	1.0	1.2	1.5	1.6	1.8
113	1.88	0.8	1.0	1.2	1.4	1.6	1.8
114	1.90	0.8	1.0	1.2	1.4	1.6	1.8
115	1.92	0.8	1.0	1.2	1.4	1.6	1.8
116	1.93	0.8	1.0	1.2	1.4	1.6	1.8
117	1.95	0.8	1.0	1.2	1.4	1.6	1.8
118	1.97	0.8	1.0	1.2	1.4	1.6	1.8
119	1.98	0.8	1.0	1.2	1.4	1.6	1.7
120	2.00	0.8	1.0	1.2	1.4	1.6	1.7

Rainfall Intensity/Duration/Frequency Relationship for Connecticut (English Units)
Table B-2.1 continued

DURATION	DURATION	RAINFALL INTENSITY (in/hr)					
		2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
121	2.02	0.8	1.0	1.2	1.4	1.6	1.7
122	2.03	0.8	1.0	1.1	1.4	1.5	1.7
123	2.05	0.8	1.0	1.1	1.4	1.5	1.7
124	2.07	0.7	1.0	1.1	1.4	1.5	1.7
125	2.08	0.7	1.0	1.1	1.3	1.5	1.7
126	2.10	0.7	1.0	1.1	1.3	1.5	1.7
127	2.12	0.7	1.0	1.1	1.3	1.5	1.7
128	2.13	0.7	1.0	1.1	1.3	1.5	1.7
129	2.15	0.7	0.9	1.1	1.3	1.5	1.6
130	2.17	0.7	0.9	1.1	1.3	1.5	1.6
131	2.18	0.7	0.9	1.1	1.3	1.5	1.6
132	2.20	0.7	0.9	1.1	1.3	1.5	1.6
133	2.22	0.7	0.9	1.1	1.3	1.4	1.6
134	2.23	0.7	0.9	1.1	1.3	1.4	1.6
135	2.25	0.7	0.9	1.1	1.3	1.4	1.6
136	2.27	0.7	0.9	1.1	1.3	1.4	1.6
137	2.28	0.7	0.9	1.1	1.3	1.4	1.6
138	2.30	0.7	0.9	1.0	1.3	1.4	1.6
139	2.32	0.7	0.9	1.0	1.2	1.4	1.6
140	2.33	0.7	0.9	1.0	1.2	1.4	1.6
141	2.35	0.7	0.9	1.0	1.2	1.4	1.5
142	2.37	0.7	0.9	1.0	1.2	1.4	1.5
143	2.38	0.7	0.9	1.0	1.2	1.4	1.5
144	2.40	0.7	0.9	1.0	1.2	1.4	1.5
145	2.42	0.7	0.9	1.0	1.2	1.4	1.5
146	2.43	0.7	0.9	1.0	1.2	1.4	1.5
147	2.45	0.7	0.9	1.0	1.2	1.3	1.5
148	2.47	0.7	0.9	1.0	1.2	1.3	1.5
149	2.48	0.7	0.9	1.0	1.2	1.3	1.5
150	2.50	0.6	0.8	1.0	1.2	1.3	1.5

Rainfall Intensity/Duration/Frequency Relationship for Connecticut (English Units)
Table B-2.1 continued

		RAINFALL INTENSITY (in/hr)					
DURATION	DURATION	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
151	2.52	0.6	0.8	1.0	1.2	1.3	1.5
152	2.53	0.6	0.8	1.0	1.2	1.3	1.5
153	2.55	0.6	0.8	1.0	1.2	1.3	1.5
154	2.57	0.6	0.8	1.0	1.2	1.3	1.4
155	2.58	0.6	0.8	1.0	1.1	1.3	1.4
156	2.60	0.6	0.8	1.0	1.1	1.3	1.4
157	2.62	0.6	0.8	1.0	1.1	1.3	1.4
158	2.63	0.6	0.8	0.9	1.1	1.3	1.4
159	2.65	0.6	0.8	0.9	1.1	1.3	1.4
160	2.67	0.6	0.8	0.9	1.1	1.3	1.4
161	2.68	0.6	0.8	0.9	1.1	1.3	1.4
162	2.70	0.6	0.8	0.9	1.1	1.3	1.4
163	2.72	0.6	0.8	0.9	1.1	1.2	1.4
164	2.73	0.6	0.8	0.9	1.1	1.2	1.4
165	2.75	0.6	0.8	0.9	1.1	1.2	1.4
166	2.77	0.6	0.8	0.9	1.1	1.2	1.4
167	2.78	0.6	0.8	0.9	1.1	1.2	1.4
168	2.80	0.6	0.8	0.9	1.1	1.2	1.4
169	2.82	0.6	0.8	0.9	1.1	1.2	1.3
170	2.83	0.6	0.8	0.9	1.1	1.2	1.3
171	2.85	0.6	0.8	0.9	1.1	1.2	1.3
172	2.87	0.6	0.8	0.9	1.1	1.2	1.3
173	2.88	0.6	0.8	0.9	1.1	1.2	1.3
174	2.90	0.6	0.8	0.9	1.0	1.2	1.3
175	2.92	0.6	0.8	0.9	1.0	1.2	1.3
176	2.93	0.6	0.7	0.9	1.0	1.2	1.3
177	2.95	0.6	0.7	0.9	1.0	1.2	1.3
178	2.97	0.6	0.7	0.9	1.0	1.2	1.3
179	2.98	0.6	0.7	0.9	1.0	1.2	1.3
180	3.00	0.6	0.7	0.9	1.0	1.2	1.3

Rainfall Intensity/Duration/Frequency Relationship for Connecticut (English Units)
Table B-2.1 continued

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	13.0	0.00	6.15	0.00	0.00	4.35	0.0	26.3	2.1	8.97	16.60	3.83	24	0.54	56.82	56.75	58.19	58.18	64.72	58.00	Sta. 223+00 LT
2	1	50.0	0.00	6.15	0.00	0.00	4.35	0.0	26.1	2.1	9.03	15.99	3.68	24	0.50	57.07	56.82	58.44	58.39	64.56	64.72	Sta 222+50
3	2	225.0	0.00	5.86	0.00	0.00	4.09	0.0	24.8	2.1	8.76	16.03	4.13	24	0.50	58.20	57.07	59.25	58.80	63.91	64.56	Sta 220+20
4	3	10.0	0.19	0.19	0.90	0.17	0.17	5.0	5.0	4.6	0.78	7.43	0.47	18	0.50	58.75	58.70	60.09	60.09	63.34	63.91	Sta. 220+20 RT
5	3	266.0	0.00	5.32	0.00	0.00	3.61	0.0	23.1	2.2	8.05	15.99	3.88	24	0.50	59.53	58.20	60.54	60.00	65.15	63.91	Sta. 217+50
6	5	10.0	0.32	5.32	0.90	0.29	3.61	5.0	23.0	2.2	8.06	15.99	2.93	24	0.50	59.58	59.53	61.20	61.19	65.00	65.15	Sta 217+50 LT
7	6	294.0	0.13	5.00	0.90	0.12	3.32	5.0	21.1	2.4	7.81	15.99	3.78	24	0.50	61.05	59.58	62.04	61.44	66.07	65.00	Sta. 214+50 LT
8	7	21.0	4.54	4.54	0.64	2.91	2.91	20.0	20.0	2.4	7.05	45.24	3.58	24	4.00	61.89	61.05	62.83	62.94	64.26	66.07	Sta. 214+50 LT
9	7	246.0	0.11	0.33	0.90	0.10	0.30	5.0	18.2	2.6	0.76	2.52	1.93	12	0.50	63.28	62.05	63.65	63.00	67.63	66.07	Sta. 212+00 LT
10	9	296.0	0.11	0.22	0.90	0.10	0.20	5.0	13.5	3.0	0.60	2.52	2.11	12	0.50	64.76	63.28	65.09	63.77	69.30	67.63	Sta. 209+00 LT
11	10	296.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	4.6	0.45	2.52	1.92	12	0.50	66.24	64.76	66.53	65.19	70.96	69.30	Sta. 206+00 LT
12	3	10.0	0.35	0.35	0.90	0.32	0.32	5.0	5.0	4.6	1.45	7.43	0.86	18	0.50	58.75	58.70	60.08	60.08	63.34	63.91	Sta 220+20 LT
13	2	10.0	0.19	0.19	0.90	0.17	0.17	5.0	5.0	4.6	0.78	2.52	2.39	12	0.50	58.50	58.45	58.92	58.91	63.99	64.56	Sta 222+50 LT
14	2	10.0	0.10	0.10	0.90	0.09	0.09	5.0	5.0	4.6	0.41	2.52	1.41	12	0.50	58.50	58.45	58.88	58.88	63.99	64.56	Sta 222+50 RT

SYSTEM NO. 1A | Number of lines: 14 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	13.0	0.00	6.15	0.00	0.00	4.35	0.0	23.7	3.2	13.94	16.60	5.83	24	0.54	56.82	56.75	58.24	58.18	64.72	58.00	Sta. 223+00 LT
2	1	50.0	0.00	6.15	0.00	0.00	4.35	0.0	23.5	3.2	14.01	15.99	4.71	24	0.50	57.07	56.82	58.82	58.68	64.56	64.72	Sta 222+50
3	2	225.0	0.00	5.86	0.00	0.00	4.09	0.0	22.6	3.3	13.45	16.03	4.43	24	0.50	58.20	57.07	59.96	59.25	63.91	64.56	Sta 220+20
4	3	10.0	0.19	0.19	0.90	0.17	0.17	5.0	5.0	6.0	1.02	7.43	0.58	18	0.50	58.75	58.70	60.61	60.61	63.34	63.91	Sta. 220+20 RT
5	3	266.0	0.00	5.32	0.00	0.00	3.61	0.0	21.5	3.4	12.19	15.99	4.25	24	0.50	59.53	58.20	61.09	60.38	65.15	63.91	Sta. 217+50
6	5	10.0	0.32	5.32	0.90	0.29	3.61	5.0	21.4	3.4	12.20	15.99	3.90	24	0.50	59.58	59.53	61.53	61.51	65.00	65.15	Sta 217+50 LT
7	6	294.0	0.13	5.00	0.90	0.12	3.32	5.0	20.1	3.5	11.61	15.99	4.02	24	0.50	61.05	59.58	62.63	61.92	66.07	65.00	Sta. 214+50 LT
8	7	21.0	4.54	4.54	0.64	2.91	2.91	20.0	20.0	3.5	10.19	45.24	4.40	24	4.00	61.89	61.05	63.02	63.21	64.26	66.07	Sta. 214+50 LT
9	7	246.0	0.11	0.33	0.90	0.10	0.30	5.0	15.1	4.0	1.20	2.52	2.15	12	0.50	63.28	62.05	63.82	63.33	67.63	66.07	Sta. 212+00 LT
10	9	296.0	0.11	0.22	0.90	0.10	0.20	5.0	11.5	4.5	0.90	2.52	2.29	12	0.50	64.76	63.28	65.16	63.98	69.30	67.63	Sta. 209+00 LT
11	10	296.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	6.0	0.59	2.52	2.02	12	0.50	66.24	64.76	66.57	65.30	70.96	69.30	Sta. 206+00 LT
12	3	10.0	0.35	0.35	0.90	0.32	0.32	5.0	5.0	6.0	1.89	7.43	1.07	18	0.50	58.75	58.70	60.60	60.60	63.34	63.91	Sta 220+20 LT
13	2	10.0	0.19	0.19	0.90	0.17	0.17	5.0	5.0	6.0	1.02	2.52	1.30	12	0.50	58.50	58.45	59.52	59.51	63.99	64.56	Sta 222+50 LT
14	2	10.0	0.10	0.10	0.90	0.09	0.09	5.0	5.0	6.0	0.54	2.52	0.69	12	0.50	58.50	58.45	59.53	59.53	63.99	64.56	Sta 222+50 RT

SYSTEM NO. 1A | Number of lines: 14 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	13.0	0.00	6.15	0.00	0.00	4.35	0.0	22.6	4.7	20.65	16.60	7.28	24	0.54	56.82	56.75	58.62	58.36	64.72	58.00	Sta. 223+00 LT
2	1	50.0	0.00	6.15	0.00	0.00	4.35	0.0	22.4	4.8	20.71	15.99	6.59	24	0.50	57.07	56.82	59.41	58.99	64.56	64.72	Sta 222+50
3	2	225.0	0.00	5.86	0.00	0.00	4.09	0.0	21.8	4.8	19.73	16.03	6.28	24	0.50	58.20	57.07	61.86	60.15	63.91	64.56	Sta 220+20
4	3	10.0	0.19	0.19	0.90	0.17	0.17	5.0	5.0	7.8	1.33	7.43	0.75	18	0.50	58.75	58.70	63.08	63.08	63.34	63.91	Sta. 220+20 RT
5	3	266.0	0.00	5.32	0.00	0.00	3.61	0.0	21.0	4.9	17.69	15.99	5.63	24	0.50	59.53	58.20	64.22	62.59	65.15	63.91	Sta. 217+50
6	5	10.0	0.32	5.32	0.90	0.29	3.61	5.0	21.0	4.9	17.71	15.99	5.64	24	0.50	59.58	59.53	64.77	64.71	65.00	65.15	Sta 217+50 LT
7	6	294.0	0.13	5.00	0.90	0.12	3.32	5.0	20.1	5.0	16.64	15.99	5.30	24	0.50	61.05	59.58	67.16	65.57	66.07	65.00	Sta. 214+50 LT
8	7	21.0	4.54	4.54	0.64	2.91	2.91	20.0	20.0	5.0	14.59	45.24	4.64	24	4.00	61.89	61.05	68.01	67.92	64.26	66.07	Sta. 214+50 LT
9	7	246.0	0.11	0.33	0.90	0.10	0.30	5.0	12.7	6.0	1.80	2.52	2.29	12	0.50	63.28	62.05	68.80	68.17	67.63	66.07	Sta. 212+00 LT
10	9	296.0	0.11	0.22	0.90	0.10	0.20	5.0	10.0	6.5	1.30	2.52	1.65	12	0.50	64.76	63.28	69.27	68.88	69.30	67.63	Sta. 209+00 LT
11	10	296.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	7.8	0.77	2.52	0.98	12	0.50	66.24	64.76	69.46	69.32	70.96	69.30	Sta. 206+00 LT
12	3	10.0	0.35	0.35	0.90	0.32	0.32	5.0	5.0	7.8	2.46	7.43	1.39	18	0.50	58.75	58.70	63.06	63.06	63.34	63.91	Sta 220+20 LT
13	2	10.0	0.19	0.19	0.90	0.17	0.17	5.0	5.0	7.8	1.33	2.52	1.70	12	0.50	58.50	58.45	60.73	60.72	63.99	64.56	Sta 222+50 LT
14	2	10.0	0.10	0.10	0.90	0.09	0.09	5.0	5.0	7.8	0.70	2.52	0.89	12	0.50	58.50	58.45	60.75	60.75	63.99	64.56	Sta 222+50 RT

SYSTEM NO. 1A

Number of lines: 14

Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	165.0	0.35	0.53	0.90	0.32	0.48	5.0	5.7	4.4	2.09	6.46	2.74	15	1.00	58.38	56.73	58.96	58.18	64.88	65.48	Sta. 225+25 LT
2	1	25.0	0.18	0.18	0.90	0.16	0.16	5.0	5.0	4.6	0.74	4.66	2.72	15	0.52	60.50	60.37	60.85	60.71	64.88	64.88	Sta. 225+25 RT

SYSTEM NO. 1B

Number of lines: 2

Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	165.0	0.35	0.53	0.90	0.32	0.48	5.0	5.5	5.8	2.78	6.46	3.22	15	1.00	58.38	56.73	59.05	58.18	64.88	65.48	Sta. 225+25 LT
2	1	25.0	0.18	0.18	0.90	0.16	0.16	5.0	5.0	6.0	0.97	4.66	2.94	15	0.52	60.50	60.37	60.90	60.76	64.88	64.88	Sta. 225+25 RT

SYSTEM NO. 1B

Number of lines: 2

Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	165.0	0.35	0.53	0.90	0.32	0.48	5.0	5.4	7.7	3.66	6.46	3.81	15	1.00	58.38	56.73	59.15	58.18	64.88	65.48	Sta. 225+25 LT
2	1	25.0	0.18	0.18	0.90	0.16	0.16	5.0	5.0	7.8	1.26	4.66	3.19	15	0.52	60.50	60.37	60.95	60.81	64.88	64.88	Sta. 225+25 RT

SYSTEM NO. 1B | Number of lines: 2 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	130.0	0.23	0.65	0.90	0.21	0.59	5.0	9.8	3.5	2.06	7.43	2.79	18	0.50	61.52	60.87	62.07	61.70	66.49	65.88	Sta 230+25 LT
2	1	25.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	4.6	0.58	2.57	2.63	12	0.52	62.15	62.02	62.47	62.34	66.49	66.49	Sta 230+25 RT
3	1	346.0	0.17	0.28	0.90	0.15	0.25	5.0	5.8	4.4	1.10	2.52	3.09	12	0.50	63.75	62.02	64.21	62.48	68.83	66.49	Sta. 233+75 LT
4	3	29.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	4.6	0.45	2.56	0.74	12	0.52	63.90	63.75	64.57	64.57	68.89	68.83	Sta. 233+75 RT

SYSTEM NO. 1C | Number of lines: 4 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Stor[illegible]Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	130.0	0.23	0.65	0.90	0.21	0.59	5.0	8.7	5.1	2.96	7.43	3.47	18	0.50	61.52	60.87	62.18	61.70	66.49	65.88	Sta 230+25 LT
2	1	25.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	6.0	0.75	2.57	2.76	12	0.52	62.15	62.02	62.52	62.41	66.49	66.49	Sta 230+25 RT
3	1	346.0	0.17	0.28	0.90	0.15	0.25	5.0	5.6	5.8	1.46	2.52	3.32	12	0.50	63.75	62.02	64.30	62.57	68.83	66.49	Sta. 233+75 LT
4	3	29.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	6.0	0.59	2.56	0.82	12	0.52	63.90	63.75	64.71	64.70	68.89	68.83	Sta. 233+75 RT

SYSTEM NO. 1C | Number of lines: 4 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	130.0	0.23	0.65	0.90	0.21	0.59	5.0	7.8	7.0	4.12	7.43	4.28	18	0.50	61.52	60.87	62.30	61.70	66.49	65.88	Sta 230+25 LT
2	1	25.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	7.8	0.98	2.57	1.29	12	0.52	62.15	62.02	63.05	63.03	66.49	66.49	Sta 230+25 RT
3	1	346.0	0.17	0.28	0.90	0.15	0.25	5.0	5.5	7.6	1.93	2.52	3.17	12	0.50	63.75	62.02	64.36	62.97	68.83	66.49	Sta. 233+75 LT
4	3	29.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	7.8	0.77	2.56	0.98	12	0.52	63.90	63.75	64.93	64.92	68.89	68.83	Sta. 233+75 RT

SYSTEM NO. 1C

Number of lines: 4

Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	48.0	0.00	2.00	0.00	0.00	1.57	0.0	24.5	2.2	3.37	43.33	3.32	20 23 e	6.71	59.70	56.48	60.28	57.34	66.91	66.20	Sta 230+78 RT
2	1	29.0	0.00	2.00	0.00	0.00	1.57	0.0	24.0	2.2	3.41	15.77	2.07	19 30 e	0.52	59.85	59.70	60.64	60.56	68.00	66.91	Sta 230+78 LT (
3	2	141.0	0.00	2.00	0.00	0.00	1.57	0.0	22.9	2.2	3.51	7.45	4.16	18	0.50	61.53	60.82	62.25	61.54	68.00	68.00	Sta 232+24 LT (
4	3	225.0	0.00	2.00	0.00	0.00	1.57	0.0	21.2	2.3	3.68	7.44	3.68	18	0.50	62.66	61.53	63.39	62.50	68.00	68.00	Sta 234+53 LT (
5	4	69.0	0.00	1.88	0.00	0.00	1.48	0.0	17.9	2.6	3.83	7.48	3.80	18	0.51	63.01	62.66	63.76	63.61	70.00	68.00	Sta 235+27 LT
6	5	29.0	0.08	1.88	0.90	0.07	1.48	5.0	17.7	2.6	3.85	10.50	4.91	18	1.00	64.28	63.99	65.03	64.62	69.85	70.00	Sta 601+75 RT
7	6	76.0	0.03	1.20	0.90	0.03	0.87	5.0	10.1	3.5	3.01	6.46	3.39	15	1.00	65.29	64.53	65.98	65.73	69.45	69.85	Sta 602+50 RT
8	7	21.0	1.17	1.17	0.72	0.84	0.84	10.0	10.0	3.5	2.94	6.46	3.68	15	1.00	65.50	65.29	66.19	66.18	69.45	69.45	Sta 602+50 LT
9	6	34.2	0.12	0.60	0.90	0.11	0.54	5.0	17.4	2.6	1.42	6.40	3.75	15	3.07	67.52	66.47	68.00	66.87	71.00	69.85	EXIST. YARD DR
10	9	290.0	0.12	0.48	0.90	0.11	0.43	5.0	13.9	3.0	1.28	4.33	2.63	15	1.41	71.60	67.52	72.05	68.15	74.30	71.00	Exist Chapman C
11	10	25.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	4.6	0.50	4.00	1.28	15	1.20	71.90	71.60	72.26	72.21	74.30	74.30	Exist Chapman C
12	10	380.0	0.12	0.24	0.90	0.11	0.22	5.0	6.0	4.3	0.93	3.30	2.15	15	0.82	74.70	71.60	75.10	72.20	77.60	74.30	Exist Chapman C
13	12	25.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	4.6	0.50	4.00	1.26	15	1.20	75.00	74.70	75.36	75.32	77.60	77.60	Exist Chapman C
14	4	8.0	0.12	0.12	0.70	0.08	0.08	20.0	20.0	2.4	0.20	7.27	1.79	18	1.50	64.50	64.38	64.67	64.55	69.00	68.00	Sta 234+53 LT

SYSTEM NO. 2 | Number of lines: 14 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	48.0	0.00	2.00	0.00	0.00	1.57	0.0	23.1	3.3	5.09	43.33	4.12	20 23 e	6.71	59.70	56.48	60.45	57.34	66.91	66.20	Sta 230+78 RT
2	1	29.0	0.00	2.00	0.00	0.00	1.57	0.0	22.8	3.3	5.12	15.77	2.43	19 30 e	0.52	59.85	59.70	60.80	60.78	68.00	66.91	Sta 230+78 LT (
3	2	141.0	0.00	2.00	0.00	0.00	1.57	0.0	22.0	3.3	5.22	7.45	4.57	18	0.50	61.53	60.82	62.45	61.75	68.00	68.00	Sta 232+24 LT (
4	3	225.0	0.00	2.00	0.00	0.00	1.57	0.0	20.8	3.4	5.38	7.44	4.31	18	0.50	62.66	61.53	63.55	62.68	68.00	68.00	Sta 234+53 LT (
5	4	69.0	0.00	1.88	0.00	0.00	1.48	0.0	14.8	4.1	6.03	7.48	3.59	18	0.51	63.01	62.66	64.30	64.12	70.00	68.00	Sta 235+27 LT
6	5	29.0	0.08	1.88	0.90	0.07	1.48	5.0	14.6	4.1	6.06	10.50	5.67	18	1.00	64.28	63.99	65.22	64.81	69.85	70.00	Sta 601+75 RT
7	6	76.0	0.03	1.20	0.90	0.03	0.87	5.0	10.1	4.8	4.16	6.46	3.45	15	1.00	65.29	64.53	66.45	66.17	69.45	69.85	Sta 602+50 RT
8	7	21.0	1.17	1.17	0.72	0.84	0.84	10.0	10.0	4.8	4.05	6.46	3.30	15	1.00	65.50	65.29	66.84	66.76	69.45	69.45	Sta 602+50 LT
9	6	34.2	0.12	0.60	0.90	0.11	0.54	5.0	14.4	4.1	2.23	6.40	4.29	15	3.07	67.52	66.47	68.12	66.98	71.00	69.85	EXIST. YARD DR
10	9	290.0	0.12	0.48	0.90	0.11	0.43	5.0	11.8	4.5	1.94	4.33	3.02	15	1.41	71.60	67.52	72.16	68.31	74.30	71.00	Exist Chapman C
11	10	25.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	6.0	0.65	4.00	1.30	15	1.20	71.90	71.60	72.34	72.30	74.30	74.30	Exist Chapman C
12	10	380.0	0.12	0.24	0.90	0.11	0.22	5.0	5.8	5.8	1.24	3.30	2.28	15	0.82	74.70	71.60	75.17	72.35	77.60	74.30	Exist Chapman C
13	12	25.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	6.0	0.65	4.00	1.15	15	1.20	75.00	74.70	75.48	75.46	77.60	77.60	Exist Chapman C
14	4	8.0	0.12	0.12	0.70	0.08	0.08	20.0	20.0	3.5	0.29	7.27	1.99	18	1.50	64.50	64.38	64.71	64.59	69.00	68.00	Sta 234+53 LT

SYSTEM NO. 2 | Number of lines: 14 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	48.0	0.00	2.00	0.00	0.00	1.57	0.0	22.1	4.8	7.49	43.33	5.32	20 23 e	6.71	59.70	56.48	60.62	57.40	66.91	66.20	Sta 230+78 RT
2	1	29.0	0.00	2.00	0.00	0.00	1.57	0.0	21.9	4.8	7.52	15.77	2.70	19 30 e	0.52	59.85	59.70	61.12	61.06	68.00	66.91	Sta 230+78 LT (
3	2	141.0	0.00	2.00	0.00	0.00	1.57	0.0	21.4	4.9	7.61	7.45	4.80	18	0.50	61.53	60.82	62.79	62.08	68.00	68.00	Sta 232+24 LT (
4	3	225.0	0.00	2.00	0.00	0.00	1.57	0.0	20.6	5.0	7.76	7.44	4.66	18	0.50	62.66	61.53	63.97	62.90	68.00	68.00	Sta 234+53 LT (
5	4	69.0	0.00	1.88	0.00	0.00	1.48	0.0	12.4	6.1	9.02	7.48	5.11	18	0.51	63.01	62.66	64.83	64.32	70.00	68.00	Sta 235+27 LT
6	5	29.0	0.08	1.88	0.90	0.07	1.48	5.0	12.4	6.1	9.05	10.50	6.04	18	1.00	64.28	63.99	65.43	65.21	69.85	70.00	Sta 601+75 RT
7	6	76.0	0.03	1.20	0.90	0.03	0.87	5.0	10.1	6.5	5.68	6.46	5.21	15	1.00	65.29	64.53	66.24	65.70	69.45	69.85	Sta 602+50 RT
8	7	21.0	1.17	1.17	0.72	0.84	0.84	10.0	10.0	6.6	5.52	6.46	5.05	15	1.00	65.50	65.29	66.47	66.43	69.45	69.45	Sta 602+50 LT
9	6	34.2	0.12	0.60	0.90	0.11	0.54	5.0	12.2	6.1	3.32	6.40	4.86	15	3.07	67.52	66.47	68.25	67.11	71.00	69.85	EXIST. YARD DR
10	9	290.0	0.12	0.48	0.90	0.11	0.43	5.0	10.2	6.5	2.81	4.33	3.49	15	1.41	71.60	67.52	72.27	68.48	74.30	71.00	Exist Chapman C
11	10	25.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	7.8	0.84	4.00	1.13	15	1.20	71.90	71.60	72.52	72.50	74.30	74.30	Exist Chapman C
12	10	380.0	0.12	0.24	0.90	0.11	0.22	5.0	5.6	7.6	1.65	3.30	2.42	15	0.82	74.70	71.60	75.25	72.52	77.60	74.30	Exist Chapman C
13	12	25.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	7.8	0.84	4.00	1.15	15	1.20	75.00	74.70	75.61	75.59	77.60	77.60	Exist Chapman C
14	4	8.0	0.12	0.12	0.70	0.08	0.08	20.0	20.0	5.0	0.42	7.27	1.97	18	1.50	64.50	64.38	64.75	64.67	69.00	68.00	Sta 234+53 LT

SYSTEM NO. 2 | Number of lines: 14 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	86.0	0.10	12.28	0.90	0.09	9.84	5.0	34.5	1.7	17.11	102.0	4.60	36	2.34	52.89	50.88	54.21	52.85	65.39	50.00	Existing
2	1	150.0	0.10	12.18	0.90	0.09	9.75	5.0	33.5	1.8	17.29	138.7	4.91	36	4.33	59.38	52.89	60.71	54.62	68.18	65.39	Existing
3	2	82.0	0.00	12.08	0.00	0.00	9.66	0.0	32.9	1.8	17.32	123.9	4.90	36	3.45	62.21	59.38	63.54	61.12	70.00	68.18	Existing
4	3	38.0	0.00	12.08	0.00	0.00	9.66	0.0	32.8	1.8	17.36	15.13	5.52	24	0.45	62.48	62.31	64.53	64.31	70.00	70.00	Existing (Tie In)
5	4	62.0	0.00	1.08	0.00	0.00	0.97	0.0	15.3	2.8	2.74	15.20	0.87	24	0.45	63.23	62.95	65.41	65.40	70.00	70.00	Sta 239+75
6	5	10.0	0.43	0.43	0.90	0.39	0.39	5.0	5.0	4.6	1.78	4.57	3.48	15	0.50	65.88	65.83	66.42	66.37	70.00	70.00	Sta 239+75 LT
7	5	34.0	0.39	0.39	0.90	0.35	0.35	5.0	5.0	4.6	1.61	4.57	3.39	15	0.50	66.00	65.83	66.51	66.34	70.00	70.00	Sta 239+75 RT
8	5	331.0	0.00	0.26	0.00	0.00	0.23	0.0	6.1	4.3	1.00	7.41	1.47	18	0.50	65.38	63.73	65.81	65.43	70.84	70.00	Sta 243+15
9	8	10.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	4.6	0.58	2.52	2.61	12	0.50	65.94	65.89	66.26	66.22	70.27	70.84	Sta 243+15 LT
10	8	41.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	4.6	0.50	2.55	2.50	12	0.51	66.10	65.89	66.40	66.19	70.39	70.84	Sta 243+15 RT
11	4	235.0	11.00	11.00	0.79	8.69	8.69	32.0	32.0	1.8	15.85	15.58	5.65	24	1.12	66.10	63.46	67.77	65.13	75.30	70.00	Existing Chapma

SYSTEM NO. 3 | Number of lines: 11 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	86.0	0.10	12.28	0.90	0.09	9.84	5.0	33.7	2.6	25.71	102.0	5.92	36	2.34	52.89	50.88	54.51	52.85	65.39	50.00	Existing
2	1	150.0	0.10	12.18	0.90	0.09	9.75	5.0	33.0	2.6	25.80	138.7	5.77	36	4.33	59.38	52.89	61.00	54.98	68.18	65.39	Existing
3	2	82.0	0.00	12.08	0.00	0.00	9.66	0.0	32.6	2.7	25.74	123.9	5.75	36	3.45	62.21	59.38	63.83	61.48	70.00	68.18	Existing
4	3	38.0	0.00	12.08	0.00	0.00	9.66	0.0	32.5	2.7	25.78	15.13	8.21	24	0.45	62.48	62.31	64.80	64.31	70.00	70.00	Existing (Tie In)
5	4	62.0	0.00	1.08	0.00	0.00	0.97	0.0	12.9	4.3	4.21	15.20	1.34	24	0.45	63.23	62.95	66.73	66.71	70.00	70.00	Sta 239+75
6	5	10.0	0.43	0.43	0.90	0.39	0.39	5.0	5.0	6.0	2.32	4.57	2.42	15	0.50	65.88	65.83	66.77	66.76	70.00	70.00	Sta 239+75 LT
7	5	34.0	0.39	0.39	0.90	0.35	0.35	5.0	5.0	6.0	2.10	4.57	2.37	15	0.50	66.00	65.83	66.78	66.76	70.00	70.00	Sta 239+75 RT
8	5	331.0	0.00	0.26	0.00	0.00	0.23	0.0	5.8	5.7	1.35	7.41	0.77	18	0.50	65.38	63.73	66.83	66.78	70.84	70.00	Sta 243+15
9	8	10.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	6.0	0.75	2.52	0.99	12	0.50	65.94	65.89	66.84	66.84	70.27	70.84	Sta 243+15 LT
10	8	41.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	6.0	0.65	2.55	0.93	12	0.51	66.10	65.89	66.85	66.84	70.39	70.84	Sta 243+15 RT
11	4	235.0	11.00	11.00	0.79	8.69	8.69	32.0	32.0	2.7	23.42	15.58	7.45	24	1.12	66.10	63.46	71.84	65.88	75.30	70.00	Existing Chapma

SYSTEM NO. 3 | Number of lines: 11 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	86.0	0.10	12.28	0.90	0.09	9.84	5.0	33.1	3.9	38.20	102.0	7.76	36	2.34	52.89	50.88	54.86	52.85	65.39	50.00	Existing
2	1	150.0	0.10	12.18	0.90	0.09	9.75	5.0	32.7	3.9	38.16	138.7	6.96	36	4.33	59.38	52.89	61.35	55.34	68.18	65.39	Existing
3	2	82.0	0.00	12.08	0.00	0.00	9.66	0.0	32.4	3.9	37.97	123.9	6.94	36	3.45	62.21	59.38	64.17	61.84	70.00	68.18	Existing
4	3	38.0	0.00	12.08	0.00	0.00	9.66	0.0	32.4	3.9	38.01	15.13	12.10	24	0.45	62.48	62.31	65.38	64.31	70.00	70.00	Existing (Tie In)
5	4	62.0	0.00	1.08	0.00	0.00	0.97	0.0	11.0	6.3	6.17	15.20	1.96	24	0.45	63.23	62.95	69.58	69.53	70.00	70.00	Sta 239+75
6	5	10.0	0.43	0.43	0.90	0.39	0.39	5.0	5.0	7.8	3.02	4.57	2.46	15	0.50	65.88	65.83	69.66	69.64	70.00	70.00	Sta 239+75 LT
7	5	34.0	0.39	0.39	0.90	0.35	0.35	5.0	5.0	7.8	2.74	4.57	2.23	15	0.50	66.00	65.83	69.70	69.64	70.00	70.00	Sta 239+75 RT
8	5	331.0	0.00	0.26	0.00	0.00	0.23	0.0	5.6	7.6	1.78	7.41	1.01	18	0.50	65.38	63.73	69.78	69.68	70.84	70.00	Sta 243+15
9	8	10.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	7.8	0.98	2.52	1.25	12	0.50	65.94	65.89	69.80	69.79	70.27	70.84	Sta 243+15 LT
10	8	41.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	7.8	0.84	2.55	1.07	12	0.51	66.10	65.89	69.82	69.79	70.39	70.84	Sta 243+15 RT
11	4	235.0	11.00	11.00	0.79	8.69	8.69	32.0	32.0	4.0	34.39	15.58	10.95	24	1.12	66.10	63.46	80.59	67.73	75.30	70.00	Existing Chapma

SYSTEM NO. 3 | Number of lines: 11 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Appendix

Runoff Coefficients (C)

Description of Area	Coefficient
Business:	
Central business	0.70 - 0.95
District and local	0.50 - 0.70
Residential:	
Single family	0.35 - 0.45
Multi-units	0.40 - 0.75
1/2 acre lots or larger	0.25 - 0.40
Industrial:	
Light	0.50 - 0.80
Heavy	0.60 - 0.90
Parks, cemeteries	0.10 - 0.25
Playgrounds	0.20 - 0.35
Railroad yards	0.20 - 0.40
Unimproved	0.10 - 0.30
Asphaltic	0.70 - 0.95
Concrete	0.80 - 0.95
Roofs	0.75 - 0.95

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	27.0	0.15	0.47	0.90	0.14	0.42	5.0	6.8	5.5	2.32	2.56	3.68	12	0.52	60.86	60.72	61.61	61.47	68.34	66.00	Sta. 249+55 LT
2	1	25.0	0.02	0.32	0.90	0.02	0.29	5.0	6.6	5.5	1.59	2.57	3.44	12	0.52	63.99	63.86	64.56	64.43	69.15	68.34	Sta. 249+55 RT
3	2	201.0	0.30	0.30	0.90	0.27	0.27	5.0	5.0	6.0	1.62	2.52	2.81	12	0.50	65.00	63.99	65.56	64.96	69.42	69.15	Sta. 247+50 RT

SYSTEM NO. 4 | Number of lines: 3 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	27.0	0.15	0.47	0.90	0.14	0.42	5.0	6.4	7.4	3.13	2.56	4.50	12	0.52	60.86	60.72	61.81	61.47	68.34	66.00	Sta. 249+55 LT
2	1	25.0	0.02	0.32	0.90	0.02	0.29	5.0	6.3	7.4	2.14	2.57	3.66	12	0.52	63.99	63.86	64.69	64.56	69.15	68.34	Sta. 249+55 RT
3	2	201.0	0.30	0.30	0.90	0.27	0.27	5.0	5.0	7.8	2.10	2.52	2.93	12	0.50	65.00	63.99	65.78	65.10	69.42	69.15	Sta. 247+50 RT

SYSTEM NO. 4 | Number of lines: 3 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	184.0	0.09	1.78	0.90	0.08	1.58	5.0	34.8	1.7	2.73	15.99	3.08	24	0.50	60.26	59.34	60.85	60.08	69.79	63.58	Sta. 254+50 LT
2	1	25.0	0.09	1.69	0.90	0.08	1.50	5.0	34.4	1.7	2.61	16.31	2.70	24	0.52	60.39	60.26	61.02	61.03	69.79	69.79	Sta. 254+50 RT
3	2	246.0	0.09	1.60	0.90	0.08	1.42	5.0	30.0	1.9	2.69	15.99	2.65	24	0.50	61.62	60.39	62.20	61.38	70.54	69.79	Sta. 257+00 RT
4	3	25.0	0.09	1.51	0.90	0.08	1.34	5.0	29.6	1.9	2.56	16.31	3.62	24	0.52	62.97	62.84	63.54	63.38	70.54	70.54	Sta. 257+00 LT
5	4	246.0	0.12	1.42	0.90	0.11	1.26	5.0	26.9	2.0	2.55	7.43	3.78	18	0.50	64.70	63.47	65.31	64.08	71.29	70.54	Sta. 259+50 LT
6	5	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	2.57	2.57	12	0.52	66.50	66.37	66.81	66.68	71.29	71.29	Sta. 259+50 RT
7	5	345.0	0.12	1.17	0.90	0.11	1.03	5.0	24.0	2.2	2.25	4.57	3.18	15	0.50	66.68	64.95	67.28	65.81	72.42	71.29	Sta. 263+00 LT
8	7	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	2.57	1.59	12	0.52	67.06	66.93	67.45	67.44	72.42	72.42	Sta. 263+00 RT
9	7	346.0	0.12	0.92	0.90	0.11	0.81	5.0	20.4	2.4	1.94	4.57	3.01	15	0.50	68.41	66.68	68.97	67.47	73.39	72.42	Sta. 266+50 LT
10	9	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	2.57	1.62	12	0.52	68.79	68.66	69.18	69.17	73.39	73.39	Sta. 266+50 RT
11	9	346.0	0.13	0.56	0.90	0.12	0.50	5.0	11.6	3.2	1.64	4.57	2.82	15	0.50	70.14	68.41	70.65	69.15	74.44	73.39	Sta. 270+00 LT
12	11	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	4.66	0.93	15	0.52	70.27	70.14	70.81	70.81	74.44	74.44	Sta. 270+00 RT
13	11	346.0	0.15	0.30	0.90	0.14	0.27	5.0	5.8	4.4	1.18	4.57	2.41	15	0.50	71.87	70.14	72.30	70.82	75.49	74.44	Sta. 273+50 LT
14	13	25.0	0.15	0.15	0.90	0.14	0.14	5.0	5.0	4.6	0.62	4.47	1.51	15	0.48	71.99	71.87	72.40	72.40	75.49	75.49	Sta. 273+50 RT
15	9	5.0	0.11	0.11	0.70	0.08	0.08	20.0	20.0	2.4	0.19	2.76	0.49	12	0.60	68.69	68.66	69.16	69.16	73.00	73.39	Sta. 266+50 LT

SYSTEM NO. 5 | Number of lines: 15 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Stoı Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	184.0	0.09	1.78	0.90	0.08	1.58	5.0	30.2	2.8	4.41	15.99	4.14	24	0.50	60.26	59.34	61.00	60.08	69.79	63.58	Sta. 254+50 LT
2	1	25.0	0.09	1.69	0.90	0.08	1.50	5.0	29.9	2.8	4.21	16.31	3.03	24	0.52	60.39	60.26	61.24	61.24	69.79	69.79	Sta. 254+50 RT
3	2	246.0	0.09	1.60	0.90	0.08	1.42	5.0	26.9	3.0	4.23	15.99	3.07	24	0.50	61.62	60.39	62.35	61.64	70.54	69.79	Sta. 257+00 RT
4	3	25.0	0.09	1.51	0.90	0.08	1.34	5.0	26.6	3.0	4.01	16.31	4.14	24	0.52	62.97	62.84	63.68	63.52	70.54	70.54	Sta. 257+00 LT
5	4	246.0	0.12	1.42	0.90	0.11	1.26	5.0	24.8	3.1	3.92	7.43	4.26	18	0.50	64.70	63.47	65.47	64.25	71.29	70.54	Sta. 259+50 LT
6	5	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	2.57	2.78	12	0.52	66.50	66.37	66.86	66.73	71.29	71.29	Sta. 259+50 RT
7	5	345.0	0.12	1.17	0.90	0.11	1.03	5.0	22.7	3.3	3.38	4.57	3.70	15	0.50	66.68	64.95	67.42	66.06	72.42	71.29	Sta. 263+00 LT
8	7	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	2.57	0.89	12	0.52	67.06	66.93	68.19	68.18	72.42	72.42	Sta. 263+00 RT
9	7	346.0	0.12	0.92	0.90	0.11	0.81	5.0	20.2	3.5	2.81	4.57	3.07	15	0.50	68.41	66.68	69.13	68.12	73.39	72.42	Sta. 266+50 LT
10	9	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	2.57	0.92	12	0.52	68.79	68.66	69.69	69.68	73.39	73.39	Sta. 266+50 RT
11	9	346.0	0.13	0.56	0.90	0.12	0.50	5.0	10.0	4.8	2.42	4.57	2.97	15	0.50	70.14	68.41	70.76	69.64	74.44	73.39	Sta. 270+00 LT
12	11	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	4.66	0.88	15	0.52	70.27	70.14	70.98	70.98	74.44	74.44	Sta. 270+00 RT
13	11	346.0	0.15	0.30	0.90	0.14	0.27	5.0	5.6	5.8	1.57	4.57	2.60	15	0.50	71.87	70.14	72.37	70.98	75.49	74.44	Sta. 273+50 LT
14	13	25.0	0.15	0.15	0.90	0.14	0.14	5.0	5.0	6.0	0.81	4.47	1.52	15	0.48	71.99	71.87	72.50	72.50	75.49	75.49	Sta. 273+50 RT
15	9	5.0	0.11	0.11	0.70	0.08	0.08	20.0	20.0	3.5	0.27	2.76	0.34	12	0.60	68.69	68.66	69.70	69.70	73.00	73.39	Sta. 266+50 LT

SYSTEM NO. 5 | Number of lines: 15 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	184.0	0.09	1.78	0.90	0.08	1.58	5.0	27.0	4.3	6.84	15.99	4.81	24	0.50	60.26	59.34	61.19	60.27	69.79	63.58	Sta. 254+50 LT
2	1	25.0	0.09	1.69	0.90	0.08	1.50	5.0	26.8	4.3	6.52	16.31	3.49	24	0.52	60.39	60.26	61.48	61.48	69.79	69.79	Sta. 254+50 RT
3	2	246.0	0.09	1.60	0.90	0.08	1.42	5.0	24.8	4.5	6.42	15.99	3.57	24	0.50	61.62	60.39	62.52	61.95	70.54	69.79	Sta. 257+00 RT
4	3	25.0	0.09	1.51	0.90	0.08	1.34	5.0	24.6	4.5	6.08	16.31	4.69	24	0.52	62.97	62.84	63.85	63.69	70.54	70.54	Sta. 257+00 LT
5	4	246.0	0.12	1.42	0.90	0.11	1.26	5.0	23.3	4.7	5.86	7.43	4.65	18	0.50	64.70	63.47	65.69	64.49	71.29	70.54	Sta. 259+50 LT
6	5	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	2.57	2.99	12	0.52	66.50	66.37	66.91	66.78	71.29	71.29	Sta. 259+50 RT
7	5	345.0	0.12	1.17	0.90	0.11	1.03	5.0	21.9	4.8	4.96	4.57	4.04	15	0.50	66.68	64.95	68.34	66.31	72.42	71.29	Sta. 263+00 LT
8	7	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	2.57	1.16	12	0.52	67.06	66.93	68.97	68.95	72.42	72.42	Sta. 263+00 RT
9	7	346.0	0.12	0.92	0.90	0.11	0.81	5.0	20.2	5.0	4.03	4.57	3.28	15	0.50	68.41	66.68	70.16	68.81	73.39	72.42	Sta. 266+50 LT
10	9	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	2.57	1.16	12	0.52	68.79	68.66	70.57	70.55	73.39	73.39	Sta. 266+50 RT
11	9	346.0	0.13	0.56	0.90	0.12	0.50	5.0	8.9	6.8	3.43	4.57	2.80	15	0.50	70.14	68.41	71.37	70.45	74.44	73.39	Sta. 270+00 LT
12	11	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	4.66	0.74	15	0.52	70.27	70.14	71.67	71.67	74.44	74.44	Sta. 270+00 RT
13	11	346.0	0.15	0.30	0.90	0.14	0.27	5.0	5.5	7.7	2.07	4.57	2.61	15	0.50	71.87	70.14	72.47	71.63	75.49	74.44	Sta. 273+50 LT
14	13	25.0	0.15	0.15	0.90	0.14	0.14	5.0	5.0	7.8	1.05	4.47	1.00	15	0.48	71.99	71.87	72.94	72.93	75.49	75.49	Sta. 273+50 RT
15	9	5.0	0.11	0.11	0.70	0.08	0.08	20.0	20.0	5.0	0.39	2.76	0.49	12	0.60	68.69	68.66	70.57	70.57	73.00	73.39	Sta. 266+50 LT

SYSTEM NO. 5 | Number of lines: 15 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	10.0	0.00	4.95	0.00	0.00	4.46	0.0	28.6	2.0	8.71	35.76	2.77	30	1.80	37.92	37.74	39.36	39.37	48.25	48.25	X-New Britian Av
2	1	95.0	0.00	4.50	0.00	0.00	4.05	0.0	27.9	2.0	8.05	35.77	3.51	30	1.80	39.63	37.92	40.58	39.59	48.73	48.25	X-New Britian Av
3	2	46.0	0.00	0.90	0.00	0.00	0.81	0.0	5.4	4.5	3.62	13.71	3.30	24	0.87	40.43	40.03	41.11	40.90	47.93	48.73	X-South St.
4	3	4.0	0.29	0.29	0.90	0.26	0.26	5.0	5.0	4.6	1.20	22.80	2.12	15	29.50	41.71	40.53	42.15	41.56	47.71	47.93	X-South St.
5	3	35.0	0.22	0.61	0.90	0.20	0.55	5.0	5.1	4.5	2.50	7.77	3.22	15	3.43	41.73	40.53	42.36	41.51	47.44	47.93	X-South St.
6	5	38.0	0.39	0.39	0.90	0.35	0.35	5.0	5.0	4.6	1.61	2.39	6.14	8	9.26	46.15	42.63	46.74	43.03	48.95	47.44	X-South St.
7	2	92.0	0.00	3.60	0.00	0.00	3.24	0.0	27.0	2.0	6.57	21.89	3.73	24 38 e	0.67	41.10	40.48	42.20	41.08	48.80	48.73	X-New Britian Av
8	7	9.0	0.23	0.23	0.90	0.21	0.21	5.0	5.0	4.6	0.95	4.85	2.97	15	1.33	45.52	45.40	45.91	45.78	48.48	48.80	X-New Britian Av
9	7	268.0	0.10	3.37	0.90	0.09	3.03	5.0	24.4	2.2	6.55	21.24	3.04	24 38 e	0.63	42.80	41.10	43.50	42.37	48.50	48.80	X-New Britian Av
10	9	37.0	0.18	0.41	0.90	0.16	0.37	5.0	5.3	4.5	1.66	4.98	4.01	12	4.62	44.91	43.20	45.46	43.70	49.91	48.50	X-Carney Rd
11	10	24.0	0.23	0.23	0.90	0.21	0.21	5.0	5.0	4.6	0.95	2.50	2.28	12	1.17	45.29	45.01	45.74	45.66	49.89	49.91	X-Carney Rd
12	9	95.0	0.05	1.68	0.90	0.05	1.51	5.0	23.2	2.2	3.36	26.73	3.04	24	3.31	45.94	42.80	46.59	43.75	48.54	48.50	X-New Britian Av
13	9	66.0	0.11	0.28	0.90	0.10	0.25	5.0	9.0	3.7	0.92	5.81	1.63	12 16 e	2.97	44.86	42.90	45.26	43.77	48.16	48.50	X-New Britian Av
14	13	142.0	0.17	0.17	0.90	0.15	0.15	5.0	5.0	4.6	0.70	5.40	3.34	12 18 e	1.89	48.25	45.56	56.97	45.71	51.15	48.16	X-New Britian Av
15	1	37.0	0.06	0.39	0.90	0.05	0.35	5.0	6.1	4.3	1.50	4.98	3.44	15	1.41	39.68	39.16	40.17	39.63	48.38	48.25	X-New Britian Av
16	15	75.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	4.6	1.36	5.04	3.37	15	1.44	45.66	44.58	46.13	45.02	48.16	48.38	X-New Britian Av
17	9	163.0	0.00	0.90	0.00	0.00	0.81	0.0	8.1	3.8	3.11	5.16	6.16	12 16 e	2.34	47.81	44.00	56.44	44.35	52.00	48.50	X-New Britian Av
18	17	9.0	0.08	0.08	0.90	0.07	0.07	5.0	5.0	4.6	0.33	2.31	0.42	12	1.00	47.90	47.81	56.71	56.71	50.50	52.00	X-New Britian Av
19	17	92.0	0.00	0.82	0.00	0.00	0.74	0.0	7.5	3.9	2.91	6.52	2.78	12 16 e	3.74	51.25	47.81	57.40	56.71	55.90	52.00	X-New Britian Av

SYSTEM NO. 6 | Number of lines: 42 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Stor.. Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
20	19	5.0	0.26	0.26	0.90	0.23	0.23	5.0	5.0	4.6	1.07	2.31	1.37	12	1.00	52.20	52.15	57.62	57.61	55.90	55.90	X-New Britian Av
21	19	45.0	0.00	0.43	0.00	0.00	0.39	0.0	7.0	4.1	1.57	3.37	1.50	12 16 e	1.00	51.70	51.25	57.74	57.64	57.90	55.90	X-New Britian Av
22	21	45.0	0.10	0.10	0.90	0.09	0.09	5.0	5.0	4.6	0.41	2.44	0.53	12	1.11	52.30	51.80	57.82	57.80	55.70	57.90	X-New Park Ave.
23	21	36.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	4.6	0.37	5.98	0.30	15	2.03	52.53	51.80	57.81	57.80	59.83	57.90	X-New Park Ave.
24	21	60.0	0.24	0.24	0.90	0.22	0.22	5.0	5.0	4.6	0.99	7.53	0.81	15	3.22	54.43	52.50	57.83	57.80	60.83	57.90	X-New Park Ave.
25	19	414.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	0.63	2.74	6	2.95	63.47	51.25	66.51	57.52	68.27	55.90	X-New Britian Av
26	1	7.0	0.06	0.06	0.90	0.05	0.05	5.0	5.0	4.6	0.25	4.20	1.87	15	1.00	42.87	42.80	43.08	43.01	48.27	48.25	X-New Britian Av
27	12	7.0	0.00	1.63	0.00	0.00	1.47	0.0	23.1	2.2	3.27	26.65	3.33	24	3.29	46.25	46.02	46.89	46.80	52.75	48.54	Sta.141+23 RT
28	27	155.0	0.00	1.63	0.00	0.00	1.47	0.0	21.2	2.3	3.44	32.29	5.26	24	2.04	52.66	49.50	53.32	49.94	61.00	52.75	Sta. 298+88 R
29	28	68.0	0.00	1.63	0.00	0.00	1.47	0.0	19.4	2.5	3.62	47.16	3.72	36	0.50	57.34	57.00	57.95	57.56	73.50	61.00	Sta. 298+88
30	29	349.0	0.00	1.63	0.00	0.00	1.47	0.0	17.2	2.6	3.88	7.44	4.25	18	0.50	64.23	62.48	65.00	63.25	71.41	73.50	Sta. 295+34
31	30	10.0	0.22	0.22	0.90	0.20	0.20	5.0	5.0	4.6	0.91	2.52	2.95	12	0.50	66.34	66.29	66.75	66.71	70.84	71.41	Sta. 295+34 LT
32	30	10.0	0.20	0.20	0.90	0.18	0.18	5.0	5.0	4.6	0.83	2.52	2.87	12	0.50	66.34	66.29	66.74	66.68	70.84	71.41	Sta. 295+34 RT
33	30	180.0	0.00	1.21	0.00	0.00	1.09	0.0	15.8	2.8	3.02	7.43	2.86	18	0.50	65.13	64.23	65.82	65.51	71.98	71.41	Sta. 293+50
34	33	10.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	4.6	0.58	2.52	2.61	12	0.50	66.91	66.86	67.23	67.19	71.41	71.98	Sta. 293+50 LT
35	33	10.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	2.52	2.55	12	0.50	66.91	66.86	67.22	67.17	71.41	71.98	Sta. 293+50 RT
36	33	345.0	0.00	0.94	0.00	0.00	0.85	0.0	12.5	3.1	2.65	7.44	2.86	18	0.50	66.86	65.13	67.48	66.24	73.21	71.98	Sta. 290+00
37	36	10.0	0.13	0.81	0.90	0.12	0.73	5.0	12.3	3.1	2.30	7.43	3.21	18	0.50	66.91	66.86	67.53	67.52	72.64	73.21	Sta. 290+00 LT
38	36	10.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	2.52	2.55	12	0.50	67.54	67.49	67.85	67.80	72.64	73.21	Sta. 290+00 RT
39	37	346.0	0.13	0.68	0.90	0.12	0.61	5.0	9.5	3.6	2.18	4.57	3.32	15	0.50	68.89	67.16	69.48	67.92	73.86	72.64	Sta. 286+50 LT
40	39	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	2.57	1.71	12	0.52	69.27	69.14	69.64	69.63	73.86	73.86	Sta. 286+50 RT

SYSTEM NO. 6 | Number of lines: 42 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Stor. Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
41	39	346.0	0.21	0.42	0.90	0.19	0.38	5.0	5.4	4.5	1.69	4.57	2.79	15	0.50	70.62	68.89	71.14	69.68	75.09	73.86	Sta. 283+00 LT
42	41	25.0	0.21	0.21	0.90	0.19	0.19	5.0	5.0	4.6	0.87	2.57	2.79	12	0.52	71.00	70.87	71.40	71.31	75.09	75.09	Sta. 283+00 RT

SYSTEM NO. 6 | Number of lines: 42 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	10.0	0.00	4.95	0.00	0.00	4.46	0.0	22.2	3.3	14.79	35.76	4.88	30	1.80	37.92	37.74	39.29	39.37	48.25	48.25	X-New Britian Av
2	1	95.0	0.00	4.50	0.00	0.00	4.05	0.0	21.7	3.4	13.62	35.77	4.34	30	1.80	39.63	37.92	40.86	40.07	48.73	48.25	X-New Britian Av
3	2	46.0	0.00	0.90	0.00	0.00	0.81	0.0	5.3	5.9	4.77	13.71	2.70	24	0.87	40.43	40.03	41.40	41.32	47.93	48.73	X-South St.
4	3	4.0	0.29	0.29	0.90	0.26	0.26	5.0	5.0	6.0	1.56	22.80	2.36	15	29.50	41.71	40.53	42.21	41.68	47.71	47.93	X-South St.
5	3	35.0	0.22	0.61	0.90	0.20	0.55	5.0	5.1	6.0	3.27	7.77	3.68	15	3.43	41.73	40.53	42.45	41.60	47.44	47.93	X-South St.
6	5	38.0	0.39	0.39	0.90	0.35	0.35	5.0	5.0	6.0	2.10	2.39	6.93	8	9.26	46.15	42.63	46.78	43.12	48.95	47.44	X-South St.
7	2	92.0	0.00	3.60	0.00	0.00	3.24	0.0	21.0	3.4	11.07	21.89	4.52	24 38 e	0.67	41.10	40.48	42.20	41.36	48.80	48.73	X-New Britian Av
8	7	9.0	0.23	0.23	0.90	0.21	0.21	5.0	5.0	6.0	1.24	4.85	3.22	15	1.33	45.52	45.40	45.97	45.83	48.48	48.80	X-New Britian Av
9	7	268.0	0.10	3.37	0.90	0.09	3.03	5.0	19.2	3.6	10.87	21.24	3.42	24 38 e	0.63	42.80	41.10	43.90	42.44	48.50	48.80	X-New Britian Av
10	9	37.0	0.18	0.41	0.90	0.16	0.37	5.0	5.3	5.9	2.18	4.98	3.70	12	4.62	44.91	43.20	45.54	44.02	49.91	48.50	X-Carney Rd
11	10	24.0	0.23	0.23	0.90	0.21	0.21	5.0	5.0	6.0	1.24	2.50	2.33	12	1.17	45.29	45.01	45.85	45.77	49.89	49.91	X-Carney Rd
12	9	95.0	0.05	1.68	0.90	0.05	1.51	5.0	18.4	3.7	5.54	26.73	3.53	24	3.31	45.94	42.80	46.77	44.09	48.54	48.50	X-New Britian Av
13	9	66.0	0.11	0.28	0.90	0.10	0.25	5.0	8.0	5.2	1.31	5.81	3.04	12 16 e	2.97	44.86	42.90	45.16	44.14	48.16	48.50	X-New Britian Av
14	13	142.0	0.17	0.17	0.90	0.15	0.15	5.0	5.0	6.0	0.92	5.40	4.36	12 18 e	1.89	48.25	45.56	64.88	45.71	51.15	48.16	X-New Britian Av
15	1	37.0	0.06	0.39	0.90	0.05	0.35	5.0	5.9	5.7	2.01	4.98	2.75	15	1.41	39.68	39.16	40.27	40.15	48.38	48.25	X-New Britian Av
16	15	75.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	6.0	1.78	5.04	3.65	15	1.44	45.66	44.58	46.19	45.09	48.16	48.38	X-New Britian Av
17	9	163.0	0.00	0.90	0.00	0.00	0.81	0.0	7.3	5.4	4.34	5.16	7.58	12 16 e	2.34	47.81	44.00	59.46	44.40	52.00	48.50	X-New Britian Av
18	17	9.0	0.08	0.08	0.90	0.07	0.07	5.0	5.0	6.0	0.43	2.31	0.55	12	1.00	47.90	47.81	59.99	59.99	50.50	52.00	X-New Britian Av
19	17	92.0	0.00	0.82	0.00	0.00	0.74	0.0	6.9	5.5	4.03	6.52	3.85	12 16 e	3.74	51.25	47.81	61.30	59.99	55.90	52.00	X-New Britian Av

SYSTEM NO. 6 | Number of lines: 42 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
20	19	5.0	0.26	0.26	0.90	0.23	0.23	5.0	5.0	6.0	1.40	2.31	1.78	12	1.00	52.20	52.15	61.73	61.71	55.90	55.90	X-New Britian Av
21	19	45.0	0.00	0.43	0.00	0.00	0.39	0.0	6.5	5.6	2.15	3.37	2.06	12 16 e	1.00	51.70	51.25	61.95	61.76	57.90	55.90	X-New Britian Av
22	21	45.0	0.10	0.10	0.90	0.09	0.09	5.0	5.0	6.0	0.54	2.44	0.69	12	1.11	52.30	51.80	62.10	62.07	55.70	57.90	X-New Park Ave.
23	21	36.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	6.0	0.49	5.98	0.40	15	2.03	52.53	51.80	62.08	62.08	59.83	57.90	X-New Park Ave.
24	21	60.0	0.24	0.24	0.90	0.22	0.22	5.0	5.0	6.0	1.29	7.53	1.05	15	3.22	54.43	52.50	62.12	62.06	60.83	57.90	X-New Park Ave.
25	19	414.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	0.63	3.57	6	2.95	63.47	51.25	76.88	61.57	68.27	55.90	X-New Britian Av
26	1	7.0	0.06	0.06	0.90	0.05	0.05	5.0	5.0	6.0	0.32	4.20	2.02	15	1.00	42.87	42.80	43.10	43.03	48.27	48.25	X-New Britian Av
27	12	7.0	0.00	1.63	0.00	0.00	1.47	0.0	18.3	3.7	5.38	26.65	3.89	24	3.29	46.25	46.02	47.07	47.04	52.75	48.54	Sta.141+23 RT
28	27	155.0	0.00	1.63	0.00	0.00	1.47	0.0	17.0	3.8	5.59	32.29	6.09	24	2.04	52.66	49.50	53.50	50.06	61.00	52.75	Sta. 298+88 R
29	28	68.0	0.00	1.63	0.00	0.00	1.47	0.0	15.7	4.0	5.81	47.16	4.27	36	0.50	57.34	57.00	58.11	57.71	73.50	61.00	Sta. 298+88
30	29	349.0	0.00	1.63	0.00	0.00	1.47	0.0	14.1	4.2	6.10	7.44	4.69	18	0.50	64.23	62.48	65.27	63.51	71.41	73.50	Sta. 295+34
31	30	10.0	0.22	0.22	0.90	0.20	0.20	5.0	5.0	6.0	1.19	2.52	3.16	12	0.50	66.34	66.29	66.82	66.77	70.84	71.41	Sta. 295+34 LT
32	30	10.0	0.20	0.20	0.90	0.18	0.18	5.0	5.0	6.0	1.08	2.52	3.08	12	0.50	66.34	66.29	66.80	66.75	70.84	71.41	Sta. 295+34 RT
33	30	180.0	0.00	1.21	0.00	0.00	1.09	0.0	13.1	4.3	4.69	7.43	3.09	18	0.50	65.13	64.23	66.19	65.84	71.98	71.41	Sta. 293+50
34	33	10.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	6.0	0.75	2.52	2.80	12	0.50	66.91	66.86	67.29	67.24	71.41	71.98	Sta. 293+50 LT
35	33	10.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	2.52	2.75	12	0.50	66.91	66.86	67.27	67.22	71.41	71.98	Sta. 293+50 RT
36	33	345.0	0.00	0.94	0.00	0.00	0.85	0.0	10.6	4.7	3.97	7.44	3.38	18	0.50	66.86	65.13	67.62	66.49	73.21	71.98	Sta. 290+00
37	36	10.0	0.13	0.81	0.90	0.12	0.73	5.0	10.6	4.7	3.43	7.43	3.37	18	0.50	66.91	66.86	67.73	67.72	72.64	73.21	Sta. 290+00 LT
38	36	10.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	2.52	2.39	12	0.50	67.54	67.49	67.92	67.91	72.64	73.21	Sta. 290+00 RT
39	37	346.0	0.13	0.68	0.90	0.12	0.61	5.0	8.4	5.1	3.13	4.57	3.77	15	0.50	68.89	67.16	69.60	68.10	73.86	72.64	Sta. 286+50 LT
40	39	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	2.57	1.31	12	0.52	69.27	69.14	69.86	69.85	73.86	73.86	Sta. 286+50 RT

SYSTEM NO. 6 | Number of lines: 42 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
41	39	346.0	0.21	0.42	0.90	0.19	0.38	5.0	5.3	5.9	2.23	4.57	3.04	15	0.50	70.62	68.89	71.22	69.84	75.09	73.86	Sta. 283+00 LT
42	41	25.0	0.21	0.21	0.90	0.19	0.19	5.0	5.0	6.0	1.13	2.57	2.87	12	0.52	71.00	70.87	71.47	71.42	75.09	75.09	Sta. 283+00 RT

SYSTEM NO. 6 | Number of lines: 42 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	10.0	0.00	4.95	0.00	0.00	4.46	0.0	17.6	5.3	23.67	35.76	6.98	30	1.80	37.92	37.74	39.55	39.37	48.25	48.25	X-New Britian Av
2	1	95.0	0.00	4.50	0.00	0.00	4.05	0.0	17.2	5.4	21.71	35.77	5.36	30	1.80	39.63	37.92	41.28	40.76	48.73	48.25	X-New Britian Av
3	2	46.0	0.00	0.90	0.00	0.00	0.81	0.0	5.2	7.7	6.25	13.71	1.99	24	0.87	40.43	40.03	42.53	42.45	47.93	48.73	X-South St.
4	3	4.0	0.29	0.29	0.90	0.26	0.26	5.0	5.0	7.8	2.03	22.80	1.92	15	29.50	41.71	40.53	42.59	42.61	47.71	47.93	X-South St.
5	3	35.0	0.22	0.61	0.90	0.20	0.55	5.0	5.1	7.8	4.27	7.77	3.50	15	3.43	41.73	40.53	42.93	42.60	47.44	47.93	X-South St.
6	5	38.0	0.39	0.39	0.90	0.35	0.35	5.0	5.0	7.8	2.74	2.39	7.84	8	9.26	46.15	42.63	47.91	43.30	48.95	47.44	X-South St.
7	2	92.0	0.00	3.60	0.00	0.00	3.24	0.0	16.8	5.4	17.56	21.89	3.72	24 38 e	0.67	41.10	40.48	42.80	42.51	48.80	48.73	X-New Britian Av
8	7	9.0	0.23	0.23	0.90	0.21	0.21	5.0	5.0	7.8	1.61	4.85	3.48	15	1.33	45.52	45.40	46.03	45.90	48.48	48.80	X-New Britian Av
9	7	268.0	0.10	3.37	0.90	0.09	3.03	5.0	15.5	5.6	17.00	21.24	3.85	24 38 e	0.63	42.80	41.10	44.30	43.28	48.50	48.80	X-New Britian Av
10	9	37.0	0.18	0.41	0.90	0.16	0.37	5.0	5.2	7.7	2.85	4.98	4.19	12	4.62	44.91	43.20	45.63	44.91	49.91	48.50	X-Carney Rd
11	10	24.0	0.23	0.23	0.90	0.21	0.21	5.0	5.0	7.8	1.61	2.50	2.43	12	1.17	45.29	45.01	46.00	45.91	49.89	49.91	X-Carney Rd
12	9	95.0	0.05	1.68	0.90	0.05	1.51	5.0	14.9	5.7	8.60	26.73	3.98	24	3.31	45.94	42.80	46.98	45.00	48.54	48.50	X-New Britian Av
13	9	66.0	0.11	0.28	0.90	0.10	0.25	5.0	7.3	7.2	1.80	5.81	2.40	12 16 e	2.97	44.86	42.90	45.41	45.11	48.16	48.50	X-New Britian Av
14	13	142.0	0.17	0.17	0.90	0.15	0.15	5.0	5.0	7.8	1.19	5.40	3.93	12 18 e	1.89	48.25	45.56	55.67	45.76	51.15	48.16	X-New Britian Av
15	1	37.0	0.06	0.39	0.90	0.05	0.35	5.0	5.7	7.6	2.67	4.98	2.17	15	1.41	39.68	39.16	41.14	40.99	48.38	48.25	X-New Britian Av
16	15	75.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	7.8	2.31	5.04	3.95	15	1.44	45.66	44.58	46.27	45.18	48.16	48.38	X-New Britian Av
17	9	163.0	0.00	0.90	0.00	0.00	0.81	0.0	6.8	7.3	5.91	5.16	5.64	12 16 e	2.34	47.81	44.00	50.11	45.11	52.00	48.50	X-New Britian Av
18	17	9.0	0.08	0.08	0.90	0.07	0.07	5.0	5.0	7.8	0.56	2.31	0.71	12	1.00	47.90	47.81	51.10	51.09	50.50	52.00	X-New Britian Av
19	17	92.0	0.00	0.82	0.00	0.00	0.74	0.0	6.5	7.4	5.44	6.52	5.20	12 16 e	3.74	51.25	47.81	53.50	51.10	55.90	52.00	X-New Britian Av

SYSTEM NO. 6 | Number of lines: 42 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Stoı Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
20	19	5.0	0.26	0.26	0.90	0.23	0.23	5.0	5.0	7.8	1.82	2.31	2.32	12	1.00	52.20	52.15	54.28	54.25	55.90	55.90	X-New Britian Av
21	19	45.0	0.00	0.43	0.00	0.00	0.39	0.0	6.2	7.5	2.89	3.37	2.76	12 16 e	1.00	51.70	51.25	54.67	54.34	57.90	55.90	X-New Britian Av
22	21	45.0	0.10	0.10	0.90	0.09	0.09	5.0	5.0	7.8	0.70	2.44	0.89	12	1.11	52.30	51.80	54.93	54.89	55.70	57.90	X-New Park Ave.
23	21	36.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	7.8	0.63	5.98	0.51	15	2.03	52.53	51.80	54.91	54.90	59.83	57.90	X-New Park Ave.
24	21	60.0	0.24	0.24	0.90	0.22	0.22	5.0	5.0	7.8	1.68	7.53	2.11	15	3.22	54.43	52.50	55.04	54.87	60.83	57.90	X-New Park Ave.
25	19	414.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	0.63	4.64	6	2.95	63.47	51.25	79.92	54.00	68.27	55.90	X-New Britian Av
26	1	7.0	0.06	0.06	0.90	0.05	0.05	5.0	5.0	7.8	0.42	4.20	2.19	15	1.00	42.87	42.80	43.14	43.07	48.27	48.25	X-New Britian Av
27	12	7.0	0.00	1.63	0.00	0.00	1.47	0.0	14.9	5.7	8.36	26.65	4.56	24	3.29	46.25	46.02	47.27	47.29	52.75	48.54	Sta.141+23 RT
28	27	155.0	0.00	1.63	0.00	0.00	1.47	0.0	13.9	5.8	8.58	32.29	6.95	24	2.04	52.66	49.50	53.70	50.20	61.00	52.75	Sta. 298+88 R
29	28	68.0	0.00	1.63	0.00	0.00	1.47	0.0	13.0	6.0	8.80	47.16	4.83	36	0.50	57.34	57.00	58.29	57.88	73.50	61.00	Sta. 298+88
30	29	349.0	0.00	1.63	0.00	0.00	1.47	0.0	11.8	6.2	9.09	7.44	5.15	18	0.50	64.23	62.48	66.60	63.98	71.41	73.50	Sta. 295+34
31	30	10.0	0.22	0.22	0.90	0.20	0.20	5.0	5.0	7.8	1.54	2.52	1.97	12	0.50	66.34	66.29	67.38	67.36	70.84	71.41	Sta. 295+34 LT
32	30	10.0	0.20	0.20	0.90	0.18	0.18	5.0	5.0	7.8	1.40	2.52	1.79	12	0.50	66.34	66.29	67.39	67.37	70.84	71.41	Sta. 295+34 RT
33	30	180.0	0.00	1.21	0.00	0.00	1.09	0.0	11.1	6.3	6.91	7.43	3.91	18	0.50	65.13	64.23	67.96	67.18	71.98	71.41	Sta. 293+50
34	33	10.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	7.8	0.98	2.52	1.25	12	0.50	66.91	66.86	68.42	68.41	71.41	71.98	Sta. 293+50 LT
35	33	10.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	2.52	1.16	12	0.50	66.91	66.86	68.42	68.42	71.41	71.98	Sta. 293+50 RT
36	33	345.0	0.00	0.94	0.00	0.00	0.85	0.0	9.3	6.7	5.67	7.44	3.21	18	0.50	66.86	65.13	69.28	68.28	73.21	71.98	Sta. 290+00
37	36	10.0	0.13	0.81	0.90	0.12	0.73	5.0	9.2	6.7	4.89	7.43	2.77	18	0.50	66.91	66.86	69.51	69.48	72.64	73.21	Sta. 290+00 LT
38	36	10.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	2.52	1.16	12	0.50	67.54	67.49	69.59	69.58	72.64	73.21	Sta. 290+00 RT
39	37	346.0	0.13	0.68	0.90	0.12	0.61	5.0	7.6	7.1	4.33	4.57	3.53	15	0.50	68.89	67.16	71.24	69.68	73.86	72.64	Sta. 286+50 LT
40	39	25.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	2.57	1.16	12	0.52	69.27	69.14	71.72	71.71	73.86	73.86	Sta. 286+50 RT

SYSTEM NO. 6 | Number of lines: 42 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
41	39	346.0	0.21	0.42	0.90	0.19	0.38	5.0	5.2	7.7	2.92	4.57	2.38	15	0.50	70.62	68.89	72.35	71.64	75.09	73.86	Sta. 283+00 LT
42	41	25.0	0.21	0.21	0.90	0.19	0.19	5.0	5.0	7.8	1.47	2.57	1.88	12	0.52	71.00	70.87	72.56	72.51	75.09	75.09	Sta. 283+00 RT

SYSTEM NO. 6 | Number of lines: 42 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Sto[illegible] Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	60.0	0.00	1.00	0.00	0.00	0.90	0.0	10.9	3.3	3.01	6.46	3.58	15	1.00	48.60	48.00	49.29	49.00	59.00	48.00	MH BUS STA.
2	1	33.0	0.11	1.00	0.90	0.10	0.90	5.0	10.7	3.4	3.03	6.46	4.73	15	1.00	54.33	54.00	55.03	54.60	68.05	59.00	Sta 306+10
3	2	165.0	0.11	0.56	0.90	0.10	0.50	5.0	9.1	3.6	1.83	4.58	3.52	15	0.50	63.35	62.52	63.90	63.07	69.55	68.05	Sta 304+40
4	3	30.0	0.19	0.19	0.90	0.17	0.17	5.0	5.0	4.6	0.78	2.52	2.74	12	0.50	64.25	64.10	64.63	64.51	69.49	69.55	Sta 304+40 RT
5	3	17.0	0.00	0.26	0.00	0.00	0.23	0.0	8.9	3.7	0.86	2.59	1.21	12	0.53	63.69	63.60	64.50	64.49	69.55	69.55	Sta 304+40 LT
6	5	114.0	0.07	0.26	0.90	0.06	0.23	5.0	7.5	4.0	0.93	2.52	2.03	12	0.50	64.26	63.69	64.71	64.52	70.00	69.55	Sta 303+25 LT
7	6	147.0	0.19	0.19	0.90	0.17	0.17	5.0	5.0	4.6	0.78	2.53	2.24	12	0.50	65.00	64.26	65.38	64.87	71.08	70.00	Sta 301+75 LT
8	2	186.0	0.08	0.33	0.90	0.07	0.30	5.0	5.3	4.5	1.33	4.57	3.22	15	0.50	60.00	59.07	60.47	59.53	66.00	68.05	Sta 308+00 LT
9	8	27.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	4.6	1.03	2.56	3.09	12	0.52	63.00	62.86	63.44	63.30	66.00	66.00	Sta 308+00 RT

SYSTEM NO. 7 | Number of lines: 9 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	60.0	0.00	1.00	0.00	0.00	0.90	0.0	9.5	4.9	4.41	6.46	4.61	15	1.00	48.60	48.00	49.44	49.00	59.00	48.00	MH BUS STA.
2	1	33.0	0.11	1.00	0.90	0.10	0.90	5.0	9.4	4.9	4.43	6.46	5.34	15	1.00	54.33	54.00	55.18	54.76	68.05	59.00	Sta 306+10
3	2	165.0	0.11	0.56	0.90	0.10	0.50	5.0	8.2	5.2	2.61	4.58	3.86	15	0.50	63.35	62.52	64.02	63.20	69.55	68.05	Sta 304+40
4	3	30.0	0.19	0.19	0.90	0.17	0.17	5.0	5.0	6.0	1.02	2.52	2.16	12	0.50	64.25	64.10	64.78	64.75	69.49	69.55	Sta 304+40 RT
5	3	17.0	0.00	0.26	0.00	0.00	0.23	0.0	8.0	5.2	1.22	2.59	1.55	12	0.53	63.69	63.60	64.76	64.74	69.55	69.55	Sta 304+40 LT
6	5	114.0	0.07	0.26	0.90	0.06	0.23	5.0	6.9	5.5	1.28	2.52	1.93	12	0.50	64.26	63.69	64.95	64.80	70.00	69.55	Sta 303+25 LT
7	6	147.0	0.19	0.19	0.90	0.17	0.17	5.0	5.0	6.0	1.02	2.53	2.36	12	0.50	65.00	64.26	65.43	65.04	71.08	70.00	Sta 301+75 LT
8	2	186.0	0.08	0.33	0.90	0.07	0.30	5.0	5.3	5.9	1.76	4.57	3.48	15	0.50	60.00	59.07	60.54	59.61	66.00	68.05	Sta 308+00 LT
9	8	27.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	6.0	1.35	2.56	3.31	12	0.52	63.00	62.86	63.51	63.38	66.00	66.00	Sta 308+00 RT

SYSTEM NO. 7 | Number of lines: 9 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	60.0	0.00	1.00	0.00	0.00	0.90	0.0	8.4	6.9	6.20	6.46	5.90	15	1.00	48.60	48.00	49.60	49.00	59.00	48.00	MH BUS STA.
2	1	33.0	0.11	1.00	0.90	0.10	0.90	5.0	8.3	6.9	6.23	6.46	5.95	15	1.00	54.33	54.00	55.33	54.99	68.05	59.00	Sta 306+10
3	2	165.0	0.11	0.56	0.90	0.10	0.50	5.0	7.4	7.1	3.60	4.58	4.13	15	0.50	63.35	62.52	64.18	63.35	69.55	68.05	Sta 304+40
4	3	30.0	0.19	0.19	0.90	0.17	0.17	5.0	5.0	7.8	1.33	2.52	2.00	12	0.50	64.25	64.10	64.99	64.96	69.49	69.55	Sta 304+40 RT
5	3	17.0	0.00	0.26	0.00	0.00	0.23	0.0	7.3	7.2	1.68	2.59	2.14	12	0.53	63.69	63.60	65.01	64.98	69.55	69.55	Sta 304+40 LT
6	5	114.0	0.07	0.26	0.90	0.06	0.23	5.0	6.4	7.4	1.73	2.52	2.20	12	0.50	64.26	63.69	65.35	65.09	70.00	69.55	Sta 303+25 LT
7	6	147.0	0.19	0.19	0.90	0.17	0.17	5.0	5.0	7.8	1.33	2.53	2.07	12	0.50	65.00	64.26	65.65	65.42	71.08	70.00	Sta 301+75 LT
8	2	186.0	0.08	0.33	0.90	0.07	0.30	5.0	5.2	7.7	2.30	4.57	3.72	15	0.50	60.00	59.07	60.63	59.70	66.00	68.05	Sta 308+00 LT
9	8	27.0	0.25	0.25	0.90	0.23	0.23	5.0	5.0	7.8	1.75	2.56	3.52	12	0.52	63.00	62.86	63.61	63.47	66.00	66.00	Sta 308+00 RT

SYSTEM NO. 7 | Number of lines: 9 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	85.0	0.00	1.81	0.00	0.00	1.63	0.0	26.7	2.0	5.81	66.69	0.82	36	1.00	44.85	44.00	48.81	48.80	63.00	47.00	Sta 310+10 FAR
2	1	72.0	0.00	1.81	0.00	0.00	1.63	0.0	25.5	2.1	5.91	47.16	4.29	36	0.50	51.93	51.57	52.71	52.29	64.42	63.00	Sta 310+10 RT
3	2	9.0	0.00	1.81	0.00	0.00	1.63	0.0	25.3	2.1	5.92	30.57	3.14	30	0.56	51.98	51.93	52.97	52.98	64.81	64.42	Sta 310+10
4	3	328.0	0.00	1.81	0.00	0.00	1.63	0.0	21.6	2.3	6.26	16.39	2.90	30	0.50	53.62	51.98	54.63	53.28	62.32	64.81	Sta. 313+43
5	4	10.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	4.6	1.36	2.52	3.27	12	0.50	57.50	57.45	58.03	57.97	61.75	62.32	Sta. 313+43 RT
6	4	350.0	0.00	1.15	0.00	0.00	1.04	0.0	18.4	2.5	5.12	15.99	4.28	24	0.50	55.87	54.12	56.67	54.94	64.28	62.32	Sta. 317+00
7	6	10.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	4.6	0.45	2.52	2.43	12	0.50	59.50	59.45	59.79	59.74	63.71	64.28	Sta. 317+00 RT
8	6	295.0	0.00	0.93	0.00	0.00	0.84	0.0	15.4	2.8	4.83	16.02	3.56	24	0.50	57.35	55.87	58.13	56.93	66.08	64.28	Sta. 320+00
9	8	10.0	0.15	0.15	0.90	0.14	0.14	5.0	5.0	4.6	0.62	2.52	2.65	12	0.50	60.00	59.95	60.34	60.29	65.51	66.08	Sta. 320+00 RT
10	8	195.0	0.00	0.64	0.00	0.00	0.58	0.0	14.1	2.9	4.17	7.44	4.33	18	0.50	58.83	57.85	59.63	58.65	67.28	66.08	Sta. 322+00
11	10	195.0	0.00	0.64	0.00	0.00	0.58	0.0	12.9	3.1	4.26	7.48	3.88	18	0.51	59.82	58.83	60.61	59.88	68.48	67.28	Sta. 324+00
12	11	10.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	4.6	0.50	2.52	2.49	12	0.50	63.50	63.45	63.80	63.75	67.91	68.48	Sta. 324+00 RT
13	11	345.0	0.00	0.39	0.00	0.00	0.35	0.0	10.3	3.4	3.69	7.44	3.56	18	0.50	61.55	59.82	62.28	60.86	70.58	68.48	Sta. 327+50
14	13	8.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	4.6	0.45	2.52	2.43	12	0.50	66.00	65.96	66.29	66.25	70.01	70.58	Sta. 327+50 RT
15	13	245.0	0.00	0.19	0.00	0.00	0.17	0.0	8.0	3.8	3.14	7.44	3.32	18	0.50	62.78	61.55	63.46	62.52	72.08	70.58	Sta. 330+00
16	15	105.0	0.00	0.12	0.00	0.00	0.11	0.0	7.3	4.0	2.91	4.63	3.99	15	0.51	63.57	63.03	64.29	63.75	72.03	72.08	Sta 331+10 LT
17	16	31.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	4.6	0.37	2.56	2.30	12	0.52	68.00	67.84	68.26	68.10	72.00	72.03	Sta. 331+43 LT
18	16	22.0	0.03	0.03	0.90	0.03	0.03	5.0	5.0	4.6	0.12	3.04	1.78	12	0.73	68.00	67.84	68.15	67.98	72.17	72.03	Sta 331+10 RT
19	16	286.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.48	4.57	3.05	15	0.50	65.00	63.57	65.63	64.72	72.00	72.03	Adjacent Project
20	4	10.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	4.6	1.36	2.52	3.27	12	0.50	57.50	57.45	58.03	57.97	61.75	62.32	Sta. 313+43 LT
21	6	10.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	4.6	0.45	2.52	2.43	12	0.50	59.50	59.45	59.79	59.74	63.71	64.28	Sta. 317+00 LT

SYSTEM NO. 8 | Number of lines: 25 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Stor Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
22	8	10.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	4.6	0.58	2.52	2.61	12	0.50	60.00	59.95	60.32	60.28	65.51	66.08	Sta. 320+00 LT
23	11	10.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	4.6	0.54	2.52	2.55	12	0.50	63.50	63.45	63.81	63.76	67.91	68.48	Sta. 324+00 LT
24	13	10.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	4.6	0.37	2.52	2.29	12	0.50	66.00	65.95	66.26	66.21	70.01	70.58	Sta. 327+50 LT
25	15	10.0	0.07	0.07	0.90	0.06	0.06	5.0	5.0	4.6	0.29	2.52	2.12	12	0.50	67.50	67.45	67.73	67.68	71.51	72.08	Sta. 330+00 LT

SYSTEM NO. 8 | Number of lines: 25 | Run Date: 04-06-2011

NOTES: Intensity = 30.12 / (Inlet time + 6.60) ^ 0.77; Return period = 2 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	85.0	0.00	1.81	0.00	0.00	1.63	0.0	20.1	3.5	9.42	66.69	1.33	36	1.00	44.85	44.00	48.82	48.80	63.00	47.00	Sta 310+10 FAR
2	1	72.0	0.00	1.81	0.00	0.00	1.63	0.0	19.3	3.6	9.55	47.16	4.95	36	0.50	51.93	51.57	52.92	52.49	64.42	63.00	Sta 310+10 RT
3	2	9.0	0.00	1.81	0.00	0.00	1.63	0.0	19.2	3.6	9.56	30.57	3.72	30	0.56	51.98	51.93	53.25	53.25	64.81	64.42	Sta 310+10
4	3	328.0	0.00	1.81	0.00	0.00	1.63	0.0	16.6	3.8	10.00	16.39	3.27	30	0.50	53.62	51.98	54.98	53.64	62.32	64.81	Sta. 313+43
5	4	10.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	6.0	1.78	2.52	3.48	12	0.50	57.50	57.45	58.12	58.07	61.75	62.32	Sta. 313+43 RT
6	4	350.0	0.00	1.15	0.00	0.00	1.04	0.0	14.4	4.1	7.99	15.99	4.62	24	0.50	55.87	54.12	56.87	55.30	64.28	62.32	Sta. 317+00
7	6	10.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	6.0	0.59	2.52	2.61	12	0.50	59.50	59.45	59.83	59.78	63.71	64.28	Sta. 317+00 RT
8	6	295.0	0.00	0.93	0.00	0.00	0.84	0.0	12.4	4.4	7.42	16.02	4.17	24	0.50	57.35	55.87	58.31	57.19	66.08	64.28	Sta. 320+00
9	8	10.0	0.15	0.15	0.90	0.14	0.14	5.0	5.0	6.0	0.81	2.52	2.86	12	0.50	60.00	59.95	60.39	60.34	65.51	66.08	Sta. 320+00 RT
10	8	195.0	0.00	0.64	0.00	0.00	0.58	0.0	11.5	4.5	6.35	7.44	4.73	18	0.50	58.83	57.85	59.89	58.92	67.28	66.08	Sta. 322+00
11	10	195.0	0.00	0.64	0.00	0.00	0.58	0.0	10.6	4.7	6.43	7.48	4.50	18	0.51	59.82	58.83	60.86	60.09	68.48	67.28	Sta. 324+00
12	11	10.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	6.0	0.65	2.52	2.68	12	0.50	63.50	63.45	63.85	63.80	67.91	68.48	Sta. 324+00 RT
13	11	345.0	0.00	0.39	0.00	0.00	0.35	0.0	8.8	5.0	5.50	7.44	3.74	18	0.50	61.55	59.82	62.55	61.46	70.58	68.48	Sta. 327+50
14	13	8.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	6.0	0.59	2.52	2.61	12	0.50	66.00	65.96	66.33	66.29	70.01	70.58	Sta. 327+50 RT
15	13	245.0	0.00	0.19	0.00	0.00	0.17	0.0	7.3	5.4	4.65	7.44	3.48	18	0.50	62.78	61.55	63.66	63.04	72.08	70.58	Sta. 330+00
16	15	105.0	0.00	0.12	0.00	0.00	0.11	0.0	6.8	5.5	4.32	4.63	4.18	15	0.51	63.57	63.03	64.52	64.05	72.03	72.08	Sta 331+10 LT
17	16	31.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	6.0	0.49	2.56	2.49	12	0.52	68.00	67.84	68.30	68.14	72.00	72.03	Sta. 331+43 LT
18	16	22.0	0.03	0.03	0.90	0.03	0.03	5.0	5.0	6.0	0.16	3.04	1.92	12	0.73	68.00	67.84	68.17	68.00	72.17	72.03	Sta 331+10 RT
19	16	286.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	3.73	4.57	3.42	15	0.50	65.00	63.57	65.93	64.96	72.00	72.03	Adjacent Project
20	4	10.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	6.0	1.78	2.52	3.48	12	0.50	57.50	57.45	58.12	58.07	61.75	62.32	Sta. 313+43 LT
21	6	10.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	6.0	0.59	2.52	2.61	12	0.50	59.50	59.45	59.83	59.78	63.71	64.28	Sta. 317+00 LT

SYSTEM NO. 8 | Number of lines: 25 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Stoı Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
22	8	10.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	6.0	0.75	2.52	2.80	12	0.50	60.00	59.95	60.38	60.33	65.51	66.08	Sta. 320+00 LT
23	11	10.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.0	0.70	2.52	2.75	12	0.50	63.50	63.45	63.86	63.81	67.91	68.48	Sta. 324+00 LT
24	13	10.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	6.0	0.49	2.52	2.48	12	0.50	66.00	65.95	66.30	66.25	70.01	70.58	Sta. 327+50 LT
25	15	10.0	0.07	0.07	0.90	0.06	0.06	5.0	5.0	6.0	0.38	2.52	2.30	12	0.50	67.50	67.45	67.76	67.71	71.51	72.08	Sta. 330+00 LT

SYSTEM NO. 8 | Number of lines: 25 | Run Date: 04-06-2011

NOTES: Intensity = 54.74 / (Inlet time + 10.80) ^ 0.80; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	85.0	0.00	1.81	0.00	0.00	1.63	0.0	15.7	5.6	14.55	66.69	2.06	36	1.00	44.85	44.00	48.84	48.80	63.00	47.00	Sta 310+10 FAR
2	1	72.0	0.00	1.81	0.00	0.00	1.63	0.0	15.1	5.7	14.69	47.16	5.64	36	0.50	51.93	51.57	53.16	52.72	64.42	63.00	Sta 310+10 RT
3	2	9.0	0.00	1.81	0.00	0.00	1.63	0.0	15.1	5.7	14.70	30.57	4.48	30	0.56	51.98	51.93	53.54	53.54	64.81	64.42	Sta 310+10
4	3	328.0	0.00	1.81	0.00	0.00	1.63	0.0	13.3	5.9	15.17	16.39	3.65	30	0.50	53.62	51.98	55.52	54.04	62.32	64.81	Sta. 313+43
5	4	10.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	7.8	2.31	2.52	3.64	12	0.50	57.50	57.45	58.25	58.21	61.75	62.32	Sta. 313+43 RT
6	4	350.0	0.00	1.15	0.00	0.00	1.04	0.0	11.7	6.2	11.92	15.99	5.14	24	0.50	55.87	54.12	57.09	55.74	64.28	62.32	Sta. 317+00
7	6	10.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	7.8	0.77	2.52	2.82	12	0.50	59.50	59.45	59.88	59.83	63.71	64.28	Sta. 317+00 RT
8	6	295.0	0.00	0.93	0.00	0.00	0.84	0.0	10.3	6.5	10.92	16.02	4.91	24	0.50	57.35	55.87	58.52	57.45	66.08	64.28	Sta. 320+00
9	8	10.0	0.15	0.15	0.90	0.14	0.14	5.0	5.0	7.8	1.05	2.52	3.07	12	0.50	60.00	59.95	60.45	60.40	65.51	66.08	Sta. 320+00 RT
10	8	195.0	0.00	0.64	0.00	0.00	0.58	0.0	9.7	6.6	9.30	7.44	5.26	18	0.50	58.83	57.85	60.88	59.35	67.28	66.08	Sta. 322+00
11	10	195.0	0.00	0.64	0.00	0.00	0.58	0.0	9.0	6.8	9.37	7.48	5.30	18	0.51	59.82	58.83	62.50	60.94	68.48	67.28	Sta. 324+00
12	11	10.0	0.12	0.12	0.90	0.11	0.11	5.0	5.0	7.8	0.84	2.52	2.88	12	0.50	63.50	63.45	63.90	63.85	67.91	68.48	Sta. 324+00 RT
13	11	345.0	0.00	0.39	0.00	0.00	0.35	0.0	7.8	7.0	7.95	7.44	4.50	18	0.50	61.55	59.82	65.04	63.06	70.58	68.48	Sta. 327+50
14	13	8.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	7.8	0.77	2.52	2.82	12	0.50	66.00	65.96	66.38	66.34	70.01	70.58	Sta. 327+50 RT
15	13	245.0	0.00	0.19	0.00	0.00	0.17	0.0	6.7	7.3	6.73	7.44	3.81	18	0.50	62.78	61.55	66.45	65.44	72.08	70.58	Sta. 330+00
16	15	105.0	0.00	0.12	0.00	0.00	0.11	0.0	6.4	7.4	6.28	4.63	5.12	15	0.51	63.57	63.03	67.67	66.67	72.03	72.08	Sta 331+10 LT
17	16	31.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	7.8	0.63	2.56	1.72	12	0.52	68.00	67.84	68.42	68.40	72.00	72.03	Sta. 331+43 LT
18	16	22.0	0.03	0.03	0.90	0.03	0.03	5.0	5.0	7.8	0.21	3.04	0.50	12	0.73	68.00	67.84	68.47	68.47	72.17	72.03	Sta 331+10 RT
19	16	286.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.48	4.57	4.47	15	0.50	65.00	63.57	70.23	68.17	72.00	72.03	Adjacent Project
20	4	10.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	7.8	2.31	2.52	3.64	12	0.50	57.50	57.45	58.25	58.21	61.75	62.32	Sta. 313+43 LT
21	6	10.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	7.8	0.77	2.52	2.82	12	0.50	59.50	59.45	59.88	59.83	63.71	64.28	Sta. 317+00 LT

SYSTEM NO. 8 | Number of lines: 25 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

Sto Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
22	8	10.0	0.14	0.14	0.90	0.13	0.13	5.0	5.0	7.8	0.98	2.52	3.01	12	0.50	60.00	59.95	60.43	60.38	65.51	66.08	Sta. 320+00 LT
23	11	10.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	7.8	0.91	2.52	2.94	12	0.50	63.50	63.45	63.92	63.87	67.91	68.48	Sta. 324+00 LT
24	13	10.0	0.09	0.09	0.90	0.08	0.08	5.0	5.0	7.8	0.63	2.52	2.66	12	0.50	66.00	65.95	66.34	66.29	70.01	70.58	Sta. 327+50 LT
25	15	10.0	0.07	0.07	0.90	0.06	0.06	5.0	5.0	7.8	0.49	2.52	2.48	12	0.50	67.50	67.45	67.80	67.75	71.51	72.08	Sta. 330+00 LT

SYSTEM NO. 8 | Number of lines: 25 | Run Date: 04-06-2011

NOTES: Intensity = 106.59 / (Inlet time + 17.00) ^ 0.85; Return period = 100 Yrs.

H – 052

Stormwater Drainage & Receiving Waters

New Britain-Hartford Busway --- State Project No. 171-305 (Contract No. 093-H052)

Drainage System Number/ Description (Station)	Wetland Impact Site Number	Receiving Waters (Name)	Outlet Protection Type	# of Catch Basins	Existing Flows (Q) 100-year (cfs)***	Proposed Flows (Q) 100-year (cfs)	Contributing Drainage Area (SQ. FT.)	Treatment	Notes
Track Discharge 1	27A	Unnamed Tributary to Piper Brook	Standard Riprap Channel Lining	1	5.65-cfs	5.65-cfs	2.9 acres	Pervious Site Cover (ballasted tracks), Ballast Ditch, HDS	System designed for the 100-year flow event
AAR System 1 765+50 to 737+50	21A	Unnamed Tributary to Piper Brook	Modified Riprap lined swale	0	8.3-cfs	8.3-cfs	4.27 acres	Pervious Site Cover (ballasted tracks), Riprap-lined open channel	System designed for the 100-year flow event
AAR/Track Discharge 2	28	Connection to 093-H046 Drainage at New Britain Ave.	N/A	1	6.50-cfs*	6.50-cfs*	3.33 acres	Perv. Site Cover, Riprap Channel, Ballast Ditch, HDS	System Designed for the 100-year flow event
AAR/Track Discharge 3	29, 30	Connection to 093-H046 Drainage at Trout Brook	Riprap apron	1	8.8-cfs*	8.8-cfs*	4.5 acres	Perv. Site Cover Riprap Channel, Modified Riprap Pad, HDS	System Designed for the 100-year flow event
AAR/Track Discharge 4	None	Kane Brook	Type I Preformed Scour Hole	12	24.6 cfs	24.6 cfs	12.5 acres	Perv. Site Cover Riprap apron/overland flow to Kane Brook, 2' min. sumps, HDS	System Designed for the 100-year flow event
AAR System 5 927+00 to 937+37	None	Ex. Drainage System – Connection to Aetna system	N/A	2	3.16 cfs	3.16 cfs	1.62 acres	Perv. Site Cover 2' min. sumps in Drainage Structures	System Designed for the 100-year flow event
Track Discharge 5A	None	Low area below I-84	Modified Riprap pad	1	1.5-cfs	1.5-cfs	0.77 acres	Pervious Site Cover (ballasted tracks), Ballast Ditch	System designed for the 100-year flow event
Track Discharge 5	None	Connection to 063-H137 Drainage	N/A	1	1.03-cfs	1.03-cfs	1.6 acres	Pervious Site Cover, Ballast Ditch	System designed for the 100-year flow event
Track Discharge 6	None	None	N/A	1	1.0-cfs**	1.0-cfs**	0.54 acres	Pervious Site Cover, Ballast Ditch, Infiltration	System designed for the 100-year flow event

*Note: Flow given is only representative of the AAR drainage system design. At these discharge locations, the AAR drainage system connects to a proposed trunk line from the 093-H046 Busway section designed by Amman & Whitney. Please see 093-H046 final drainage analysis and report for final design discharges.

**Note: Track Drainage will be conveyed into the ground via an infiltration trench along the RRR project.

***Note: For design purposes, it is assumed that the proposed land use and drainage areas are consistent with the existing use and areas, as the ground cover will remain stone ballast and the topography of the track corridor will generally remain the same. Therefore it is assumed there is no net change in flows from pre to post conditions for the AAR.

RESPONSE TO COMMENT #4 ATTACHMENTS

Baker

Professional Certification

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"I certify that in my professional judgement, each requirement listed in the Engineering Report Checklist has been addressed in the Engineering Report submitted as part of the IWRD permit application as Attachment H, Part 1 and that the information is true, accurate and complete to the best of my knowledge and belief.

This certification is based on my review of the Engineering Report.

I understand that a false statement made in the submitted information may, pursuant to Section 22a-6 of the General Statutes, be punishable as a criminal offense under Section 53a-157b of the General Statutes, and may also be punishable under Section 22a-438 of the General Statutes."

Thomas J. Maziarz	4-14-2011
Signature of Applicant	Date
THOMAS J. MAZIARZ	~~CHIEF~~ CHIEF
Name of Applicant (print or type)	Title (if applicable)
Cory Garro	10/15/09
Signature of Professional Engineer	Date
Cory Garro	CT 11820
Name of Professional Engineer (print or type)	P.E. Number (if applicable)

Affix P.E. Stamp Here
(if applicable)

STATE OF CONNECTICUT
CORY GARRO
No. 11820
LICENSED
PROFESSIONAL ENGINEER

Professional Certification

For any Engineering Report submitted as part of the IWRD permit application, the following certification must be signed and sealed by a professional engineer licensed to practice in Connecticut and submitted with the Engineering Report Checklist and Report.

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Thomas J. Maziarz	4-14-2011
Signature of Applicant	Date
THOMAS J. MAZIARZ	CHIEF
Name of Applicant (print or type)	Title (if applicable)
	12/17/09
Signature of Professional Engineer	Date
Michael J. Mastroluca, P.E.	0022681
Name of Professional Engineer (print or type)	P.E. Number (if applicable)

Affix P.E. Stamp Here
(if applicable)

STATE OF CONNECTICUT
MICHAEL J. MASTROLUCA
#22681
LICENSED
PROFESSIONAL ENGINEER

H137

Professional Certification

For any Engineering Report submitted as part of the IWRD permit application, the following certification must be signed and sealed by a professional engineer licensed to practice in Connecticut and submitted with the Engineering Report Checklist and Report.

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Thomas J. Maziarz	4-14-2011
Signature of Applicant	Date
THOMAS J. Maziarz CT Department of Transportation	Chief
Name of Applicant (print or type)	Title (if applicable)
Albert Bisacky	12/17/09
Signature of Professional Engineer	Date
Al Bisacky	14856
Name of Professional Engineer (print or type)	P.E. Number (if applicable)
	Affix P.E. Stamp Here (if applicable)

STATE OF CONNECTICUT
ALBERT G. BISACKY
No.14856
LICENSED
PROFESSIONAL ENGINEER

New Britain Station

Professional Certification

For any Engineering Report submitted as part of the IWRD permit application, the following certification must be signed and sealed by a professional engineer licensed to practice in Connecticut and submitted with the Engineering Report Checklist and Report.

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Thomas J. Maziarz

Signature of Applicant

4-14-2011

Date

THOMAS J. MAZIARZ

CT Department of Transportation

Name of Applicant (print or type)

CHIEF

Title (if applicable)

Signature of Professional Engineer

12/4/09

Date

Al Bisacky

Name of Professional Engineer (print or type)

14856

P.E. Number (if applicable)

Affix P.E. Stamp Here
(if applicable)

STATE OF CONNECTICUT
ALBERT G. BISACKY
No.14856
LICENSED
PROFESSIONAL ENGINEER

Elmwood Station

Professional Certification

For any Engineering Report submitted as part of the IWRD permit application, the following certification must be signed and sealed by a professional engineer licensed to practice in Connecticut and submitted with the Engineering Report Checklist and Report.

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Thomas J Maziarz Signature of Applicant	4-14-2011 Date
Thomas J. Maziarz CT Department of Transportation Name of Applicant (print or type)	Chief Title (if applicable)
Albert M Bisacky Signature of Professional Engineer	1/13/10 Date
Al Bisacky Name of Professional Engineer (print or type)	14856 P.E. Number (if applicable)

Affix P.E. Stamp Here
(if applicable)

STATE OF CONNECTICUT
ALBERT G. BISACKY
No. 14856
LICENSED
PROFESSIONAL ENGINEER

Professional Certification

For any Engineering Report submitted as part of the IWRD permit application, the following certification must be signed and sealed by a professional engineer licensed to practice in Connecticut and submitted with the Engineering Report Checklist and Report.

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Thomas J Maziarz — Signature of Applicant

4-14-2011 — Date

Thomas. J. Maziarz — Name of Applicant (print or type)

Chief — Title (if applicable)

Albert G. Bisacky — Signature of Professional Engineer

3/16/11 — Date

ALBERT G. BISACKY — Name of Professional Engineer (print or type)

14856 — P.E. Number (if applicable)

Affix P.E. Stamp Here
(if applicable)

STATE OF CONNECTICUT
ALBERT G. BISACKY
No. 14856
LICENSED
PROFESSIONAL ENGINEER

Kane 9 Station

Professional Certification

For any Engineering Report submitted as part of the IWRD permit application, the following certification must be signed and sealed by a professional engineer licensed to practice in Connecticut and submitted with the Engineering Report Checklist and Report.

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Signature of Applicant	4-14-2011 Date
Thomas J. Maziarz CT Department of Transportation Name of Applicant (print or type)	Chief Title (if applicable)
Signature of Professional Engineer	11/9/09 Date
Al Bisacky Name of Professional Engineer (print or type)	14856 P.E. Number (if applicable)

Affix P.E. Stamp Here
(if applicable)

STATE OF CONNECTICUT
ALBERT G. BISACKY
No.14856
LICENSED
PROFESSIONAL ENGINEER

Union Station

H – 035

Professional Certification

For any Engineering Report submitted as part of the IWRD permit application, the following certification must be signed and sealed by a professional engineer licensed to practice in Connecticut and submitted with the Engineering Report Checklist and Report.

"I certify that in my professional judgement, each requirement listed in the Engineering Report Checklist has been addressed in the Engineering Report submitted as part of the IWRD permit application as Attachment H, Part 1 and that the information is true, accurate and complete to the best of my knowledge and belief.

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I understand that a false statement made in the submitted information may, pursuant to Section 22a-6 of the General Statutes, be punishable as a criminal offense under Section 53a-157b of the General Statutes, and may also be punishable under Section 22a-438 of the General Statutes."

Thomas J. Mazziarz	4-14-2011
Signature of Applicant	Date
Thomas J. Mazziarz	Chief
Name of Applicant (print or type)	Title (if applicable)
Thomas A. Walb	April 6, 2011
Signature of Professional Engineer	Date
Thomas A. Walb	12846
Name of Professional Engineer (print or type)	P.E. Number (if applicable)

Affix P.E. Stamp Here
(if applicable)

STATE OF CONNECTICUT
THOMAS A. WALB JR.
No. 12846
LICENSED
PROFESSIONAL ENGINEER

H – 025

Professional Certification

For any Engineering Report submitted as part of the IWRD permit application, the following certification must be signed and sealed by a professional engineer licensed to practice in Connecticut and submitted with the Engineering Report Checklist and Report.

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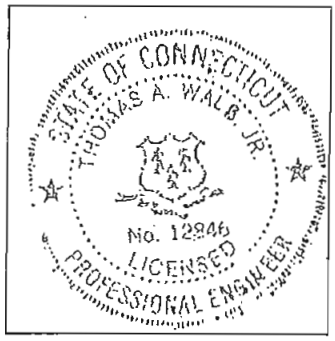
Thomas J. Maziarz	4-14-2011
Signature of Applicant	Date
Thomas J. Maziarz	Chief
Name of Applicant (print or type)	Title (if applicable)
Thomas A. Walb	April 6, 2011
Signature of Professional Engineer	Date
Thomas A. Walb	12846
Name of Professional Engineer (print or type)	P.E. Number (if applicable)

Affix P.E. Stamp Here
(if applicable)



H – 046

Attachment H: Engineering Documentation

Part 1: Engineering Report Checklist

The following is a checklist of requirements that need to be completed, included and submitted as part of the Engineering Report. Please complete this checklist by identifying where each requirement listed is addressed in the Engineering Report (report title and page numbers). If an item is not applicable, place "NA" in the box. Attach the completed checklist as the cover sheet to engineering reports, as applicable, which fully describe the design of the proposed facilities or other actions and the hydraulic and hydrologic effects thereof. The application instructions (DEP-IWRD-INST-100) should be consulted for a complete description of each item listed. This checklist is required to be signed and sealed by a professional engineer licensed in the State of Connecticut.

Stormwater Management

Location of Item	Item Description
CTDOT Drainage Manual – Table B-2.1	Description of the design storm frequency intensity, volume and duration
Pre/Post Drainage Maps	Watershed maps, existing and proposed
Pre/Post Calcs Report	Computations for Tc
Pre/Post Calcs Report	Imperviousness calculations
NA	NRCS runoff curve numbers, volumetric runoff coefficients
Channel Comps within Drainage Computations Report	Computations used to determine peak runoff rates, and velocities for each watershed area (24-hour storm): • Stream Channel Protection: 2-year frequency ("over-control" of 2-year storm) • Conveyance Protection: 10-year frequency • Peak Runoff Attenuation: 2-year, 10-year, and 100-year frequency • Emergency Outlet Sizing: safely pass the 100-year frequency or larger storm
NA	Hydrograph routing calculations
Drainage Comps Report	Description, schematics, and calculations for drainage and stormwater management systems, bridges and culverts
NA	Infiltration rates
NA	Documentation of sources
NA	Computer disk containing input and output data and the associated program for all computer models used in the analyses
Drainage Comps Report	Hard copy of input and output data including input/output tables
NA	Detention basin analysis including timing and duration of expected outflow, stream stability analysis and hydrograph summation

Flood Plain Assessment

Location of Item	Item Description
NA	Description or simulation of existing and proposed conditions upstream and downstream of the proposed activity
NA	(For SCEL applications only) A determination of the effect of the proposed activity on flooding and flood hazards together with an equivalent encroachment on the opposite bank for the flood event establishing the encroachment lines
NA	For any bridge or culvert placement or replacement with a drainage area of 100 acres or more, plan sheets showing the existing and proposed inundation area for the 2, 10, 25, 50, and 100 year discharges, carried to convergence
NA	A description and analysis of the floodplain modifications required to restore any flood conveyance and flood storage capacity
NA	Demonstration that backwater from the proposed activity will not impact an existing dam, dike, or similar structure
NA	Backup data and complete hydraulic analysis for proposed modifications to the floodplain including location plan and plot for sections, profile sheet, summary sheet

Dams, Dikes, Diversion Channels, Similar Structures

Location of Item	Item Description
NA	Primary and emergency spillway and outlet structure erosion protection
NA	Dam breach analysis
NA	Geotechnical evaluation
NA	Construction Specifications for foundation preparation, embankment material, outlet structure, and construction inspection

Soil Erosion and Sediment Control Plan

Location of Item	Item Description
NA	Narrative
05.10 Drawings	Drawings
Common Set	Details
Drainage Comps Report	Calculations for Engineered Measures

Professional Certification

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Thomas J Maziarz — 4-14-2011

Signature of Applicant — Date

Thomas J. Maziarz — Chief

Name of Applicant (print or type) — Title (if applicable)

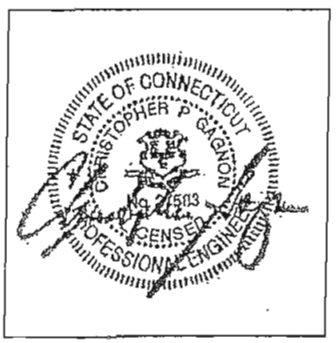
Christopher Gagnon — 4/7/11

Signature of Professional Engineer — Date

Christopher Gagnon — 27853

Name of Professional Engineer (print or type) — P.E. Number (if applicable)

Affix P.E. Stamp Here
(if applicable)



H – 052

Attachment H: Engineering Documentation

Part 1: Engineering Report Checklist

The following is a checklist of requirements that need to be completed, included and submitted as part of the Engineering Report. Please complete this checklist by identifying where each requirement listed is addressed in the Engineering Report (report title and page numbers). If an item is not applicable, place "NA" in the box. Attach the completed checklist as the cover sheet to engineering reports, as applicable, which fully describe the design of the proposed facilities or other actions and the hydraulic and hydrologic effects thereof. The application instructions (DEP-IWRD-INST-100) should be consulted for a complete description of each item listed. This checklist is required to be signed and sealed by a professional engineer licensed in the State of Connecticut.

Stormwater Management

Location of Item	Item Description
see attached	Description of the design storm frequency intensity, volume and duration
see attached	Watershed maps, existing and proposed
see attached	Computations for Tc
see attached	Imperviousness calculations
see attached	NRCS runoff curve numbers, volumetric runoff coefficients
see attached	Computations used to determine peak runoff rates, and velocities for each watershed area (24-hour storm): • Stream Channel Protection: 2-year frequency ("over-control" of 2-year storm) • Conveyance Protection: 10-year frequency • Peak Runoff Attenuation: 2-year, 10-year, and 100-year frequency • Emergency Outlet Sizing: safely pass the 100-year frequency or larger storm
see attached	Hydrograph routing calculations
see attached	Description, schematics, and calculations for drainage and stormwater management systems, bridges and culverts
see attached	Infiltration rates
see attached	Documentation of sources
see attached	Computer disk containing input and output data and the associated program for all computer models used in the analyses
see attached	Hard copy of input and output data including input/output tables
see attached	Detention basin analysis including timing and duration of expected outflow, stream stability analysis and hydrograph summation

Attachment to Attachment H: Engineering Documentation

Engineering Report Checklist for "Drainage Report Final Design July 2010 – Amtrak Access Road/Track Drainage Contract Project No: 093-H052/063-H157

Location of Item	Item Description
Drainage Report – Pg. 4 – Global Design Parameters	Description of the design storm frequency intensity, volume and duration
Drainage Report – Pg. 3 – Computational Approach gives discussion of determination of contributing drainage areas.	Watershed maps, existing and proposed
Drainage Report – Pg. 4 – Global Design Parameters	Computations for Tc
N/A	Imperviousness calculations
Drainage Report – Pg. 4 – Global Design Parameters	NRCS runoff curve numbers, volumetric runoff coefficients
Drainage Report – **Each individual section has computations following the section narrative. 100-year event only as this was the design event for the Track and Access Road Drainage Design**	Computations used to determine peak runoff rates, and velocities for each watershed area (24-hour storm): • Stream Channel Protection: 2-year frequency ("over-control" of 2-year storm) • Conveyance Protection: 10-year frequency • Peak Runoff Attenuation: 2-year, 10-year, and 100-year frequency • Emergency Outlet Sizing: safely pass the 100-year frequency or larger storm
Included with sections titled "TRACK DRAINAGE OUTLET 5 AREAS BETWEEN STATION 907+00 (BASELINE FOR 093-H052) AND STATION SM 52+50 (BASELINE FOR 063-H157) / 483+00 (BASELINE FOR 063-H137)" and "TRACK DRAINAGE OUTLET 6 AREAS BETWEEN STATION SM 53+50 AND STATION SM 59+50 (BASELINE FOR 063-H157)" As these were the only segments of the project that required hydrograph computations.	Hydrograph routing calculations
Drainage Report – **Each individual section has computations following the section narrative.** **Bridges and culverts not applicable**	Description, schematics, and calculations for drainage and stormwater management systems, ~~bridges and culverts~~

N/A – for the infiltration system proposed for the areas between SM 53+50 AND STATION SM 59+50 (BASELINE FOR 063-H157), Minimum infiltration rate of 0.3 inches/hour was used for design. Recommendations for field verification of design assumptions was made in the narrative.	Infiltration rates
Drainage Report Introduction and narrative for individual systems	Documentation of sources
Included with Drainage Report Submission	Computer disk containing input and output data and the associated program for all computer models used in the analyses
Drainage Report – Each individual section has computations following the section narrative.	Hard copy of input and output data including input/output tables
No Detention Basins associated with "Drainage Report Final Design July 2010 – Amtrak Access Road/Track Drainage Contract Project No: 093-H052/063-H157"	Detention basin analysis including timing and duration of expected outflow, stream stability analysis and hydrograph summation

Flood Plain Assessment

Location of Item	Item Description
N/A	Description or simulation of existing and proposed conditions upstream and downstream of the proposed activity
N/A	(For SCEL applications only) A determination of the effect of the proposed activity on flooding and flood hazards together with an equivalent encroachment on the opposite bank for the flood event establishing the encroachment lines
N/A	For any bridge or culvert placement or replacement with a drainage area of 100 acres or more, plan sheets showing the existing and proposed inundation area for the 2, 10, 25, 50, and 100 year discharges, carried to convergence
N/A	A description and analysis of the floodplain modifications required to restore any flood conveyance and flood storage capacity
N/A	Demonstration that backwater from the proposed activity will not impact an existing dam, dike, or similar structure
N/A	Backup data and complete hydraulic analysis for proposed modifications to the floodplain including location plan and plot for sections, profile sheet, summary sheet

Dams, Dikes, Diversion Channels, Similar Structures

Location of Item	Item Description
N/A	Primary and emergency spillway and outlet structure erosion protection
N/A	Dam breach analysis
N/A	Geotechnical evaluation
N/A	Construction Specifications for foundation preparation, embankment material, outlet structure, and construction inspection

Soil Erosion and Sediment Control Plan

Location of Item	Item Description
Attached	Narrative
Attached	Drawings
Attached	Details
Attached	Calculations for Engineered Measures

Professional Certification

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"I certify that in my professional judgement, each requirement listed in the Engineering Report Checklist has been addressed in the Engineering Report submitted as part of the IWRD permit application as Attachment H, Part 1 and that the information is true, accurate and complete to the best of my knowledge and belief.

This certification is based on my review of the Engineering Report.

I understand that a false statement made in the submitted information may, pursuant to Section 22a-6 of the General Statutes, be punishable as a criminal offense under Section 53a-157b of the General Statutes, and may also be punishable under Section 22a-438 of the General Statutes."

Thomas J Mazion	4-14-2011
Signature of Applicant	Date
Thomas J. Mazion	Chief
Name of Applicant (print or type)	Title (if applicable)
E Whitbread	4/6/2011
Signature of Professional Engineer	Date
E. Raymond Whitbread	**No. 12963**
Name of Professional Engineer (print or type)	P.E. Number (if applicable)

Affix P.E. Stamp Here
(if applicable)

RESPONSE TO

COMMENT # 6

ATTACHMENTS

Connecticut Department of Environmental Protection Comment No. 6:

Water Quality is required for the following stormwater drainage systems:

Contract No. 93-H046

- System 1A - prior to discharging into the tributary of Piper Brook
- System 1C and System 2 - prior to discharging to Wetland 27A
- System 8 - prior to discharging into Trout Brook
- System 5 drainage ditch- construction details and calculations are required

Contract No. 155-H025

- System 3 - prior to discharging into Kane Brook
- System 4 - prior to discharging into Kane Brook

Contract No. 63-H137

- No proposed pretreatment shown on entire project

Connecticut Department of Transportation (Department) Response:

Primary water quality treatment practices were incorporated wherever possible throughout the New Britain - Hartford busway project when space was available to implement these features. The primary goal was to promote groundwater recharge and stormwater retention through open stormwater practices versus closed structural practices prior to discharge. Primary water quality treatment was not possible at the locations specified above due to the existing urban landscape and active Amtrak rail line that are located on the west and east side of the busway respectively within Project Nos. 93-H046 (Newington), 155-H025 (Hartford South) and 63-H137 (Hartford North).

As a result, secondary water quality treatment practices were implemented in various ways depending on the outfall location based on the restrictions outlined above. These secondary water quality treatment practices included deep sump catch basins, grass drainage channels, riprap drainage channels, hydrodynamic separators (HDS), outlet protection, underground detention facilities, offline drainage systems and level spreaders. In most cases, many drainage systems would employ multiple secondary water quality treatment practices prior to discharge. The same could be said for those systems providing primary treatment.

Other non-traditional methods were also used to retain as much runoff upland prior to discharge. These methods would include placement of temporary or permanent check dams within channels or the elimination of curbing to allow sheet flow off the busway were considered and implemented wherever possible.

The following is a summary of the type of water quality treatment measures provided at the locations identified in the DEP comments:

Contract No. 93-H046 (Newington)

System 1A - prior to discharging into the tributary of Piper Brook:

The Department designed an offline storm drainage system in conjunction with standard catch basins that would serve as the primary water quality treatment measure. It was agreed during the design process that this would be a suitable approach to reduce the stormwater sediment in long storm trunkline systems. The manhole trunkline would typically begin after the storm drainage system became an 18" diameter pipe or larger. This offline design approach would eliminate the need for large hydrodynamic separators or deep sumps, which is particularly beneficial at those locations where the outfall drainage system is already deep.

The principle behind this offline stormwater drainage design is to collect runoff and associated sediment in each of the catch basins discharging each of these small increments of runoff into the trunkline manholes that will carry the design flow. The sediment generated from the pavement will be collected in each catch basin sump and will not discharge and accumulate in the main trunkline system.

System 1C and System 2 - prior to discharging to Wetland 27A:

Both System 1C and System 2 are existing outlets which will be modified by removing the existing headwalls, extending the existing culverts and adding scour hole protection. System 1C will discharge busway drainage and System 2 will continue to discharge municipal drainage as before.

The storm drainage system for System 1C is comprised of 4 catch basins before outletting to Wetland 27A. Improvements to the municipal storm drainage System 2 are minor and involve resetting existing catch basins and adding a couple of catch basins to intercept a newly created low point before outletting to Wetland 27A. The Department felt that standard catch basins in conjunction with scour hole protection and upland overland runoff distance from the outlets to the regulated area to be adequate water quality treatment for System 1C and System 2.

System 8 - prior to discharging into Trout Brook:

An offline storm drainage system is provided before drainage outlets to Trout Brook. Discharging the drainage through a long open channel is not feasible at this location because of the brook's steep, 2:1 embankment that is located on the downstream side of the existing bridge. The drainage system was designed with a drop manhole and outlets onto a short rip rap channel.

System 5 drainage ditch- construction details and calculations are required for the swale and the calculations must confirm the adequacy of pretreatment for treating the 2000 foot piped drainage system:

The drainage ditch for System 5 was revised from the August 2010 submission inorder to reduce the excessive impacts onto the residential property that were initially proposed for the stormwater treatment channel. The ditch has been shortened and the calculations will be submitted with the current Attachment H.

Based on the proposed flows, the Department believes that deep sumps in conjunction with a Type C splash pad and approximately 75-feet of a grass line channel to be adequate water quality treatment.

Contract No. 155-H025 (Hartford South)

System 3 - prior to discharging into of Kane Brook:

The Department designed an offline storm drainage system in conjunction with deep sumps and splash pad that would serves as the primary water quality treatment measure. It was agreed during the design process that this would be a suitable approach to reduce the stormwater sediment in long storm trunkline systems.

System 4 - prior to discharging into of Kane Brook:

Based on the proposed flows, the Department designed an offline storm drainage system in conjunction with deep sumps and splash pad that would serves as the primary water quality treatment measure. It was agreed during the design process that this would be a suitable approach to reduce the stormwater sediment in long storm trunkline systems.

For further information regarding System 3 and System 4, see the Department's response to DEP comment No. 8 under this cover.

Contract No. 63-H137 (Hartford North)

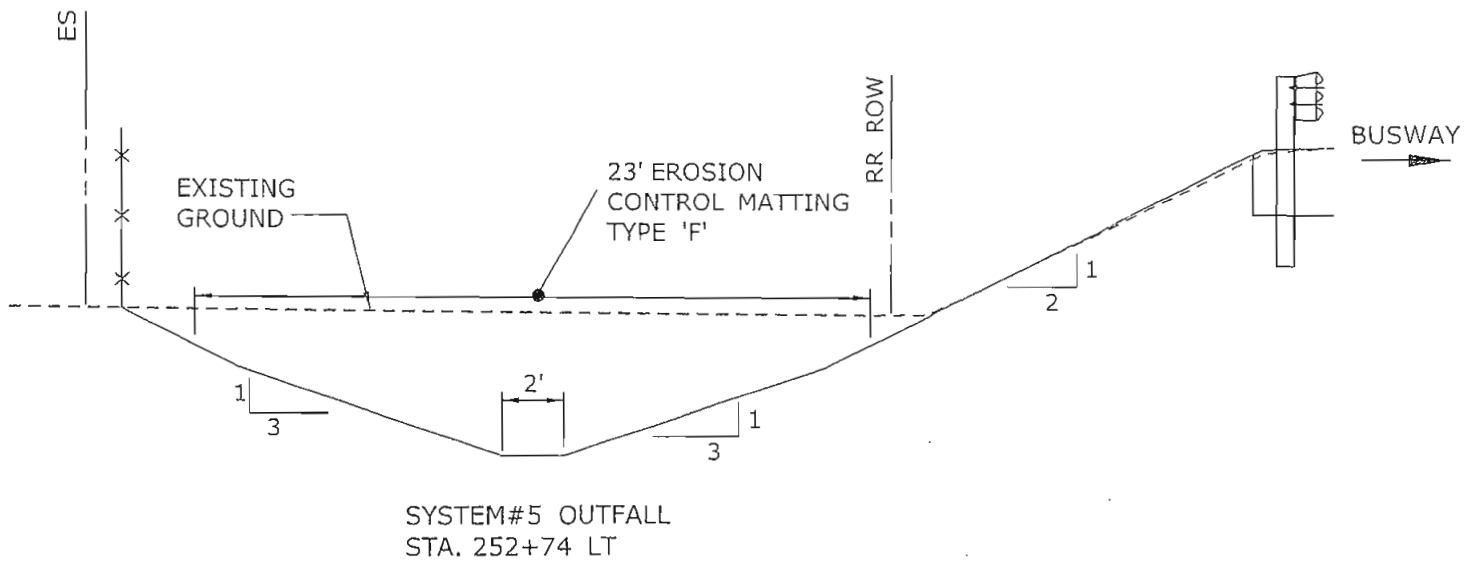
Entire project

Use of HDS units before connecting to the existing drainage lines that feed into the Park River Conduit were considered during design development, but a decision was made to not incorporate due in part to the construction and maintenance concerns associated with the deep units that would be required within the busway. Design plans and permit documentation include the use of both 2' and 4' sumps for secondary treatment and local roads include hoods in the catch basins as pretreatment.

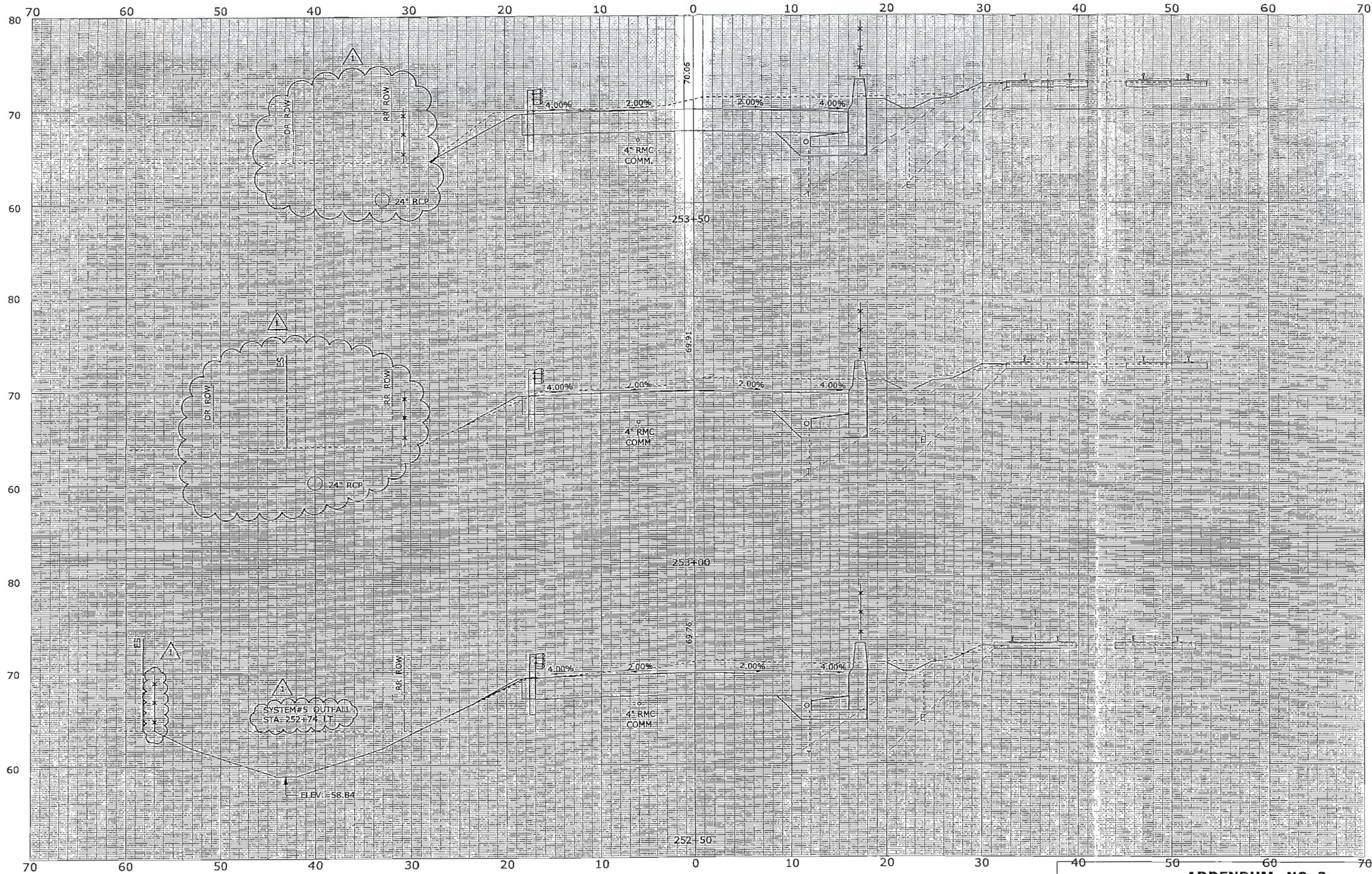
An assessment was also made during the design phase to review the infield area between the ramps to I-84WB for possible placement of a stormwater quality pond, but it was considered not viable due to shallow bedrock.

RESPONSE TO COMMENT #7 ATTACHMENTS

Baker



SYSTEM #5 OUTFALL/DITCH #3



ADDENDUM NO. 2

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted: 4/8/2011

DESIGNER/DRAFTER: S. RUSSO, Y. BARON
CHECKED BY: R. LOHNE
SCALE IN FEET
0 5 10
SCALE 1" = 5'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: HW_MSH_0093_0046_XSC-35.dgn

AMMANN & WHITNEY CONSULTING ENGINEERS, P.C.
96 MORTON STREET
NEW YORK, NY 10014

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY WEST HARTFORD SECTION

TOWN: NEWINGTON, WEST HARTFORD & HARTFORD

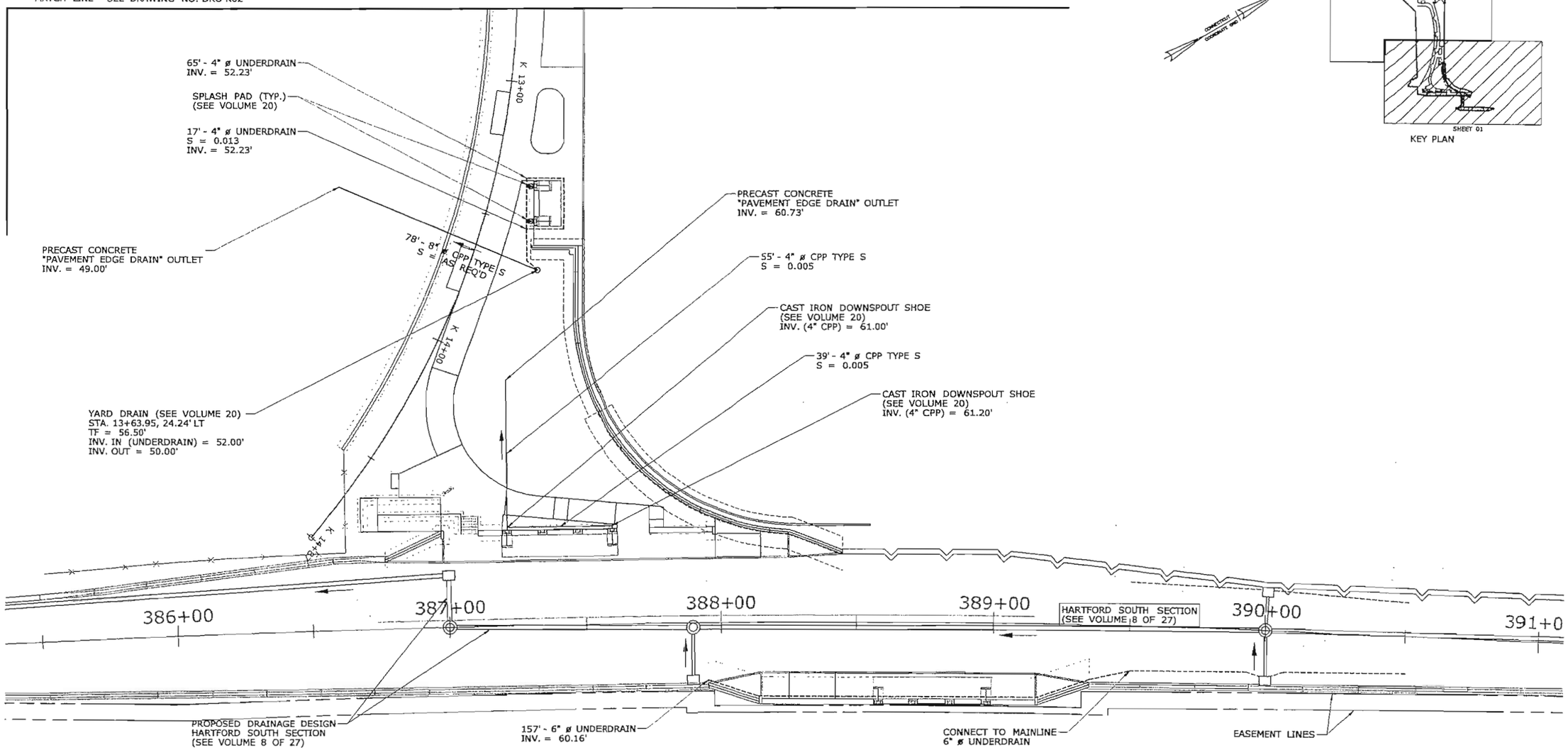
DRAWING TITLE: CROSS SECTIONS

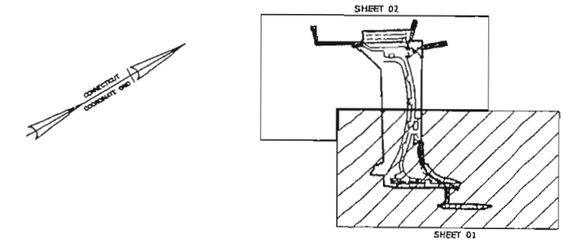
PROJECT NO. 093-180
DRAWING NO. XSC-35
SHEET NO. 07.02.035.A2

RESPONSE TO COMMENT #9 ATTACHMENTS

Baker

MATCH LINE - SEE DRAWING NO. DRG-K02





KEY PLAN

NOTES:

1. ALL DETAIL SHALL REFERENCE VOLUME 1 EXCEPT WHERE OTHERWISE NOTED.

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 12/22/2010

DESIGNER/DRAFTER: EAD
CHECKED BY: AGB
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SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD_MSH_DRG_BBH039_KANE-01.dgn

SIGNATURE BLOCK:

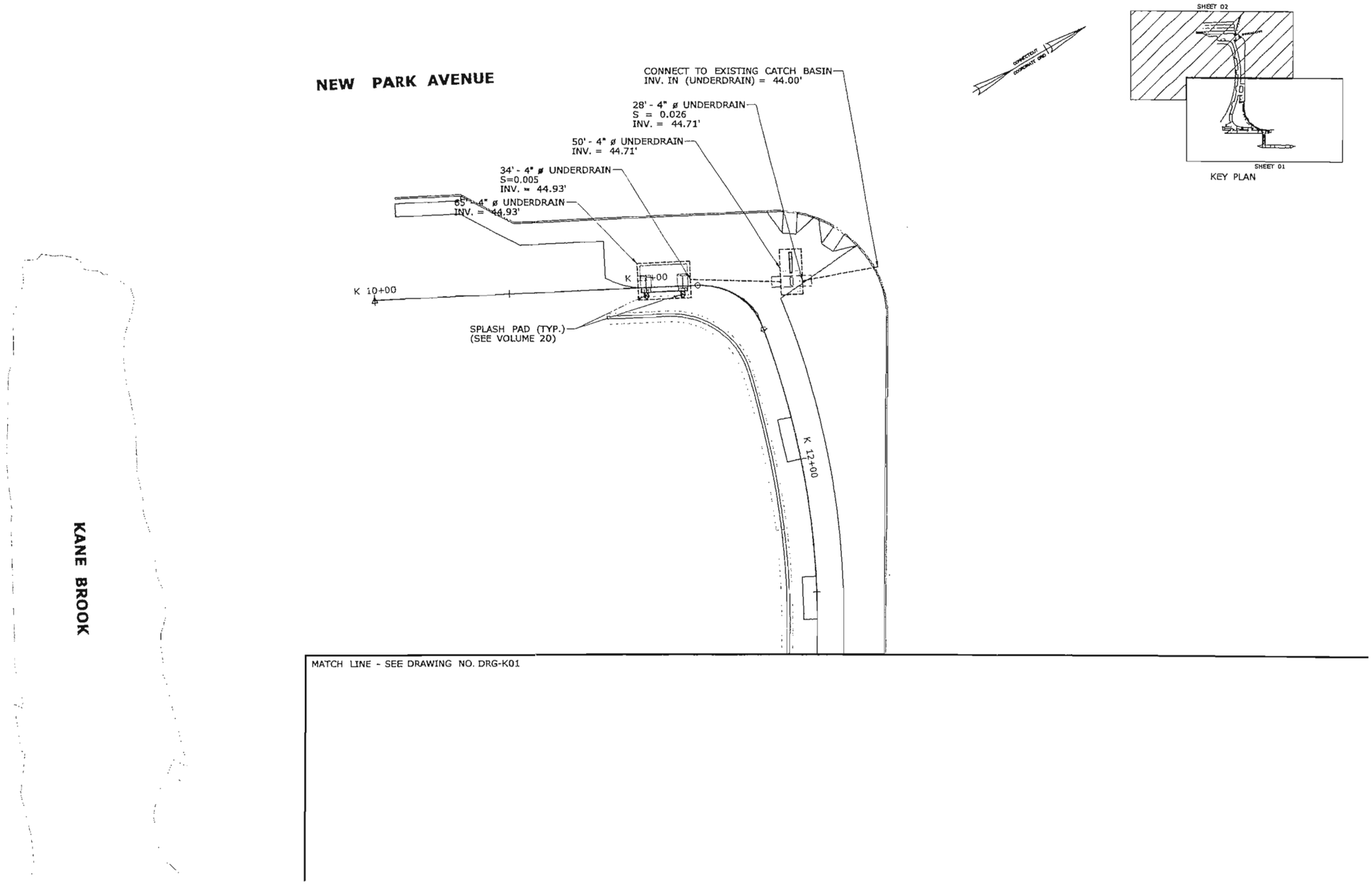
S E A Consultants Inc.
200 Corporate Place
Rocky Hill, CT 06067

PROJECT TITLE:
NEW BRITAIN - HARTFORD
BUSWAY
KANE STREET STATION

TOWN: HARTFORD

DRAWING TITLE: DRAINAGE PLANS

PROJECT NO. 093-180
DRAWING NO. DRG-K01
SHEET NO. 25.05.001



NOTES:

1. ALL DETAIL SHALL REFERENCE VOLUME 1 EXCEPT WHERE OTHERWISE NOTED.

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THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 12/22/2010

DESIGNER/DRAFTER: EAD
CHECKED BY: AGB
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SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD_MSH_DRG_68H039_KANE-02.dgn

SIGNATURE BLOCK:

S E A Consultants Inc.
200 Corporate Place
Rocky Hill, CT 06067

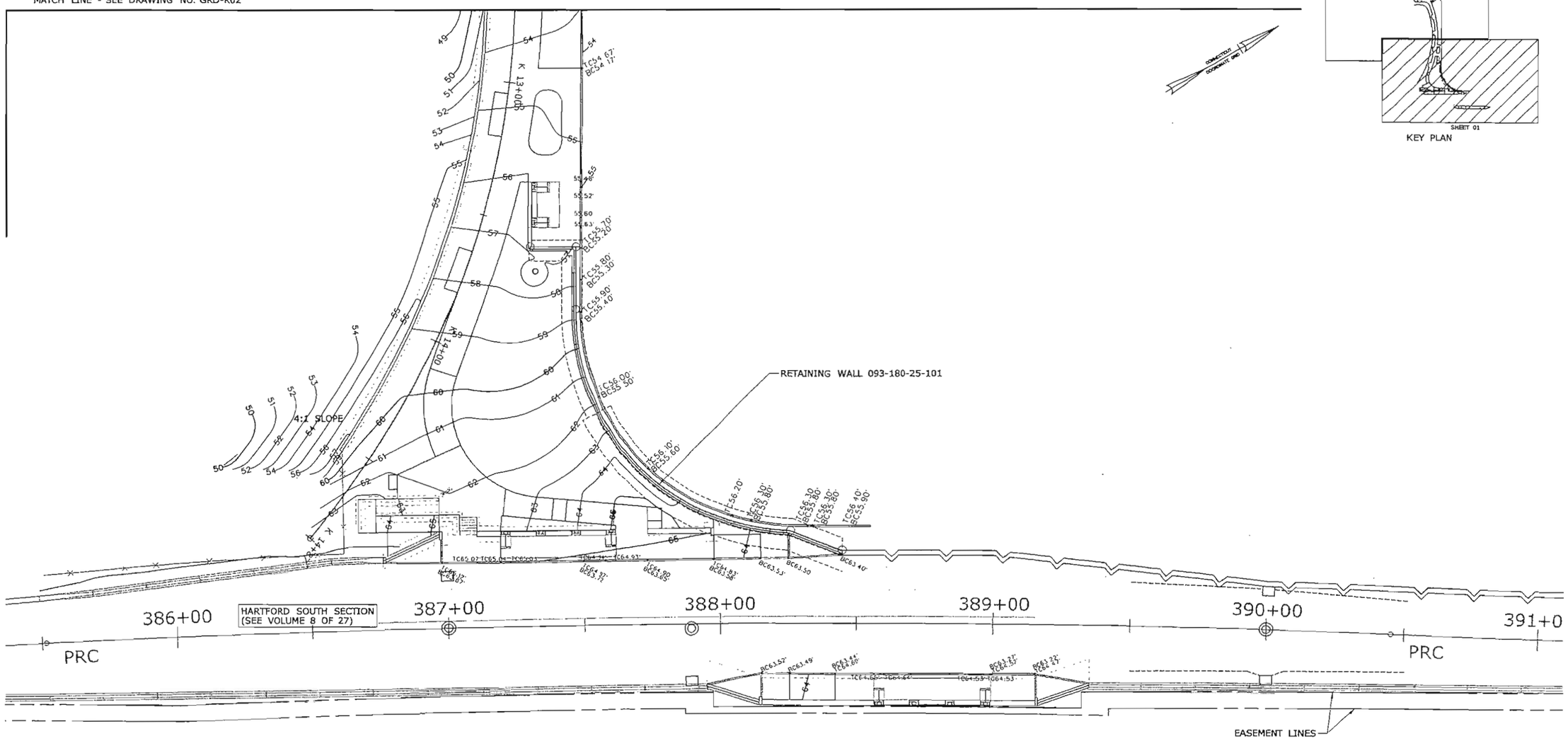
PROJECT TITLE:
NEW BRITAIN - HARTFORD
BUSWAY
KANE STREET STATION

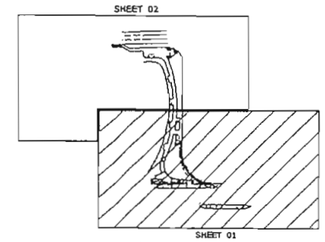
TOWN: HARTFORD

DRAWING TITLE: DRAINAGE PLAN

PROJECT NO. 093-180
DRAWING NO. DRG-K02
SHEET NO. 25.05.002

MATCH LINE - SEE DRAWING NO. GRD-K02





KEY PLAN

NOTES:

1. SEE GRADING ENLARGEMENTS FOR ADDITIONAL SPOT GRADES.
2. SEE STATION AND BUSWAY DRAINAGE PLANS FOR DRAINAGE STRUCTURES AND PIPE DATA.

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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Plotted Date: 12/22/2010

DESIGNER/DRAFTER: EAD
CHECKED BY: AGB
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SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD.MSH.GRD.88H039.KANE-01.dgn

SIGNATURE BLOCK:

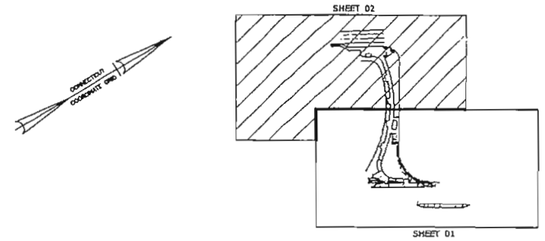
S E A Consultants Inc.
200 Corporate Place
Rocky Hill, CT 06067

PROJECT TITLE:
NEW BRITAIN - HARTFORD BUSWAY
KANE STREET STATION

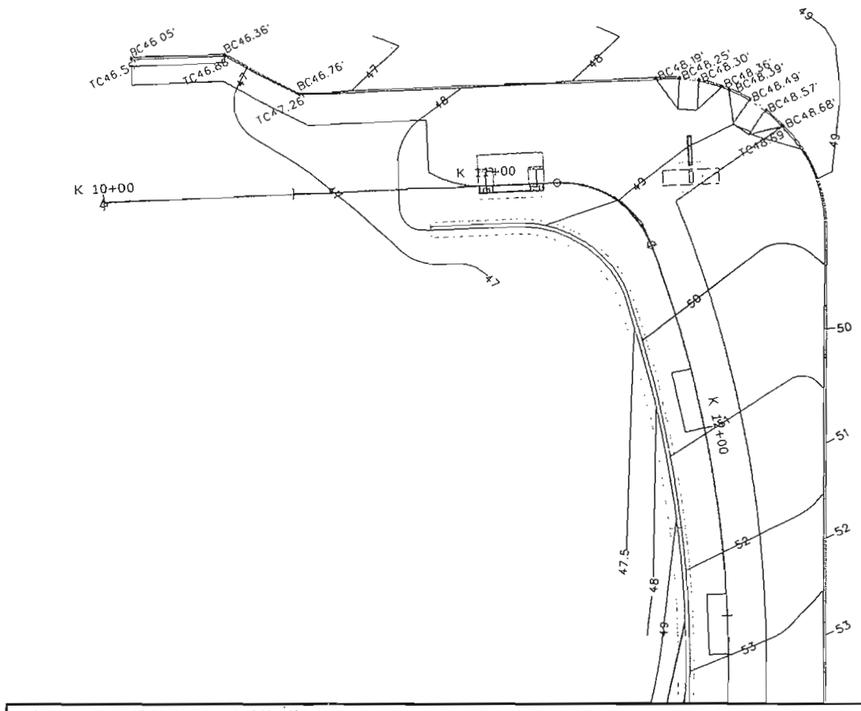
TOWN: HARTFORD

DRAWING TITLE: GRADING PLAN

PROJECT NO. 093-180
DRAWING NO. GRD-K01
SHEET NO. 25.07.001



KEY PLAN



MATCH LINE - SEE DRAWING NO. GRD-K01

NOTES:

1. SEE GRADING ENLARGEMENTS FOR ADDITIONAL SPOT GRADES.
2. SEE STATION AND BUSWAY DRAINAGE PLANS FOR DRAINAGE STRUCTURES AND PIPE DATA.

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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Plotted Date: 12/22/2010

DESIGNER/DRAFTER: EAD
CHECKED BY: AGB
SCALE IN FEET 0 20 40
SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD-MSH.GRD.88H039.KANE-02.dgn

SIGNATURE BLOCK:

S E A Consultants Inc.
200 Corporate Place
Rocky Hill, CT 06067

PROJECT TITLE:
NEW BRITAIN - HARTFORD BUSWAY
KANE STREET STATION

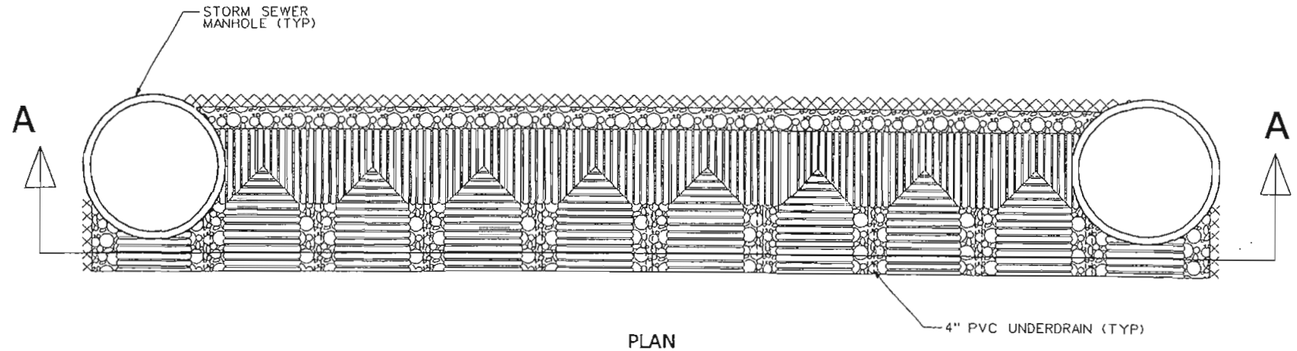
TOWN: HARTFORD

DRAWING TITLE: GRADING PLAN

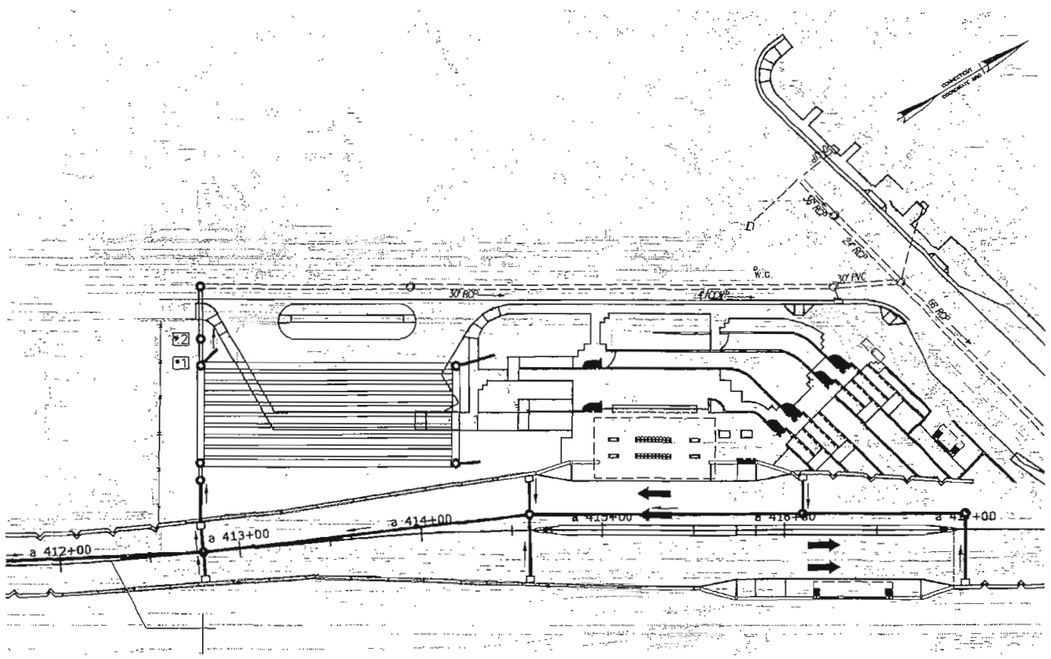
PROJECT NO. 093-180
DRAWING NO. GRD-K02
SHEET NO. 25.07.002

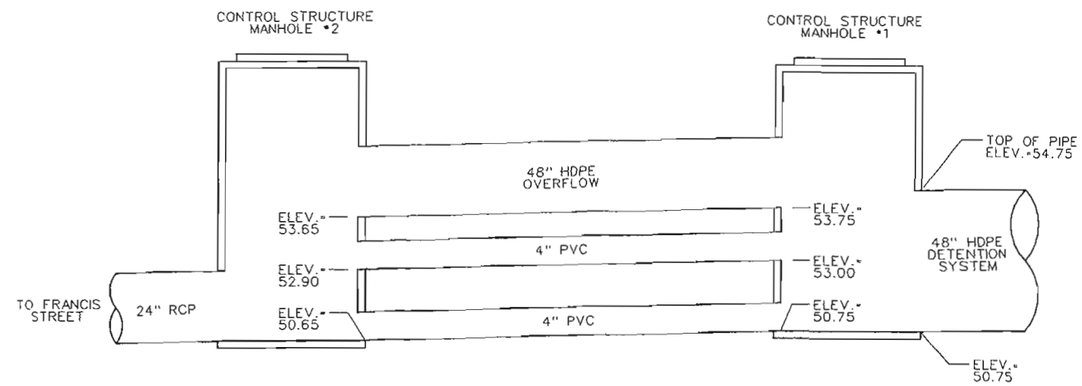
RESPONSE TO COMMENT #10 ATTACHMENTS

Baker

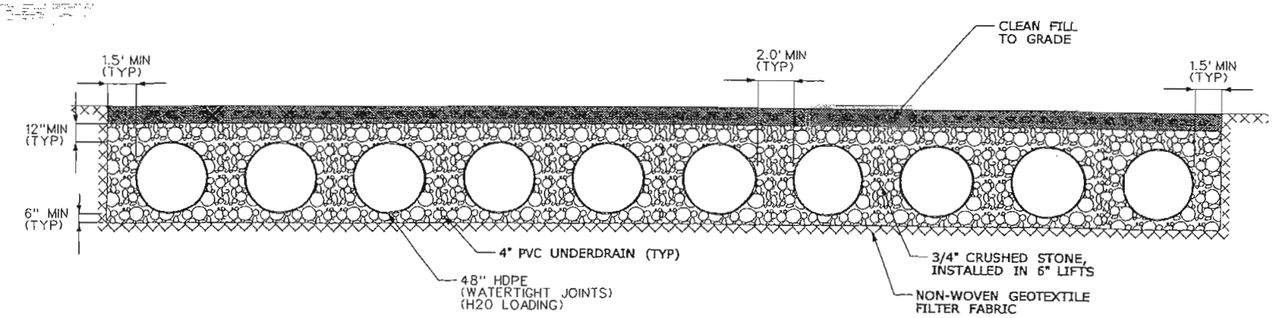


PLAN





CONTROL STRUCTURE



SECTION A-A

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 12/22/2010

DESIGNER/DRAFTER: J. Bambara
CHECKED BY: C. Lanphear
SCALE IN FEET 0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\hw.msh.155.h025.DRG-14.DGN

SIGNATURE BLOCK

VN ENGINEERS, INC.
116 WASHINGTON AVE.
NORTH HAVEN, CT 06473
(203) 234-7862

PROJECT TITLE:
NEW BRITAIN - HARTFORD BUSWAY
HARTFORD SOUTH SECTION

TOWN:
NEWINGTON, WEST HARTFORD & HARTFORD

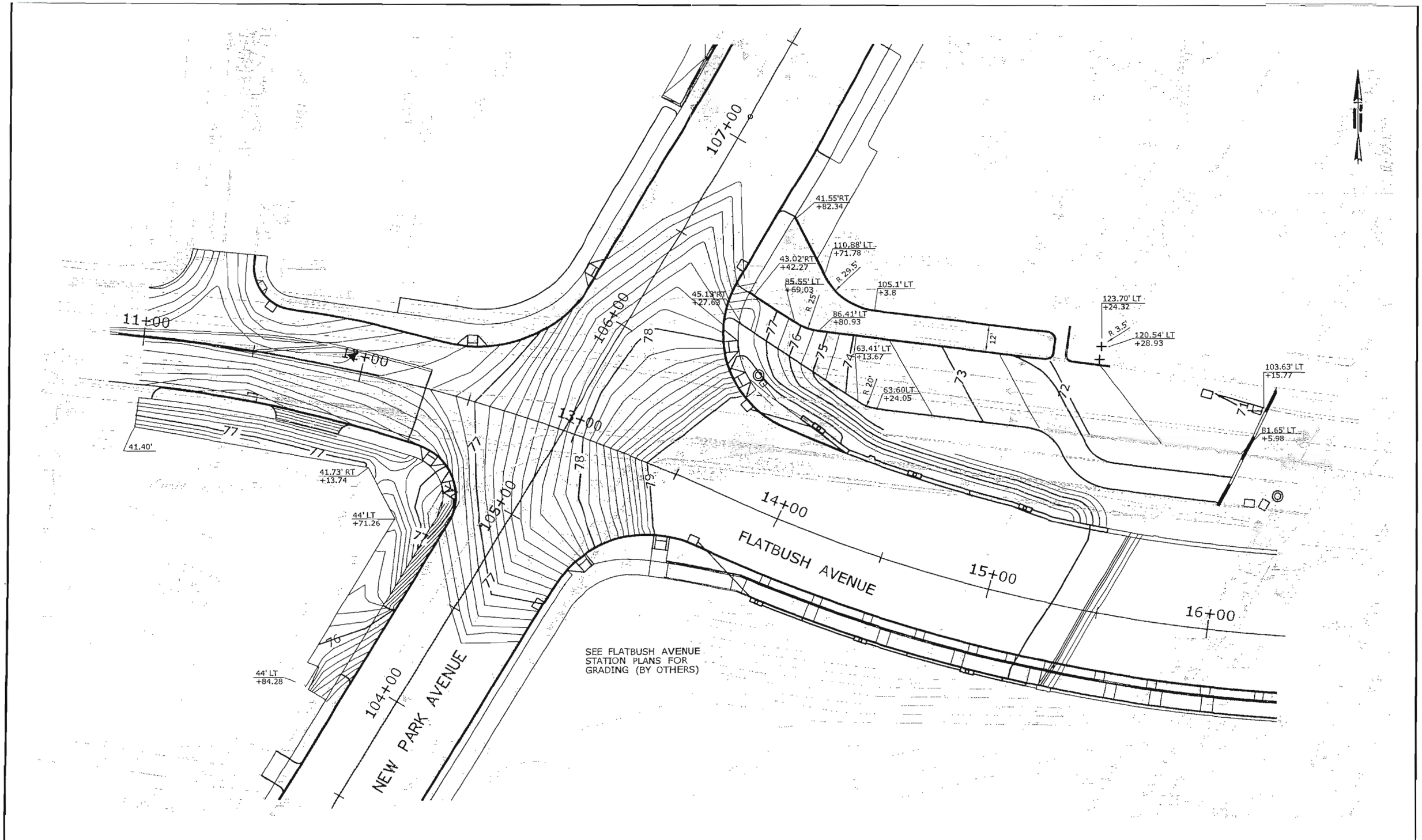
DRAWING TITLE:
UNDERGROUND STORMWATER DETENTION

PROJECT NO. 093-180
DRAWING NO. DRG-14
SHEET NO. 08.14.014

Border Version: 11/14/08

RESPONSE TO COMMENT #11 ATTACHMENTS

Baker



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Plotted: 12/20/2010

DESIGNER/DRAFTER: D.SHI

CHECKED BY: R.ALOISE

HORIZ. SCALE IN FEET 0 20 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: P:\155_H030_FLATBUSH\Highways\MS_Contract_Sheet_Files\hw_msh_0155_h030_GP-01.dgn

SIGNATURE/BLOCK:

STATE OF CONNECTICUT · RONALD B. BACON · No. 19698 · LICENSED · PROFESSIONAL ENGINEER

URS CORPORATION AES
500 ENTERPRISE DRIVE
ROCKY HILL, CT 06067

PROJECT TITLE:
NEW BRITAIN - HARTFORD
BUSWAY
FLATBUSH AVE OVER BUSWAY & AMTRAK

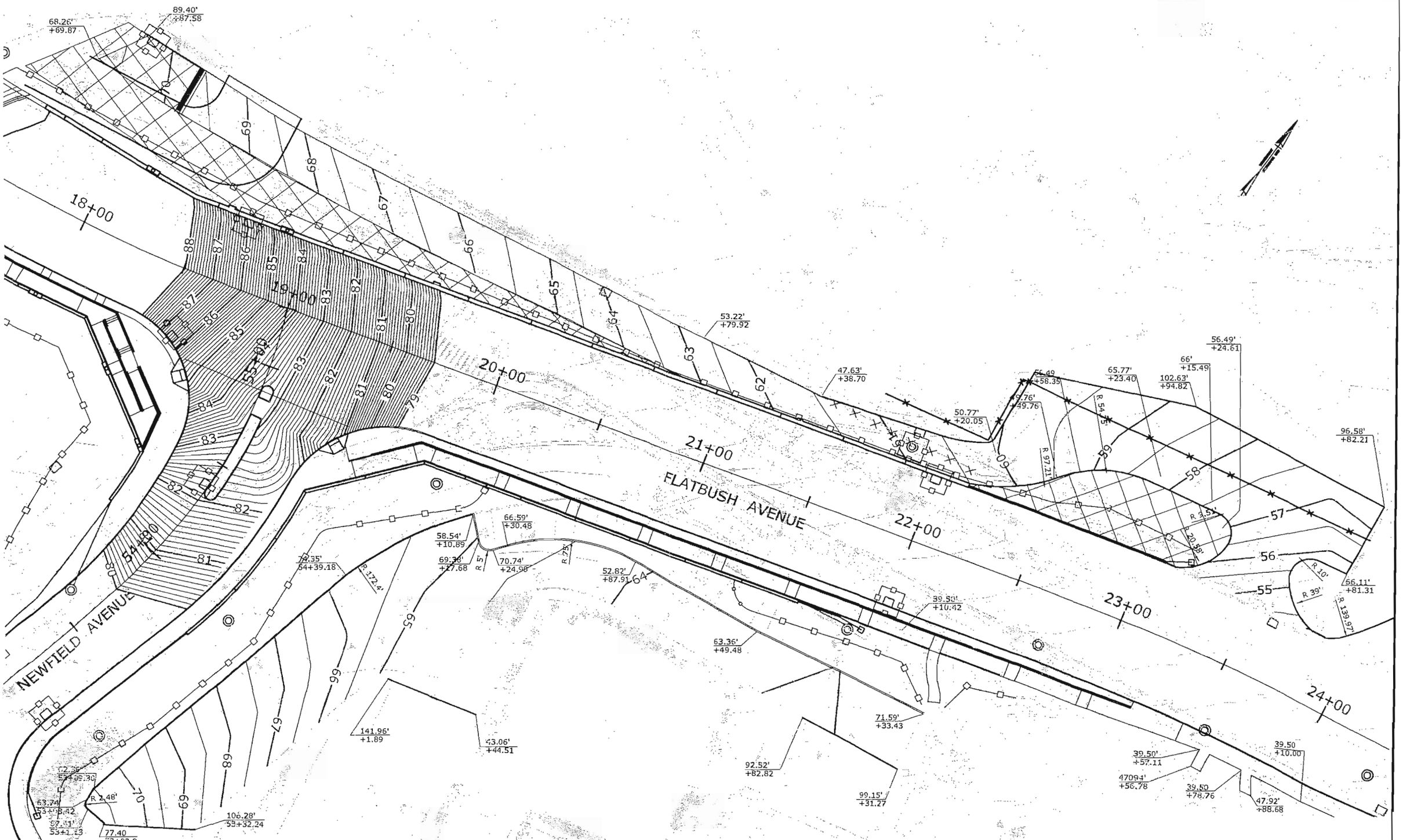
TOWN: WEST HARTFORD/ HARTFORD

DRAWING TITLE: INTERSECTION GRADING PLAN

PROJECT NO. 63-643

DRAWING NO. IGP-01

SHEET NO. 17.15.001



REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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Plotted: 12/20/2010

DESIGNER/DRAFTER: D. SHI

CHECKED BY: R. ALOISE

SCALE IN FEET

0 20 40

SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: P:\155_H030_FLATBUSH\Highways\MS_Contract_Sheet_Files\hw_mth_0155_h030_IGP-02.dgn

SIGNATURE/BLOCK:

STATE OF CONNECTICUT
RONALD G. BACCHI
No. 18684
LICENSED
PROFESSIONAL ENGINEER

URS CORPORATION AES
500 ENTERPRISE DRIVE
ROCKY HILL, CT 06067

PROJECT TITLE:

NEW BRITAIN - HARTFORD
BUSWAY
FLATBUSH AVE OVER BUSWAY & AMTRAK

TOWN: WEST HARTFORD/ HARTFORD

DRAWING TITLE: INTERSECTION GRADING PLAN

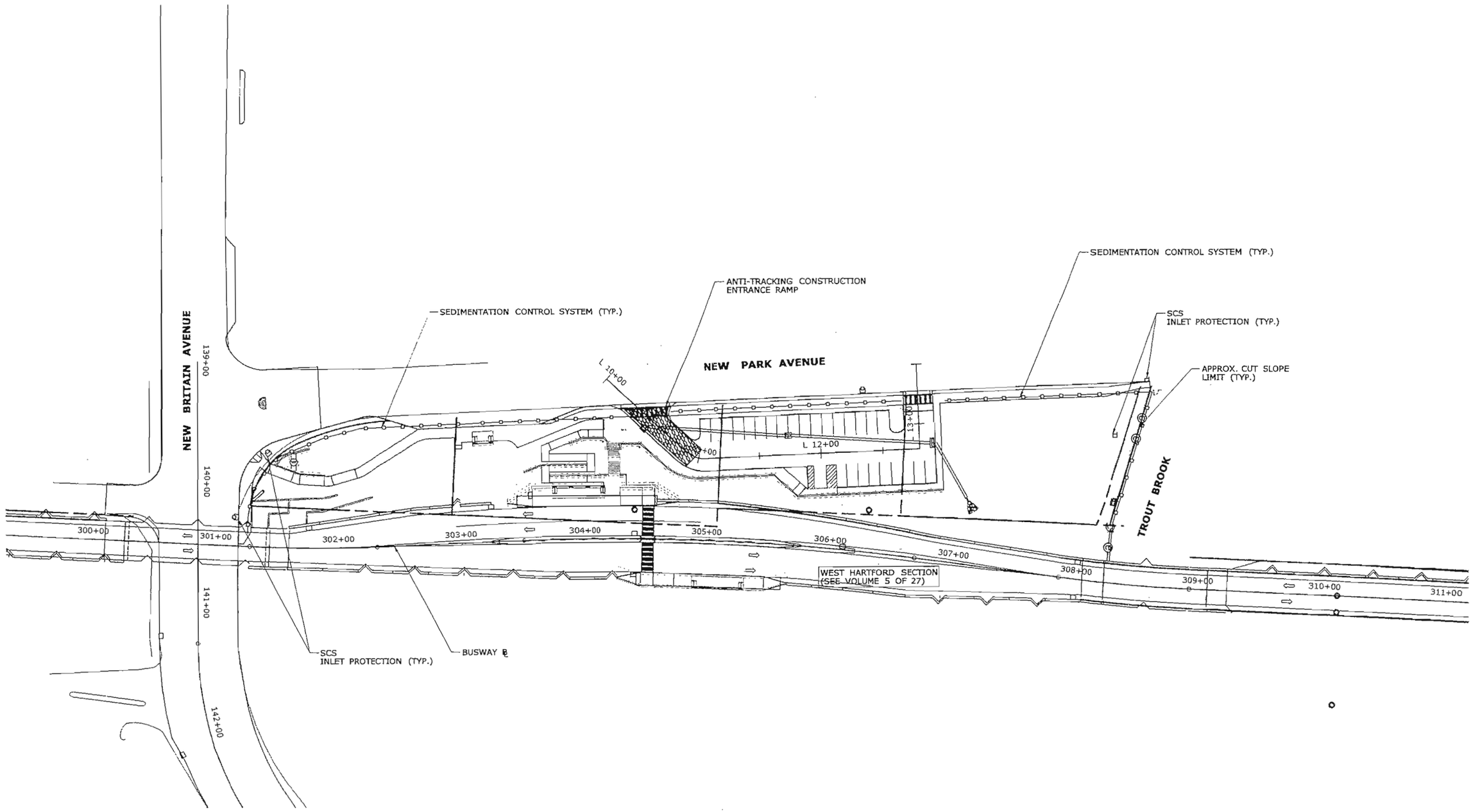
PROJECT NO. 63-643

DRAWING NO. IGP-02

SHEET NO. 17.15.002

RESPONSE TO COMMENT #12 ATTACHMENTS

Baker



NOTES:

1. EARTH SLOPES STEEPER OR EQUAL TO 3:1 AND FLATTER OR EQUAL TO 2:1 SHALL HAVE EROSION CONTROL MATTING.
2. CONTRACTOR SHOULD BE DIRECTED TO 2002 D.E.P. E&S GUIDELINES FOR EROSION AND SEDIMENTATION CONTROL.
3. ALL DETAILS SHALL REFERANCE VOLUME 1 EXCEPT WHERE OTHERWISE NOTED.

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 12/22/2010

DESIGNER/DRAFTER: EAD
CHECKED BY: AGB
SCALE IN FEET
0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD_MSH_SED_88H039_ELMWOOD.dgn

SIGNATURE BLOCK:
STATE OF CONNECTICUT
ALBERT G. DIEKAN
PROFESSIONAL ENGINEER
5 E A Consultants Inc.
200 Corporate Place
Rocky Hill, CT 06067

PROJECT TITLE:
NEW BRITAIN - HARTFORD BUSWAY
ELMWOOD STATION

TOWN: WEST HARTFORD

DRAWING TITLE: SEDIMENTATION AND EROSION CONTROL

PROJECT NO. 093-180
DRAWING NO. SED-L01
SHEET NO. 23.11.001

RESPONSE TO COMMENT #13 ATTACHMENTS

Baker

Brand, Paul

From: Suehr, Shaun [SSuehr@AMMANN-WHITNEY.COM]
Sent: Thursday, April 07, 2011 2:10 PM
To: Margiotta, Antonio
Cc: Morelli, Antonio; Bob Reilly; 'Cunningham, Brian T'; Dan Hageman; 'Mancini(david.mancini@ct.gov); 'JacobArgiro'; 'LaRocca, Laurie I.'; Long, Lori; 'Armstrong, Richard B'; Bob Reilly; yolanda antoniak; Brand, Paul; Lesay, Kimberly C; Alexander, Mark W; Stark, Brett W; Piraneo, Andrew
Subject: RE: DEP COMMENTS

Tony,

Our responses to DEP's comments are below. The additional documents requested have been uploaded to VN's ftp site (see below for info). I believe you may already have much of this but just in case, it should all be there on the FTP site.

To address DEP comment #3
-The current drainage report has been uploaded.
-Revised Pre/Post Chart (this is the chart that we updated on March 10, 2011, there are no changes to the flows) have been uploaded.
-Post Development supporting calculations (this is the back up for the flows shown in the Revised Pre/Post Chart) have been uploaded.
-Pre Development supporting calculations (this is the back up for the flows shown in the Revised Pre/Post Chart) have been uploaded.

To address DEP comment #4
We have filled out and signed the Certification Form and will send it by FedEx to you this afternoon.

To address DEP comment #6
-The water quality treatment measures used at the following locations are:
-System 1A: 2' Deep Sumps and an offline type system design (ie, trunk line of the drainage system running down the middle with CB's located off of the trunk line) for the last 500'+/- of the system.
-System 1C: 2' Deep Sumps
-System 2: 2' Deep Sumps
-System 8: 2' Deep Sumps and an offline type system design (ie, trunk line of the drainage system running down the middle with CB's located off of the trunk line) for the entire system.
-System 5: 2' Deep Sumps

To address DEP comment #7
-See the Busway Plan Drawings (Sheets 05.12.009 and 05.12.011) and the HO46 Drainage Report (Appendix D – Sheet 4a) for System 5 Drainage Ditch (Ditch #3) information.

To address DEP comment #13
-This is correct, Channel No. 5 has been removed from Contract No. 93-HO46.

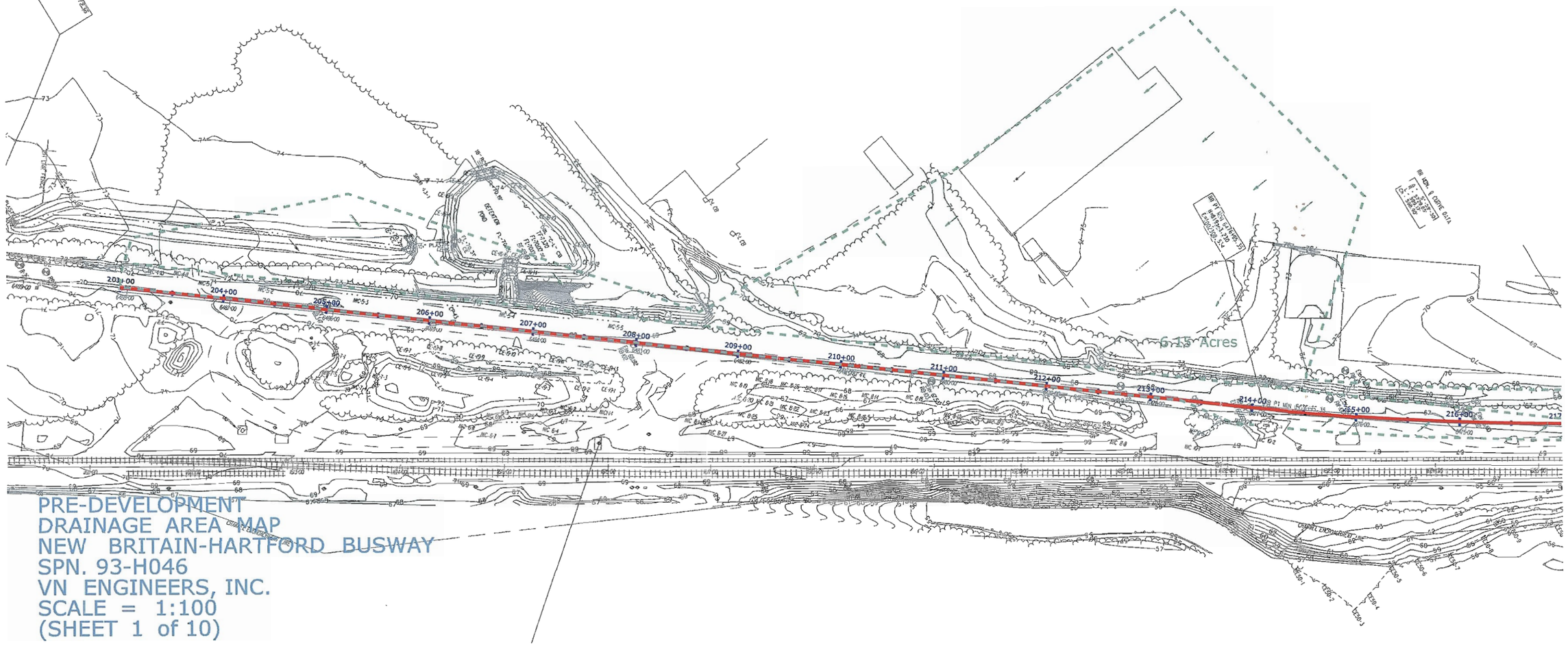
To address DEP comment #14
-The current Watershed maps for both the PRE and POST conditions have been uploaded.

Plans can be retrieved by following the attached link:
ftp.vnengineers.com

RESPONSE TO COMMENT #14 ATTACHMENTS

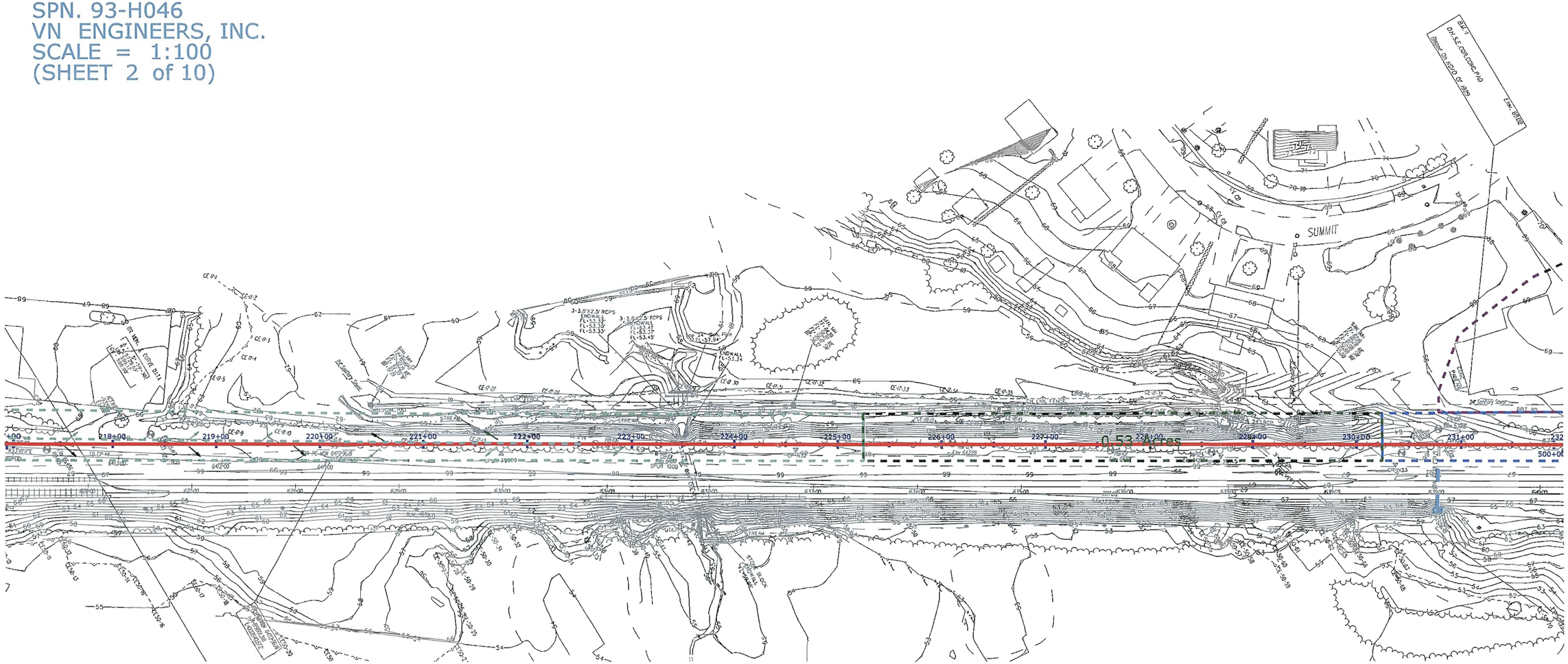
Baker

H – 046

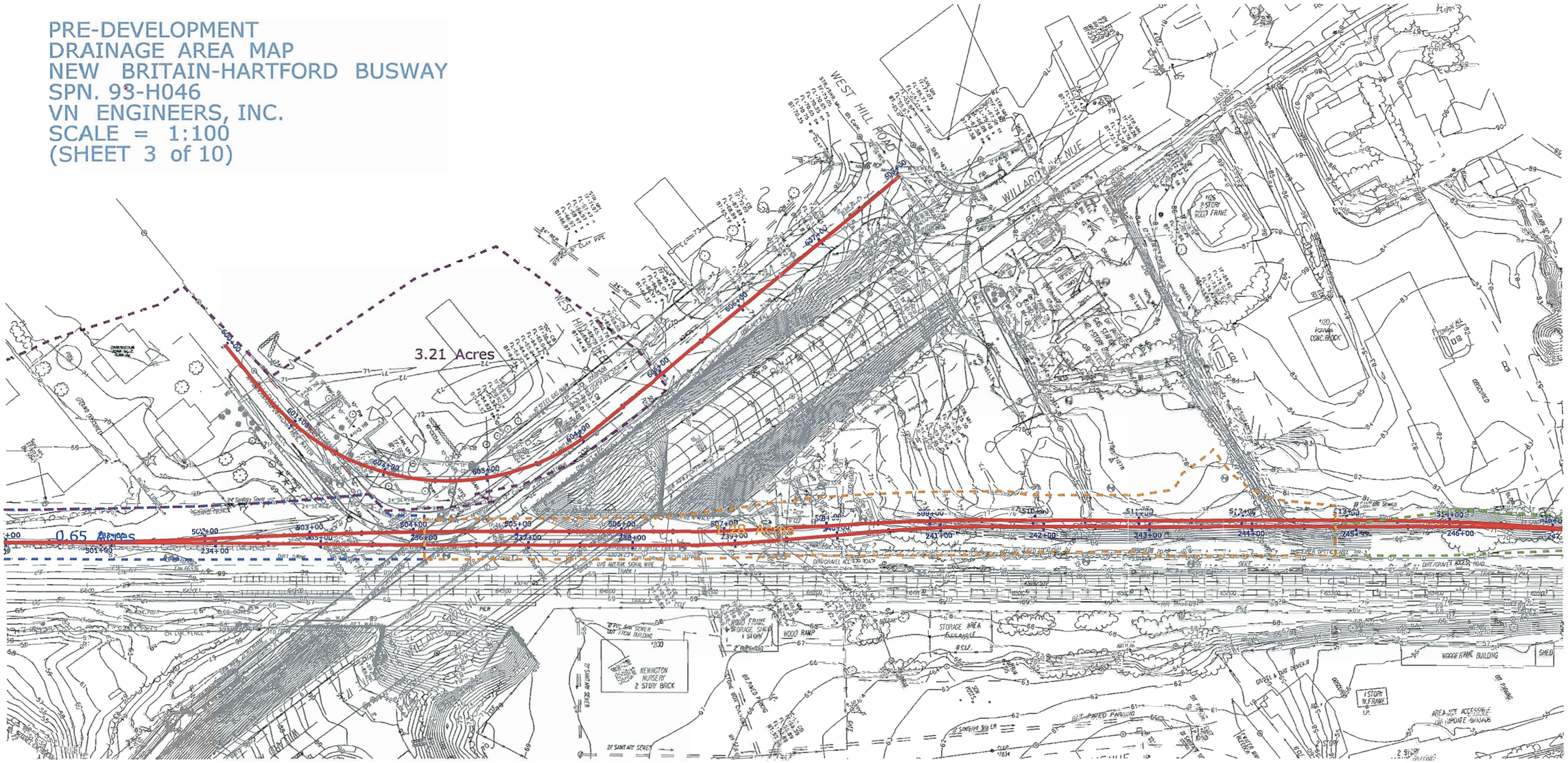


PRE-DEVELOPMENT
DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
SCALE = 1:100
(SHEET 1 of 10)

PRE-DEVELOPMENT
DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
SCALE = 1:100
(SHEET 2 of 10)



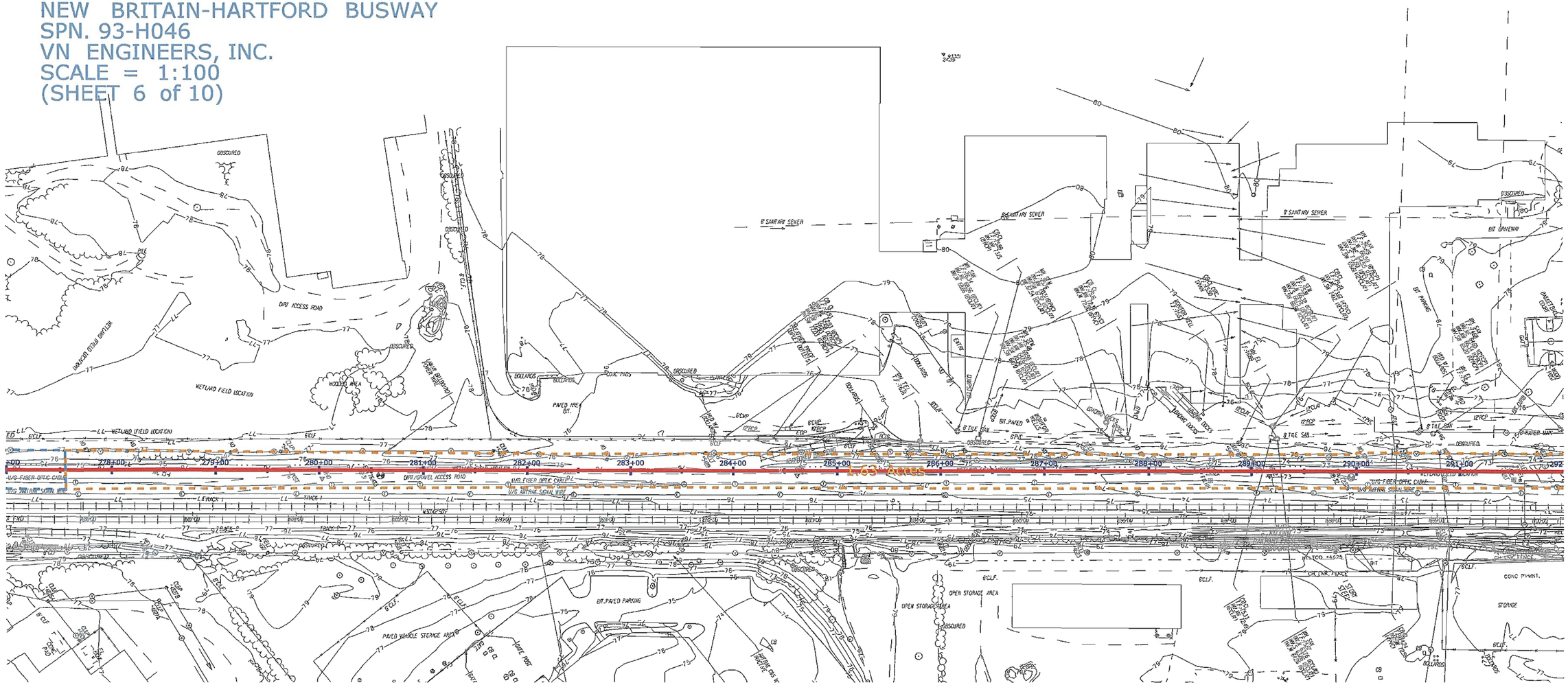
PRE-DEVELOPMENT
DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
SCALE = 1:100
(SHEET 3 of 10)



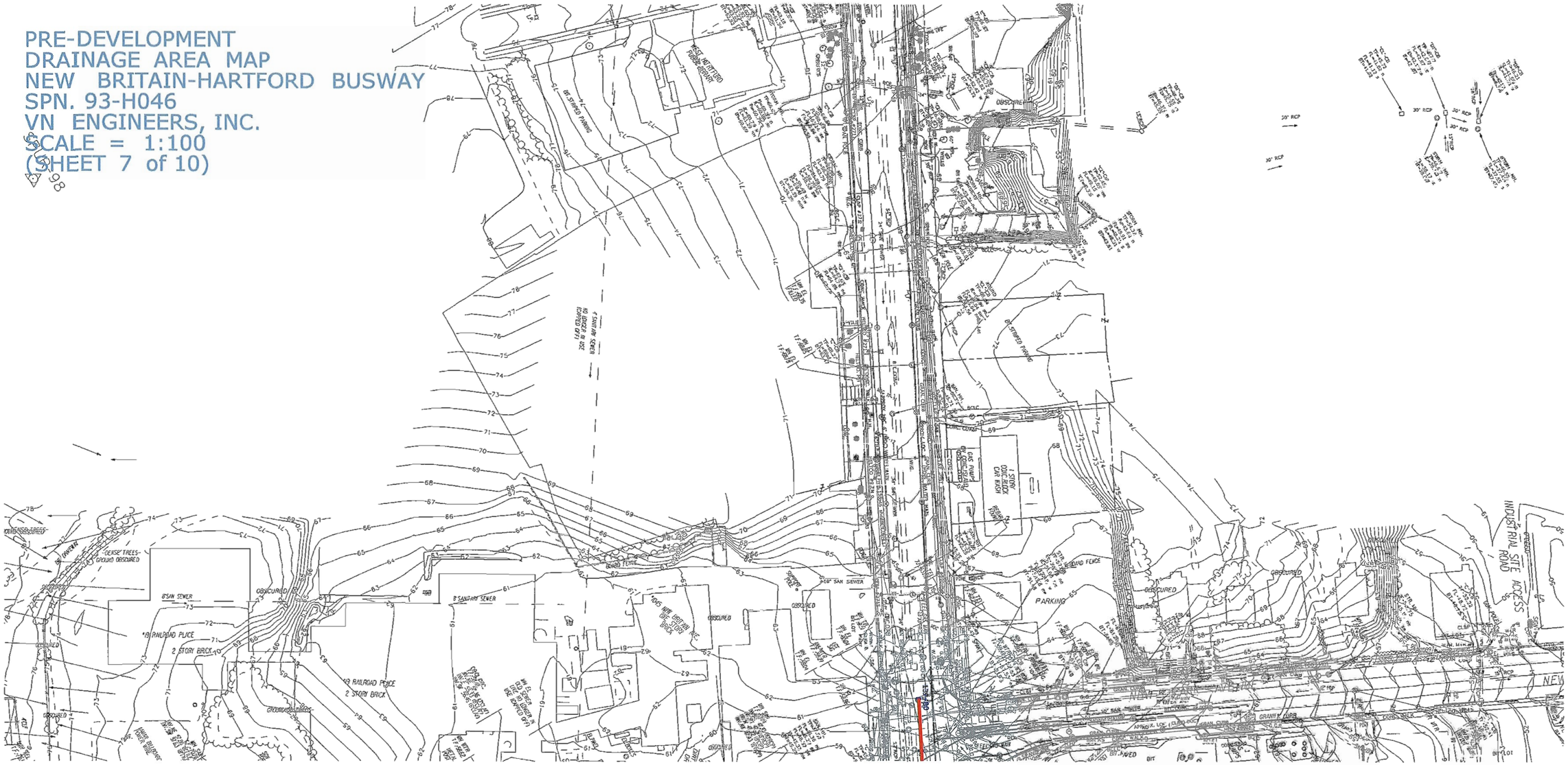
PRE-DEVELOPMENT
DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
SCALE = 1:100
(SHEET 4 of 10)

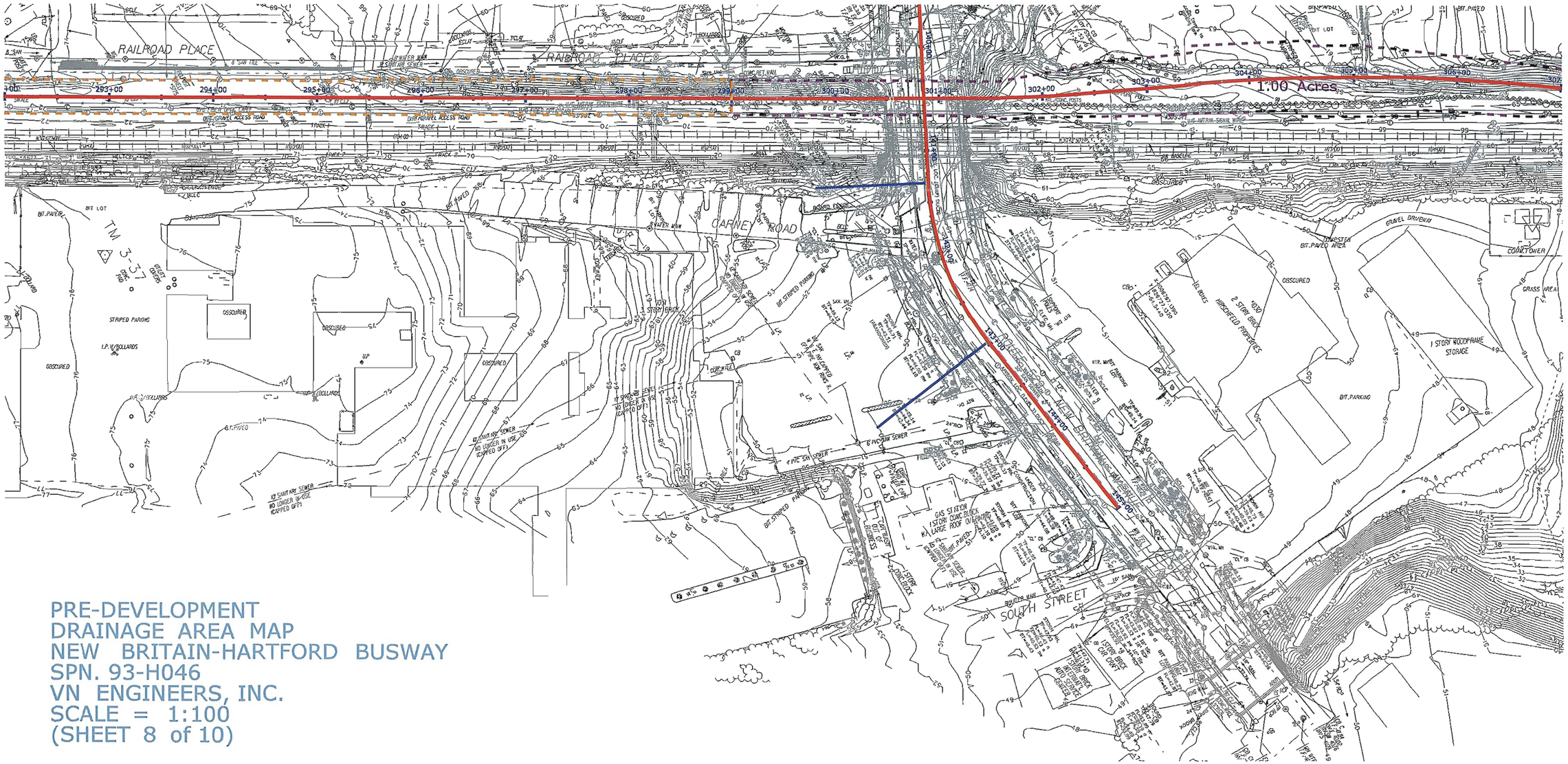
PRE-DEVELOPMENT
DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
SCALE = 1:100
(SHEET 5 of 10)

PRE-DEVELOPMENT
DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
SCALE = 1:100
(SHEET 6 of 10)



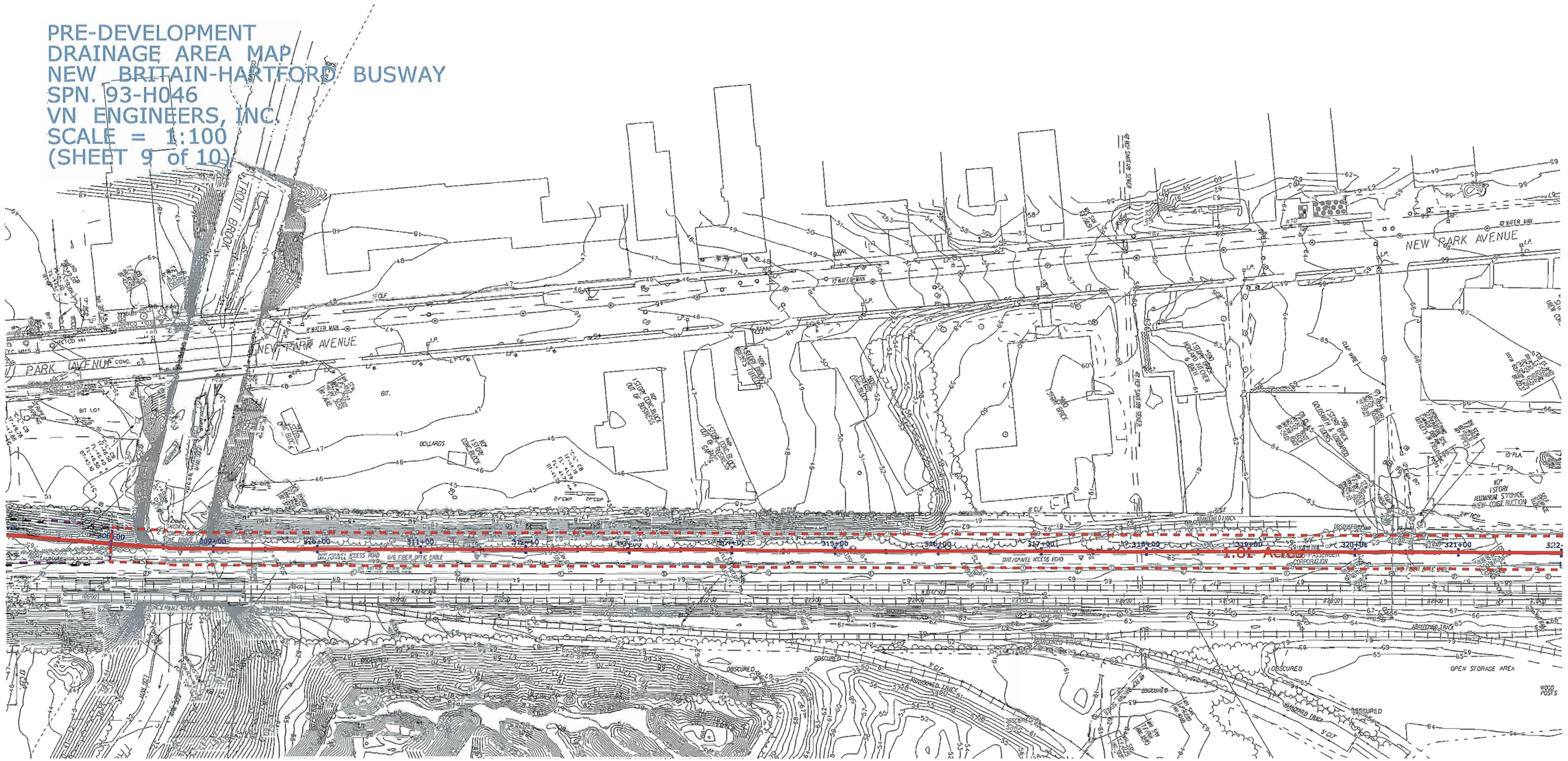
PRE-DEVELOPMENT
DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
SCALE = 1:100
(SHEET 7 of 10)



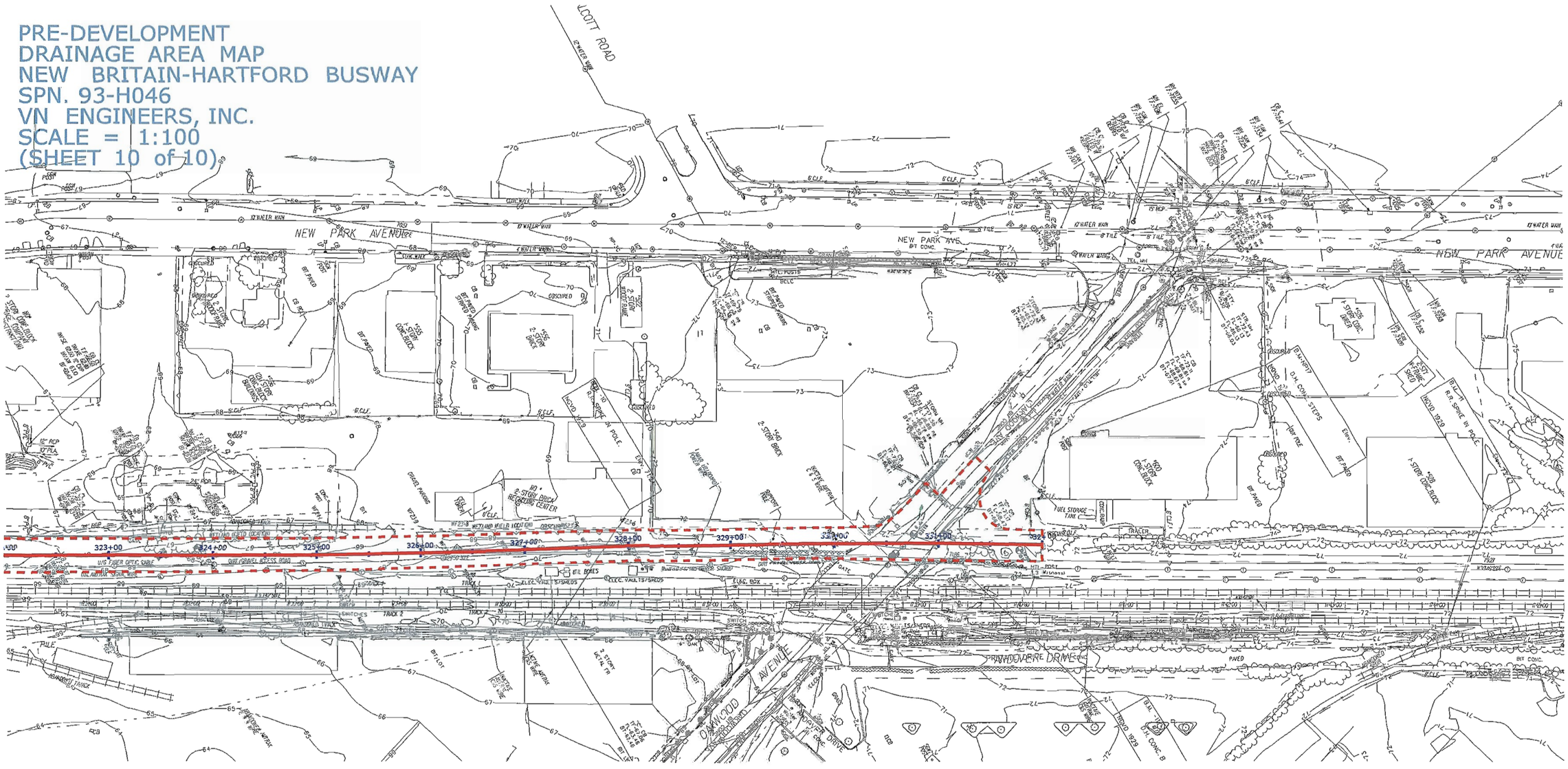


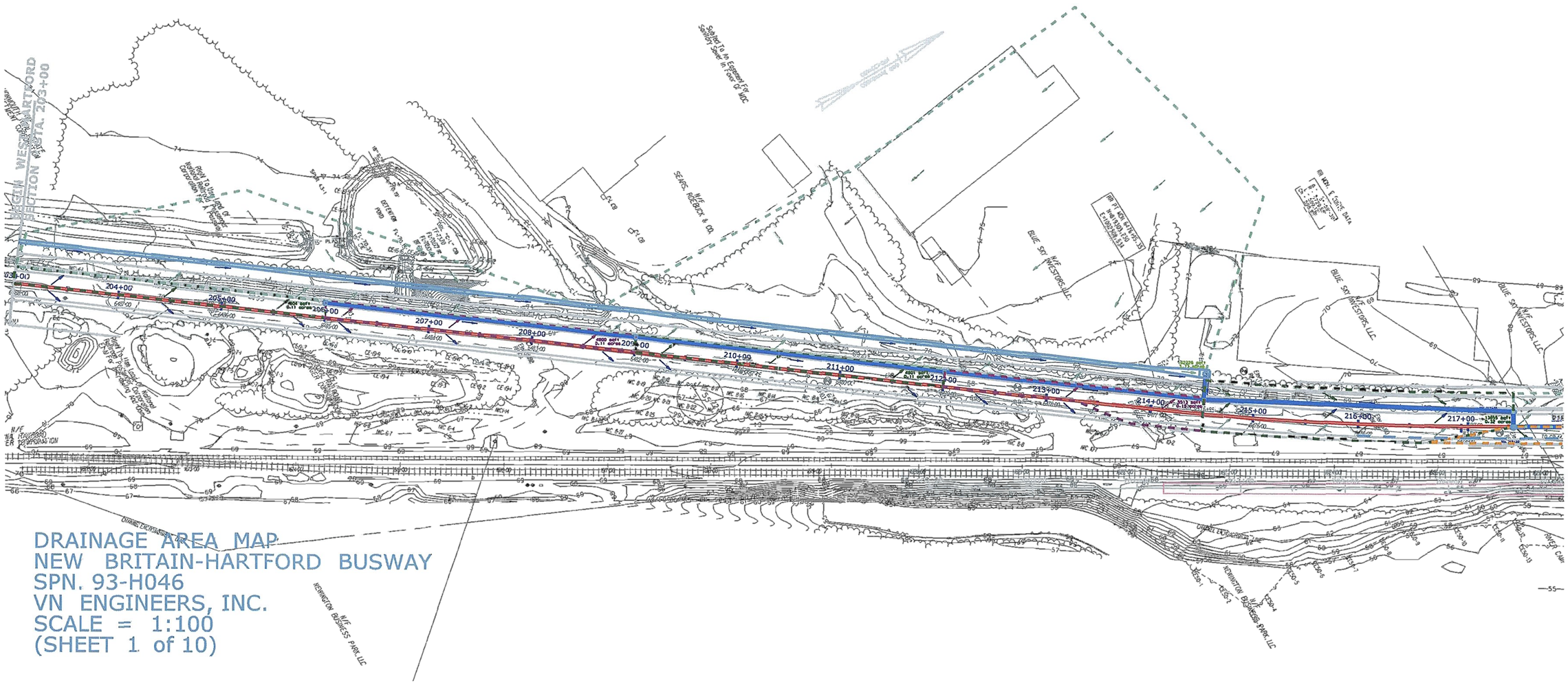
PRE-DEVELOPMENT
DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
SCALE = 1:100
(SHEET 8 of 10)

PRE-DEVELOPMENT
DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
SCALE = 1:100
(SHEET 9 of 10)



PRE-DEVELOPMENT
DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
SCALE = 1:100
(SHEET 10 of 10)





DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
SCALE = 1:100
(SHEET 1 of 10)

DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
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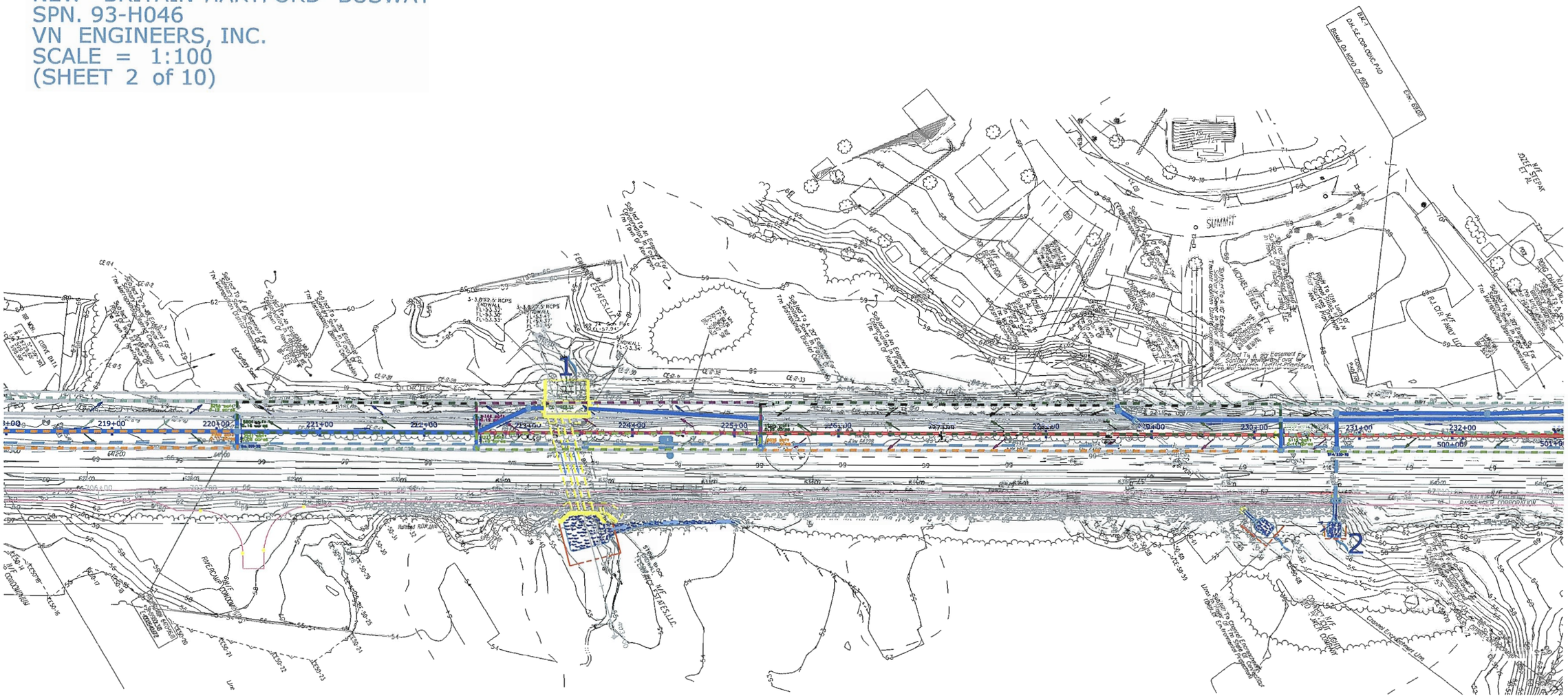
(SHEET 2 of 10)



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NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
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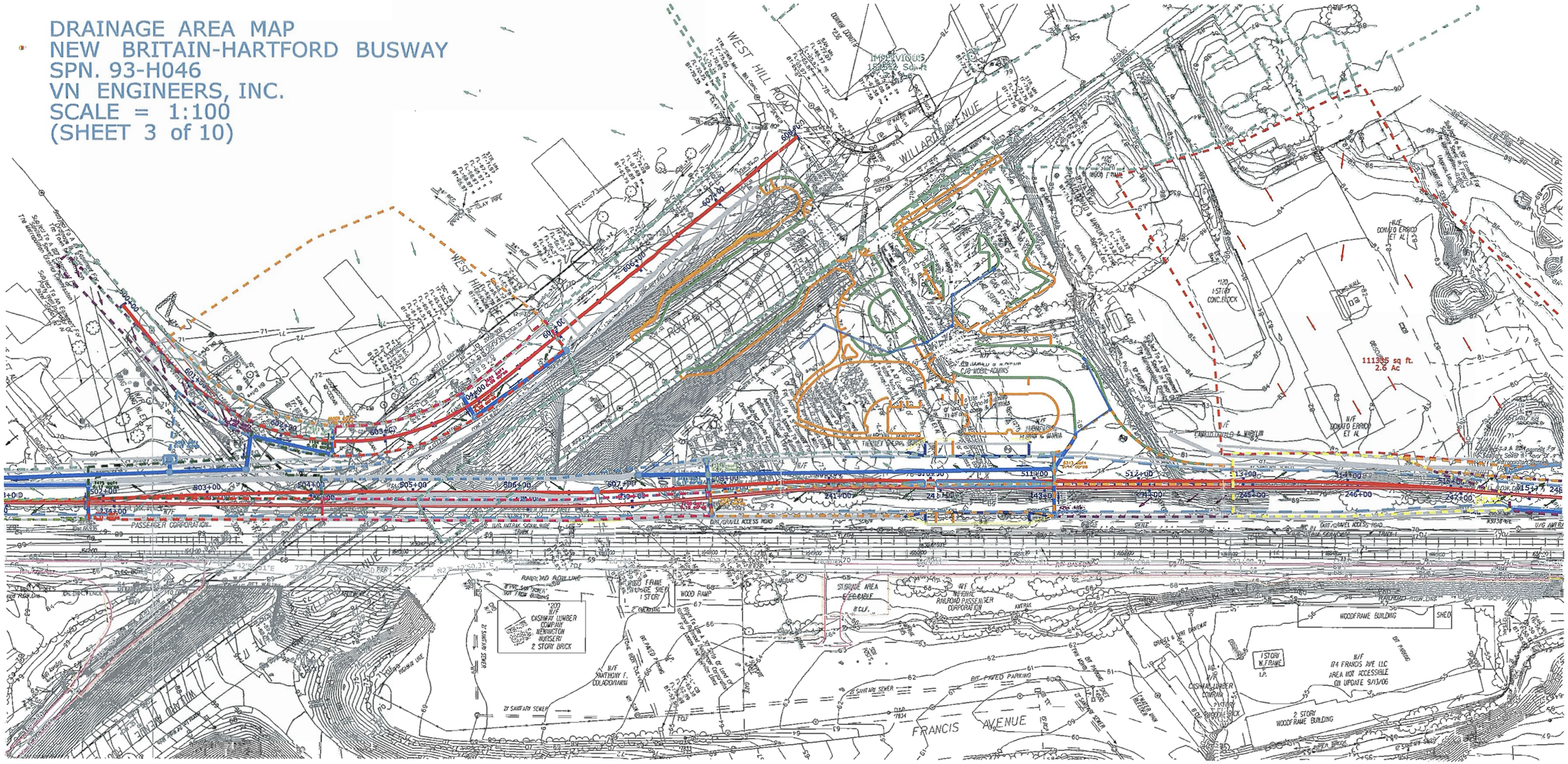

DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
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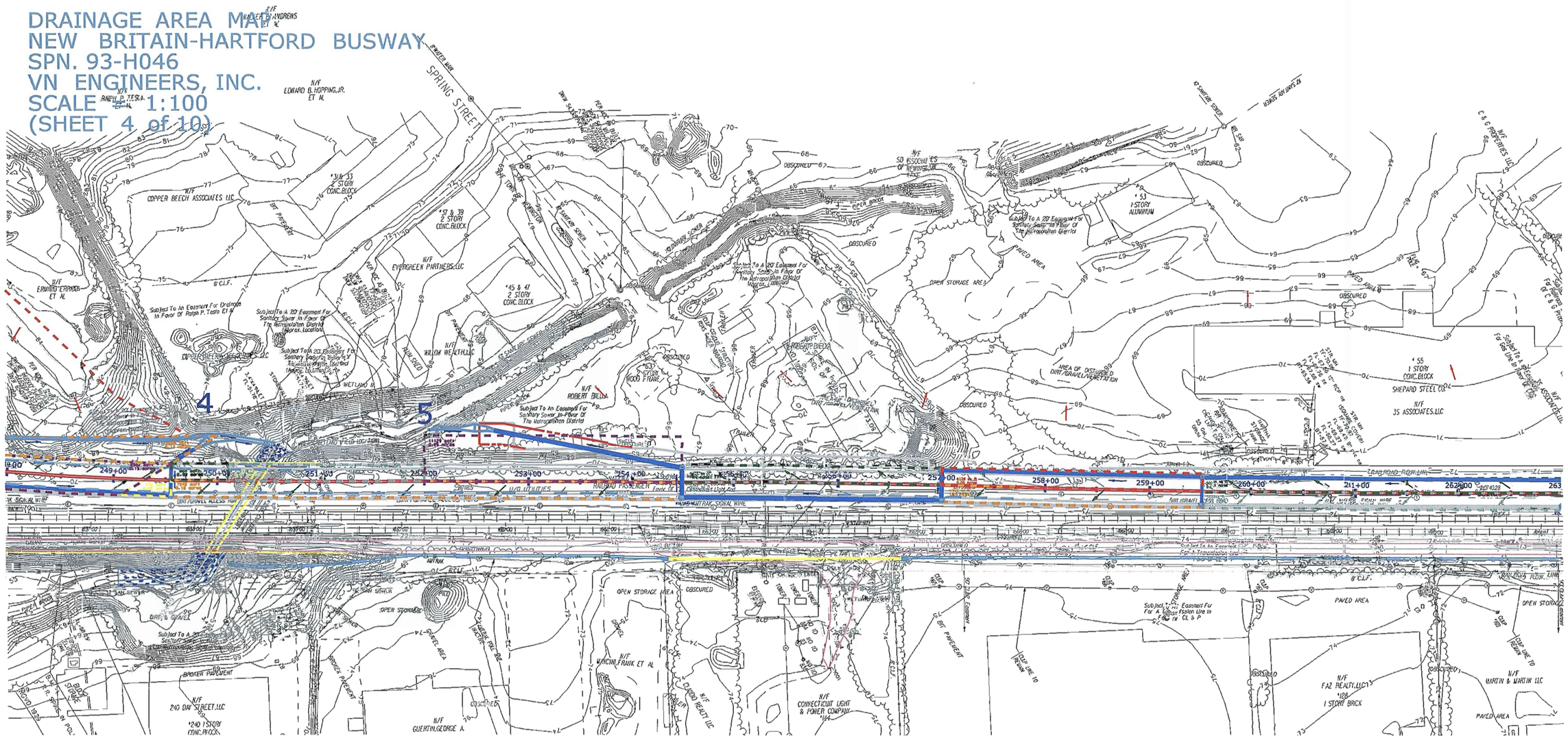

DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
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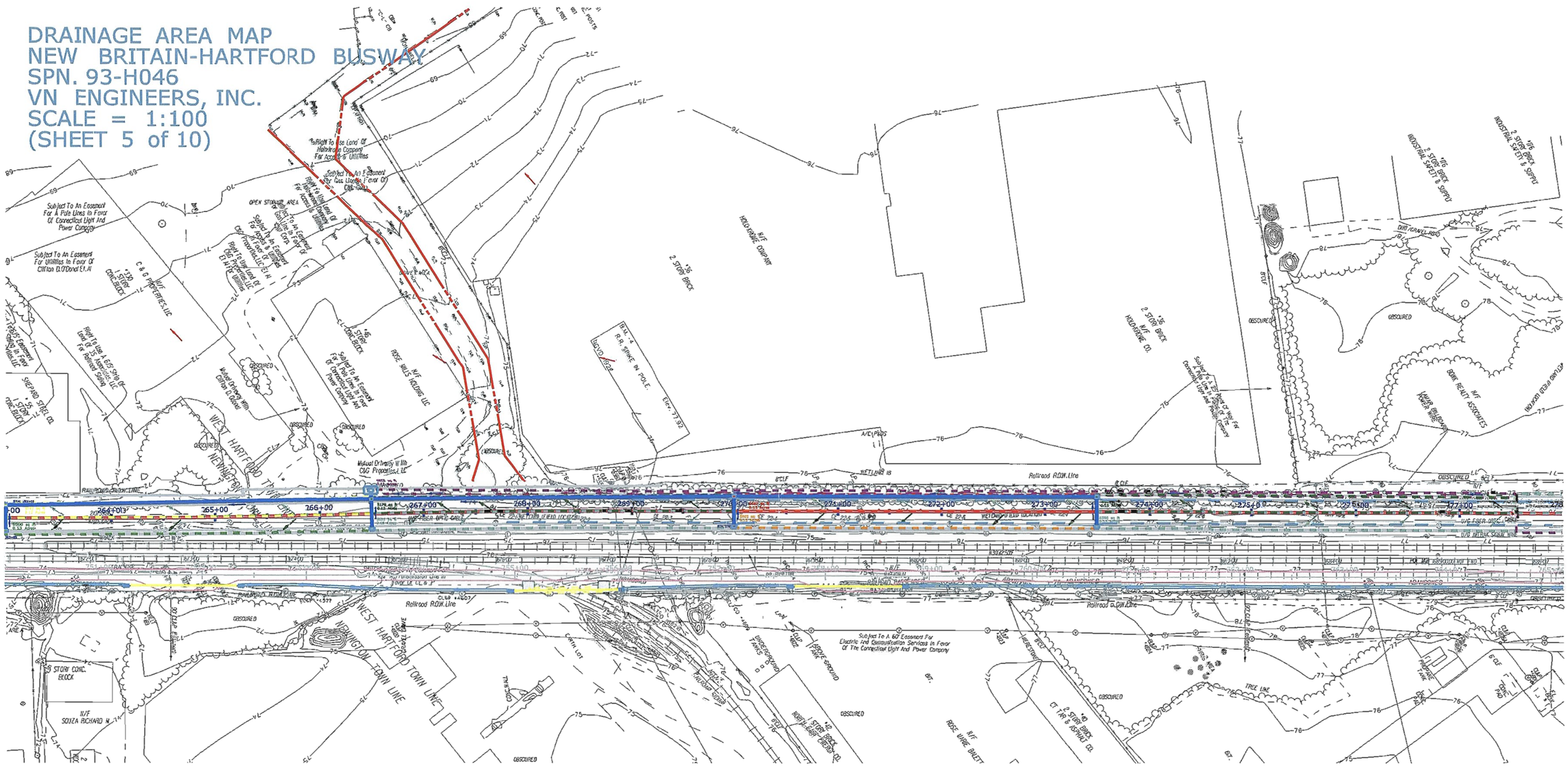
(SHEET 5 of 10)



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NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
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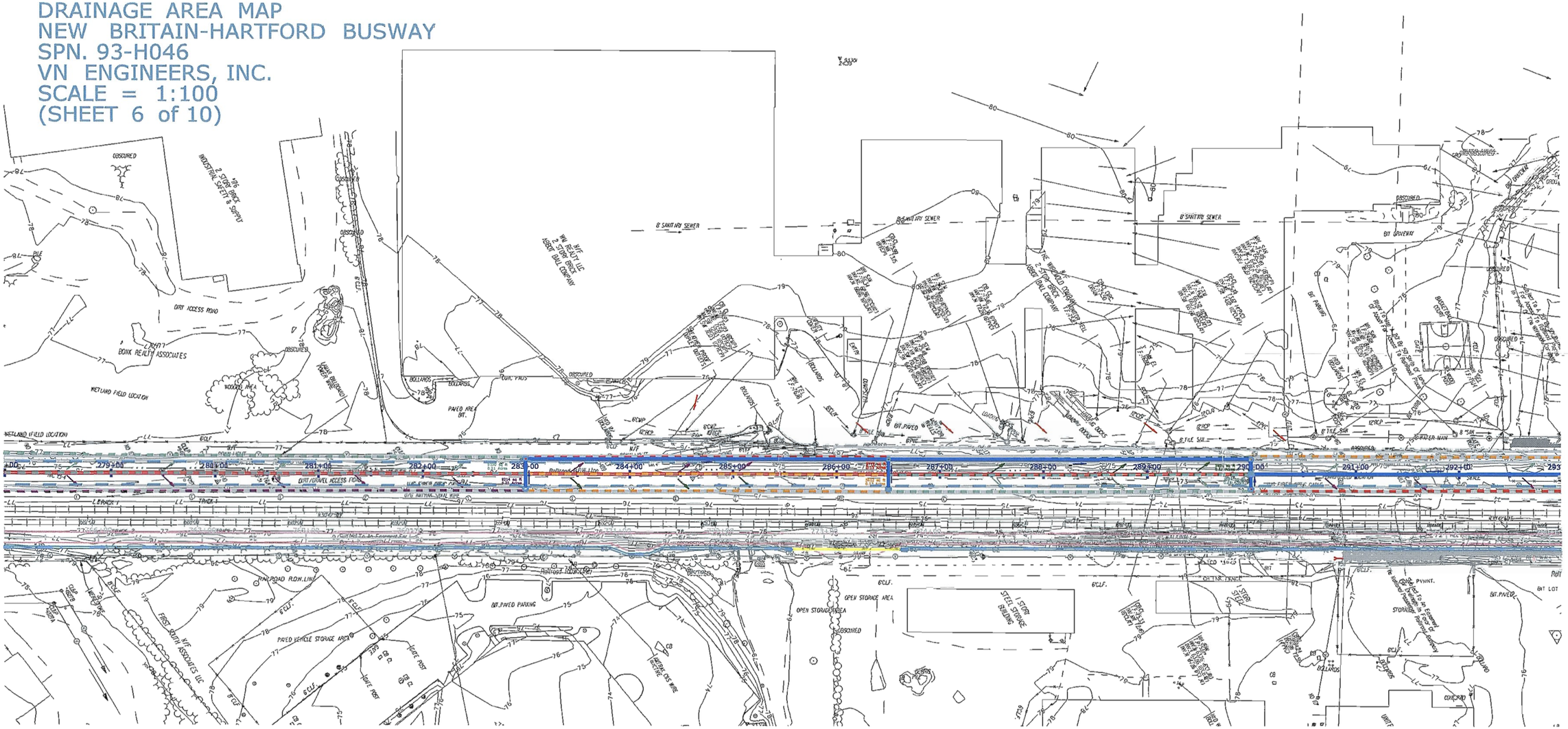

DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
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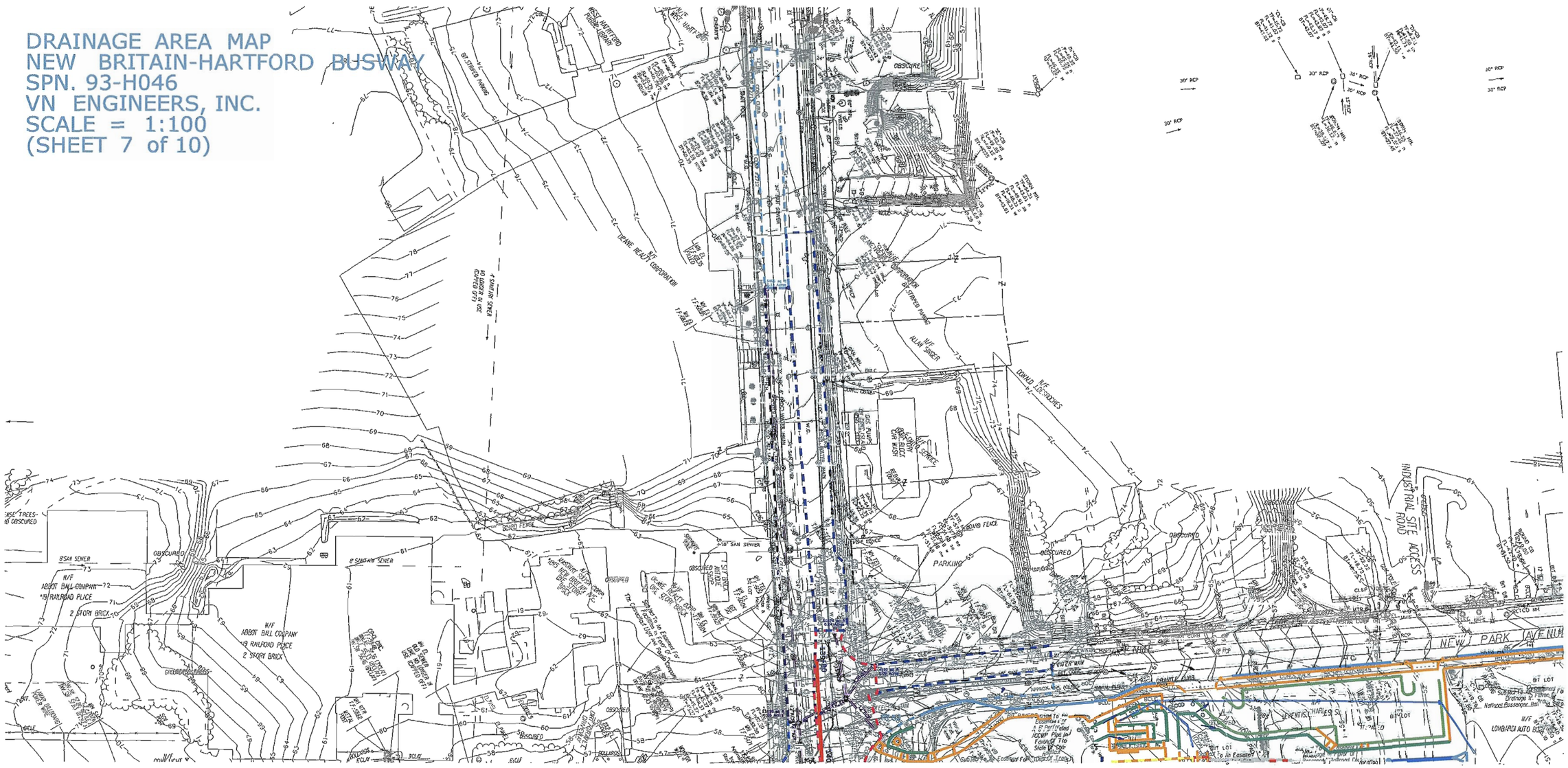
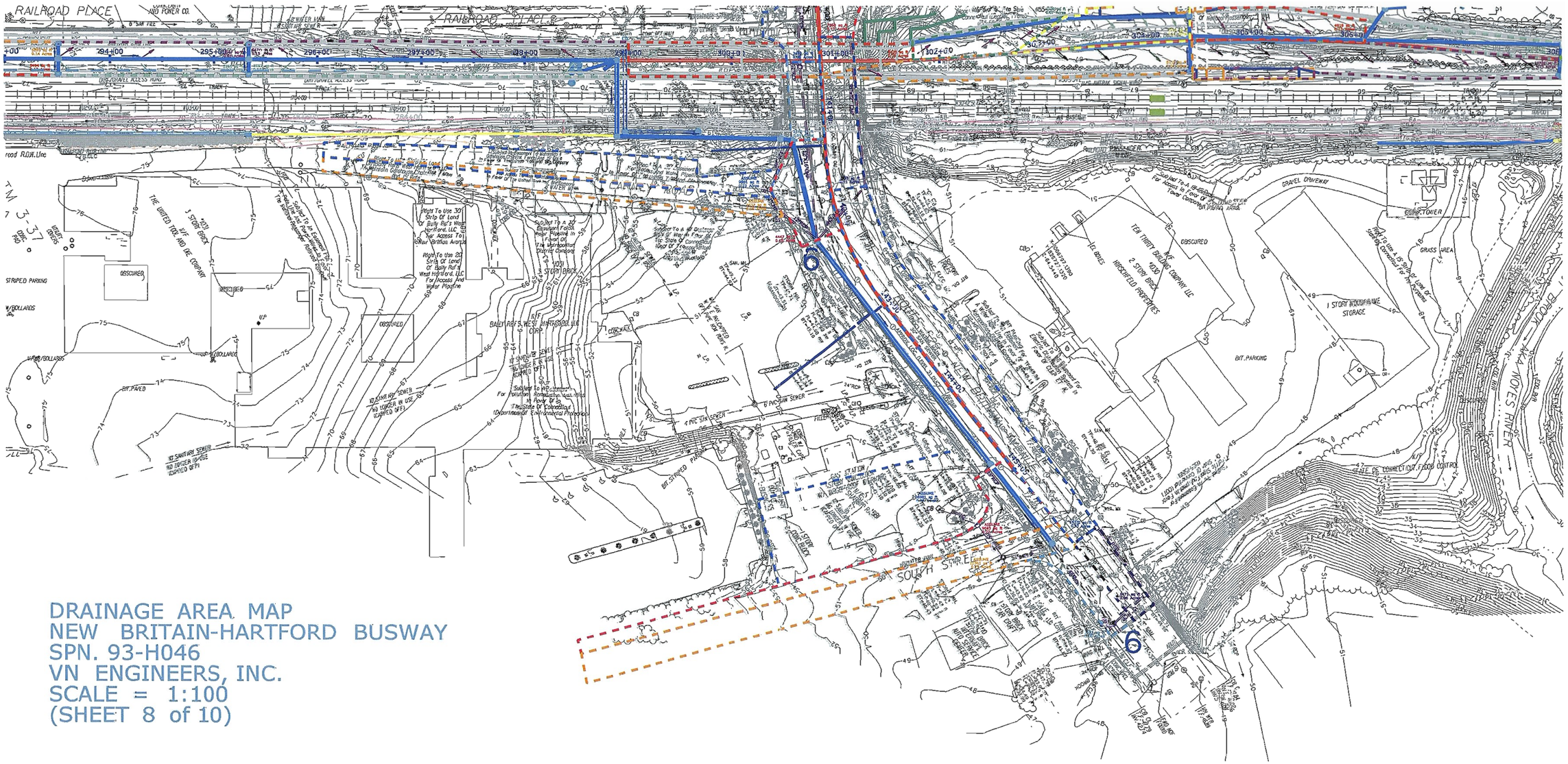
(SHEET 7 of 10)





DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
SCALE = 1:100
(SHEET 8 of 10)

DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
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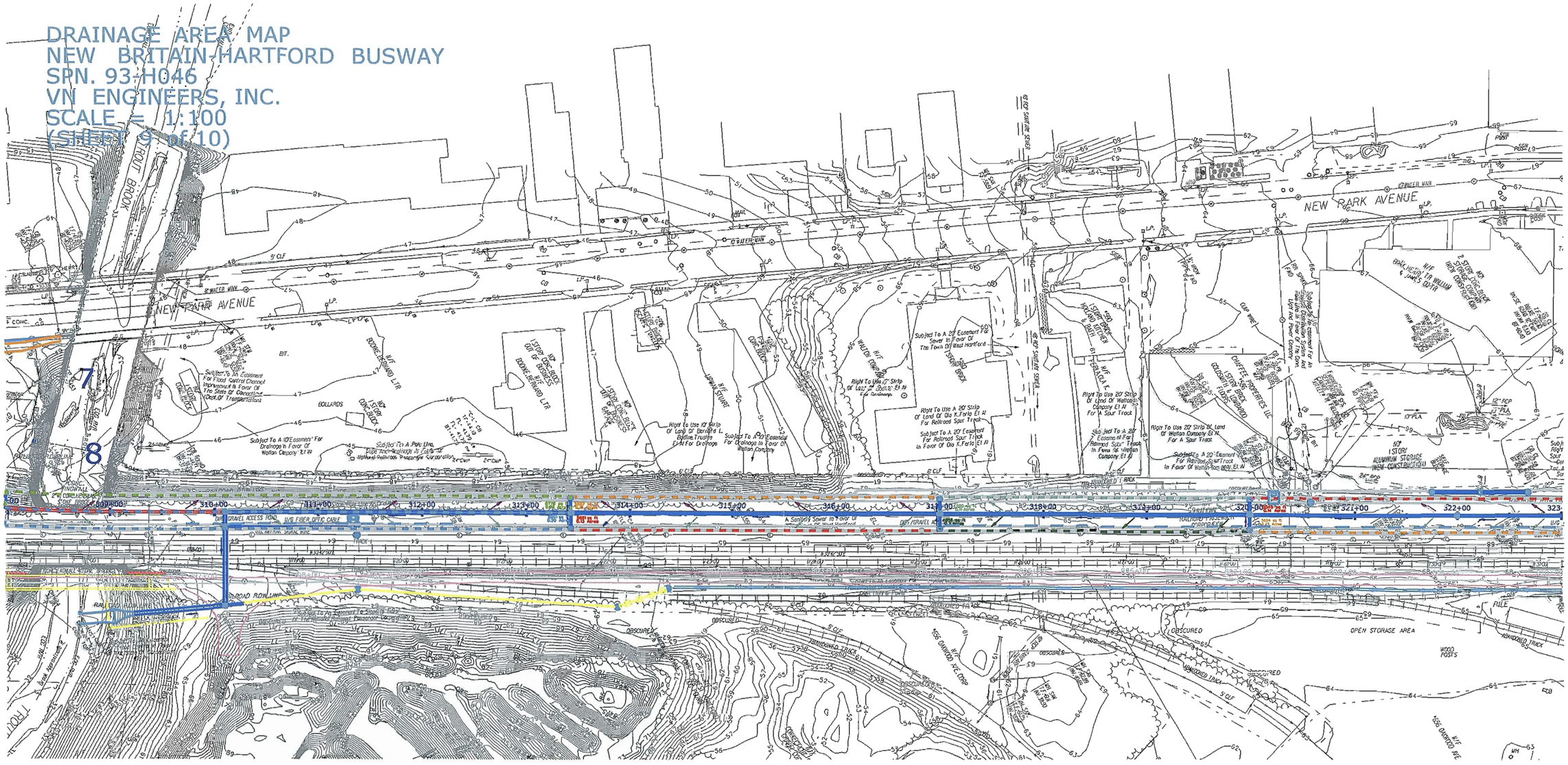

DRAINAGE AREA MAP
NEW BRITAIN-HARTFORD BUSWAY
SPN. 93-H046
VN ENGINEERS, INC.
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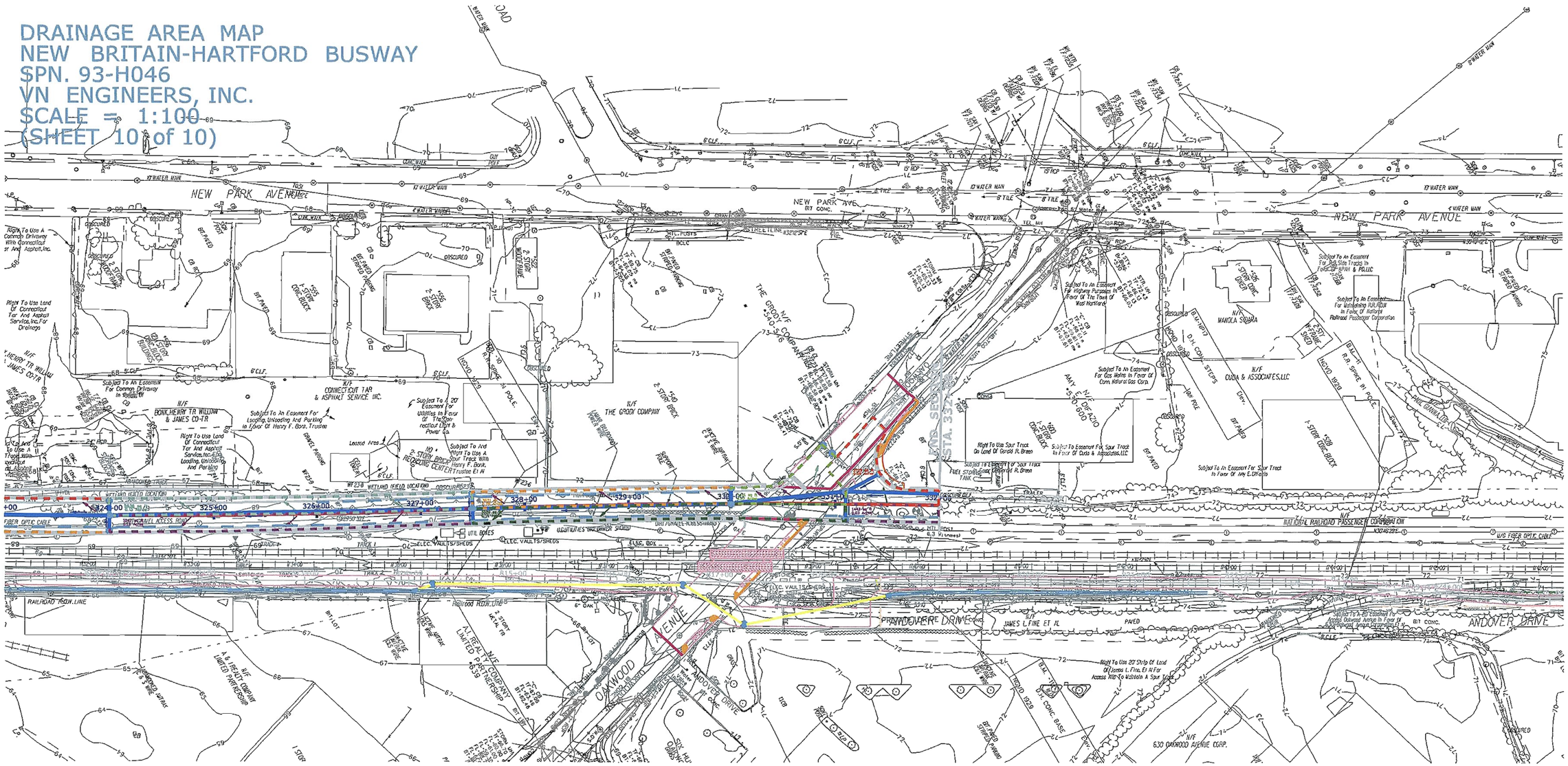
(SHEET 10 of 10)



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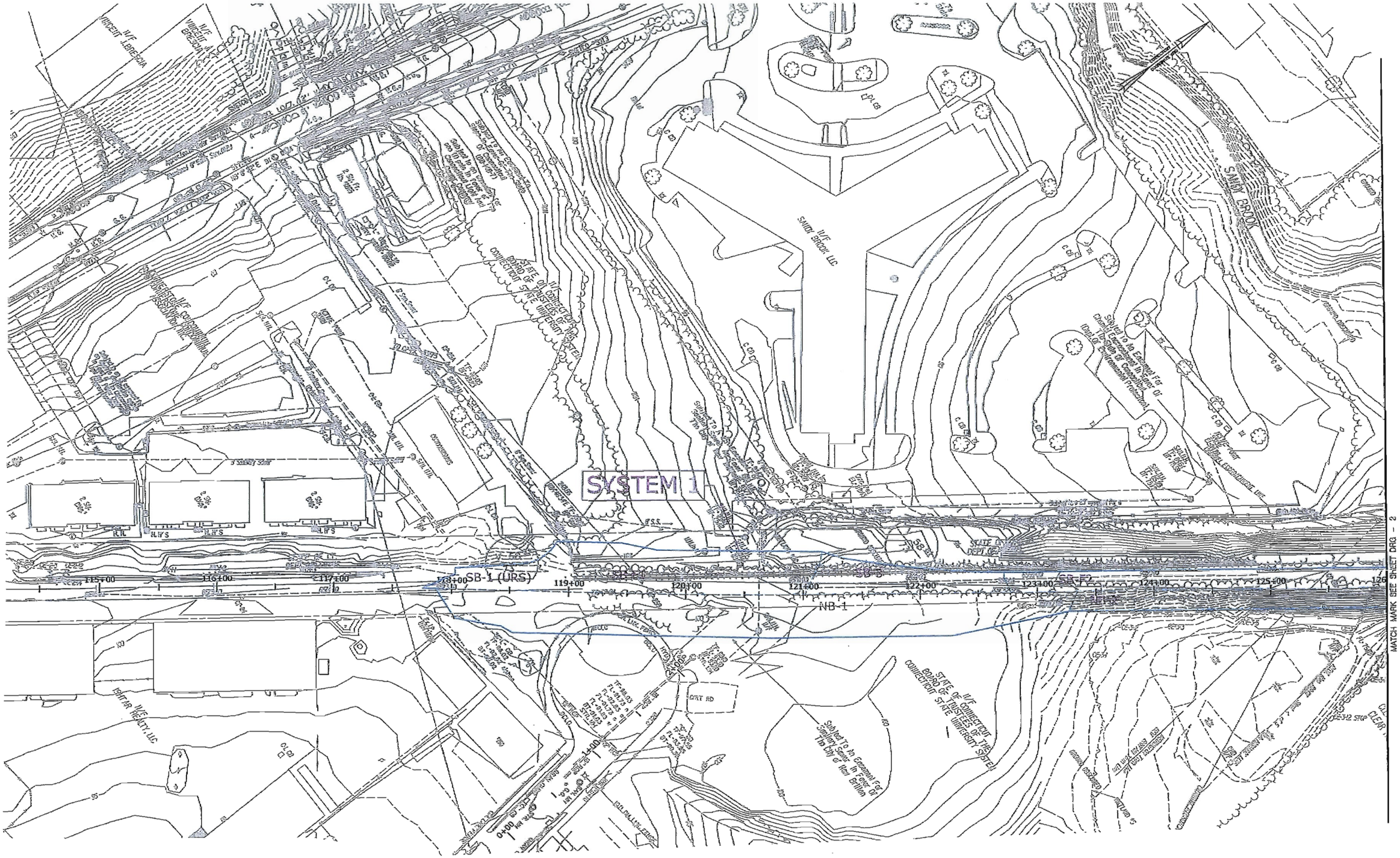

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THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted: 10/22/2009

DESIGNER/DRAFTER: AB/JF
CHECKED BY: CG
SCALE IN FEET 0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: SFILES

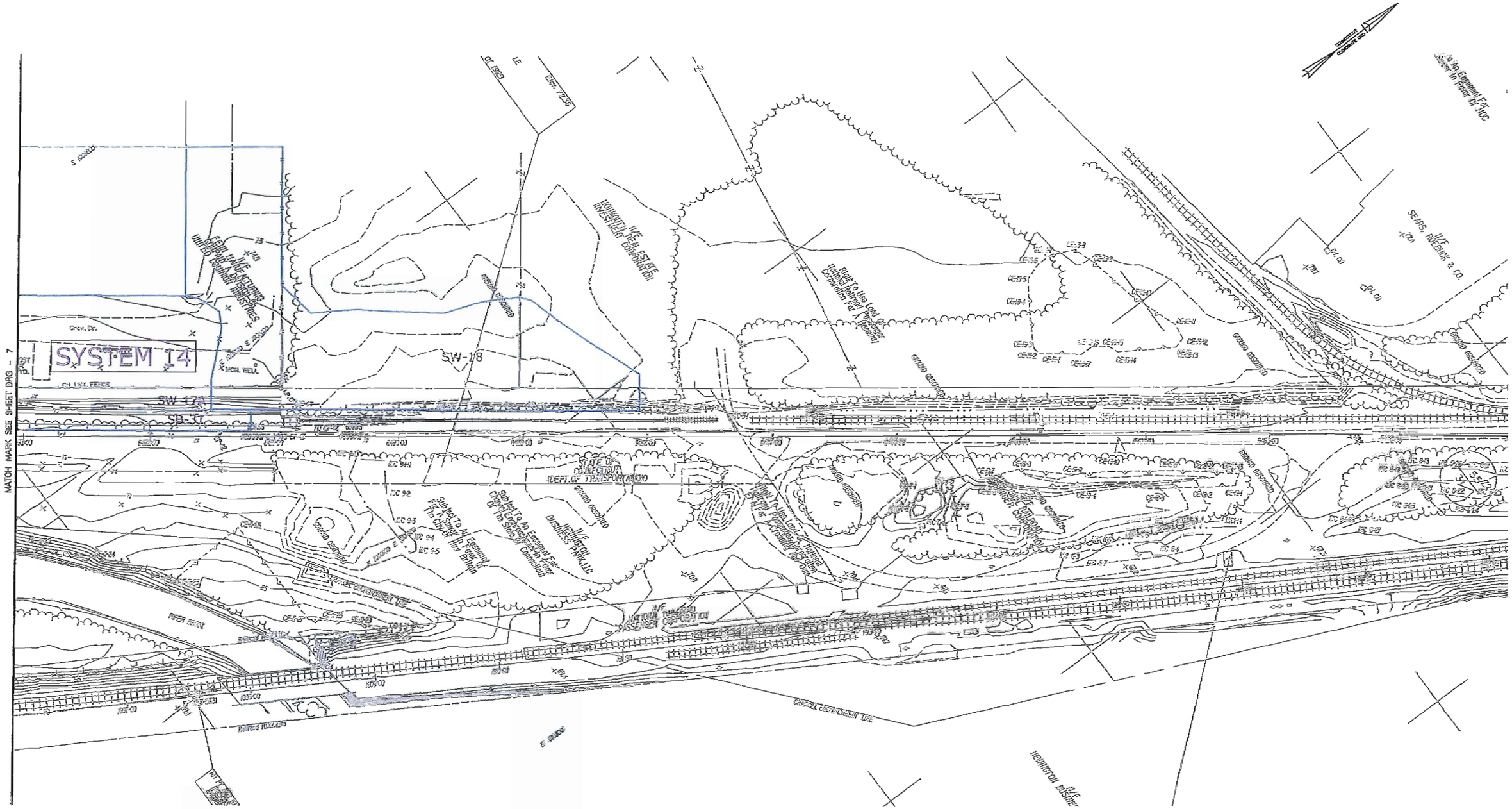
SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON

DRAWING TITLE: EXISTING DRAINAGE MAP

PROJECT NO. 171-305
DRAWING NO. B-01
SHEET NO.



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Plotted: 10/22/2009

DESIGNER/DRAFTER: AB/JF
CHECKED BY: CG
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SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

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APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON
DRAWING TITLE: EXISTING DRAINAGE MAP

PROJECT NO. 171-305
DRAWING NO. B-08
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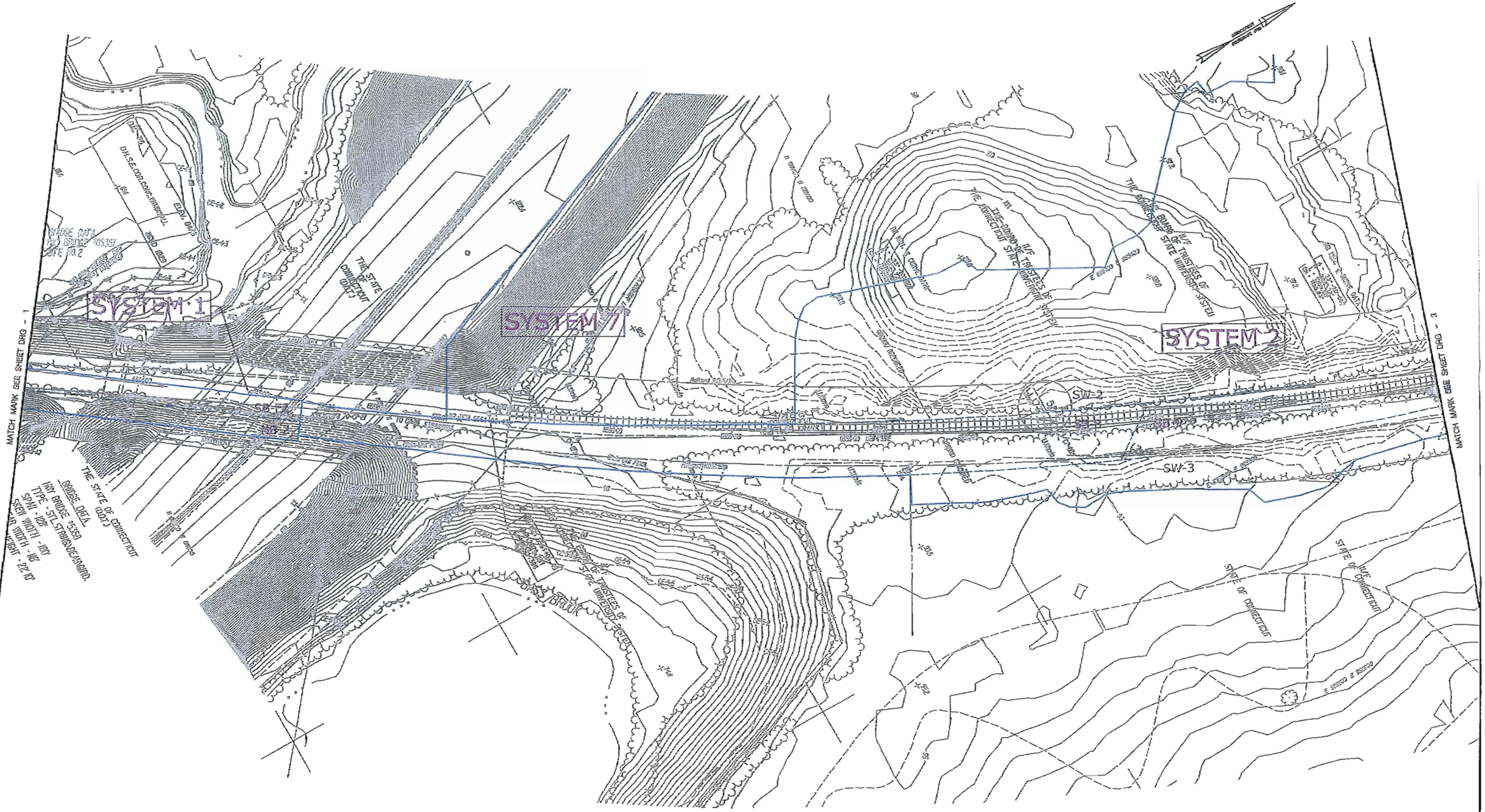

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Plotted: 10/22/2009

DESIGNER/DRAFTER: AB/JF
CHECKED BY: CG
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SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

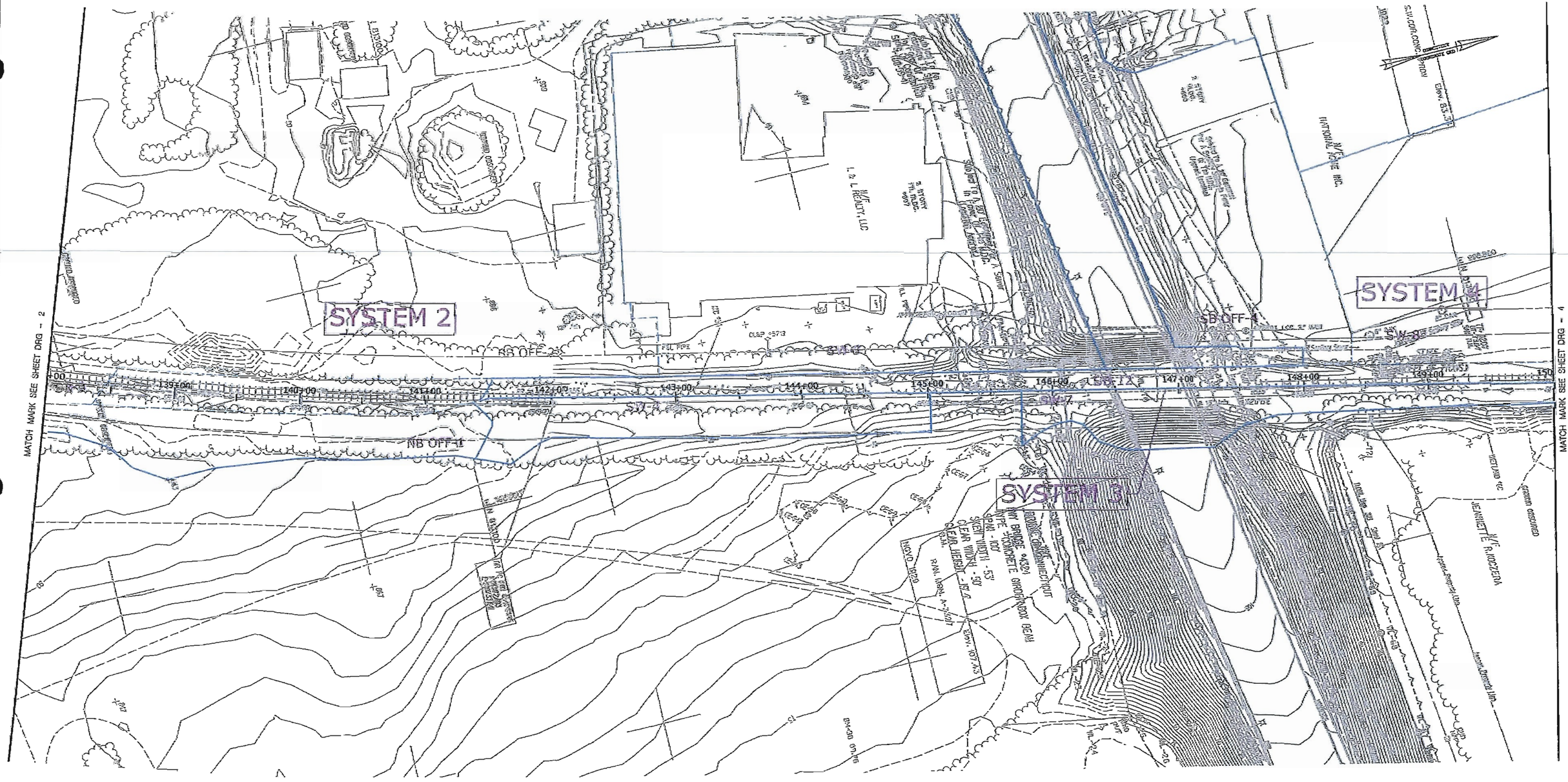
Filename: $FILE$

SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON
DRAWING TITLE: EXISTING DRAINAGE MAP

PROJECT NO. 171-305
DRAWING NO. B-02
SHEET NO.



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Plotted: 10/22/2009

DESIGNED/DRAFTED: AB/JF
CHECKED BY: CG
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SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: S2ILE3

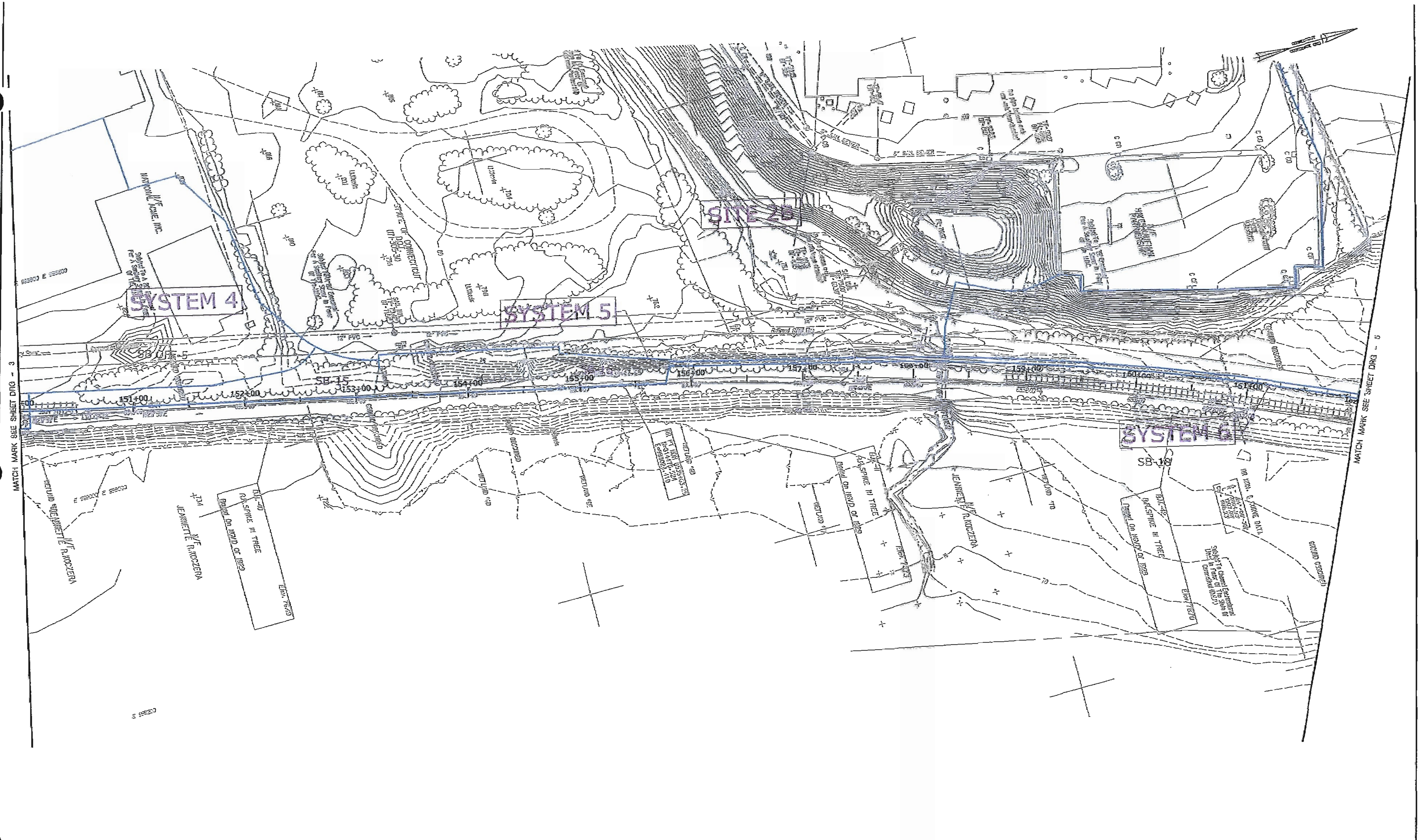
SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON

DRAWING TITLE: EXISTING DRAINAGE MAP

PROJECT NO. 171-305
DRAWING NO. B-03
SHEET NO.



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Plotted: 10/22/2009

DESIGNER/DRAFTER: AB/JF

CHECKED BY: CG

SCALE IN FEET 0 40 80

SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILES

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APPROVED BY: - DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

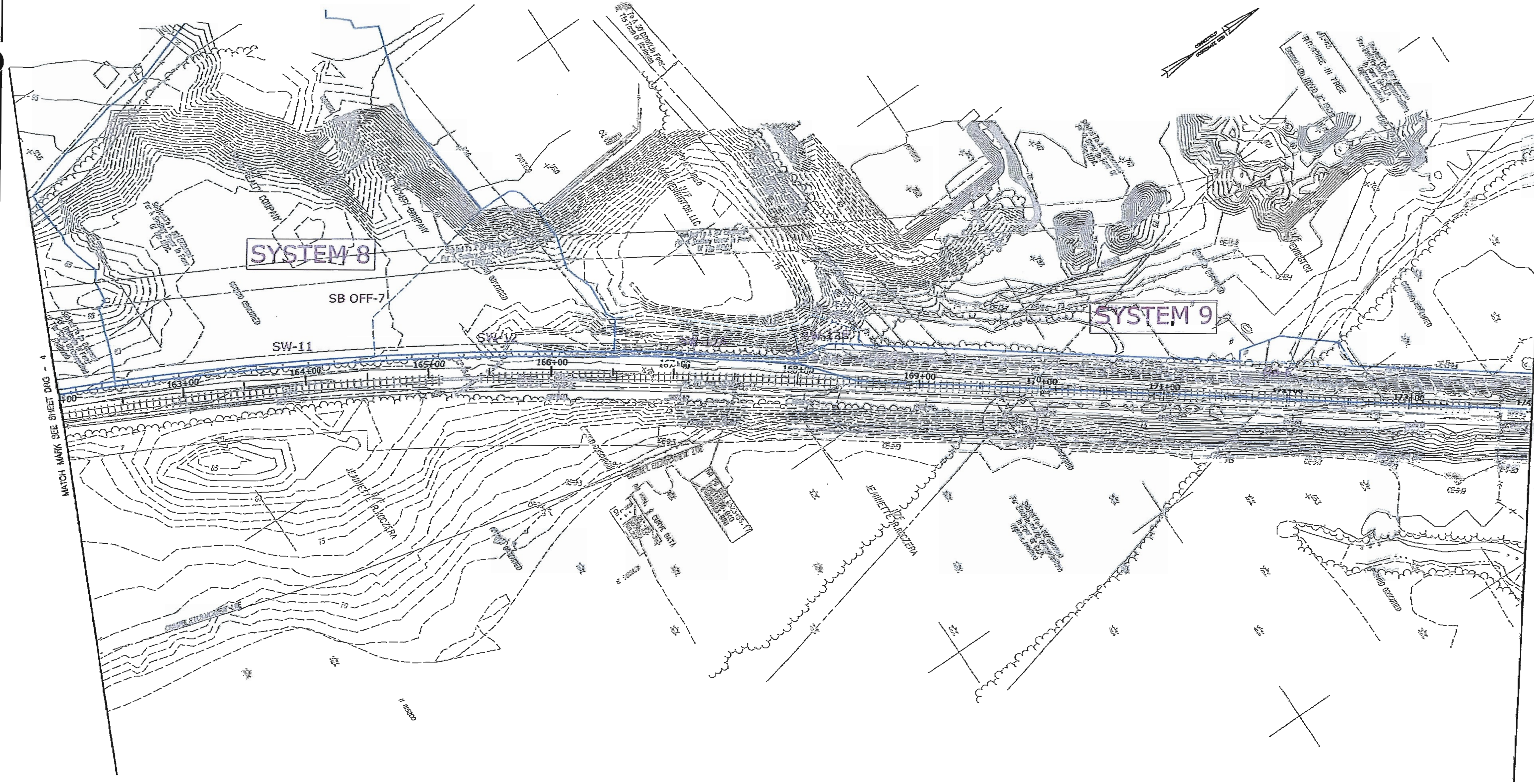
TOWN: NEWINGTON

DRAWING TITLE: EXISTING DRAINAGE MAP

PROJECT NO. 171-305

DRAWING NO. B-04

SHEET NO.



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Plotted: 10/22/2009

DESIGNER/DRAFTER: AB/JF

CHECKED BY: CG

SCALE IN FEET 0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

SIGNATURE/BLOCK: OFFICE OF ENGINEERING

APPROVED BY: DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

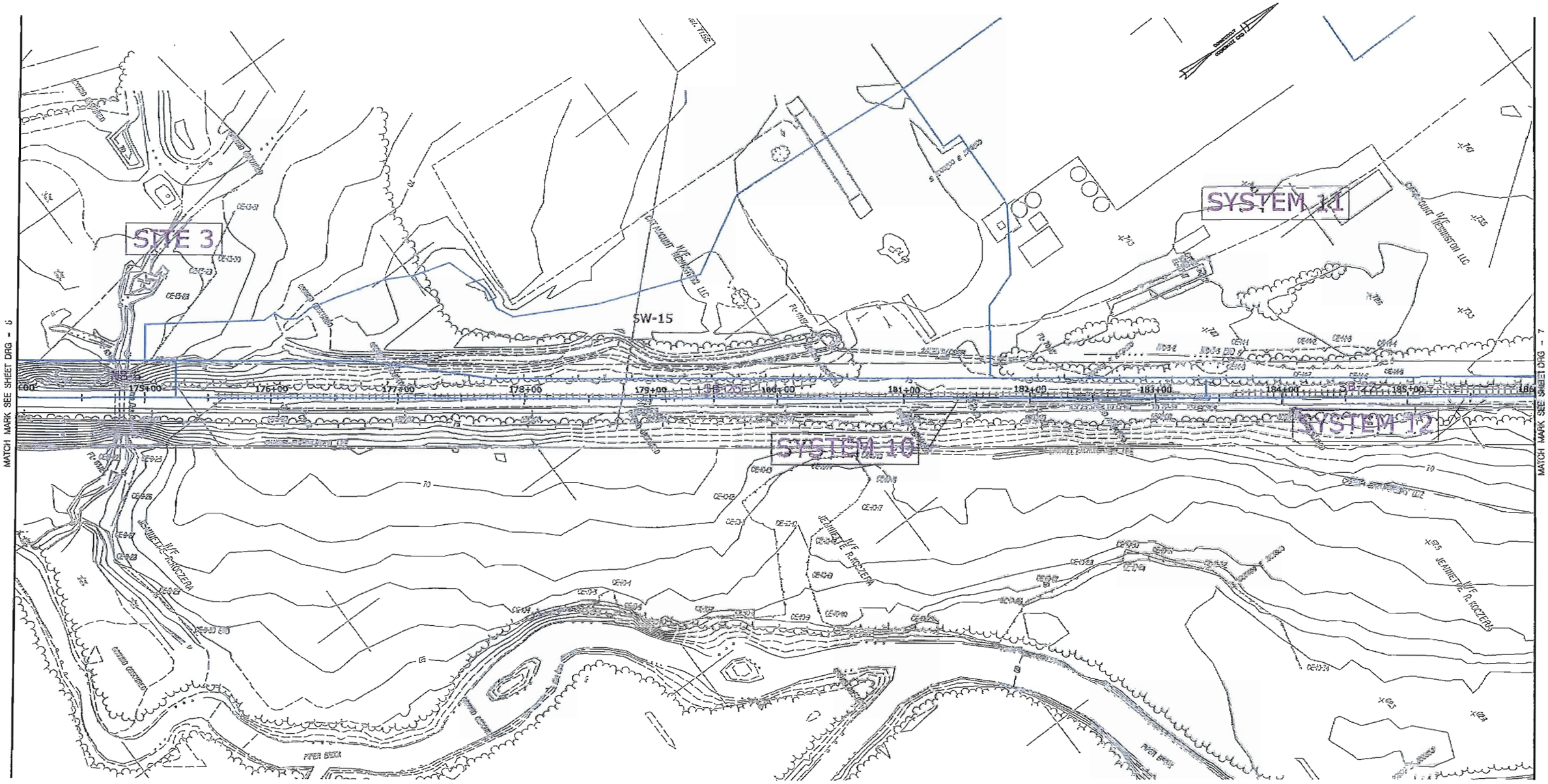
TOWN: NEWINGTON

DRAWING TITLE: EXISTING DRAINAGE MAP

PROJECT NO. 171-305

DRAWING NO. B-05

SHEET NO.



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Plotted: 10/22/2009

DESIGNER/DRAFTER: AB/JF
CHECKED BY: CG
SCALE IN FEET 0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: SFILES

SIGNATURE/ BLOCK: OFFICE OF ENGINEERING
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON

DRAWING TITLE: EXISTING DRAINAGE MAP

PROJECT NO. 171-305
DRAWING NO. B-06
SHEET NO.

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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Plotted: 10/22/2009

DESIGNER/DRAFTER: AB/JF

CHECKED BY: CG

SCALE IN FEET 0 40 80

SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: SFILES

SIGNATURE/BLOCK: OFFICE OF ENGINEERING

APPROVED BY: - DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

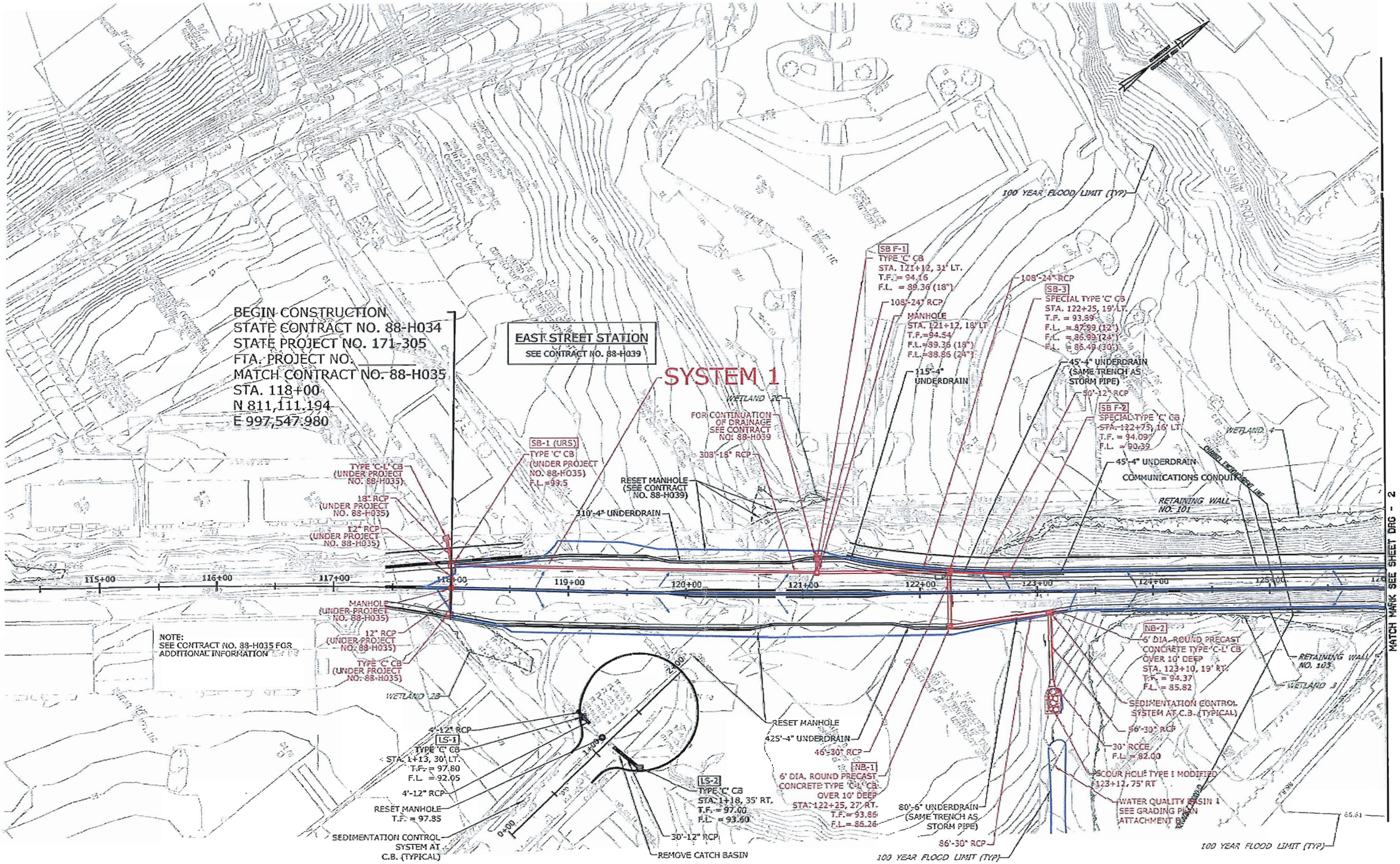
TOWN: NEWINGTON

DRAWING TITLE: EXISTING DRAINAGE MAP

PROJECT NO. 171-305

DRAWING NO. B-07

SHEET NO.



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Plotted: 5/12/2010

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CHECKED BY: CG
SCALE IN FEET 0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

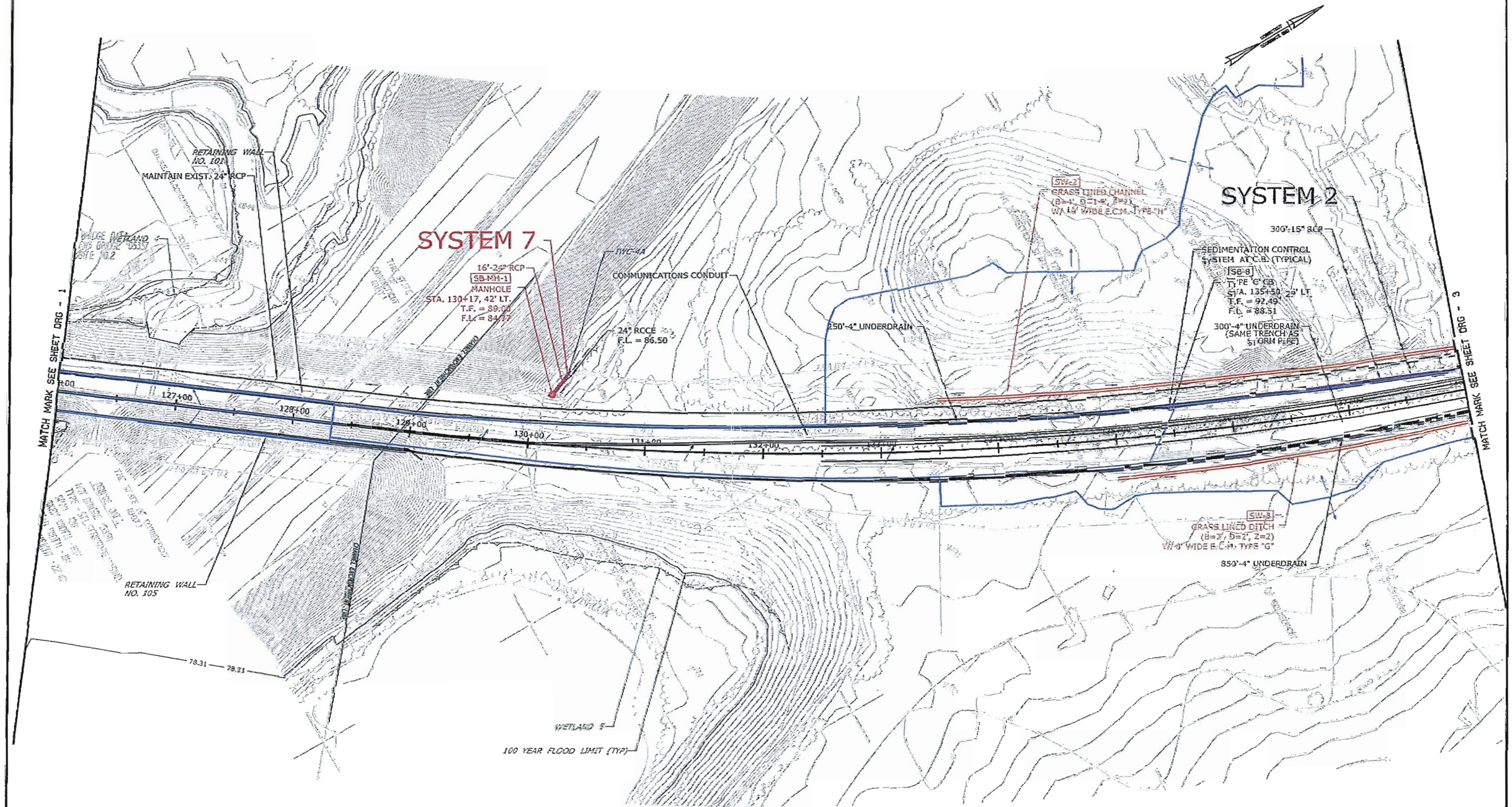
Filename: $FILE$

SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY: - DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON
DRAWING TITLE: DRAINAGE PLAN

PROJECT NO. 171-305
DRAWING NO. C-01
SHEET NO.



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Plotted: 5/13/2010

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SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

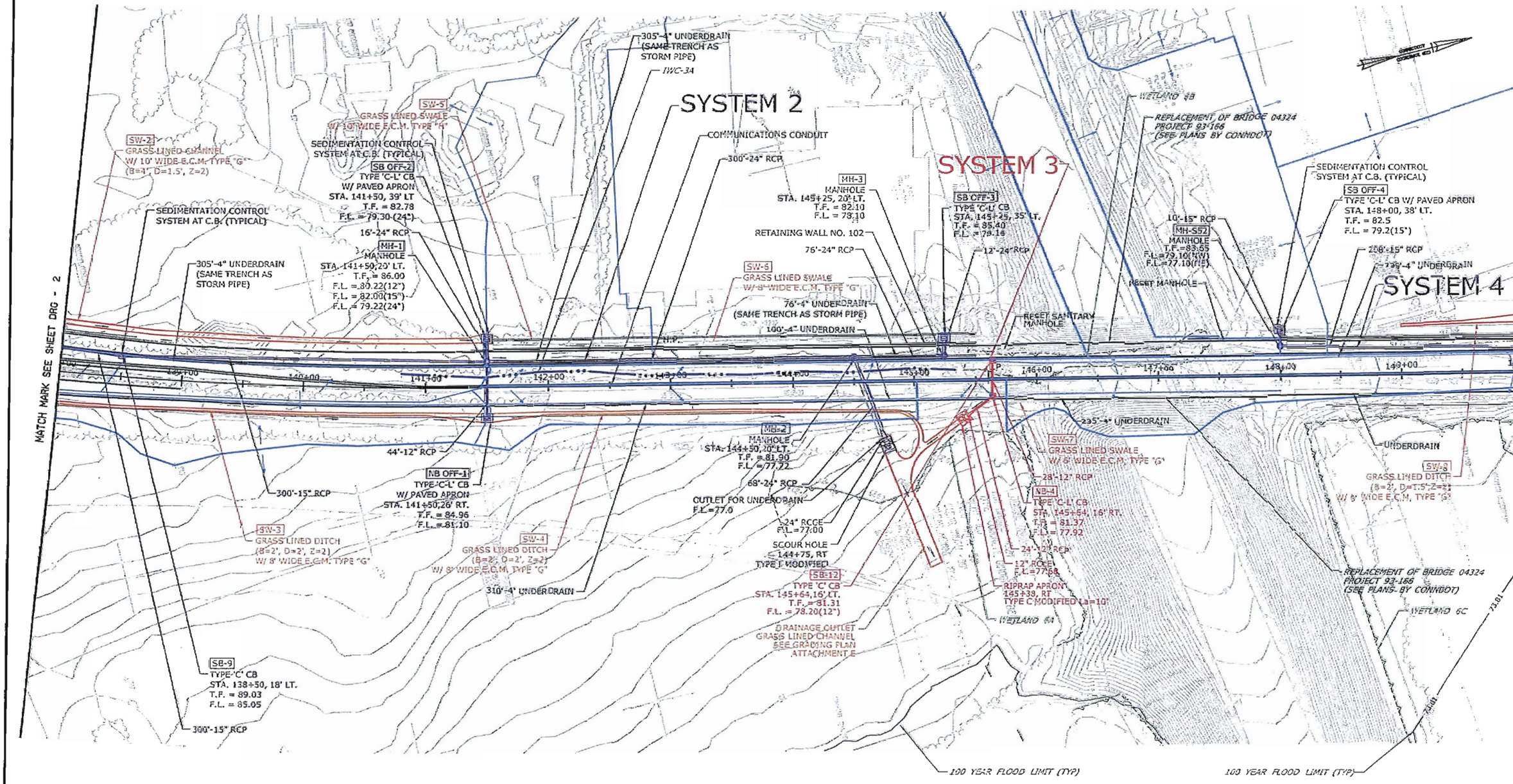
Filename: $FILE$

SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON
DRAWING TITLE: DRAINAGE PLAN

PROJECT NO. 171-305
DRAWING NO. C-02
SHEET NO.



REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted: 5/12/2010

DESIGNER/DRAFTER: AB/JF
CHECKED BY: CG
SCALE IN FEET 0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

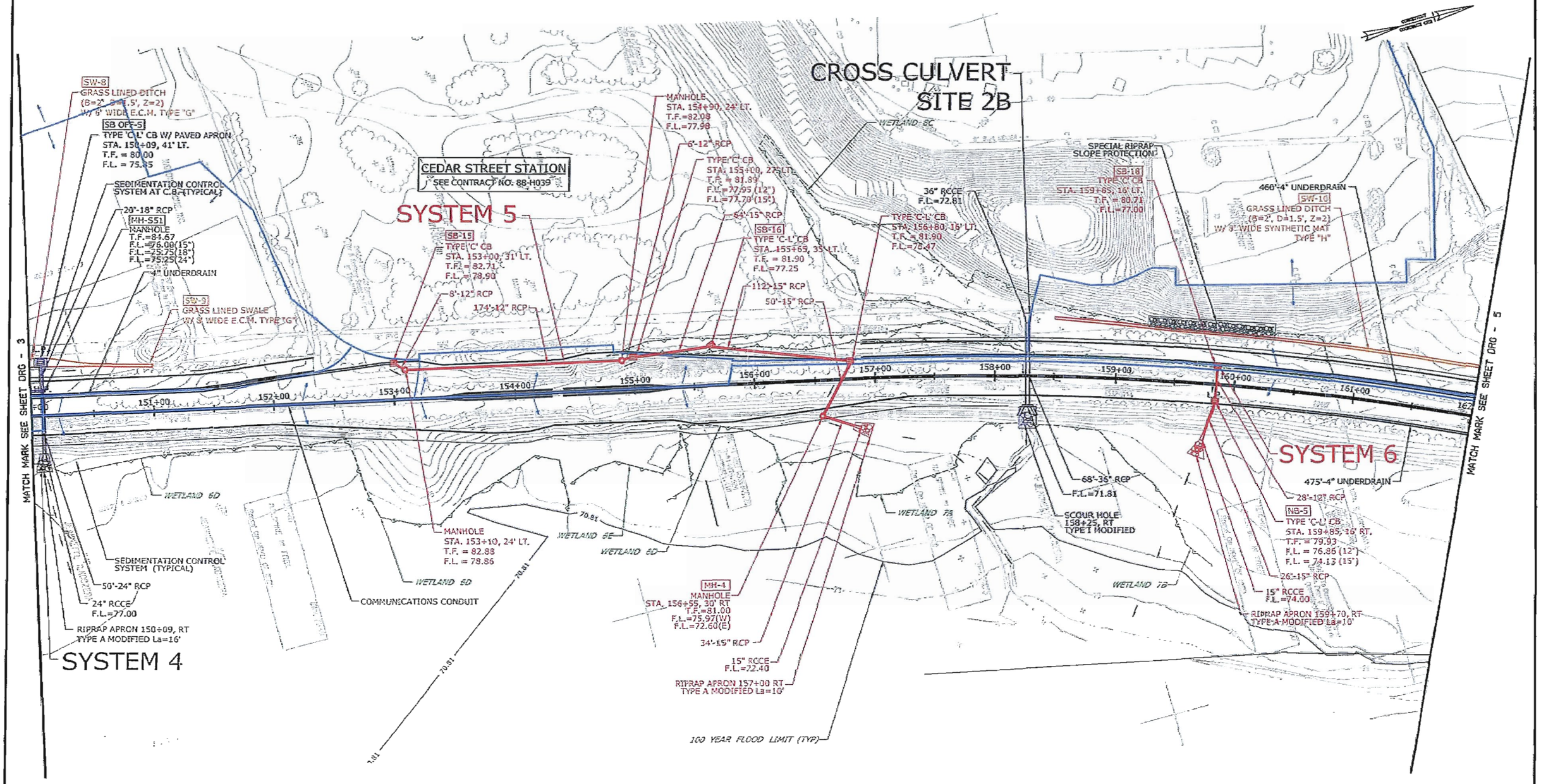
Filename: $FILE$

SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY: - DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON
DRAWING TITLE: DRAINAGE PLAN

PROJECT NO. 171-305
DRAWING NO. C-03
SHEET NO.



REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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Plotted: 5/12/2010

DESIGNER/DRAFTER: AB/JF
CHECKED BY: CG
SCALE IN FEET
0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

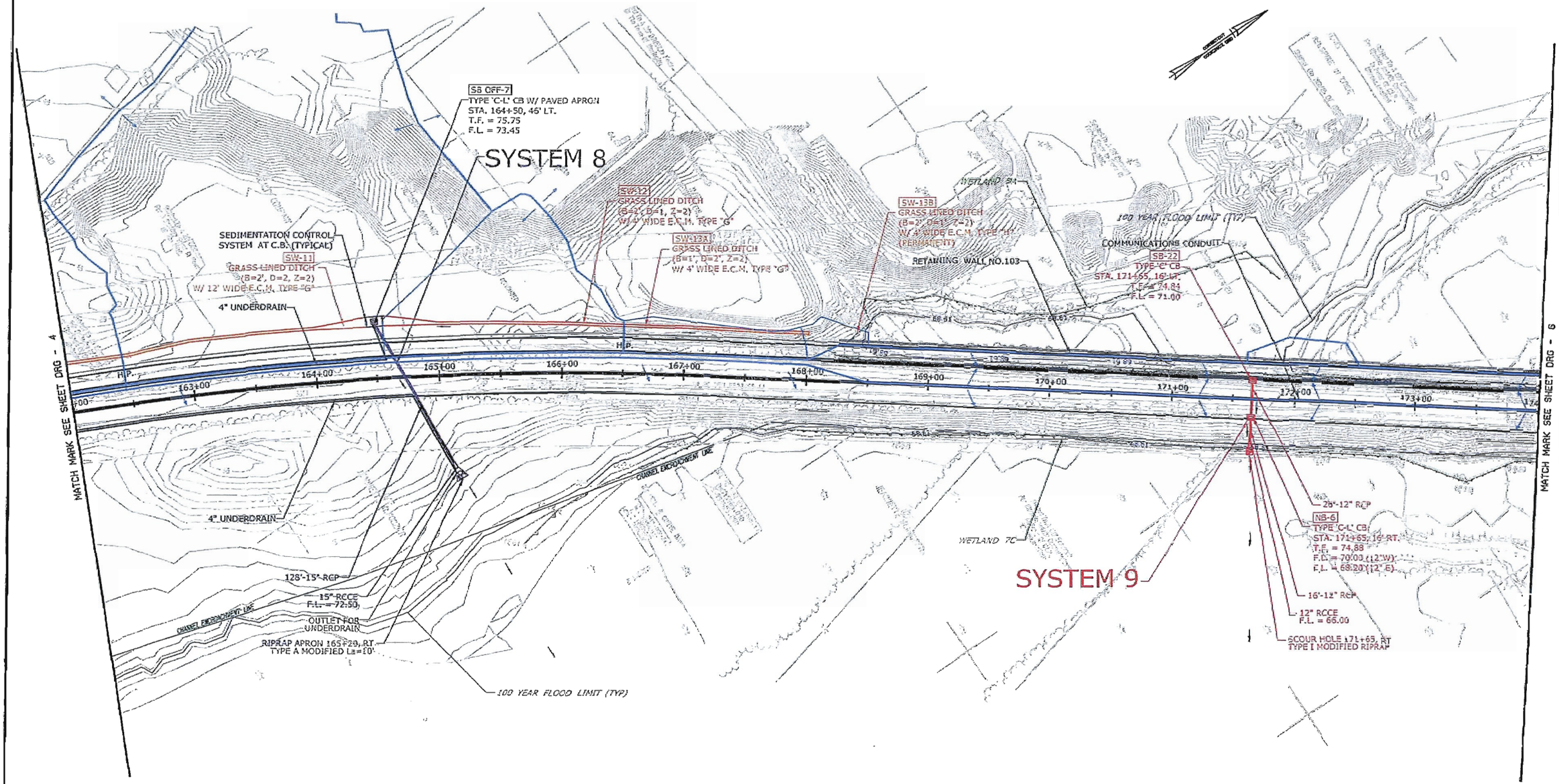
Filename: sFILES

SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY: - DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON
DRAWING TITLE: DRAINAGE PLAN

PROJECT NO. 171-305
DRAWING NO. C-04
SHEET NO.



REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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Plotted: 5/12/2010

DESIGNER/DRAFTER: AB/JF
CHECKED BY: CG
SCALE IN FEET 0 40 80
SCALE 1"=40'

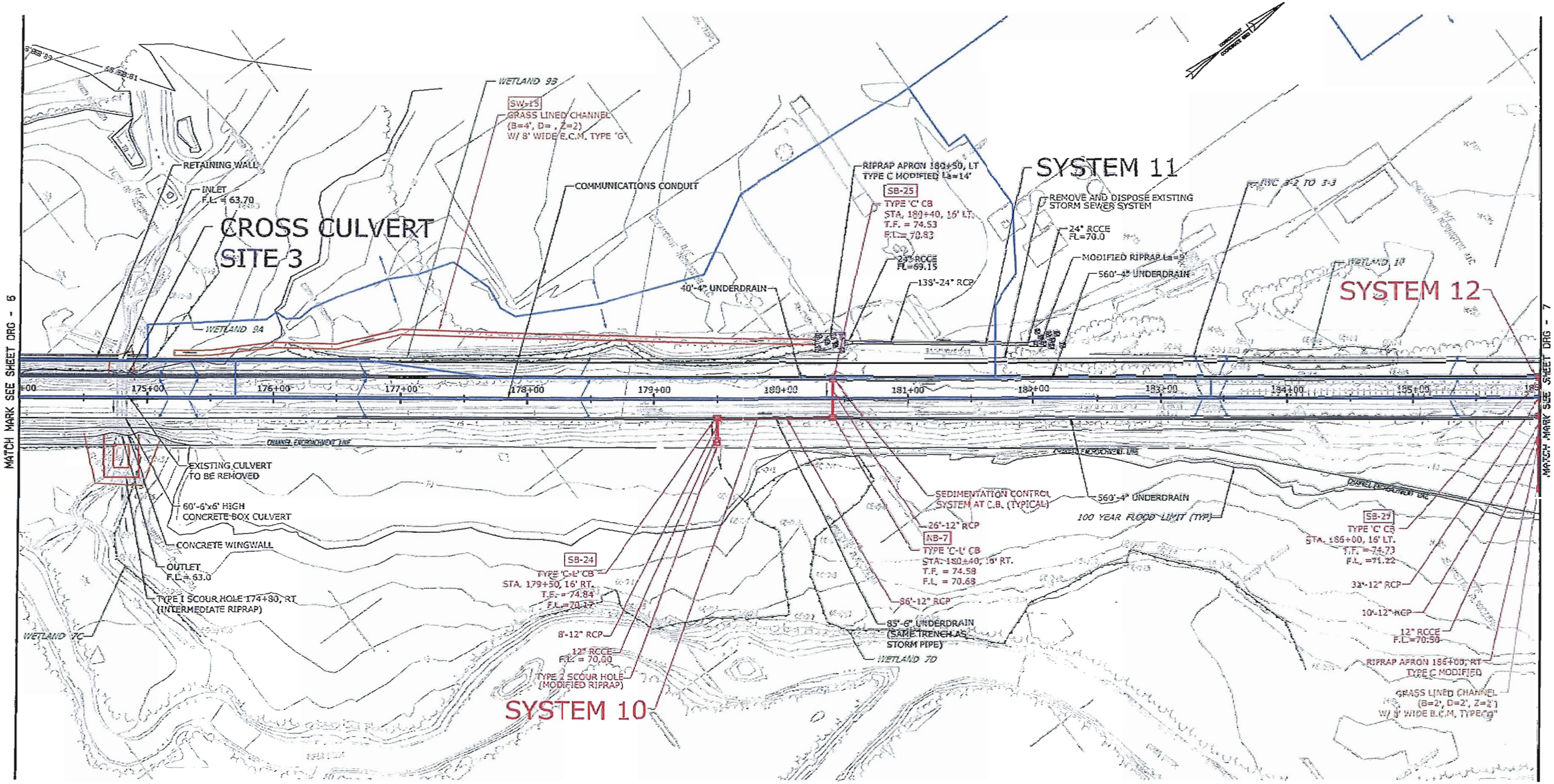
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON
DRAWING TITLE: DRAINAGE PLAN

PROJECT NO. 171-305
DRAWING NO. C-05
SHEET NO.



REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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Plotted: 3/12/2010

DESIGNED/DRAFTED: AB/JF
CHECKED BY: CG
SCALE IN FEET 0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

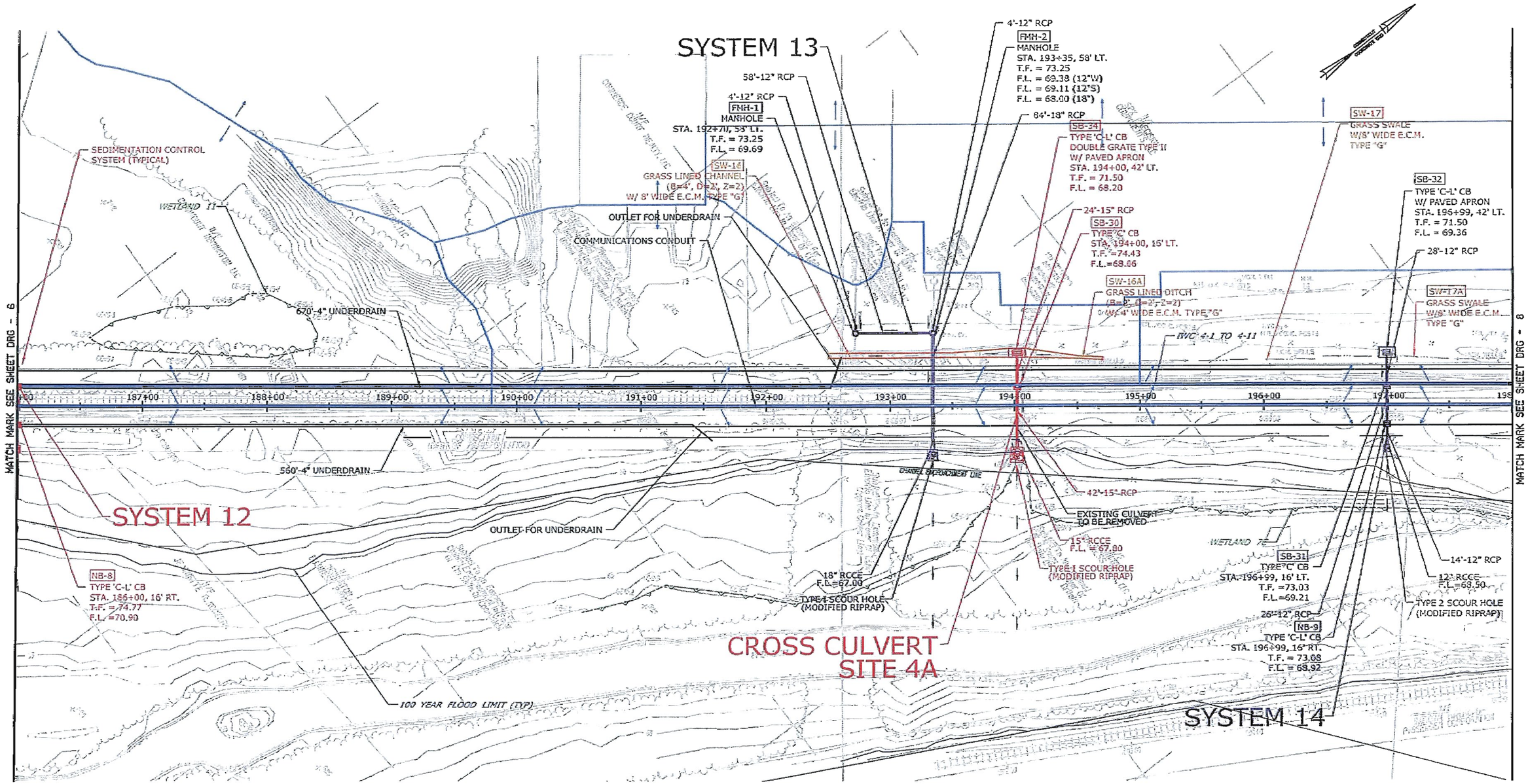
Filename: $FILE$

SIGNATURE BLOCKS: OFFICE OF ENGINEERING
APPROVED BY: DATE:

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON
DRAWING TITLE: DRAINAGE PLAN

PROJECT NO. 171-305
DRAWING NO. C-06
SHEET NO.



REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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Plotted: 5/12/2020

DESIGNER/DRAFTER: AB/JF
CHECKED BY: CG
SCALE IN FEET 0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: SFILES

SIGNATURE BLOCK: OFFICE OF ENGINEERING
APPROVED BY: -
DATE: -

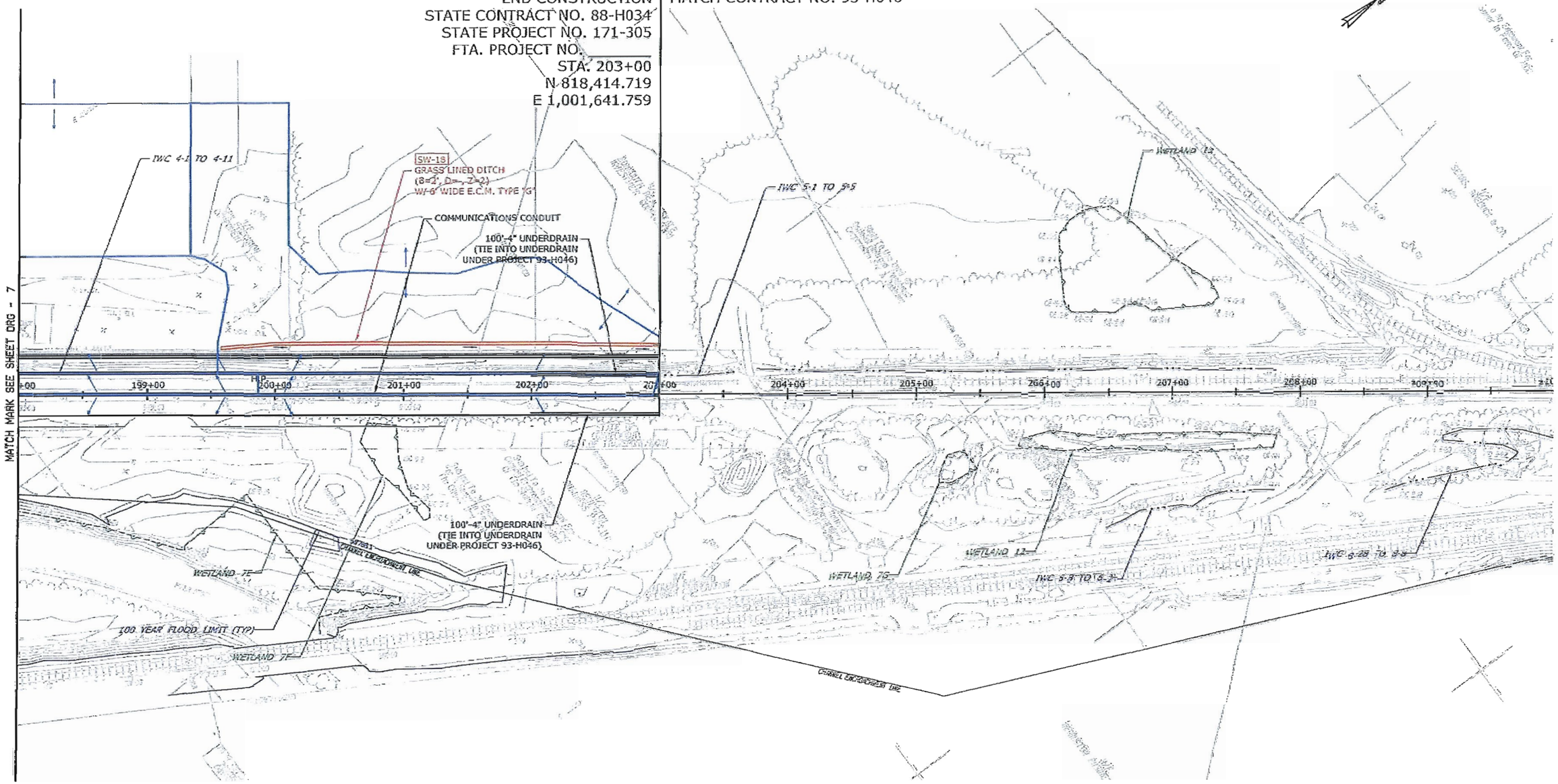
PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON

DRAWING TITLE: DRAINAGE PLAN

PROJECT NO. 171-305
DRAWING NO. C-07
SHEET NO.

END CONSTRUCTION — MATCH CONTRACT NO. 93-H046
STATE CONTRACT NO. 88-H034
STATE PROJECT NO. 171-305
FTA. PROJECT NO. _____
STA. 203+00
N 818,414.719
E 1,001,641.759



REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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THIS INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK SHOWN ON THESE SHEETS IS BASED ON UNITED DESIGNATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted: 5/12/2010

DESIGNER/DRAFTER: AB/JF
CHECKED BY: CG
SCALE IN FEET
0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\NW_HSH_088_H034_DRP_C-08.dgn

SIGNATURE BLOCK: OFFICE OF ENGINEERING
APPROVED BY: - DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEWINGTON

DRAWING TITLE: DRAINAGE PLAN

PROJECT NO. 171-305
DRAWING NO. C-08
SHEET NO.

RESPONSE TO COMMENT #15 ATTACHMENTS

Baker

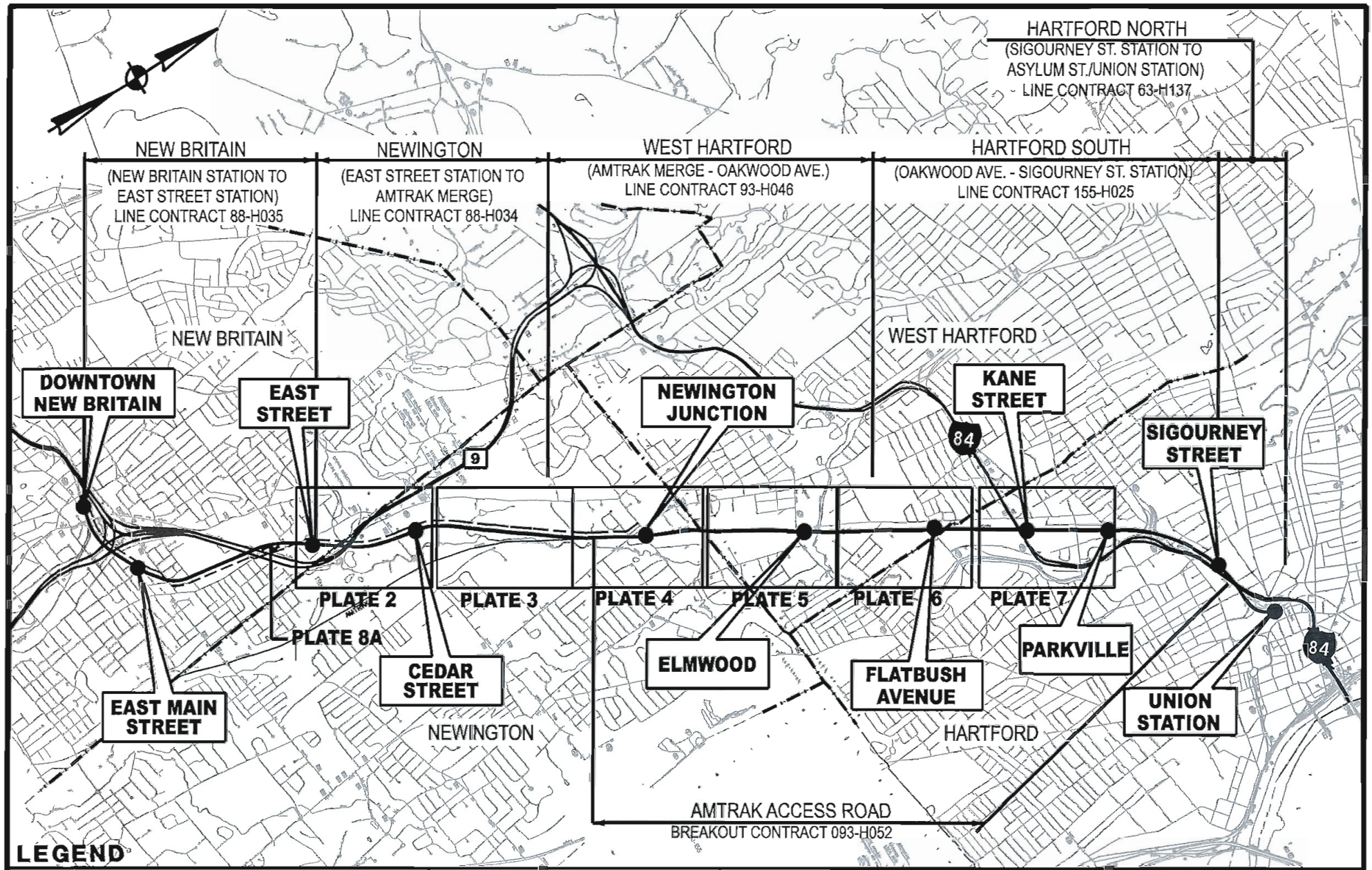
KEY OF IMPORTANT FEATURES

	FLAGGED INLAND WETLAND LIMIT
	FLAGGED INTERMITTENT WATER COURSE CENTERLINE
C C	LIMIT OF CUT SLOPE GRADING
F F	LIMIT OF FILL SLOPE GRADING
	LIMIT OF PERMANENT WETLAND IMPACT
	LIMIT OF TEMPORARY WETLAND IMPACT
	LIMIT OF PERMANENT IWC IMPACT
	PROPOSED SWALE/CHANNEL/DITCH
	PROPOSED TRACK DRAINAGE DITCH
	100 YEAR FLOOD LIMIT ELEVATION
	STREAM CHANNEL ENCROACHMENT LINE
	PROPOSED CONCRETE BARRIER
OHW	ORDINARY HIGH WATER LINE
	FLOODWAY LIMITS
	SEDIMENTATION CONTROL SYSTEM (SCS)
	PROPOSED CATCH BASIN
	PROPOSED STORM MANHOLE
EOR	EDGE OF ROAD

GENERAL NOTES:

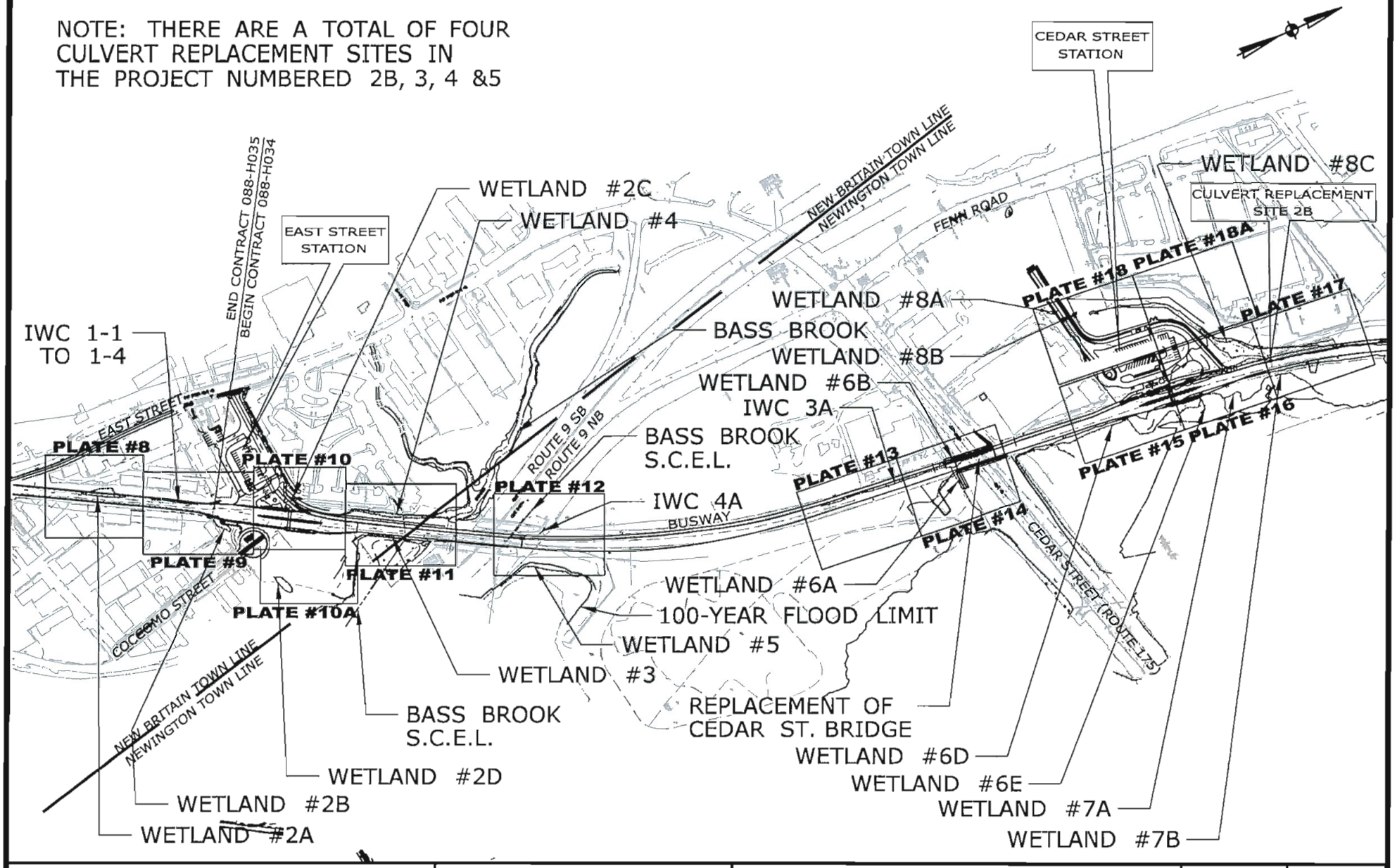
1. THE CONTRACTOR SHALL BE LIMITED TO WORKING WITHIN THE TEMPORARY WORK AREAS AS INDICATED ON THE PLANS WHEN WORKING WITHIN A DELINEATED WETLAND BOUNDARY. THE TEMPORARY WORK AREAS WILL BE LOCATED AND STAKED IN THE FIELD BY THE CONTRACTOR PRIOR TO CLEARING AND GRUBBING OR THE COMMENCEMENT OF ANY OTHER CONSTRUCTION ACTIVITY. WORK OUTSIDE THE DELINATED IMPACT AREAS IS NOT PERMITTED. IF ANY MEANS AND METHODS CHOSEN BY THE CONTRACTOR REQUIRE ADDITIONAL WETLAND IMPACT, EITHER PERMANENT OR TEMPORARY, THE CONTRACTOR SHALL NOTIFY CTDOT IMMEDIATELY, AS THIS WILL REQUIRE ADDITIONAL REVIEW BY THE CTDOT OFFICE OF ENVIRONMENTAL PLANNING AND CTDEP AT THE CONTRACTOR'S EXPENSE.

2. ALL WETLAND AREAS TEMPORARILY IMPACTED FOR THE PURPOSES OF CONSTRUCTION, STAGING OR ACCESS SHALL BE RESTORED BY THE CONTRACTOR IMMEDIATELY FOLLOWING THE USE OF THESE AREAS. THE CONTRACTOR SHALL REMOVE TEMPORARY STONE STAGING AREAS, WHERE USED, DECOMPACT THE AREA BY APPROVED METHODS, RETURN AREA TO EXISTNIG GRADE WITH "WETLAND CREATION" MATERIAL AND STABILIZE THE AREA WITH WETLAND GRASS ESTABLISHMENT SEEDING. WETLAND GRASS WILL BE ESTABLISHED TO THE SATISFACTION OF CTDOT OFFICE OF ENVIRONMENTAL PLANNING PRIOR TO THE INSTALLATION OF SHRUB AND TREE PLANTINGS (WHERE CALLED FOR). SEE SPECIAL PROVISIONS FOR INFORMATION ON WETLAND CREATION MATERIAL REQUIREMENTS. UPLAND AREAS SHALL BE STABILIZED WITH CTDOT CONSERVATION FOR SLOPES SEED MIX.

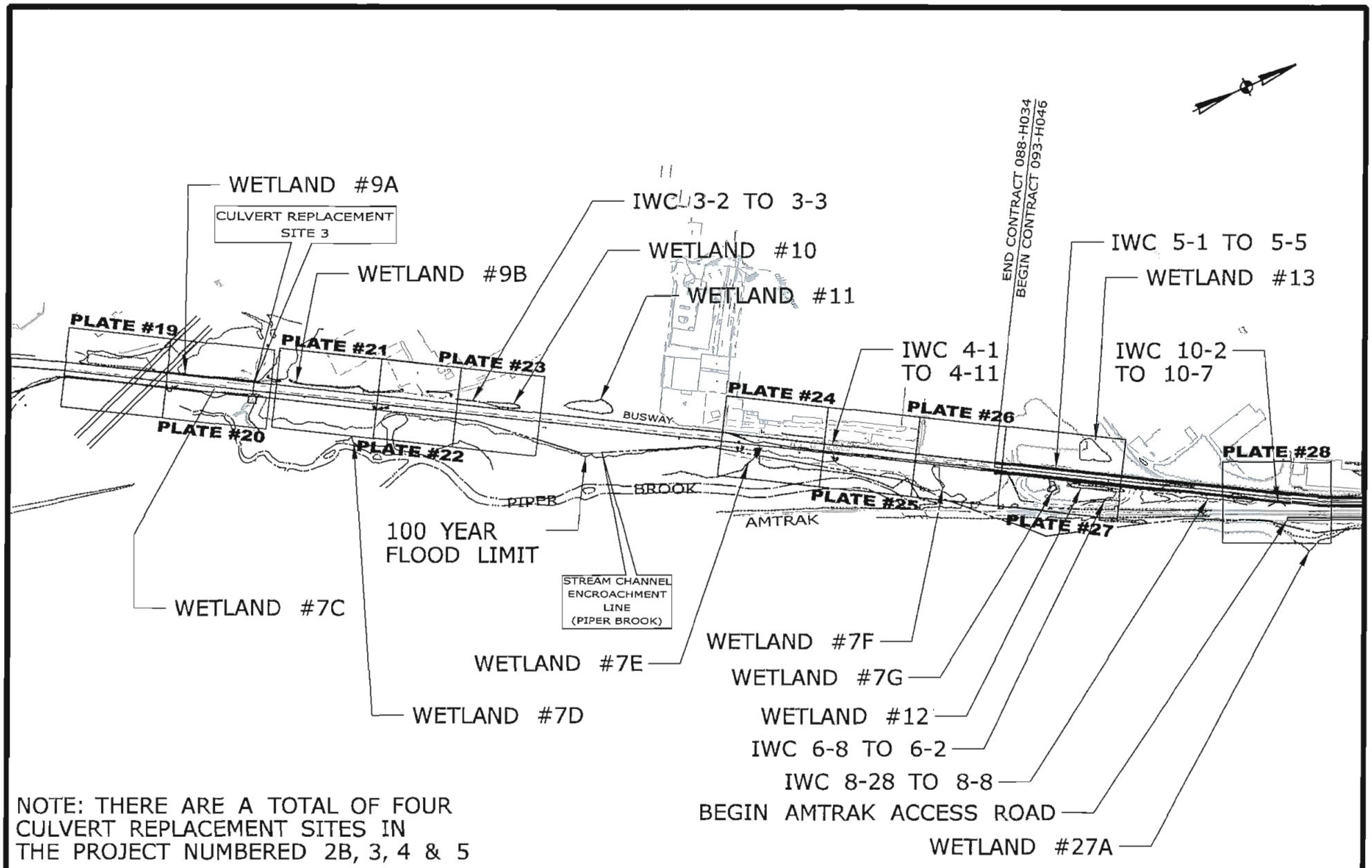


● STATION	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
—— BUSWAY				
---- MULTI-USE TRAIL	SCALE : NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES VICINTY AND LOCATION MAP	MICHAEL BAKER ENGINEERING	PLATE NO. 1

NOTE: THERE ARE A TOTAL OF FOUR CULVERT REPLACEMENT SITES IN THE PROJECT NUMBERED 2B, 3, 4 &5

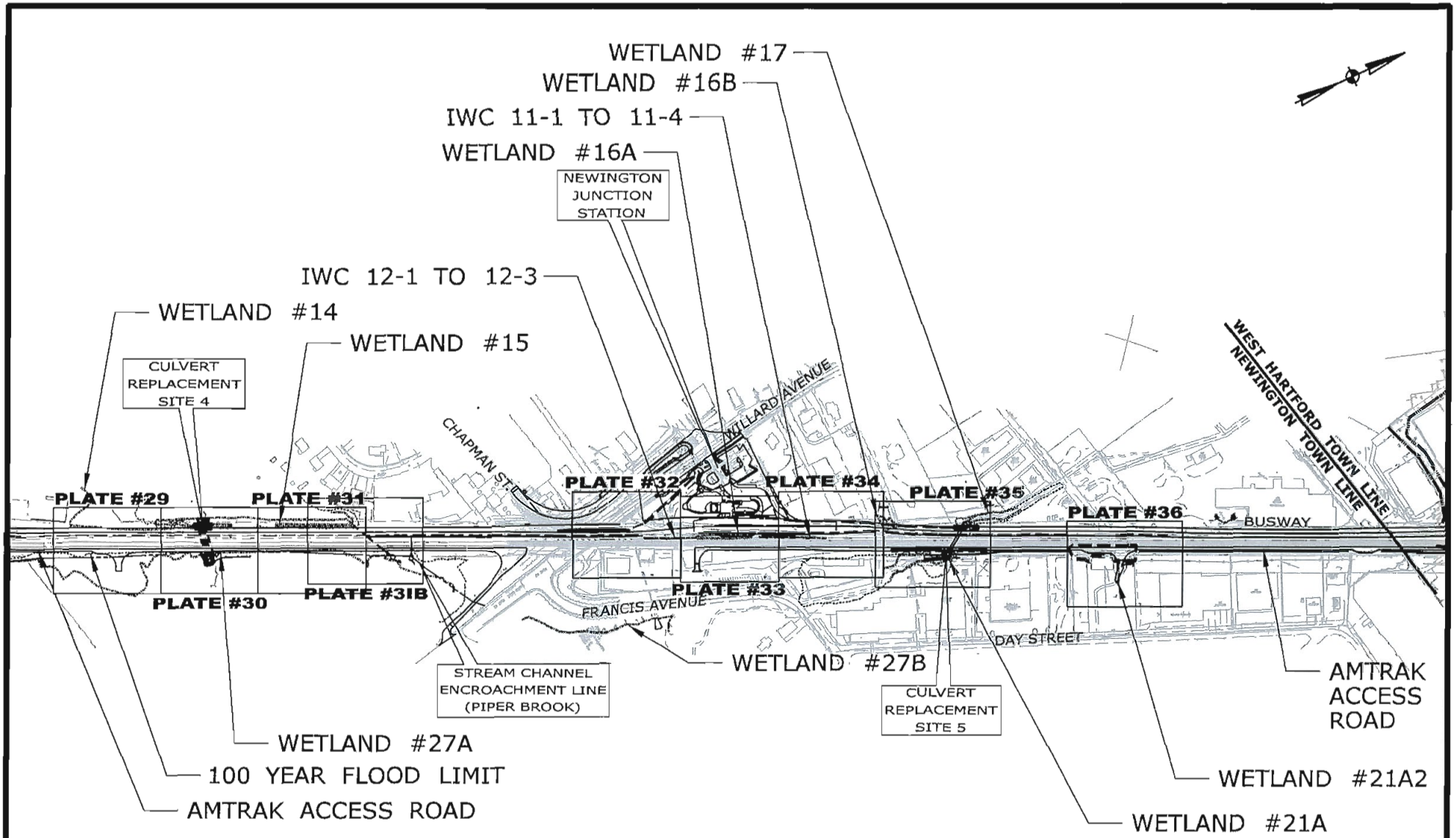


	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE 1" = 500' 500 250 0 500	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES KEY PLAN 1 OF 6	MICHAEL BAKER ENGINEERING	PLATE NO. 2



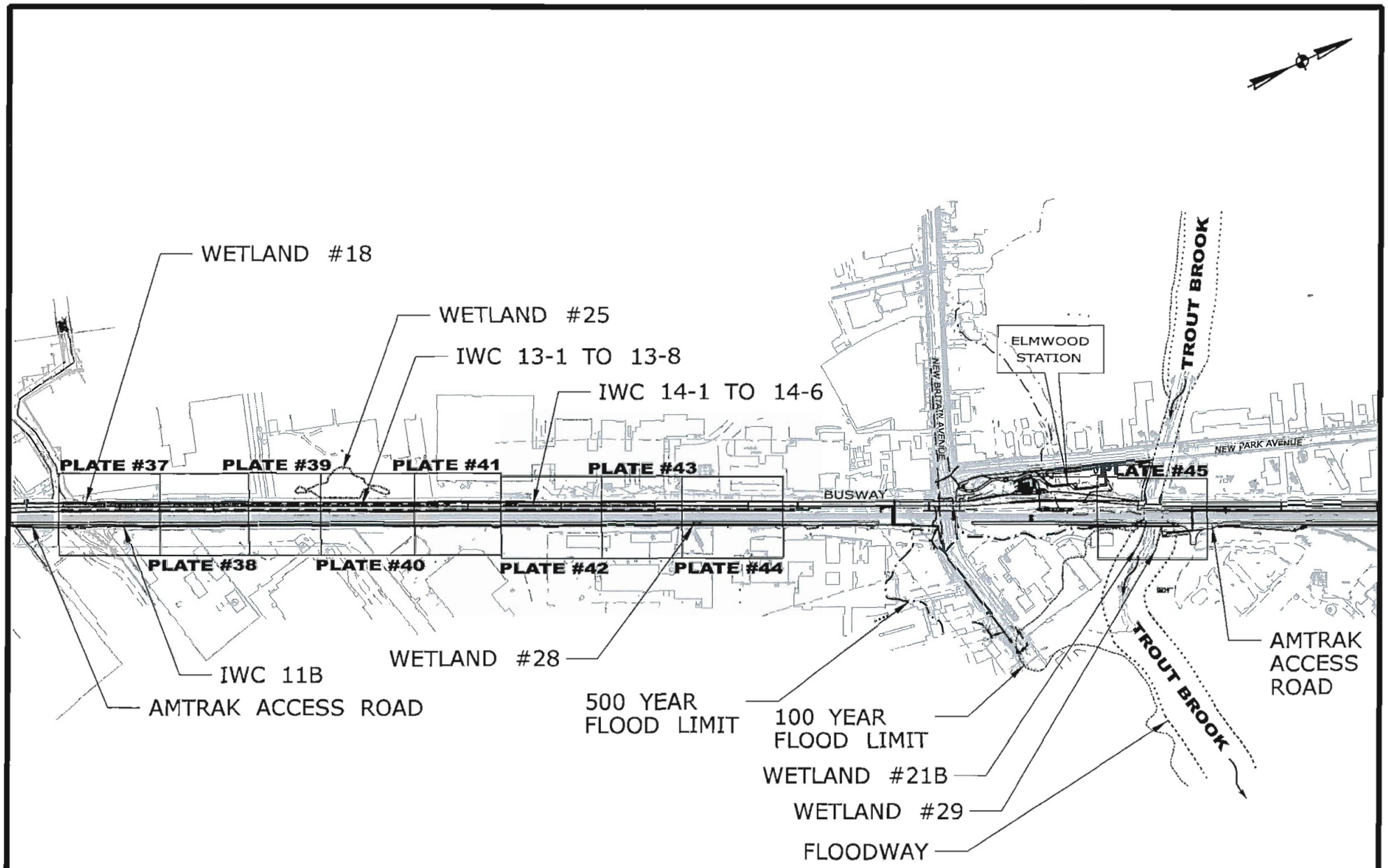
NOTE: THERE ARE A TOTAL OF FOUR CULVERT REPLACEMENT SITES IN THE PROJECT NUMBERED 2B, 3, 4 & 5

	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE 1" = 500' 500 250 0 500	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES KEY PLAN 2 OF 6	MICHAEL BAKER ENGINEERING	PLATE NO. 3

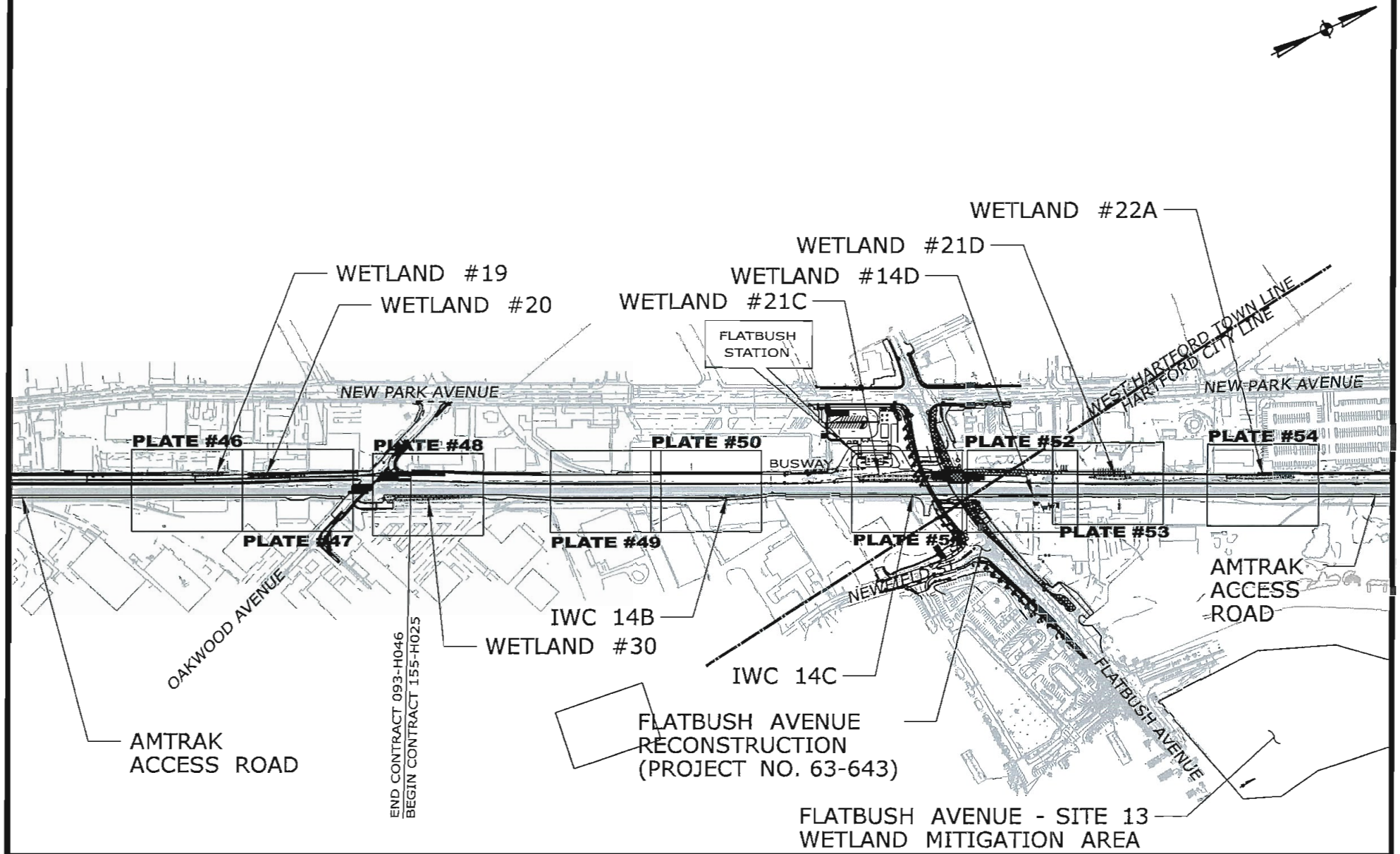


NOTE: THERE ARE A TOTAL OF FOUR CULVERT REPLACEMENT SITES IN THE PROJECT NUMBERED 2B, 3, 4 & 5

	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE 1" = 500' 500 250 0 500	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES KEY PLAN 3 OF 6	MICHAEL BAKER ENGINEERING	PLATE NO. 4



	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE 1" = 500' 500 250 0 500	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES KEY PLAN 4 OF 6	MICHAEL BAKER ENGINEERING	PLATE NO. 5



	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION		DATE: FEBRUARY 2011
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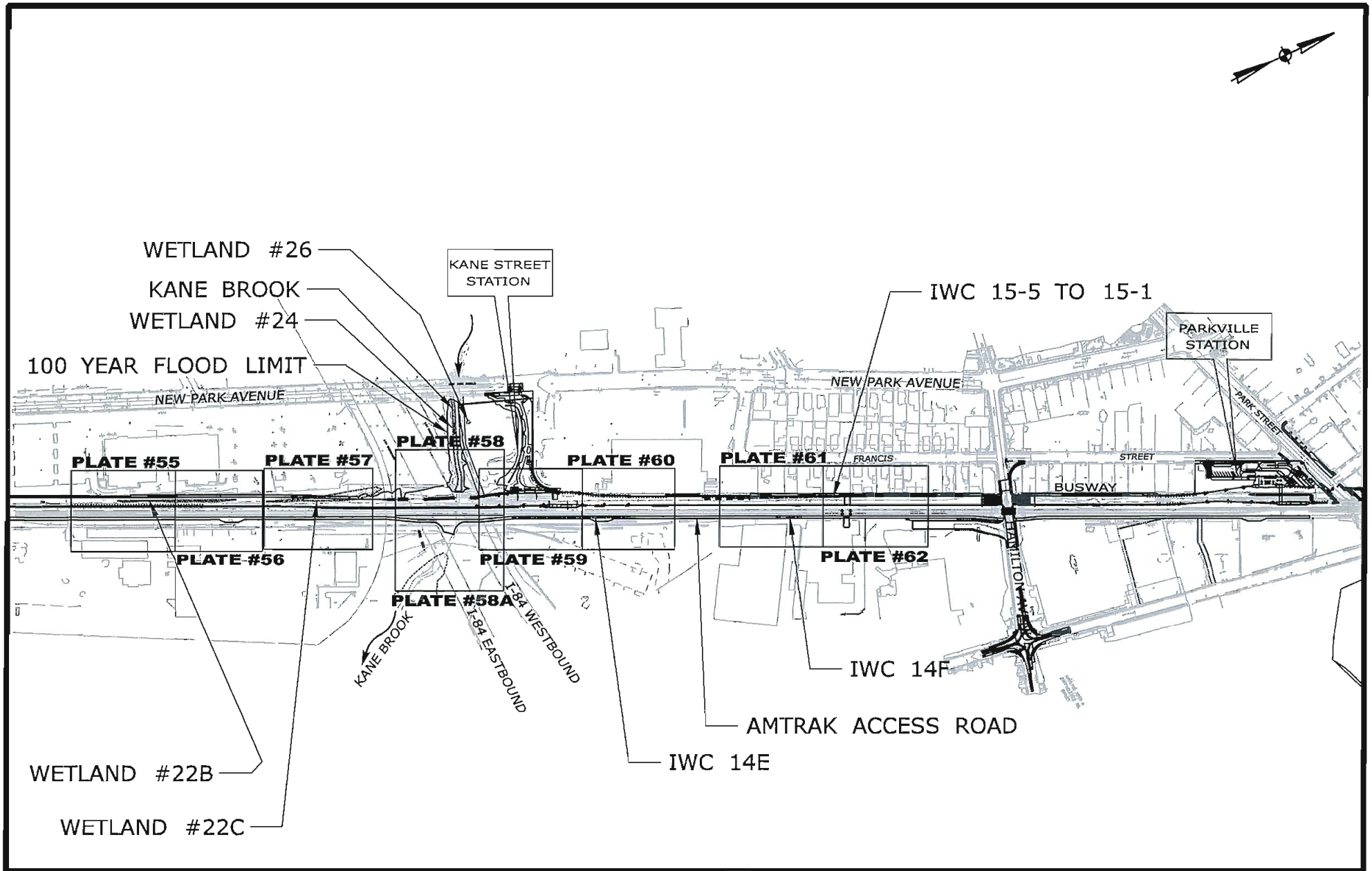
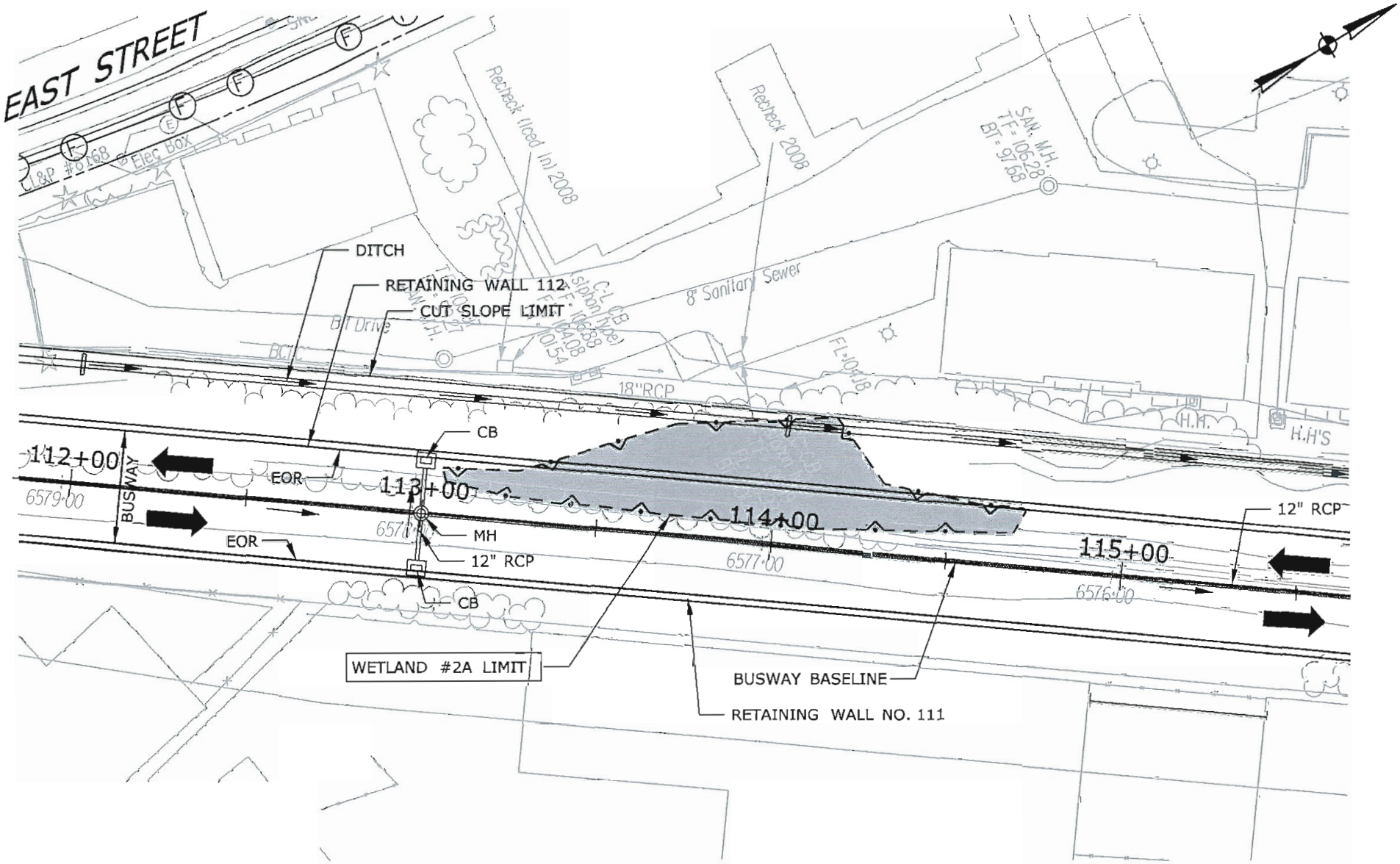


	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE 1" = 500' 500 250 0 500	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES KEY PLAN 6 OF 6	MICHAEL BAKER ENGINEERING	PLATE NO. 7



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #2A IMPACT	2,888 S.F.

STATE PROJECT NO.: 171-305
NEW BRITAIN SECTION
CONTRACT NO. 88-H035

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

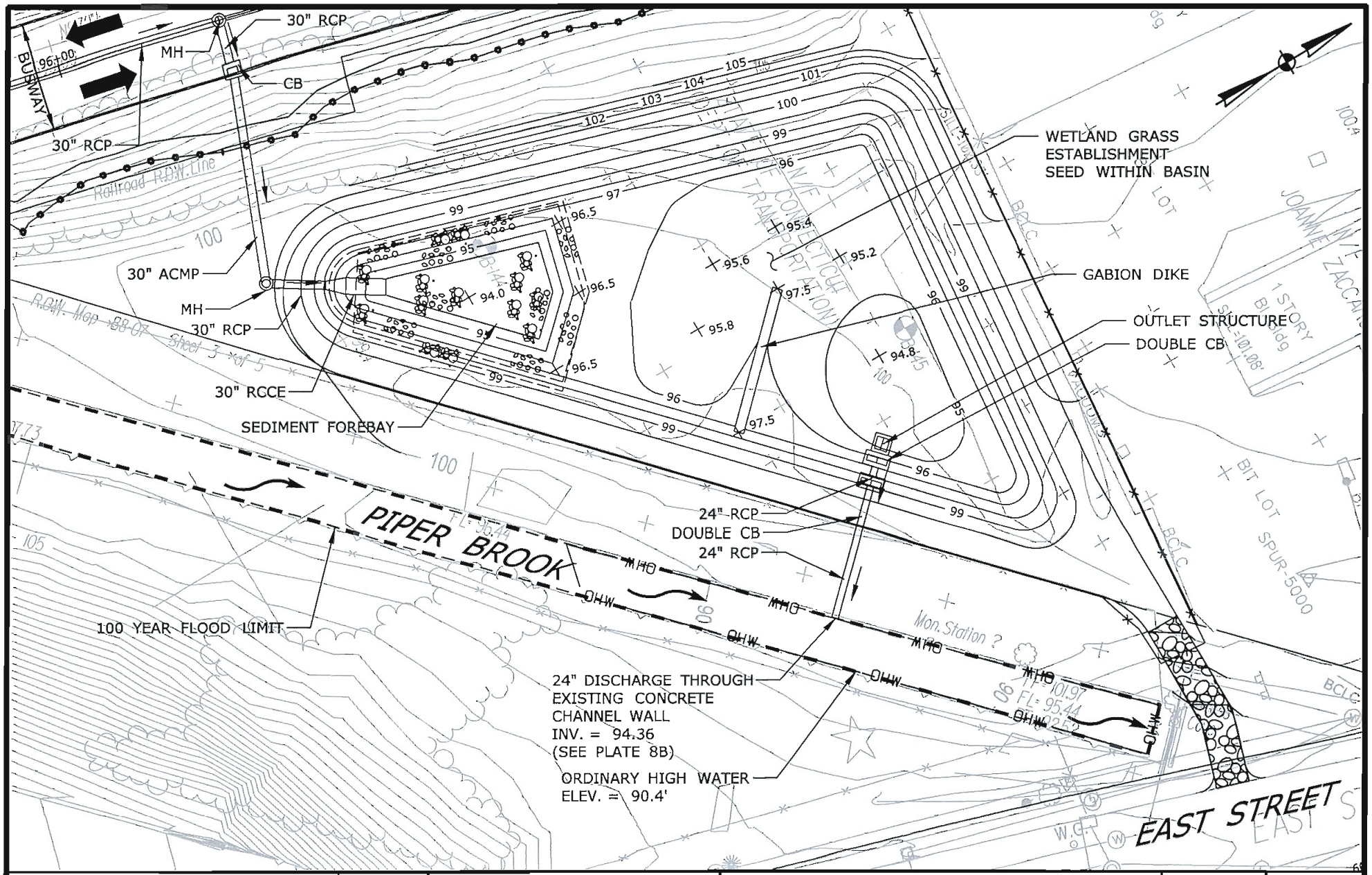
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

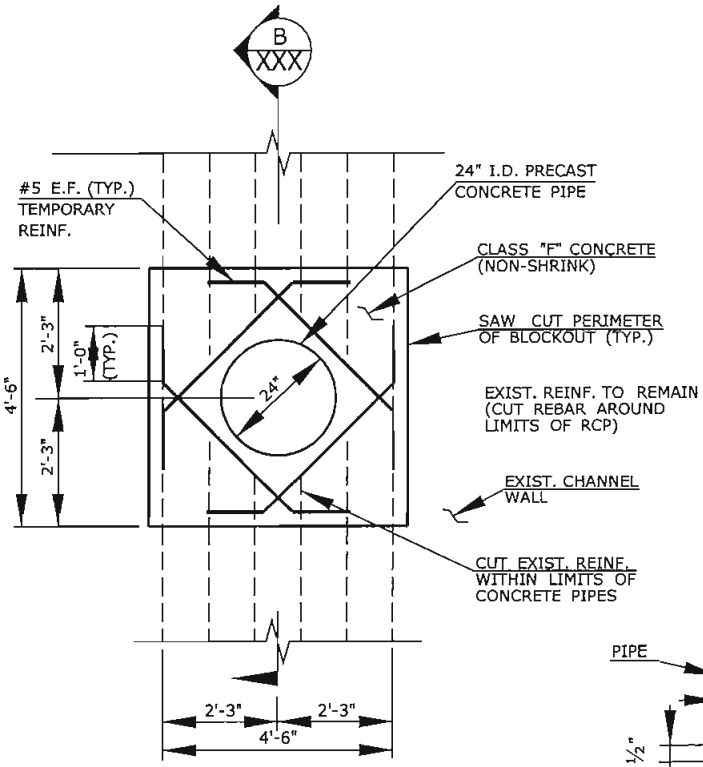
MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

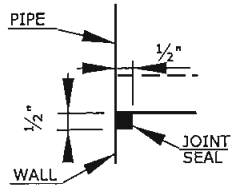
PLATE NO. 8



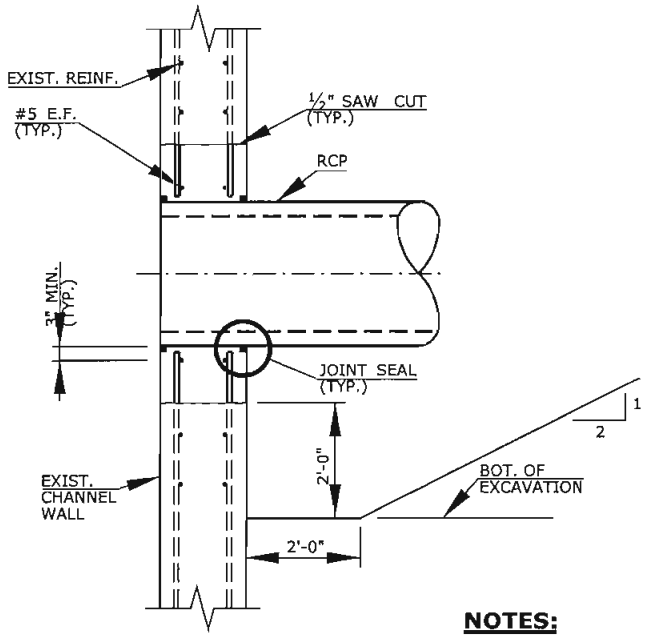
IMPACT SUMMARY	TOTAL IMPACT AREA	STATE PROJECT NO.: 171-305 NEW BRITAIN SECTION CONTRACT NO. 88-H035	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
NO WETLAND IMPACTS		SCALE 1" = 40' 40 20 0 40	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 8A



ELEVATION



JOINT SEAL DETAIL



SECTION

NOTES:

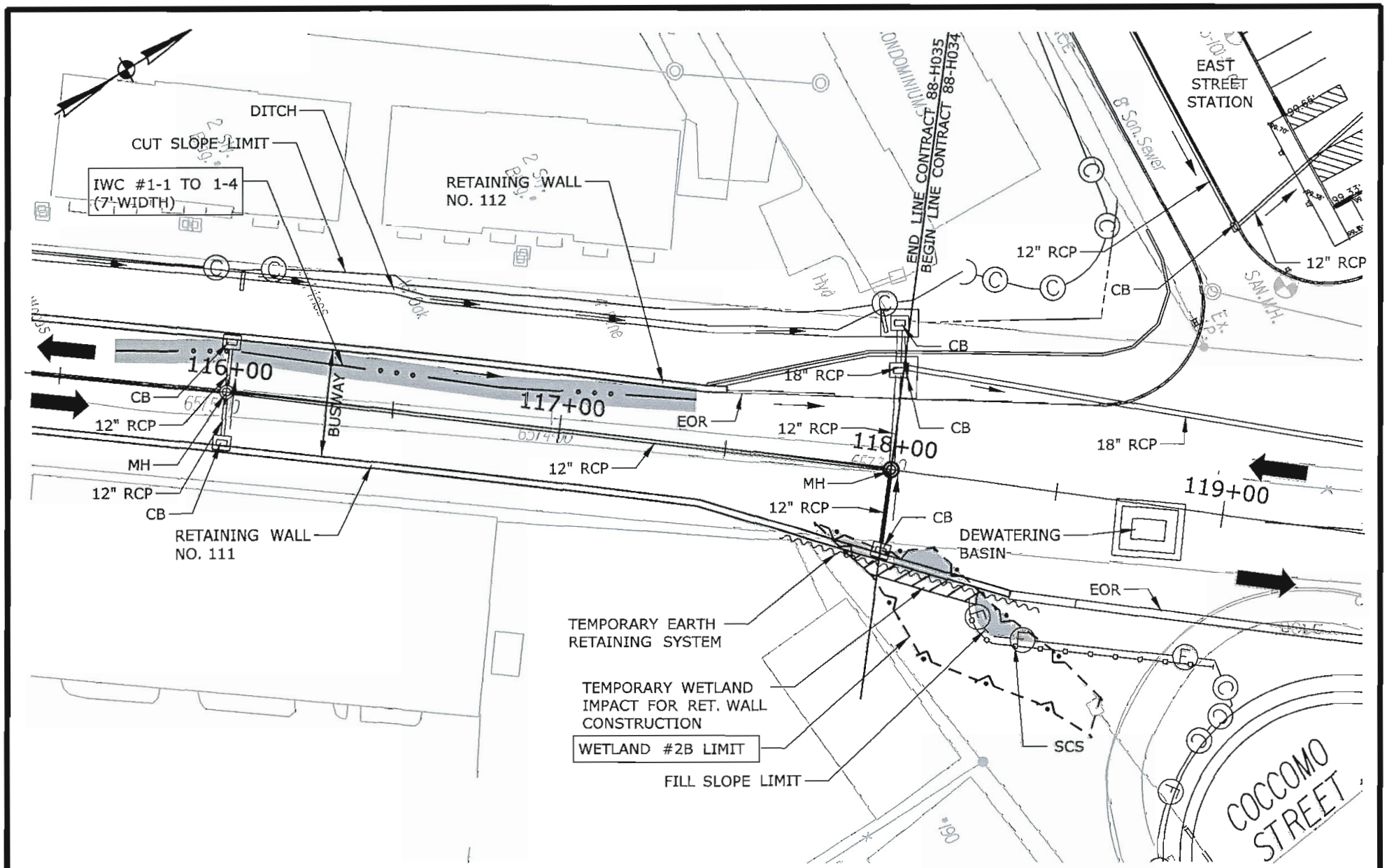
1. THIS WORK SHALL BE PAID FOR UNDER THE FOLLOWING ITEMS; STRUCTURE EXCAVATION EARTH (COMPLETE), REMOVAL OF EXISTING MASONRY LIMITED METHODS, DEFORMED STEEL BARS, CLASS "F" CONCRETE. JOINT SEAL SHALL BE INCLUDED IN THE COST OF CLASS "F" CONCRETE.
2. IN THE EVENT THAT EXISTING REINFORCEMENT IS INADVERTENTLY CUT. DRILL AND GROUT REPLACEMENT BAR ADJACENT TO CUT REBAR.
3. CONTRACTOR SHALL FURNISH, INSTALL, AND REMOVE A TEMPORARY SUPPORT SYSTEM REQUIRED TO PERFORM THIS WORK. THE SUPPORT SYSTEM SHALL INCLUDE PROVISIONS TO CONTAIN DEBRIS FROM THE SAWCUTTING AND REMOVAL OF THE EXISTING CONCRETE.
4. COST OF TEMPORAERY SUPPORT SYSTEM INCLUDED IN COST OF CLASS "F" CONCRETE.
5. TEMPORARY SUPPORT SYSTEM SHALL NOT EXTEND BELOW THE ELEVATION OF ORDINARY HIGH WATER (OHW).
6. SAWCUTTING ON THE CHANNEL FACE OF THE WALL SHALL BE PERFORMED DRY WITHOUT USE OF WATER TO LUBRICATE THE SAW BLADE.

CONSTRUCTION SEQUENCE:

1. SAWCUT (1/2" MAX. DEPTH) PERIMETER OF PIPE BLOCKOUT ON EACH FACE OF WALL.
2. REMOVE EXISTING MASONRY AND MAINTAIN EXISTING REINFORCEMENT.
3. PARTIALLY CUT REINFORCEMENT THAT OBSTRUCTS PIPE OPENING.
4. INSTALL TEMPERATURE REINFORCEMENT AS SHOWN. FORM AND POUR CONCRETE.
5. REMOVE FORM AFTER CONCRETE HAS SET AND APPLY JOINT SEAL.

DRAINAGE OUTLET AT PIPER BROOK CHANNEL

	STATE PROJECT NO.: 171-305 NEW BRITAIN SECTION CONTRACT NO. 88-H035	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2010
	SCALE 1" = 40' 40 20 0 40	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 8B



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #2B IMPACT	302 S.F.
TEMPORARY WETLAND #2B IMPACT	188 S.F.
PERMANENT IWC #1 IMPACT	174 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H035/H034

SCALE 1" = 40'

40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

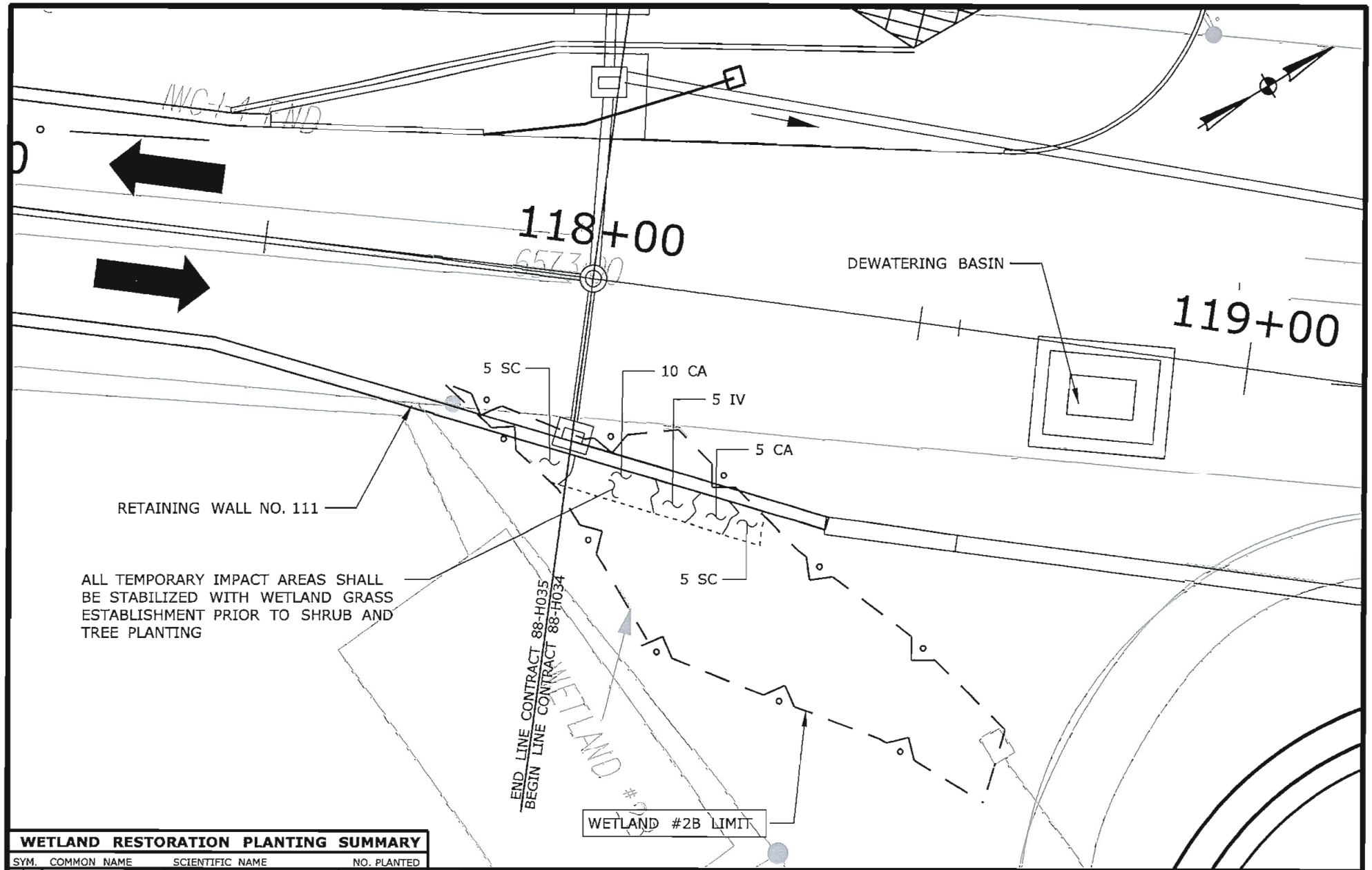
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 9



WETLAND RESTORATION PLANTING SUMMARY

SYM.	COMMON NAME	SCIENTIFIC NAME	NO. PLANTED
SC	ELDERBERRY	SAMBUCUS CANADENSIS	10
CA	SILKY DOGWOOD	CORNUS AMOMUM	15
IV	WINTERBERRY	ILEX VERTICILLATA	5
TOTAL PLANTINGS			30

STATE PROJECT NO.: 171-305
CONTRACT NO.: H035/H034

SCALE 1" = 20'
20 10 0 20

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

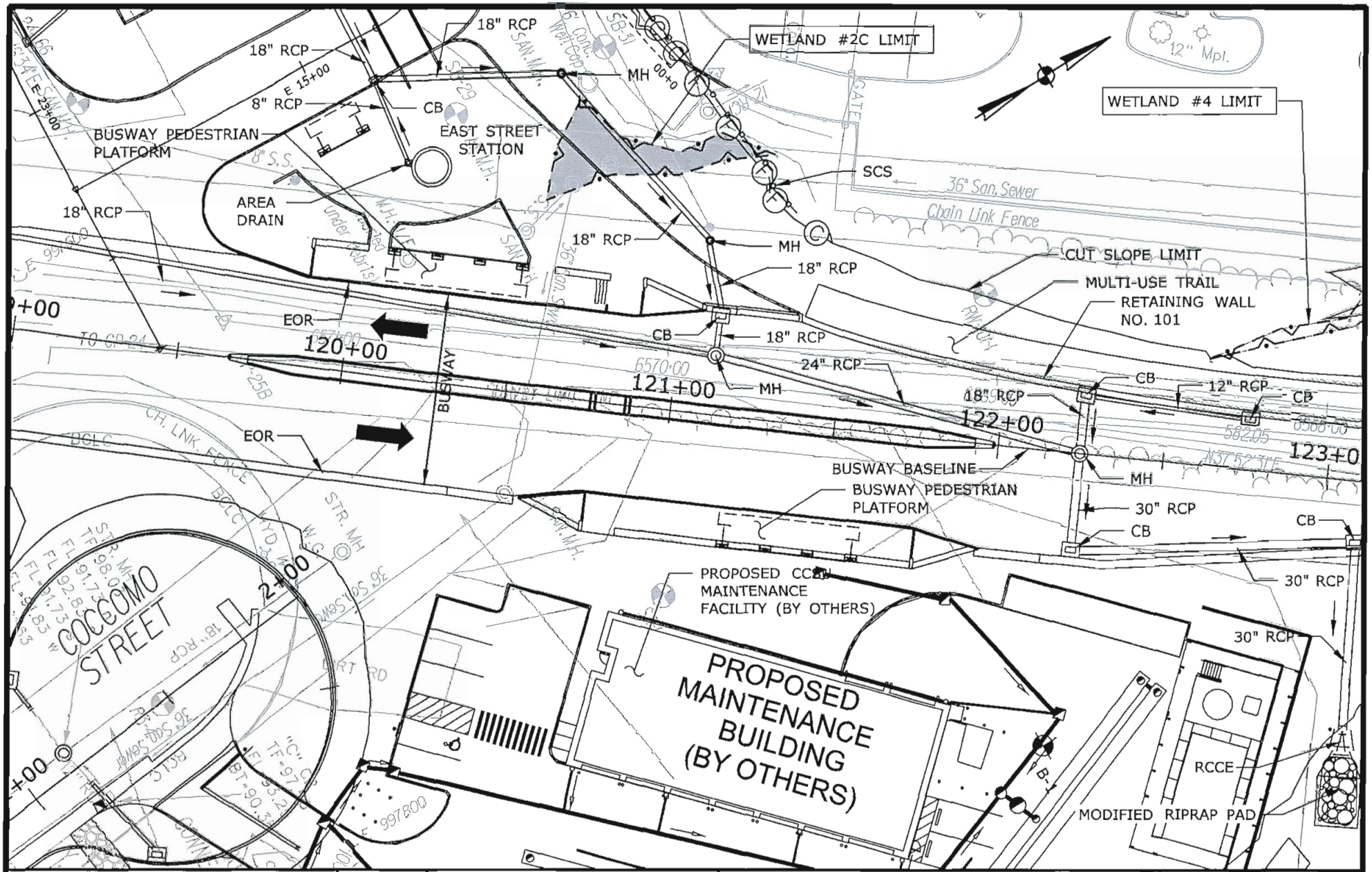
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 9A



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #2C IMPACT	728 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

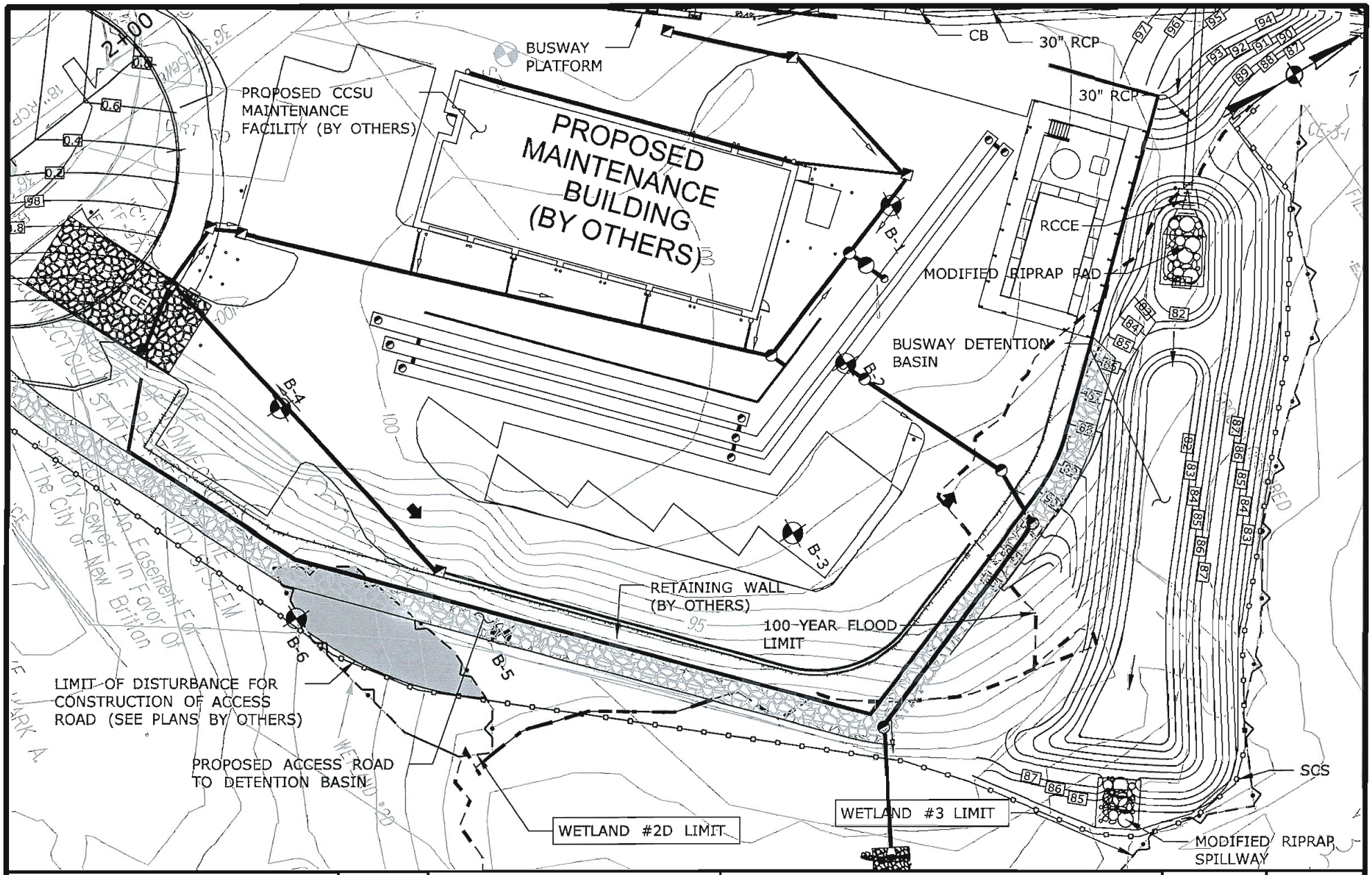
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 10



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #2D IMPACT	1,160 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

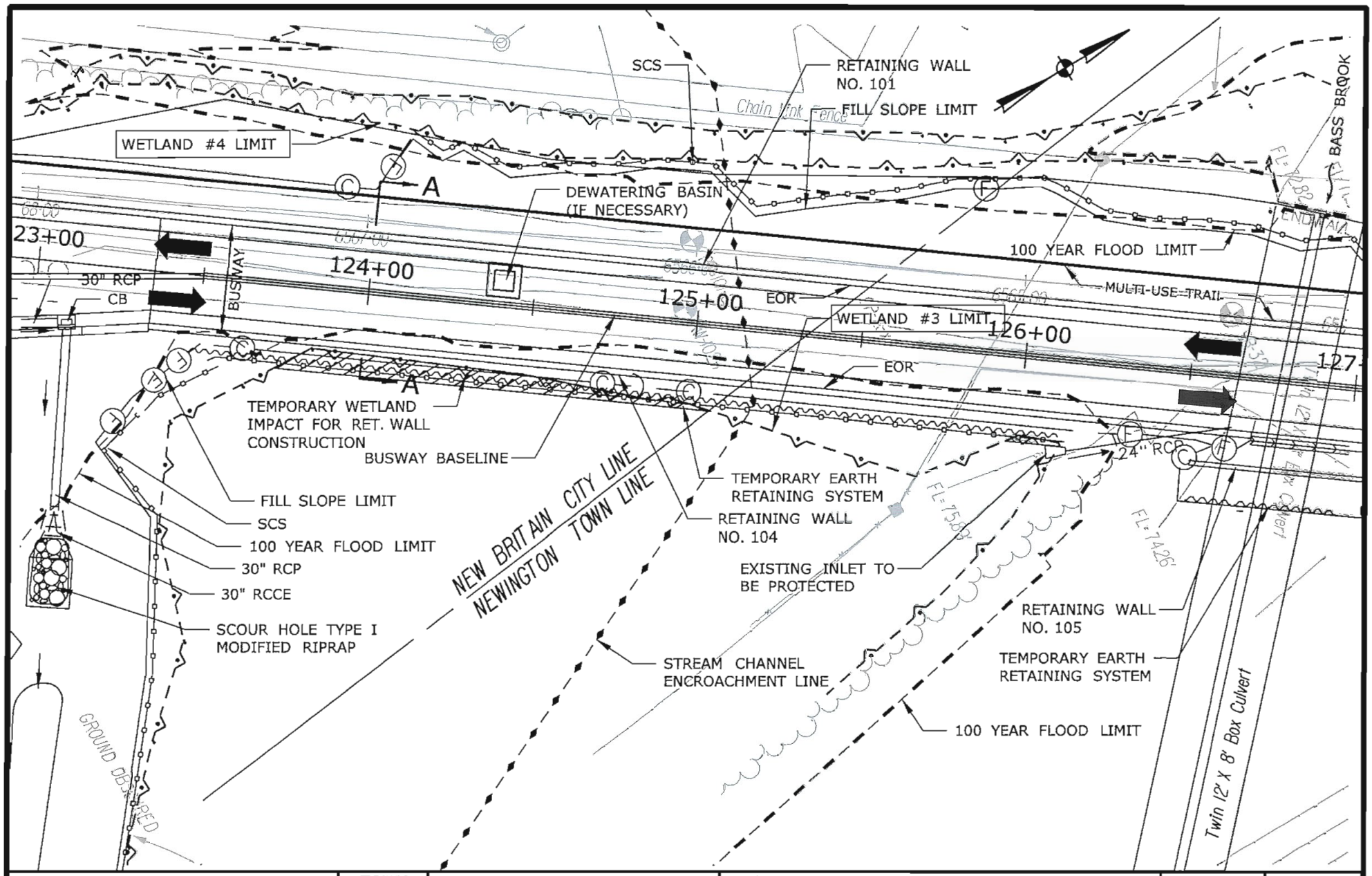
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 10A



IMPACT SUMMARY	TOTAL IMPACT AREA
TEMPORARY WETLAND #3 IMPACT	634 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

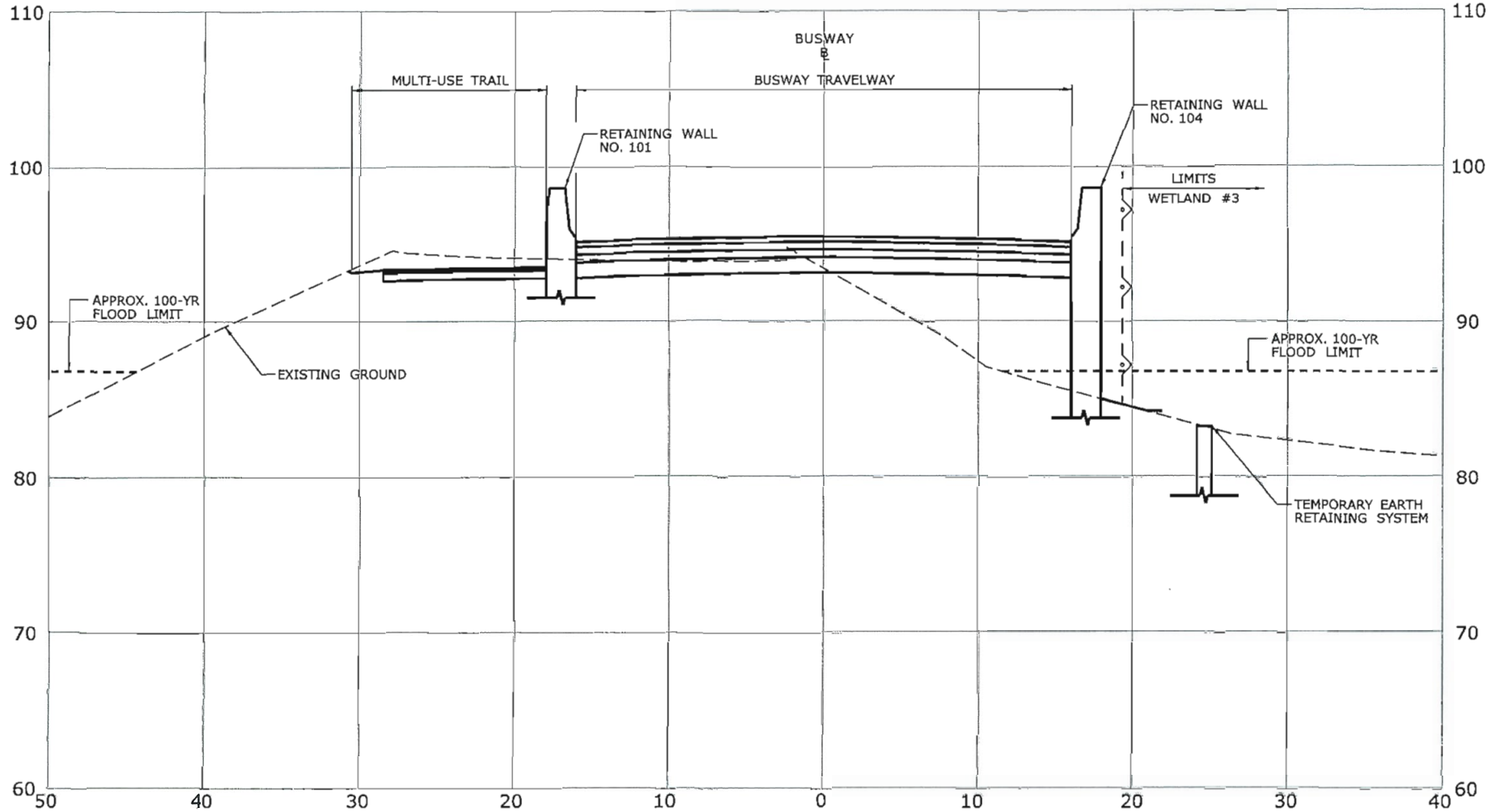
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

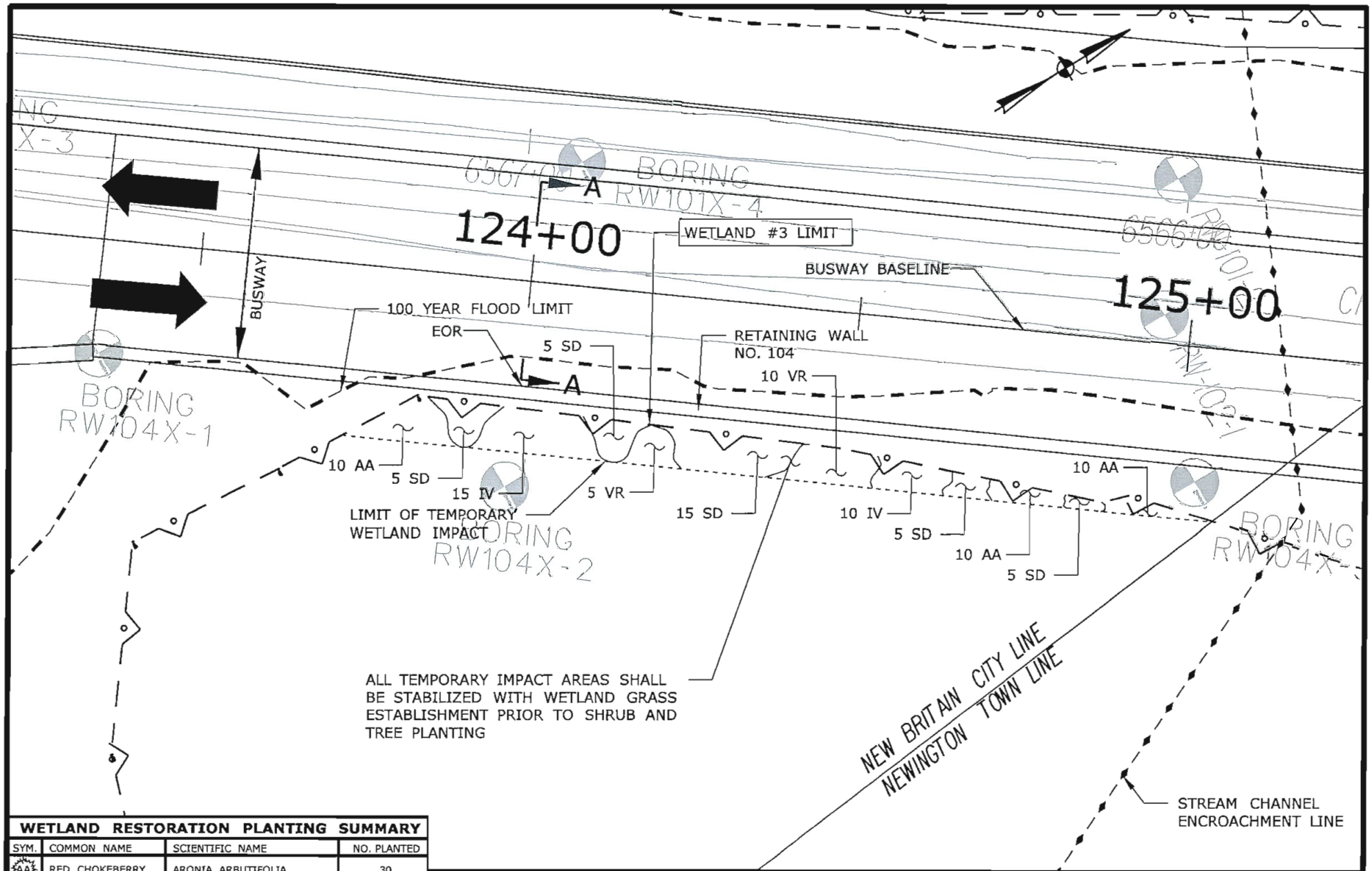
DATE: FEBRUARY 2011

PLATE NO. 11



SECTION A-A (ON PLATE 11)

TYPICAL SECTION WHERE RETAINING WALL IS USED TO MINIMIZE WETLAND IMPACT	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=10'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 11A



WETLAND RESTORATION PLANTING SUMMARY

SYM.	COMMON NAME	SCIENTIFIC NAME	NO. PLANTED
AA	RED CHOKEBERRY	ARONIA ARBUTIFOLIA	30
SD	PUSSY WILLOW	SALIX DISCOLOR	35
IV	WINTERBERRY	ILEX VERTICILLATA	25
VR	NORTHERN ARROWWOOD	VIBURNUM RECOGNITUM	15
TOTAL PLANTINGS			105

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 20'

20 10 0 20

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

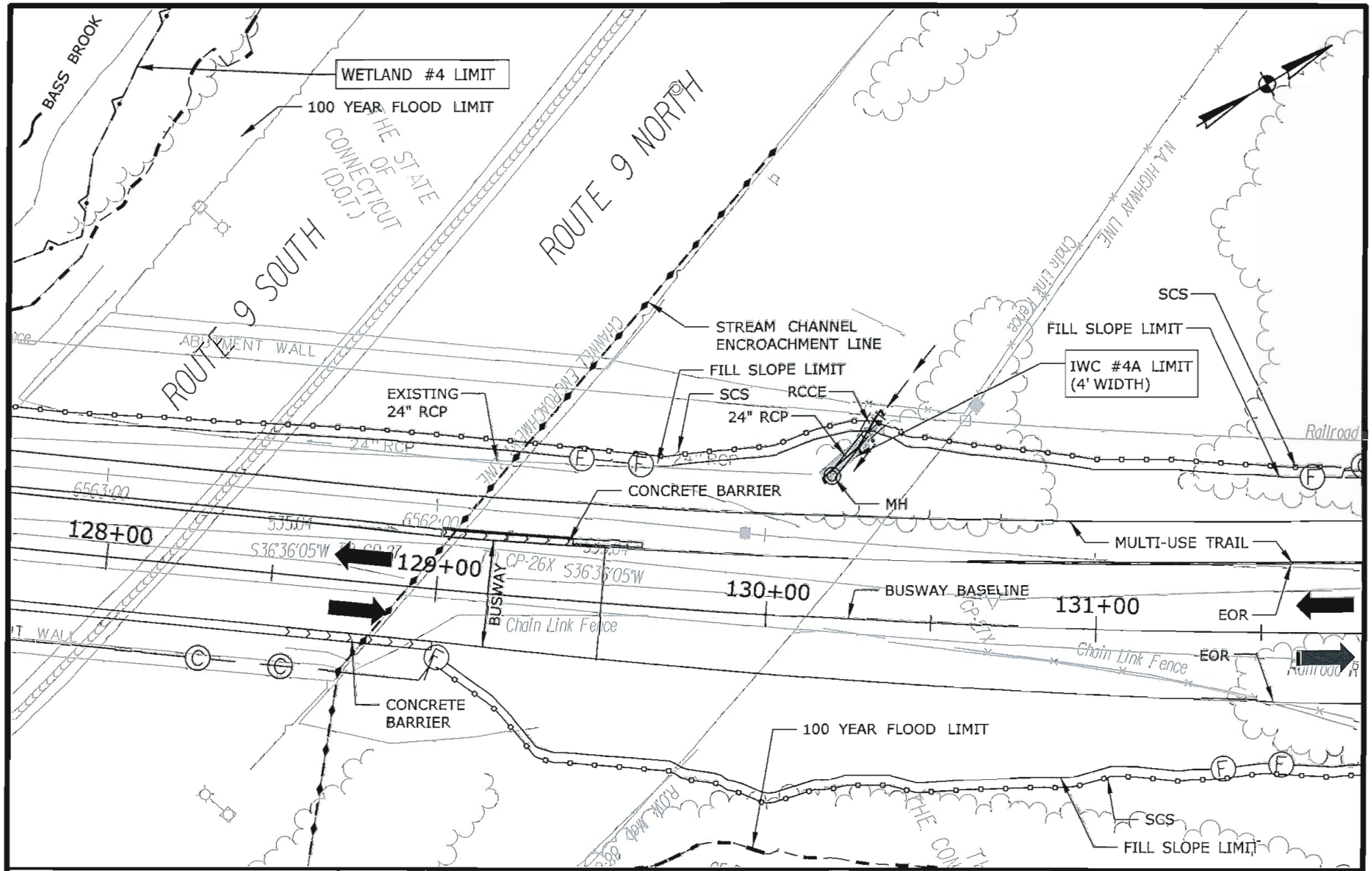
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 11B



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #4A IMPACT	21 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

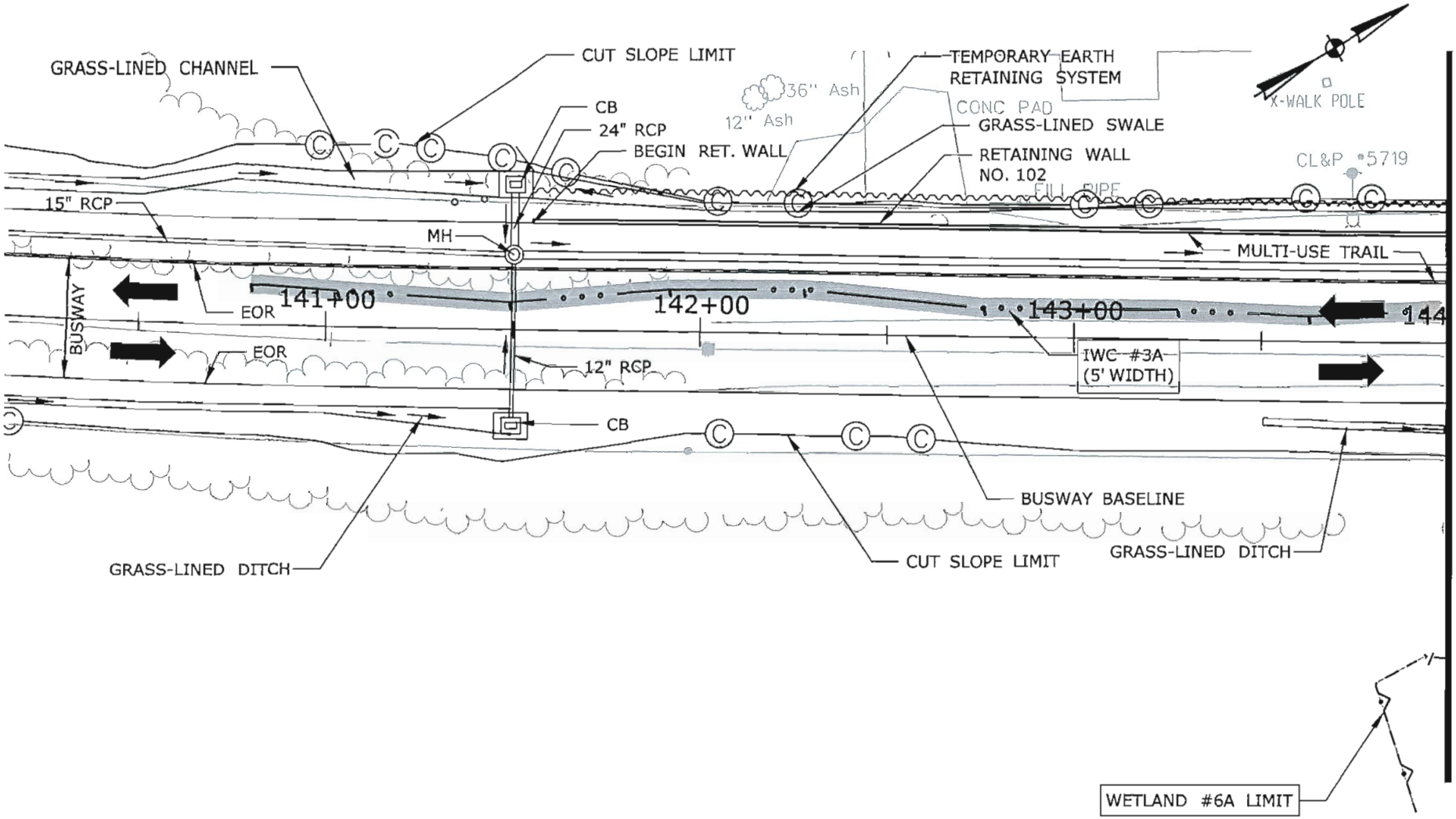
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 12



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #3A IMPACT	454 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

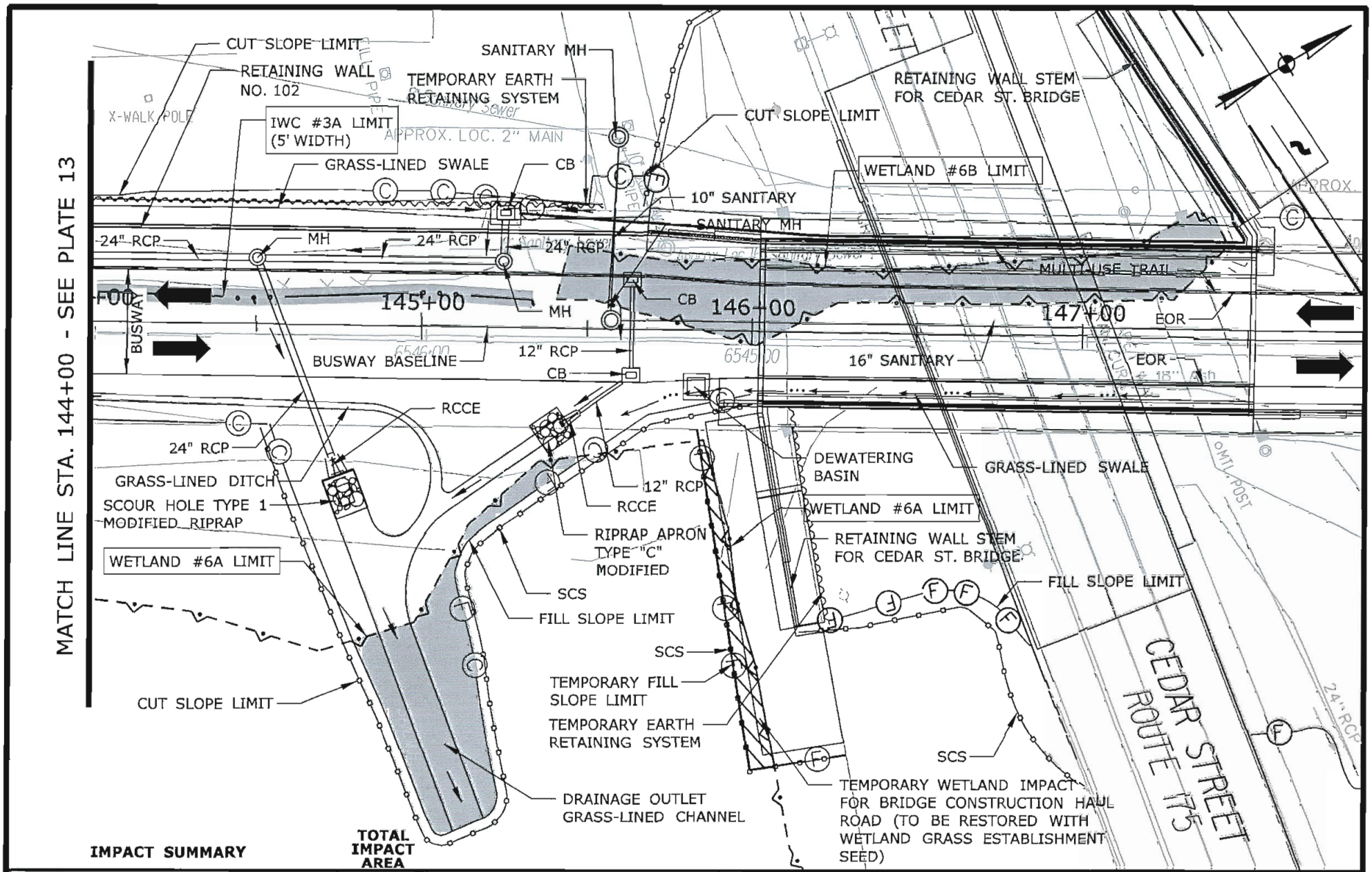
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 13



IMPACT SUMMARY

	TOTAL IMPACT AREA
PERMANENT WETLAND #6A IMPACT	2,080 S.F.
PERMANENT WETLAND #6B IMPACT	3,152 S.F.
TEMPORARY WETLAND #6A IMPACT	515 S.F.
PERMANENT IWC #3A IMPACT	454 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034/93-166

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

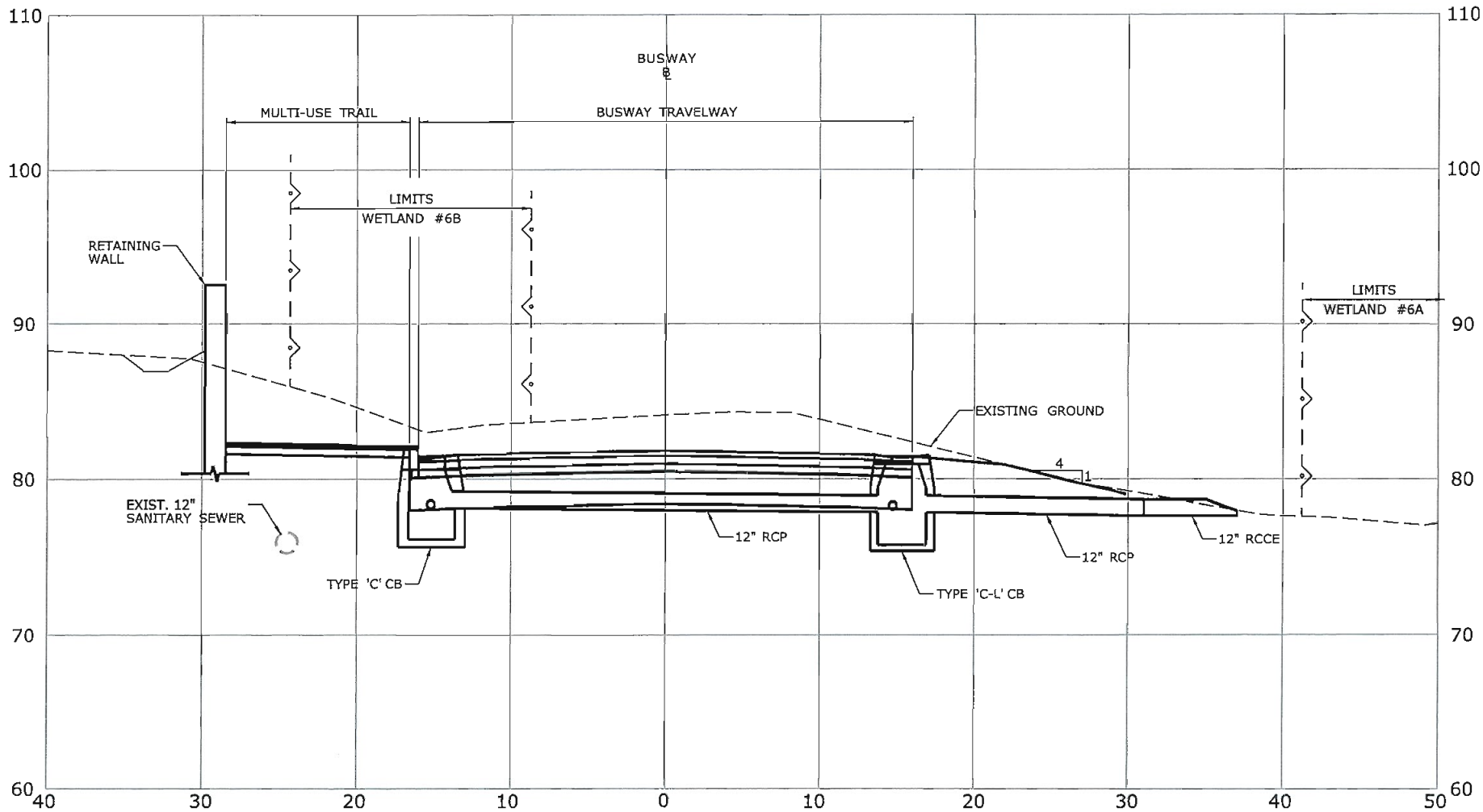
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

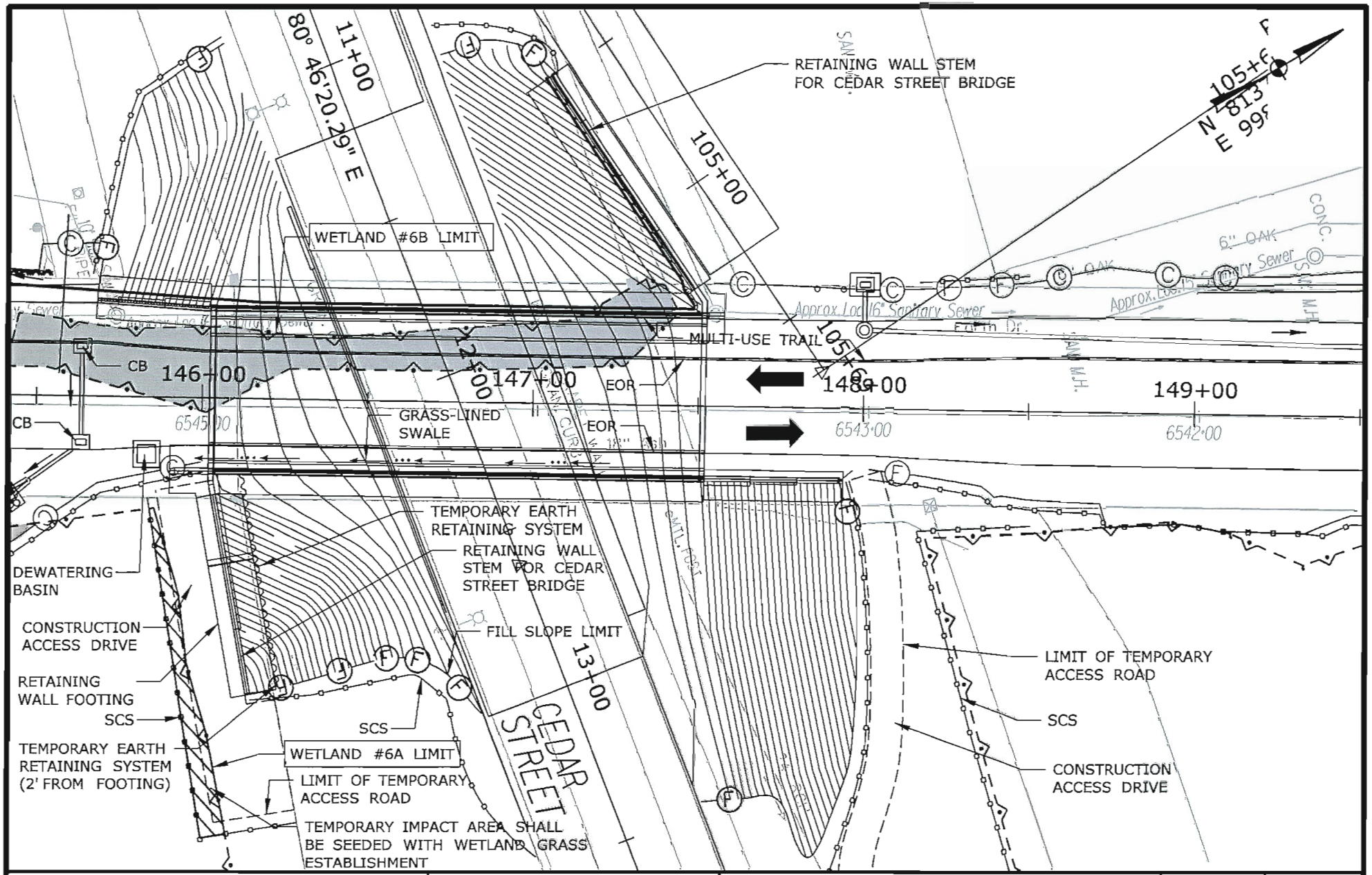
DATE: FEBRUARY 2011

PLATE NO. 14

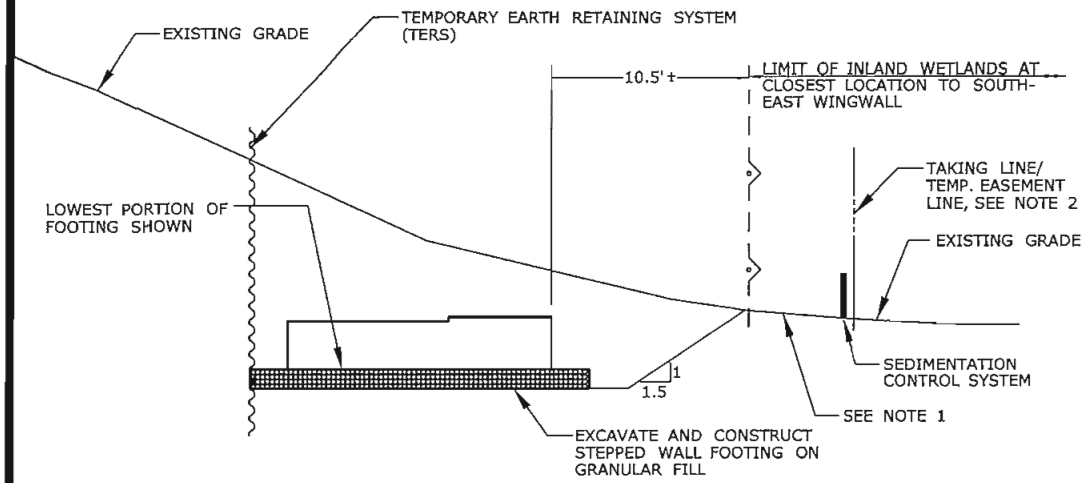


TYPICAL SECTION
(SEE PLATE 14)

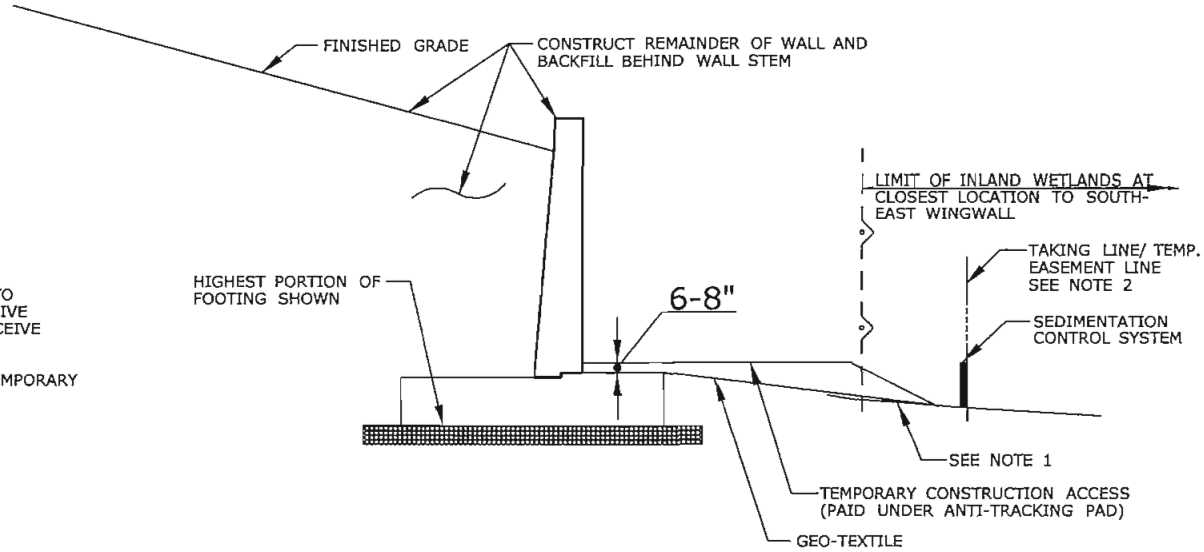
TYPICAL SECTION WHERE CUT WITHIN WETLAND IS REQUIRED FOR CONSTRUCTION	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=10'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 14A



CEDAR STREET BRIDGE ABUTMENT GRADING PLAN	STATE PROJECT NO.: 171-305 CONTRACT NO.: H034/93-166	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE 1" = 40' 40 20 0 40	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 14B



SECTION AT SOUTH EAST WINGWALL (EXCAVATION FOR FOOTING)



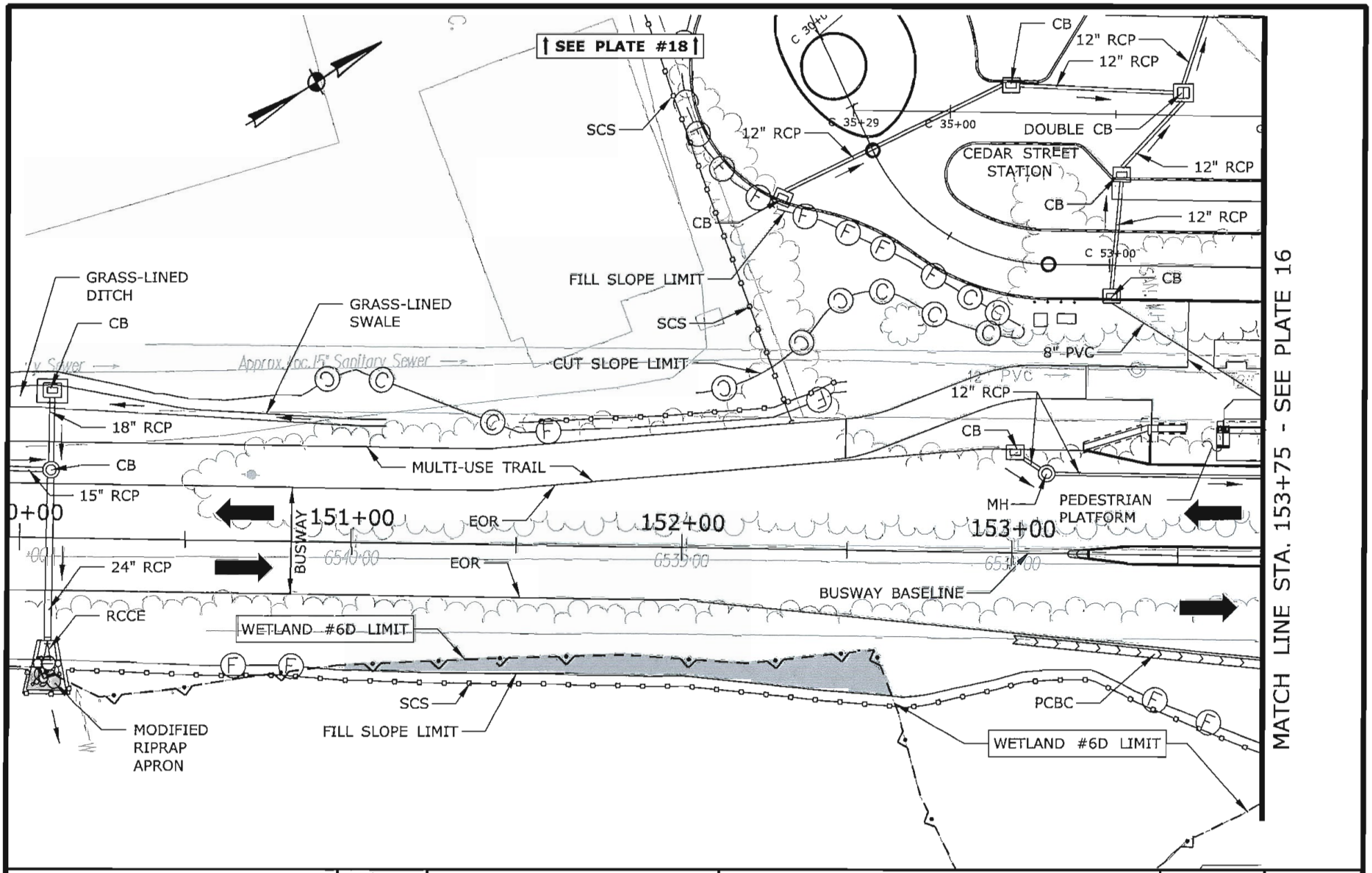
SECTION AT SOUTH EAST WINGWALL (TEMPORARY CONSTRUCTION ACCESS)

NOTES:

1: ALL DISTURBED AREAS SHALL BE RESTORED AND GRADED BACK TO ITS ORIGINAL CONDITION. UPLAND DISTURBED AREAS SHALL RECEIVE TURF ESTABLISHMENT AND DISTURBED WETLAND AREAS SHALL RECEIVE WETLAND GRASS FOR PERMANENT STABILIZATION.

2: CONTRACTOR IS NOT TO ENCROACH BEYOND THE TAKING LINE/TEMPORARY WORK AREA AS SHOWN ON PLATE 14 AND THE GENERAL PLAN.

CEDAR STREET BRIDGE TYPICAL SECTION AT WETLAND IMPACT	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: N.T.S.	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 14C



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #6D IMPACT	1,102 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034/H039

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

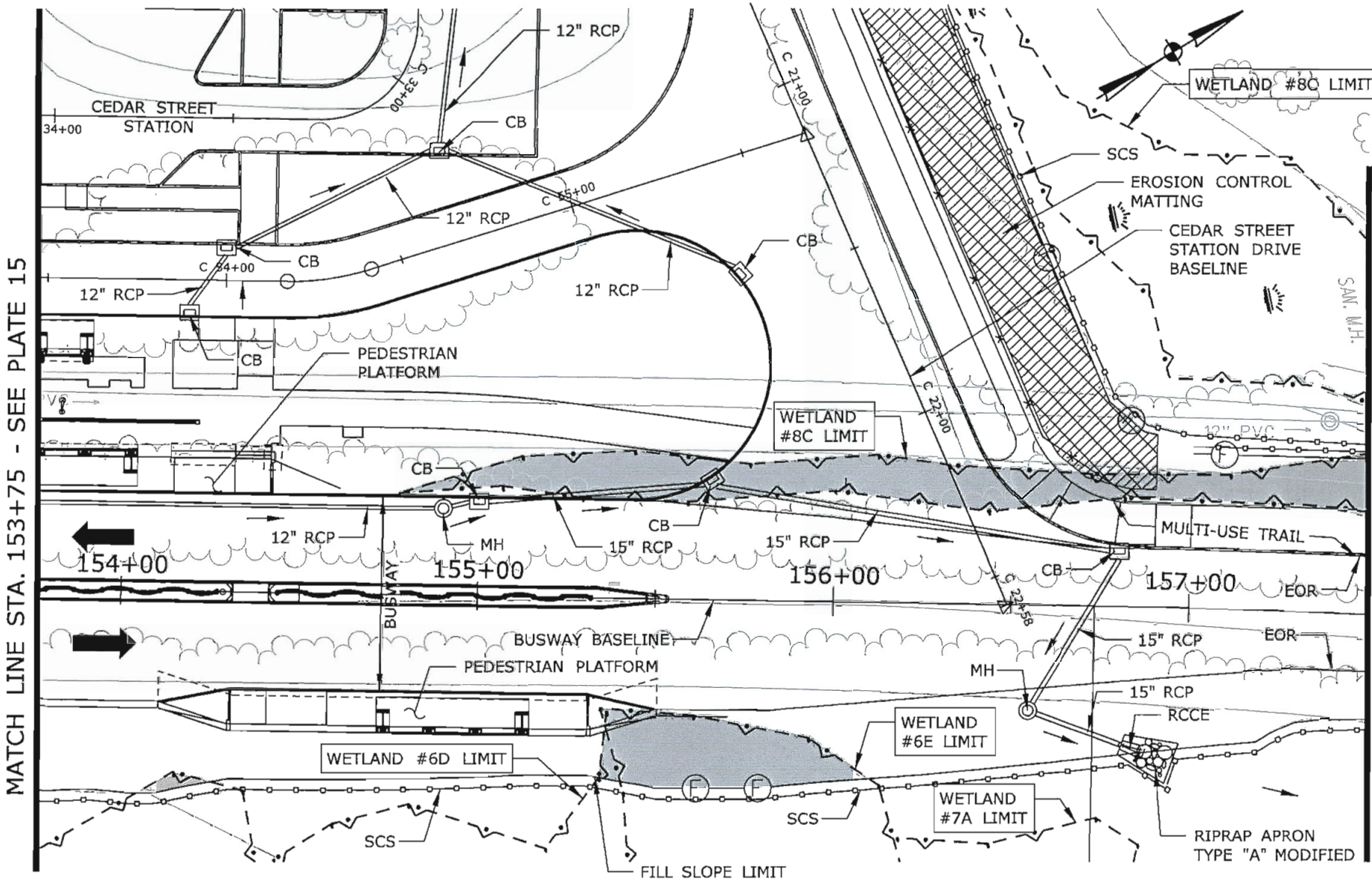
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 15



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #8C IMPACT	12,001 S.F.
PERMANENT WETLAND #6D IMPACT	1,102 S.F.
PERMANENT WETLAND #6E IMPACT	1,126 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034/H039

SCALE 1" = 40'

40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

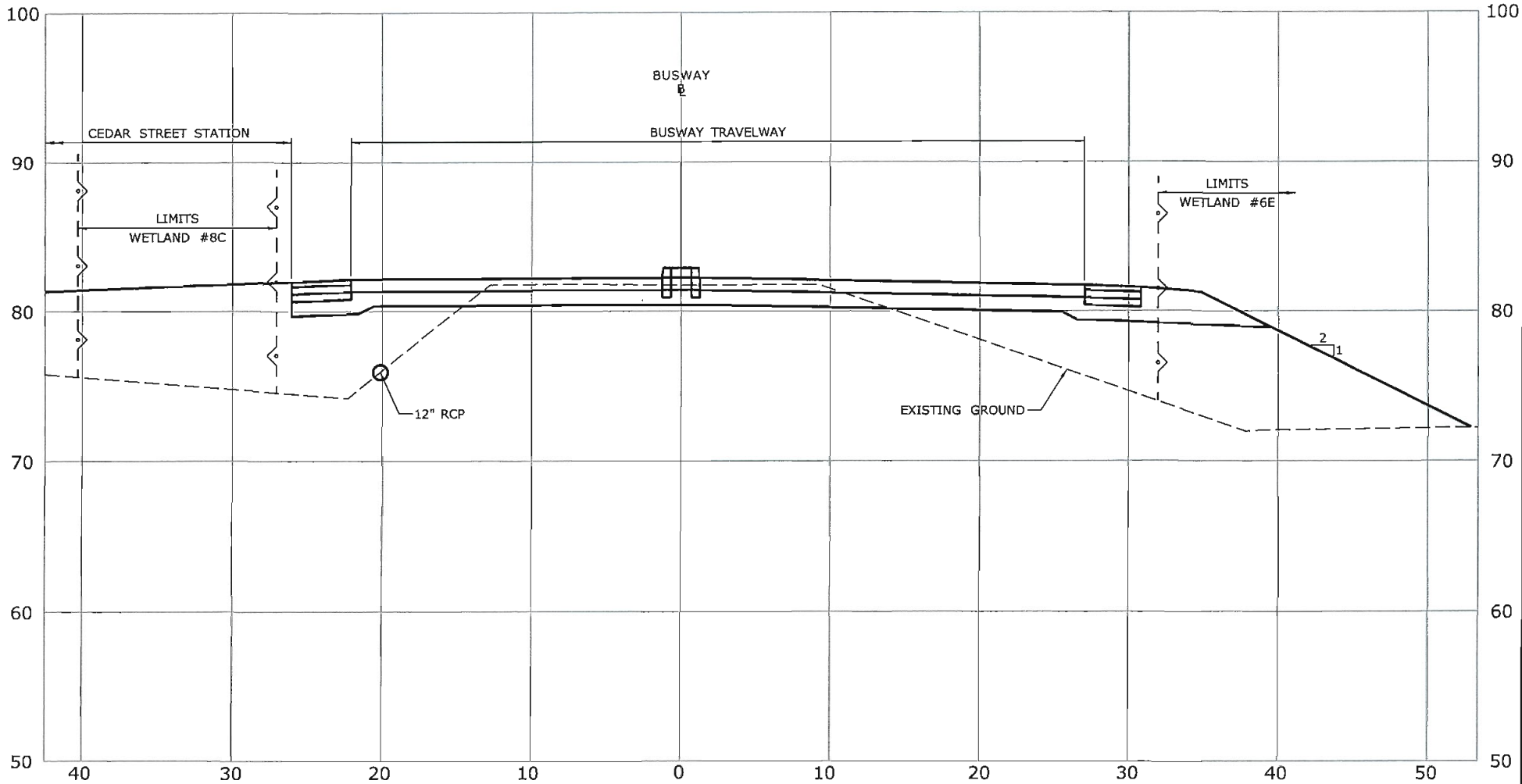
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

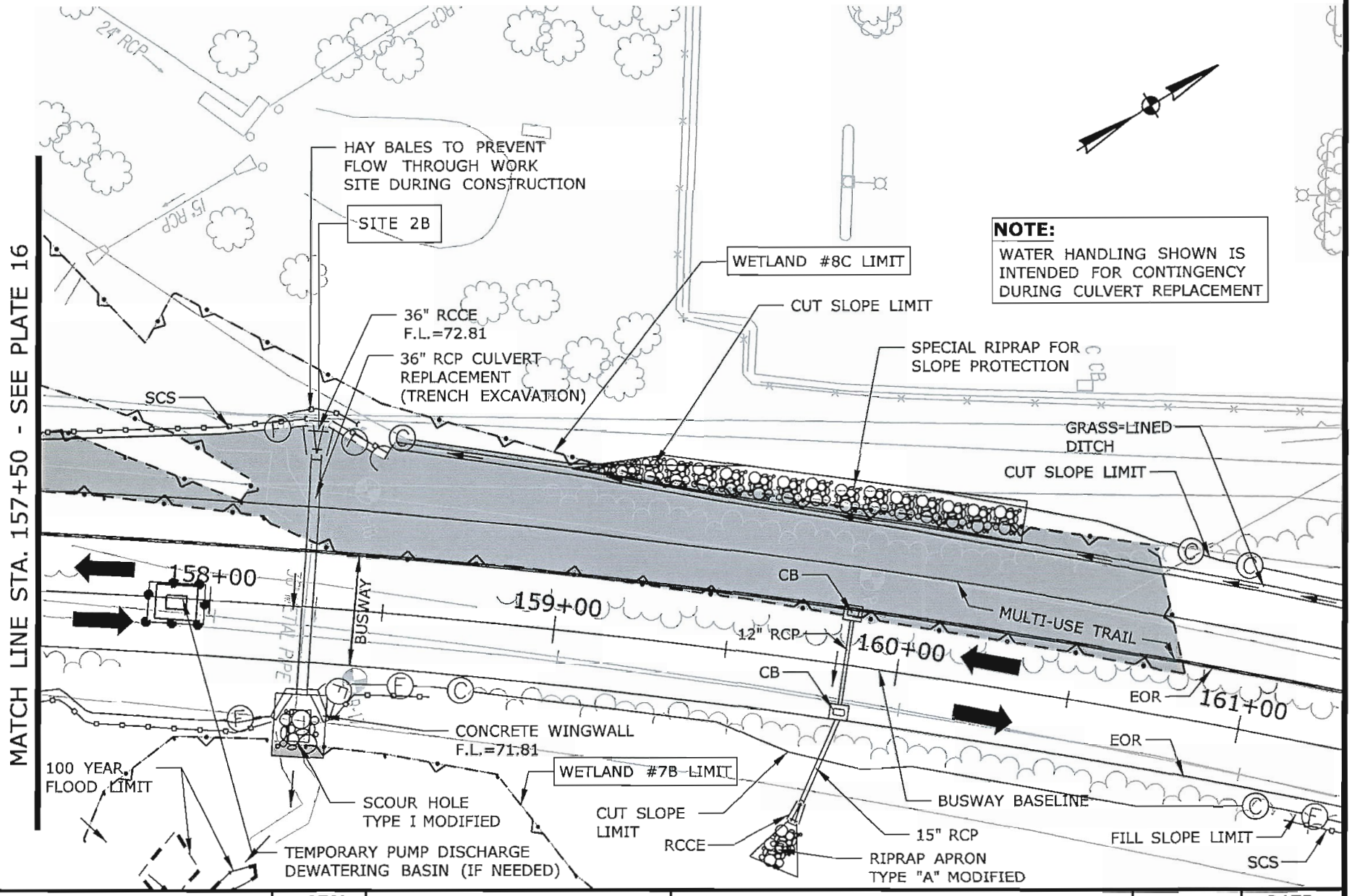
DATE: FEBRUARY 2011

PLATE NO. 16



TYPICAL SECTION
(SEE PLATE 16)

TYPICAL SECTION WHERE CUT WITHIN WETLAND IS REQUIRED FOR CONSTRUCTION	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=10'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 16A



NOTE:
WATER HANDLING SHOWN IS INTENDED FOR CONTINGENCY DURING CULVERT REPLACEMENT

IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #8C IMPACT	12,022 S.F.
PERMANENT WETLAND #7B IMPACT	59 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034/H039

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

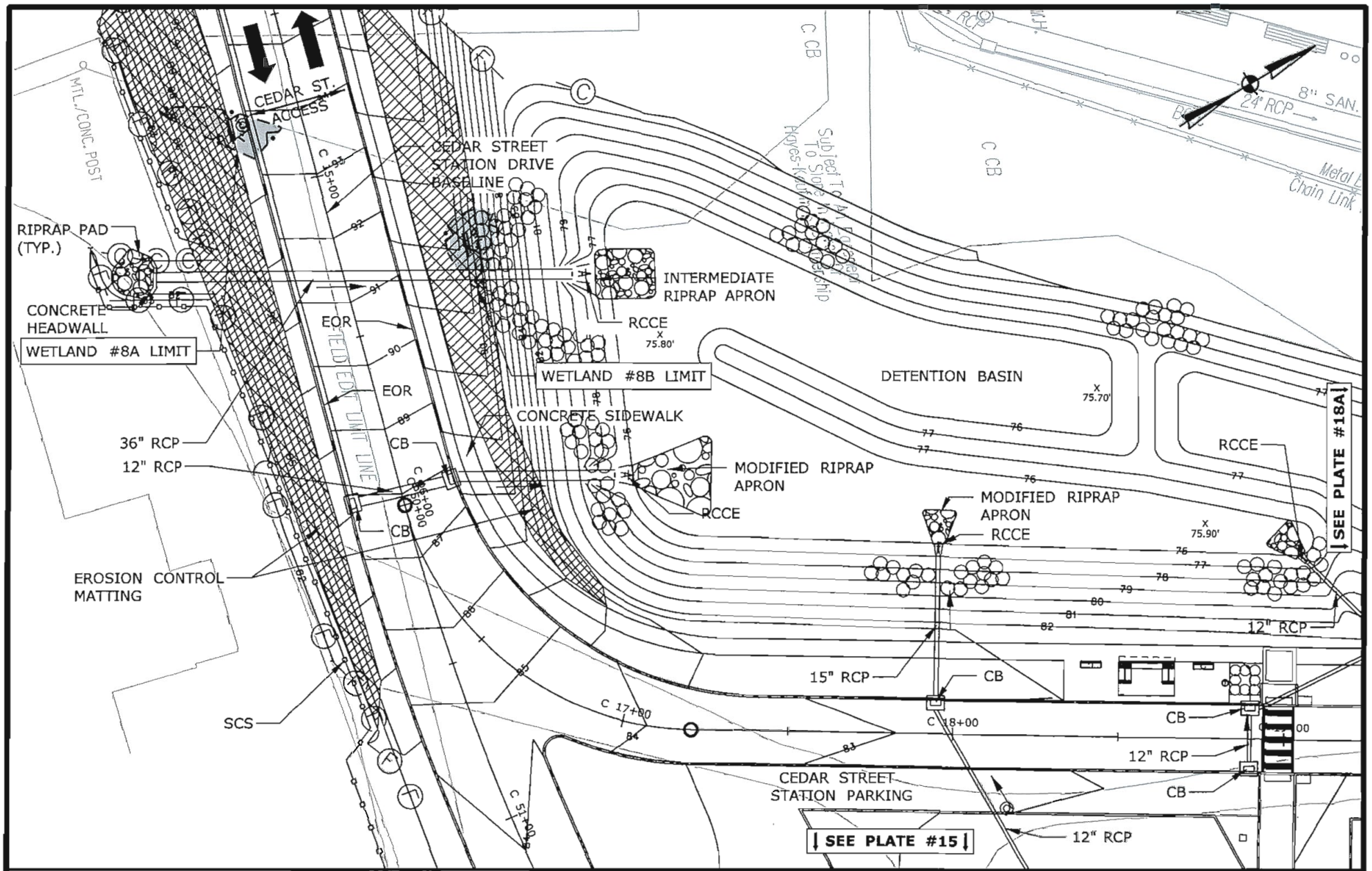
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 17



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #8A IMPACT	285 S.F.
PERMANENT WETLAND #8B IMPACT	241 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034/H039

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

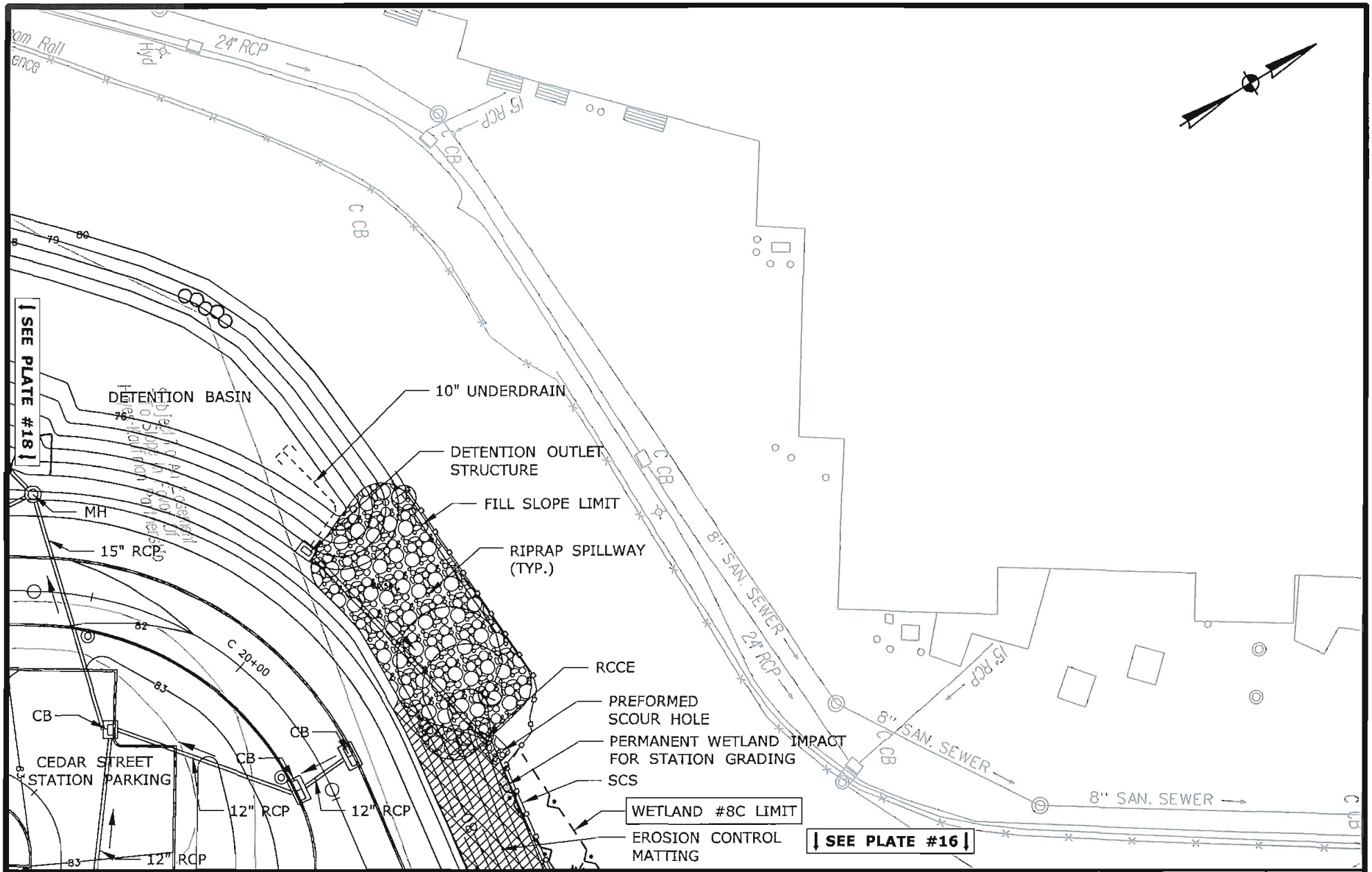
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 18



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #8C IMPACT	12,022 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034/H039

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

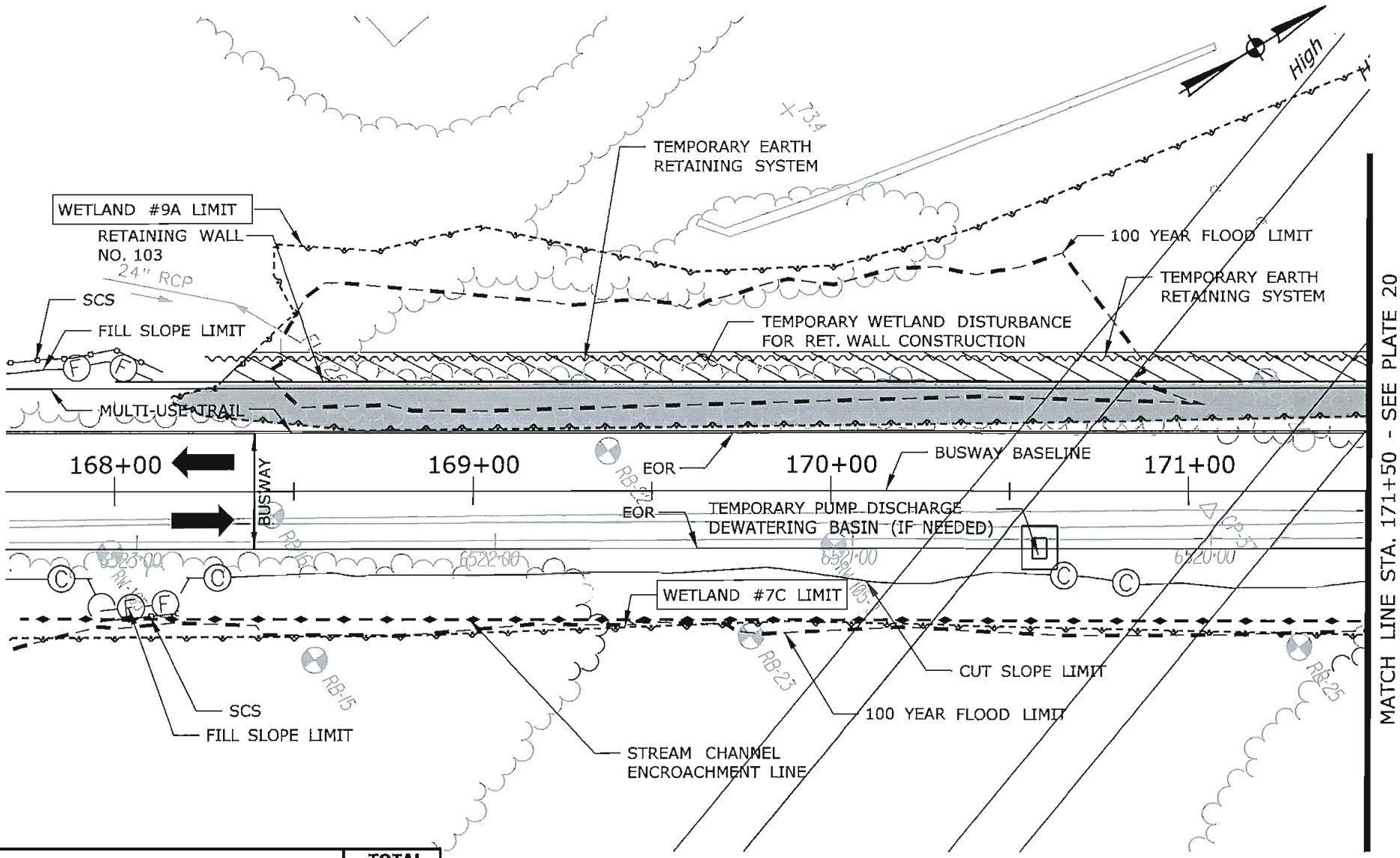
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 18A



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #9A IMPACT	7,230 S.F.
TEMPORARY WETLAND #9A IMPACT	5,449 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

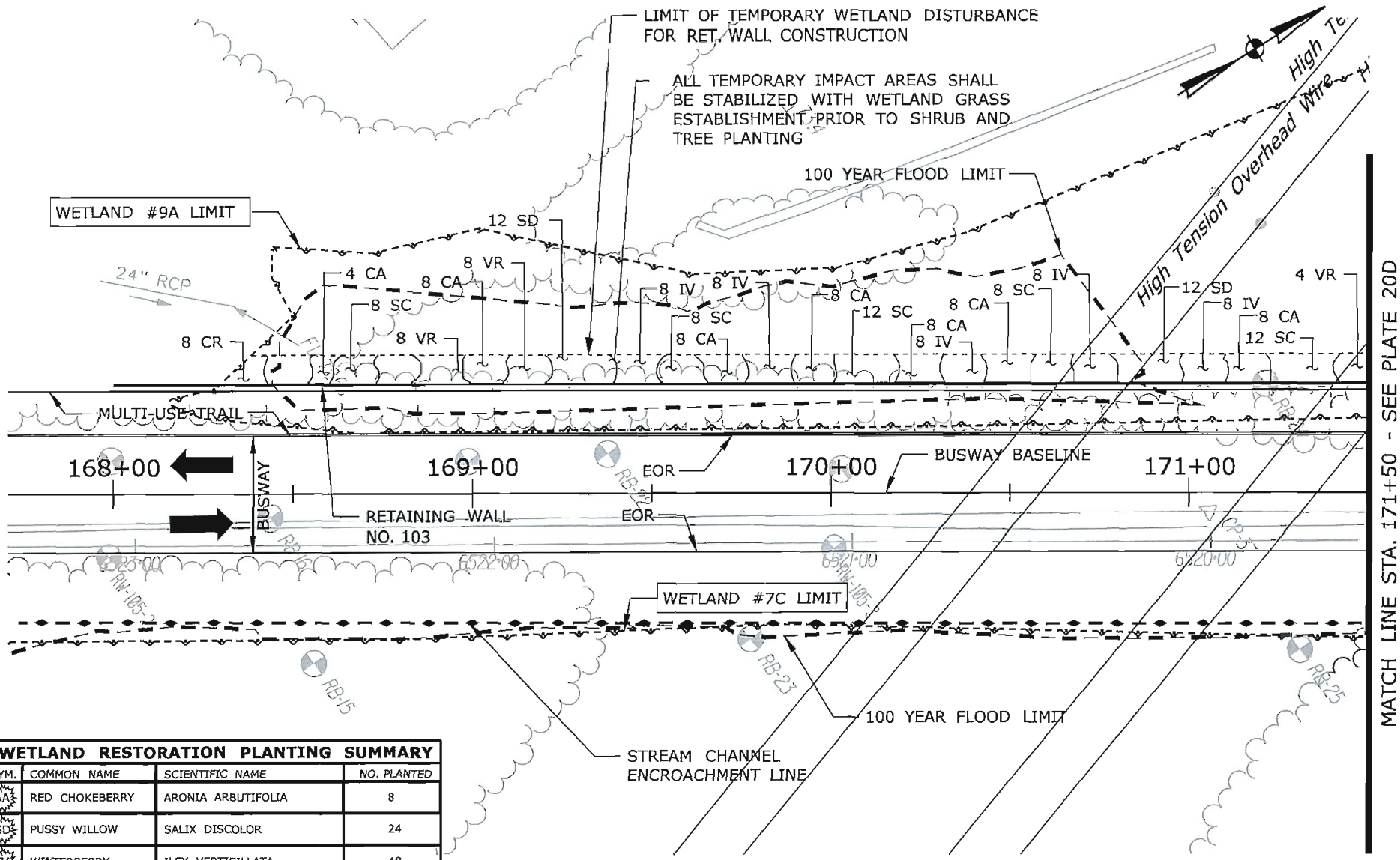
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 19



WETLAND RESTORATION PLANTING SUMMARY

SYM.	COMMON NAME	SCIENTIFIC NAME	NO. PLANTED
AA	RED CHOKEBERRY	ARONIA ARBUTIFOLIA	8
SD	PUSSY WILLOW	SALIX DISCOLOR	24
IV	WINTERBERRY	*ILEX VERTICILLATA*	48
VR	NORTHERN ARROWWOOD	VIBURNUM RECOGNITUM	24
SC	ELDERBERRY	SAMBUCUS CANADENSIS	48
CA	SILKY DOGWOOD	CORNUS AMOMUM	52
CR	GREY-STEM DOGWOOD	CORNUS RACEMOSA	8
TOTAL PLANTINGS			212

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

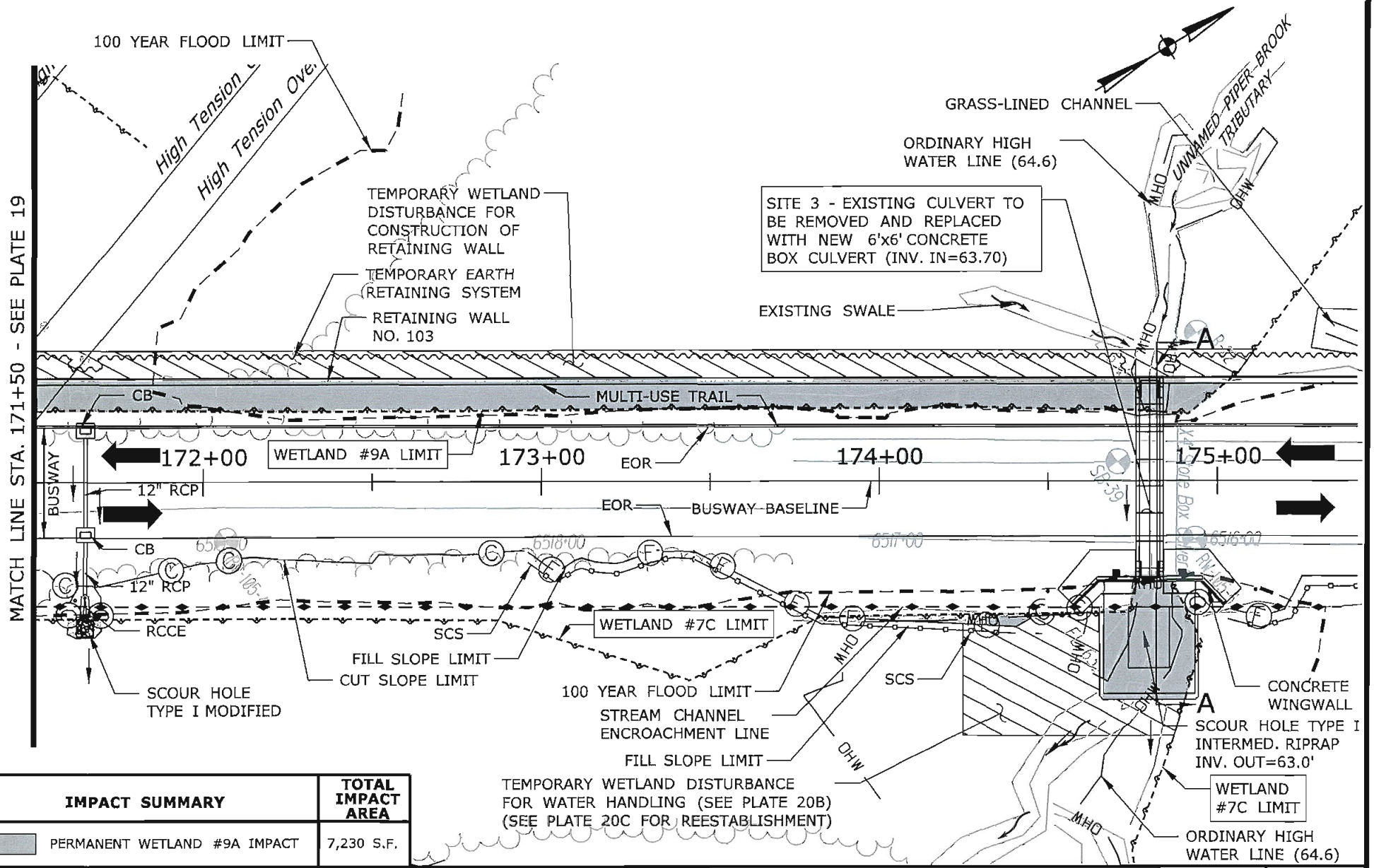
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 19A



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #9A IMPACT	7,230 S.F.
PERMANENT WETLAND #7C IMPACT	1,023 S.F.
TEMPORARY WETLAND #9A IMPACT	5,449 S.F.
TEMPORARY WETLAND #7C IMPACT	1,640 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

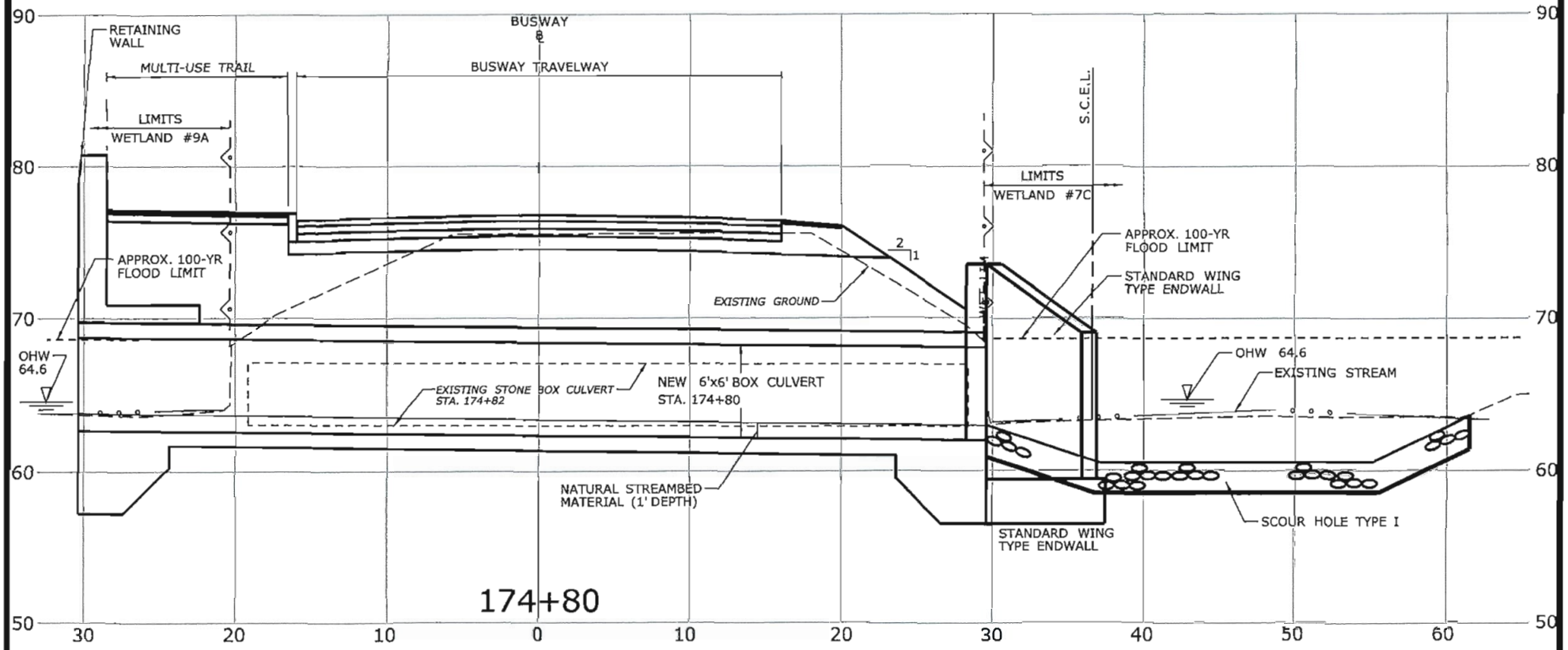
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

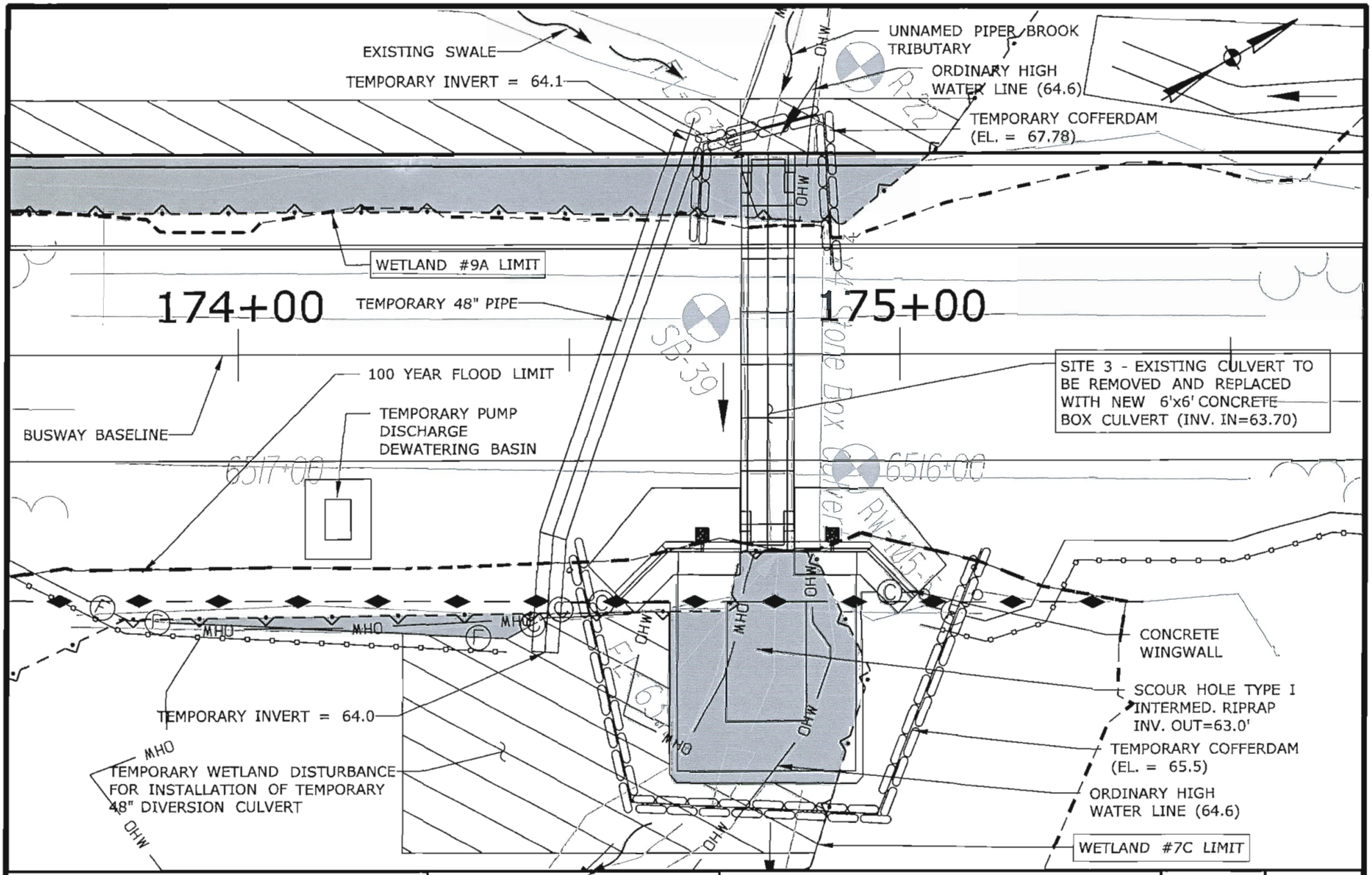
DATE: FEBRUARY 2011

PLATE NO. 20



SECTION A-A (SEE PLATE 20)

TYPICAL SECTION OF WETLAND IMPACTS AT SITE 3 CULVERT REPLACEMENT	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=10'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 20A



SITE 3 WATER HANDLING PLAN	STATE PROJECT NO.: 171-305 CONTRACT NO.: H034	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE 1" = 20' 20 10 0 20	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 20B

GENERAL NOTES:

1. THE CONTRACTOR SHALL MAINTAIN WATER THROUGH THE TEMPORARY BYPASS PIPE AS SHOWN DURING CONSTRUCTION OF THE NEW CULVERT.

2. ALL WORK ASSOCIATED WITH THE TEMPORARY WATER DIVERSION, INCLUDING THE TEMPORARY BYPASS PIPE SHALL BE INCLUDED UNDER "HANDLING WATER".

3. A PUMP DISCHARGE AREA SHALL BE ESTABLISHED OUTSIDE OF THE WETLAND LIMITS, USING THE MODIFIED RIPRAP FILTERING SYSTEM SHOWN. THE LOCATION AND SIZE OF THE DEWATERING BASIN SHOWN IS APPROXIMATE. THE EXACT LOCATION MAY VARY BASED ON THE SIZE OF BASIN REQUIRED TO PROVIDE A STORAGE VOLUME CAPABLE OF RETAINING THE FIRST TWO HOURS OF PUMP DISCHARGE.

4. SEE PERMIT PLATES FOR ADDITIONAL DETAILS AND NOTES.

CONSTRUCTION SEQUENCE:

THE FOLLOWING SEQUENCE SHALL BE FOLLOWED FOR THE CONSTRUCTION OF THE NEW BOX CULVERT AND RETAINING WALL NO. 103 UNLESS OTHERWISE APPROVED:

1. CONSTRUCT THE TEMPORARY BYPASS PIPE AS SHOWN AND IN ACCORDANCE WITH THE "HANDLING WATER" SPECIAL PROVISION AND THE PERMIT DOCUMENTS.

2. CONSTRUCT THE COFFERDAM AS SHOWN.

3. DIVERT THE BROOK THROUGH THE BYPASS PIPE USING SANDBAGS OR SIMILAR MEANS TO DEFINE THE CHANNEL.

4. REMOVE THE EXISTING CULVERT.

5. CONSTRUCT THE BOX CULVERT, WINGWALLS AND THE PORTION OF RETAINING WALL NO.103 INSIDE THE COFFERDAM. DEWATERING SHALL BE ACCOMPLISHED BY PUMPING.

6. ONCE THE CULVERT IS IN PLACE, COMPLETE THE CHANNEL IMPROVEMENTS AND REMOVE THE COFFERDAM.

7. DIVERT THE BROOK THROUGH THE CULVERT USING SANDBAGS OR SIMILAR MEANS.

8. REMOVE THE TEMPORARY BYPASS PIPE.

9. CONSTRUCT THE RETAINING WALL AS SHOWN ON THE RETAINING WALL PLANS.

10. REMOVE THE TEMPORARY PUMP DISCHARGE BASIN.

11. CONSTRUCT THE ROADWAY AND STABILIZE SLOPES AS SHOWN ON THE PLANS.

12. ONCE ALL DISTURBED AREAS HAVE BEEN STABILIZED, REMOVE THE SEDIMENTATION CONTROL SYSTEMS.

CONSTRUCTION METHODS:

1. INSTALL SEDIMENTATION CONTROL SYSTEM AS SHOWN ON THE PLANS PRIOR TO CONSTRUCTION. THE EROSION PROTECTION SHALL REMAIN IN PLACE UNTIL ALL OF THE DISTURBED AREAS ARE STABILIZED.

2. BEST MANAGEMENT PRACTICES SHALL BE FOLLOWED DURING CONSTRUCTION AS DESCRIBED IN THE SPECIFICATIONS.

3. TURF ESTABLISH ALL DISTURBED AREAS ONCE FINAL SLOPES ARE ESTABLISHED.

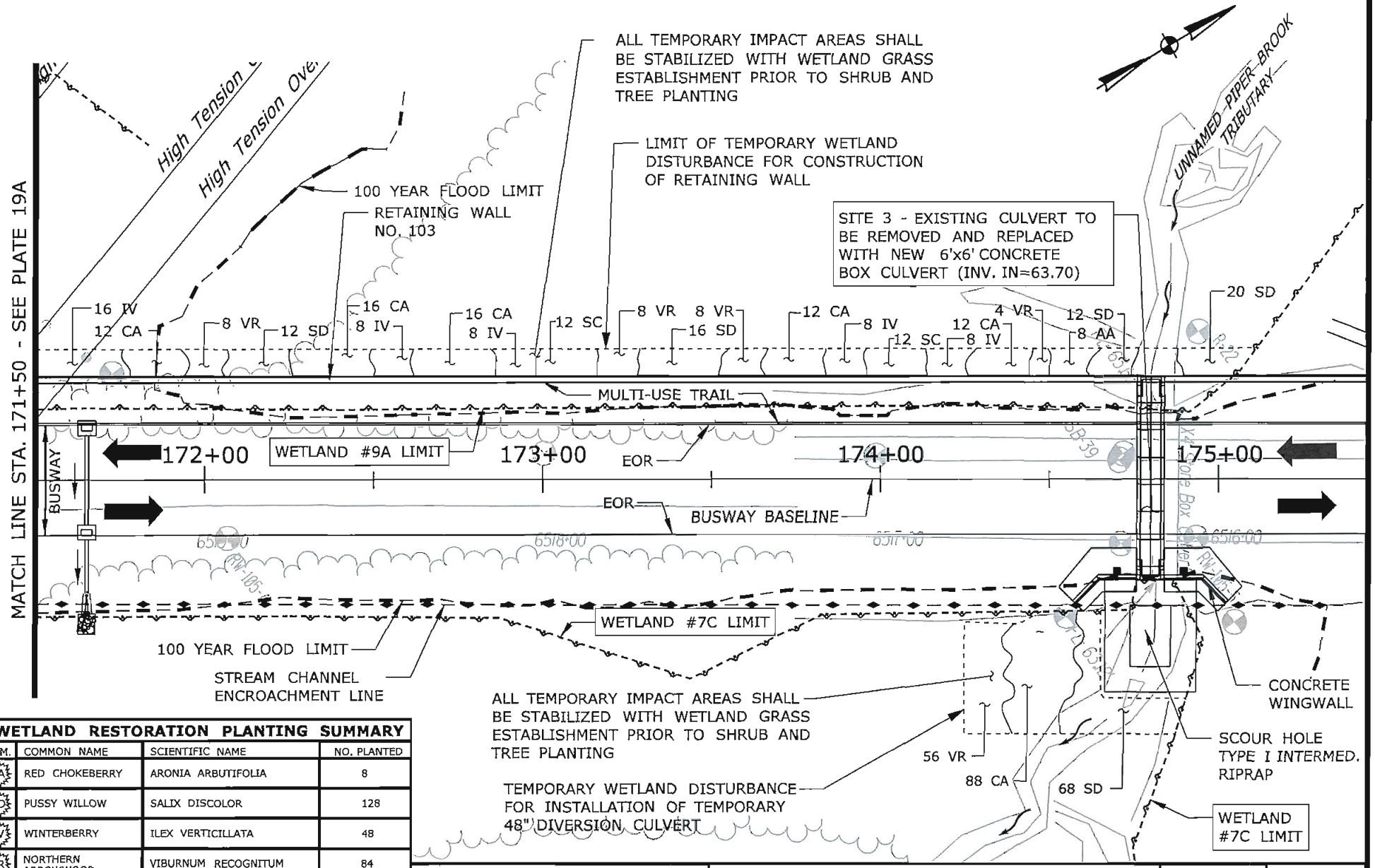
NATIVE STREAMBED MATERIAL NOTES:

1. NATIVE STREAMBED MATERIAL EXCAVATED DURING THE CULVERT INSTALLATION SHALL BE STOCKPILED AND THEN REPLACED WITHIN THE CULVERT TO THE DEPTH SHOWN ON THE PLANS, AND AS DIRECTED BY THE ENGINEER.

2. THE STOCKPILE SHALL BE LOCATED OUTSIDE THE WETLAND LIMITS AND PROTECTED WITH SEDIMENTATION CONTROL SYSTEM.

2. THE COST OF STOCKPIING AND REPLACING THE STREAMBED MATERIAL WITHIN THE CULVERT SHALL BE INCLUDED IN THE COST OF THE ITEM "STRUCTURE EXCAVATION EARTH (EXCLUDING COFFERDAM AND DEWATERING)".

TEMPORARY HYDRAULIC DATA	
AVERAGE DAILY FLOW	0.6 cfs
AVERAGE SPRING FLOW	1.15 cfs
2-YEAR FREQUENCY DISCHARGE	63.0 cfs
TEMPORARY DESIGN DISCHARGE	63.0 cfs
TEMPORARY DESIGN FREQUENCY	2 YEAR
TEMPORARY WATER SURFACE ELEVATION UPSTREAM	67.78'
TEMPORARY WATER SURFACE ELEVATION DOWNSTREAM	65.5'



WETLAND RESTORATION PLANTING SUMMARY

SYM.	COMMON NAME	SCIENTIFIC NAME	NO. PLANTED
AA	RED CHOKEBERRY	ARONIA ARBUTIFOLIA	8
SD	PUSSY WILLOW	SALIX DISCOLOR	128
IV	WINTERBERRY	ILEX VERTICILLATA	48
VR	NORTHERN ARROWWOOD	VIBURNUM RECOGNITUM	84
SC	ELDERBERRY	SAMBUCUS CANADENSIS	24
CA	SILKY DOGWOOD	CORNUS AMOMUM	156
CR	GREY-STEM DOGWOOD	CORNUS RACEMOSA	8
TOTAL PLANTINGS			456

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

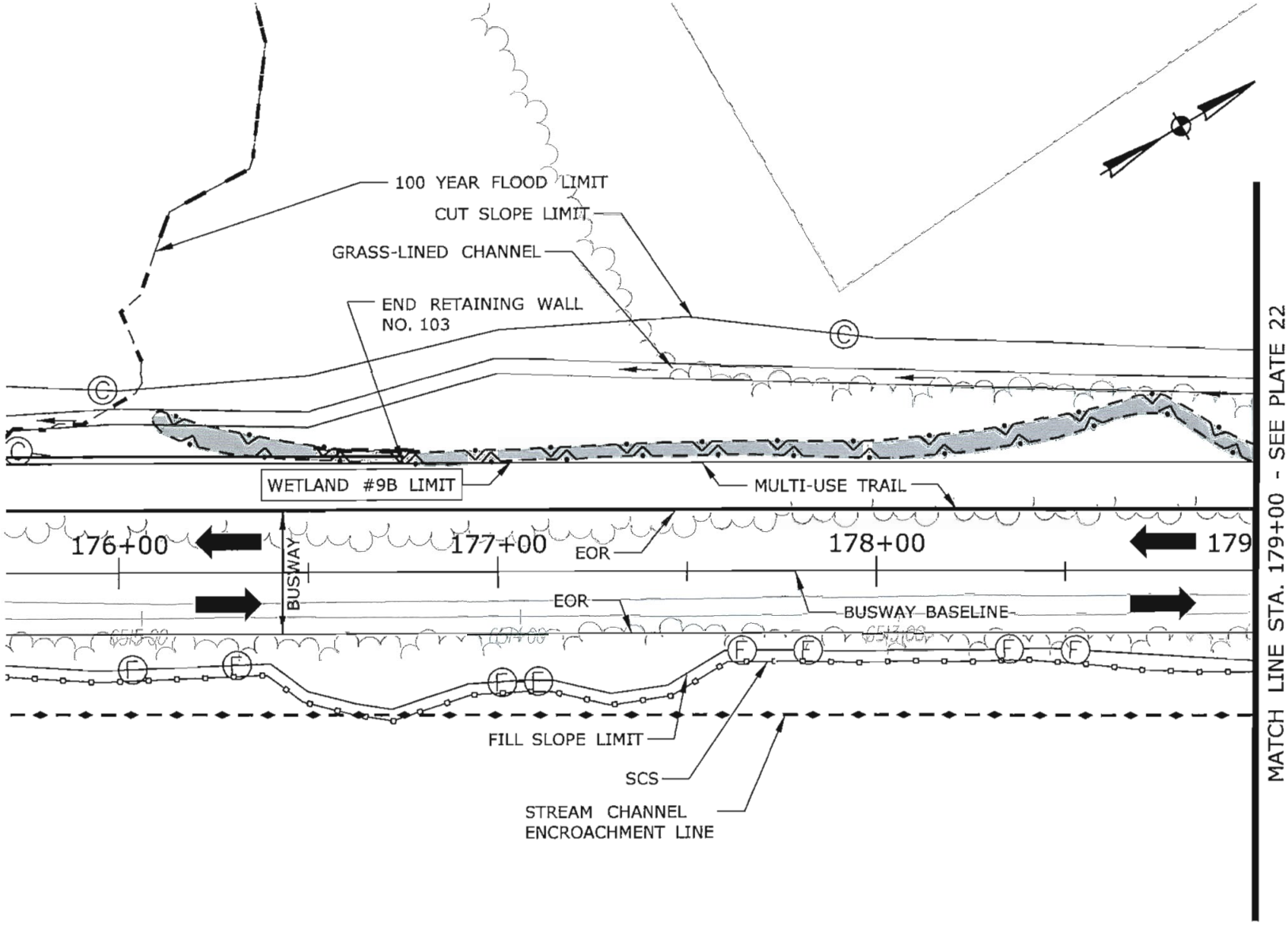
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 20D



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #9B IMPACT	1,987 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

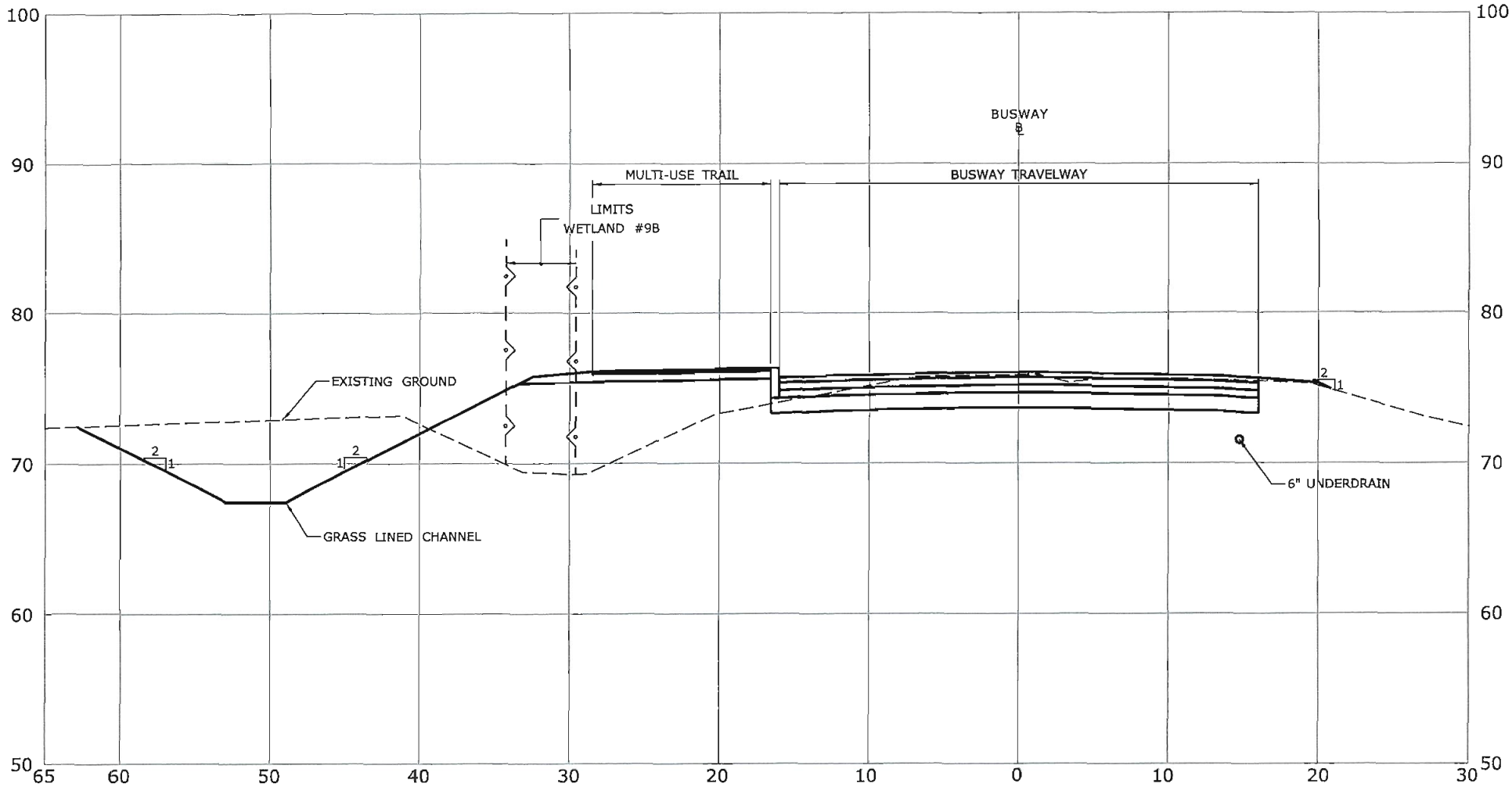
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

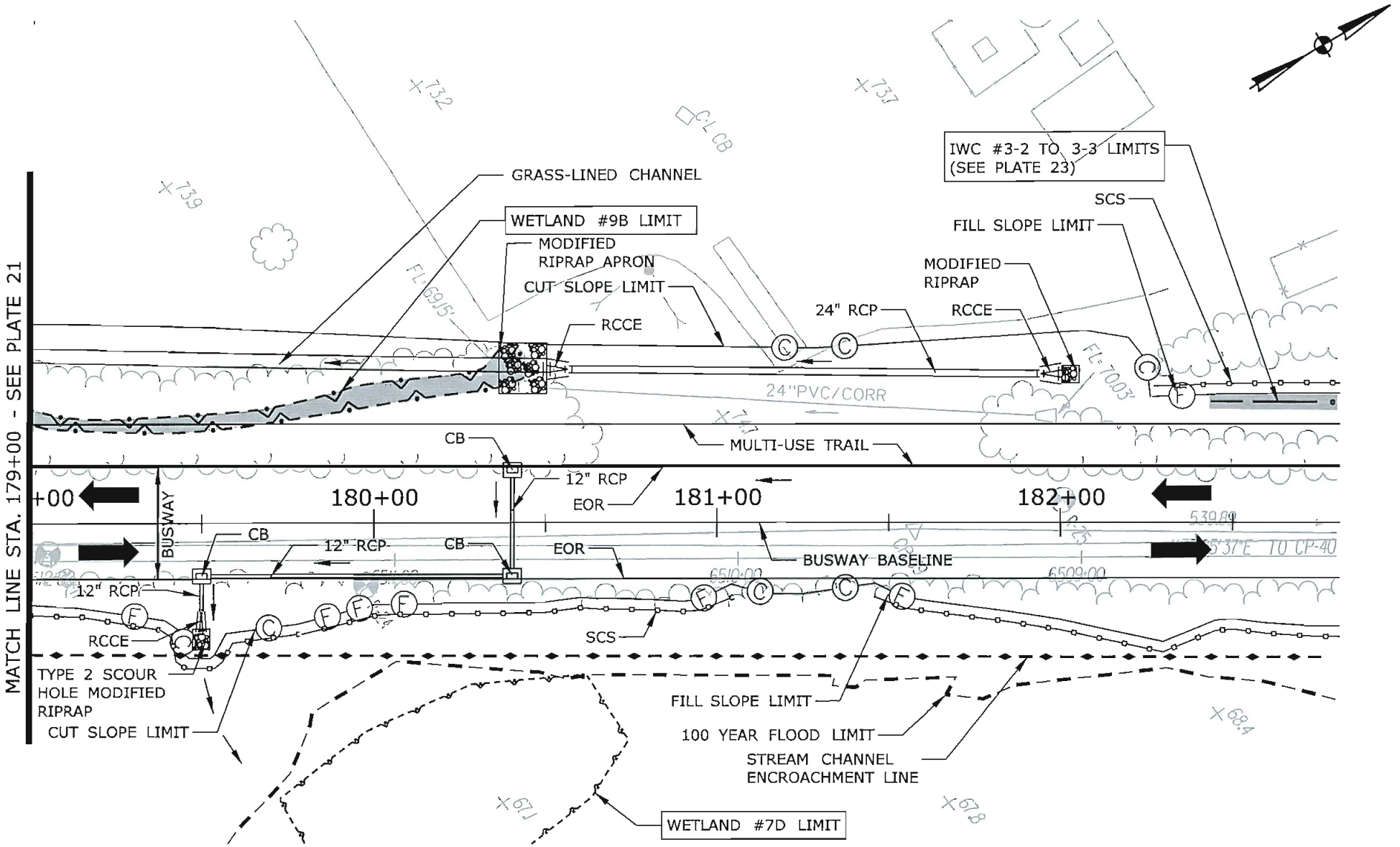
DATE: FEBRUARY 2011

PLATE NO. 21



TYPICAL SECTION
(SEE PLATE 21)

TYPICAL SECTION OF COMPLETE WETLAND FILL AND CONSTRUCTION OF NEW GRASS-LINED DITCH	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=10'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 21A



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #9B IMPACT	1,987 S.F.
PERMANENT IWC #3-2 TO 3-3 IMPACT	121 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

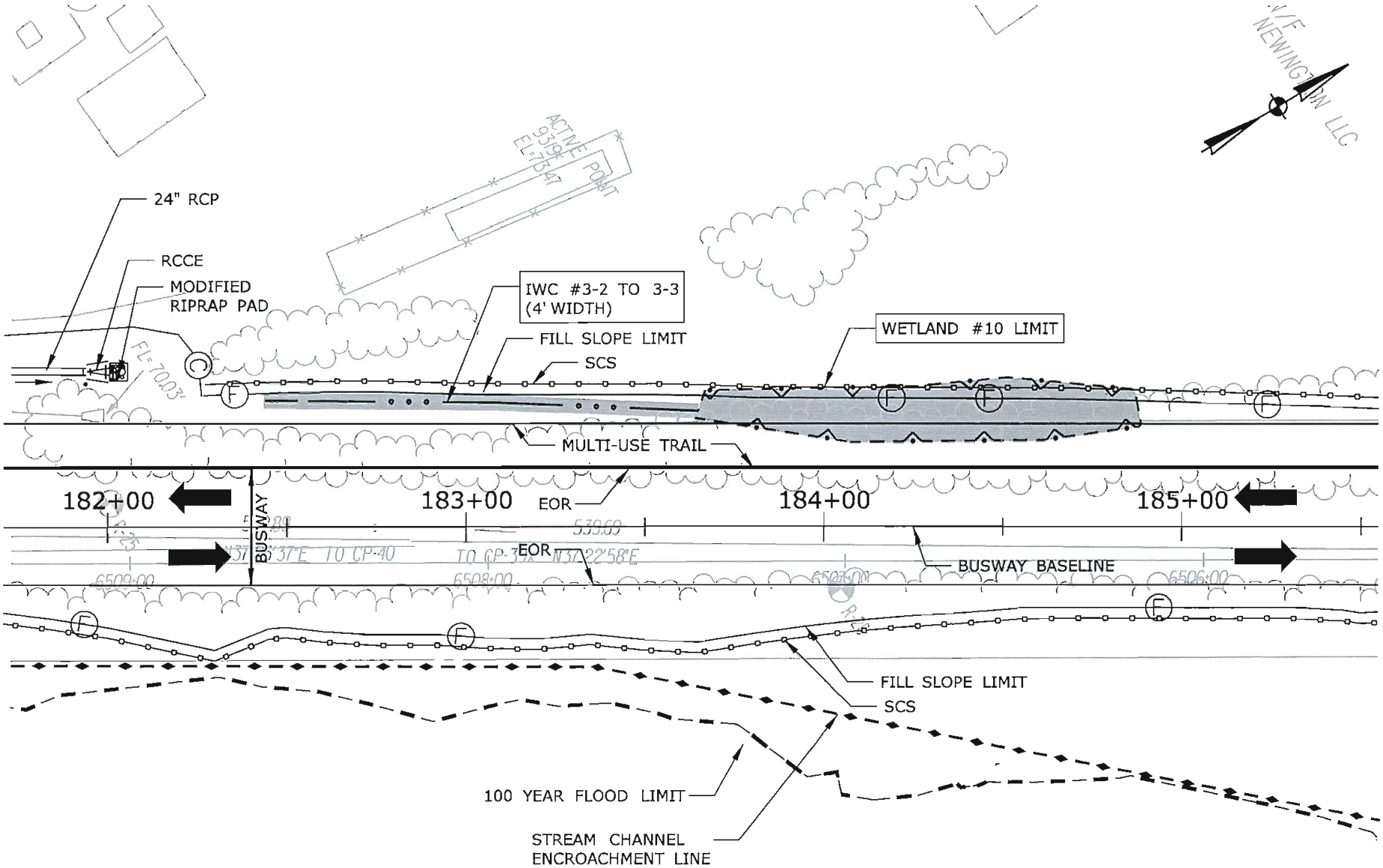
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 22



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #10 IMPACT	1,710 S.F.
PERMANENT IWC #3-2 TO 3-3 IMPACT	121 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO. H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

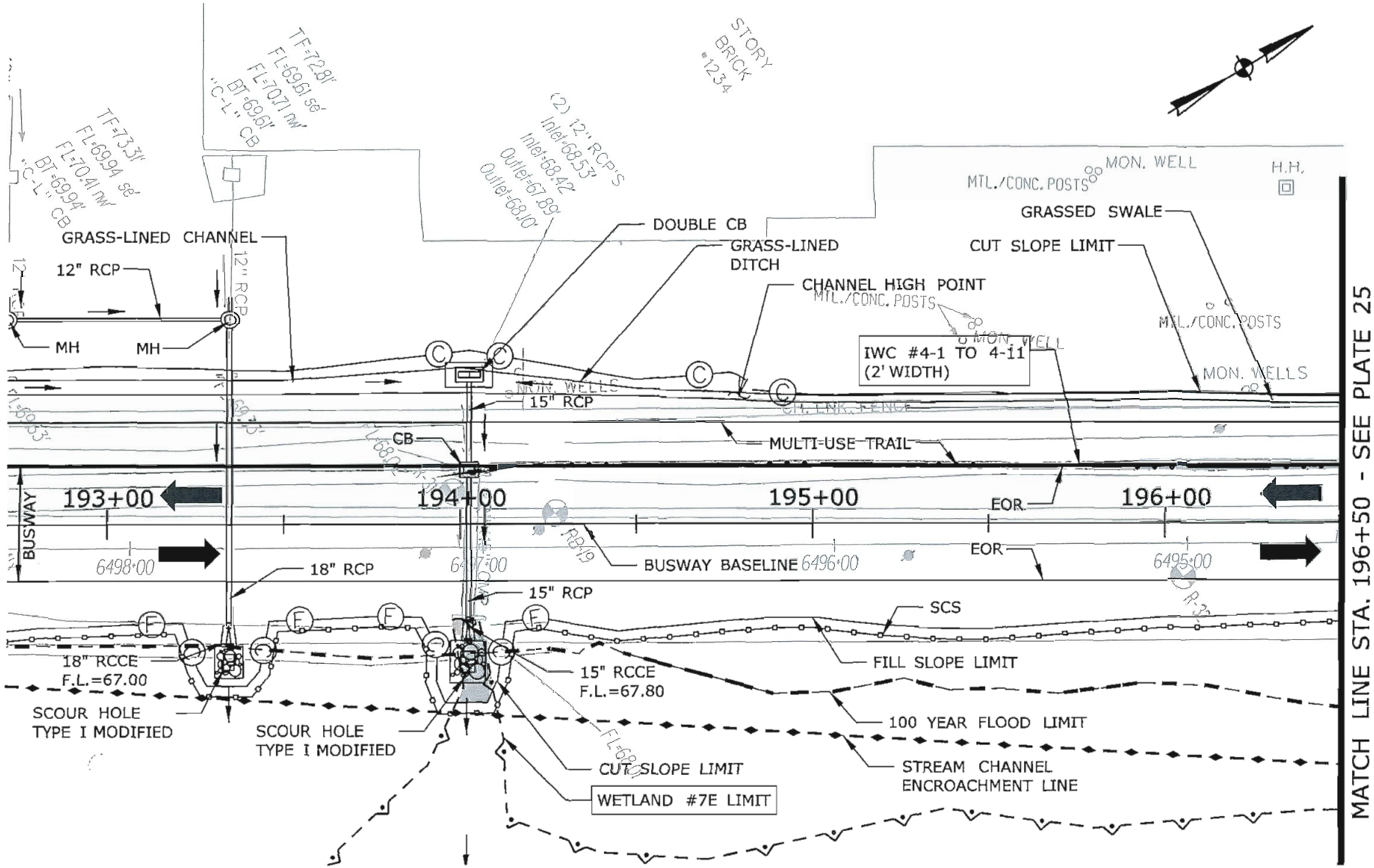
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 23



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #7E IMPACT	192 S.F.
PERMANENT IWC #4 IMPACT	950 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

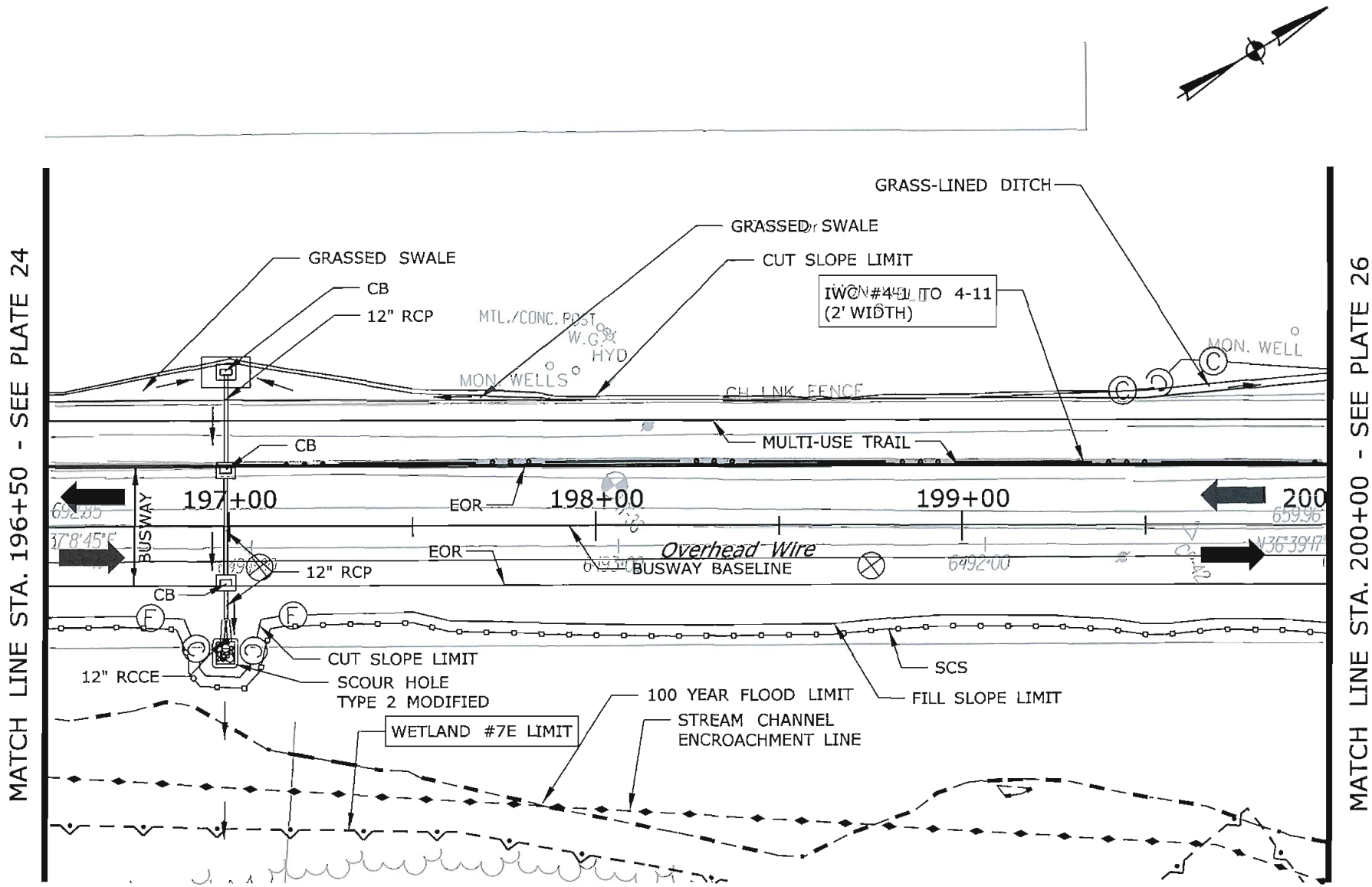
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 24



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #7E IMPACT	192 S.F.
PERMANENT IWC #4 IMPACT	950 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

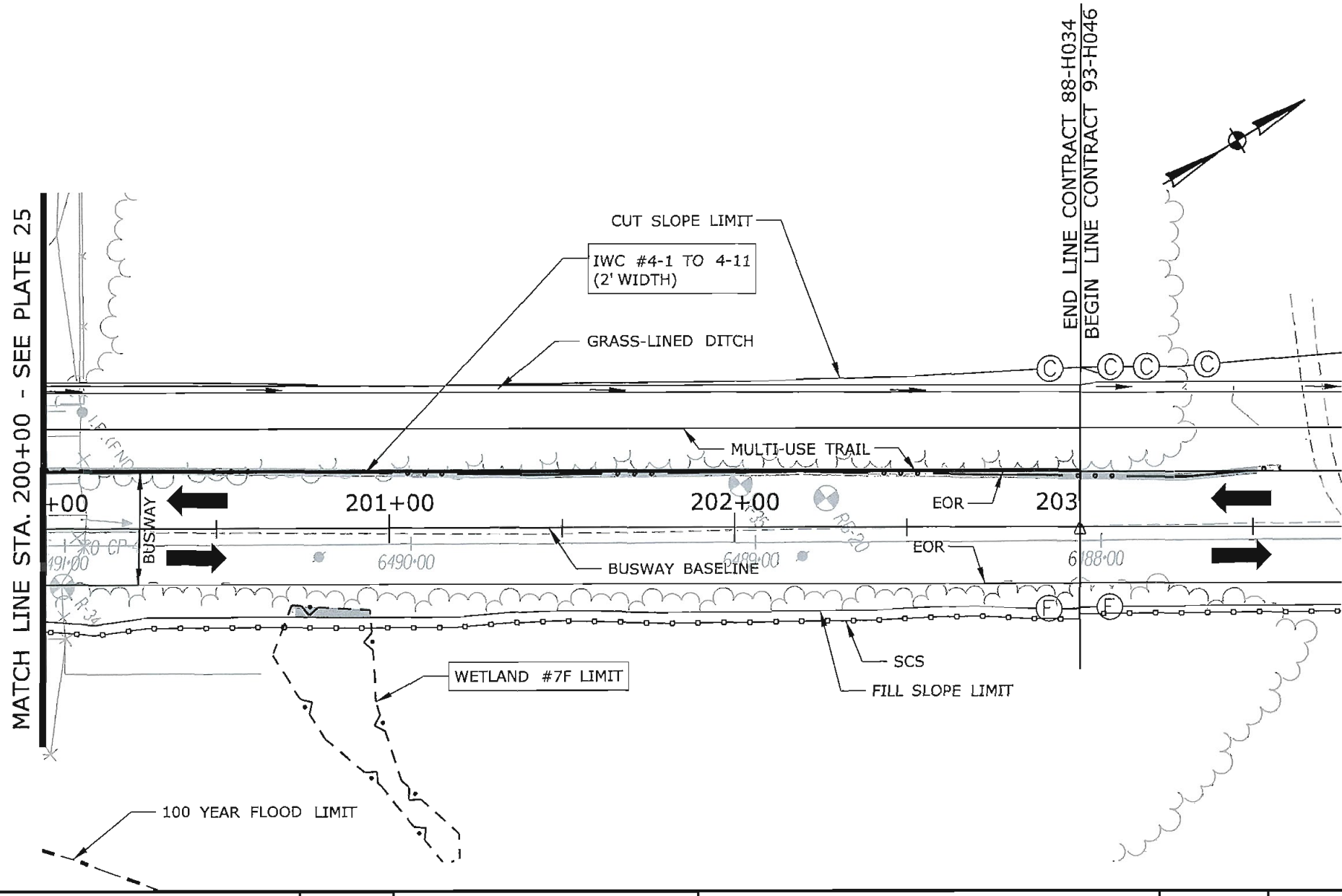
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 25



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #7F IMPACT	66 S.F.
PERMANENT IWC #4 IMPACT	950 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H034/H046

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

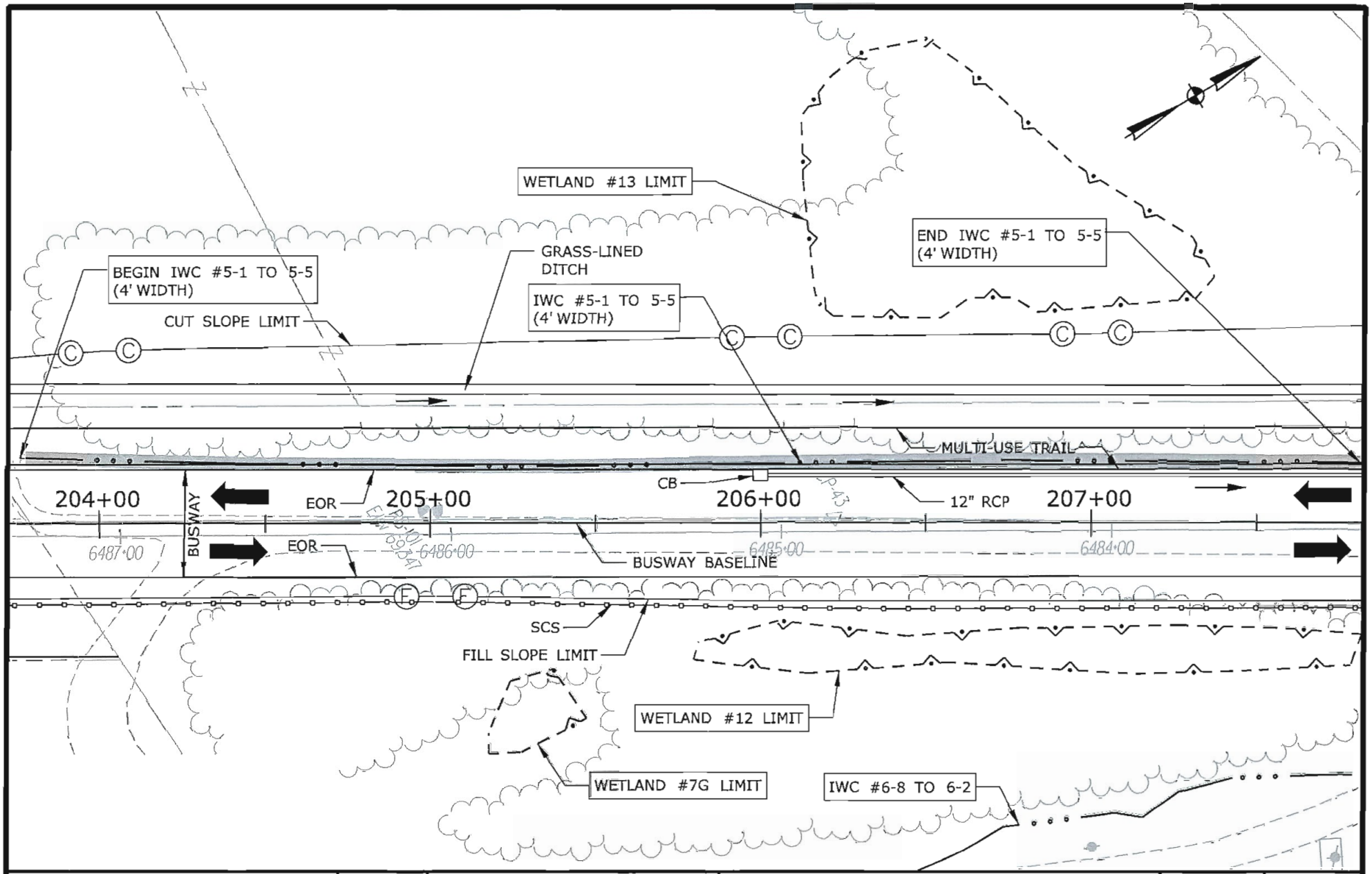
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 26



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #5 IMPACT	405 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

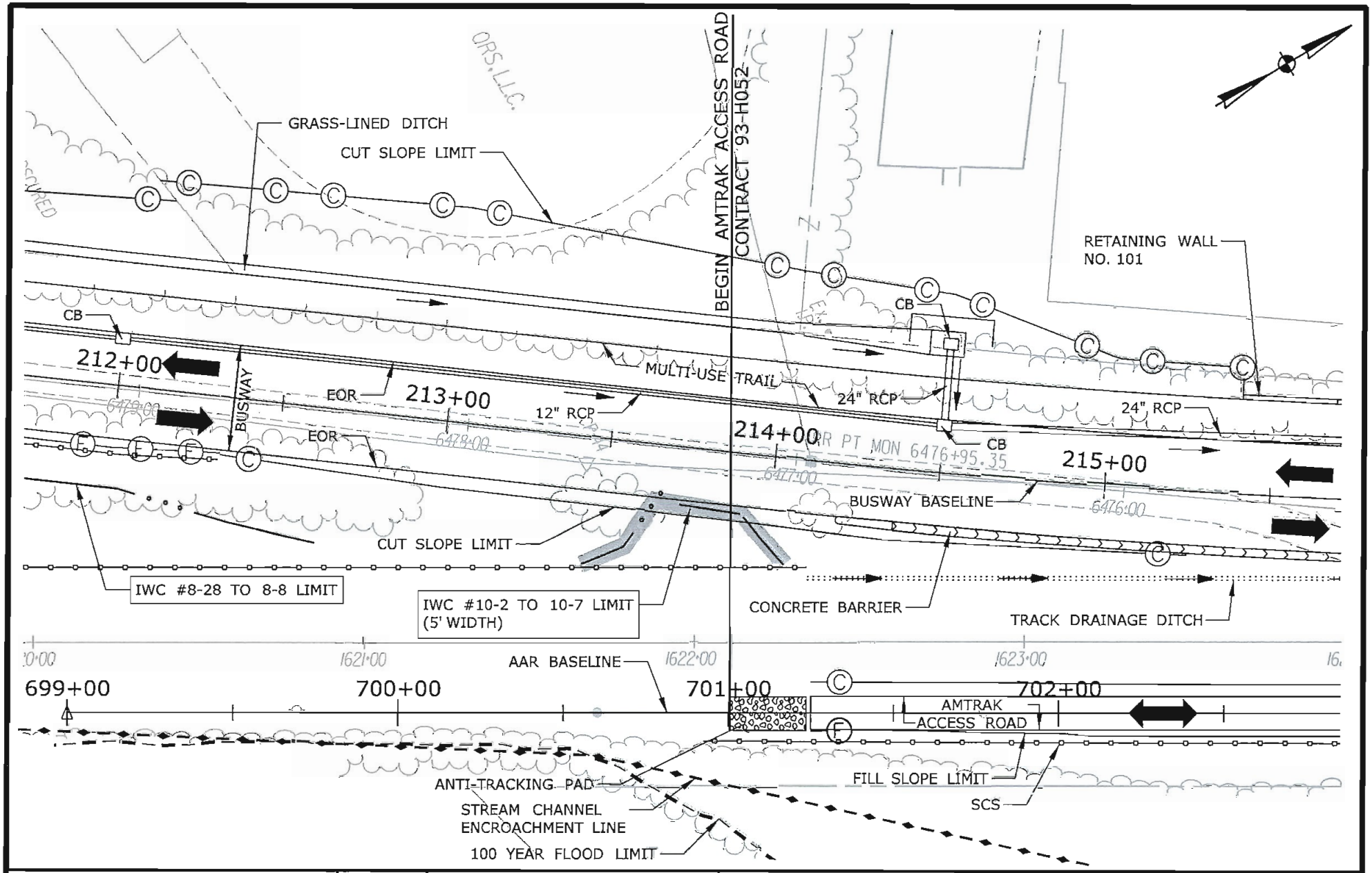
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 27



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #10 IMPACT	77 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

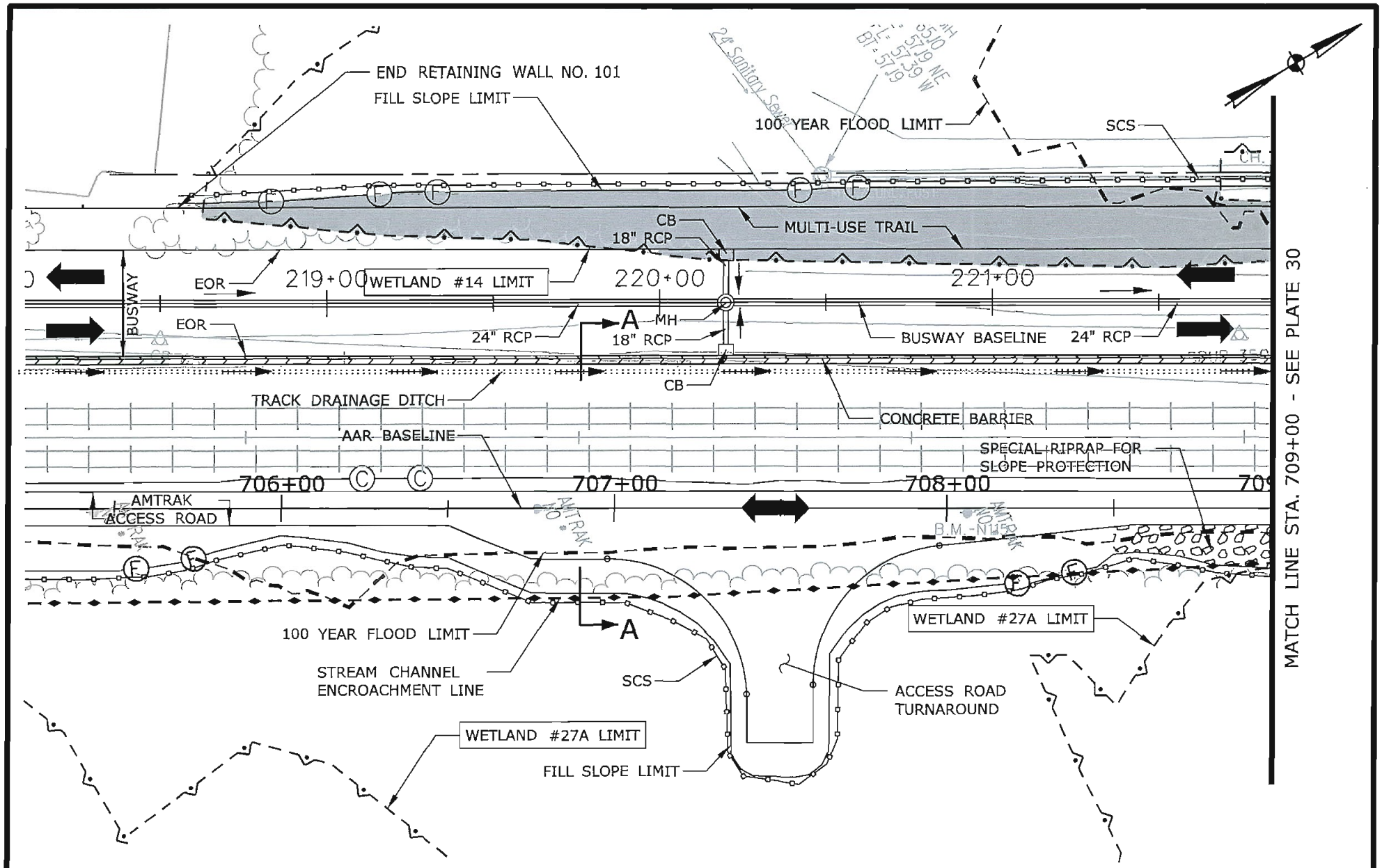
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 28



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #14 IMPACT	8,887 S.F.
PERMANENT WETLAND #27A IMPACT	9,587 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

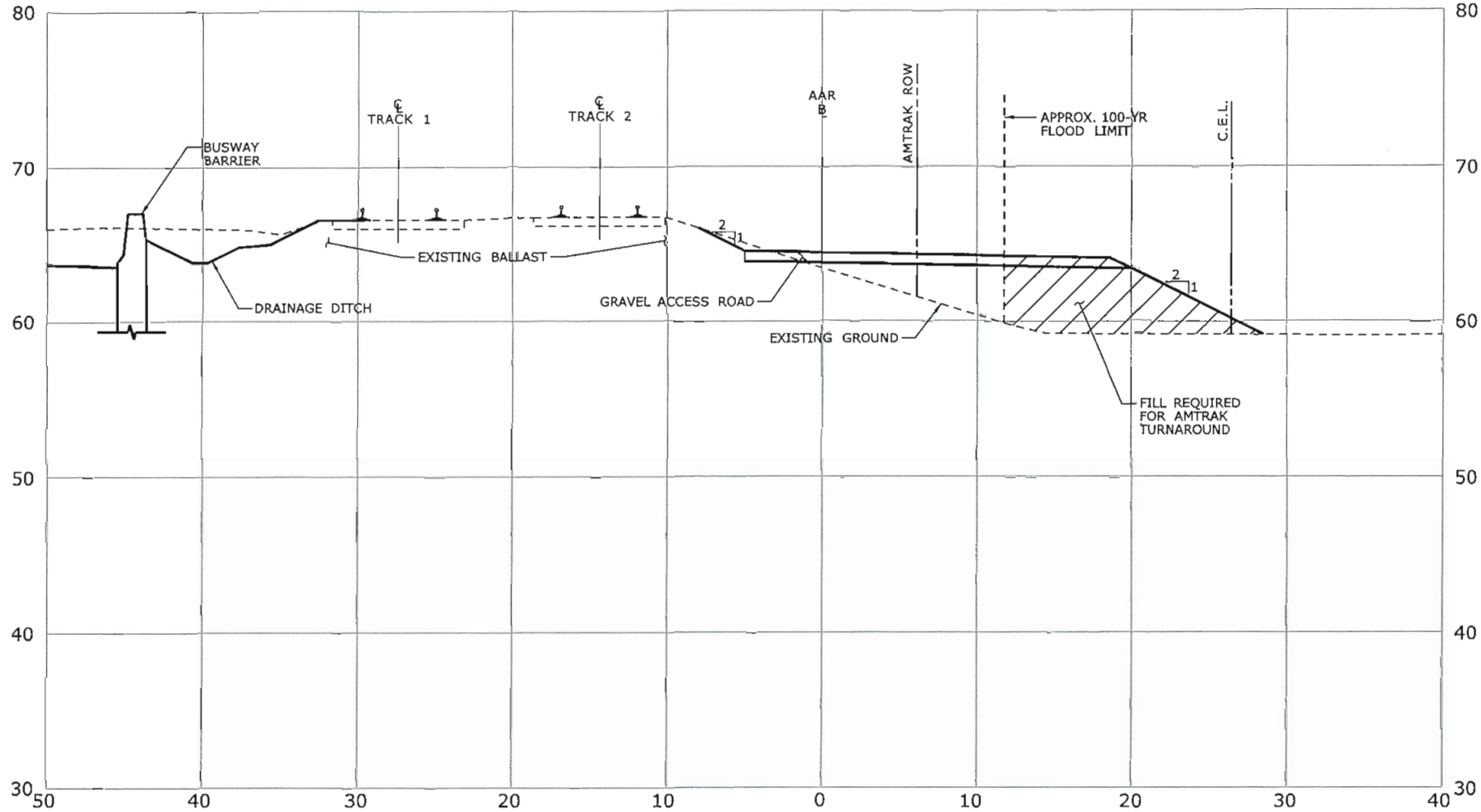
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

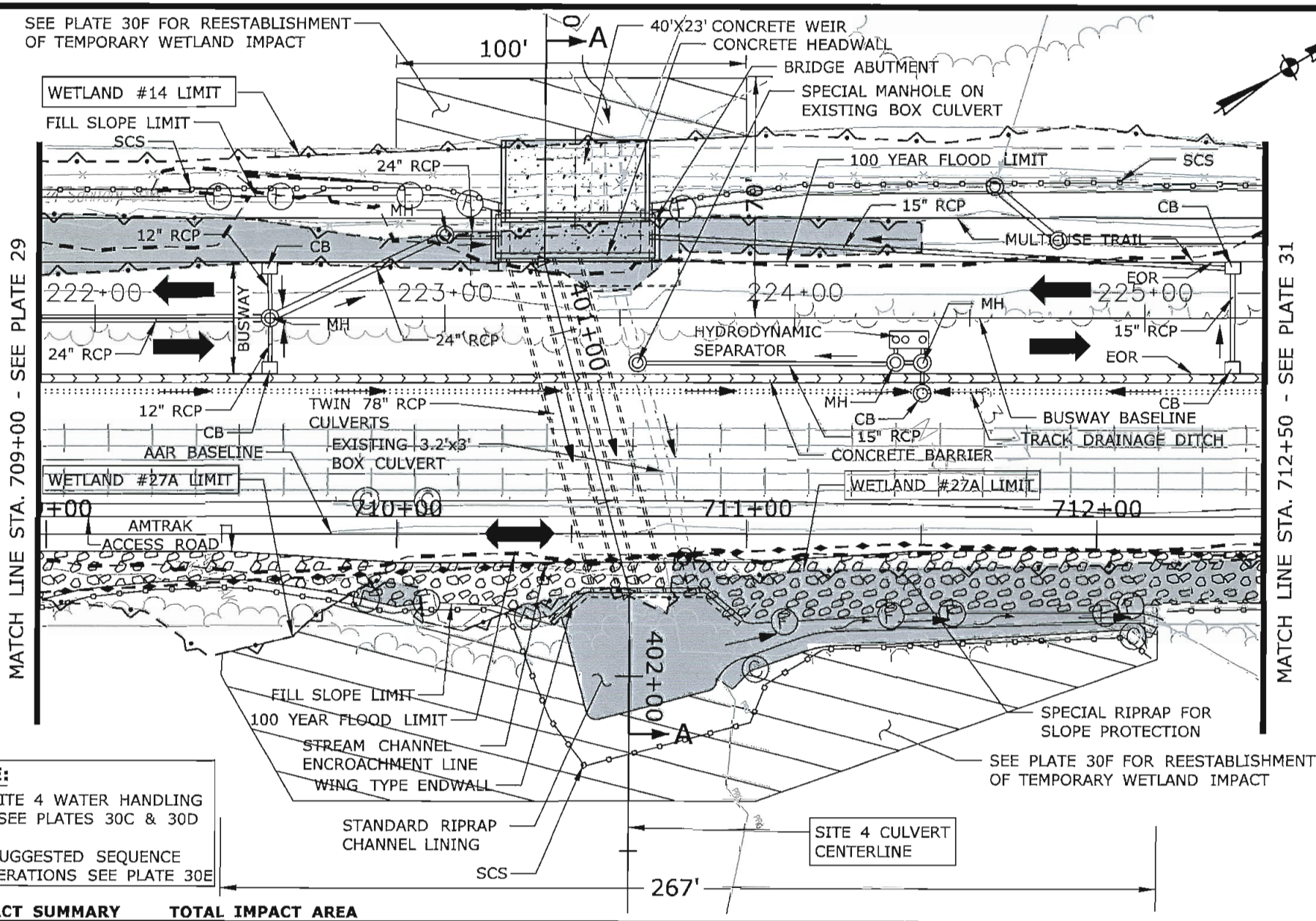
DATE: FEBRUARY 2011

PLATE NO. 29



TYPICAL SECTION A-A
(SEE PLATE 29)

TYPICAL SECTION OF FILL WITHIN 100-YEAR FLOOD LIMIT AND STREAM CHANNEL ENCROACHMENT LINE	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=10'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 29A



NOTE:

FOR SITE 4 WATER HANDLING PLAN, SEE PLATES 30C & 30D

FOR SUGGESTED SEQUENCE OF OPERATIONS SEE PLATE 30E

IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #14 IMPACT	8,887 S.F.
PERMANENT WETLAND #27A IMPACT	9,587 S.F.
TEMPORARY WETLAND #14 IMPACT	2,025 S.F.
TEMPORARY WETLAND #27A IMPACT	9,256 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

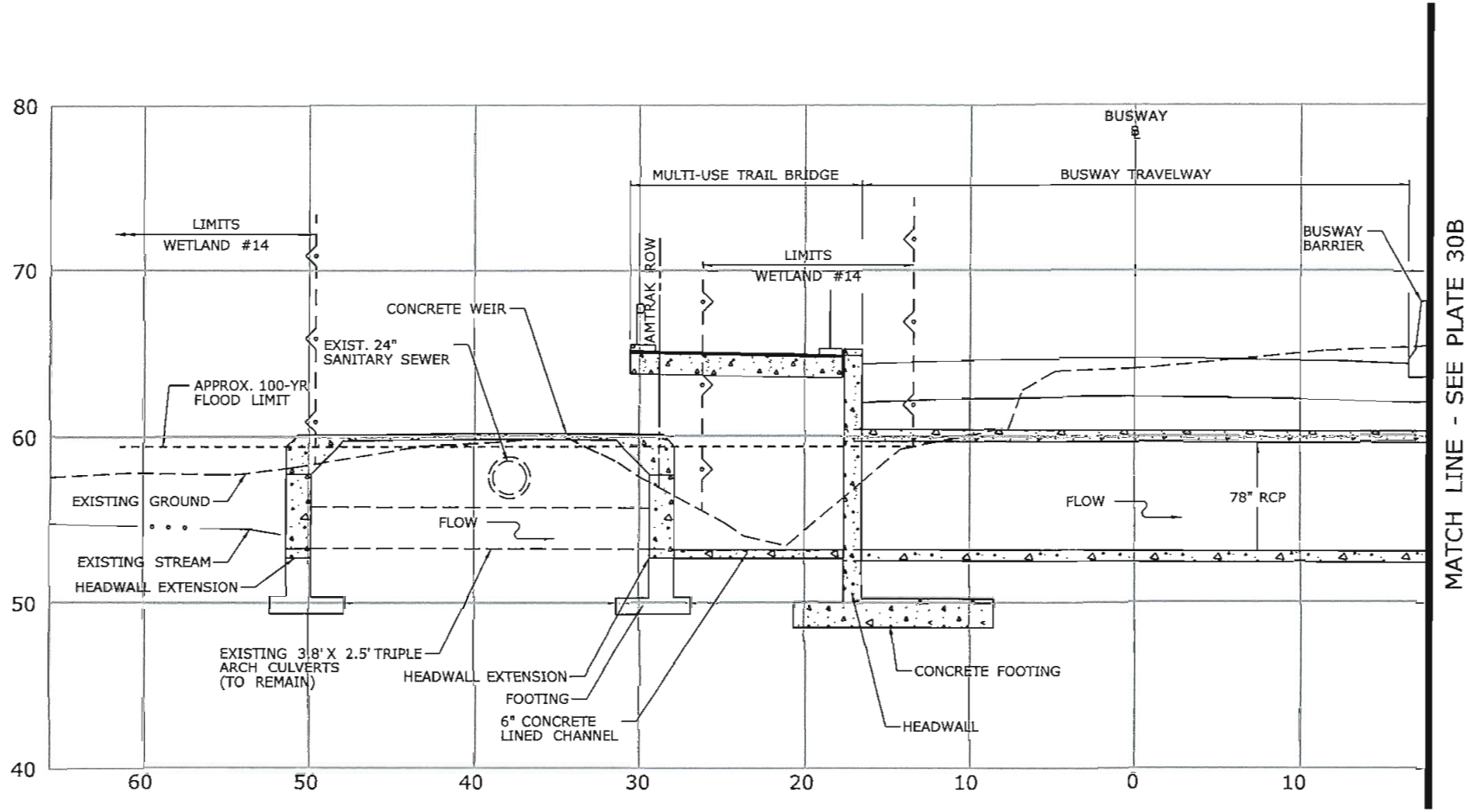
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

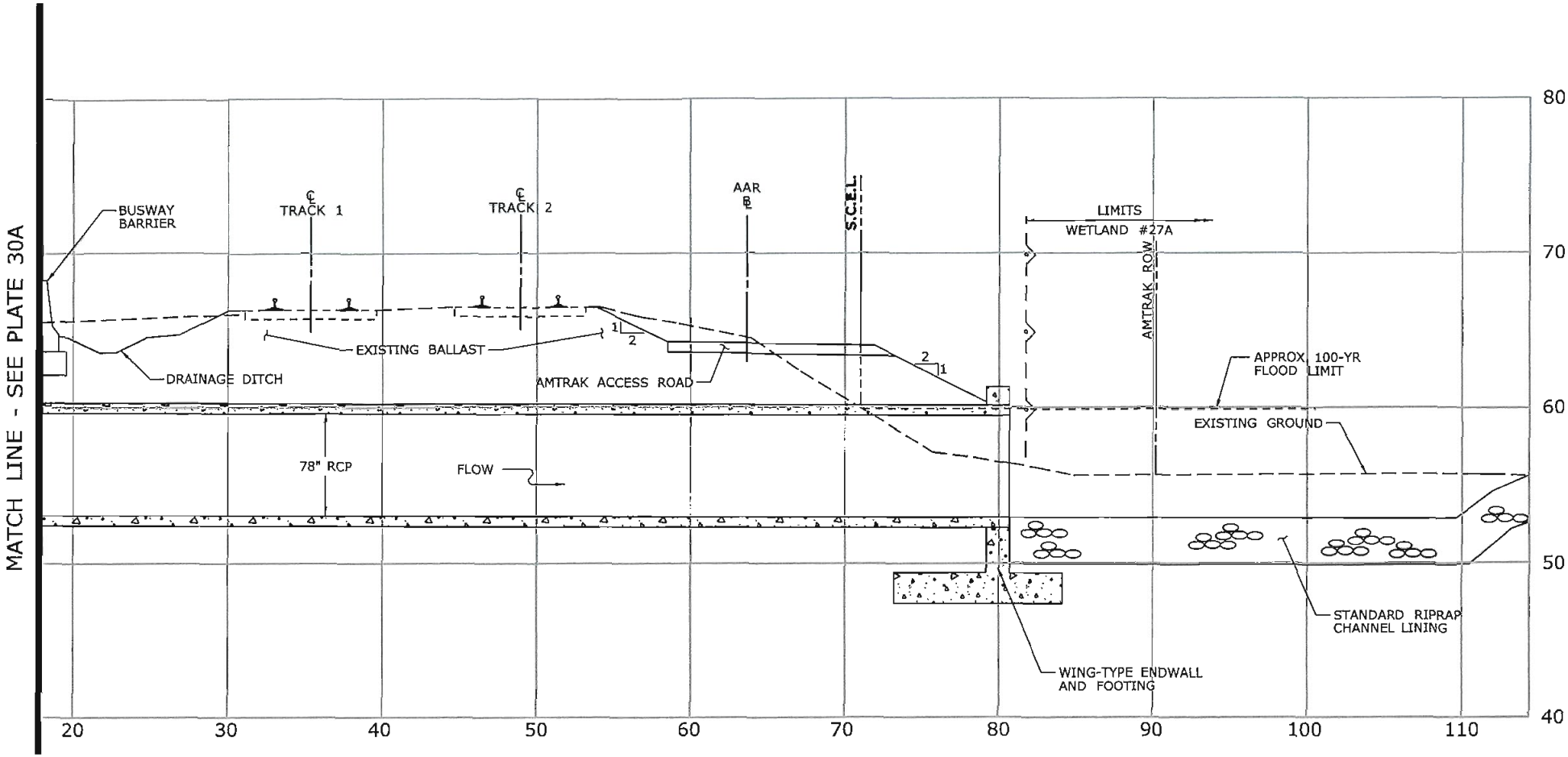
DATE: FEBRUARY 2011

PLATE NO. 30



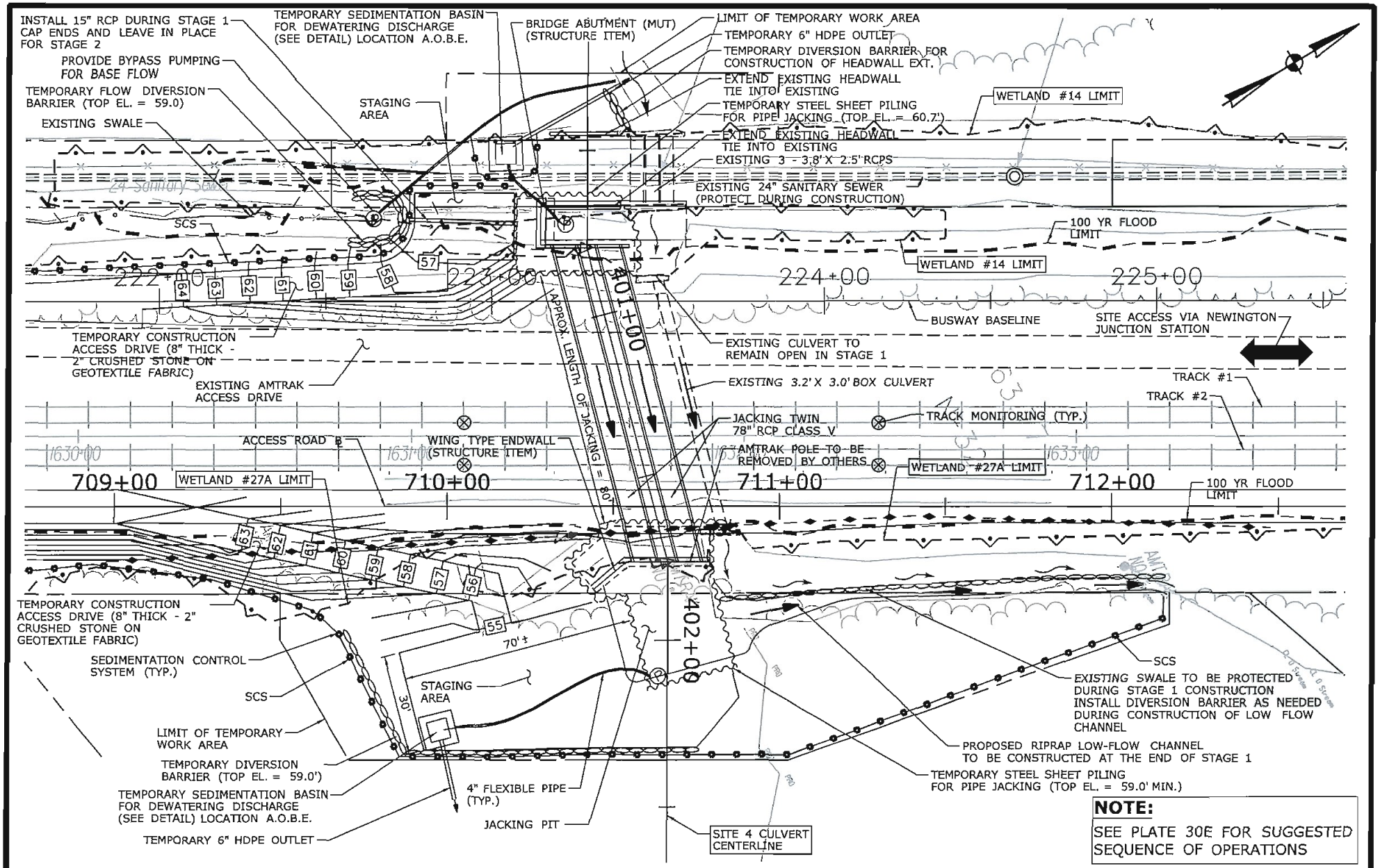
SECTION A-A (SEE PLATE 30)

SITE 4 CULVERT REPLACEMENT	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=10'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 30A



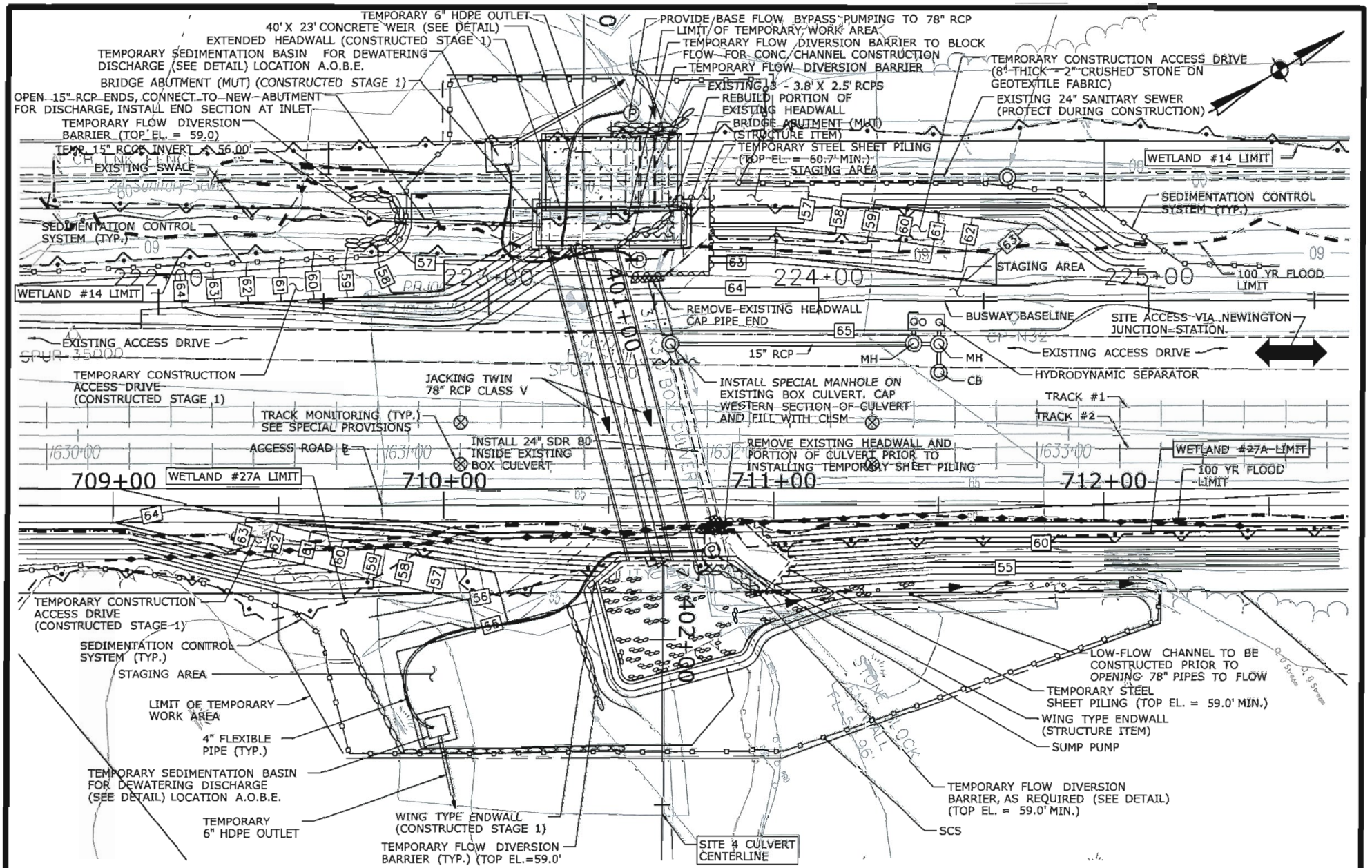
SECTION A-A (SEE PLATE 30)

SITE 4 CULVERT REPLACEMENT	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=10'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 30B



NOTE:
SEE PLATE 30E FOR SUGGESTED SEQUENCE OF OPERATIONS

CONSTRUCTION STAGING AND WATER HANDLING PLAN FOR SITE 4 CULVERT REPLACEMENT	STATE PROJECT NO.: 171-305 CONTRACT NO.: H046/H052	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
STAGE 1	SCALE 1" = 40' 40 20 0 40	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 30C



CONSTRUCTION STAGING AND WATER HANDLING PLAN FOR SITE 4 CULVERT REPLACEMENT	STATE PROJECT NO.: 171-305 CONTRACT NO.: H046/H052	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
STAGE 2		NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 30D

GENERAL NOTES:

1. THE CONTRACTOR SHALL BE LIMITED TO WORKING WITHIN THE TEMPORARY WORK AREAS AS INDICATED ON THE PLANS WHEN WORKING WITHIN A DELINEATED WETLAND BOUNDARY. THE TEMPORARY WORK AREAS WILL BE LOCATED AND STAKED IN THE FIELD BY THE CONTRACTOR PRIOR TO CLEARING AND GRUBBING OR THE COMMENCEMENT OF ANY OTHER CONSTRUCTION ACTIVITY. WORK OUTSIDE THE DELINATED IMPACT AREAS IS NOT PERMITTED. IF ANY MEANS AND METHODS CHOSEN BY THE CONTRACTOR REQUIRE ADDITIONAL WETLAND IMPACT, EITHER PERMANENT OR TEMPORARY, THE CONTRACTOR SHALL NOTIFY CTDOT IMMEDIATELY, AS THIS WILL *REQUIRE* ADDITIONAL REVIEW BY THE CTDOT OFFICE OF ENVIRONMENTAL PLANNING AND CTDEP AT THE CONTRACTOR'S EXPENSE.

2. ALL WETLAND AREAS TEMPORARILY IMPACTED FOR THE PURPOSES OF CONSTRUCTION, STAGING OR ACCESS SHALL BE REESTABLISHED BY THE CONTRACTOR IMMEDIATELY FOLLOWING THE USE OF THESE AREAS. SEE SPECIAL PROVISIONS FOR METHOD OF REESTABLISHMENT AND MATERIAL REQUIREMENTS. SEE PLATE 30F FOR PLANTING PLAN. REESTABLISHED WETLAND AREAS SHALL BE SEEDED WITH "WETLAND GRASS ESTABLISHMENT" SEED MIX. UPLAND AREAS SHALL BE STABILIZED WITH "CONSERVATION FOR SLOPES" SEED MIX.

3. ALL WORK ASSOCIATED WITH THE TEMPORARY WATER DIVERSION, INCLUDING THE TEMPORARY BYPASS PIPE SHALL BE INCLUDED UNDER "HANDLING WATER".

4. A PUMP DISCHARGE AREA SHALL BE ESTABLISHED OUTSIDE OF THE WETLAND LIMITS, USING THE MODIFIED RIPRAP FILTERING SYSTEM SHOWN. THE LOCATION AND SIZE OF THE DEWATERING BASIN SHOWN IS APPROXIMATE. THE EXACT LOCATION MAY VARY BASED ON THE SIZE OF BASIN REQUIRED TO PROVIDE A STORAGE VOLUME CAPABLE OF RETAINING THE FIRST TWO HOURS OF PUMP DISCHARGE.

5. SEE PERMIT APPLICATION NARRATIVE FOR ADDITIONAL INFORMATION.

6. SEQUENCE OF OPERATIONS AND STAGING IS FOR DEMOSTRATION PURPOSES ONLY. THE CONTRACTOR SHALL SUBMIT A MEANS AND METHODS PROCEDURE PRIOR TO THE START OF CONSTRUCTION.

TABLE 3-3

AVERAGE DAILY FLOW (CFS)	1
AVERAGE SPRING FLOW (CFS)	2
2-YEAR FREQUENNCY DISCHARGE * (CFS)	88
TEMPORARY DESIGN DISCHARGE (CFS)	88
TEMPORARY DESIGN FREQUENCY YEAR	2
TEMPORARY WATER SURFACE ELEV. UPSTREAM (FT)	AMTRAK CULVERT =60.7
TEMPORARY WATER SURFACE ELEV. DOWNSTREAM (FT)	NONE FOR 2-YR STORM

* ESTIMATED

SUGGESTED CONSTRUCTION SEQUENCE:

STAGE 1:
1. INSTALL TEMPORARY GRADE CROSSING.

2. INSTALL EROSION AND SEDIMENTATION CONTROLS AS INDICATED.

3. CONSTRUCT TEMPORARY CONSTRUCTION ACCESS DRIVES AND STAGING AREAS.

4. INSTALL TEMPORARY FLOW DIVERSION BARRIERS AROUND DOWNSTREAM STAGING AREA AS INDICATED.

5. INSTALL TEMPORARY BYPASS PUMP AND CHECK DAM TO COLLECT AND PUMP BASE FLOW AS INDICATED - SEE SPECIAL PROVISIONS.

6. REMOVE SECTION OF EXISTING ENDWALL ON DOWNSTREAM SIDE PRIOR TO INSTALLATION OF TEMPORARY STEEL SHEET PILING.

7. INSTALL TEMPORARY STEEL SHEET PILING WITH OPENING FOR PIPE JACKING AND CONSTRUCT JACKING AND RECEIVING PITS (DESIGN TO BE PROVIDED BY CONTRACTOR).

8. MONITOR TRACKS PER AMTRAK REQUIREMENTS AND PROVIDE MONITORING DURING JACKING PROCEDURE.

9. JACK APPROXIMATELY 80 FEET OF TWIN 78" RCP CLASS V UNDER RAILROAD EMBANKMENT - SEE SPECIAL PROVISIONS.

10. CONSTRUCT FOOTINGS FOR SOUTHERN SECTION OF WALLS ON EITHER END OF PIPE JACKING WITH KEY-IN FOR HEADWALLS AND SUPPORT SECTION FOR TWIN 78" *RCP END SECTIONS.*

11. BACKFILL FOOTING HEELS WITH CRUSHED STONE AND INSTALL FINAL SECTIONS OF TWIN 78" RCP CLASS V.

12. INSTALL TEMPORARY DIVERSION BARRIERS ON UPSTREAM SIDE OF EXISTING TRIPLE ARCH PIPES AS SHOWN.

13. CONSTRUCT HEADWALL EXTENSIONS ON BOTH SIDES OF EXISTING SANITARY SEWER FOR SUPPORT OF CONCRETE WEIR.

14. CONSTRUCT SOUTH PORTIONS OF WING TYPE ENDWALL AND BRIDGE ABUTMENTS IN PLACE AROUND TWIN 78" RCP CLASS V.

15. INSTALL TEMPORARY 15" RCP THROUGH NEW ABUTMENT AND REMOVE BYPASS PUMP.

16. REMOVE JACKING AND RECEIVING PITS AND TEMPORARY STEEL SHEET PILING NOT NECESSARY FOR FLOW DIVERSION.

STAGE 2:
1. MAINTAIN OR REMOVE STAGE 1 EROSION CONTROL MEASURES AS REQUIRED. INSTALL ADDITIONAL EROSION & SEDIMENTATION CONTROLS AS INDICATED.

2. MAINTAIN AND REPAIR EXISTING ACCESS DRIVES AND STAGING AREAS FROM STAGE 1. CONSTRUCT ADDITIONAL TEMPORARY CONSTRUCTION ACCESS DRIVES AND STAGING AREAS AS INDICATED ON PLAN.

3. CONSTRUCT LOW-FLOW RIPRAP CHANNEL PARALLEL WITH EXISTING GRASSED SWALE ON DOWNSTREAM SIDE. PROVIDE ADDITIONAL FLOW DIVERSION BARRIERS, IF NECESSARY *(NOT SHOWN)*, DURING EXCAVATION OF NEW CHANNEL.

4. INSTALL STANDARD RIPRAP CHANNEL LINING DOWNSTREAM PRIOR TO OPENING TWIN 78" RCP FOR USE.

5. INSTALL STAGE 2 TEMPORARY FLOW DIVERSION BARRIERS AS INDICATED AND REMOVE REMAINING STAGE 1 TEMPORARY STEEL SHEET PILING AND FLOW DIVERSION BARRIERS.

6. DIVERT UPSTREAM FLOWS TO NEW TWIN 78" RC PIPES.

7. REMOVE EXISTING UPSTREAM CULVERT HEADWALL. REMOVE PORTION OF CULVERT IF NECESSARY AND CAP EXISTING CULVERT END.

8. *INSTALL SPECIAL MANHOLE ON EXISTING* BOX CULVERT AS SHOWN, CAP WESTERN SECTION FROM MANHOLE WALL TO UPSTREAM END OF CULVERT AND FILL SECTION WITH CLSM.

9. REMOVE DOWNSTREAM HEADWALL AND INSTALL 24" SDR 80 PIPE IN EASTERN SECTION OF EXISTING BOX CULVERT FROM NEW HEADWALL TO SPECIAL MANHOLE.

10. INSTALL TEMPORARY STEEL SHEET PILING AS INDICATED.

11. CONSTRUCT REMAINING PORTION OF WALL FOOTINGS, WING TYPE ENDWALL, BRIDGE ABUTMENT AND SUPERSTRUCTURE.

12. CONSTRUCT CONCRETE WEIR ACROSS SANITARY SEWER BERM FROM HEADWALL TO HEADWALL.

13. RELOCATE FLOW DIVERSION BARRIER ON UPSTREAM END OF EXISTING TRIPLE ARCH PIPES TO BLOCK FLOW AND PROVIDE BYPASS PUMP FOR BASE FLOW TO NEW 78" RCP. POUR 6" CONCRETE LINED CHANNEL AND REMOVE DIVERSION BARRIER AND PUMP WHEN CURED.

14. REMOVE TEMPORARY STEEL SHEET PILING AND DIVERSION BARRIERS, BACKFILL WALLS AND ABUTMENTS.

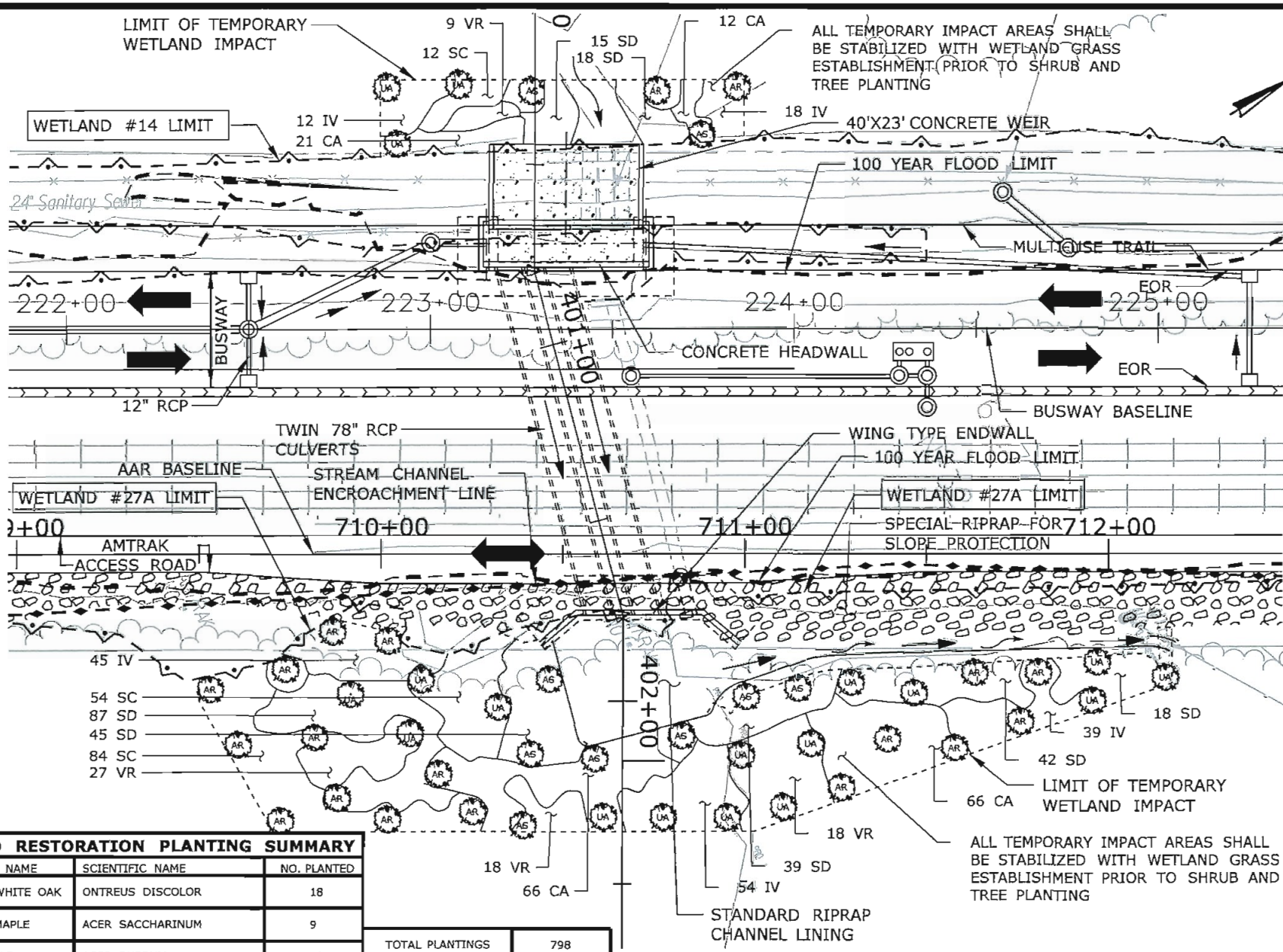
15. LEAVE TEMPORARY 15" RCP AND RCCE IN PLACE UNTIL CONSTRUCTION OF BUSWAY AND MUT BEGINS.

16. REMOVE TEMPORARY ACCESS ROAD AND STAGING AREA WHEN DIRECTED BY THE ENGINEER (SEE GENERAL NOTE 2).

17. REMOVE EROSION CONTROL MEASURES.

18. REESTABLISH WETLAND AREA PER SPECIAL PROVISIONS, SEED WITH APPROPRIATE MIX (PLANTINGS TO BE INSTALLED AFTER ESTABLISHMENT OF WETLAND GRASS).

19. REMOVE TEMPORARY GRADE CROSSING.



WETLAND RESTORATION PLANTING SUMMARY

SYM.	COMMON NAME	SCIENTIFIC NAME	NO. PLANTED
UA	SWAMP WHITE OAK	ONTREUS DISCOLOR	18
AS	SILVER MAPLE	ACER SACCHARINUM	9
AR	RED MAPLE	ACER RUBRUM	18
SD	PUSSY WILLOW	SALIX DISCOLOR	273
IV	WINTERBERRY	ILEX VERTICILLATA	168
VR	NORTHERN ARROWWOOD	VIBURNUM RECOGNITUM	111
SC	ELDERBERRY	SAMBUCUS CANADENSIS	150
CA	SILKY DOGWOOD	CORNUS AMOMUM	51

TOTAL PLANTINGS	798

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

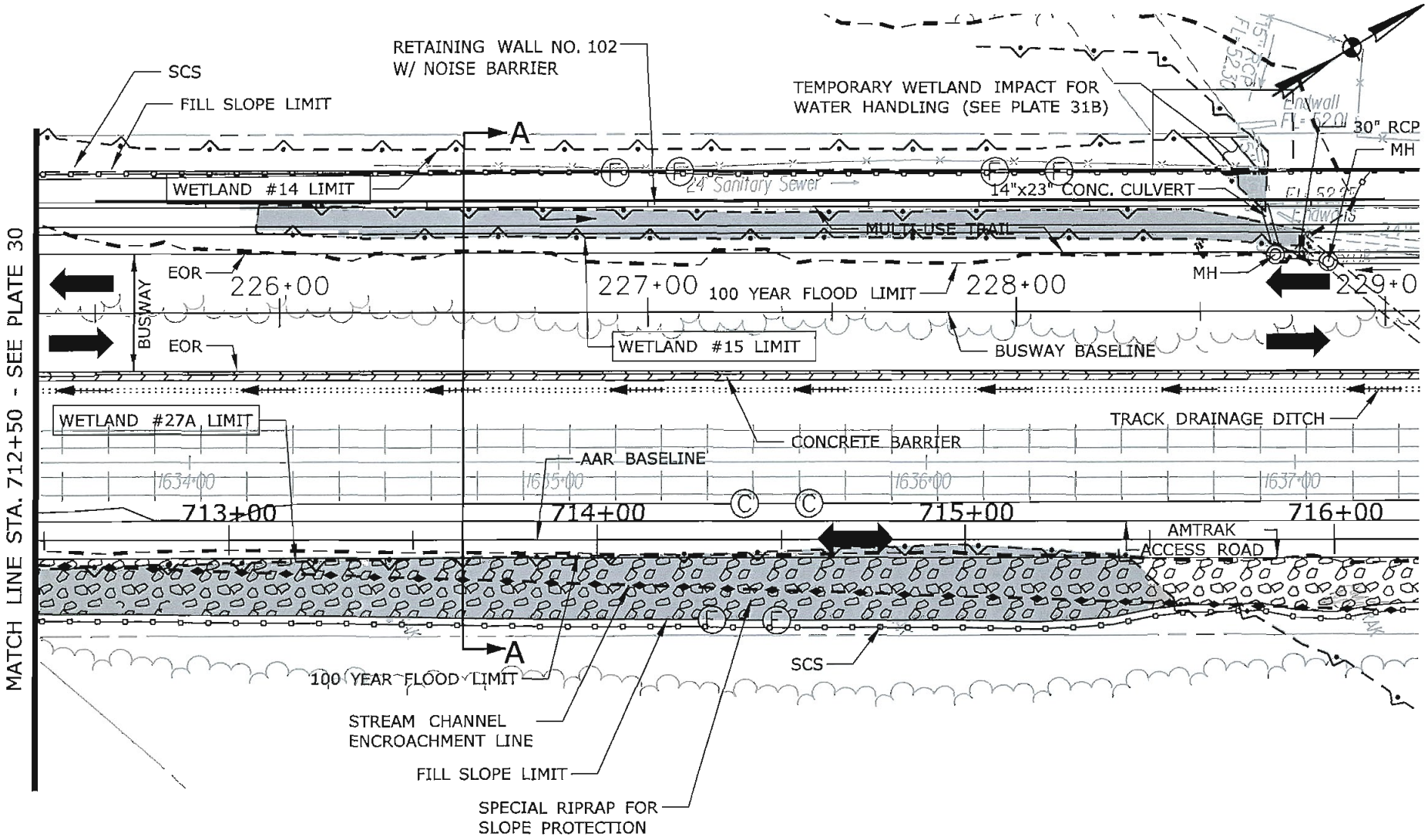
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 30F



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #14 IMPACT	8,887 S.F.
PERMANENT WETLAND #15 IMPACT	2,111 S.F.
PERMANENT WETLAND #27A IMPACT	9,587 S.F.
TEMPORARY WETLAND #14 IMPACT	2,025 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

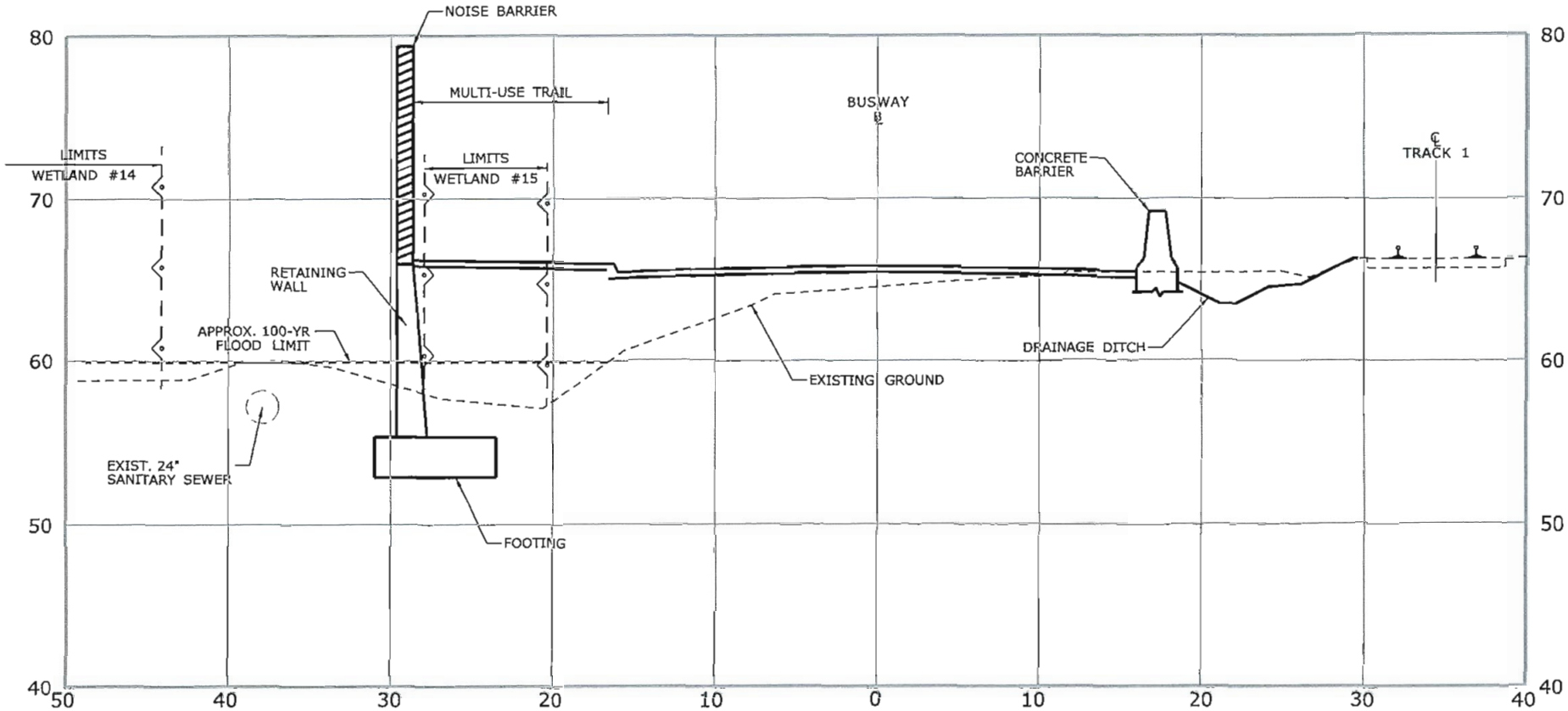
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

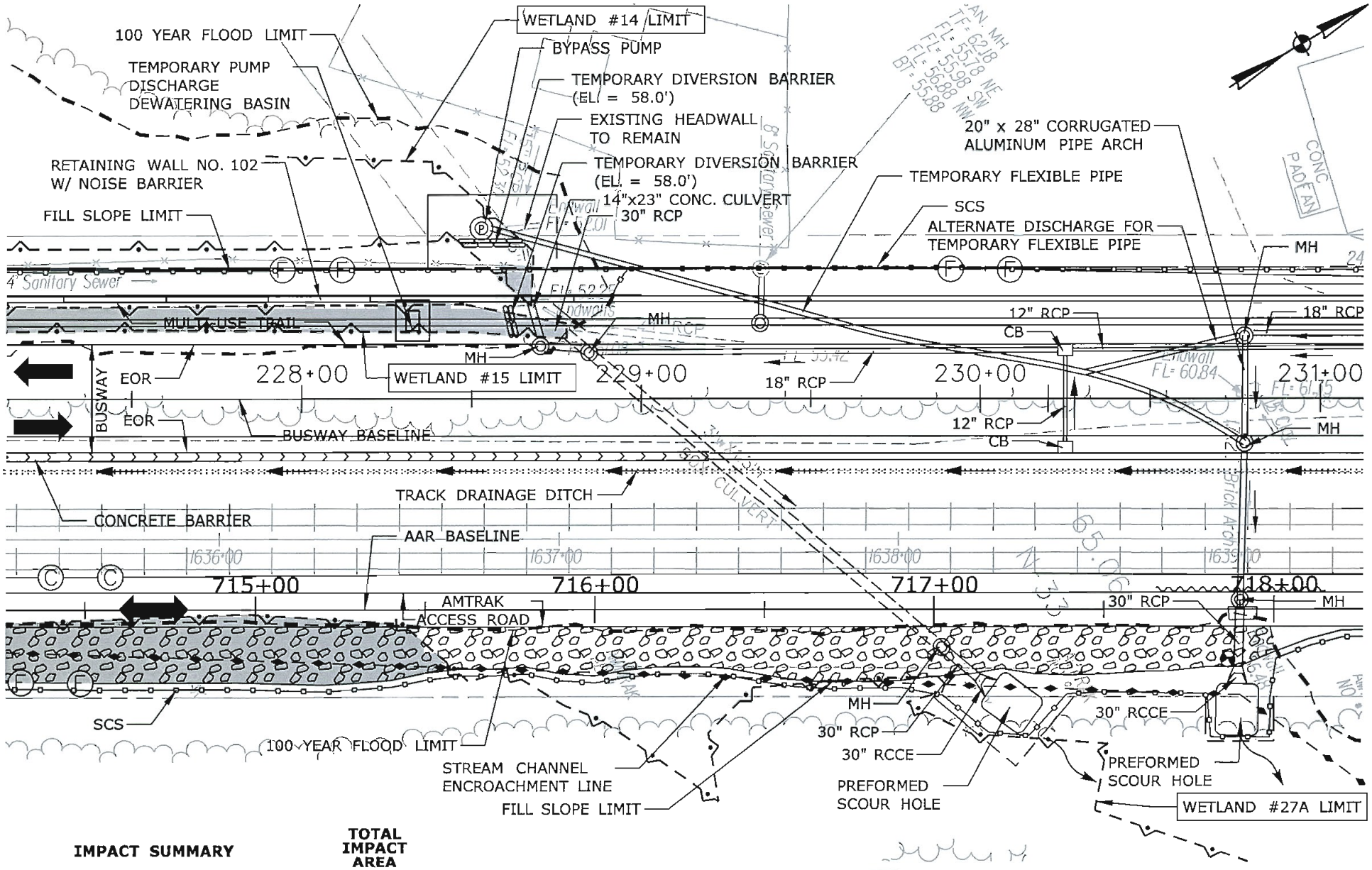
DATE: FEBRUARY 2011

PLATE NO. 31



SECTION A-A (SEE PLATE 31)

TYPICAL SECTION OF FILL FOR CONSTRUCTION OF MULTI-USE TRAIL	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=10'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 31A



IMPACT SUMMARY	TOTAL IMPACT AREA
TEMPORARY WETLAND #14 IMPACT	2,025 S.F.
PERMANENT WETLAND #14 IMPACT	8,887 S.F.
PERMANENT WETLAND #15 IMPACT	2,111 S.F.
PERMANENT WETLAND #27A IMPACT	9,587 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

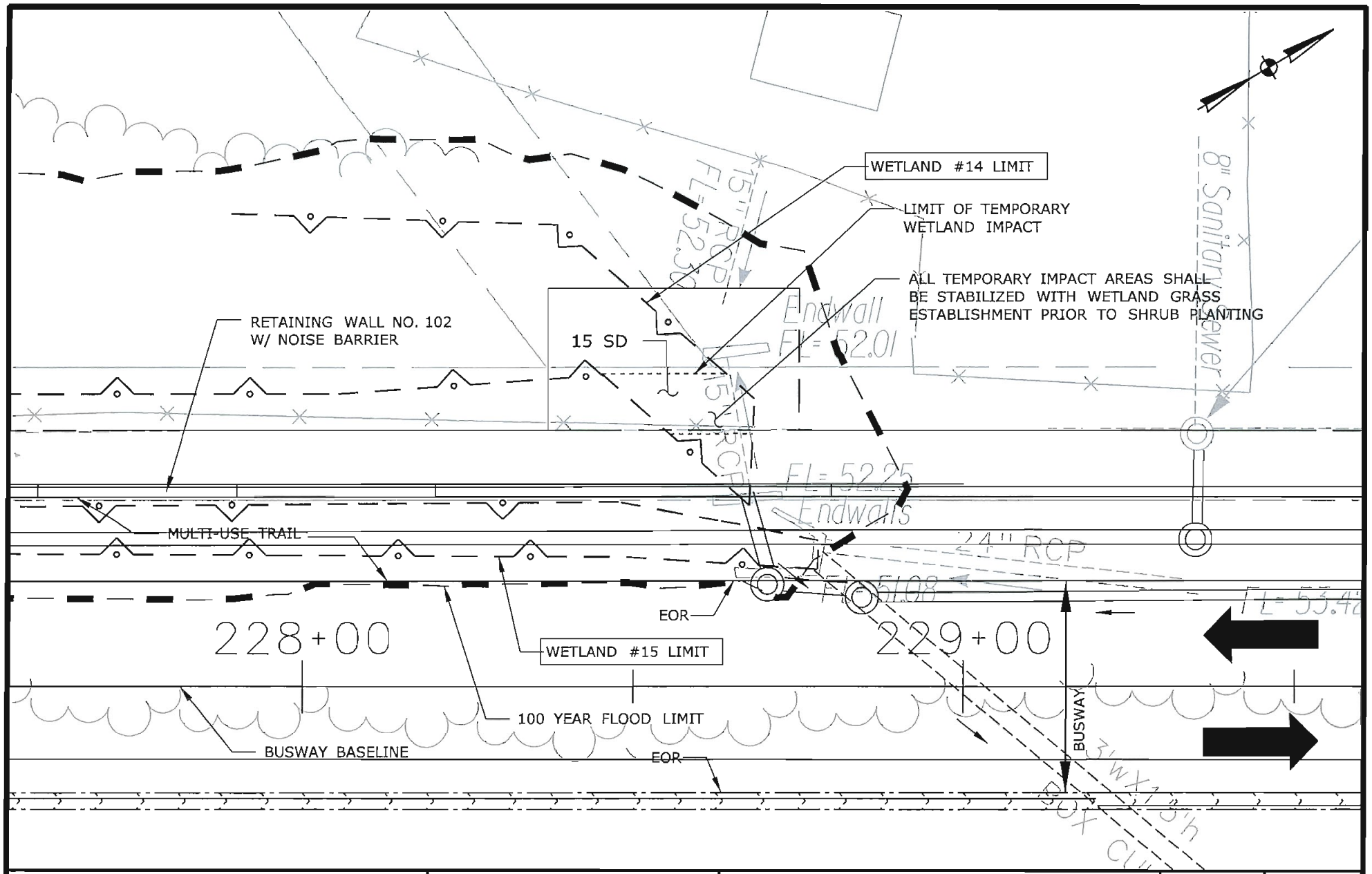
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 31B



WETLAND RESTORATION PLANTING SUMMARY			
SYM.	COMMON NAME	SCIENTIFIC NAME	NO. PLANTED
SD	PUSSY WILLOW	SALIX DISCOLOR	15
TOTAL PLANTINGS			15

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 10'
20 10 0 20

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

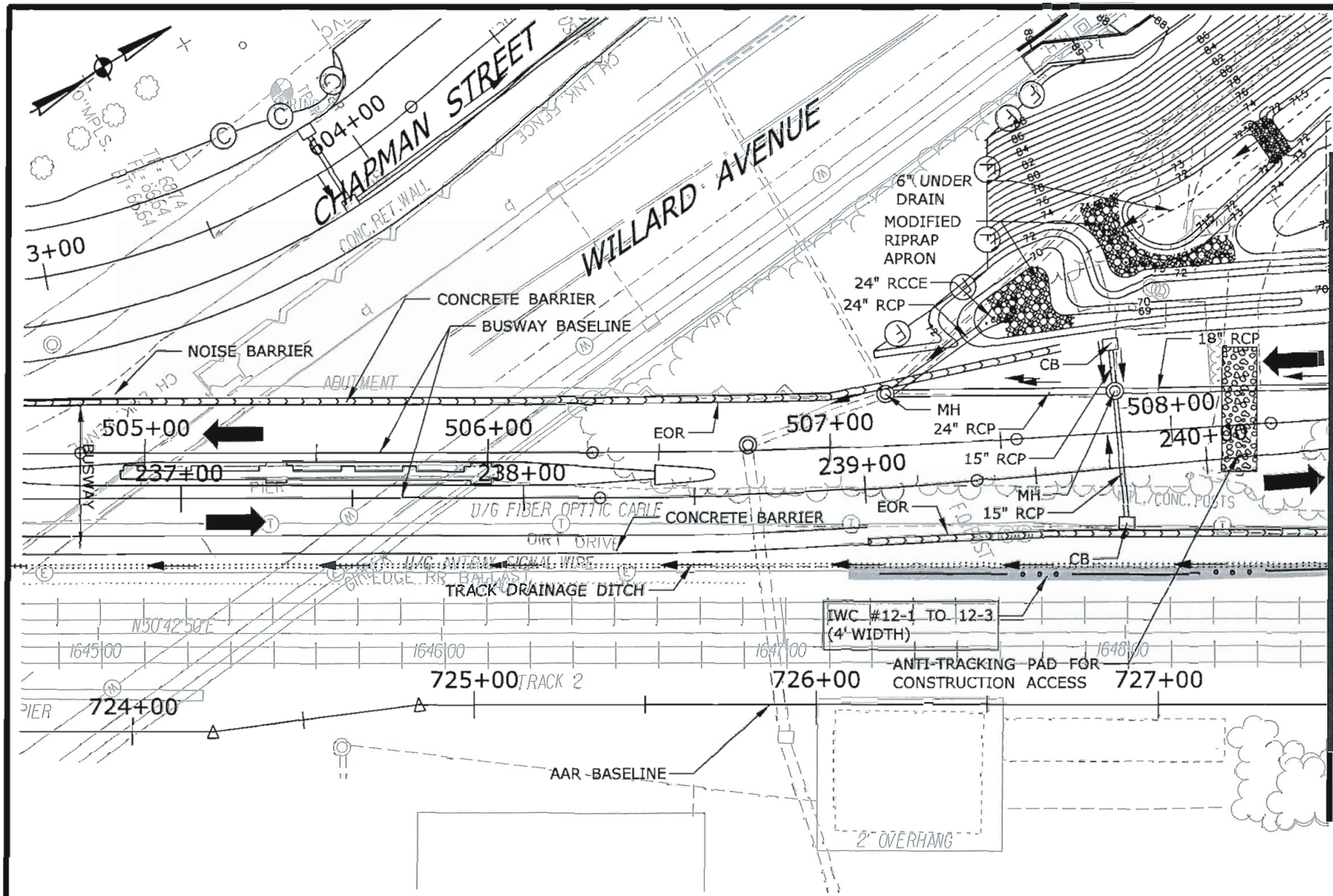
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 31C



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #12 IMPACT	196 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

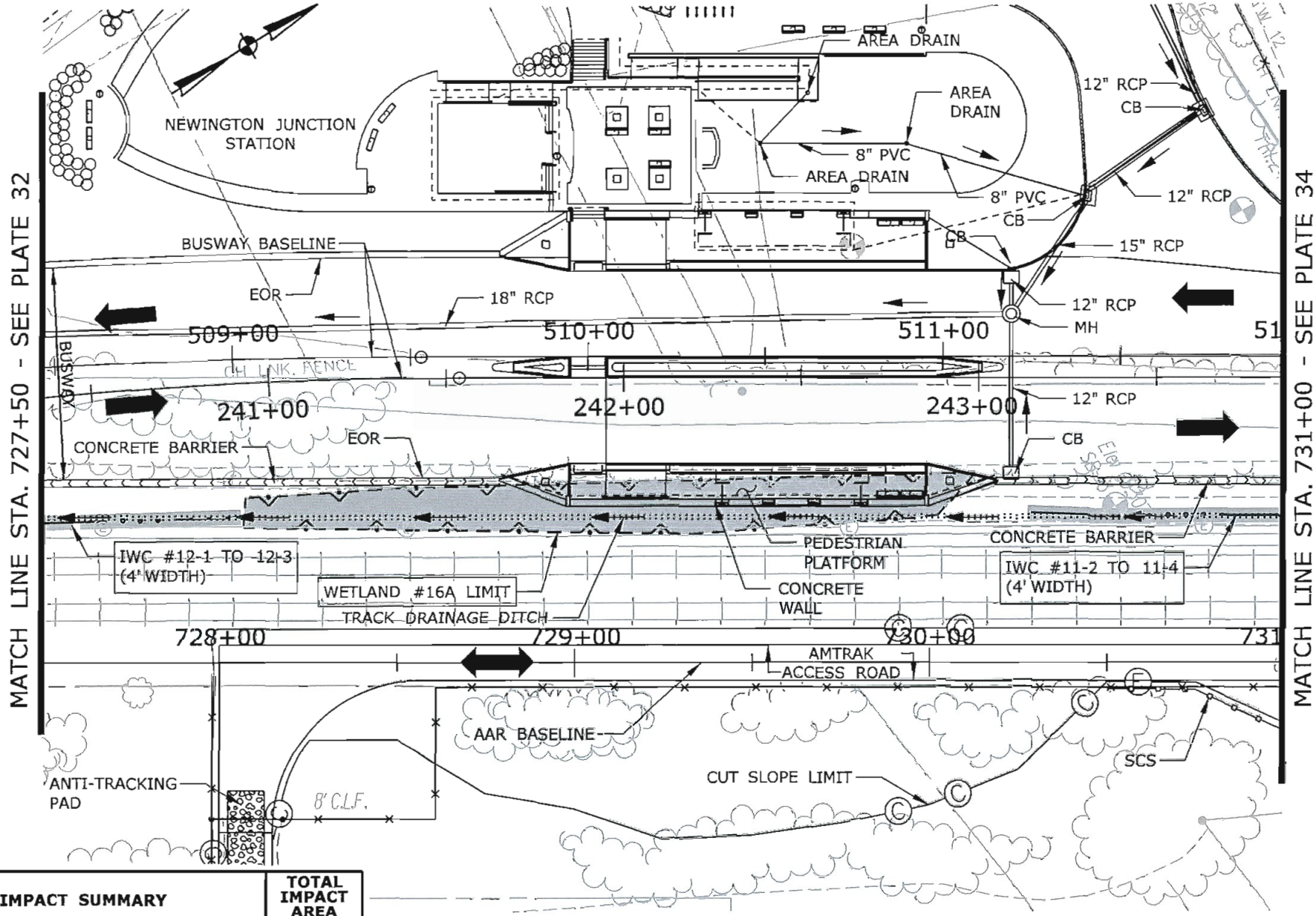
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 32



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #16A IMPACT	2,523 S.F.
PERMANENT IWC #12 IMPACT	196 L.F.
PERMANENT IWC #11 IMPACT	241 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

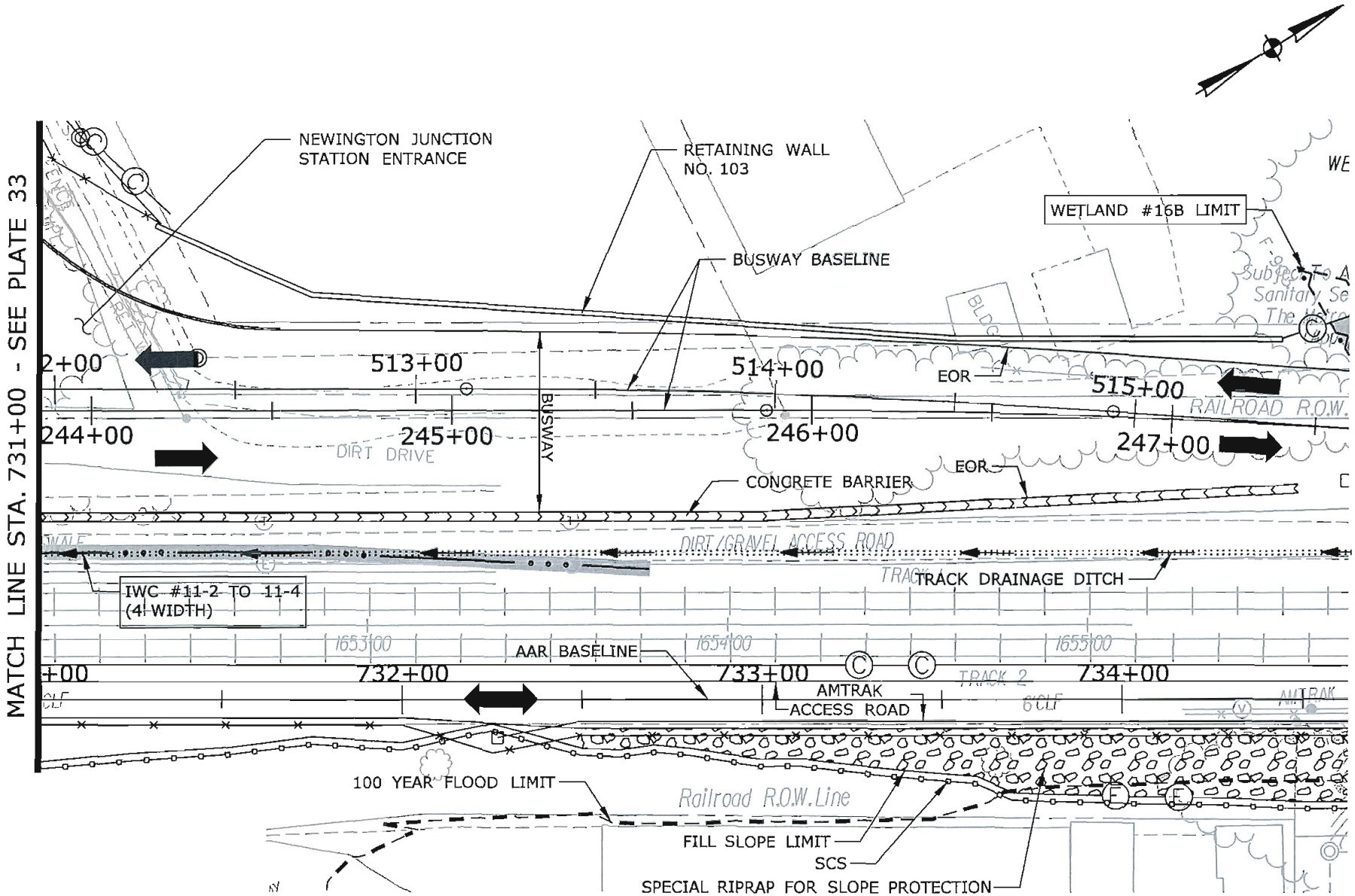
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 33



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #11 IMPACT	241 L.F.
PERMANENT WETLAND #16B IMPACT	1,698 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

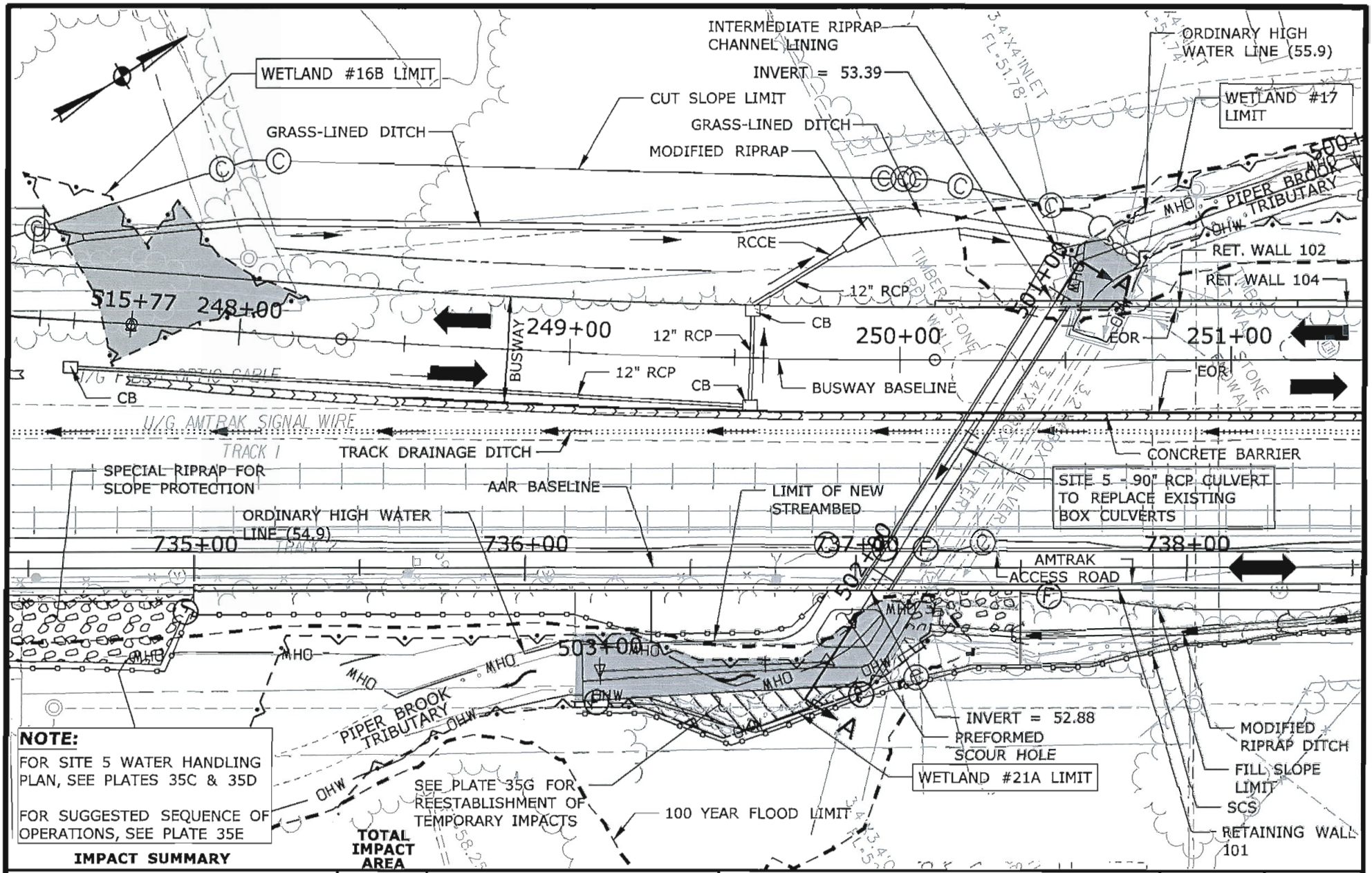
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 34



IMPACT SUMMARY

	TOTAL IMPACT AREA
PERMANENT WETLAND #16B IMPACT	1,698 S.F.
PERMANENT WETLAND #17 IMPACT	351 S.F.
PERMANENT WETLAND #21A IMPACT	1,527 S.F.
TEMPORARY WETLAND #21A IMPACT	680 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

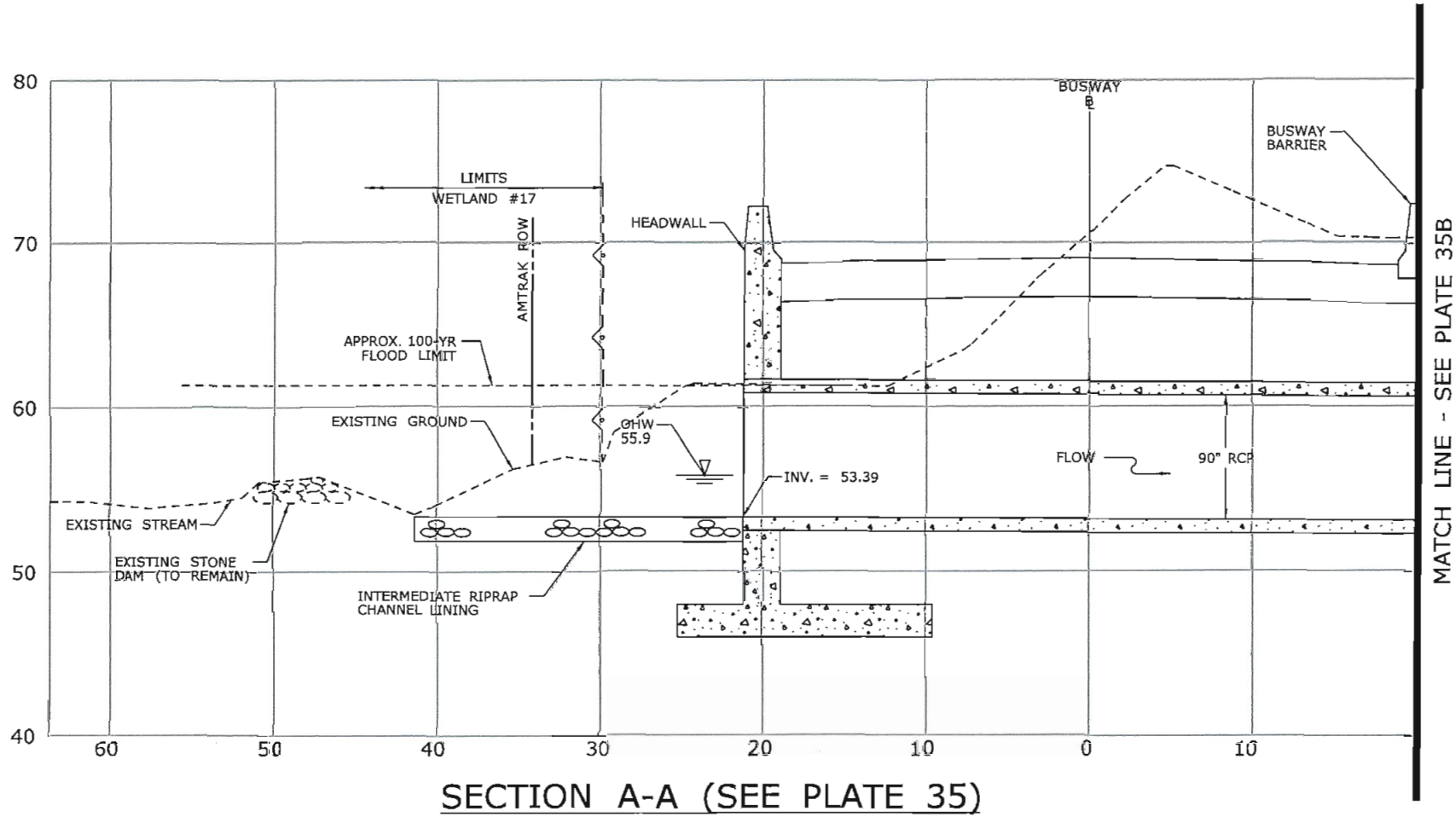
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

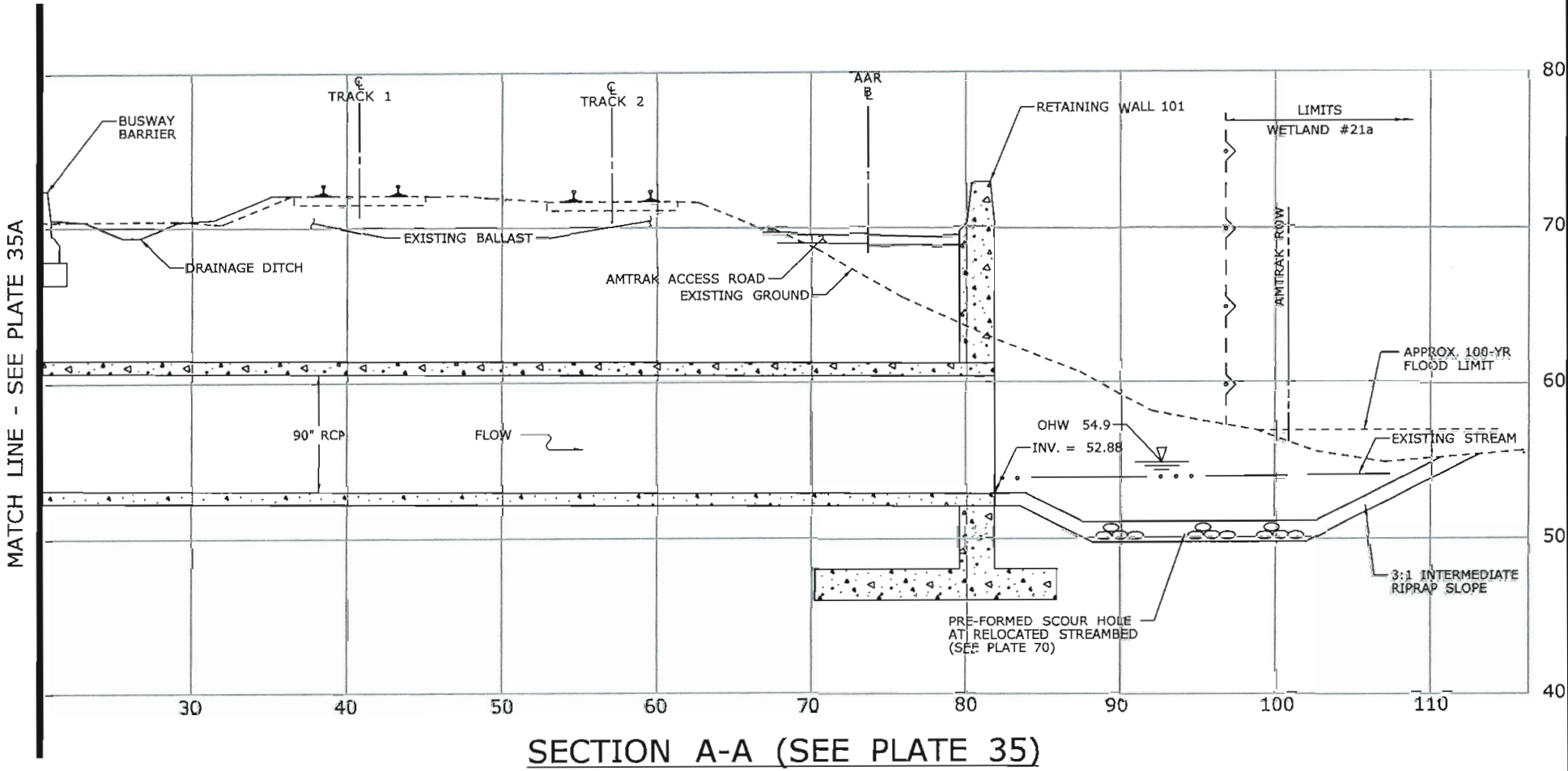
DATE: FEBRUARY 2011

PLATE NO. 35



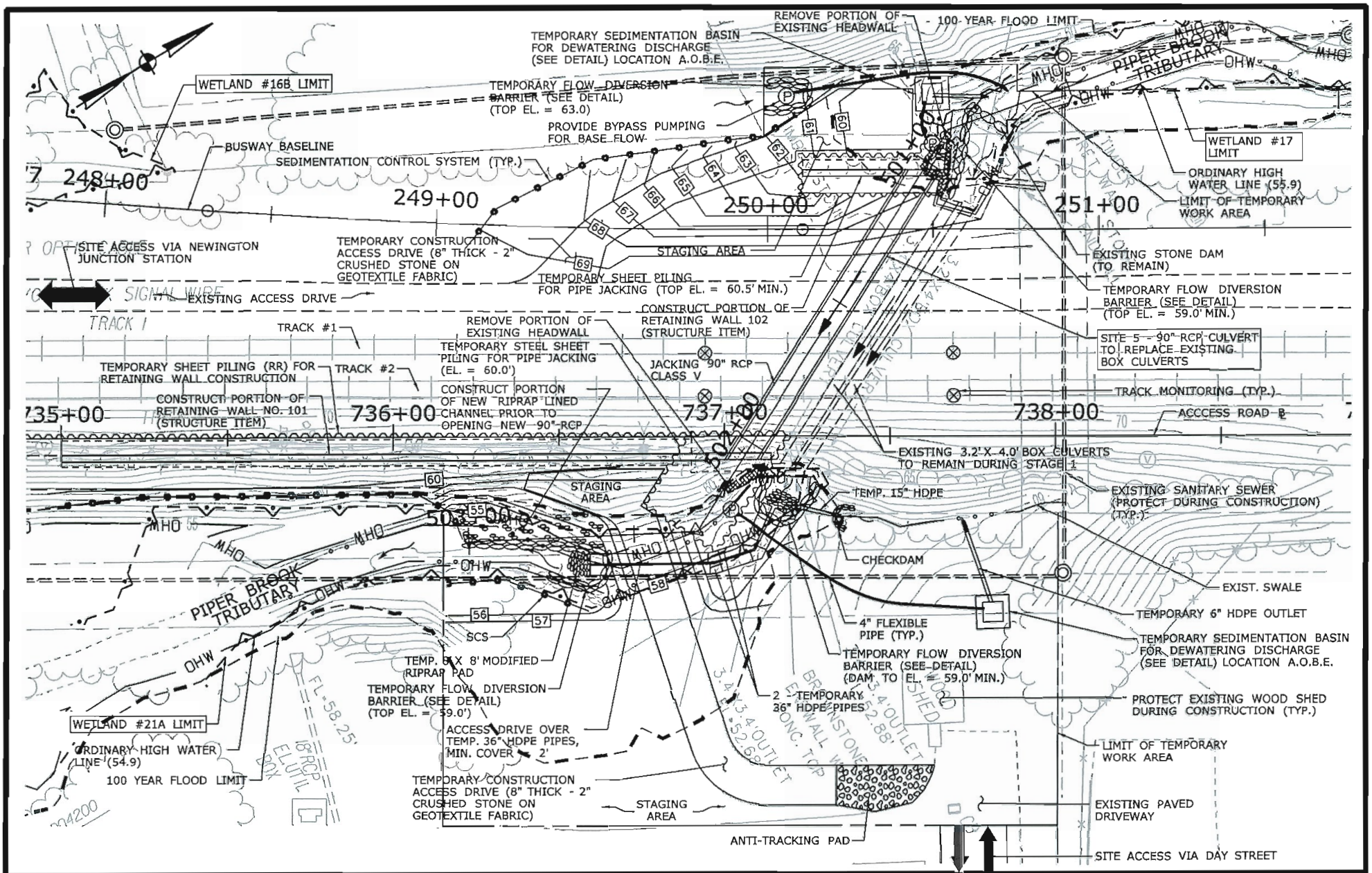
SECTION A-A (SEE PLATE 35)

SITE 5 CULVERT REPLACEMENT	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=10'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 35A

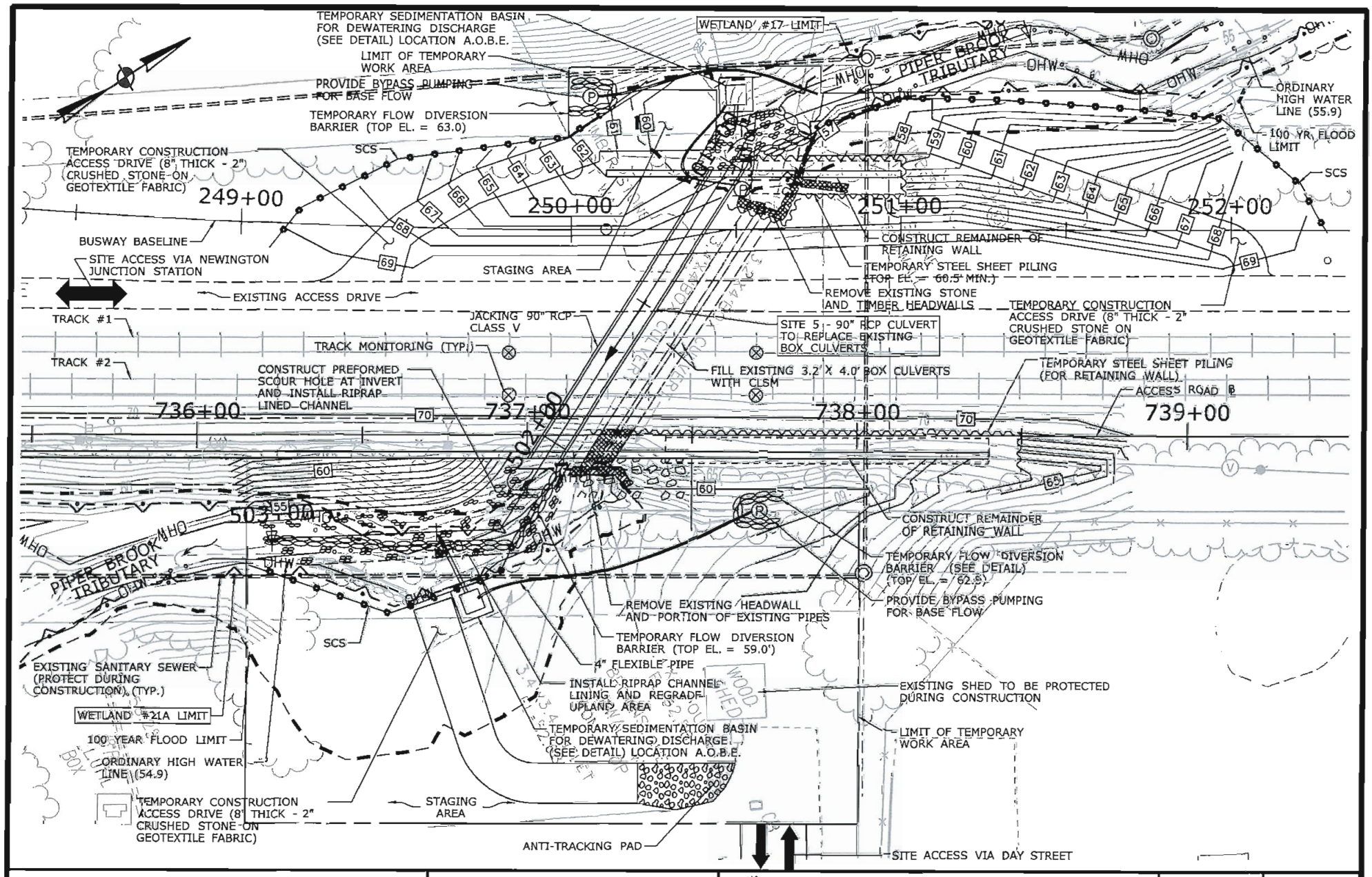


SECTION A-A (SEE PLATE 35)

SITE 5 CULVERT REPLACEMENT	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=10'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 35B



CONSTRUCTION STAGING AND WATER HANDLING PLAN FOR SITE 5 CULVERT REPLACEMENT	STATE PROJECT NO.: 171-305 CONTRACT NO.: H046/H052	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
STAGE 1	SCALE 1" = 40' 40 20 0 40	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 35C



CONSTRUCTION STAGING AND WATER HANDLING PLAN FOR SITE 5 CULVERT REPLACEMENT	STATE PROJECT NO.: 171-305 CONTRACT NO.: H046/H052	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
STAGE 2	SCALE 1" = 40' 40 20 0 40	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 35D

GENERAL NOTES:

1. THE CONTRACTOR SHALL BE LIMITED TO WORKING WITHIN THE TEMPORARY WORK AREAS AS INDICATED ON THE PLANS WHEN WORKING WITHIN A DELINEATED WETLAND BOUNDARY. THE TEMPORARY WORK AREAS WILL BE LOCATED AND STAKED IN THE FIELD BY THE CONTRACTOR PRIOR TO CLEARING AND GRUBBING OR THE COMMENCEMENT OF ANY OTHER CONSTRUCTION ACTIVITY. WORK OUTSIDE THE DELINATED IMPACT AREAS IS NOT PERMITTED. IF ANY MEANS AND METHODS CHOSEN BY THE CONTRACTOR REQUIRE ADDITIONAL WETLAND IMPACT, EITHER PERMANENT OR TEMPORARY, THE CONTRACTOR SHALL NOTIFY CTDOT IMMEDIATELY, AS THIS WILL REQUIRE ADDITIONAL REVIEW BY THE CTDOT OFFICE OF ENVIRONMENTAL PLANNING AND CTDEP AT THE CONTRACTOR'S EXPENSE.

2. ALL WETLAND AREAS TEMPORARILY IMPACTED FOR THE PURPOSES OF CONSTRUCTION, STAGING OR ACCESS SHALL BE REESTABLISHED BY THE CONTRACTOR IMMEDIATELY FOLLOWING THE USE OF THESE AREAS. SEE SPECIAL PROVISIONS FOR METHOD OF REESTABLISHMENT AND MATERIAL REQUIREMENTS. SEE PLATE 30F FOR PLANTING PLAN. REESTABLISHED WETLAND AREAS SHALL BE SEEDED WITH "WETLAND GRASS ESTABLISHMENT" SEED MIX. UPLAND AREAS SHALL BE STABILIZED WITH "CONSERVATION FOR SLOPES" SEED MIX.

3. ALL WORK ASSOCIATED WITH THE TEMPORARY WATER DIVERSION, INCLUDING THE TEMPORARY BYPASS PIPE SHALL BE INCLUDED UNDER "HANDLING WATER".

4. A PUMP DISCHARGE AREA SHALL BE ESTABLISHED OUTSIDE OF THE WETLAND LIMITS, USING THE MODIFIED RIPRAP FILTERING SYSTEM SHOWN. THE LOCATION AND SIZE OF THE DEWATERING BASIN SHOWN IS APPROXIMATE. THE EXACT LOCATION MAY VARY BASED ON THE SIZE OF BASIN REQUIRED TO PROVIDE A STORAGE VOLUME CAPABLE OF RETAINING THE FIRST TWO HOURS OF PUMP DISCHARGE.

5. SEE PERMIT APPLICATION NARRATIVE FOR ADDITIONAL INFORMATION.

6. SEQUENCE OF OPERATIONS AND STAGING IS FOR DEMOSTRATION PURPOSES ONLY. THE CONTRACTOR SHALL SUBMIT A MEANS AND METHODS PROCEDURE PRIOR TO THE START OF CONSTRUCTION.

SUGGESTED CONSTRUCTION SEQUENCE:

STAGE 1:
1.INSTALL EROSION AND SEDIMENTATION CONTROLS AS INDICATED.

2. TEMPORARILY DIVERT DOWNSTREAM FLOW, UTILIZING FLOW DIVERSION BARRIERS AS REQUIRED, AND INSTALL TEMPORARY 36" HDPE PIPES, DAMS AND RIPRAP PADS.

3. CONSTRUCT TEMPORARY CONSTRUCTION ACCESS DRIVES AND STAGING AREAS.

4. INSTALL TEMPORARY FLOW DIVERSION BARRIERS AS INDICATED.

5. BYPASS PUMP BASE FLOW AS INDICATED - SEE SPECIAL PROVISIONS.

6. CONSTRUCT ACCESS DRIVE OVER TEMPORARY 36" PIPES.

7. REMOVE PORTION OF EXISTING UPSTREAM AND DOWNSTREAM WINGWALLS.

8. INSTALL TEMPORARY STEEL SHEET PILING AND CONSTRUCT JACKING PITS.

9. JACK 90" RCP CLASS V - SEE SPECIAL PROVISIONS.

10. CONSTRUCT FOOTINGS FOR SOUTHERN SECTION OF WALLS ON EITHER END OF PIPE JACKING WITH KEY-IN FOR HEADWALLS AND SUPPORT SECTION FOR 90" RCP END SECTIONS.

11. REMOVE TEMPORARY STEEL SHEET PILING AROUND JACKING AND RECEIVING PITS AND INSTALL TEMPORARY SHEET PILING (RAILROAD) FOR RETAINING WALL CONSTRUCTION.

12. CONSTRUCT SOUTHERN PORTION OF RETAINING WALL NO. 101 (SEE STRUCTURE DWGS).

13. CONDUCT FINAL GRADING AT BASE OF RETAINING WALL AND STABILIZE WITH SPECIAL RIPRAP SLOPE PROTECTION.

14. CONSTRUCT PORTION OF NEW RIPRAP CHANNEL LINING IN RELOCATED STREAMBED AT BASE OF SPECIAL RIPRAP SLOPE PROTECTION.

STAGE 2:
1. MAINTAIN OR REMOVE STAGE 1 EROSION CONTROL MEASURES AS REQUIRED. INSTALL ADDITIONAL EROSION & SEDIMENTATION CONTROLS AS INDICATED.

2. MAINTAIN AND REPAIR EXISTING ACCESS DRIVES AND STAGING AREAS FROM STAGE 1. CONSTRUCT ADDITIONAL TEMPORARY CONSTRUCTION ACCESS DRIVES AND STAGING AREAS AS INDICATED ON PLAN.

3. INSTALL PRE-FORMED SCOUR HOLE AND REMAINDER OF WESTERN PORTION OF RIPRAP CHANNEL LINING IN RELOCATED STREAMBED.

4. RELOCATE TEMPORARY FLOW DIVERSION BARRIERS AS INDICATED AND REMOVE STAGE 1 TEMPORARY STEEL SHEET PILING AND ANY UNNECESSARY FLOW DIVERSION BARRIERS.

5. DIVERT STREAM FLOWS TO NEW 90" RC PIPE AND REMOVE TEMPORARY 36" HDPE PIPES, DAMS AND UNNECESSARY DIVERSION BARRIERS.

6. FOLLOWING THE OPENING OF THE 90" RC PIPE TO FLOWS, PUMP ANY STANDING WATER IN THE DOWNSTREAM EASTERN PORTION OF RELOCATED STREAMBED INTO DEWATERING BASIN AND CONSTRUCT EASTERN PORTION OF THE RIPRAP CHANNEL LINING.

7. REMOVE REMAINDER OF EXISTING UPSTREAM AND DOWNSTREAM CULVERT HEADWALLS, FILL EXISTING 3.2'x4.0' BOX CULVERTS WITH CLSM, CAP EXISTING CULVERT ENDS AND BACKFILL.

8. INSTALL REMAINDER OF NEW RIPRAP CHANNEL LINING IN EASTERN PORTION OF UPSTREAM END.

9. INSTALL TEMPORARY SHEET PILING (RAILROAD) AS INDICATED FOR RETAINING WALL CONSTRUCTION.

10. CONSTRUCT REMAINING PORTION OF WALL FOOTINGS AND NORTHERN PORTION OF RETAINING WALLS.

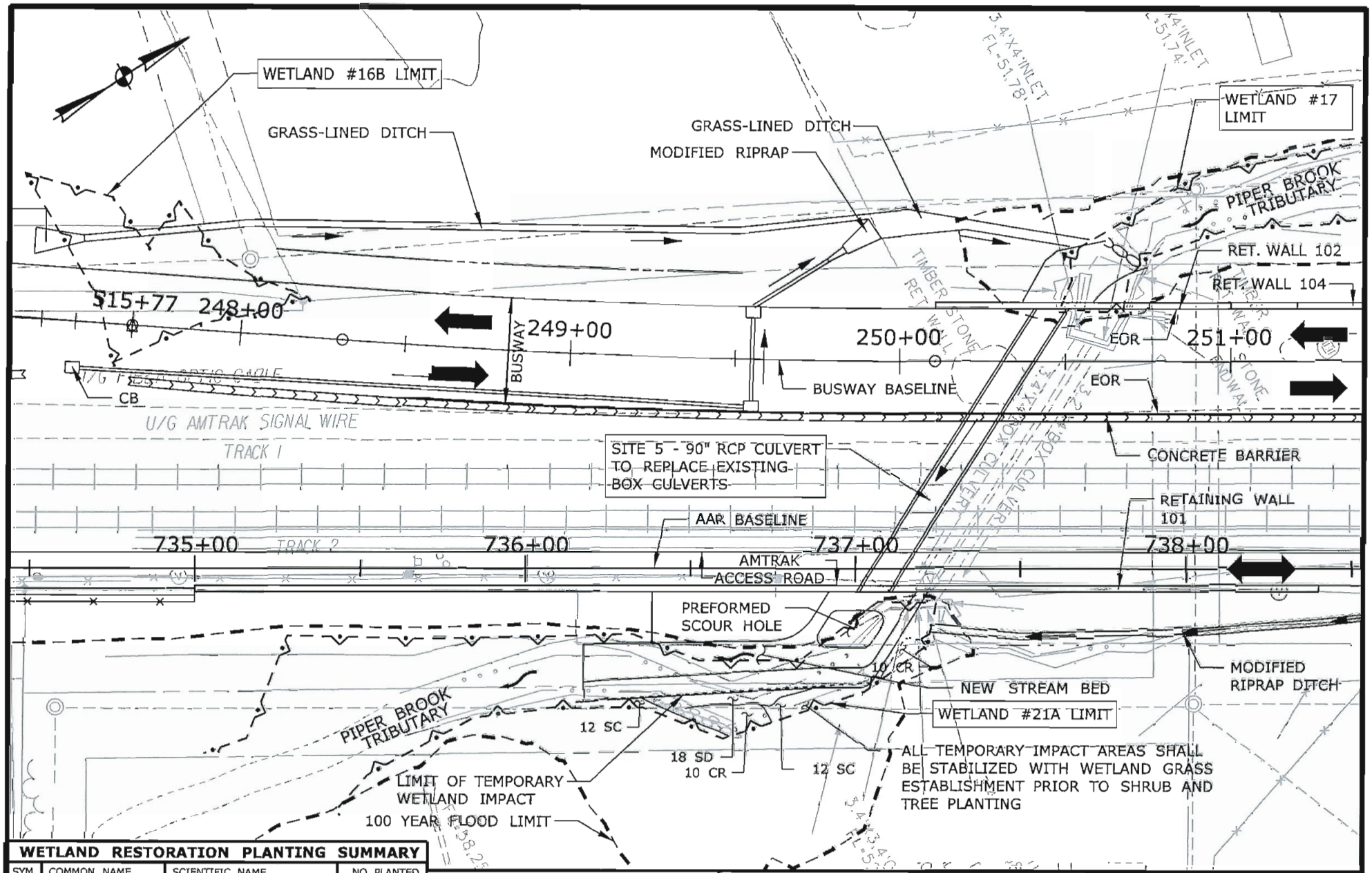
11. REMOVE TEMPORARY ACCESS ROAD AND STAGING AREA WHEN DIRECTED BY THE ENGINEER (SEE NOTE 2).

12. REMOVE EROSION CONTROL MEASURES.

13. REESTABLISH WETLAND AREA PER SPECIAL PROVISIONS, SEED WITH APPROPRIATE MIX (PLANTINGS TO BE INSTALLED AFTER ESTABLISHMENT OF WETLAND GRASS).

TABLE 3-3

AVERAGE DAILY FLOW (CFS)	1.5
AVERAGE SPRING FLOW (CFS)	3
2-YEAR FREQUENNCY DISCHARGE (CFS)	153
TEMPORARY DESIGN DISCHARGE (CFS)	124
TEMPORARY DESIGN FREQUENCY YEAR	1
TEMPORARY WATER SURFACE ELEV. UPSTREAM (FT)	59
TEMPORARY WATER SURFACE ELEV. DOWNSTREAM (FT)	58



WETLAND RESTORATION PLANTING SUMMARY

SYM.	COMMON NAME	SCIENTIFIC NAME	NO. PLANTED
SD	PUSSY WILLOW	SALIX DISCOLOR	18
CR	GREY-STEM DOGWOOD	CORNUS RACEMOSA	18
SC	ELDERBERRY	SAMBUCUS CANADENSIS	18
TOTAL PLANTINGS			62

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

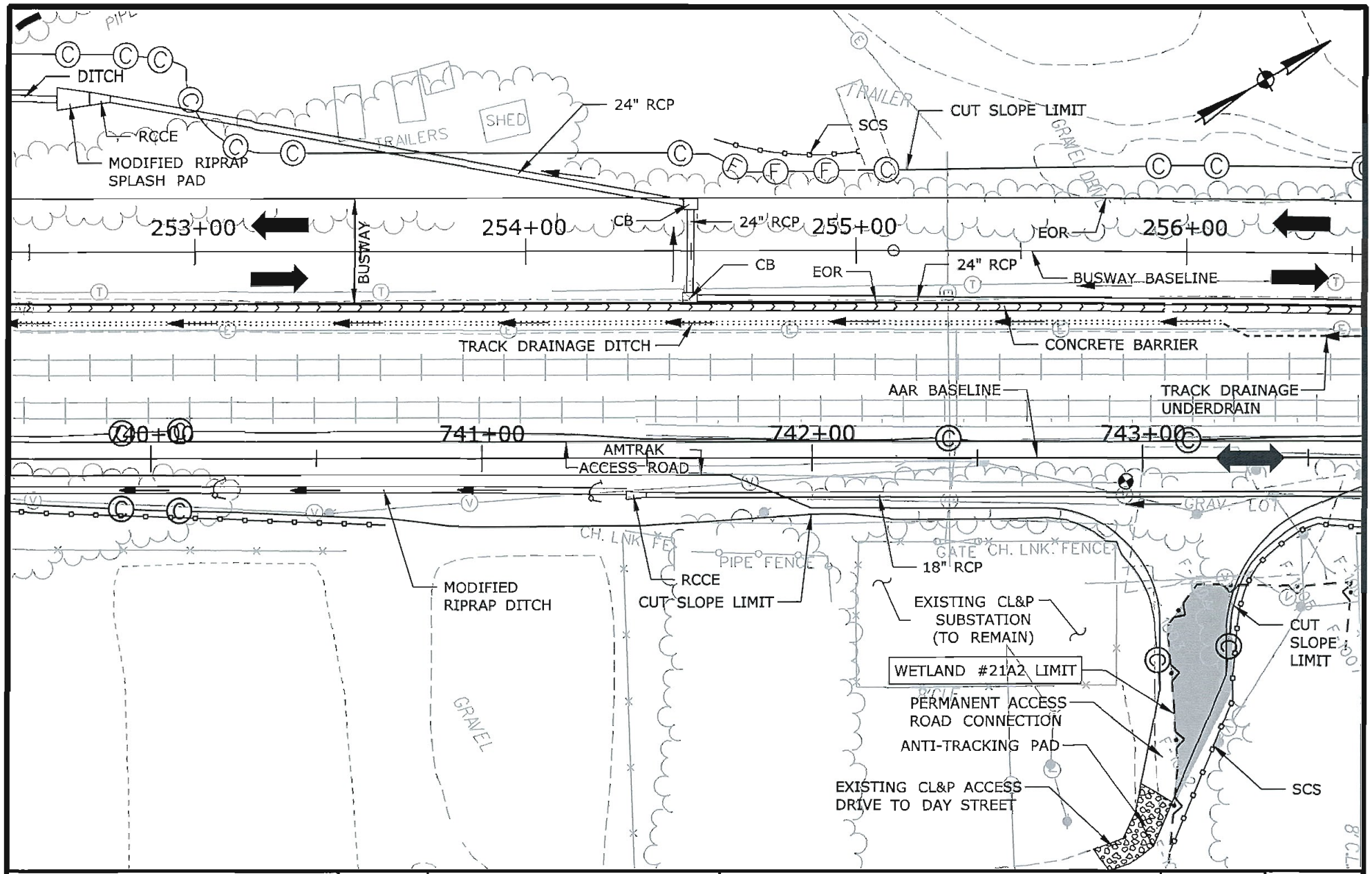
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 35G



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #21A2 IMPACT	847 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

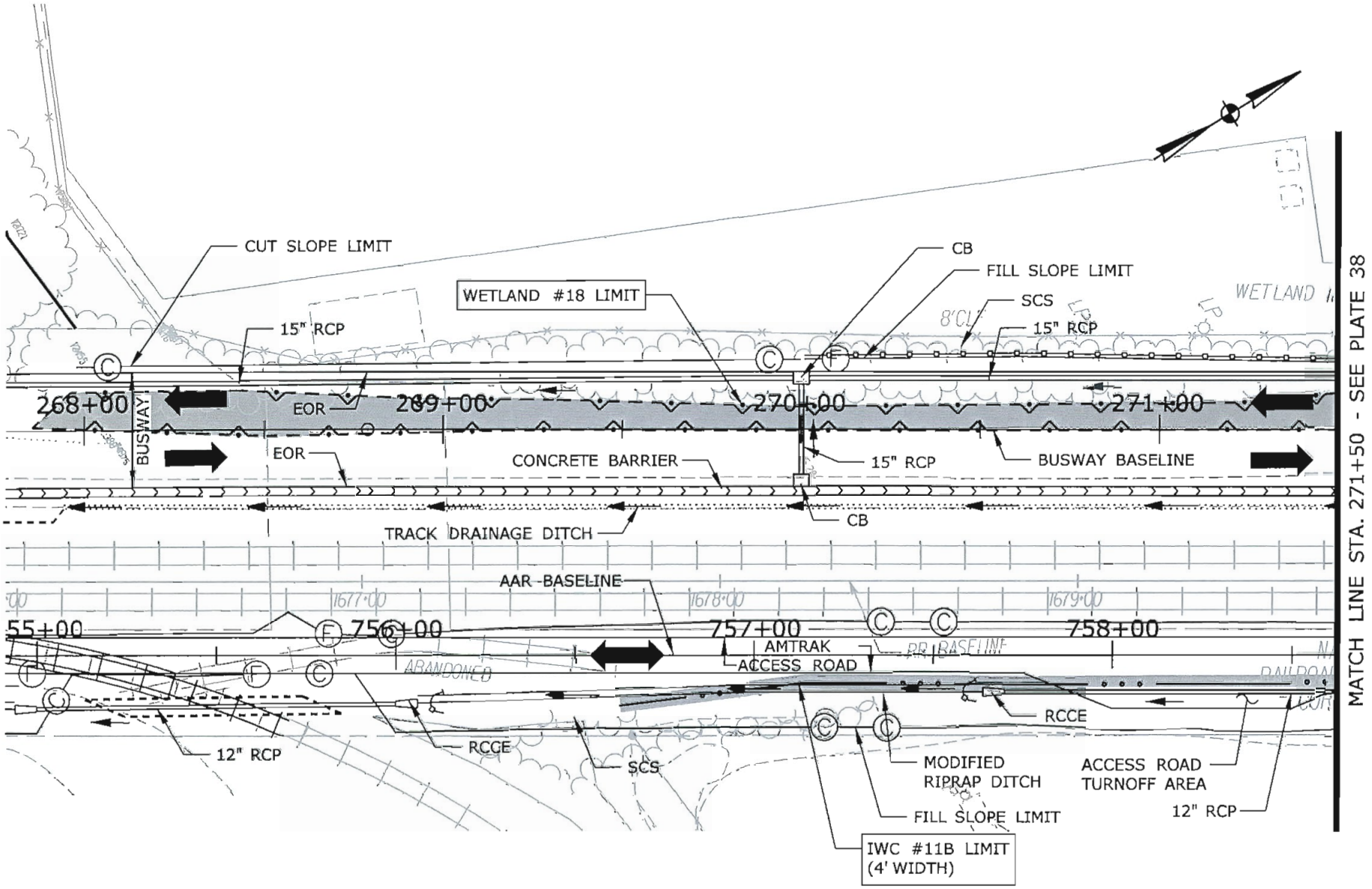
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 36



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #18 IMPACT	5,415 S.F.
PERMANENT IWC #11B IMPACT	271 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

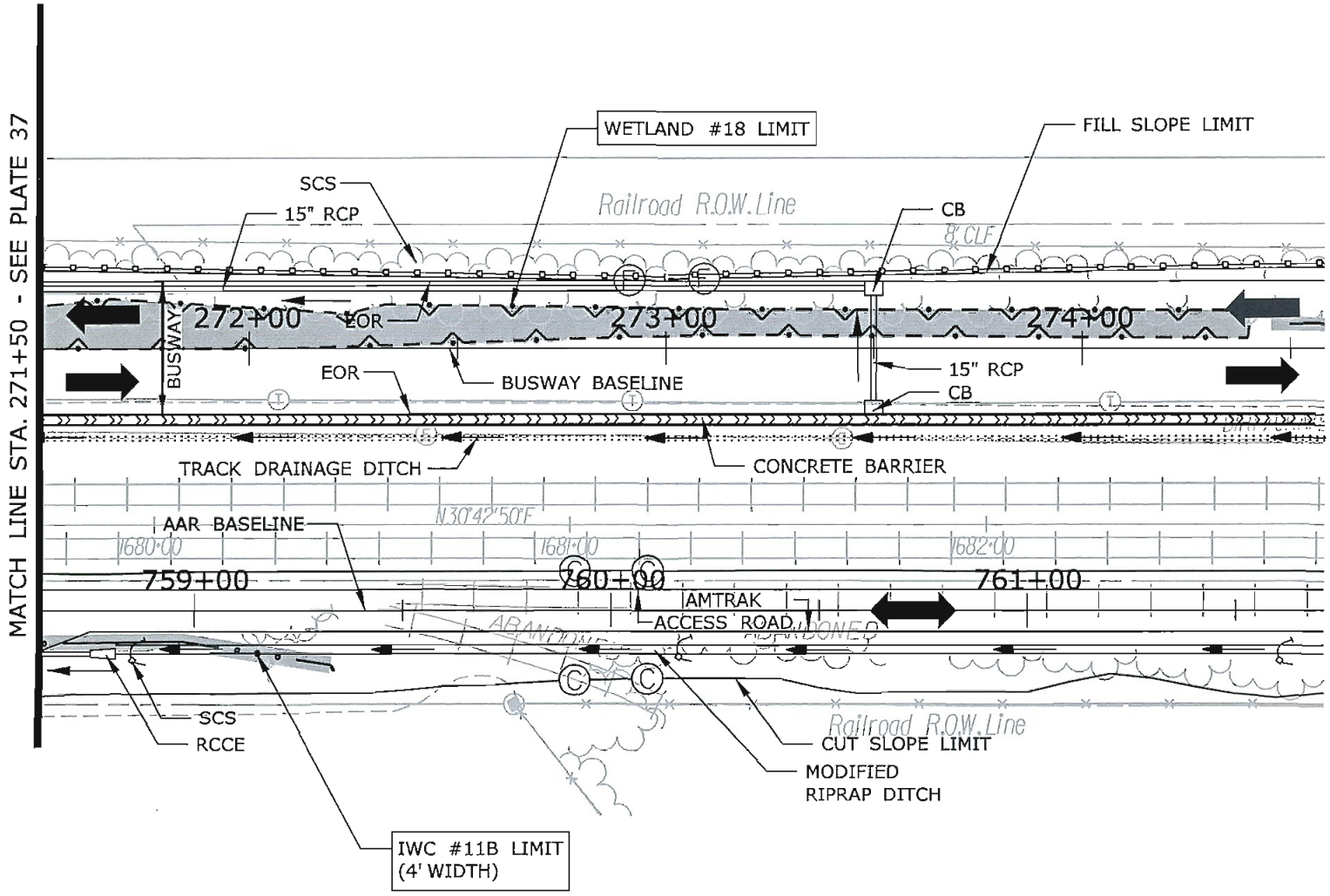
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 37



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #18 IMPACT	5,415 S.F.
PERMANENT IWC #11B IMPACT	271 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

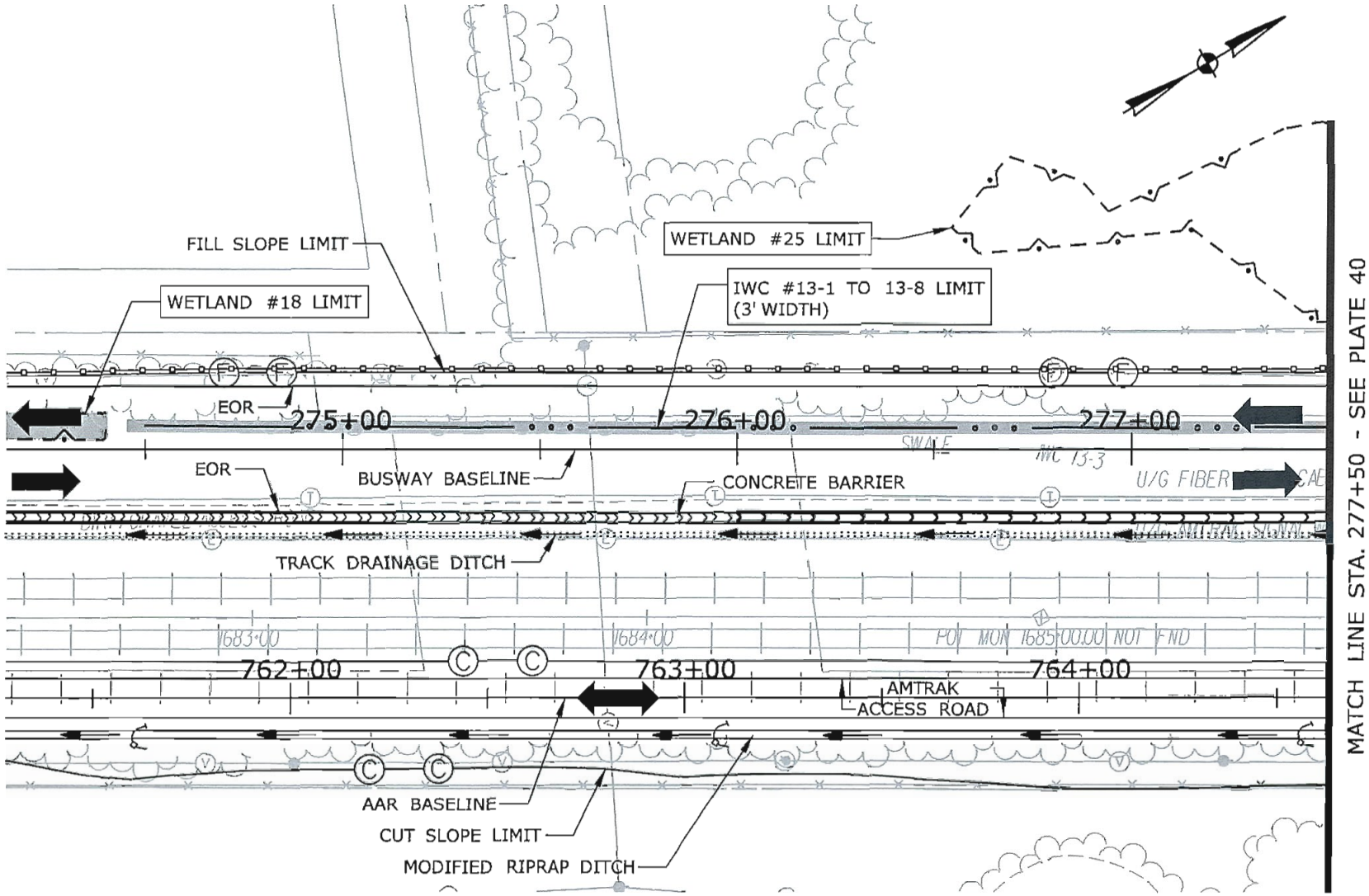
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 38



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #13 IMPACT	789 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

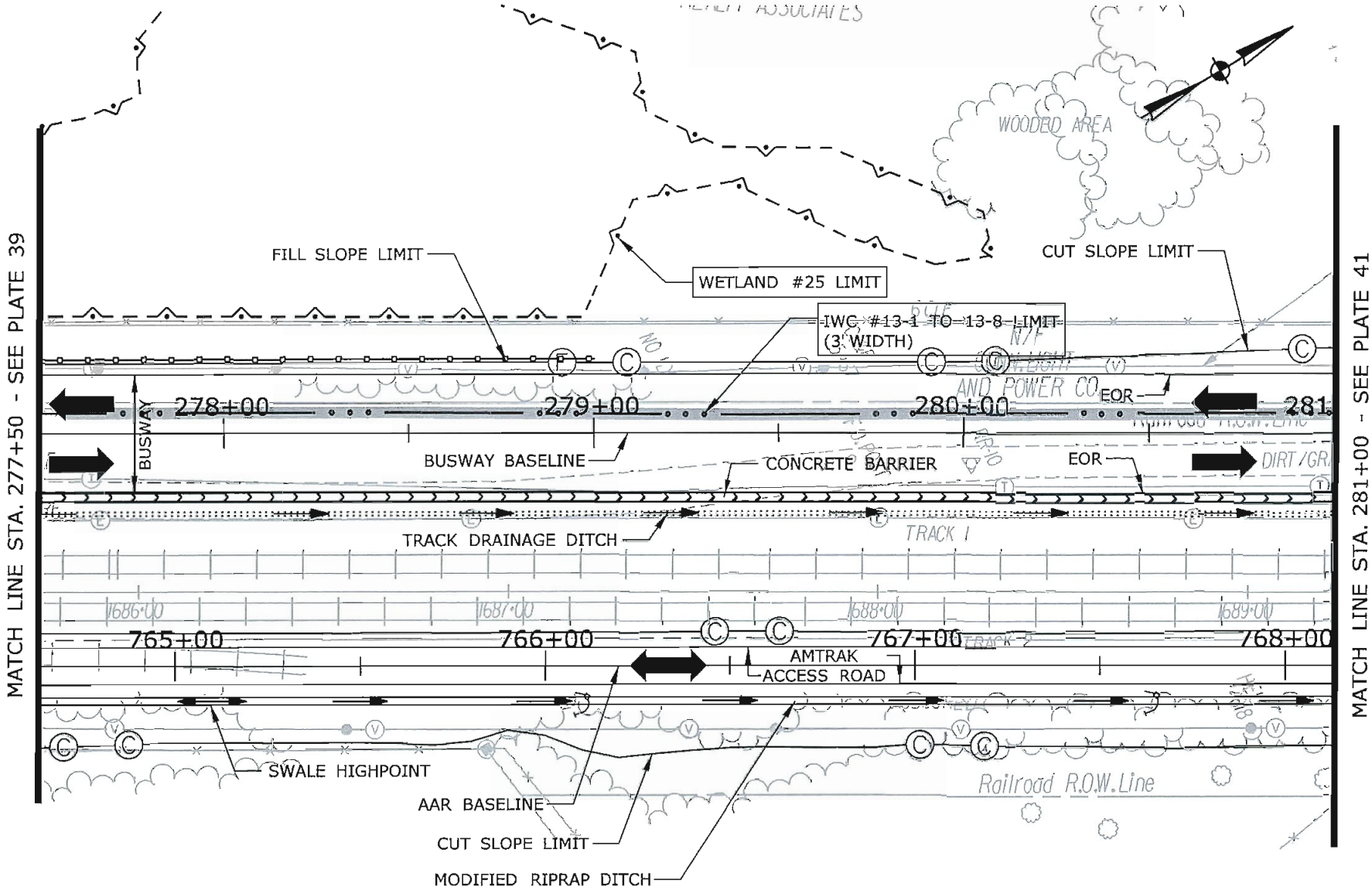
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 39



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #13 IMPACT	789 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

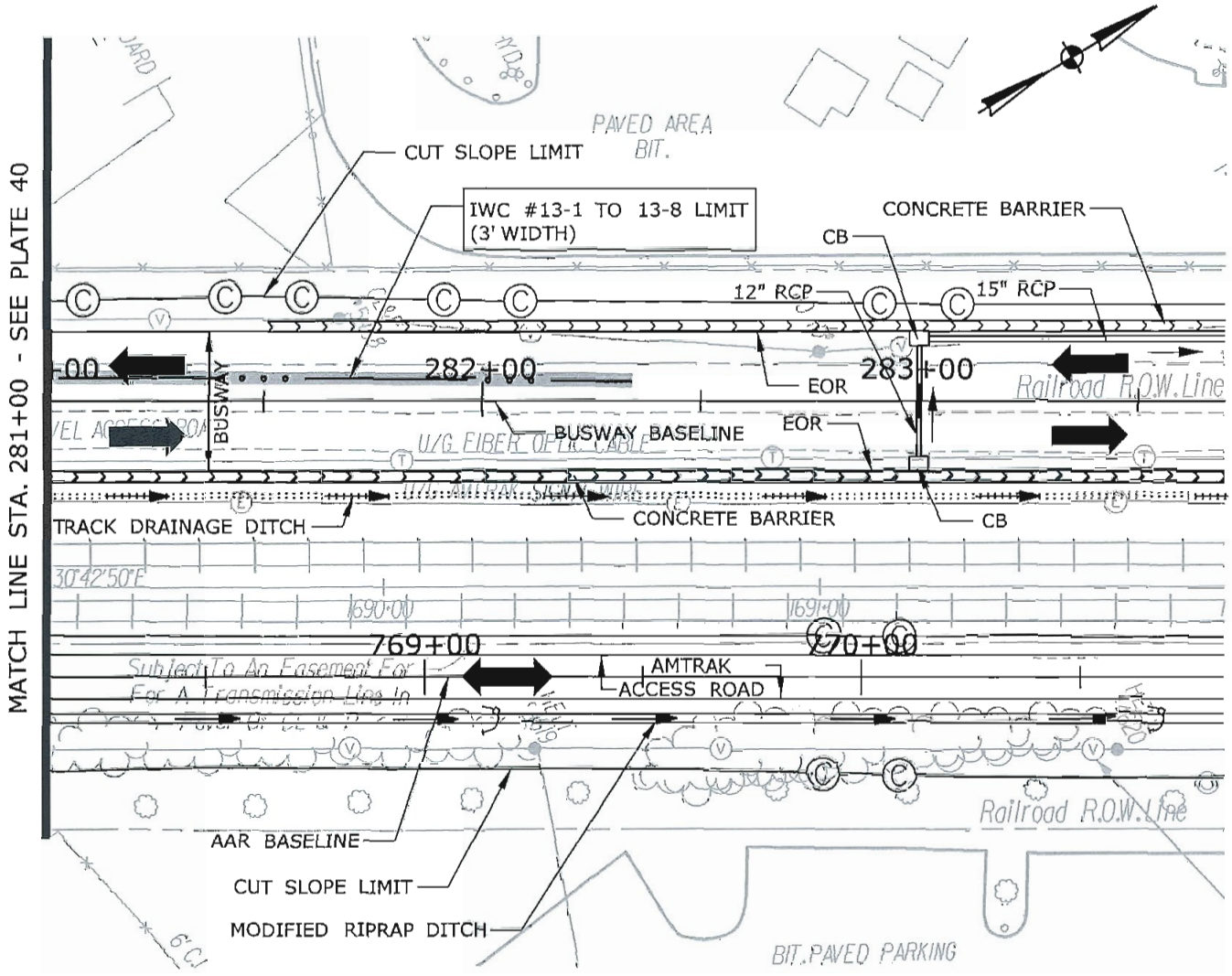
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 40



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #13 IMPACT	789 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

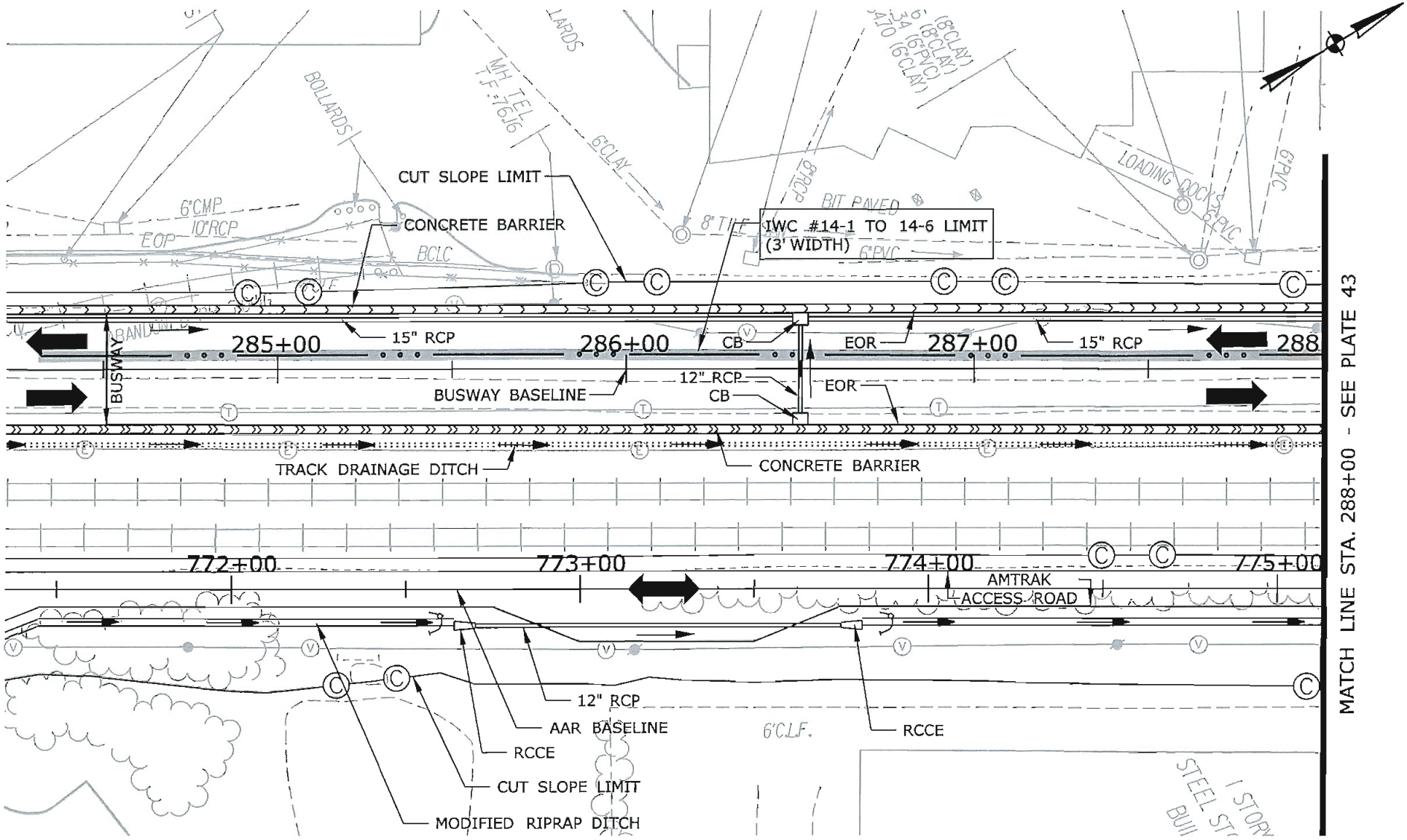
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 41



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #14 IMPACT	817 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

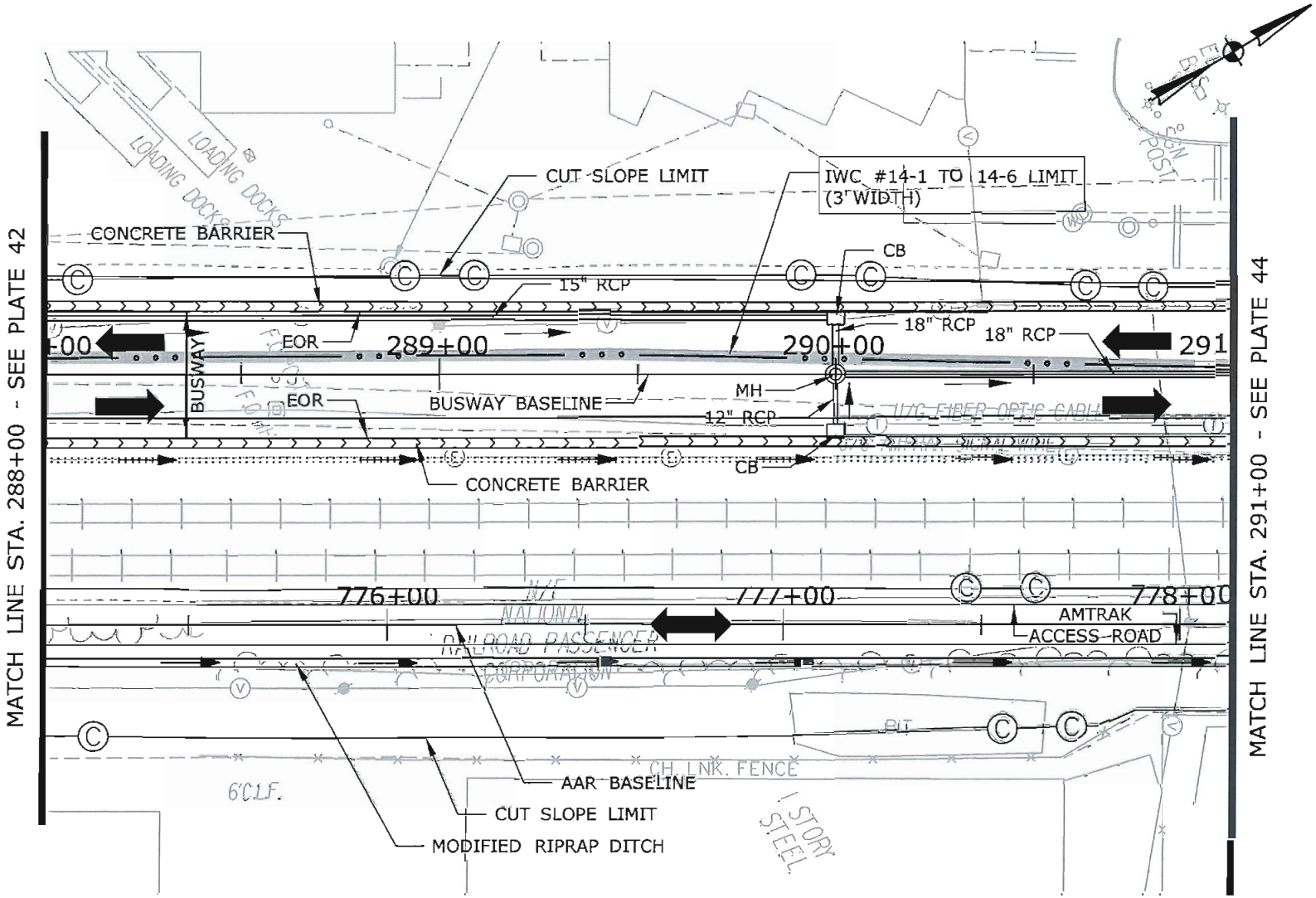
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 42



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #14 IMPACT	817 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

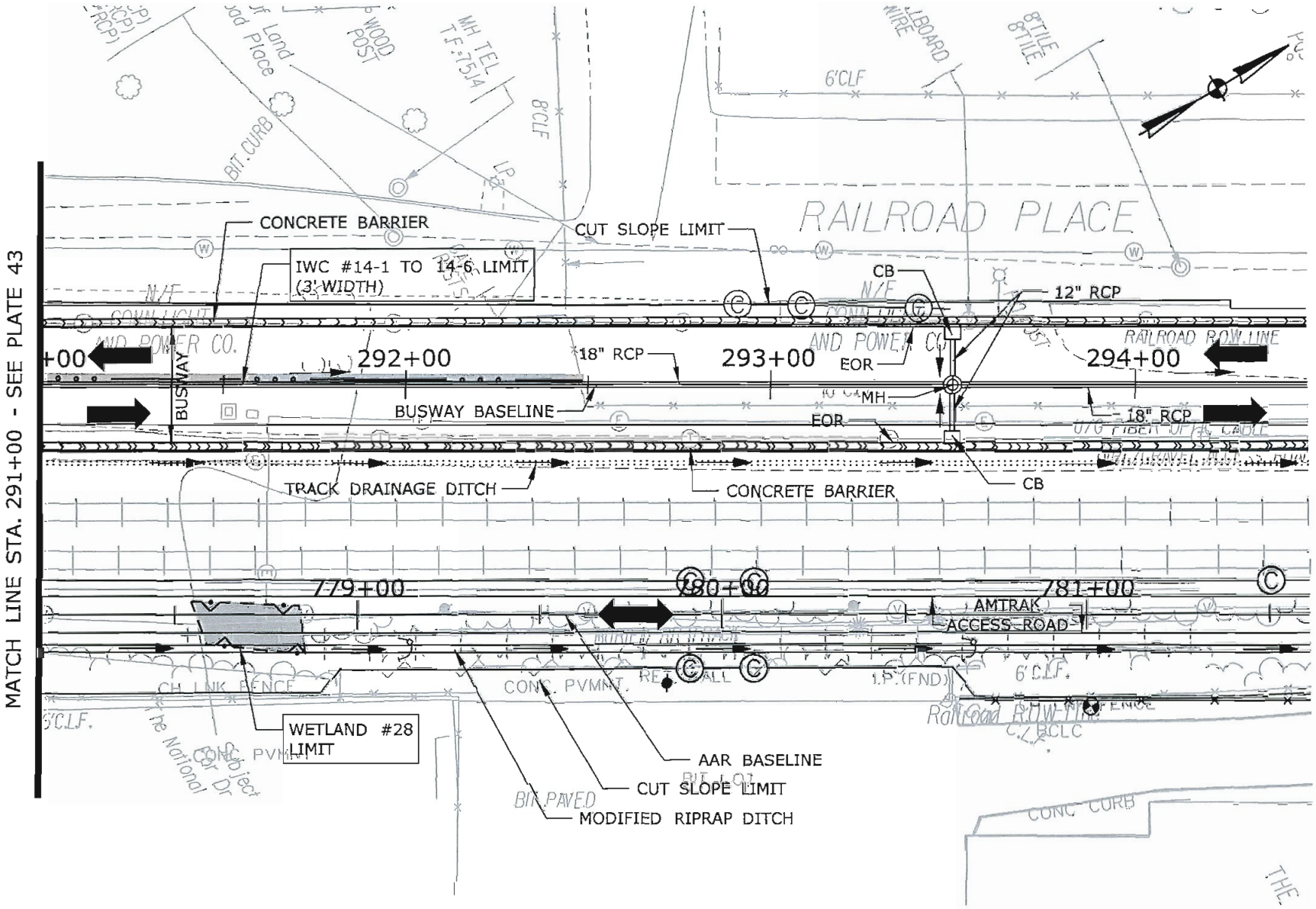
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 43



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #14 IMPACT	817 L.F.
PERMANENT WETLAND #28 IMPACT	352 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

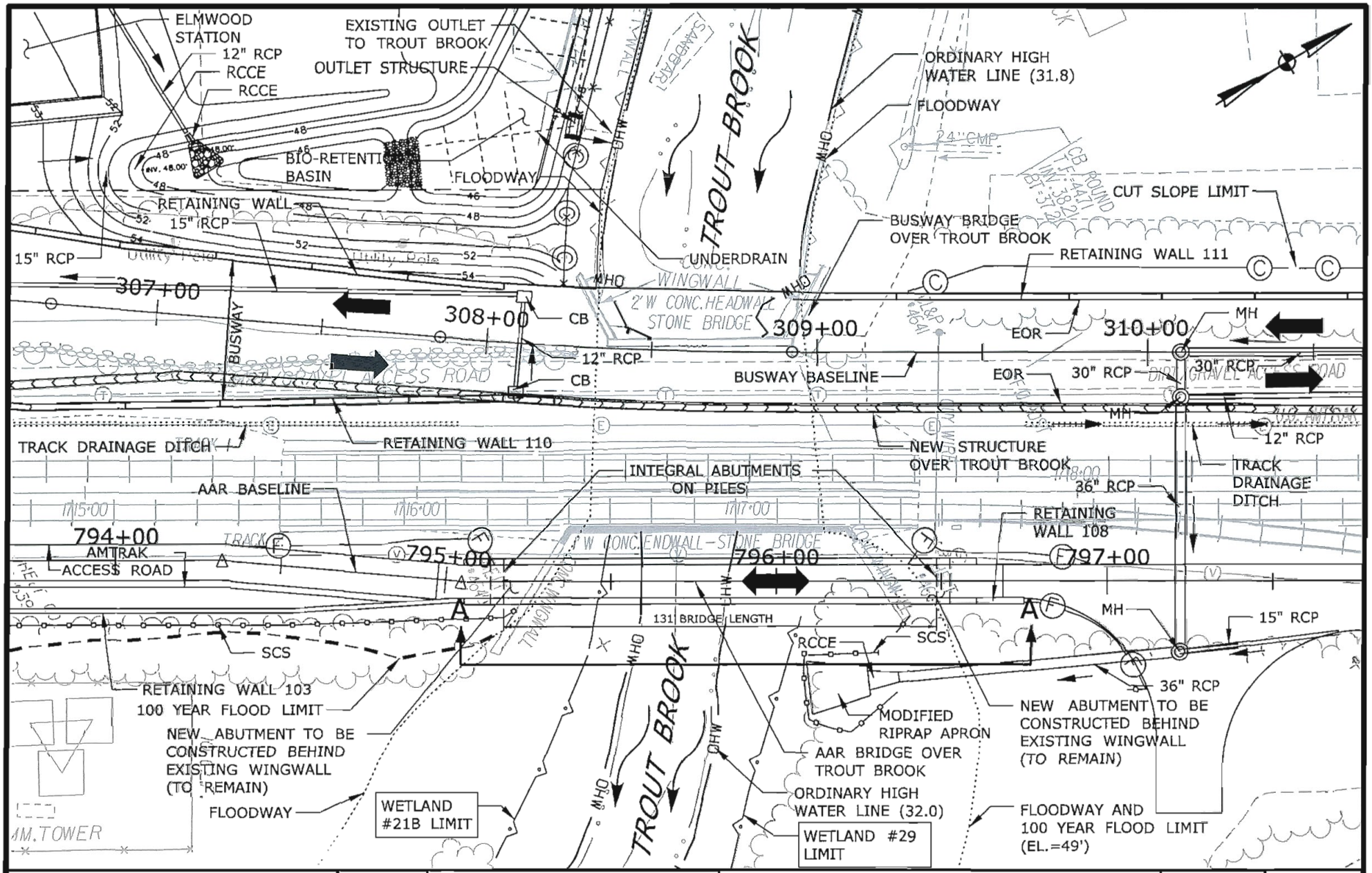
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

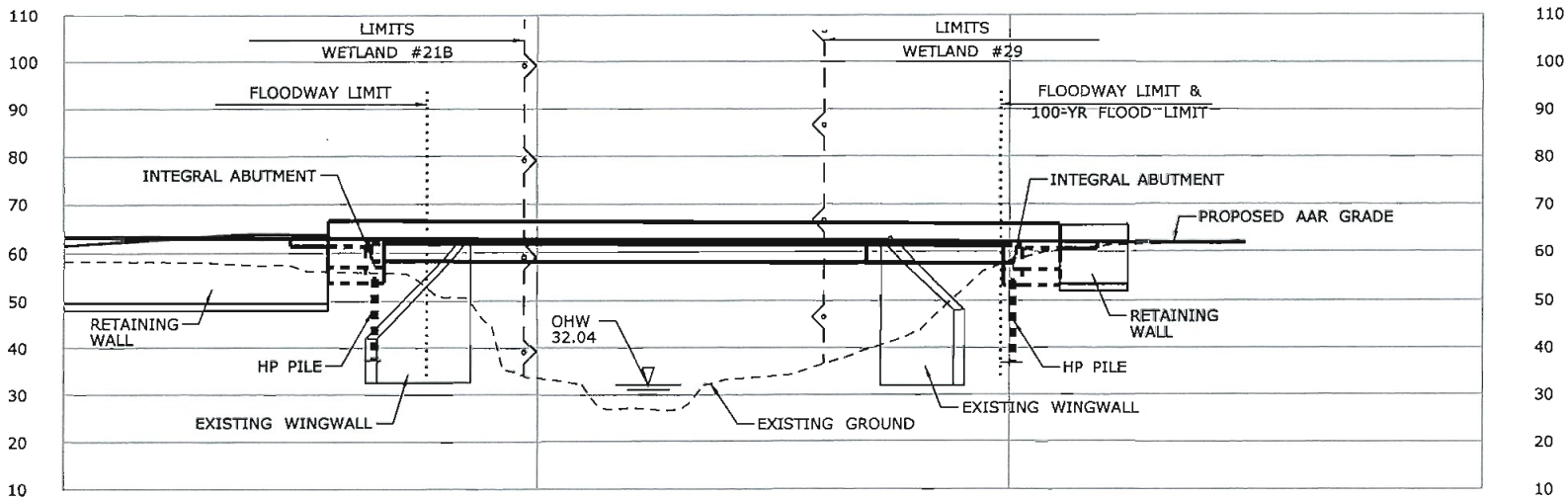
MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 44

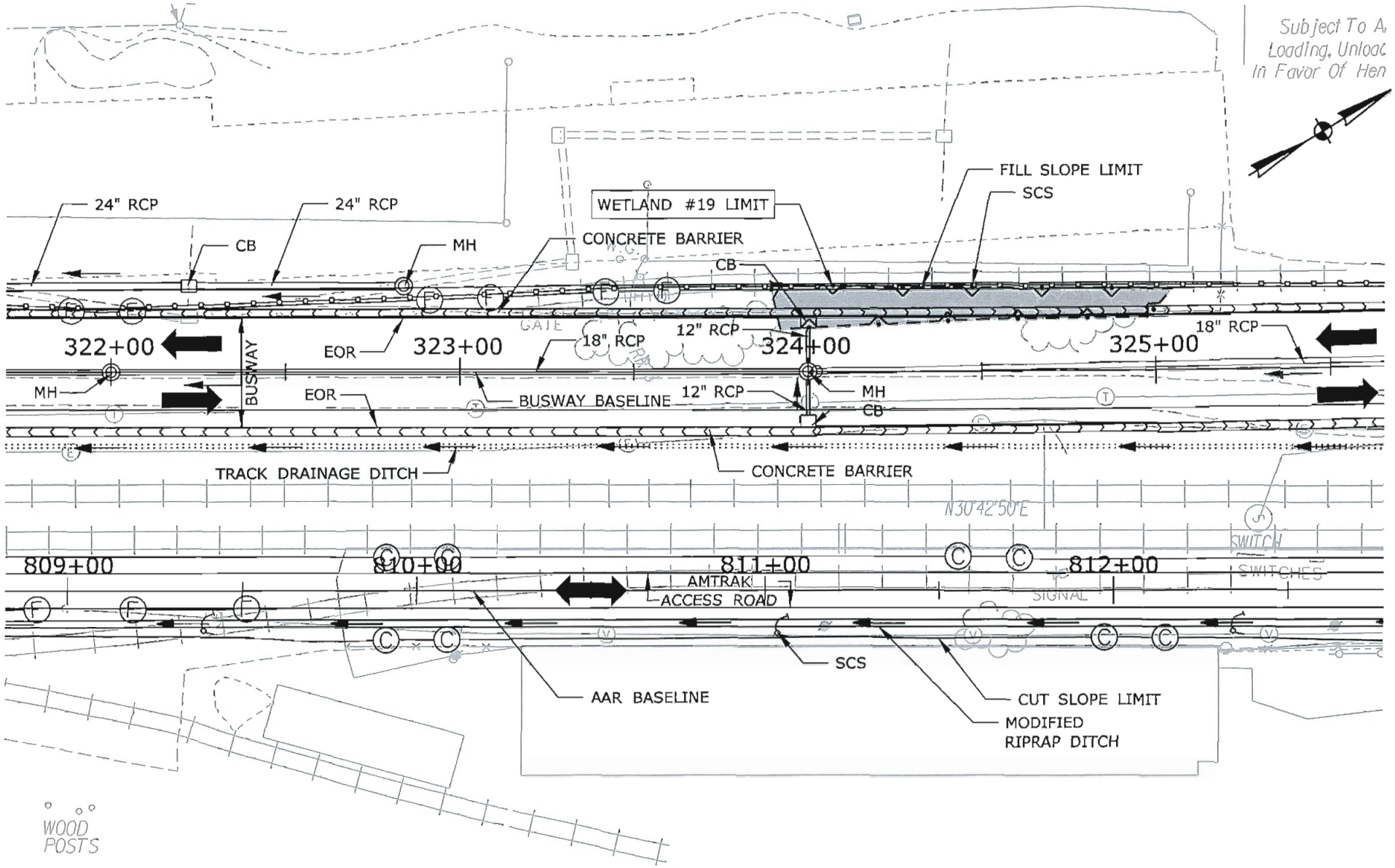


IMPACT SUMMARY	TOTAL IMPACT AREA	STATE PROJECT NO.: 171-305 CONTRACT NO.: H046/H052	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
NO WETLAND IMPACTS		SCALE 1" = 40' 40 20 0 40	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 45



SECTION A-A (SEE PLATE 45)

ELEVATION AT AAR BRIDGE OVER TROUT BROOK LOOKING UPSTREAM (WEST)	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=10'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 45A



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #19 IMPACT	1,077 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

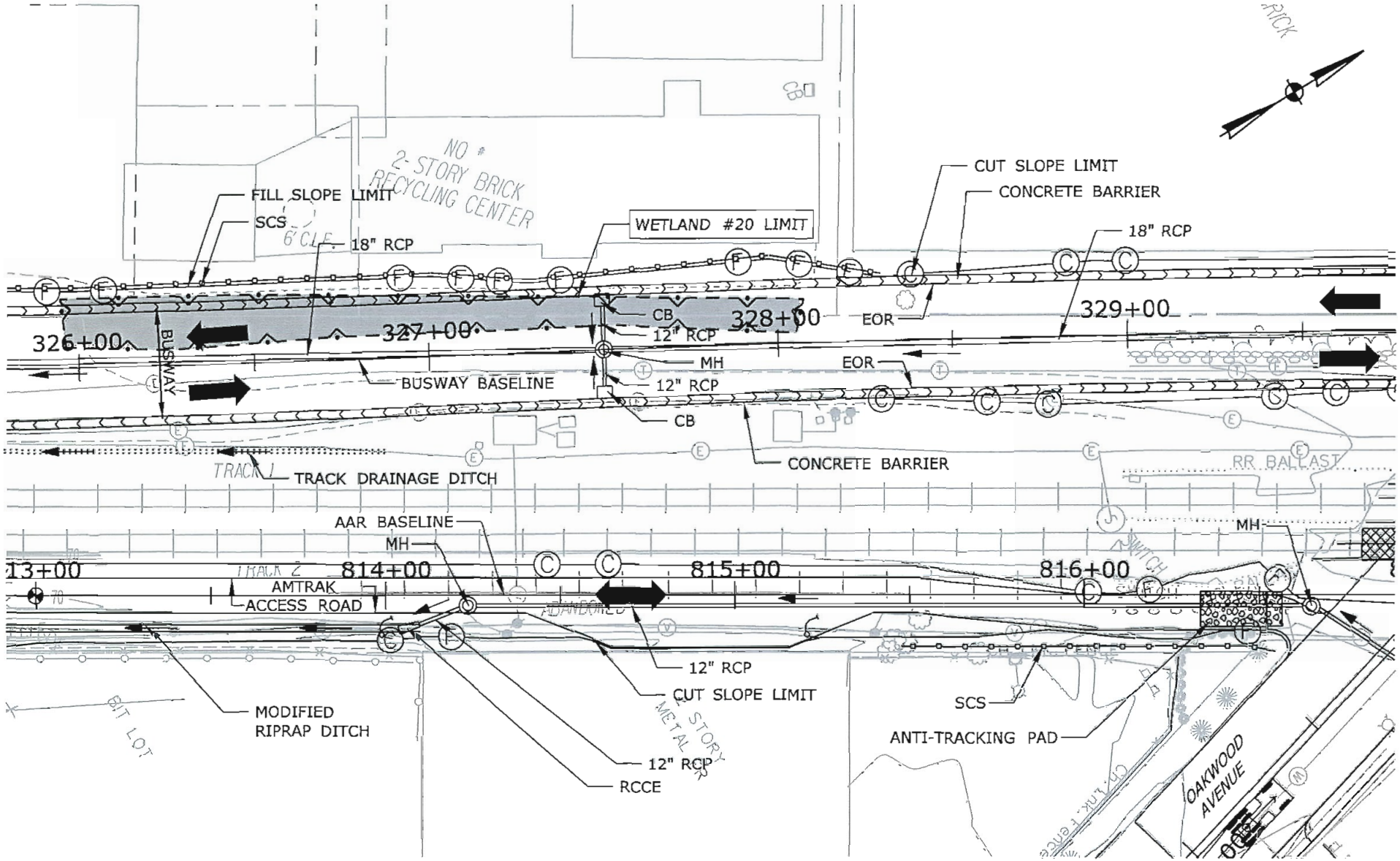
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 46



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #20 IMPACT	2,381 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

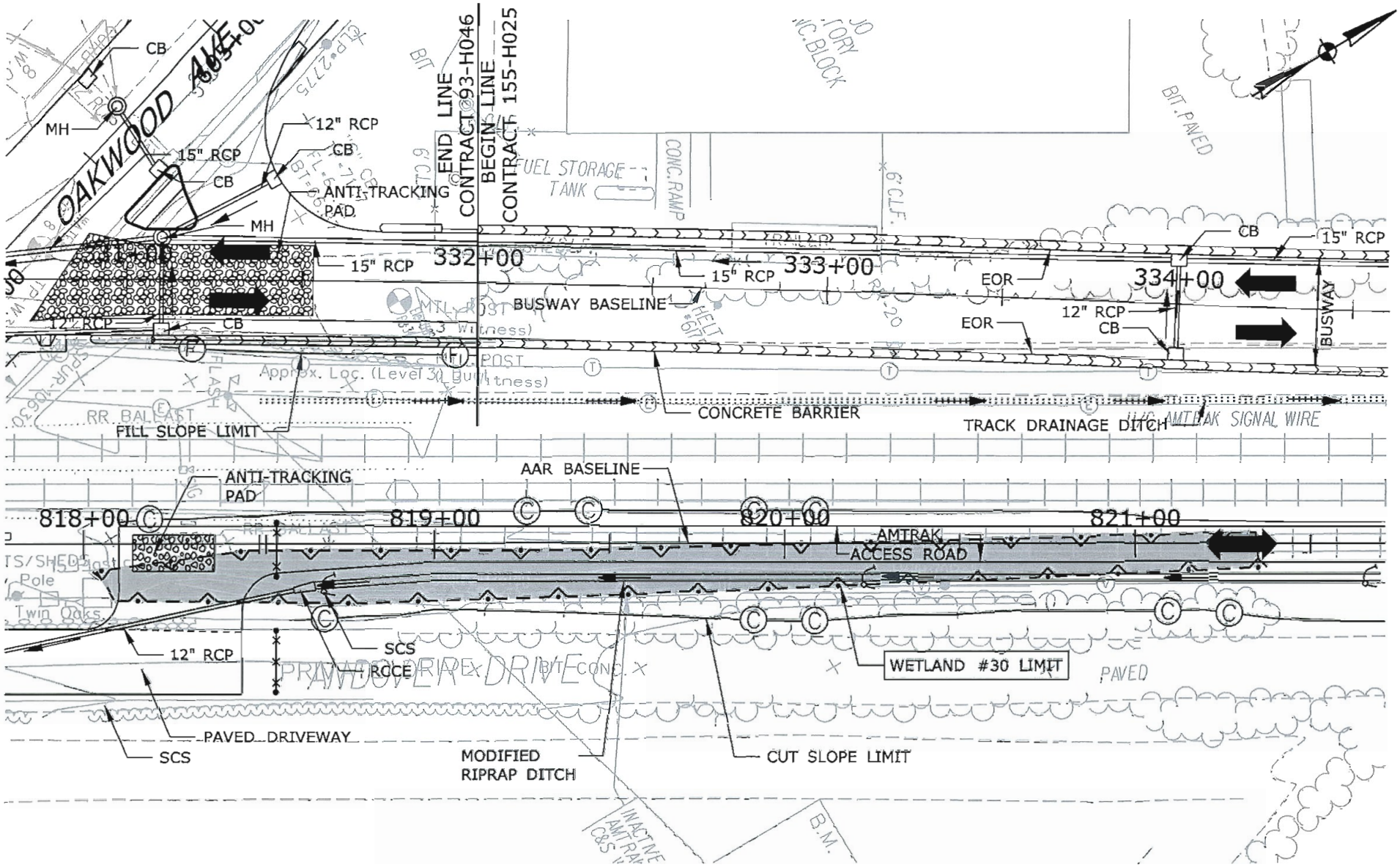
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 47



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #30 IMPACT	4,068 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H046/H025/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

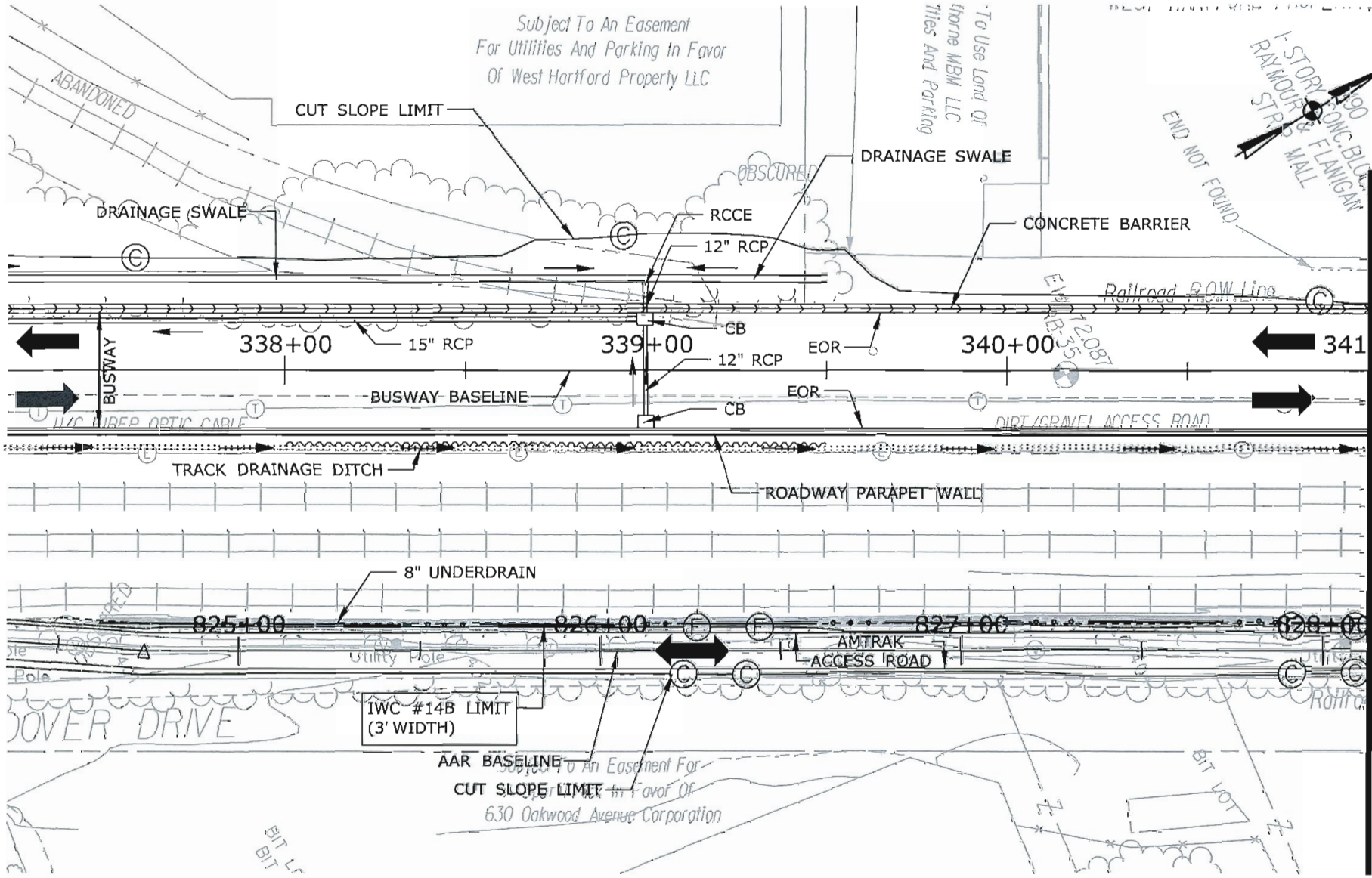
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 48



LEGEND	TOTAL IMPACT AREA
PERMANENT IWC #14B IMPACT	742 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

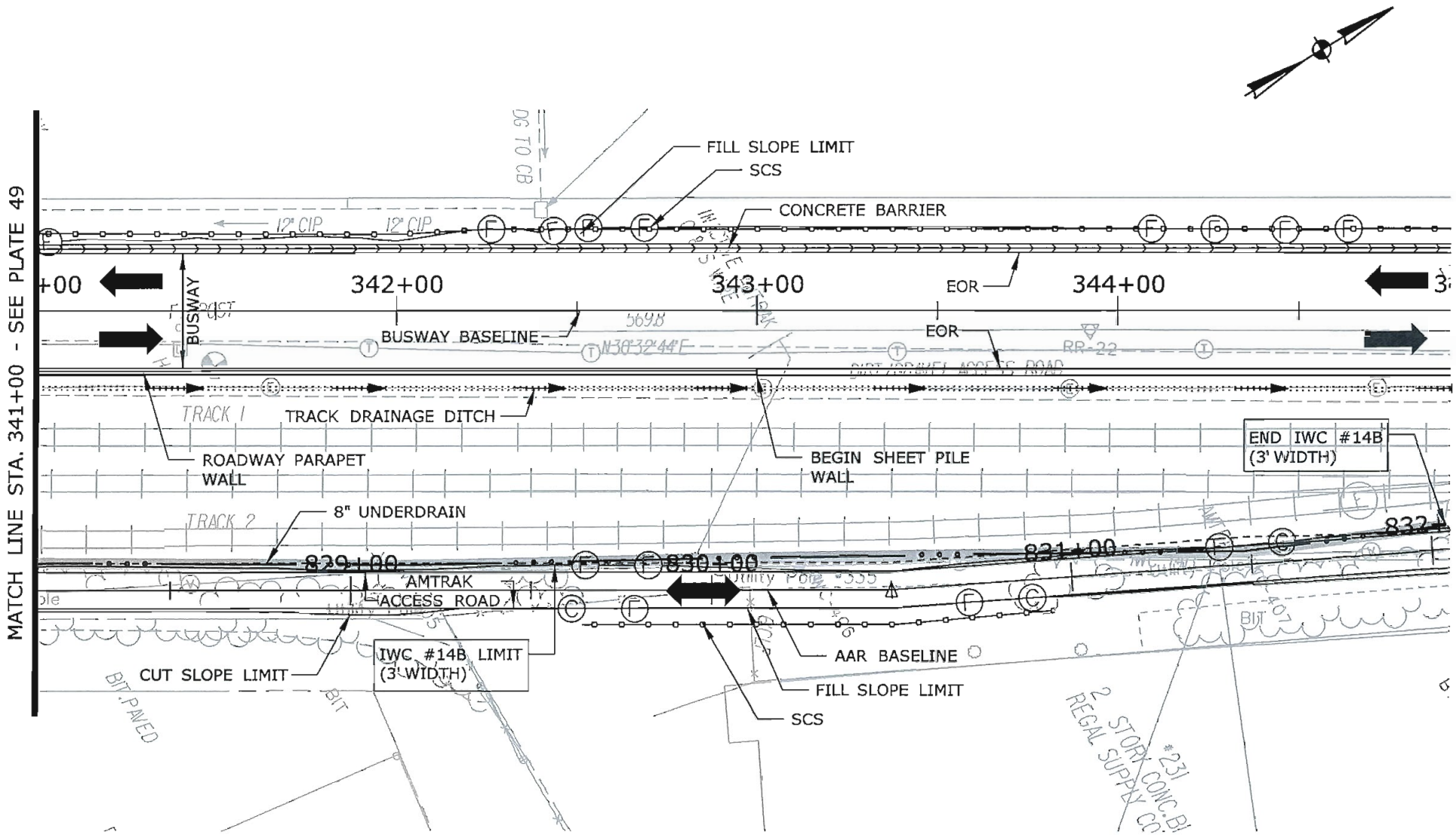
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 49



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #14B IMPACT	742 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

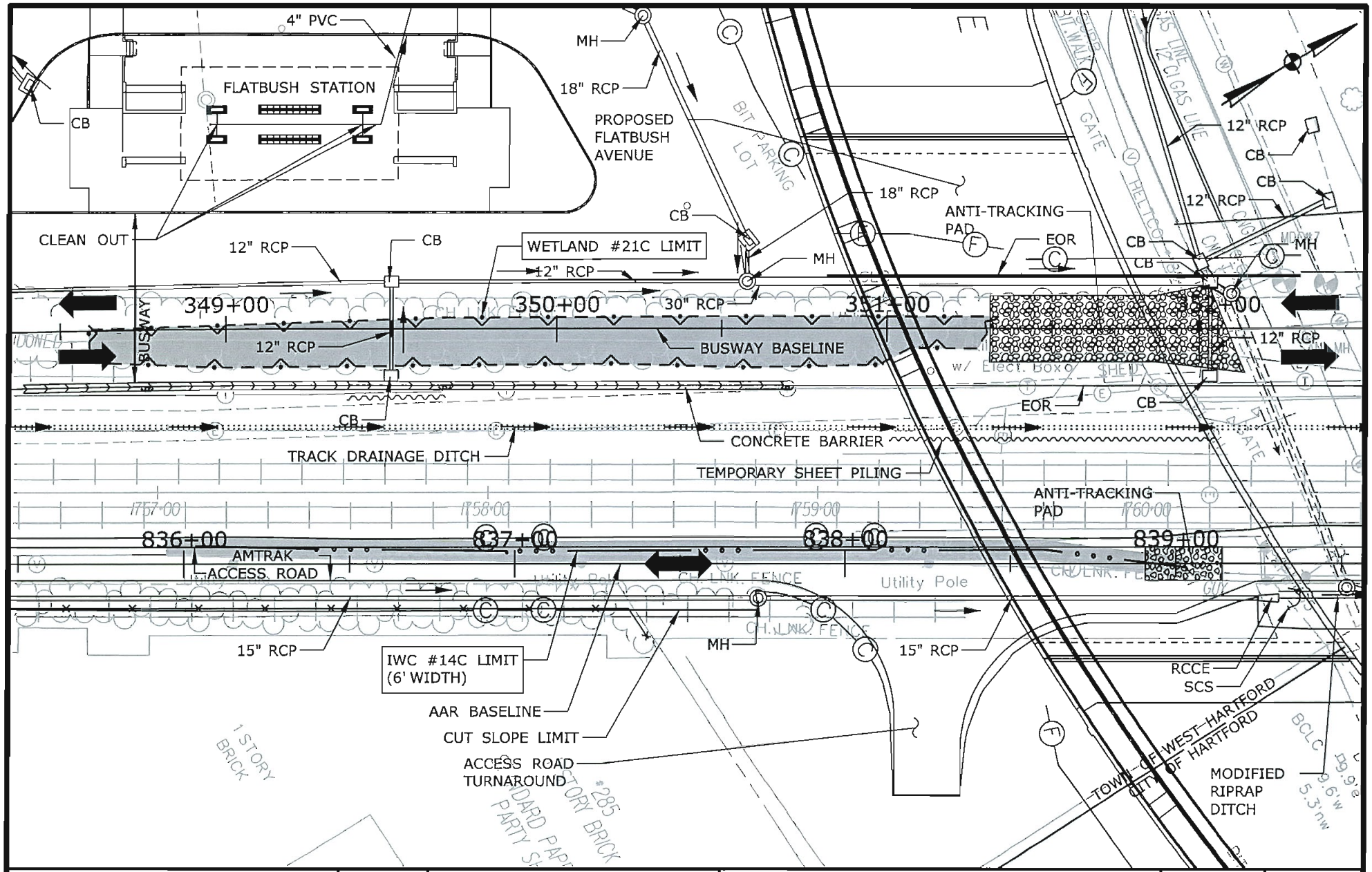
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 50



LEGEND	TOTAL IMPACT AREA
PERMANENT WETLAND #21C IMPACT	3,637 S.F.
PERMANENT IWC #14C IMPACT	309 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

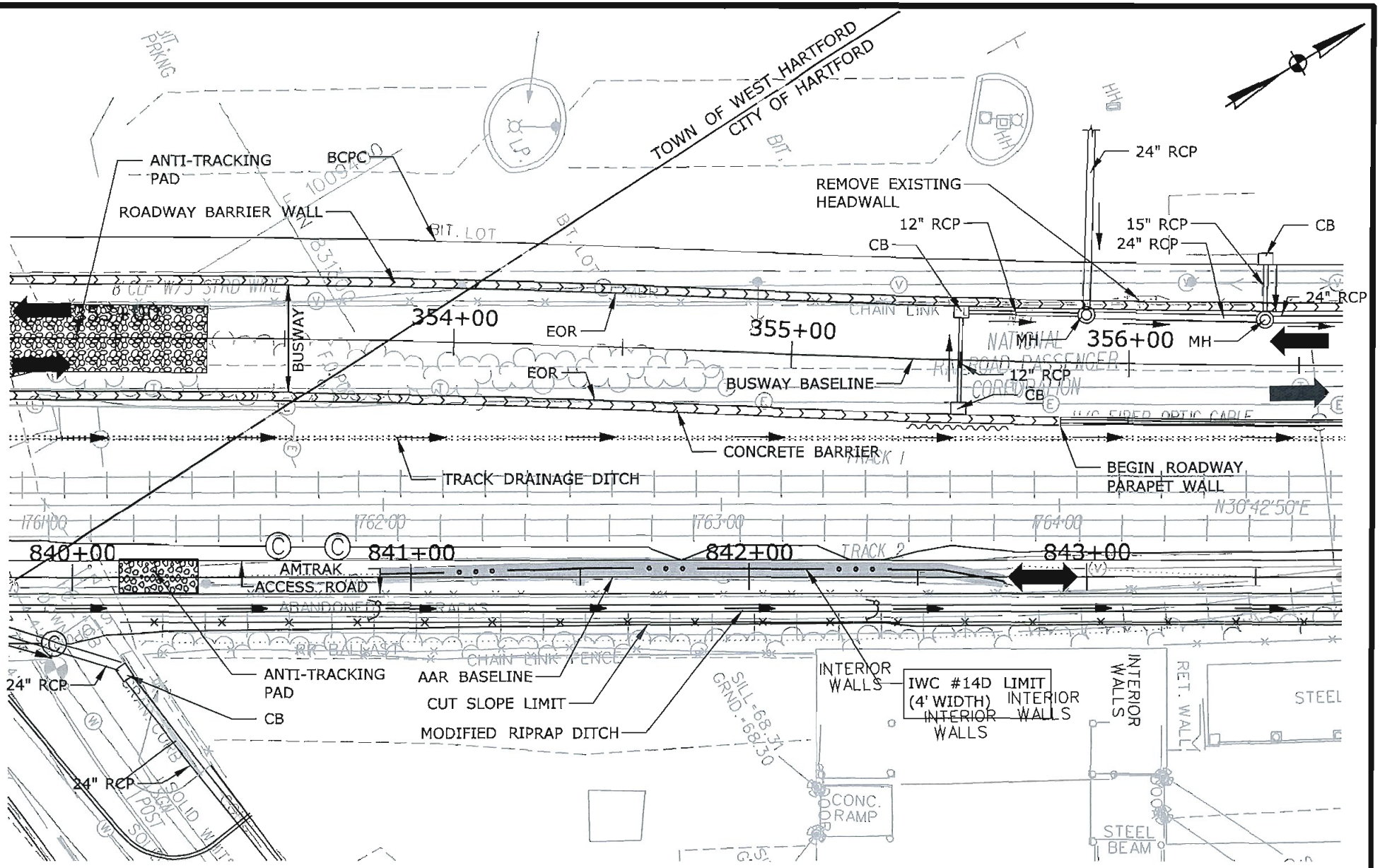
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 51



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #14D IMPACT	185 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

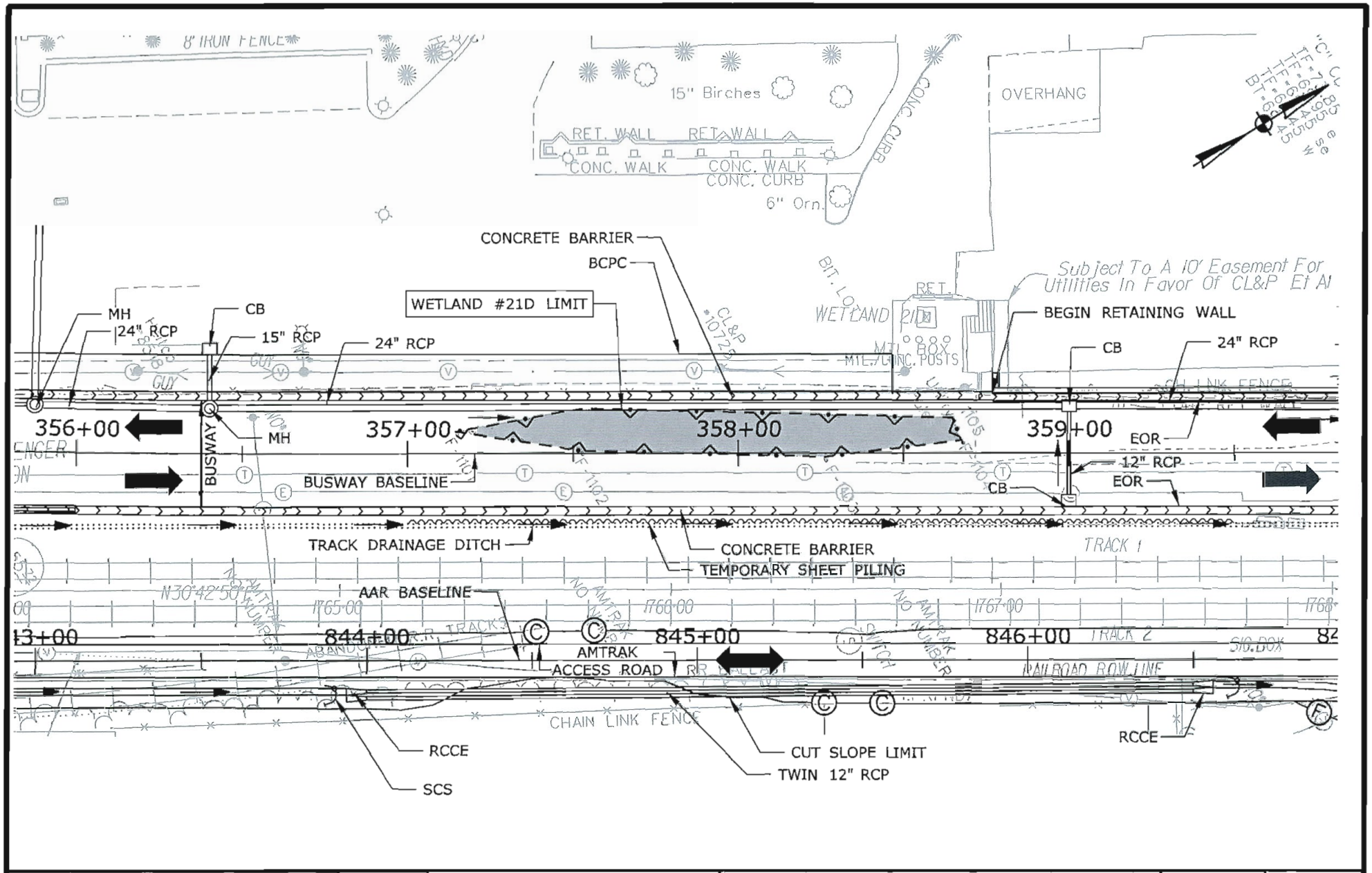
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 52



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #21D IMPACT	1,570 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

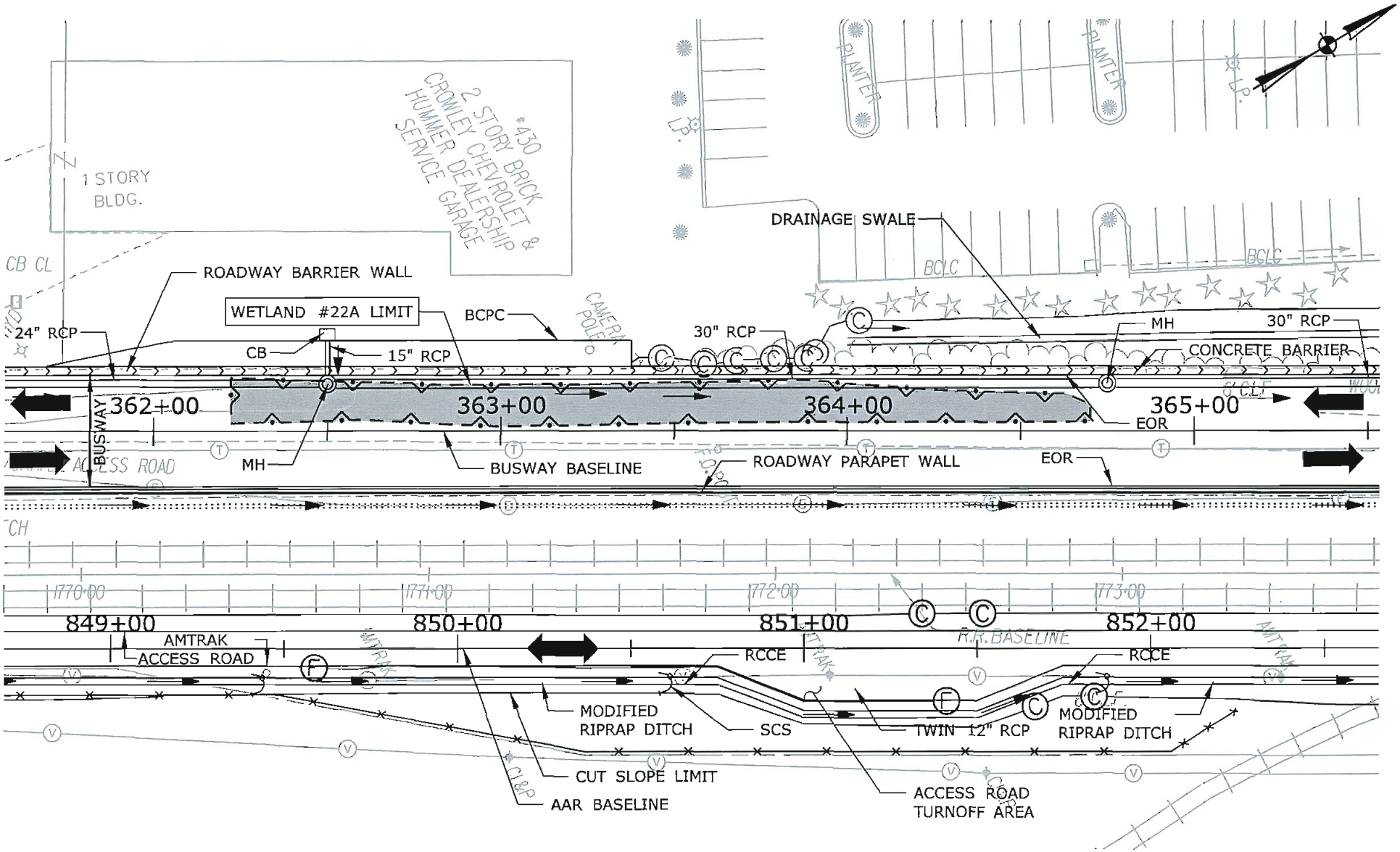
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 53



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #22A IMPACT	2,691 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

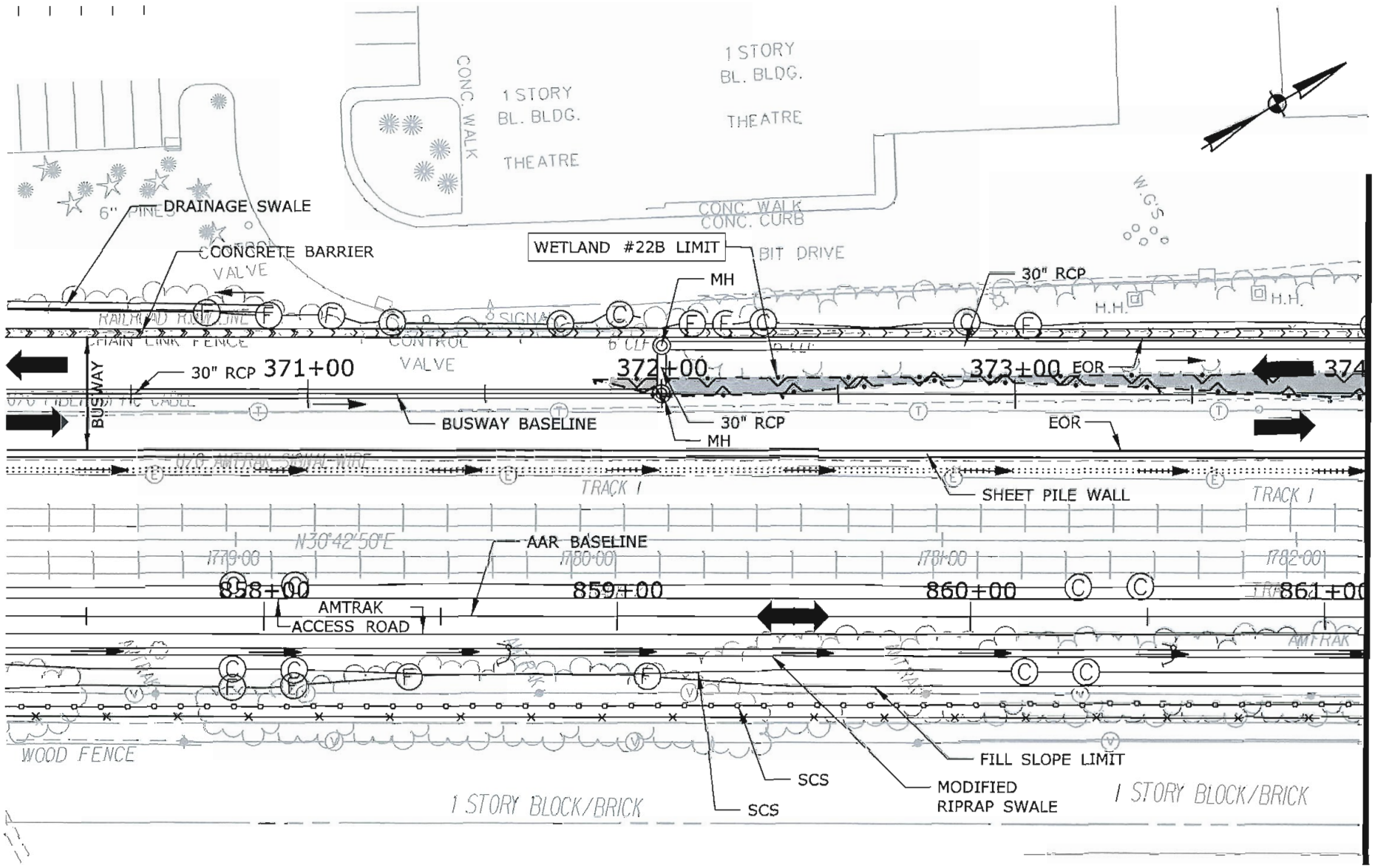
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 54



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #22B IMPACT	2,080 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

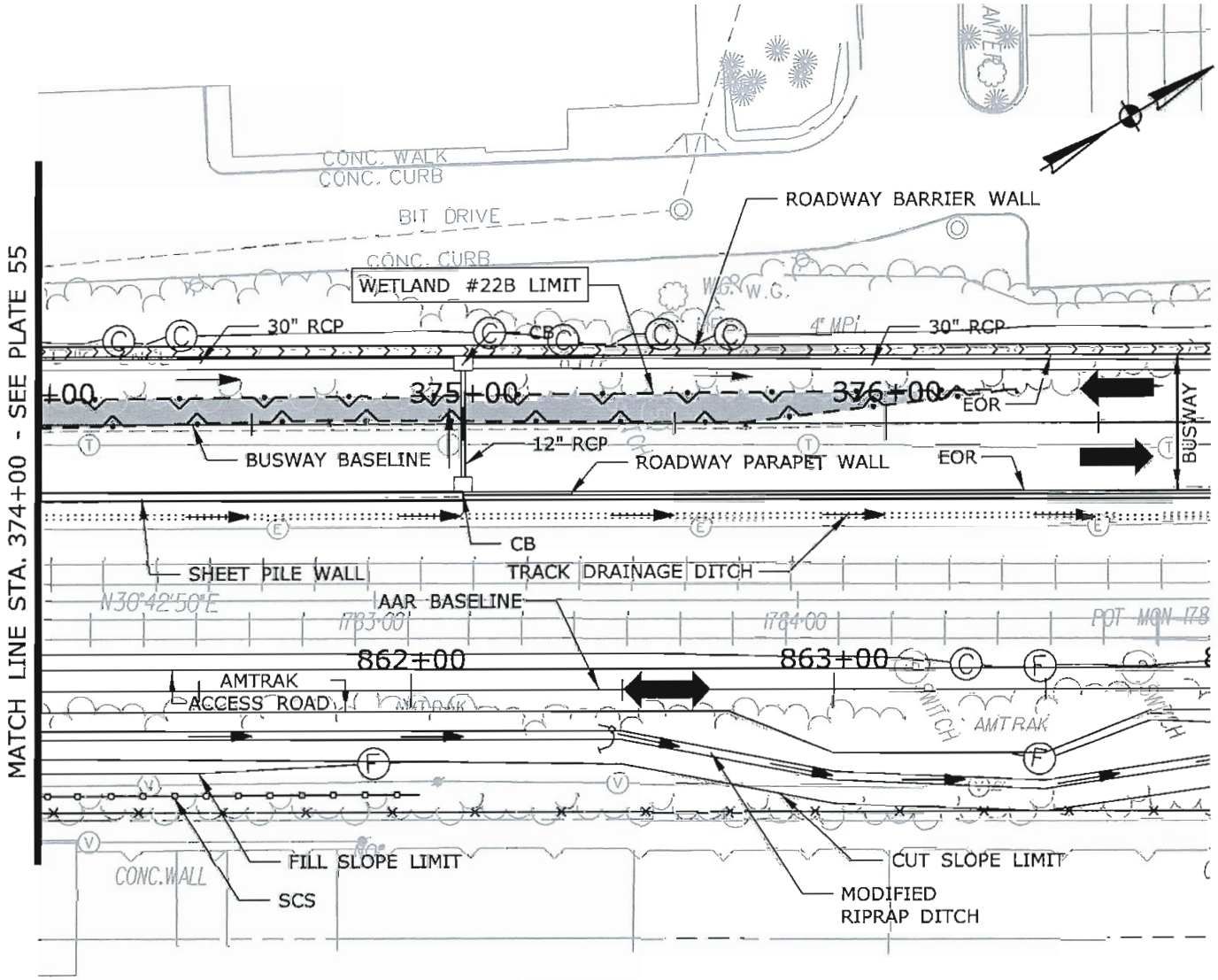
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 55



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #22B IMPACT	2,080 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

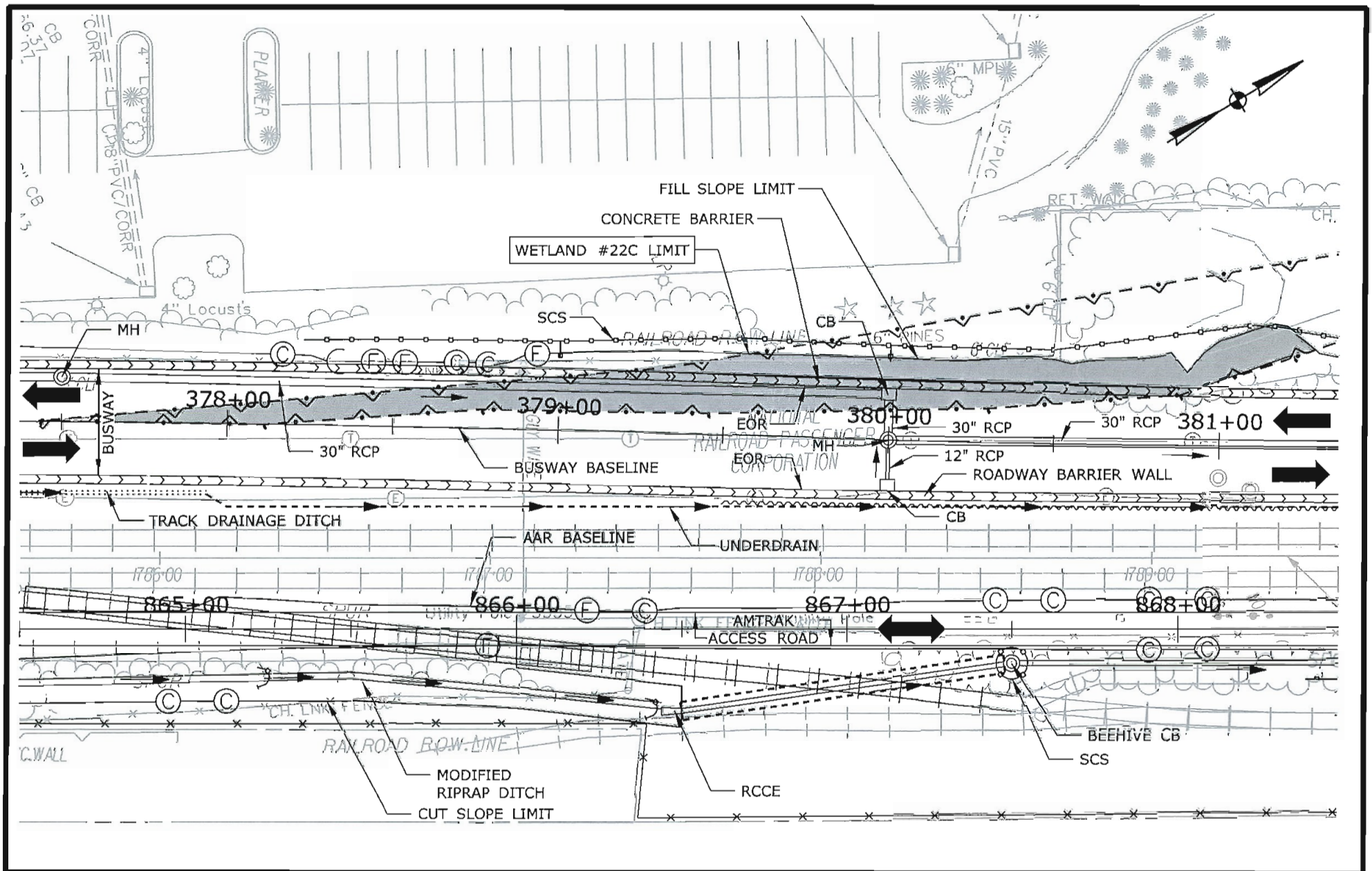
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 56



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT WETLAND #22C IMPACT	4,013 S.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

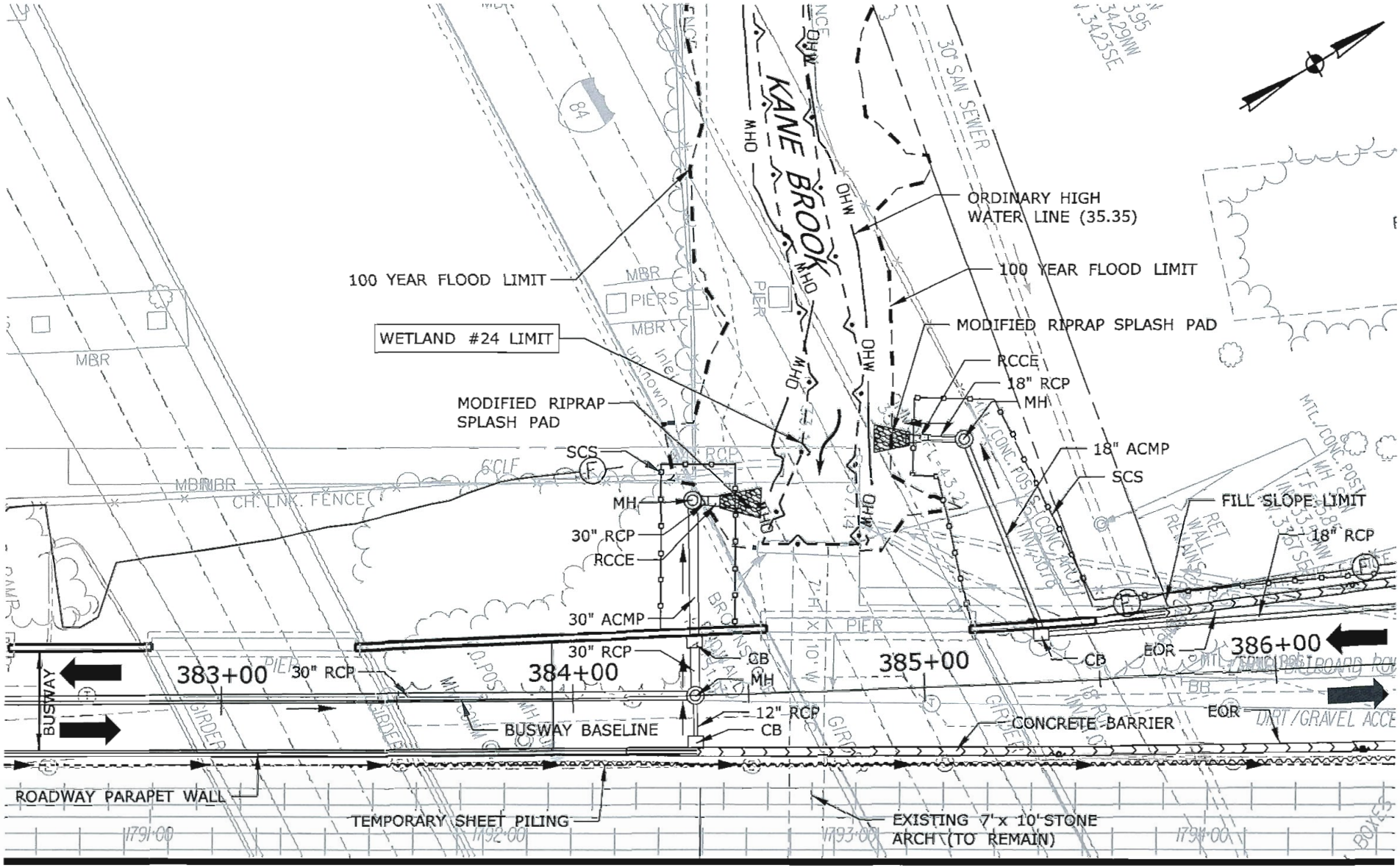
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

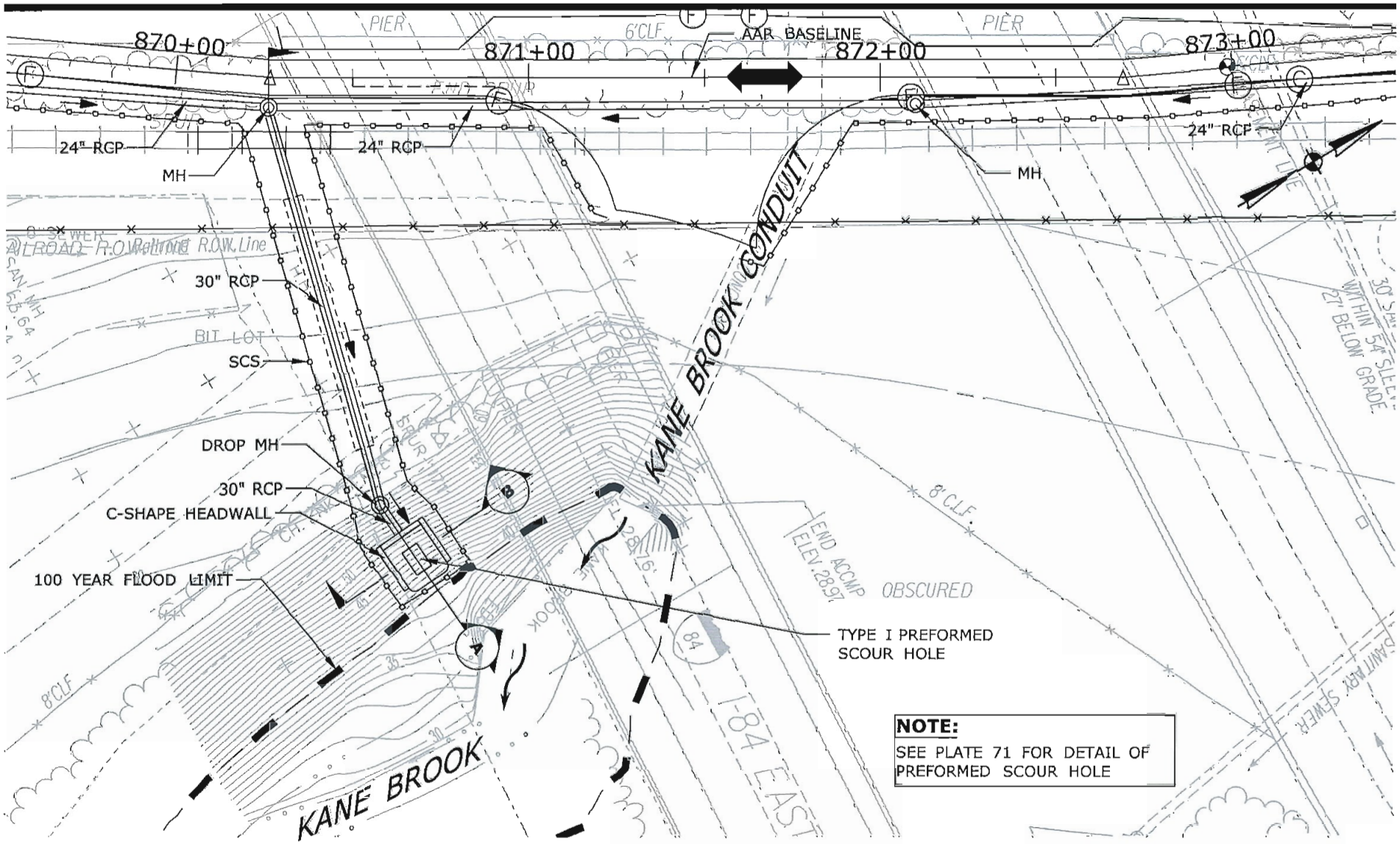
PLATE NO. 57



MATCH LINE - SEE PLATE 58A

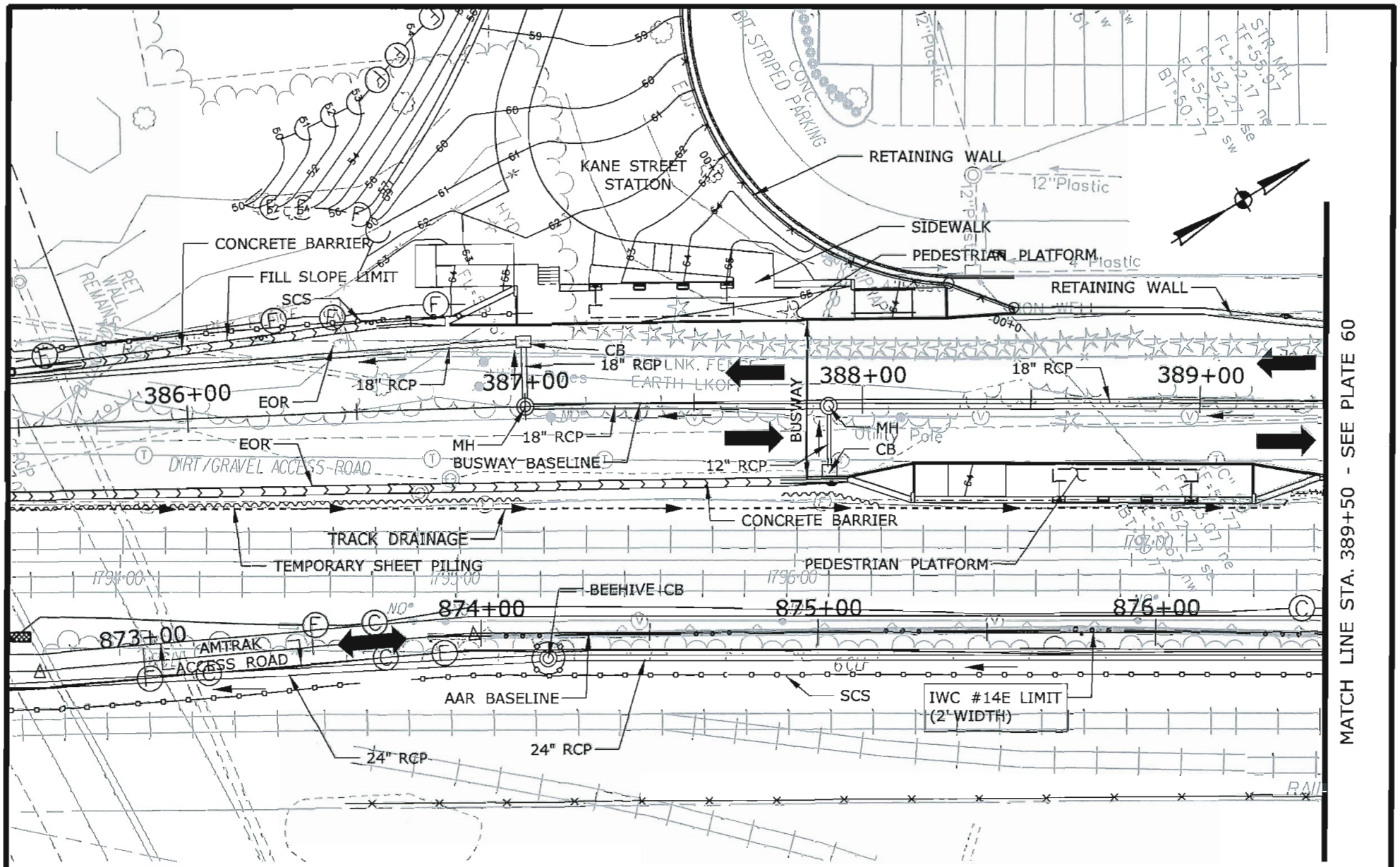
IMPACT SUMMARY	TOTAL IMPACT AREA	STATE PROJECT NO.: 171-305 CONTRACT NO.: H025/H052	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
NO WETLAND IMPACTS		SCALE 1" = 40' 40 20 0 40	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 58

MATCH LINE - SEE PLATE 58



NOTE:
SEE PLATE 71 FOR DETAIL OF PREFORMED SCOUR HOLE

IMPACT SUMMARY	TOTAL IMPACT AREA	STATE PROJECT NO.: 171-305 CONTRACT NO.: H025/H052	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
NO WETLAND IMPACTS		SCALE 1" = 40' 40 20 0 40	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 58A



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #14E IMPACT	501 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H039/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

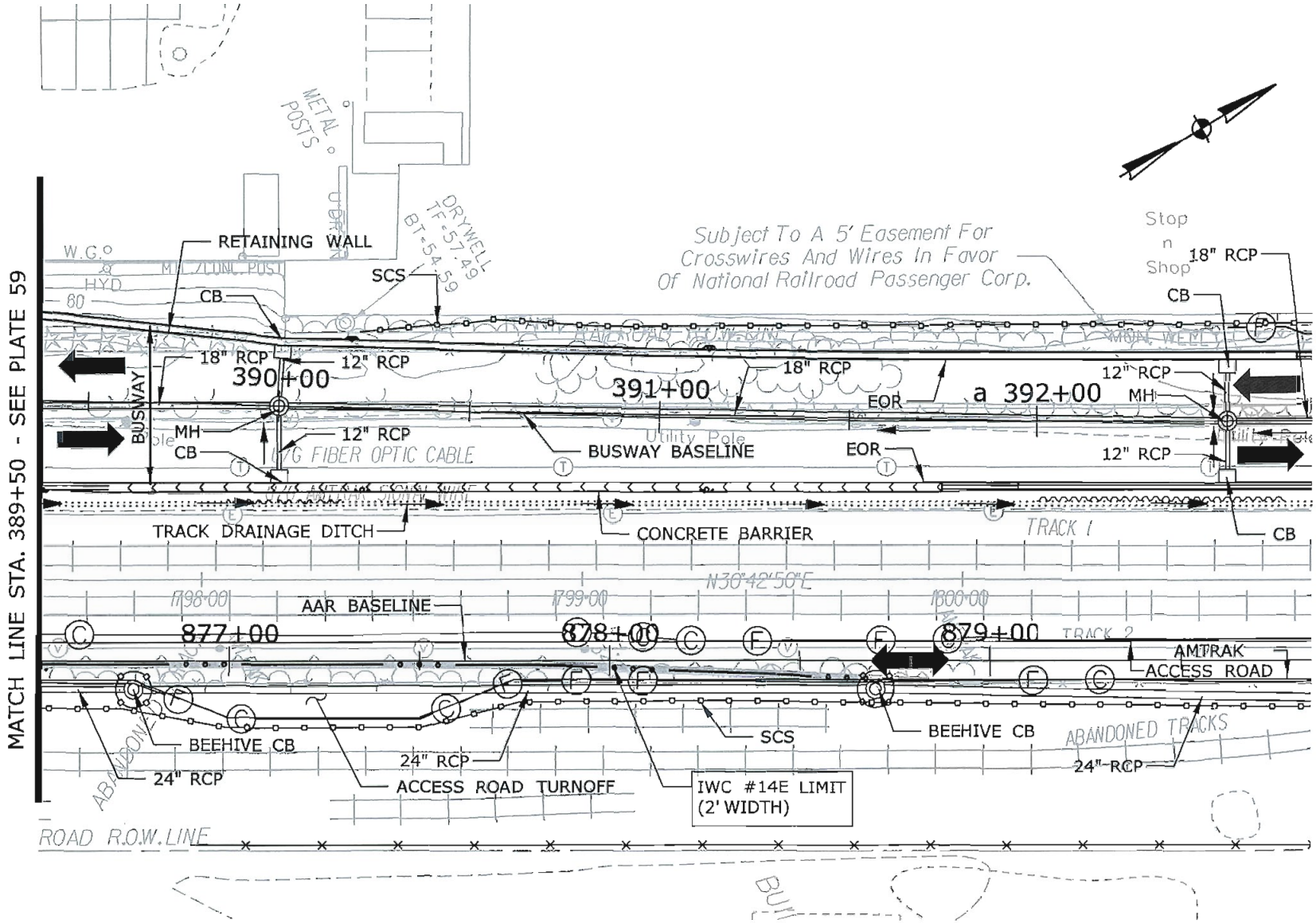
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 59



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #14E IMPACT	501 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H039/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

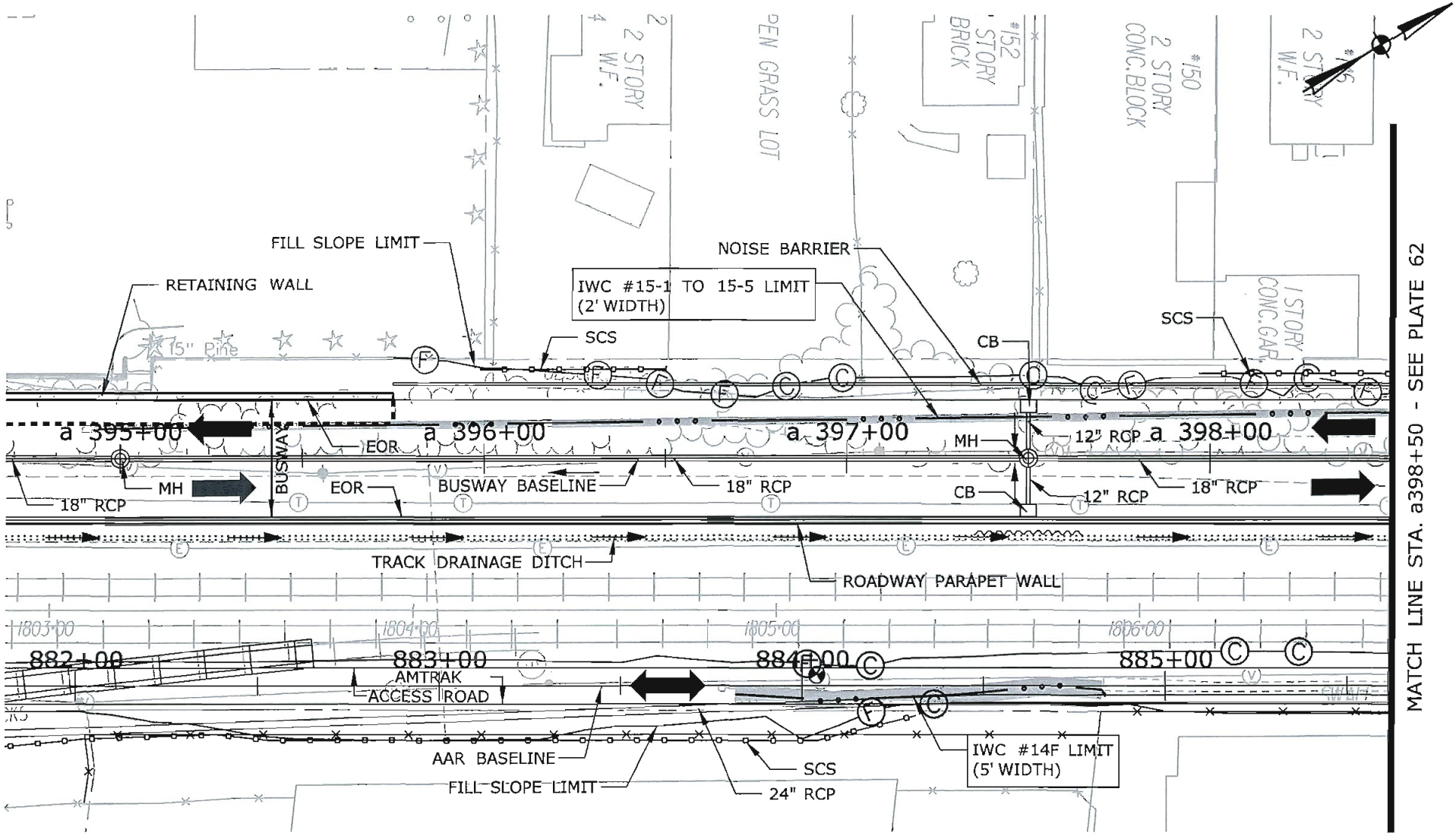
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 60



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #15 IMPACT	754 L.F.
PERMANENT IWC #14F IMPACT	101 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

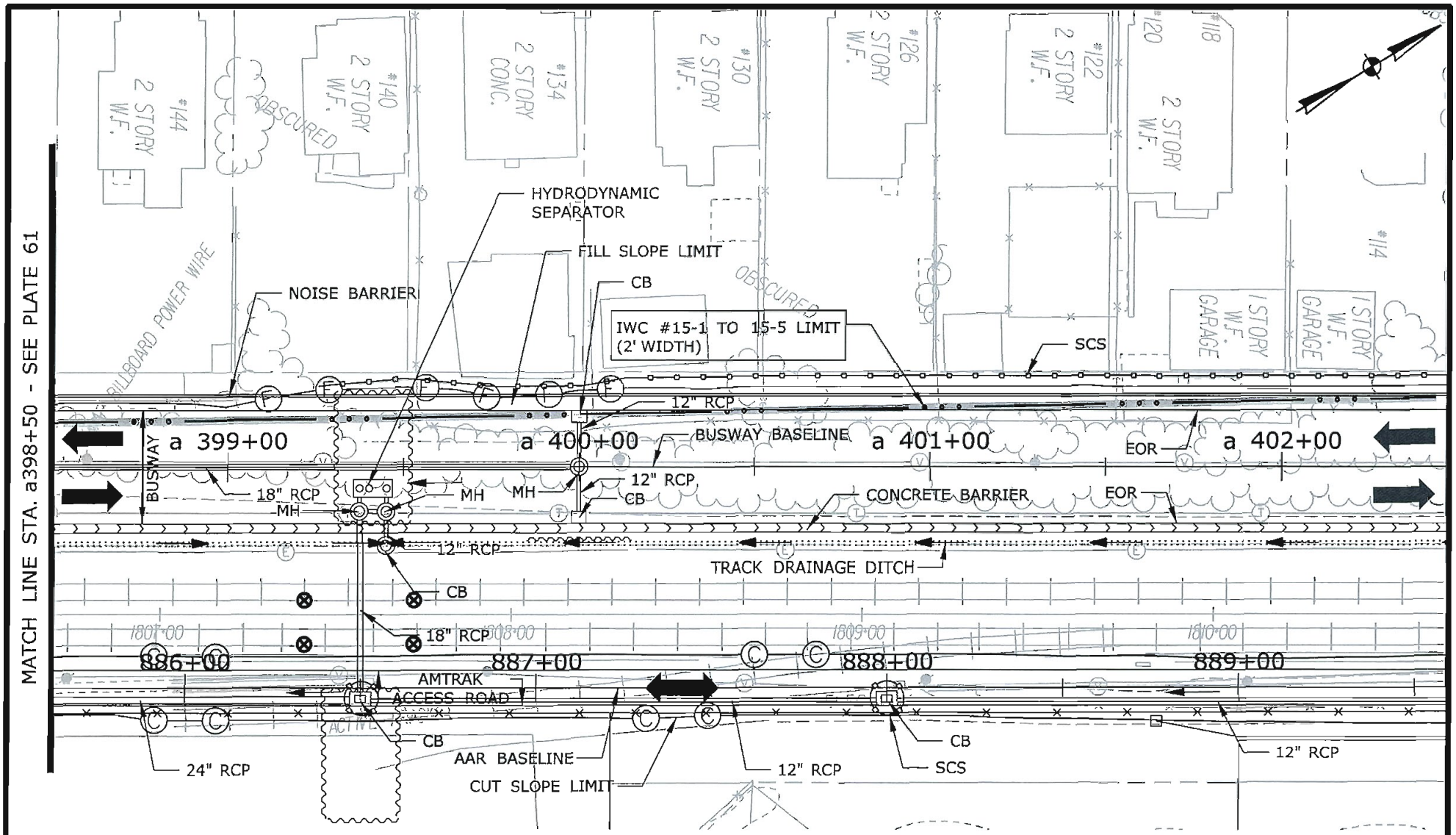
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 61



IMPACT SUMMARY	TOTAL IMPACT AREA
PERMANENT IWC #15 IMPACT	754 L.F.

STATE PROJECT NO.: 171-305
CONTRACT NO.: H025/H052

SCALE 1" = 40'
40 20 0 40

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

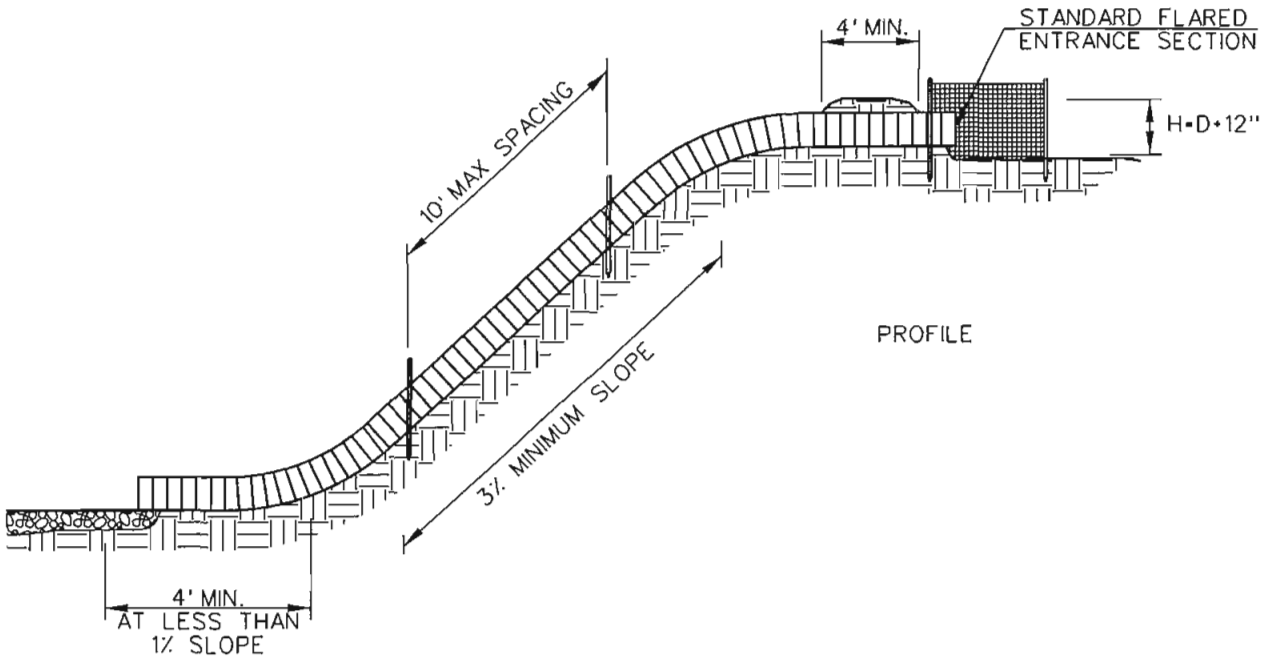
NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

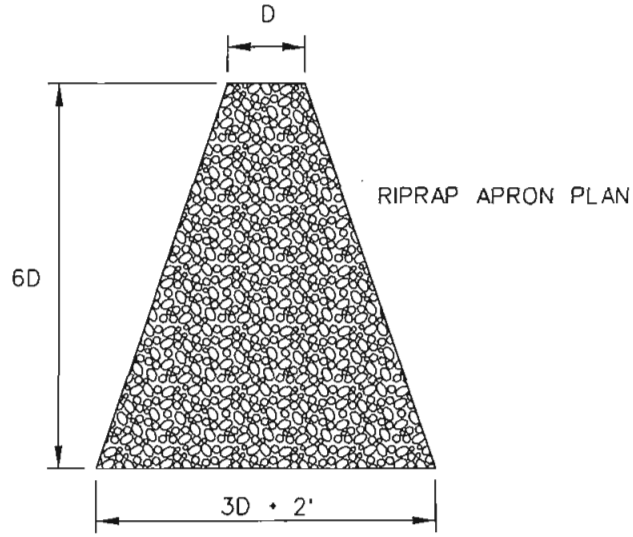
OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 62

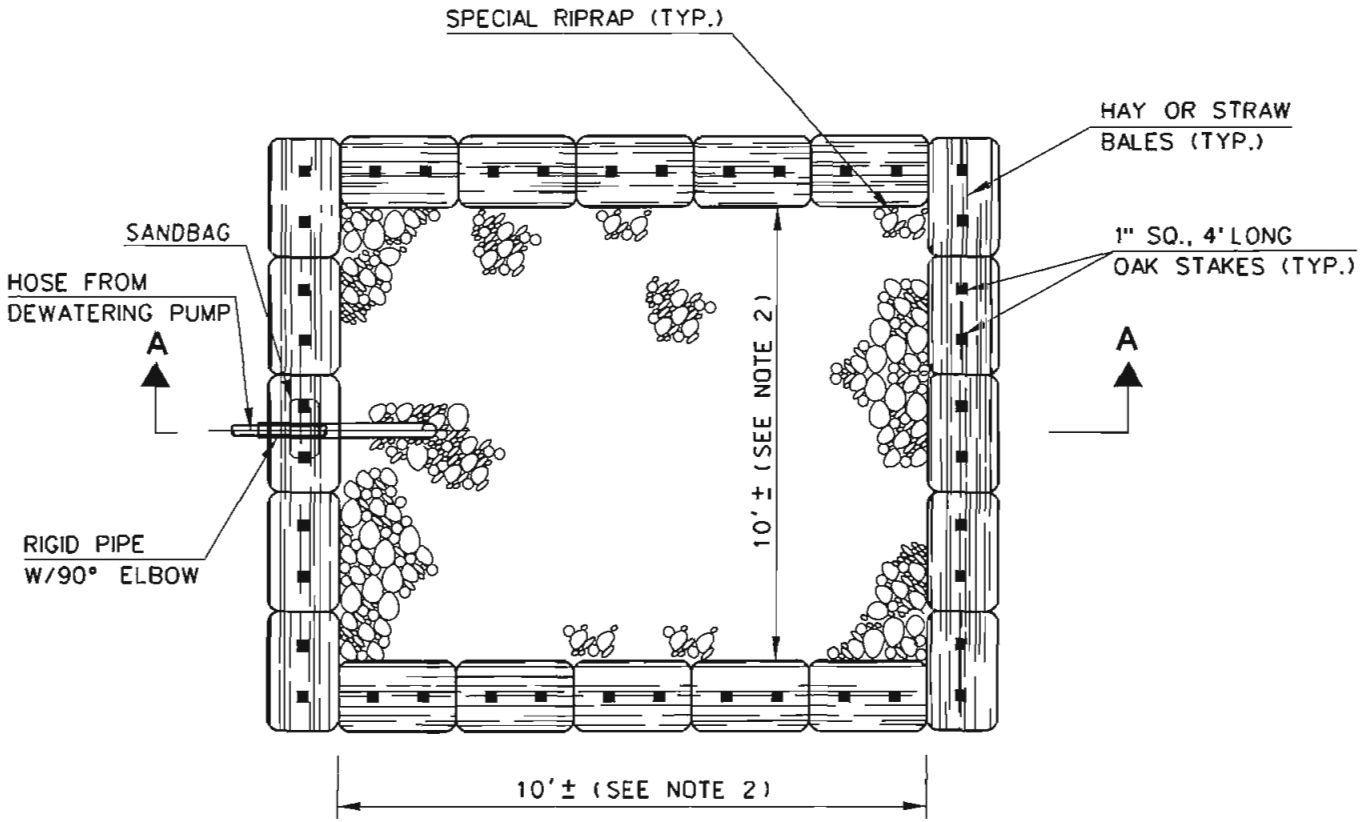




SLOPE DRAIN

1. THE PIPE SLOPE DRAIN SHALL HAVE A SLOPE OF 3% OR STEEPER.
2. TOP OF THE EARTH DIKE OVER THE INLET PIPE AND ALL DIKES CARRYING WATER TO THE PIPE SHALL BE AT LEAST 1 FOOT HIGHER THAN THE TOP OF THE PIPE.
3. ADD 0.3 FOOT TO DIKE HEIGHT FOR SETTLEMENT.
4. SOIL AROUND AND UNDER THE SLOPE PIPE SHALL BE HAND TEMPERED IN 4-INCH LIFTS.
5. THE PIPE SHALL BE PLASTIC OR CORRUGATED METAL PIPE WITH WATERTIGHT 12-INCH WIDE CONNECTING BANDS OR FLANGE CONNECTIONS.
6. PIPE ANCHORS TO BE PLACED AT 10-FOOT MAXIMUM SPACING.
7. RIPRAP TO BE 6 INCHES IN A LAYER AT LEAST 12 INCHES AND PRESSED INTO THE SOIL.
8. PERIODIC INSPECTION AND REQUIRED MAINTENANCE MUST BE PROVIDED AFTER EACH RAIN EVENT.

	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 63



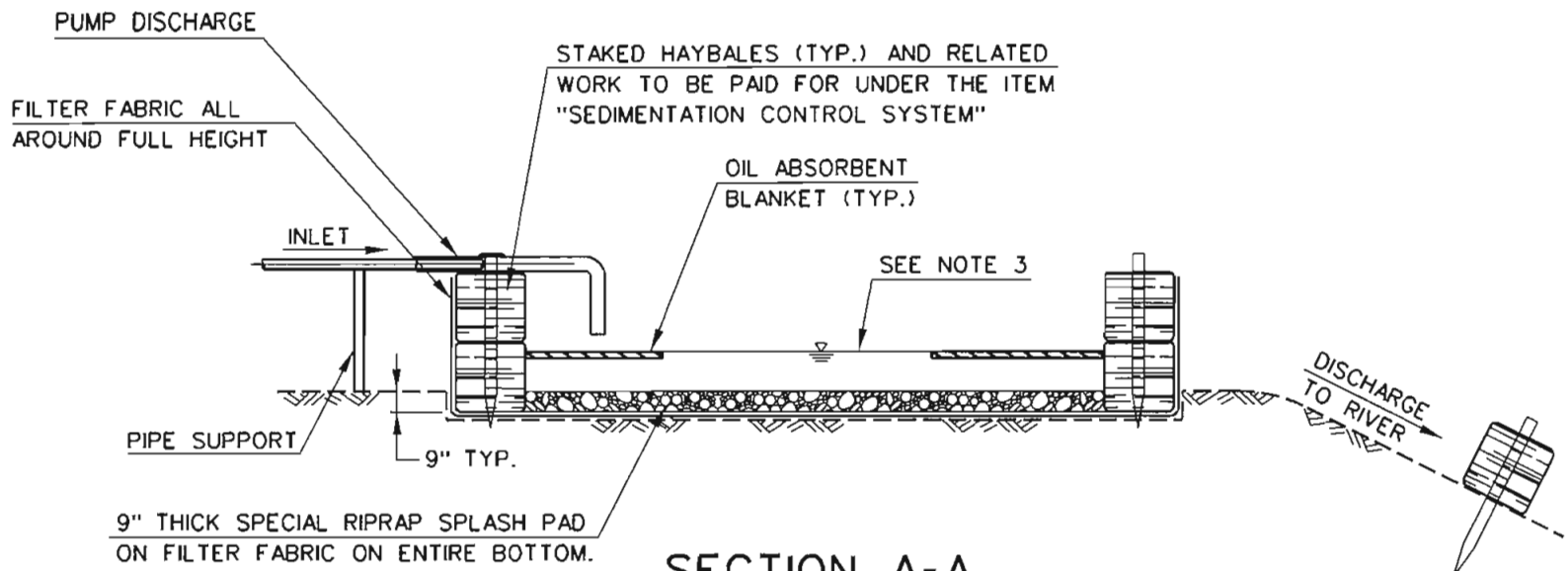
PLAN

TEMPORARY SEDIMENT BASIN FOR DEWATERING DISCHARGE

BASIN NOTES:

SEE PLATE 65 FOR NOTES

	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 64



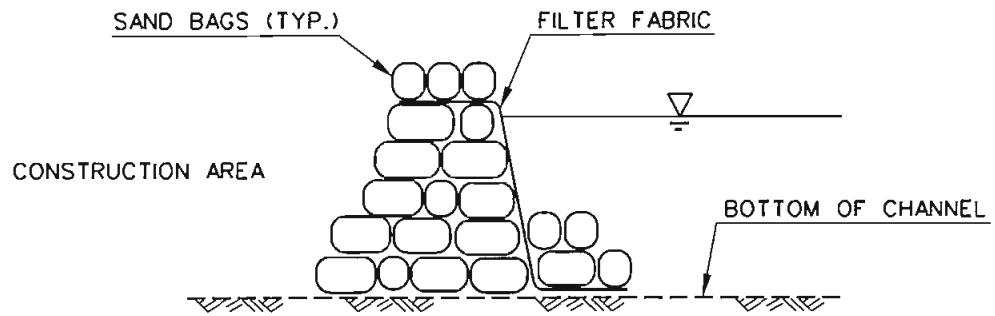
SECTION A-A

TEMPORARY SEDIMENT BASIN FOR DEWATERING DISCHARGE

BASIN NOTES:

1. CONTRACTOR TO BRACE HAY BALES AS REQUIRED FOR STABILITY.
2. DIMENSIONS TO VARY DEPENDENT UPON DE-WATERING RATE.
3. VOLUME OF BASIN IS EQUAL TO THE MAXIMUM VOLUME OF WATER CAPABLE OF BEING PUMPED OVER ONE HOUR. THIS VOLUME CAN BE DETERMINED BY PUMP MANUFACTURER'S SPECIFICATIONS. IF PUMPING VOLUME EXCEEDS BASIN CAPACITY, BASIN MAY BE USED IN TANDEM OR IN TIERS.
4. SPECIAL RIPRAP STONE SHALL CONFORM TO NO. 3 STONE AS SHOWN IN SECTION M.01.01 OF CONNDOT FORM 816.
5. AT THE COMPLETION OF THE WORK, THE BASIN AND ALL RELATED MATERIALS SHALL BE REMOVED FROM THE SITE, AND THE AREA SHALL BE RETURNED TO ITS ORIGINAL CONDITION BY THE CONTRACTOR AS DIRECTED BY THE ENGINEER. THE COST OF THIS WORK WILL BE INCLUDED UNDER EACH ITEM, EXCEPT THE CLEAN-UP WHICH WILL NOT BE MEASURED FOR PAYMENT BUT INCLUDED IN THE GENERAL COST OF THE WORK.
6. THE TEMPORARY SEDIMENT BASIN SHALL BE DESIGNED IN ACCORDANCE WITH 2002 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL

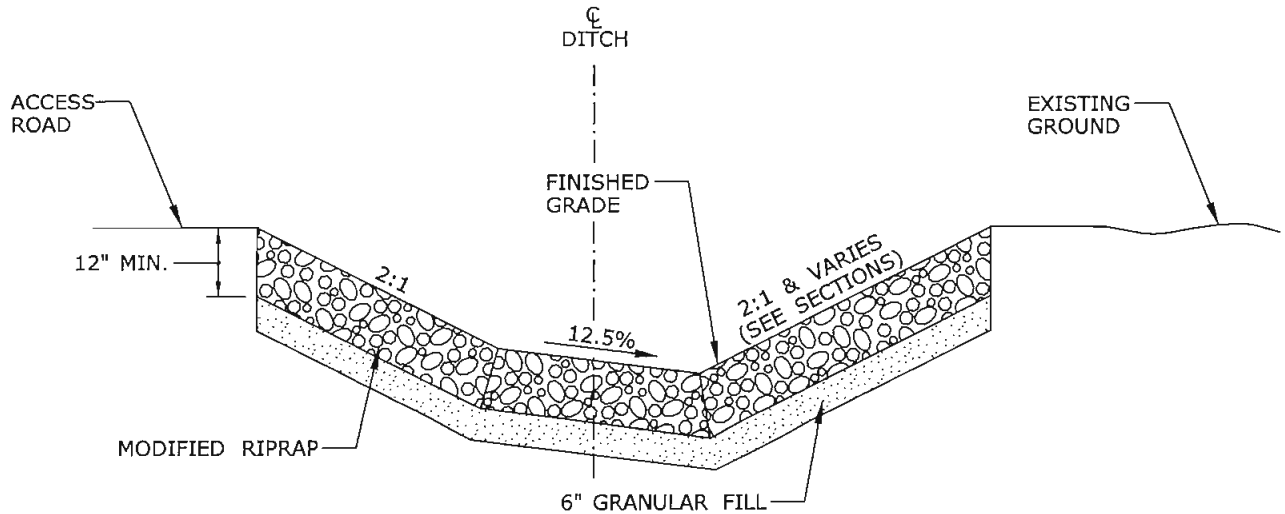
	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 65



NOTE: THE COST OF THIS WORK SHALL BE INCLUDED UNDER THE ITEM "HANDLING WATER". SEE SPECIAL PROVISIONS.

SUGGESTED FLOW DIVERSION BARRIER DETAIL

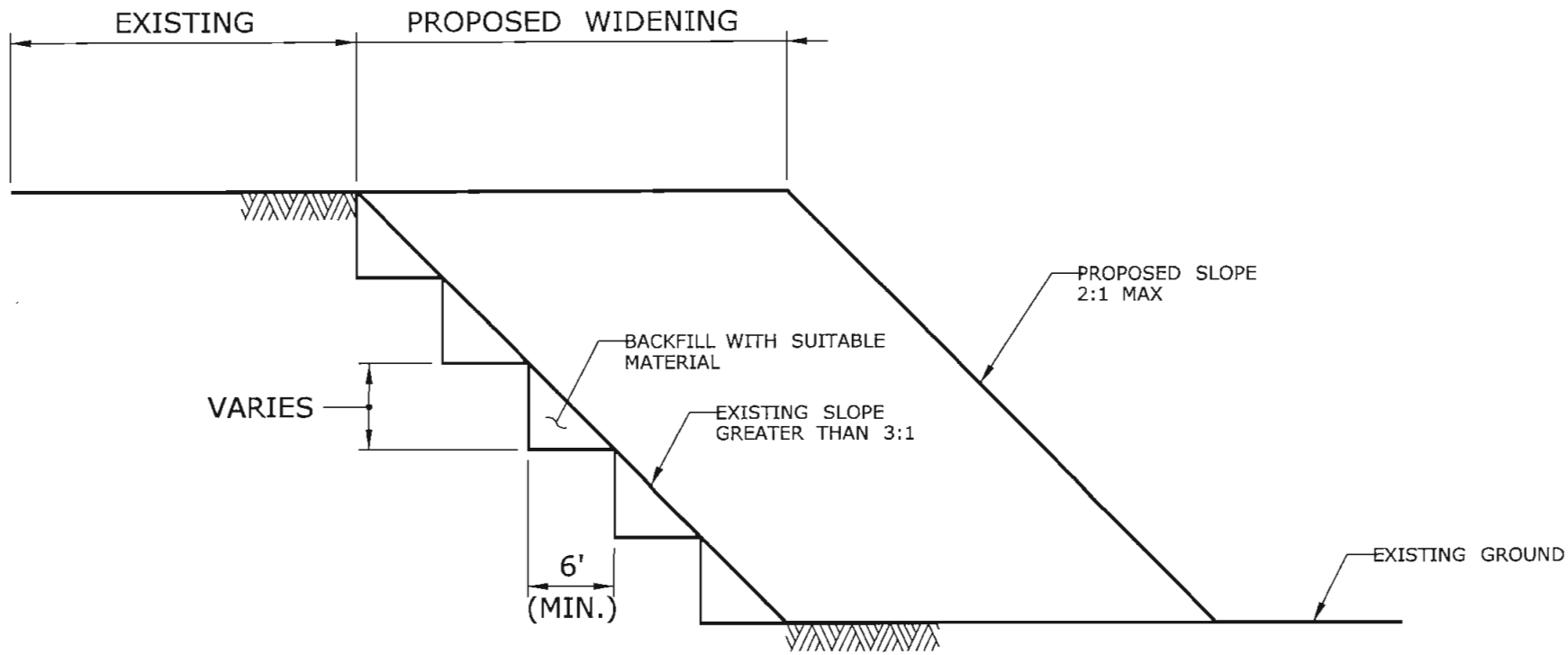
	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 66



MODIFIED RIPRAP DITCH

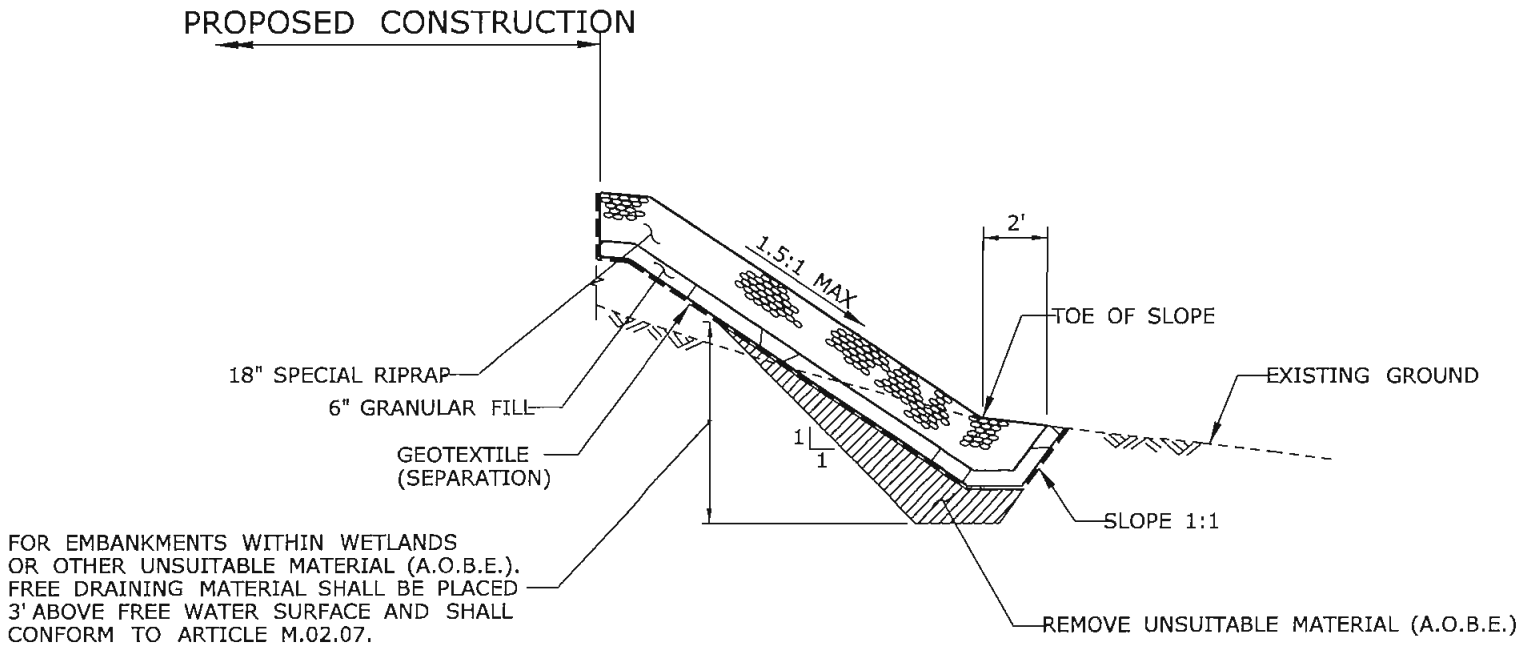
FOR AMTRAK ACCESS ROAD

	STATE PROJECT NO.: 171-305 CONTRACT NO: H052	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 67



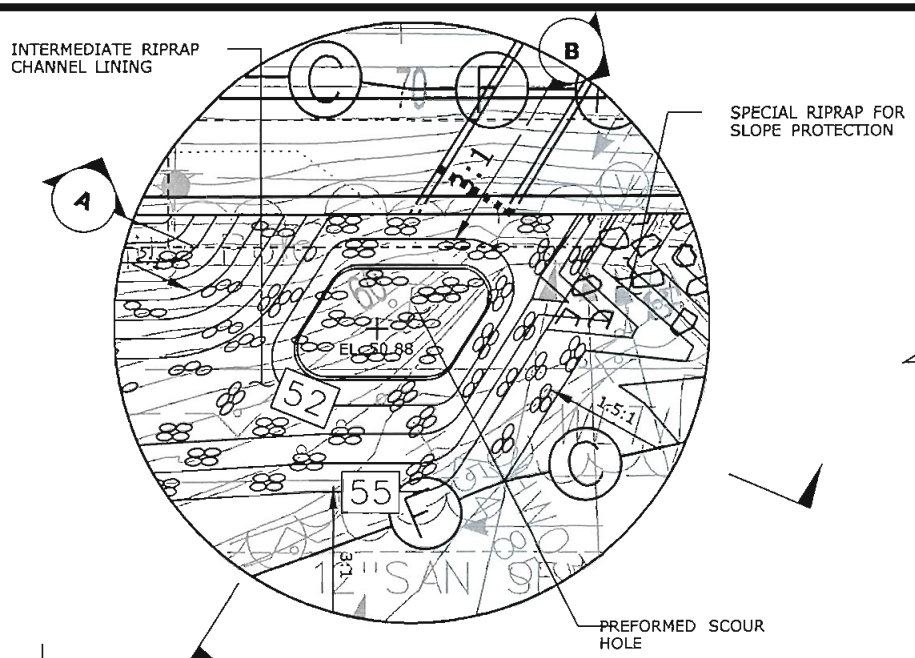
BENCHING DETAIL

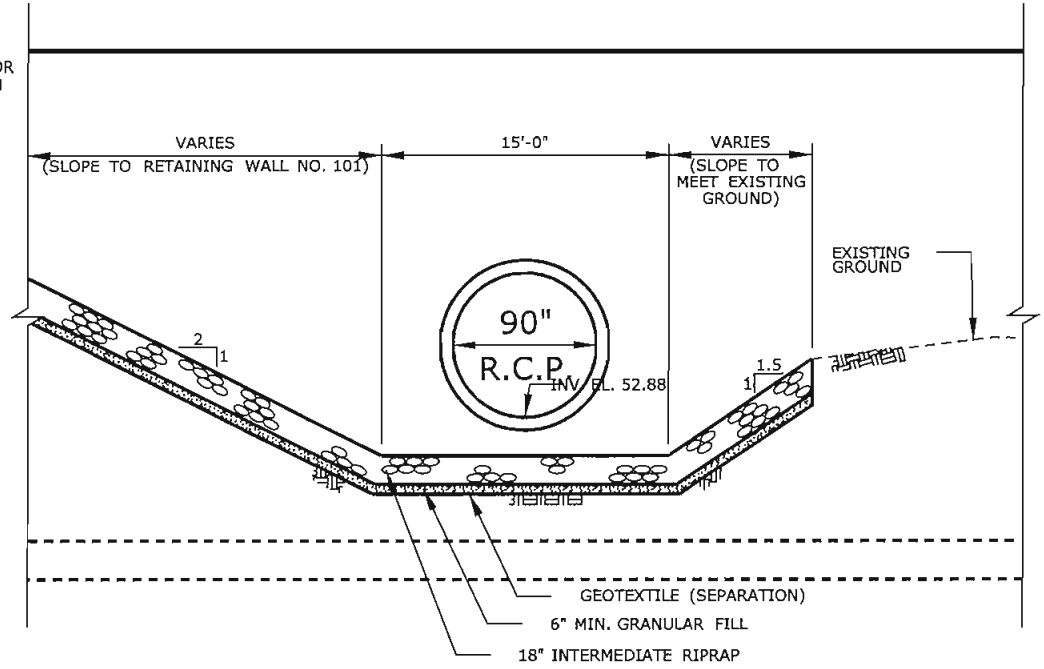
	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 68



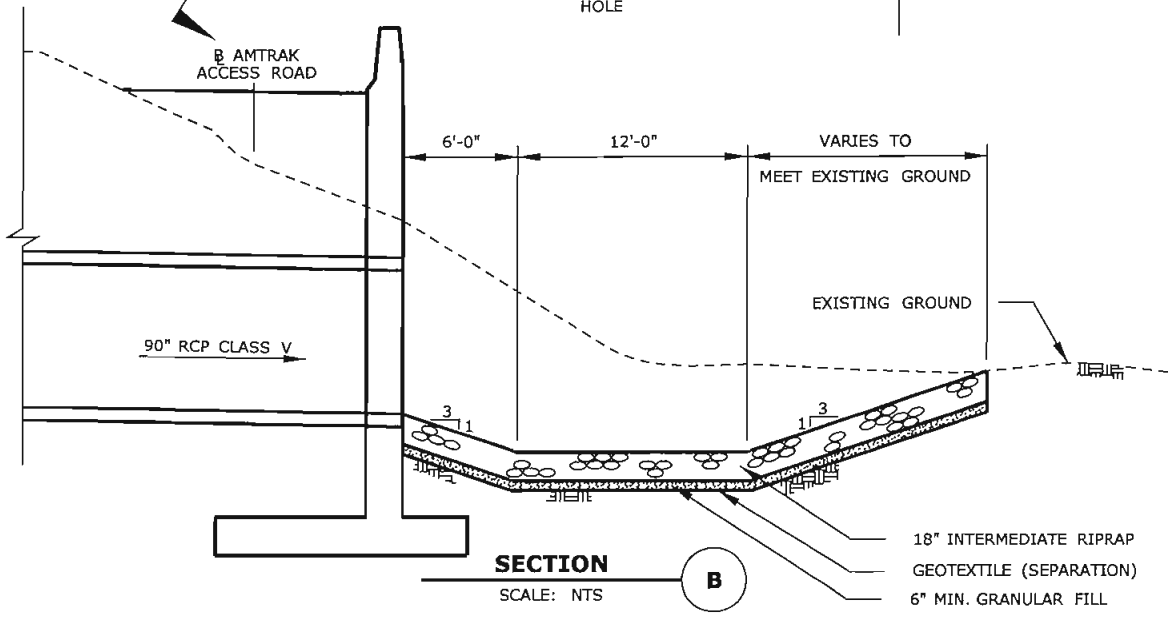
SPECIAL RIPRAP FOR SLOPE PROTECTION DETAIL
FOR AMTRAK ACCESS ROAD

	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 69





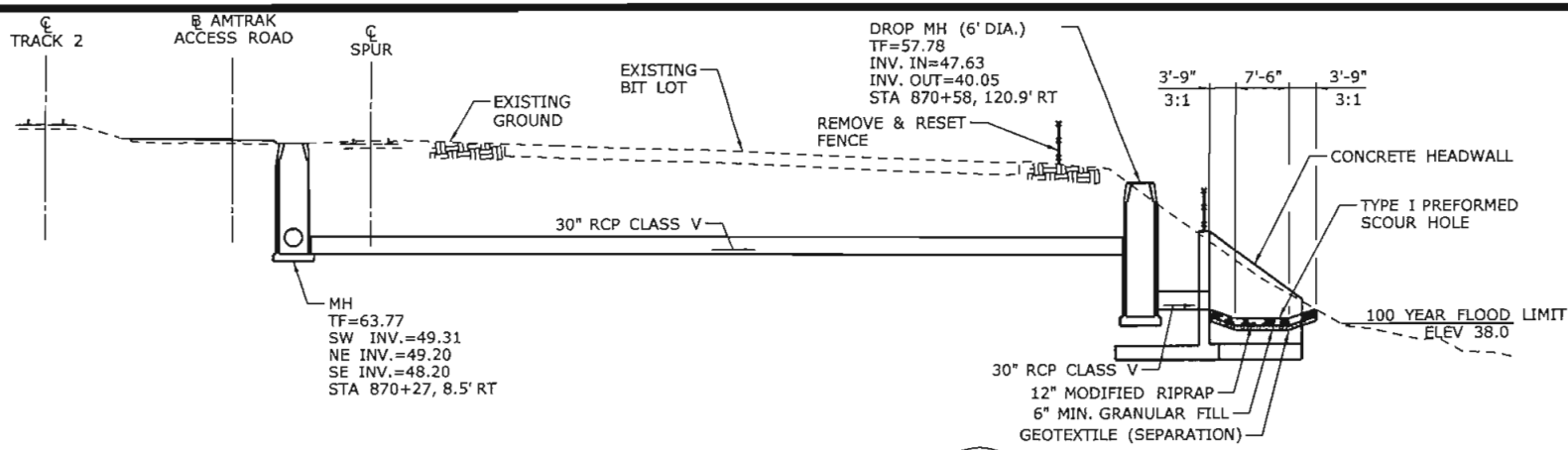
SECTION A
SCALE: NTS



SECTION B
SCALE: NTS

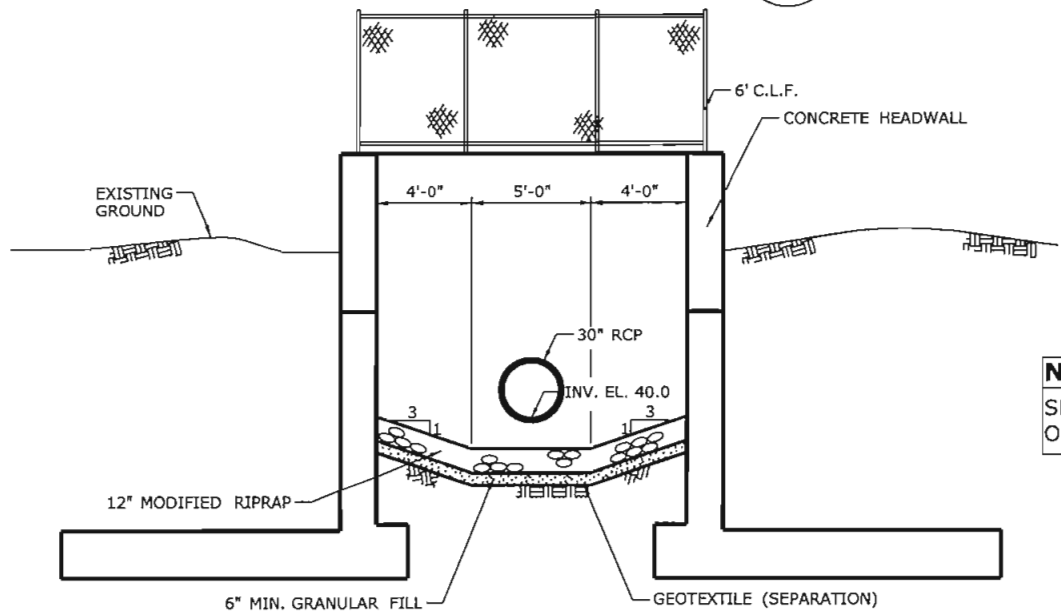
TYPE I PREFORMED SCOUR HOLE
FOR SITE 5 HYDRAULIC CROSSING

	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 70



OUTFALL TO KANE BROOK SECTION **A**

SCALE: NTS

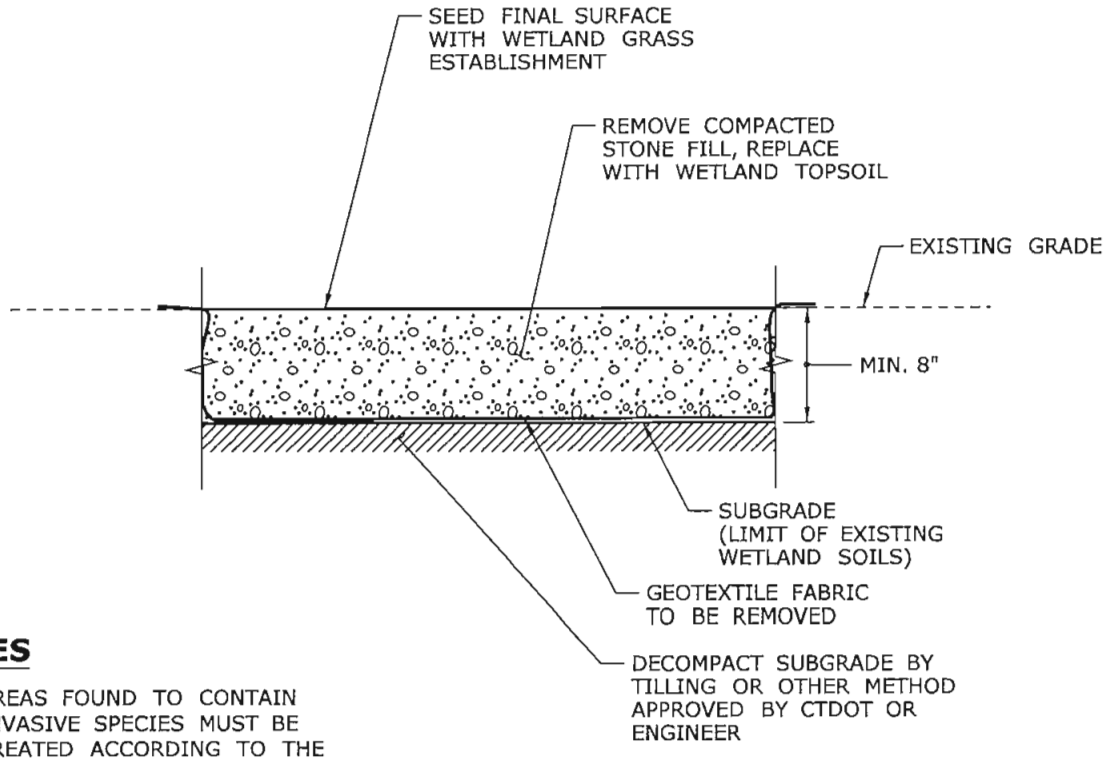


NOTE:
SEE PLATE 58A FOR LOCATION OF SECTIONS

OUTFALL TO KANE BROOK SECTION **B**

SCALE: NTS

	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 71



NOTES

1. AREAS FOUND TO CONTAIN INVASIVE SPECIES MUST BE TREATED ACCORDING TO THE SPECIAL PROVISIONS AT THE DIRECTION OF CTDOT OFFICE OF ENVIRONMENTAL PLANNING.

SEQUENCE OF OPERATIONS

1. REMOVE STONE / GRAVEL USED FOR STAGING AREAS / ACCESS ROADS.
2. DECOMPACT SUBGRADE.
3. PLACE "WETLAND TOPSOIL" FILL MATERIAL PER SPECIAL PROVISION.
4. SEED FINISHED GRADE WITH WETLAND GRASS ESTABLISHMENT MIX.
5. ONCE SEEDING AREA HAS BEEN STABILIZED AND A STAND OF GRASS HAS BEEN ESTABLISHED, THE CONTRACTOR MAY PLANT SHRUB AND TREE SPECIES AT THE DIRECTION OF CTDOT OFFICE OF ENVIRONMENTAL PLANNING.

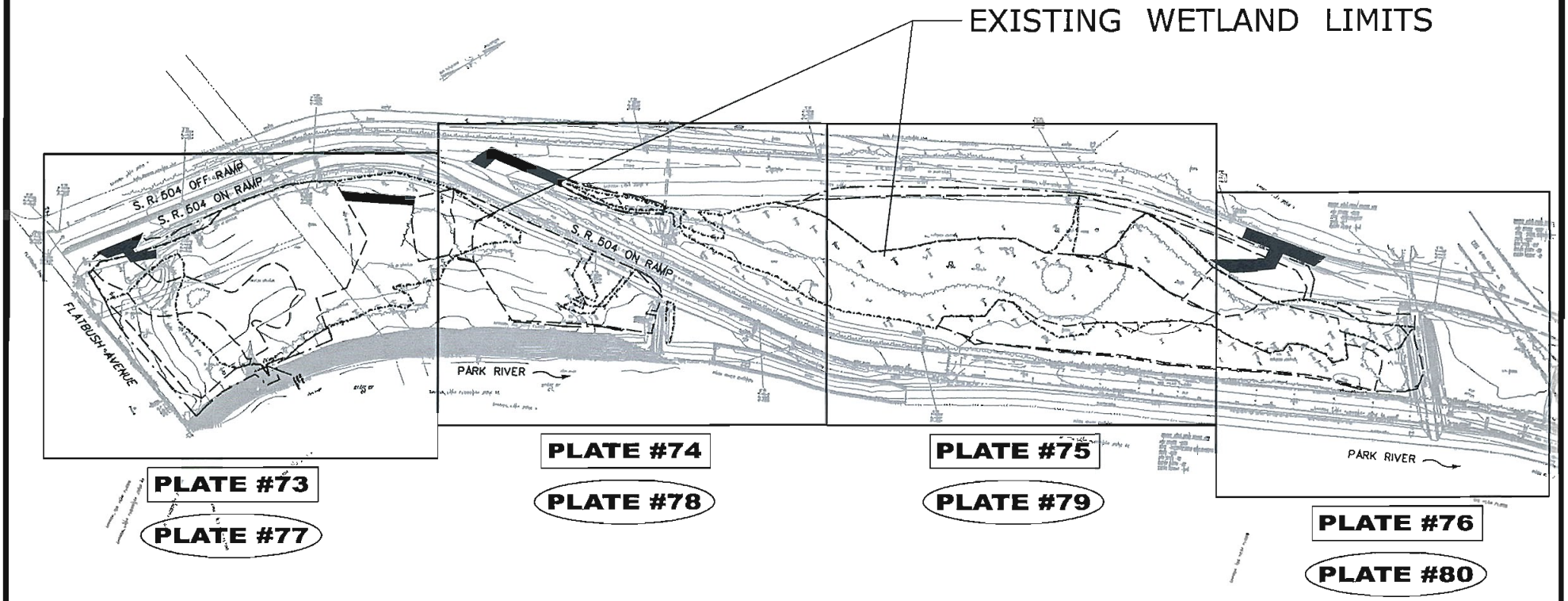
TYPICAL WETLAND RESTORATION DETAIL

	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: APRIL 2011
	NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 71A

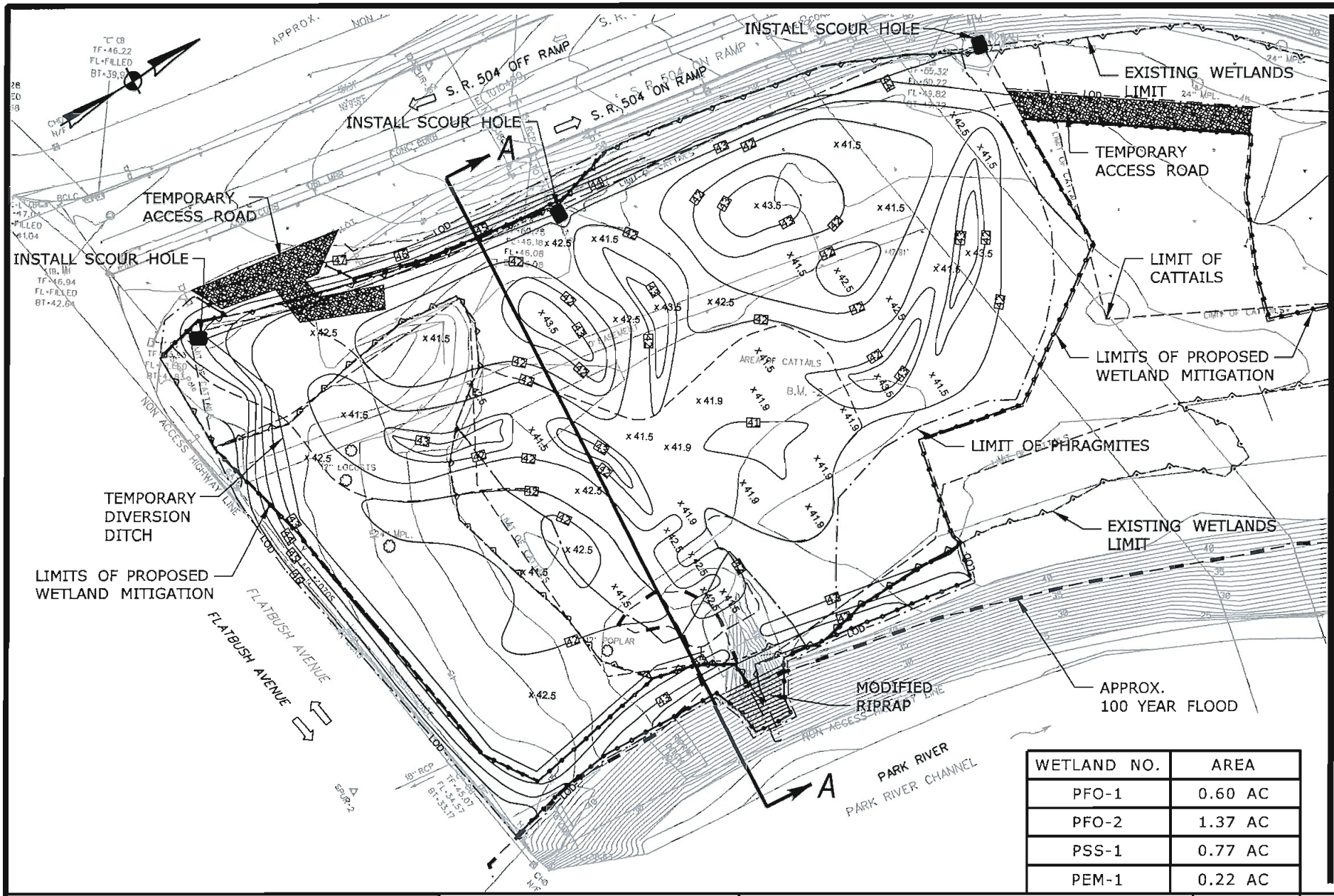
LEGEND

PLATE #XX GRADING PLAN

PLATE #XX PLANTING PLAN



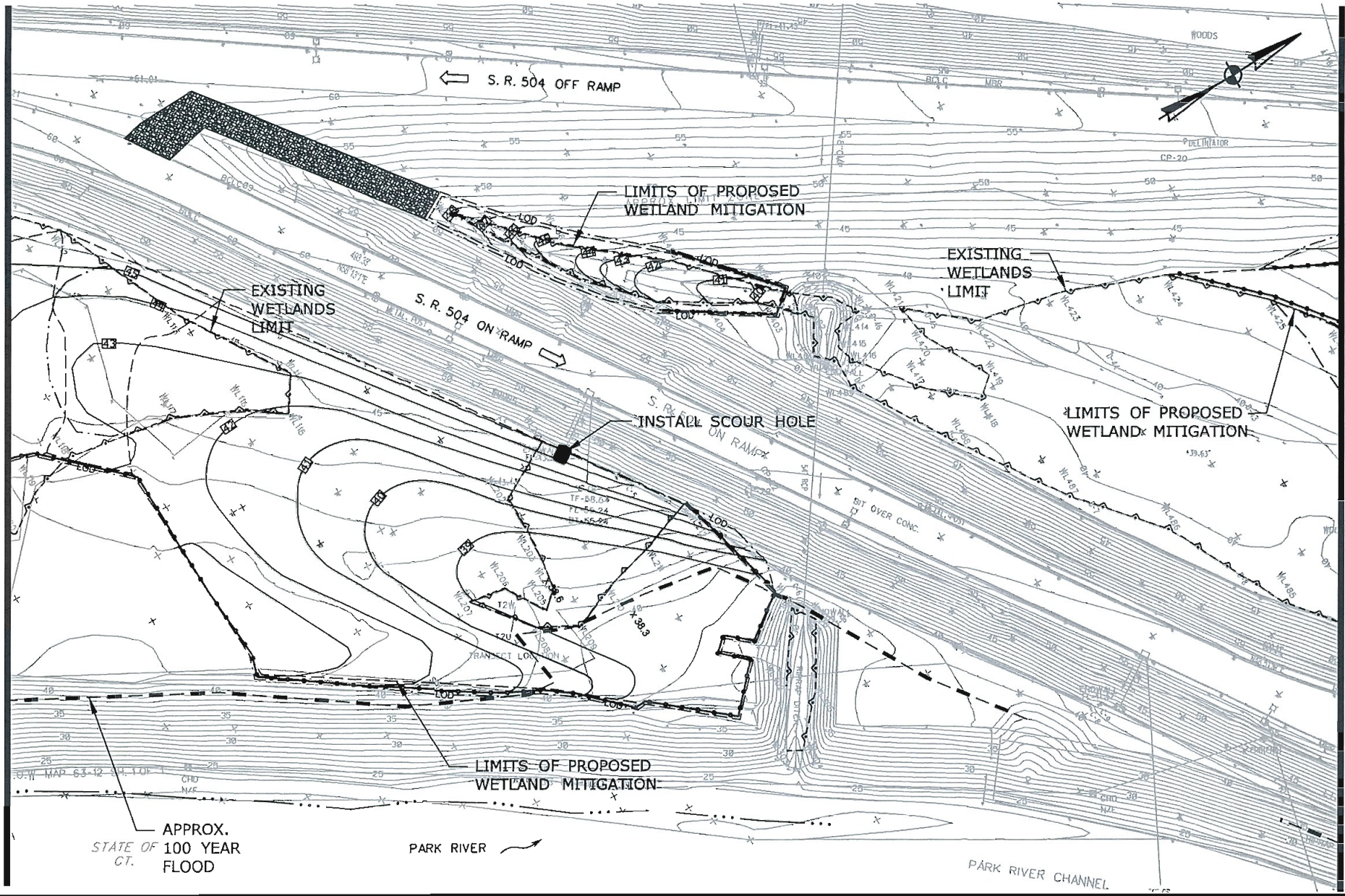
SITE 13 - WETLANDS MITIGATION INDEX PLAN	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=300'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 72



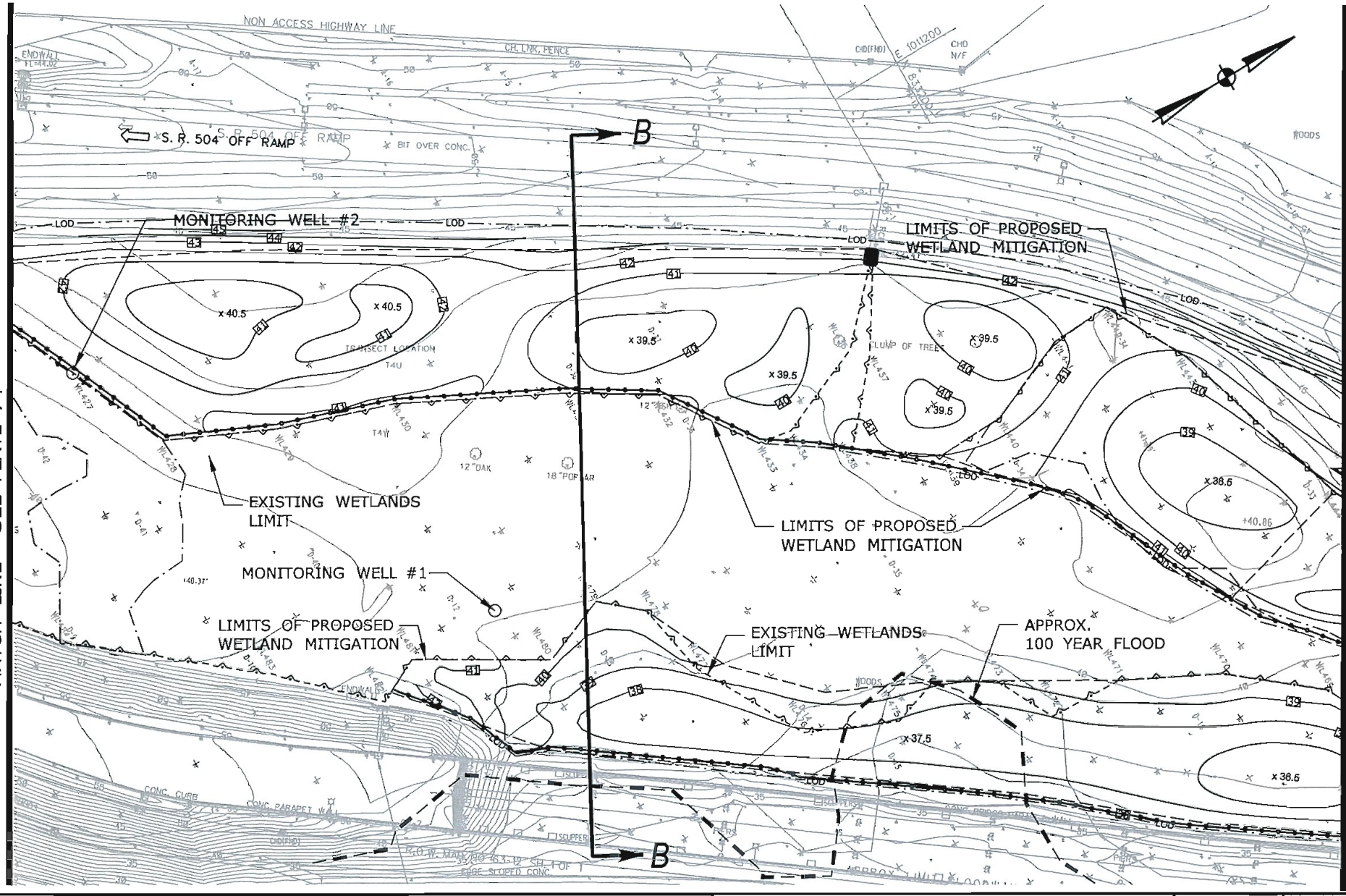
MATCH LINE - SEE PLATE 74

WETLAND NO.	AREA
PFO-1	0.60 AC
PFO-2	1.37 AC
PSS-1	0.77 AC
PEM-1	0.22 AC

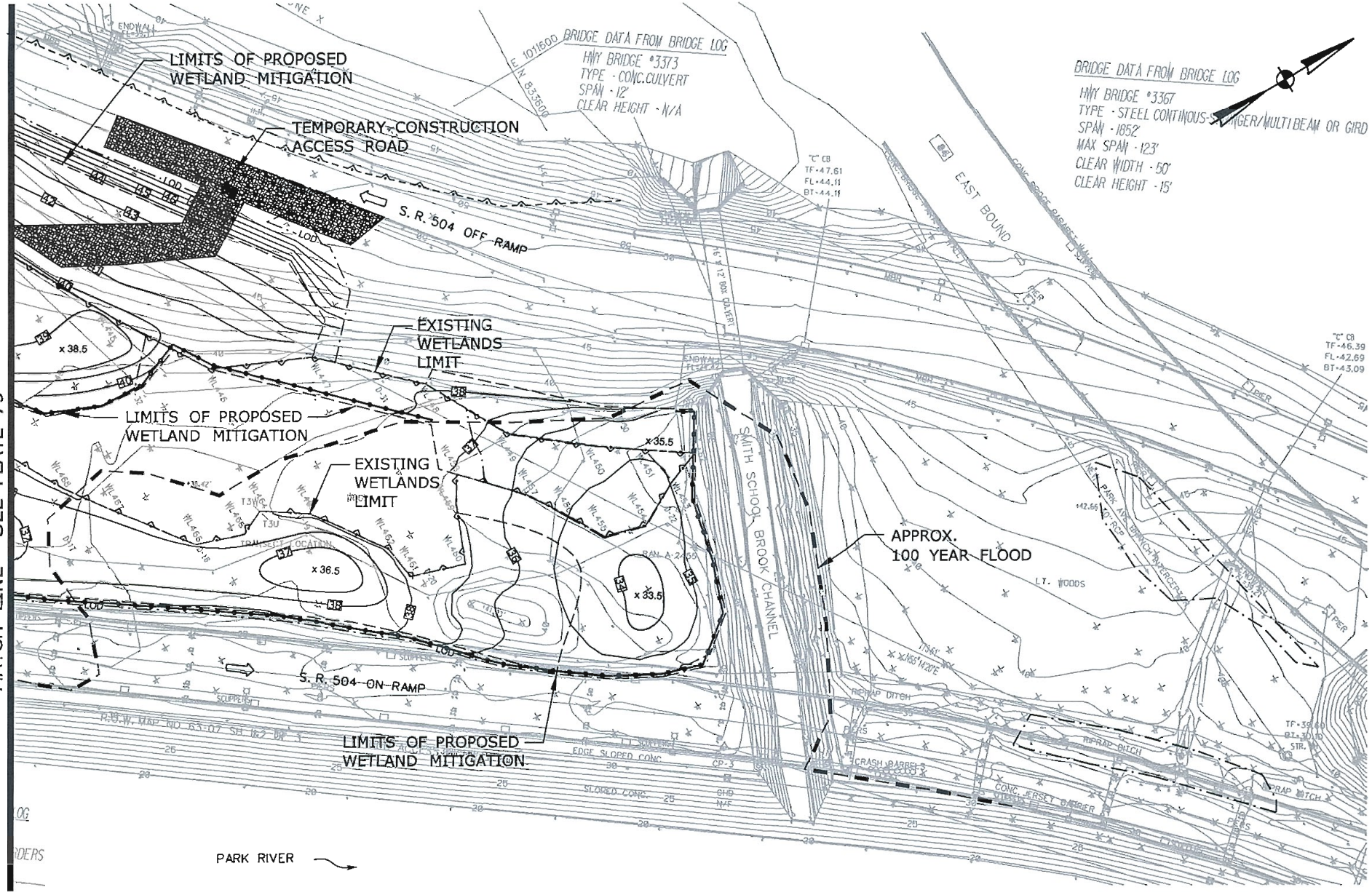
SITE 13 - WETLANDS MITIGATION GRADING PLAN	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=80'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 73



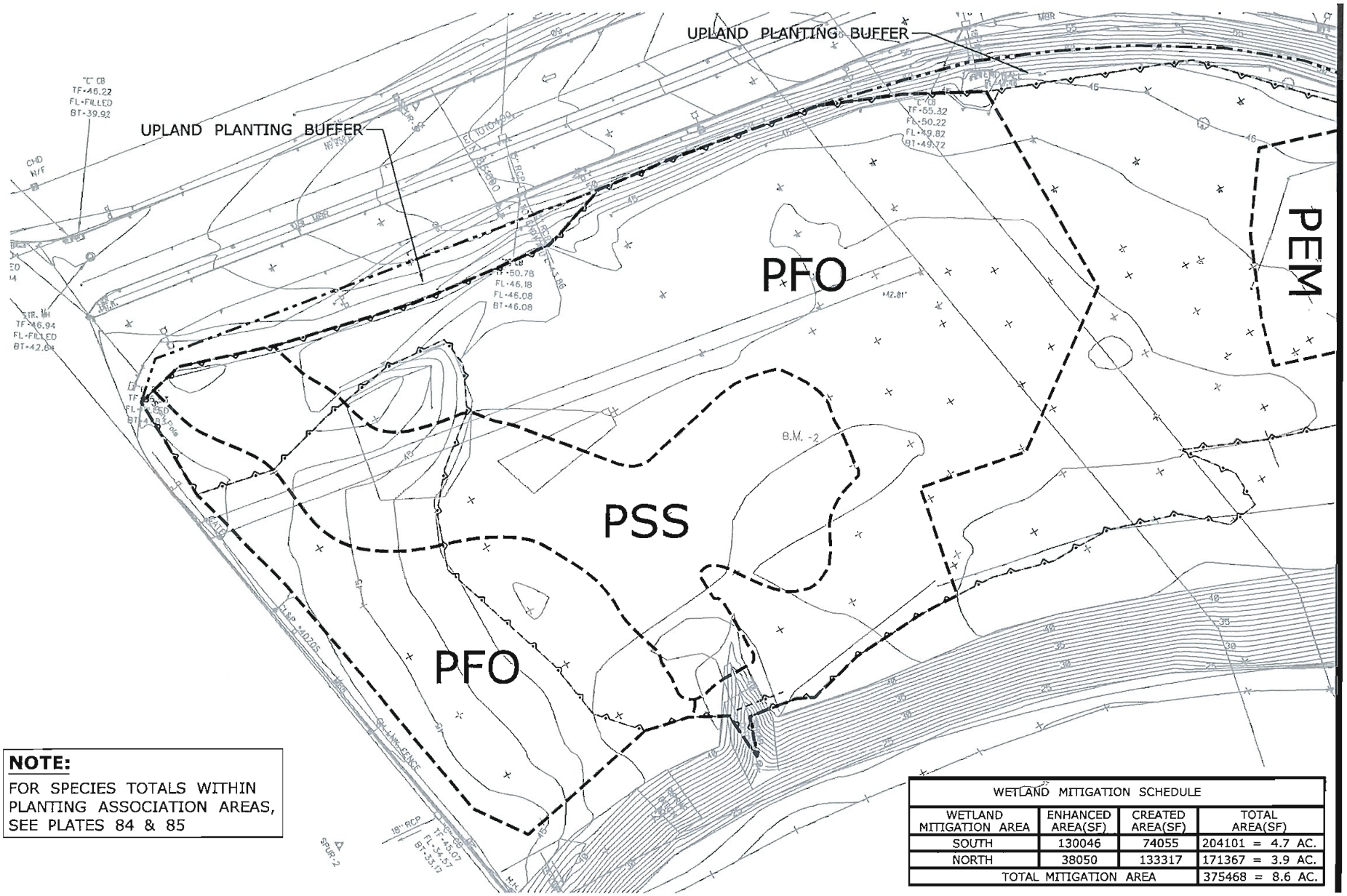
SITE 13 - WETLANDS MITIGATION GRADING PLAN	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=80'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 74



SITE 13 - WETLANDS MITIGATION GRADING PLAN	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=80'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 75



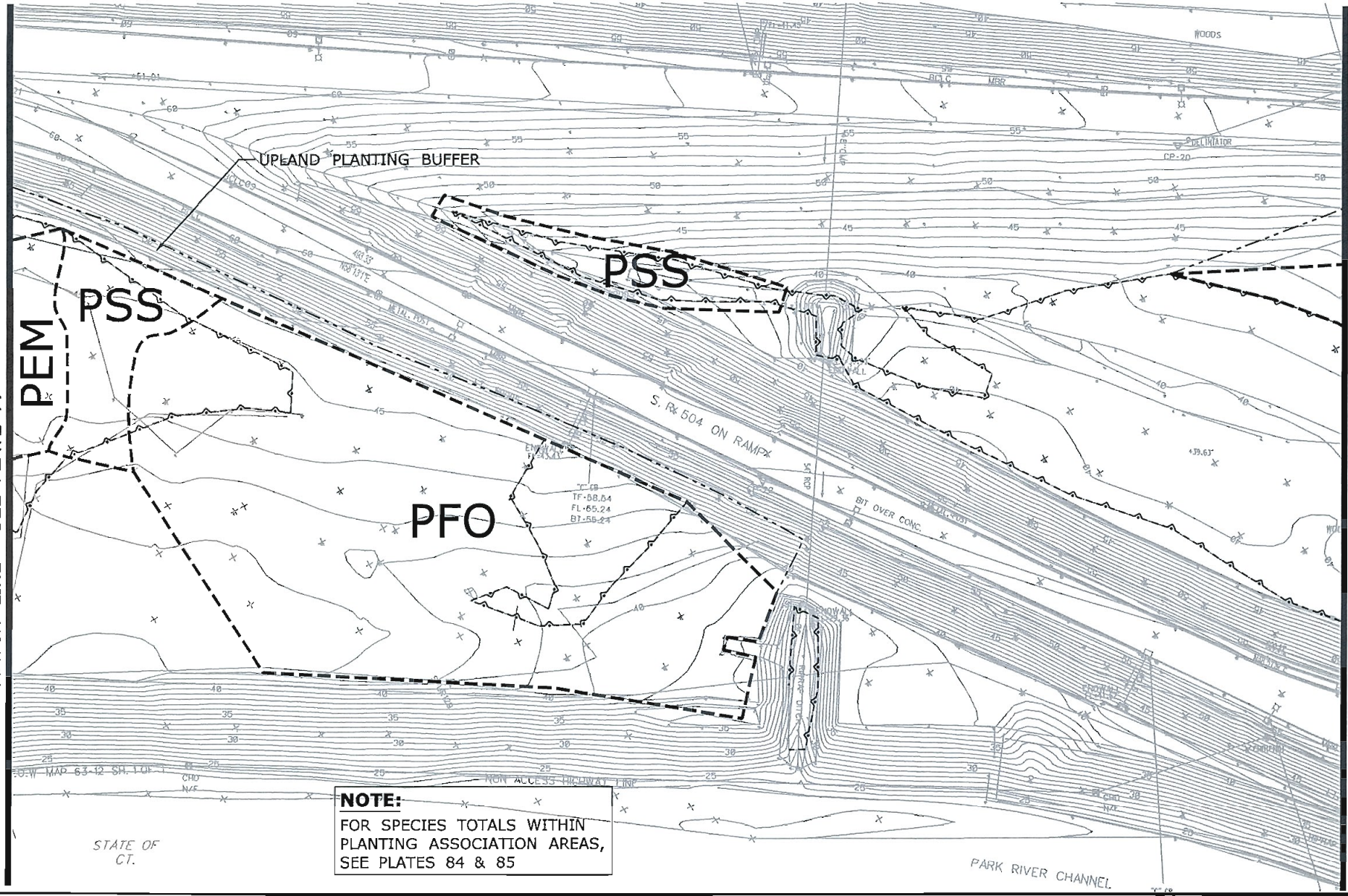
SITE 13 - WETLANDS MITIGATION GRADING PLAN	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=80'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 76



NOTE:
FOR SPECIES TOTALS WITHIN PLANTING ASSOCIATION AREAS, SEE PLATES 84 & 85

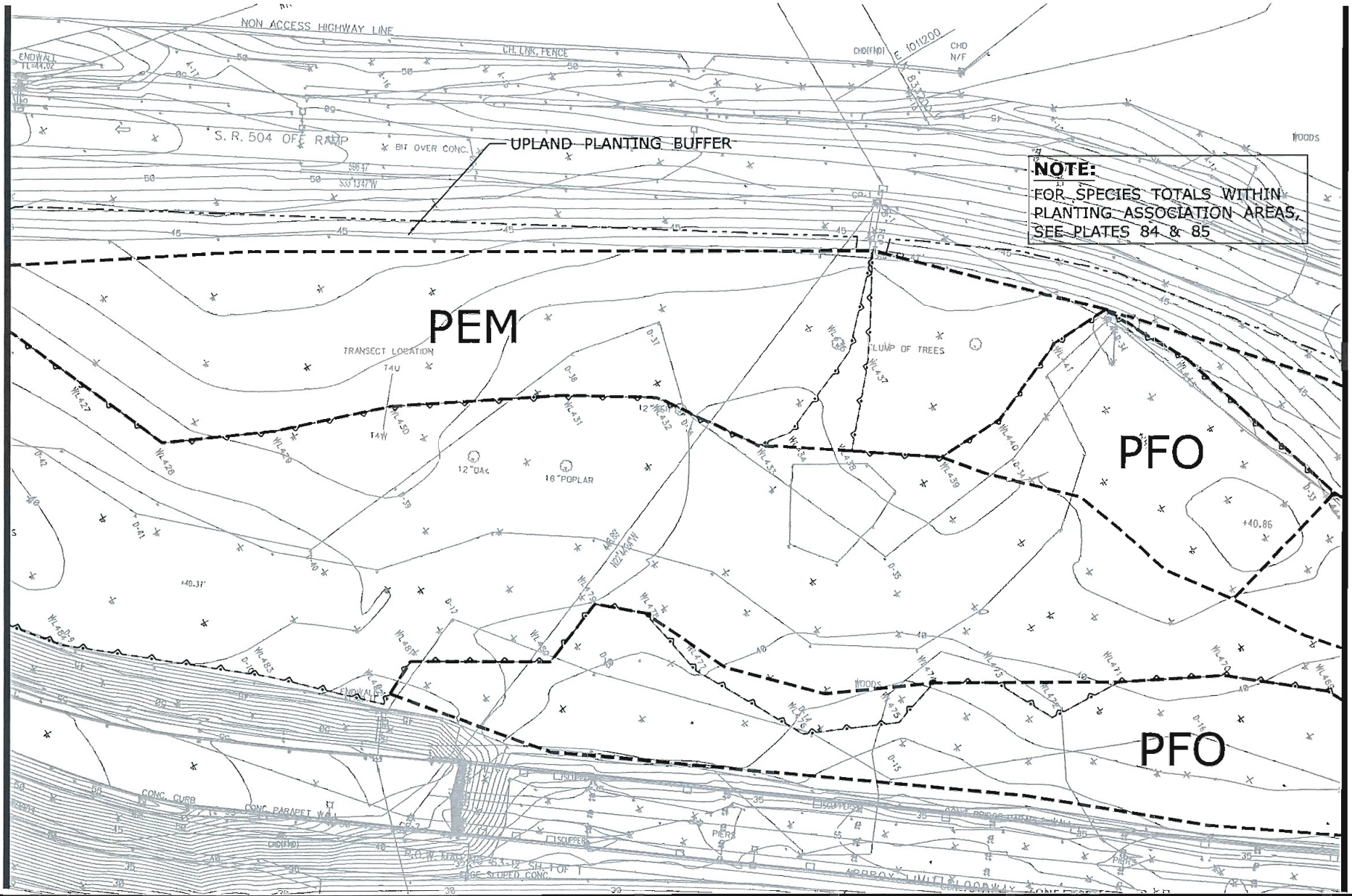
WETLAND MITIGATION SCHEDULE			
WETLAND MITIGATION AREA	ENHANCED AREA(SF)	CREATED AREA(SF)	TOTAL AREA(SF)
SOUTH	130046	74055	204101 = 4.7 AC.
NORTH	38050	133317	171367 = 3.9 AC.
TOTAL MITIGATION AREA			375468 = 8.6 AC.

SITE 13 - WETLANDS MITIGATION PLANTING PLAN	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=80'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 77

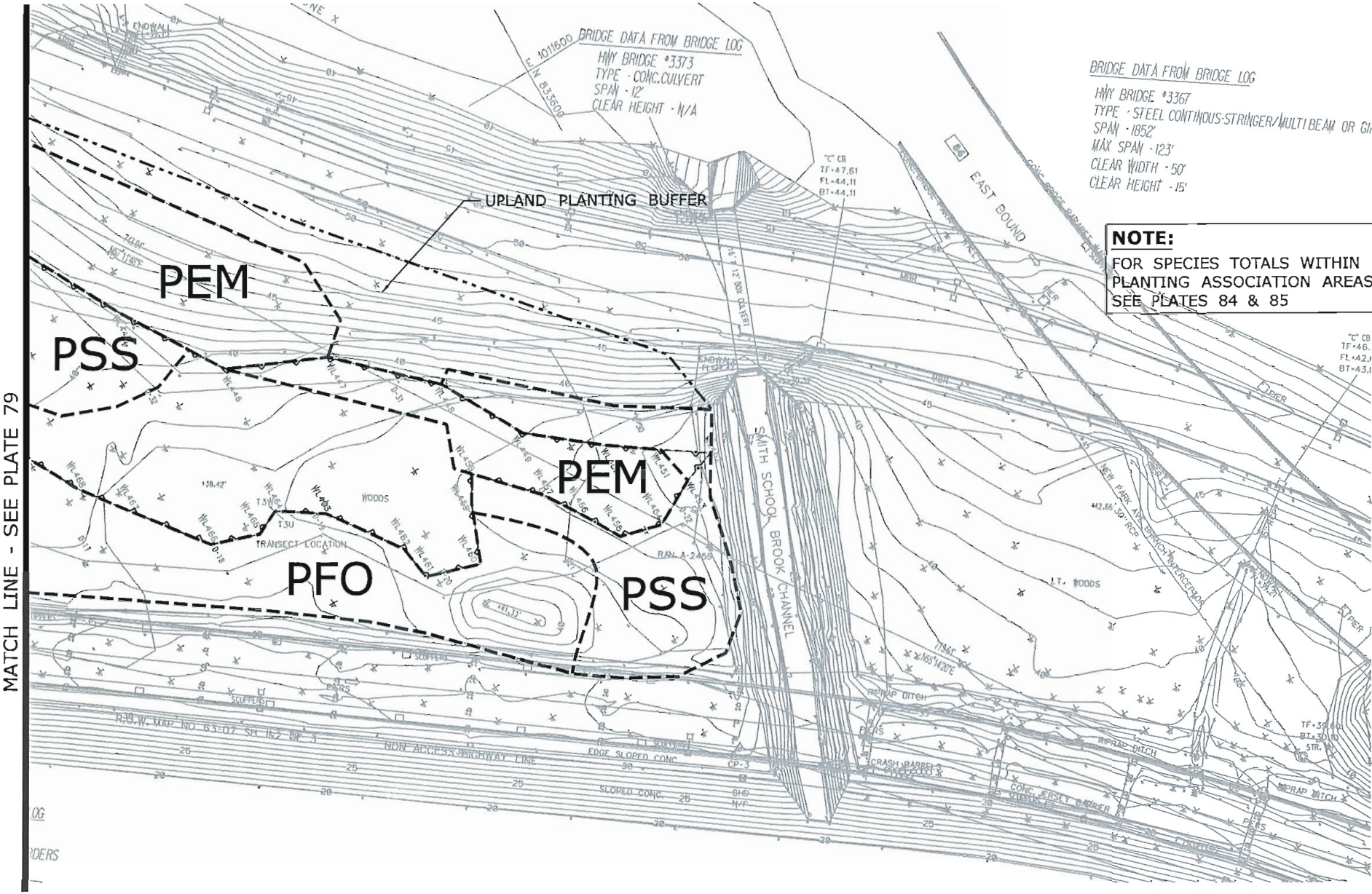


NOTE:
FOR SPECIES TOTALS WITHIN PLANTING ASSOCIATION AREAS, SEE PLATES 84 & 85

SITE 13 - WETLANDS MITIGATION PLANTING PLAN	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=80'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 78

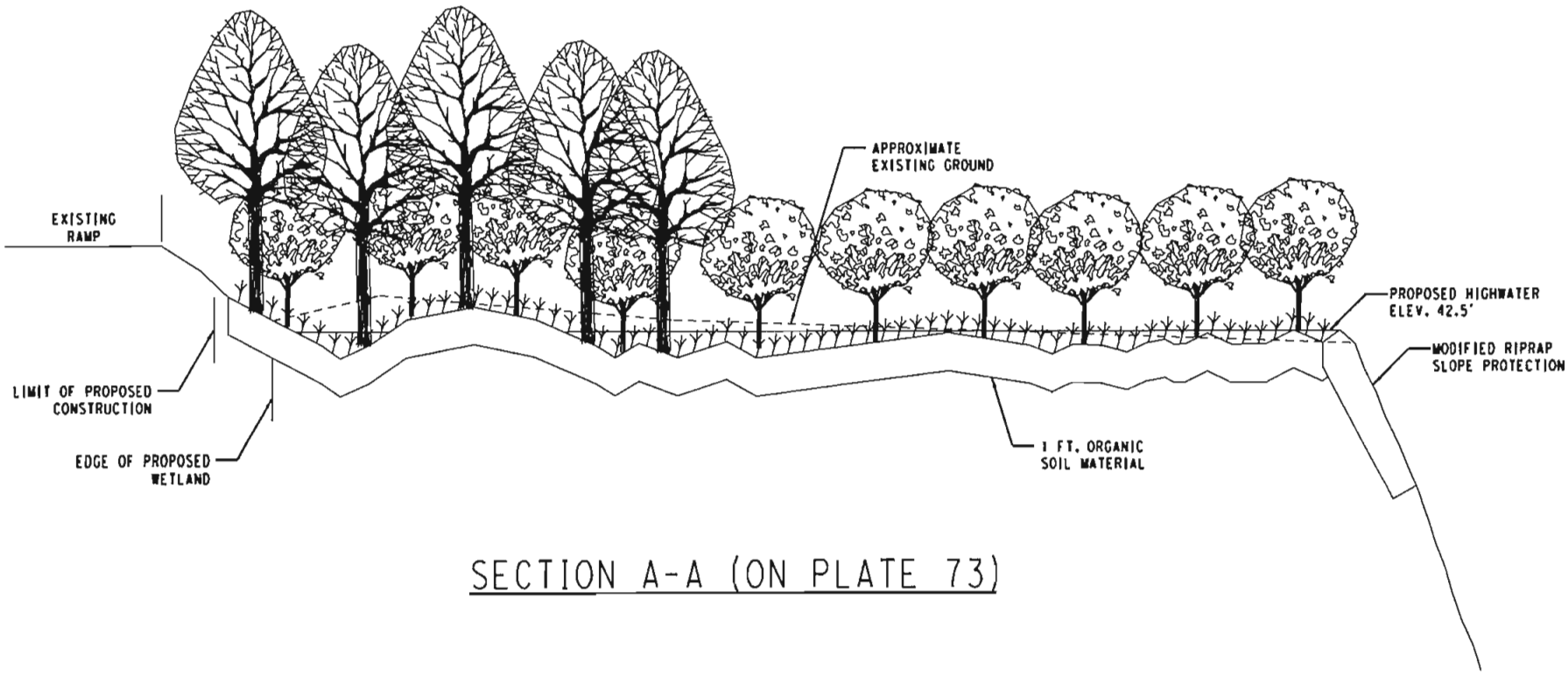


SITE 13 - WETLANDS MITIGATION PLANTING PLAN	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=80'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 79



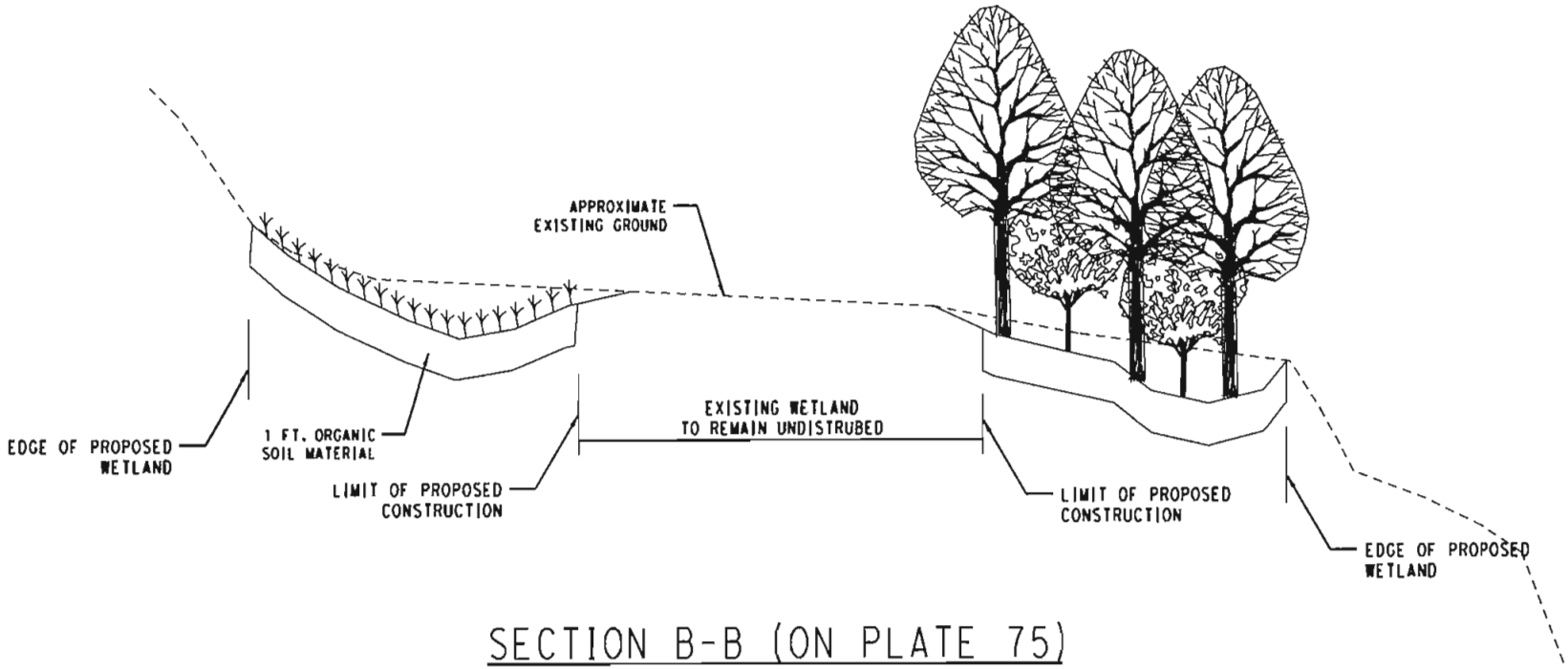
NOTE:
FOR SPECIES TOTALS WITHIN PLANTING ASSOCIATION AREAS, SEE PLATES 84 & 85

SITE 13 - WETLANDS MITIGATION PLANTING PLAN	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	SCALE: 1"=80'	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 80



SECTION A-A (ON PLATE 73)

PROPOSED WETLAND MITIGATION TYPICAL GRADING AND PLANTING SECTION	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 81



SECTION B-B (ON PLATE 75)

PROPOSED WETLAND MITIGATION TYPICAL GRADING AND PLANTING SECTION	STATE PROJECT NO.: 171-305	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING	DATE: FEBRUARY 2011
	NOT TO SCALE	NEW BRITAIN - HARTFORD BUSWAY ENVIRONMENTAL IMPACT PLATES	MICHAEL BAKER ENGINEERING	PLATE NO. 82

CONSTRUCTION NOTES

1. IDENTIFY CONSTRUCTION ACCESS POINTS AND TEMPORARY STOCKPILE AND STAGING LOCATIONS. INSTALL TEMPORARY SEDIMENTATION AND EROSION CONTROL MEASURES FOR THESE LOCATIONS.

2. INSTALL EROSION AND SEDIMENTATION CONTROLS AS SHOWN ON THE PLAN OR AS DIRECTED BY OEP AND/OR ENGINEER. GEOTEXTILE SILT FENCE AND A SINGLE ROW OF HAY BALES (EROSION CONTROL BARRIER) SHOULD BE INSTALLED ALONG THE LIMITS OF DISTURBANCE (LOD) AS SHOWN AND WITHIN THE EXISTING WETLANDS ALONG THE LIMITS OF MITIGATION.

3. MAINTAIN EROSION AND SEDIMENTATION CONTROLS THROUGHOUT THE PROJECT. ALL CONTROLS SHALL BE INSPECTED AFTER EACH RAINFALL AND MAINTAINED PER THE CTDOT 816 REQUIREMENTS.

4. IDENTIFY, CLEAR, GRADE, AND STABILIZE ANY REQUIRED HAUL ROAD(S). CONSTRUCT AND MAINTAIN HAUL ROADS IN A MANNER THAT MINIMIZES DISTURBANCE TO EXISTING VEGETATION. ALL HAUL ROADS SHALL BE REMOVED FOLLOWING COMPLETION OF THE MITIGATION WORK AND AREAS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION OR AS DIRECTED BY OEP AND/OR THE ENGINEER.

5. WOODY DEBRIS (LOGS, STUMPS AND ROOT WADS) FROM THE CLEARING AND GRUBBING ACTIVITY SHALL BE SET ASIDE IN APPROVED UPLAND STOCKPILING LOCATIONS FOR USE IN THE WETLAND MITIGATION AREA.

6. SOIL AND DEBRIS FROM AREAS WHERE INVASIVE SPECIES ARE REMOVED SHALL NOT BE REUSED ANYWHERE ON SITE.

7. ALL SCRAPED SOILS MUST BE REMOVED FROM THE SITE AND LEGALLY DISPOSED OF. PRIOR TO DISPOSAL, ANY SOILS STOCKPILES MUST BE LOCATED OUTSIDE THE WETLAND MITIGATION AREAS. ALL STOCKPILE LOCATIONS MUST BE APPROVED BY OEP OR THE ENGINEER.

8. ROCKS AND BOULDERS EXPOSED DURING EXCAVATION MAY BE LEFT IN PLACE AT THE DISCRETION OF OEP. OTHERWISE, ALL EXPOSED MATERIAL IS TO BE STOCKPILED AT AN UPLAND LOCATION APPROVED BY OEP OR THE ENGINEER

9. PLACEMENT OF STOCKPILED WOODY DEBRIS AND BOULDERS SHALL BE AT THE DISCRETION OF OEP.

10. ALL MATURE TREES WITHIN THE WETLAND MITIGATION AREA SHALL BE REVIEWED BY OEP PRIOR TO CLEARING AND GRUBBING OPERATIONS. WHERE TREES HAVE BEEN IDENTIFIED TO BE SAVED, THE CONTRACTOR SHALL PLACE PROTECTIVE FENCING AROUND THE TREE.

11. THE SITE GENERALLY CONTAINS LOW LEVEL AREAS OF ENVIRONMENTAL CONCERN. MATERIAL EXCAVATED FROM OUTSIDE AREAS CONTAINING INVASIVE SPECIES MAY BE REUSED ON THE SITE FOR ROUGH GRADING. ALL EXCESS MATERIAL MUST BE TRANSPORTED TO A WASTE STOCKPILE AREA AS DIRECTED BY CT DOT IN A LOCATION TO BE PROVIDED. ALL MATERIAL EXCAVATED FROM WITHIN AREAS CONTAINING INVASIVE SPECIES MUST BE SEGREGATED PRIOR TO TRANSPORT TO THE WASTE STOCKPILE AREA.

12. INVASIVE SPECIES OTHER THAN THOSE IDENTIFIED TO BE REMOVED BY EXCAVATION SHALL BE IDENTIFIED ON SITE AND TREATED AND REMOVED AS REQUIRED UNDER THE "CONTROL AND REMOVAL OF INVASIVE VEGETATION" SPECIAL PROVISION. A MINIMUM OF TWO WEEKS WILL BE REQUIRED TO ALLOW THE TREATMENT TO TAKE ROOT AND MUST PRECEDE ANY MOBILIZATION OR EXCAVATION ACTIVITIES ON SITE.

13. ALL PLANTING WILL BE PERFORMED IN THE SPRING.

14. ALL PLANTINGS SHALL BE SPACED RANDOMLY AT THE DIRECTION OF THE DOT OEP TO SIMULATE NATURAL GROWTH PATTERNS, TO APPROXIMATE THE SPACING CALLED OUT IN THE PLANTING SCHEDULE.

15. UPON COMPLETION OF PLANTING, THE UPLAND BUFFER PLANTINGS SHALL BE MULCHED PER CONSTRUCTION SPECIFICATIONS.

16. EROSION CONTROL BARRIERS WILL BE DISASSEMBLED AND PROPERLY DISPOSED OF AFTER PLANTING AND PERMANENT STABILIZATION OF WETLAND MITIGATION AREAS. SEDIMENT COLLECTED BY THESE DEVICES SHALL BE REMOVED IN A FASHION THAT PREVENTS EROSION AND TRANSPORTED TO A WATERWAY OR WETLAND AND LEGALLY DISPOSED OF. SEDIMENTS SHALL NOT BE REUSED.

17. ALL OFF-SITE LOCATIONS INCLUDING, BUT NOT LIMITED TO, FIELD TRAILERS, WASTE STOCKPILE AREAS, LAYDOWN AREAS OR MATERIAL STOCKPILE LOCATIONS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION OR AS DIRECTED BY OEP OR THE ENGINEER.

South Wetland Mitigation Planting Table

BOTANICAL NAME	COMMON NAME	INDICATOR	SIZE	SPACING	LOCATION
					South PFO & PSS
	AREA (S.F.)				189,237
	TREES				QUANTITY
ACER NEGUNDO	BOXELDER	FAC	2 - 3' HT B B.	10' O.C.	325
ACER SACCHARINUM	SILVER MAPLE	FACW	18" – 24" HT B.B	10' O.C.	280
FRAXINUS PENNSYLVANICA	GREEN ASH	FACW	2 - 3' HT B.B.	10' O.C	315
QUERCUS BICOLOR	SWAMP WHITE OAK	FACW	2 - 3' HT CONTAINER	10' O.C.	69
QUERCUS PALUSTRIS	PIN OAK	FACW	24"-36' HT CONTAINER	10' O.C	99
SALIX NIGRA	BLACK WILLOW	FACW	18" – 24" HT B B	10' O.C.	321
				TOTAL QTY=	1,409
	SHRUBS				QUANTITY
ALNUS INCANA	SPECKLED ALDER	FACW	18" – 24" HT B.B	5' O.C.	44
AMELANCHIER CANADENSIS	SERVICEBERRY	FAC	4'-5' HT B.B	5' O C.	53
ARONIA ARBUTIFOLIA	RED CHOKEBERRY	FACW	18" – 24" HT B.R.	5' O.C.	54
CEPHALANTHUS OCCIDENTALIS	BUTTONBUSH	OBL	1 GAL CONTAINER	5' O.C.	82
CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	FAC	2-3' HT B.B.	5' O.C.	350
COMPTONIA PEREGRINA	SWEET FERN	UPL	15" – 18" HT B.B	5' O.C.	15
CORNUS AMOMUM	SILKY DOGWOOD	FACW	18" – 24" HT CONTAINER	5' O.C	62
CORNUS RACEMOSA	GREY-STEM DOGWOOD	FAC	2 - 3' HT B B.	5' O.C.	121
CORNUS SERICEA	REDOSIER DOGWOOD	FACW	18" – 24" HT CONTAINER	5' O.C.	99
MYRICA GALE	SWEETGALE	OBL	18" – 24" HT CONTAINER	5' O.C.	8
MYRICA PENNSYLVANICA	NORTHERN BAYBERRY	FAC	18" – 24" HT B.B	5' O C.	19
SALIX DISCOLOR	PUSSY WILLOW	FACW	2 - 3' HT B.B.	5' O.C.	76
SAMBUCUS CANADENSIS	ELDERBERRY	FACW	18" – 24" HT CONTAINER	5' O C.	36
SPIRAEA TOMENTOSA	STEEPLEBUSH	FACW	18" – 24" HT CONTAINER	5' O.C.	7
VACCINIUM CORYMBOSUM	HIGHBUSH BLUEBERRY	FACW	18" – 24" HT CONTAINER	5' O.C.	7
VIBURNUM ACERIFOLIUM	MAPLELEAF VIBURNUM	UPL	12"-15" HT B.B.	5' O.C.	21
VIBURNUM DENTATUM	ARROWWOOD	FACW	2'-3' HT B B.	5' O C.	67
VIBURNUM LENTAGO	NANNYBERRY	FAC	3'-4' HT B.B.	5' O C.	136
VIBURNUM TRILOBUM	CRANBERRYBUSH	FACW	18" – 24" HT CONTAINER	5' O C.	35
				TOTAL QTY=	1,282

North Wetland Mitigation Planting Area

BOTANICAL NAME	COMMON NAME	INDICATOR	SIZE	SPACING	LOCATION
					North PFO & PSS
	AREA (S.F.)				95,239
	TREES				QUANTITY
ACER NEGUNDO	BOXELDER	FAC	2 - 3' HT B B.	10' O.C.	122
ACER SACCHARINUM	SILVER MAPLE	FACW	18" – 24" HT B.B.	10' O.C.	126
FRAXINUS PENNSYLVANICA	GREEN ASH	FACW	2 - 3' HT B.B.	10' O.C.	141
QUERCUS BICOLOR	SWAMP WHITE OAK	FACW	2 - 3' HT CONTAINER	10' O.C.	26
QUERCUS PALUSTRIS	PIN OAK	FACW	24"-36' HT CONTAINER	10' O.C.	73
SALIX NIGRA	BLACK WILLOW	FACW	18" – 24" HT B.B.	10' O.C.	171
				TOTAL QTY=	659
	SHRUBS				QUANTITY
ALNUS INCANA	SPECKLED ALDER	FACW	18" – 24" HT B.B	5' O.C.	18
AMELANCHIER CANADENSIS	SERVICEBERRY	FAC	4'-5' HT B.B.	5' O.C.	24
ARONIA ARBUTIFOLIA	RED CHOKEBERRY	FACW	18" – 24" HT B.R.	5' O.C.	21
CEPHALANTHUS OCCIDENTALIS	BUTTONBUSH	OBL	1 GAL CONTAINER	5' O.C.	57
CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	FAC	2'-3' HT B.B.	5' O.C.	116
CORNUS AMOMUM	SILKY DOGWOOD	FACW	18" – 24" HT CONTAINER	5' O.C.	25
CORNUS RACEMOSA	GREY-STEM DOGWOOD	FAC	2 - 3' HT B.B.	5' O.C.	79
CORNUS SERICEA	REDOSIER DOGWOOD	FACW	18" – 24" HT CONTAINER	5' O.C.	61
MYRICA GALE	SWEETGALE	OBL	18" – 24" HT CONTAINER	5' O.C.	30
MYRICA PENNSYLVANICA	NORTHERN BAYBERRY	FAC	18" – 24" HT B.B.	5' O.C.	9
SALIX DISCOLOR	PUSSY WILLOW	FACW	2 - 3' HT B.B.	5' O.C.	39
SAMBUCUS CANADENSIS	ELDERBERRY	FACW	18" – 24" HT CONTAINER	5' O.C.	29
SPIRAEA TOMENTOSA	STEEPLEBUSH	FACW	18" – 24" HT CONTAINER	5' O.C.	32
VACCINIUM CORYMBOSUM	HIGHBUSH BLUEBERRY	FACW	18" – 24" HT CONTAINER	5' O.C.	27
VIBURNUM DENTATUM	ARROWWOOD	FACW	2'-3' HT B.B.	5' O.C.	40
VIBURNUM LENTAGO	NANNYBERRY	FAC	3'-4' HT B.B.	5' O.C.	99
VIBURNUM TRILOBUM	CRANBERRYBUSH	FACW	18" – 24" HT CONTAINER	5' O.C.	55
				TOTAL QTY=	761

SITE 13 - WETLANDS MITIGATION PLANTING ASSOCIATION TABLES

STATE PROJECT NO.: 171-305

SCALE: N.T.S.

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 84

South Mitigation Buffer Area

BOTANICAL NAME	COMMON NAME	INDICATOR	SIZE	SPACING	LOCATION	Number of plants
					South PFO & PSS	
AREA (S.F.)					22,708	
TREES					% Plant Cover	
JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	FACU	3'-4' HT B.B.	10' O.C.	15	34
PRUNUS SEROTINA	BLACK CHERRY	FACU	24"-36" HT B.B	10' O.C.	15	34
ACER SACCHARINUM	SILVER MAPLE	FACW	18" – 24" HT B.B	10' O.C.	15	34
				TOTAL % COVER=	45	102
SHRUBS					% Plant Cover	
CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	FAC	2'-3' HT B.B	5' O.C.	20	181
COMPTONIA PEREGRINA	SWEET FERN	UPL	18" – 24" HT B.B	5' O.C.	10	90
RHUS GLABRA	SMOOTH SUMAC	—	18" – 24" HT B.B	5' O.C.	15	136
VIBURNUM LENTAGO	NANNYBERRY	—	18" – 24" HT B.B.	5' O.C.	15	136
VIBURNUM ACERIFOLIUM	MAPLELEAF VIBURNUM	UPL	12"-15" HT B.B.	5' O.C.	10	90
				TOTAL % COVER=	70	633

North Mitigation Buffer Area

BOTANICAL NAME	COMMON NAME	INDICATOR	SIZE	SPACING	LOCATION	Number of Plants
					North PFO & PSS	
AREA (S.F.)					28,810	
TREES					% Plant Cover	
JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	FACU	3'-4' HT B.B	10' O.C.	10	28
BETULA POPULIFOLIA	GRAY BIRCH	FAC	18" – 24" HT B.B.	10' O.C.	10	28
ACER SACCHARINUM	SILVER MAPLE	FACW	18" – 24" HT B.B.	20' O.C.	10	7
PRUNUS SEROTINA	BLACK CHERRY	FACU	24"-36" HT B.B	10' O.C.	10	28
QUERCUS PALUSTRIS	PIN OAK	FACW	24"-36" HT CONTAINER	20' O.C.	5	3
				TOTAL % COVER=	45	94
SHRUBS					% Plant Cover	
AMELANCHIER CANADENSIS	SERVICEBERRY	FAC	4'-5' HT B.B	5' O.C.	10	115
CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	FAC	2'-3' HT B.B	5' O.C.	5	57
COMPTONIA PEREGRINA	SWEET FERN	UPL	18" – 24" HT B.B.	5' O.C.	10	115
RHUS GLABRA	SMOOTH SUMAC	—	18" – 24" HT B.B.	5' O.C.	10	115
VIBURNUM LENTAGO	NANNYBERRY	—	18" – 24" HT B.B.	5' O.C.	10	115
MYRICA PENNSYLVANICA	NORTHERN BAYBERRY	FAC	18" – 24" HT B.B.	5' O.C.	10	115
VIBURNUM ACERIFOLIUM	MAPLELEAF VIBURNUM	UPL	12"-15" HT B.B.	5' O.C.	5	57
VIBURNUM DENTATUM	ARROWWOOD	FACW	2'-3' HT B.B.	5' O.C.	5	57
				TOTAL % COVER=	65	746

SITE 13 - WETLANDS BUFFER PLANTING ASSOCIATION TABLES

STATE PROJECT NO.: 171-305

SCALE: N.T.S.

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

NEW BRITAIN - HARTFORD BUSWAY
ENVIRONMENTAL IMPACT PLATES

OFFICE OF ENGINEERING

MICHAEL BAKER ENGINEERING

DATE: FEBRUARY 2011

PLATE NO. 85

APPENDIX
A

New Britain – Hartford Busway
DEP Permit Application

RE: Updated Attachment H drainage discharge tables

DESIGN SECTION: 155-H025 (Hartford South)

SUMMARY: The attached package includes specific pages of the 155-H025 section of the Permit Application Attachment H that have been updated to be consistent with the drainage calculations submitted in response to March 30, 2011 review comments and as a follow-up to the drainage revision scroll plan submitted to DEP on 3/8/11 that illustrated the minor drainage changes that have taken place since August, 2010. These pages are meant to replace the originals submitted in August, 2010.

Section II: Stormwater Management

Subsection 1. *Stormwater Runoff*

Drainage System 1: Proposed Busway Drainage (Sta. 332+00 to 343+50)

	10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
			2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	--	24	1.5	2.29	3.23
Post-Development (1)	22.9	0.38	2.48	3.73	5.48

NOTES: 1. System discharges into adjacent Busway Contract No. 93-H034 at Sta. 332+00.

Drainage System 2: Proposed Busway Drainage (Sta. 343+50 to 351+98)

		10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	2-1 (Proposed Busway Drainage)	--	24	1.22 0.34	1.86 0.52	2.63 0.74
	2-2 (Flatbush Avenue Station)	5	0.08	9.18	11.98	15.57
	2-3 (Flatbush Avenue System)	--	24	14.4 16.19	22.71 24.66	32.42 34.82
Post-Development	2-1 (Proposed Busway Drainage) (1)	8 8.4	0.13 0.14	1.79 1.85	2.52 2.50	3.44 3.36
	2-2 (Flatbush Avenue Station) (2)	8	0.13	4.17	5.30	6.24
	2-3 (Flatbush Avenue System) (3)	27 26.9	0.45	11.22 11.89	19.72 20.79	30.40 31.[illegible]

INFO. NOT PROVIDED BY DOT

NOTES: 1. System discharges into Flatbush Avenue Project (Contract No. 63-643, 155-H030) at Sta. 351+98.
2. Flatbush Station discharges into proposed busway system at Sta. 350+57.
3. Flatbush Avenue system ties into existing MDC system at Sta. 22+68.

Drainage System 3: Proposed Busway Drainage (Sta. 351+98 to 384+50)

	10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
			2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	--	24	3.75	5.72	8.09
Post-Development (1)	29.5	0.49	9.83	15.80	24.43

NOTES: 1. System discharges into Kane Brook at Sta. 384+50.

Drainage System 4: Proposed Busway Drainage (Sta. 384+50 to 404+00)

	10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
			2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	--	24	1.11	1.68	2.38
Post-Development (1)	15.4	0.26	3.82	6.11	9.23

NOTES: 1. System discharges into Kane Brook at Sta. 385+00.

Drainage System 5: Proposed Busway Drainage (Sta. 404+00 to 418+00)

		10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	5-1 (Proposed Busway Drainage)	--	24	0.85	1.29	1.82
	5-2 (Parkville Station)	5	0.08	9.85	12.84	16.69
Post-Development	5-1 (Proposed Busway Drainage) (1), (2)	~~10.8~~ 10.0	0.18	~~3.73~~ 3.69	~~5.45~~ 5.50	~~7.59~~ 7.63
	5-2 (Parkville Station)	5	0.08	4.40	5.75	7.47

NOTES: 1. System discharges into existing MDC drainage system on Francis Avenue (Left of Sta. 412+75).
2. The Busway drainage system will outlet into a proposed underground detention system located to the left of the Busway at Sta. 412+75 just prior to discharging into the existing MDC system.

Drainage System 6: Proposed Busway Drainage (Sta. 418+00 to 439+25)

	10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
			2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	--	24	1.76	2.67	3.78
Post-Development (1)	31.2	0.52	3.14	5.11	7.43

NOTES: 1. System discharges into existing MDC drainage system on Park Road (Sta. 418+00)

Drainage System 7: Proposed Busway Drainage (Sta. 439+25 to 450+00)

	10-year Storm Time of Concentration (min)	10-year Storm Duration (hr)	Return Frequency		
			2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	--	24	3.30	5.02	7.11
Post-Development (1)	29.8	0.5	4.32	6.62	9.91

NOTES: 1. System discharges into adjacent Busway project at Sta. 405+00 (Contract No. 63+H137)

Section II: Stormwater Management (continued)

Describe the location of the design point and why this location was chosen:

Please see preceding attached sheet.

2. *Stormwater Detention Facilities*

Does the proposed project include the construction of any stormwater detention facilities?

☒ Yes ☐ No If no, skip to subsection 3 *(Storm Drainage Systems)*.

If yes, has the DEP determined whether a dam construction permit is required? ☐ Yes ☒ No

The pre and post development peak flow rates at the downstream design point are as follows:

Return Frequency (Year)	Peak Discharges (CFS)		
	Pre-Development	Post-Development (without detention)	Post-Development (with detention)
2	0	~~4.35~~ 4.37	~~0.35~~ 0.53
10	0	~~7.08~~ 6.72	~~0.97~~ 0.89
100	0	~~8.39~~ 9.06	~~2.77~~ 3.95

The above peak discharges were computed utilizing the: 24 hour duration storm. This duration storm was selected because:

A 24-hour storm duration was used to calculated the above peak discharges as required by the Connecticut Department of Transportation.

Describe the location of the design point and why this location was chosen:

The design point for the detention basin is located under the proposed Parkville Station. This location was chosen as this is where the proposed Busway drainage system will connect to the existing MDC system along Francis Avenue. Additionally, the proposed Parkville Station was designed with the intentions that the detention basin would be located under the site.

New Britain – Hartford Busway
DEP Permit Application

RE: Updated Attachment H drainage discharge tables

DESIGN SECTION: 88-H035 (New Britain)

SUMMARY: The attached package includes specific pages of the 88-H035 section of the Permit Application Attachment H that have been updated to be consistent with the drainage calculations submitted in response to March 30, 2011 review comments and as a follow-up to the drainage revision scroll plan submitted to DEP on 3/8/11 that illustrated the minor drainage changes that have taken place since August, 2010. These pages are meant to replace the originals submitted in August, 2010.

Section II: Stormwater Management

Subsection 1. *Stormwater Runoff*

Pre and Post Development Peak Flow Rates

Piper Brook Watershed

	Peak Discharges (CFS)					
	Return Frequency					
	2 Year		10 Year		100 Year	
Drainage System	Pre-Development	Post-Development	Pre-Development	Post-Development	Pre-Development	Post-Development
1	3.3	1.9	4.4	2.6	7.5	4.4
3	6.6	1.4	10.0	5.8	19.0	23.6
4 (1)	5.9	9.0	8.4	12.0	14.4	20.2
5 (3)	7.5	6.7	10.0	8.8	17.0	18.2
6	10.2	10.2	14.3	14.3	25.5	25.5
7 (2)	7.1	6.1	9.5	8.1	16	13.8
8	3.6	3.9	4.5	4.9	7.3	7.9
9	0.7	0.7	0.9	0.8	1.5	1.4
10	2.0	0.8	2.5	1.0	4.1	1.7
Totals	46.9	40.7	64.5	58.3	112.3	116.7

Willow Brook Watershed

	Peak Discharges (CFS)					
	Return Frequency					
	2 Year		10 Year		100 Year	
Drainage System	Pre-Development	Post-Development	Pre-Development	Post-Development	Pre-Development	Post-Development
2	5.9	5.6	7.9	7.5	13.4	12.7
11	3.8	3.9	5.1	5.7	8.6	9.3
Totals	9.7	9.5	13	13.2	22	22

NOTES:

(1) Discharges to abutting Busway segment. See Contract No. 88-H034.

(2) Discharges to City of New Britain municipal system. Runoff to existing City system anticipated to be less than existing conditions as proposed Station will have less paved areas than the development.

(3) Peak discharge for 10 Year Return Frequency for this system reduced with use of 120'-48" RCP for detention.

(4) The totals shown for Pre and Post development are conservative values for the impacts as the Time of Concentrations (Tc) vary. See following sheet for Tc's.

Storm Duration Computations

Piper Brook Watershed

Drainage System 1: Proposed Busway Drainage (Sta. 19+00 to 22+00)

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	0.92	10	0.33	3.3	4.4	7.5
Post-Development	0.54	10	0.33	1.9	2.6	4.4

Drainage System 3: Proposed Busway Drainage (Sta. 35+50 to 108+50)

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	4.74	50	1.70	6.6	10.0	19.0
Post-Development	7.41	30	1.00	1.4	5.8	23.6

Drainage System 4: Proposed Busway Drainage (Sta. 108+50 to 118+00)

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	2.10	15	0.50	5.9	8.4	14.4
Post-Development	2.49	10	0.33	9.0	12.0	20.2

Drainage System 5: Route 72 Eastbound Exit Ramp & Route 9 Southbound Entrance Ramp

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency (year)		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	2.09	10	0.33	7.5	10.0	17.0
Post-Development	2.29	10	0.33	6.7	8.8	18.2

Drainage System 6: Fairview Cemetery System

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	4.10	21	0.70	10.2	14.3	25.5
Post-Development	4.10	21	0.70	10.2	14.3	25.5

Drainage System 7: East Main Street System

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	1.97	10	0.33	7.1	9.5	16
Post-Development	1.70	10	0.33	6.1	8.1	13.8

Drainage System 8: Florence Street System

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	0.75	5	0.17	3.6	4.5	7.3
Post-Development	0.83	5	0.17	3.9	4.9	7.9

Drainage System 9: Columbus Boulevard System

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	0.15	5	0.17	0.7	0.9	1.5
Post-Development	0.14	5	0.17	0.7	0.8	1.4

Drainage System 10: DPW YARD System

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	0.42	5	0.17	2.0	2.5	4.1
Post-Development	0.17	5	0.17	0.8	1.0	1.7

Willow Brook Watershed

Drainage System 2: Proposed Busway Drainage (Sta. 22+00 to 28+85)

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	1.65	10	0.33	5.9	7.9	13.4
Post-Development	1.56	10	0.33	5.6	7.5	12.7

Drainage System 11: Busway over Route 9 Bridge Deck Drainage System

	AC	Time of Concentration (min)	Duration Storm (hr)	Return Frequency (year)		
				2-year (CFS)	10-year (CFS)	100-year (CFS)
Pre-Development	1.03	10	0.33	3.8	5.1	8.6
Post-Development	1.18	10	0.33	3.9	5.7	9.3

Section II: Stormwater Management

Subsection 1: Stormwater Runoff

Describe the location of the design point and why this location was chosen:

Contract No. 88-H035 involves the construction of approximately 10,000 linear feet of roadway for the Busway project. Stormwater runoff from this construction contract will impact the Piper Brook and the Willow Brook watersheds. The contract includes connections to several existing storm drainage systems and the construction of a new system for a segment of the Busway roadway. The impacts at specific discharge points vary. A common downstream point of each watershed was selected to evaluate the cumulative impacts of the proposed project contract.

The channel crossing of East Street was selected for Piper Brook. This point in immediately below the outet for the proposed Busway drainage system and downstream of the convergence of the various subdrainage systems. The outlet to the existing drainage basin north of South street was selected for the Willow Brook Watershed. This is the outlet for the Route 9 drainage systems that convey the discharges from two of the project systems.

The individual roadway drainage systems that convey stormwater flows associated with this segment of the Busway Project are listed by the watershed they discharge into and are described as follows:

<u>Piper Brook Watershed</u>

Drainage System 1

Drainage system 1 is located at the very beginning of the busway (Sta. 19+00 to Sta. 22+00) and includes three catch basins. Two of the catch basins are located along the busway gutter lines and a third catch basin conveys runoff from a grass lined channel. These catch basins connect to the City system. This was done to maintain the existing drainage patterns at this location.

Drainage System 3

Drainage system 3 includes the proposed busway trunk line, which begins just east of the proposed Busway Bridge over Route 9 to the high point on the bridge over Allen and East Street (Sta. 35+50 to Sta. 108+50). The system is comprised of catch basins located along the gutter lines of the busway and multi-use trail. There are also grass lined ditches located intermittently on the side of the busway that convey runoff from the busway. The drainage in this area is conveyed to a water quality basin located at the low point in the busway (Sta. 98+00). This water quality basin outfalls into Piper Brook.

Drainage System 4

Drainage system 4 includes the proposed busway drainage at the north end of the project (Sta. 108+50 to 118+00). This system outfalls into a proposed roadway drainage system to be constructed under Contract No 88-H034 and was designed to maintain the drainage patterns. See Contract No. 88-H034 for more information.

Drainage System 5

Drainage system 5 includes the drainage from the Route 72 and Route 9 ramps. There are four different outlet points in this system in order to maintain the existing watershed divides. The systems are connected to the Route 9/72 trunk line through four existing catch basins located along the Route 72 eastbound shoulder. Three of these catch basins are located on the west side of Route 71 along the and one catch basin is located to the east. The peak discharge for 10 Year Return Frequency for this system was reduced with 120'-48" RCP intoduced between catch basins for detention.

Drainage System 6

Drainage system 6 includes the proposed system at Fairview Cemetery. The system includes a catch basin at the low point in the Cemetery underpass and piping to convey runoff to a remnant of the old Piper Brook located at the northwest corner of Fairview Cemetery.

Drainage System 7

Drainage system 7 includes the drainage along East Main Street, which intersects the busway. Proposed catch basins will be connected to the existing City system along East Main Street so that the existing drainage pattern at this location is maintained.

Drainage System 8

Drainage system 8 includes the drainage along Florence Street, which intersects the Harvard Street. The drainage area for this system is approximately 1.24 acres in size. Two new catch basins will be constructed at low points in the vicinity of the proposed Florence Street/Harvard Street intersection. Stormwater runoff intercepted by those catch basins will be discharged into an existing City 48" RCP trunk line along Harvard Street.

Drainage System 9

Drainage system 9 includes the drainage along Columbus Boulevard. The drainage area for this system is approximately 0.16 acres in size. Two existing catch basins will be replaced by two new catch basins. Stormwater runoff intercepted by those catch basins will be discharged into an existing City storm drain system along Columbus Boulevard.

Drainage System 10

The existing drainage area at DPW Yard is approximately 0.47 acres in size. A portion of the existing drainage area will contribute to the proposed busway drainage system. Therefore, the proposed drainage area for DPW Yard system is reduced to 0.19 acres. Two existing catch basins will be replaced by three new catch basins along the multi-use trail curb line. Stormwater runoff intercept by those catch basins will be discharged in to an existing City storm drain system.

Willow Brook Watershed

Drainage System 2

Drainage system 2 includes the proposed busway just west of the bridge over Route 9 (Sta. 22+00 to 28+85) and includes some runoff from the Route 9 entrance ramp. This system is comprised of catch basins along the busway gutter line that outlet into a grass lined channel on the left side of the busway. The grass channel carries the runoff from the busway in this location into an existing catch basin on Route 9, which is conveyed into the Route 9 South trunk line system. This system was designed to maintain the existing drainage pattern at this location, which is currently conveyed into the Route 9 South trunk line.

Drainage System 11

Drainage system 11 includes the proposed Busway Bridge over Route 9 (Sta. 28+85 to 35+50). This system is comprised of bridge scuppers located along the busway gutter line that outlet into the existing Route 9 roadway drainage system.

New Britain – Hartford Busway
DEP Permit Application

RE: Updated Attachment H drainage discharge tables

DESIGN SECTION: *88-H034 (Newington)*

SUMMARY: The attached package includes specific pages of the 88-H034 section of the Permit Application Attachment H that have been updated to be consistent with the drainage calculations submitted in response to March 30, 2011 review comments and as a follow-up to the drainage revision scroll plan submitted to DEP on 3/8/11 that illustrated the minor drainage changes that have taken place since August, 2010. These pages are meant to replace the originals submitted in August, 2010.

The following table is a comparison of existing and proposed discharges for the drainage systems of the project. Flows are based on a 2-year, 10-year storm and 100-year event and measured at the outlet.

Discharge Summary Table

System	2-Year		10-Year		100-Year	
	Existing Discharge CFS	Proposed Discharge CFS	Existing Discharge CFS	Proposed Discharge CFS	Existing Discharge CFS	Proposed Discharge CFS
1	12.15	19.2	17.56	27.69	24.76	39.0
2	8.7	9.37	13.2	14.21	19.9	21.29
3	0.7	2.15	0.9	2.75	1.2	3.56
4	7.07	7.07	10.1	10.1	14.0	14.0
5	0.4	1.34	0.6	1.98	0.8	2.81
6	0.4	1.13	0.5	1.49	0.7	1.95
7	*	*	*	*	*	*
8	2.48	2.48	3.43	3.43	4.67	4.67
9	0.9	2.35	1.2	3.07	1.6	3.99
10	0.6	1.49	0.8	1.94	1.0	2.47
11	5.78	5.78	8.54	8.54	12.54	12.54
12	0.6	1.4	0.7	1.83	1.0	2.38
13	12.4	12.4	13.3	13.3	14.45	14.45
14	2.5	2.99	3.2	3.93	4.3	5.13

*This system watershed will not be developed therefore no change in runoff.

New Britain – Hartford Busway
DEP Permit Application

RE: Updated Attachment H drainage discharge tables

DESIGN SECTION: 88-H039 (Stations)

SUMMARY: The attached package includes specific pages of the 88-H039 section of the Permit Application Attachment H that have been updated to be consistent with the drainage calculations submitted in response to March 30, 2011 review comments and as a follow-up to the drainage revision scroll plan submitted to DEP on 3/8/11 that illustrated the minor drainage changes that have taken place since August, 2010. These pages are meant to replace the originals submitted in August, 2010.

Attachment H, Submitted5/17/2010

Kane Street

Drainage Report Permitting Submission 10/30/2009, rev 3/22/2011

Attachment H, Originally submitted 5/17/2009, rev 3/16/2011

Union

Drainage Report Permitting Submission 11/13/2009

Attachment H, Submitted May 17, 2010

The summary of the submission dates for those reports that do not contain an Attachment H are as follows:

East Main Street

Drainage Report Permitting Submission 1/27/2010

East Street

Drainage Report Permitting Submission 11/6/2009

Newington Junction

Drainage Report Permitting Submission 1/22/2010

Flatbush Ave.

Drainage Report Permitting Submission 10/30/2009

Parkville

Drainage Report Permitting Submission 10/30/2009

Sigourney

Drainage Report Permitting Submission 11/13/2009

END

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S E A
S E A CONSULTANTS INC

MEMORANDUM

DATE:	March 22, 2011
TO:	Mr. Brian Cunningham, P.E., CTDOT
FROM:	Al Bisacky, P.E.
CC:	file
SUBJECT:	Confirmation of Stormwater Flows, NBH Busway Stations
S E A No.:	2008228

We have reviewed the design analysis flows as determined for the eleven Busway Station drainage systems reported in Drainage Reports and (where relevant) the DEP form "Attachment H: Engineering Documentation". The flows cited in the Reports and Attachment H (where applicable) remain valid. It is noted that the general configuration of the systems outlet locations are unchanged. However there have been changes to specific system elements, such as the precise location and elevations of individual catch basins, slight changes in surface material, etc. These changes are due to the design development that occurred subsequent to the submission of the Drainage Reports and do not appreciably change the expected discharge flows as reported.

The design of the Kane Station drainage system was changed; therefore a revised Drainage Report and Attachment H were prepared. The change included the addition of <u>one</u> yard drain (where originally there were none) and associated outlet discharging to an upland area; however the peak discharge flow rates from the site or general internal site flow characteristics did not change. The yard drain was added to reduce the potential for runoff to flow across a sidewalk and create a safety hazard.

The summary of the submission dates for those reports that contain an Attachment H are as follows:

Downtown New Britain
- Drainage Report Permitting Submission 12/18/2009
- Attachment H, Submitted 5/17/2010

Cedar Street
- Drainage Report Permitting Submission 2/24/2010
- Attachment H, Submitted 5/17/2010

Elmwood
- Drainage Report Permitting Submission 12/4/2009

NEW BRITAIN – HARTFORD BUSWAY

State Project Number 171-305

Connecticut Department of Environmental Protection
Inland Water Resources Permit Application

Attachment H: Engineering Documentation

Part 1: Engineering Report Checklist
Part 2: Hydrologic and Hydraulic Consistency Worksheet

Design Contract Number: 093-180

Design Contract Name: New Britain Hartford Busway Stations
Kane Street

Date: March 2011

Date of Pre-Application Attachment H (if applicable): May 2010

Changes From Pre-Application Submittal (if applicable): March 2011

Engineering Reports Pertinent to Attachment H

- New Britain – Hartford Busway Permitting Submission Kane Street Station. October 30, 2009.

Attachment H: Engineering Documentation

Part 1: Engineering Report Checklist

The following is a checklist of requirements that need to be completed, included and submitted as part of the Engineering Report. Please complete this checklist by identifying where each requirement listed is addressed in the Engineering Report (report title and page numbers). If an item is not applicable, place "NA" in the box. Attach the completed checklist as the cover sheet to engineering reports, as applicable, which fully describe the design of the proposed facilities or other actions and the hydraulic and hydrologic effects thereof. The application instructions (DEP-IWRD-INST-100) should be consulted for a complete description of each item listed. This checklist is required to be signed and sealed by a professional engineer licensed in the State of Connecticut.

Stormwater Management

Location of Item	Item Description
2.0	Description of the design storm frequency intensity, volume and duration
Appendix B	Watershed maps, existing and proposed
N/A	Computations for Tc
3.0.1/3.0.2	Imperviousness calculations
N/A	NRCS runoff curve numbers, volumetric runoff coefficients
6.0	Computations used to determine peak runoff rates, and velocities for each watershed area (24-hour storm): • Stream Channel Protection: 2-year frequency ("over-control" of 2-year storm) • Conveyance Protection: 10-year frequency • Peak Runoff Attenuation: 2-year, 10-year, and 100-year frequency • Emergency Outlet Sizing: safely pass the 100-year frequency or larger storm
N/A	Hydrograph routing calculations
N/A	Description, schematics, and calculations for drainage and stormwater management systems, bridges and culverts
N/A	Infiltration rates
2.0	Documentation of sources
N/A	Computer disk containing input and output data and the associated program for all computer models used in the analyses
6.0	Hard copy of input and output data including input/output tables
N/A	Detention basin analysis including timing and duration of expected outflow, stream stability analysis and hydrograph summation

Flood Plain Assessment

Location of Item	Item Description
N/A	Description or simulation of existing and proposed conditions upstream and downstream of the proposed activity
N/A	(For SCEL applications only) A determination of the effect of the proposed activity on flooding and flood hazards together with an equivalent encroachment on the opposite bank for the flood event establishing the encroachment lines
N/A	For any bridge or culvert placement or replacement with a drainage area of 100 acres or more, plan sheets showing the existing and proposed inundation area for the 2, 10, 25, 50, and 100 year discharges, carried to convergence
N/A	A description and analysis of the floodplain modifications required to restore any flood conveyance and flood storage capacity
N/A	Demonstration that backwater from the proposed activity will not impact an existing dam, dike, or similar structure
N/A	Backup data and complete hydraulic analysis for proposed modifications to the floodplain including location plan and plot for sections, profile sheet, summary sheet

Dams, Dikes, Diversion Channels, Similar Structures

Location of Item	Item Description
N/A	Primary and emergency spillway and outlet structure erosion protection
N/A	Dam breach analysis
N/A	Geotechnical evaluation
N/A	Construction Specifications for foundation preparation, embankment material, outlet structure, and construction inspection

Soil Erosion and Sediment Control Plan

Location of Item	Item Description
3.0.4	Narrative
7.0	Drawings
7.0	Details
N/A	Calculations for Engineered Measures

Professional Certification

For any Engineering Report submitted as part of the IWRD permit application, the following certification must be signed and sealed by a professional engineer licensed to practice in Connecticut and submitted with the Engineering Report Checklist and Report.

"I certify that in my professional judgement, each requirement listed in the Engineering Report Checklist has been addressed in the Engineering Report submitted as part of the IWRD permit application as Attachment H, Part 1 and that the information is true, accurate and complete to the best of my knowledge and belief.

This certification is based on my review of the Engineering Report.

I understand that a false statement made in the submitted information may, pursuant to Section 22a-6 of the General Statutes, be punishable as a criminal offense under Section 53a-157b of the General Statutes, and may also be punishable under Section 22a-438 of the General Statutes."

Signature of Applicant	Date
Name of Applicant (print or type)	Title (if applicable)
Signature of Professional Engineer	Date 3/16/11
Name of Professional Engineer (print or type) ALBERT G. BISACKY	P.E. Number (if applicable) 14856

Affix P.E. Stamp Here
(if applicable)

STATE OF CONNECTICUT
ALBERT G. BISACKY
No. 14856
LICENSED
PROFESSIONAL ENGINEER

Attachment H: Engineering Documentation

Part 2: Hydrologic and Hydraulic Consistency Worksheet

Inland Water Resources Division Permit Activities

This worksheet has four sections; only complete the section(s) applicable to the proposed project. Where a question requires a "Yes" or "No" answer, select the appropriate response and explain your response, if required, in the space provided.

Section I: **Floodplain Management** *(if the proposed project involves a structure, obstruction, encroachment or work in a watercourse, floodplain, or coastal high hazard area)*

Section II: **Stormwater Management** *(if the proposed project involves stormwater drainage or stormwater runoff)*

Sections III: **State Grants and Loans** and **Section IV: Disposal of State Land** *(only if the applicant is a state agency seeking flood management certification approval for state grants and loans or disposal of state land)*

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Definitions of terms used in these worksheets are found in Section 25-68b of the Connecticut General Statutes and Section 25-68h-1 of the Regulations of Connecticut State Agencies and in the National Flood Insurance Program Regulations (44 CFR, Chapter 1, Subchapter B, Part 59.1).

Section I: Floodplain Management

Section I: Floodplain Management

Name of Applicant: Connecticut Department of Transportation

Name of Proposed Project: New Britain-Hartford Busway, Proj. No. 171-305 (88-H039

1. *General Criteria*

a. *Critical Activity* - Does the proposed project involve the treatment, storage and disposal of hazardous waste or the siting of hospitals, housing for the elderly, schools or residences, in the 0.2 per cent [500 year] floodplain? ☐ Yes ☒ No

If yes, the base flood for the critical activity shall have a recurrence interval equal to the 500 year flood event; if no, the base flood for the activity shall have a recurrence interval equal to the 100 year flood event.

b. *Nonintensive Floodplain Uses* - Will the proposed project promote development in floodplains or will utilities servicing the project be located so as to enable floodplain development?

☐ Yes ☒ No

Explain:

c. *National Flood Insurance Program* (NFIP) - Will the proposed project be located within an area of special flood hazard designated by the Federal Emergency Management Agency (FEMA)?

☐ Yes ☒ No If yes, list the FEMA flood zone(s):

Does the proposed project meet the NFIP minimum standards established in 44 CFR, Chapter 1, Subchapter B, Part 60.3, floodplain management criteria for flood-prone areas?

☒ Yes ☐ No

d. *Municipal Regulations* - Has the municipality in which the proposed project is to be located adopted floodplain regulations containing requirements that are more restrictive than the NFIP floodplain management criteria for flood-prone areas? ☐ Yes ☒ No

If yes, describe the more restrictive requirements:

Does the proposed project comply with the more restrictive standards of the municipality?

☐ Yes ☐ No

2. *Flooding and Flood Hazards*

a. *Flooding* - Will the proposed project pose any hazard to human life, health or property in the event of a base flood? ☐ Yes ☒ No

If yes, explain:

b. *Flood Velocities* - Will the proposed project cause an increase in flow velocity or depth during the base flood discharge? ☐ Yes ☒ No

If yes, the increase in velocity is: fps
and/or the increase in depth is: ft.

Will such increase in velocity or depth cause channel erosion or pose any hazard to human life, health or property? ☐ Yes ☐ No

Explain:

c. *Flood Storage* - Will the proposed project affect the flood storage capacity or flood control value of the floodplain? ☐ Yes ☒ No

If yes, describe the effects:

d. *Degrading or Aggrading Stream Beds* - Is the streambed currently degrading or aggrading?

☐ Degrading ☐ Aggrading ☒ Neither

Has the project design addressed degrading or aggrading streambed conditions?

☐ Yes ☒ No

e. *Ice Jams* - Is the watercourse prone to ice jams or floods due to ice? ☐ Yes ☒ No

Has the project design considered ice jams or floods due to ice? ☐ Yes ☒ No

f. *Storage of Materials & Equipment* - Will the construction or use of the proposed project involve the storage of materials below the 500 year flood elevation that are buoyant, hazardous, flammable, explosive, soluble, expansive or radioactive, or the storage of any other materials which could be injurious to human, animal or plant life in the event of a flood?

☐ Yes ☒ No

If yes, describe the materials and how such materials will be protected from flood damage, secured or removed from the floodplain to prevent pollution and hazards to life and property.

Storage of materials that could be injurious to human health or the environment in the event of flooding is prohibited below the elevation of the 500 year flood. Other material or equipment may be stored below the 500 year flood elevation provided that such material or equipment is not subject to major damage by floods, and provided that such material or equipment is firmly anchored, restrained or enclosed to prevent it from floating away or that such material or equipment can be removed prior to flooding.

g. *Floodwater Loads* - Will structures, facilities and stored materials be anchored or otherwise designed to prevent floatation, collapse, or lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy? ☐ Yes ☐ No

3. *Standards for Structures in Floodplains or Coastal High Hazard Areas*

Does the proposed project involve a new or substantially improved structure or facility located within a floodplain or coastal high hazard area? ☐ Yes ☒ No

If yes, complete this subsection; if no, skip to subsection 4 (***Topography Changes within Floodplain***).

a. *Structures in Coastal High Hazard Areas* - Will the structure or facility be located within an NFIP coastal high hazard area? ☐ Yes ☐ No

If no, skip to paragraph 3(b); if yes:

1. Will the structure or facility be located landward of the reach of mean high tide?

   ☐ Yes ☐ No

2. Will a new structure or facility be located on an undeveloped coastal barrier beach designated by FEMA? ☐ Yes ☐ No

3. If the structure or facility is/will be located within a coastal high hazard area, the structure or facility must be elevated on pilings or columns so that the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to at least one foot above the base flood level and the pile or column foundation and structure attached thereto must be anchored to resist floatation, collapse and lateral movement due to the effects of wind, velocity waters, hurricane wave wash, and base flood water loads acting simultaneously on all building components.

   Does the proposed structure or facility meet these standards? ☐ Yes ☐ No

   The base flood elevation is: ft. (Datum:)

   The elevation of the lowest horizontal structural member is: ft. (Datum:)

Section I: Floodplain Management (continued)

4. Will the space below the lowest floor be either free of obstruction or constructed with non-supporting breakaway walls? ☐ Yes ☐ No

5. Will fill be used for structural support of any buildings within coastal high hazard areas?

   ☐ Yes ☐ No

b. *Structures in Floodplain Areas* - Are the structures residential or nonresidential?

   ☐ Residential ☐ Nonresidential If *nonresidential*, skip to paragraph 3(d) below.

c. *Residential Structures* - If the structure or facility is for human habitation will the lowest floor of such structure or facility, including its basement, be elevated one foot above the level of the 500 year flood?

   ☐ Yes ☐ No

   The 500 year flood elevation is: ft. (Datum:)

   The elevation of the lowest floor, including basement, is: ft. (Datum:)

d. *Non-residential Structures* - If the structure or facility is not intended for residential uses, will the lowest floor of such structure or facility, including its basement, be elevated to or above the 100 year flood height or be floodproofed to that height, or in the case of a critical activity, the 500 year flood height?

   ☐ Yes ☐ No

   If yes, the structure will be: ☐ Elevated ☐ Floodproofed

   The base flood elevation is: ft. (Datum:)

   The elevation of the lowest floor, including basement, is: ft. (Datum:)

   The structure is floodproofed to: ft. (Datum:)

   Note: for insurance purposes nonresidential structures must be floodproofed to at least one foot above the base flood elevation. DEP strongly encourages that the height of floodproofing incorporate one foot of freeboard.

e. *Utilities* - Will service facilities such as electrical, heating, ventilation, plumbing, and air conditioning equipment be constructed at or above the elevation of the base flood or floodproofed with a passive system? ☐ Yes ☐ No

f. *Water Supply Systems* - Does the proposed project include a new or replacement water supply system?
   ☐ Yes ☐ No

   If yes, is the water supply system designed to prevent floodwaters from entering and contaminating the system during the base flood? ☐ Yes ☐ No

g. *Sanitary Sewage Systems* - Does the proposed project include a new or replacement sanitary sewage or collection system? ☐ Yes ☐ No

   If yes, is the sanitary sewage system designed to minimize or eliminate the infiltration of flood waters into the systems and discharges from the systems into flood waters during the base flood?

   ☐ Yes ☐ No

h. *Foundation Drains* - Are foundation drains of buildings designed to prevent backflow from the 100 year frequency flood into the building?

   ☐ Yes ☐ No ☐ No foundation drains

4. *Activity within Floodplain*

Does the proposed project involve activity in a floodplain including but not limited to filling, dumping, construction, excavating, or grading?

☐ Yes ☒ No If no, skip to subsection 5 *(Alterations of Watercourses)*.

If yes, does the proposed project include encroachments, including fill, new construction, substantial improvements, or other development within a NFIP adopted regulatory floodway?

☐ Yes ☐ No If yes, skip to paragraph 4(b) below.

a. *No Regulatory Floodway* - The NFIP requires that until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point. (If no regulatory floodway has been adopted, project impacts may be evaluated by considering an equivalent conveyance loss on the opposite side of the river from the proposed project.)

Is the proposed project consistent with this requirement? ☐ Yes ☐ No

b. *Floodway Encroachments* - Will the proposed encroachment into the floodway result in any increase in flood levels during either the 100 year or 10 year discharges?

100 year: ☐ Yes; the increase is: (in 1/100ths of a foot) ☐ No

If yes, has the applicant received approval of such increase in accordance with 44 CFR, Chapter 1, Subchapter B, Part 65.12? ☐ Yes ☐ No

10 year: ☐ Yes; the increase is: (in 1/100ths of a foot) ☐ No

c. *Coastal Areas* - Flood hazard potential in coastal areas shall be evaluated considering surface profiles of the combined occurrence of tides, storm surges, and peak runoff. The starting water surface elevation for the base flood in watersheds with time of concentrations of over 6 hours shall be the 10 year frequency tidal surge level.

If the proposed project is in a coastal area, have the hydraulic analyses incorporated these criteria?

☐ Yes ☐ No ☐ Not in Coastal Area

5. *Alterations of Watercourses*

Does the proposed project include the construction or alteration to a natural perennial watercourse or man-made channel?

☐ Yes ☒ No If no, skip to subsection 6 *(Culverts and Bridges)*; if yes, complete the following subsection:

a. *Topography Change* - Is the watercourse or channel located within a regulatory floodway or Zone A1-30 or AE as designated by the NFIP? ☐ Yes ☐ No

b. *Hydraulic Capacity* - Does the channel have a minimum flow capacity of a flood equal to at least the 25 year frequency flood? ☐ Yes ☐ No

The channel capacity is designed for the: year flood.

Does the channel have an inner channel with a capacity of a 2 year frequency flood? ☐ Yes ☐ No

c. *Aquatic Habitat* - Channel alterations should be designed to create aquatic habitats suitable for fisheries, including suitable habitat for maintaining fish populations and to enable fish passage, and to maintain or improve water quality, aesthetics, and recreation.

Has the applicant had any pre-application meetings or correspondence with DEP Fisheries?

☐ Yes ☐ No

Check each of the following criteria that have been incorporated into the project design:

☐ 1. artificial channel linings have been avoided;

☐ 2. the channel will encourage ecological productivity and diversity;

☐ 3. the channel and its banks will be compatible with their surroundings;

☐ 4. the channel will vary in its width, depth, invert elevations, and side slopes to provide diverse aquatic habitat;

☐ 5. straightening existing channels and thereby decreasing their length has been avoided;

☐ 6. the channel will not create barriers to upstream and downstream fish passage;

☐ 7. the channel will contain pools and riffles and a low flow channel to concentrate seasonal low water flows;

☐ 8. the channel will contain flow deflectors, boulders and low check dams to enhance aquatic habitat;

☐ 9. stream bank vegetation will be preserved where feasible and disturbed stream bank areas will be replanted with suitable vegetation;

☐ 10. clean natural stream bed materials of a suitable size will be incorporated in the new channel; and

☐ 11. construction of the proposed project will be scheduled to minimize conflicts with spawning, stocking, and recreational fishing seasons.

Describe how the above aquatic habitat design criteria have been incorporated into the project design:

6. *Culverts and Bridges*

Does the proposed project involve the repair or new construction of a culvert or bridge?

☐ Yes ☒ No If no, go to subsection 7 *(Temporary Hydraulic Facilities)*.

If yes, complete this subsection:

a. *Fish Passage* - Does the culvert design allow for the passage of fish? ☐ Yes ☐ No

If yes, describe the specific design provisions for fish passage:

b. *Depressed Structural Floors* - Is the rigid structural floor of the culvert or bridge depressed below the normal stream bed to allow a natural stream bed to form over the floor?

☐ Yes ☐ No ☐ No rigid structural floor

c. *Multiple Openings* - The use of a single large culvert or bridge opening is preferred over the use of multiple small openings. Has the design minimized the use of multiple small openings?

☐ Yes ☐ No

If no, explain:

d. *Sag Vertical Curves* - Does the design utilize solid parapet walls in the sag part of a vertical curve?

☐ Yes ☐ No ☐ Not located in a sag vertical curve

e. *Debris Blockage* - Is the culvert or bridge prone to blockage by debris? ☐ Yes ☐ No

If yes, has the project design incorporated measures to minimize the potential for debris blockage?

☐ Yes ☐ No

f. *Topography Change* - Is the culvert or bridge located within a regulatory floodway or Zone A1-30 or AE as designated by the NFIP? ☐ Yes ☐ No

g. *State Highways* - Does the watercourse pass under a state roadway?

☐ Yes ☐ No If no, skip to paragraph 6(g)(2).

If yes, culverts and bridges for state highways shall be designed in accordance with the Connecticut Department of Transportation (DOT) Drainage Manual and all applicants should refer to it for specific design criteria. In general, however, the Drainage Manual requires the following:

(Place a check mark for all applicable criteria utilized)

☐ *Minor Structures* - Minor structures have a drainage area of less than one square mile in which there is no established watercourse. They shall be designed to pass the 25 year frequency discharge.

☐ *Small Structures* - Small structures have a drainage area of less than one square mile in which there is an established watercourse. *They* shall be designed to pass the 50 year frequency discharge.

☐ *Intermediate Structures* - Intermediate structures have a drainage area greater than one square mile and less than 10 square miles. They *shall* be designed to pass the 100 year frequency discharge with reasonable underclearance.

☐ *Large Structures* - Large structures have a drainage area greater than 10 square miles and less than 1000 square miles. They shall be designed to pass the 100 year frequency discharge with an underclearance not less than two feet.

☐ *Monumental Structures* - Monumental structures *have* a drainage area greater than 1000 square miles. They shall be designed to meet the requirements of the Connecticut Department of Environmental Protection, U.S. Army Corps of Engineers, and the U.S. Coast Guard.

☐ *Tidal Structures* - Tidal structures are subject to tidal action and shall be classified as minor, small, intermediate, etc. depending on their drainage area. These structures shall be designed in accordance with the previously listed *classifications*. However if the highway is subject to frequent tidal flooding, the design storm may be made consistent with the frequency of flooding by tidal action. The proposed culvert or bridge is classified as:

☐ Tidal, minor

☐ Tidal, small

☐ Tidal, intermediate

☐ Tidal, large

☐ Tidal, monumental

1. Has the structure been designed in accordance with the criteria established in the DOT Drainage Manual? ☐ Yes ☐ No

   If no, describe the lower design standards and the reasons for not complying with the DOT Drainage Manual:

2. Will the proposed culvert or bridge increase upstream water surface elevations in the event of a base flood above that which would have been obtained in the natural channel if the highway embankment were not constructed? ☐ Yes ☐ No

   If yes, is the increase in elevation more than one foot? Describe:

3. Will the proposed culvert or bridge be designed so that flooding during the design discharge does not endanger the roadway or cause damage to upstream developed property? (NOTE: The design discharge for culverts and bridges on state highways should be that which was determined by FEMA. If the applicant judges that the FEMA discharge is inappropriate, the project should be analyzed for both the applicant's computed flow and the FEMA discharge. The project, however, must still meet the standards of the NFIP.) ☐ Yes ☐ No

   Explain:

h. *Local Roads & Driveways* - Local roads (not state highways) and driveways may be designed for flood frequencies and underclearances less stringent than those specified in the DOT Drainage Manual when (check all that have been incorporated into the project design):

☐ 1. the road is at or close to the floodplain grade

☐ 2. water surface elevations are not increased by more than one foot nor cause damage to upstream properties

☐ 3. provisions are made to barricade the road when overtopped

☐ 4. the road or driveway is posted as being subject to flooding

☐ 5. the road or driveway has low traffic volume

☐ 6. alternate routes are available

The culvert or bridge has been designed to pass the: year frequency discharge with an underclearance of: feet.

Utilizing the DOT Drainage Manual classifications listed under paragraph 6(g) above, the culvert or bridge is classified as a: structure.

h. If the culvert or bridge is designed to standards lower than which is stipulated in the DOT Drainage Manual, list such standards and the reasons for the lower design standards:

i. *Downstream Peak Flows* - Will the proposed culvert or bridge increase downstream peak flows by decreasing existing headwater depths during flooding events? ☐ Yes ☐ No

If yes, describe the selected design criteria and the impacts to downstream properties:

7. *Temporary Hydraulic Facilities*

Temporary hydraulic facilities include all channels, culverts or bridges which are required for haul roads, channel relocations, culvert installations, bridge construction, temporary roads, or detours. They are to be designed with the same care which is used for the primary facility.

If the proposed activity involves a temporary hydraulic facility(s), has such facility been designed in accordance with Chapter 6, Appendix F, "Temporary Hydraulic Facilities," of the DOT Drainage Manual?

☐ Yes ☐ No ☒ No temporary hydraulic facilities

If yes, the design flood frequency is the: year flood.

Describe the temporary facilities:

Section II: Stormwater Management

Name of Applicant: Connecticut Department of Transportation

Name of Proposed Project: New Britain-Hartford Busway, Proj. No. 171-305 (88-H039

1. *Stormwater Runoff*

The proposed project will (check all that apply):

- ☒ Increase the area of impervious surfaces
- ☒ Increase runoff coefficients
- ☐ Alter existing drainage patterns
- ☐ Alter time of concentrations
- ☐ Change the timing of runoff in relation to adjacent watersheds

Will the proposed project impact downstream areas by increasing peak flow rates, the timing of runoff, or the volume of runoff? ☐ Yes ☒ No

If yes, describe the downstream impacts for the 2, 10 and 100 year frequency discharges:

The pre and post development peak flow rates at the downstream design point are as follows:

Return Frequency (Year)	Peak Discharges (CFS)	
	Pre-Development	Post-Development
2	See attached sheet.	
10		
100		

The above peak discharges were computed utilizing the: hour duration storm. This duration storm was selected because:

Section II: Stormwater Management
1. *Stormwater runoff*

Pre-Development and Post-Development Comparison

	Return Frequency Discharge (cfs)					
	2 Year		10 Year		100 Year	
	Pre-Development	Post-Development	Pre-Development	Post-Development	Pre-Development	Post-Development
To New Park Avenue system	3.55	3.32	4.63	4.33	6.01	5.63
Sheet flow to Kane Brook	4.88	3.84	6.36	5.01	8.27	6.51

To New Park Avenue System

	Area (ac)	Rational Method C value
Pre-Development	1.01	0.76
Post-Development	0.83	0.87

Sheet Flow to Kane Brook

	Area (ac)	Rational Method C value
Pre-Development	2.65	0.40
Post-Development	2.32	0.36

Two design points are relevant in this hydrologic analysis of the development area. An existing drainage system within New Park Avenue collects flow from the proposed site and a proposed single yard drain within a grassed area collects runoff and conveys it under a sidewalk discharging to and an upland area remote from Kane Brook. Each design point was selected to compare the site development impact.

Section II: Stormwater Management (continued)

Describe the location of the design point and why this location was chosen:

2. *Stormwater Detention Facilities*

Does the proposed project include the construction of any stormwater detention facilities?

☐ Yes ☒ No If no, skip to subsection 3 *(Storm Drainage Systems)*.

If yes, has the DEP determined whether a dam construction permit is required? ☐ Yes ☐ No

The pre and post development peak flow rates at the downstream design point are as follows:

Return Frequency (Year)	Peak Discharges (CFS)		
	Pre-Development	Post-Development (without detention)	Post-Development (with detention)
2			
10			
100			

The above peak discharges were computed utilizing the: hour duration storm. This duration storm was selected because:

Section II: Stormwater Management (continued)

Describe the location of the design point and why this location was chosen:

If the proposed project increases peak flow rates for the 2, 10 or 100 year frequency discharges, describe the impacts to downstream areas:

Will the detention facility aggravate erosion along the downstream channel? ☐ Yes ☐ No

In certain situations, detention of stormwater aggravates downstream flooding. This occurs when the discharge from a subwatershed is delayed by a detention facility so that it adds to the peak discharge from another subwatershed. Adding the hydrographs of the two subwatersheds results in a higher peak discharge over that which would occur if detention were not present.

Is the location of the detention facility within the watershed suitable for detention? ☐ Yes ☐ No

Explain:

3. *Storm Drainage Systems*

Does the proposed project include the construction of subsurface storm drainage systems?

☒ Yes ☐ No If no, you have completed Section II of the worksheets.

If yes, complete this subsection:

a. *DOT Standards* - Is the proposed storm drainage system designed in accordance with the Connecticut Department of Transportation's (DOT) Drainage Manual? ☒ Yes ☐ No

If no, describe the lower design standards and the reasons for not complying with the Drainage Manual:

b. *Design Storm* - Is the storm drainage system designed for a ten year frequency storm without closing the use of the facility? ☒ Yes ☐ No

c. *Future Development* - Has the design of the system considered future development of adjacent properties? ☒ Yes ☐ No

d. *Outlet Protection* - Have the outlets from the system been designed to minimize the potential for downstream erosion? ☒ Yes ☐ No

e. *Overland Flow* - Has the use of curbing been minimized to encourage overland dispersed flow through stable vegetated areas? ☒ Yes ☐ No

f. *Vegetated Filter Strips* - Has the design incorporated the use of vegetated filter strips or grass swales to improve the quality of water outletting from the storm drainage system? ☒ Yes ☐ No

g. *Stormwater Treatment* - Describe features of the stormwater collection system intended to improve the quality of stormwater runoff prior to its discharge to surface waters.

None

Section II: Stormwater Management (continued)

h. *E & S Control Plan* - Has the design and installation of the storm drainage system been coordinated with the soil erosion and sediment control plan prepared in accordance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control? ☒ Yes ☐ No

Explain:

The Erosion and Sedimentaion Control plans are designed presuming that the busway will be built prior to the station site. By implementing best management practices during construction, the project will minimize construction impacts.

Erosion will be minimized by providing temporary or permanent cover on surfaces exposed by construction activities. Sediment from erosion which does occue will be captured and kept on site by perimeter sediment barriers.

Section III: State Grants and Loans

Name of Applicant:

Name of Proposed Project:

1. This Flood Management Certification concerns a: ☐ grant ☐ loan

2. Total amount of grant or loan: $

3. The recipient of the grant or loan will be:

   Name:

   Mailing Address:

   City/Town: State: Zip Code:

   Phone: ext. Fax:

   Recipient Contact person:

   Name:

   Mailing Address:

   City/Town: State: Zip Code:

   Phone: ext. Fax:

4. The recipient will use the grant or loan to (check all that apply):

   ☐ construct a structure, obstruction or encroachment or conduct other work within a floodplain or coastal high hazard area.

   ☐ construct a facility or develop a site affecting drainage and stormwater runoff.

   ☐ conduct a study or prepare a report concerning land use or land use planning affecting a floodplain, drainage or stormwater runoff.

5. If the grant or loan is for a study or report, describe the anticipated effects on floodplains, drainage or stormwater runoff if the recommendations are implemented:

6. Will the proposed project promote development in floodplains or will utilities servicing the project be located so as to enable floodplain development? ☐ Yes ☐ No

   Explain:

If the grant or loan is for construction of a structure, obstruction or encroachment or other work within a floodplain, or if it is for construction of a facility or development of a site that will affect drainage and stormwater runoff, Sections I and/or II of this Worksheet must be completed and the engineering report (Attachment H) and plans (Attachment G) must be provided as part of this application.

Section IV: Disposal of State Land

Name of Applicant:

Name of Proposed Project:

1. The grantee will be:

   Name:

   Mailing Address:

   City/Town: State: Zip Code:

   Phone: ext. Fax:

   Contact Person: Phone:

2. Describe the current state of development and use of the land to be disposed.

3. Why is the agency disposing of the land?

4. Describe the grantee's intended use of the land.

5. Will the disposal of the land promote development in floodplains? ☐ Yes ☐ No

   Explain:

6. Will the grantee's use of the land be consistent with the state's flood management statutes and regulations?

   ☐ Yes ☐ No Explain:

New Britain – Hartford Busway
DEP Permit Application

RE: Updated Attachment H drainage discharge tables

DESIGN SECTION: 063-H137 (Hartford North)

SUMMARY: The attached package includes specific pages of the 063-H137 section of the Permit Application Attachment H that have been updated to be consistent with the drainage calculations submitted in response to March 30, 2011 review comments and as a follow-up to the drainage revision scroll plan submitted to DEP on 3/8/11 that illustrated the minor drainage changes that have taken place since August, 2010. These pages are meant to replace the originals submitted in August, 2010.

3/23/11
MARK UP OF CHANGES TO GATES 8 AND 11 SINCE MAY 19, 2010 ATTACHMENT H SUBMISSION

Peak Discharges

As discussed in the drainage report, there are nine design points, which include:

- A manhole on Flower Street from the CTDPW Parking Lot
- Five numbered gate structures (Gates 6, 8, 9, 10 and 11)
- Armory Pump Station (48-inch and 36 inch)
- Gully Brook Conduit Gate (36-inch Sluice Gate)

The design points all convey stormwater from existing areas adjacent to the Busway as well as the proposed Busway to the Park River Conduit. Below is a summary of the 2, 10 and 100 year discharges for the pre and post conditions.

Gate 6		
Return Frequency (Year)	Peak Discharges (CFS)	
	Pre-Development	Post-Development
2	15.57	4.02
10	21.36	6.08
100	28.43	9.57

Gate 8		
Return Frequency (Year)	Peak Discharges (CFS)	
	Pre-Development	Post-Development
2	25.96	8.94
10	35.90	13.56
100	45.44	18.14

Gate 9		
Return Frequency (Year)	Peak Discharges (CFS)	
	Pre-Development	Post-Development
2	12.83	15.60
10	18.00	21.74
100	19.12	24.16

Gate 10		
Return Frequency (Year)	Peak Discharges (CFS)	
	Pre-Development	Post-Development
2	7.99	10.62
10	10.96	14.52
100	14.64	18.99

Gate 11		
Return Frequency (Year)	Peak Discharges (CFS)	
	Pre-Development	Post-Development
2	22.00	~~34.95~~ 27.39
10	32.00	~~50.01~~ 40.01
100	~~46.35~~ 47.96	~~60.91~~ 55.33

ARMORY PUMP STATION 36 -INCH		
Return Frequency (Year)	Peak Discharges (CFS)	
	Pre-Development	Post-Development
2	32.76	32.77
10	47.08	47.04
100	66.63	66.63

ARMORY PUMP STATION 48 -INCH		
Return Frequency (Year)	Peak Discharges (CFS)	
	Pre-Development	Post-Development
2	3.49	4.38
10	5.31	6.17
100	7.16	7.23

GULLY BROOK GATE		
Return Frequency (Year)	Peak Discharges (CFS)	
	Pre-Development	Post-Development
2	48.06	11.33
10	66.16	16.99
100	92.12	24.69
DPW PARKING LOT TO MH ON FLOWER STREET		
Return Frequency (Year)	Peak Discharges (CFS)	
	Pre-Development	Post-Development
2	8.95	11.44
10	11.94	14.92
100	16.17	19.40

Drainage Tables

Gate 6		
	Pre-Development	Post-Development
Area (acres)	7.610	9.178
% impervious	61%	58%
Runoff Coef.	0.61	0.55
Time of Concentration (min)	11.71	104.30
Duration (hrs)	0.39	3.48
2 yr intensity (inches/hr)	3.30	0.80
10 yr intensity (inches/hr)	4.50	1.30
100 yr intensity (inches/hr)	6.10	1.90
Gate 8		
	Pre-Development	Post-Development
Area (acres)	11.684	14.187
% impervious	~~62%~~ 61	67%
Runoff Coef.	0.64	0.60
Time of Concentration (min)	12.02	90.87
Duration (hrs)	0.40	3.03
2 yr intensity (inches/hr)	3.30	0.90
10 yr intensity (inches/hr)	4.50	1.40
100 yr intensity (inches/hr)	6.10	2.10

Gate 9		
	Pre-Development	Post-Development
Area (acres)	3.172	4.007
% Impervious	100%	100%
Runoff Coef.	0.90	0.90
Time of Concentration (min)	8.62	8.65
Duration (hrs)	0.29	0.29
2 yr intensity (inches/hr)	3.80	3.80
10 yr intensity (inches/hr)	5.10	5.10
100 yr intensity (inches/hr)	6.70	6.70
Gate 10		
	Pre-Development	**Post-Development**
Area (acres)	4.177	4.945
% impervious	66%	72%
Runoff Coef.	0.56	0.61
Time of Concentration (min)	11.37	11.06
Duration (hrs)	0.38	0.37
2 yr intensity (inches/hr)	3.40	3.40
10 yr intensity (inches/hr)	4.70	4.70
100 yr intensity (inches/hr)	6.30	6.30

GATE 11		
	Pre-Development	Post-Development
Area (acres)	~~18.858~~ 19.757	~~21.600~~ ~~[illegible]~~ 20.876
% impervious	68 ~~69%~~	73%
Runoff Coef.	~~0.61~~ 0.62	~~0.66~~ 0.68
Time of Concentration (min)	31.06	~~28.41~~ 32.54
Duration (hrs)	1.04	~~0.95~~ 1.08
2 yr intensity (inches/hr)	1.90	~~2.00~~ 1.80
10 yr intensity (inches/hr)	2.80	~~3.00~~ 2.70
100 yr intensity (inches/hr)	4.00	~~4.30~~ 3.9
Amory 36 inch		
	Pre-Development	Post-Development
Area (acres)	15.051	15.051
% impervious	91%	91%
Runoff Coef.	0.84	0.84
Time of Concentration (min)	18.08	18.07
Duration (hrs)	0.60	0.60
2 yr intensity (inches/hr)	2.70	2.70
10 yr intensity (inches/hr)	3.80	3.80
100 yr intensity (inches/hr)	5.30	5.30

Armory 48 inch		
	Pre-Development	Post-Development
Area (acres)	12.806	12.426
% impervious	44%	44%
Runoff Coef.	0.43	0.45
Time of Concentration (min)	164.96	164.21
Duration (hrs)	5.50	5.47
2 yr intensity (inches/hr)	0.60	0.60
10 yr intensity (inches/hr)	0.90	0.90
100 yr intensity (inches/hr)	1.30	1.30
Gully Brook		
	Pre-Development	Post-Development
Area (acres)	17.808	17.669
% impervious	94%	93%
Runoff Coef.	0.88	0.87
Time of Concentration (min)	13.23	134.94
Duration (hrs)	0.44	4.50
2 yr intensity (inches/hr)	3 10	0.70
10 yr intensity (inches/hr)	4.30	1.10
100 yr intensity (inches/hr)	5.90	1.60

DPW Parking Lot		
	Pre-Development	Post-Development
Area (acres)	2.763	2.763
% impervious	100%	100%
Runoff Coef.	0.90	0.90
Time of Concentration (min)	10.00	5.00
Duration (hrs)	0.33	0.17
2 yr intensity (inches/hr)	3.60	4.60
10 yr intensity (inches/hr)	4.80	6.00
100 yr intensity (inches/hr)	6.50	7.80

Below is a table summarizing discharges, treatment to the receiving waters.

Stormwater Drainage &Receiving Waters
New Britain- Hartford Busway
State Project No. 171-305
Contract No. 063-H137

Drainage System Number/ Description (Station)	Wetland Impact Site Number	Receiving Waters (Name)	Outlet Protection	# of Proposed Catch Basins	10 Year Peak Discharges (CFS)		Existing Contributing Drainage Area (Acres)	Proposed Contributing Drainage Area (Acres)	Treatment	Notes
					Existing	Proposed				
6 481+64.6	N/A	Park River Conduit	N/A	6	21.36	6.08	7.610	9.178	Catch basins with 2-foot sumps	
8 471+98.02	N/A	Park River Conduit	N/A	11	35.90	13.56	11.684	14.187*	Catch basins with 2-foot sumps and last CB with a 4 foot sump	Includes treated flows from the Rail Road Relocation project
9 468+62.19	N/A	Park River Conduit	N/A	3	18.00	21.74	3.172	4.007	Catch basins with 2-foot sumps	Includes flows routed from scuppers
10 462+00.00	N/A	Park River Conduit	N/A	6	10.96	14.52	4.177	4.945	Catch basins with 2-foot sumps and last CB with a 4 foot sump	
11 458+49.30	N/A	Park River Conduit	N/A	27 42	32.00	40.01 ~~50.01~~	19.257 ~~18.858~~	20.876 ~~21.600~~**	--	Combined Drainage to Gate 11
11A	N/A	Park River Conduit	N/A	20 34	--	25.11 ~~46.35~~	--	15.247 ~~15.977~~	Hooded Catch Basins	Sigourney Street and Hawthorn Street Drainage
11B	N/A	Park River Conduit	N/A	28	--	12.02 ~~27.05~~	--	5.6229	Off Line System with CBs with 2-foot sumps	Busway Drainage
Armory 36	N/A	Park River Conduit	N/A	0	47.08	47.04	15.051	15.051	N/A	
Armory 48	N/A	Park River Conduit	N/A	8	5.31	6.17	12.806	12.426	Catch basins with 2-foot sumps and last CB with a 4 foot sump	
Gully Brook I-84 WB 206+33.97	N/A	Park River Conduit	N/A	12	66.16	16.99	17.808	17.669	Catch basins with 2-foot sumps and last CB with a 4 foot sump	

and Aetna Campus, service Road, and Access Roads

Stormwater Drainage &Receiving Waters (Cont)
New Britain- Hartford Busway
State Project No. 171-305
Contract No. 063-H137

Drainage System Number/ Description (Station)	Wetland Impact Site Number	Receiving Waters (Name)	Outlet Protection	# of Proposed Catch Basins	10 Year Peak Discharges (CFS)		Existing Contributing Drainage Area (Acres)	Proposed Contributing Drainage Area (Acres)	Treatment	Notes
DPW Parking Lot Between Flower and Broad Street	N/A	Park River Conduit	N/A	2	11.94	14.92	2.763	2.763	Hooded Catch Basins	Parking lot discharges to Park River via a 42-inch pipe

* Includes treated area and flow from the Rail Road Relocation Project

** Includes area and flow from Hartford South, and an area that was entering a combined sewer system that know will go to this gate

The proposed conditions will cause an increase in five of the nine outfalls. These increases will not cause adverse flooding impacts upstream due to the increases in discharge. When comparing the total areas as a whole there is an approximately 10 acres of increase in area from existing to the proposed with the maximum increase in area of 7 acres, occurring at Gate 11. This increase is primarily due to redirecting drainage from a 3.7 acres residential area that currently enters the combined sewer and approximately 3.22 acres of proposed Busway from Hartford South's System 7 drainage system. The other increases at the other gates are due to the proposed Busway and I-84 scupper outlets above the Busway. Below are summary tables comparing existing and proposed drainage areas. The CONNDOT evaluated options to reduce the increase at Gate 11; one of the options included the rerouting of the Hartford South Drainage to Gate 12. Due to the location of Gate 12 to the Busway, a pipe would need to be jacked under Amtrak and this option was found to be cost prohibitive.

New Britain – Hartford Busway
DEP Permit Application

RE: Updated Attachment H drainage discharge tables

DESIGN SECTION: 93-H046 (West Hartford)

SUMMARY: The attached package includes specific pages of the 93-H046 section of the Permit Application Attachment H that have been updated to be consistent with the drainage calculations submitted in response to March 30, 2011 review comments and as a follow-up to the drainage revision scroll plan submitted to DEP on 3/8/11 that illustrated the minor drainage changes that have taken place since August, 2010. These pages are meant to replace the originals submitted in August, 2010.

PRE/POST CONDITION DRAINAGE

This report provides supporting documentation for Department of Environmental Protection (DEP) Attachment-H for a portion of the New Britain – Hartford Busway located in the towns of Newington and West Hartford (Sta. 203+00 to Sta. 332+00). The busway will be a dedicated Bus Rapid Transit (BRT) facility along a 9.4-mile corridor between downtown New Britain and downtown Hartford. The corridor for the busway follows and abandoned railroad right-of-way from New Britain to Newington Junction and lies mainly within the Amtrak right-of-way, essentially parallel to the active rail line, north of Newington Junction. The busway will be two lanes wide (one in each direction).

Summary: (REVISED MARCH 2011)

Pre Condition Flows (in cfs);

System No.	2 YR Storm Event	10 YR Storm Event	100 YR Storm Event
#1 (A / B / C)	4.65 / 0.29 / 0.39	6.97 / 0.40 / 0.55	10.07 / 0.57 / 0.74
#2	~~4.69~~ 3.40	~~6.49~~ 4.70	~~8.70~~ 6.30
#3 (Does not include Bus Station flows)	~~0.69~~ 15.58	~~0.97~~ 21.93	~~1.38~~ 31.17
#4	~~0.23~~ 0.25	~~0.33~~ 0.36	~~0.46~~ 0.50
#5	0.55	0.82	1.21
#6 (Does not include AAR or New Britain Ave.flows)	0.55	0.82	1.21
#7	0.56	0.80	1.10
#8 (Does not include AAR or SPN. 155-H025 flows)	0.69	1.01	1.45

Post Condition Flows

System No.	Discharge Location	2 YR Storm Event	10 YR Storm Event	100 YR Storm Event
#1 (A / B / C)	Hydraulic Site #4 (Sta 223+15 Lt)/ Hydraulic Site #4 (Sta 223+58 Lt)/ Ex. Culvert (Sta 228+85 Lt)	~~9.03~~ / 2.09 / 2.06 8.97	~~14.01~~ / 2.78 / 2.96 13.94	~~20.71~~ / 3.66 / 4.12 20.65
#2	Ex. Culvert (Sta 230+78 Rt)	~~5.26~~ 3.37	~~7.90~~ 5.09	~~11.60~~ 7.49
#3 (Does not include Bus Station flows)	Ex. Culvert (Sta 238+66 Lt)	~~2.76~~ 17.11	~~4.43~~ 25.71	~~6.75~~ 38.20
#4	Prop. channel (Sta 238+66 Lt) discharging to Piper Brook Tributary via channel at Hydraulic Site #5	~~1.47~~ 1.68	~~2.06~~ 2.32	~~2.81~~ 3.13
#5	Prop. channel (Sta 252+70 Lt) discharging to Piper Brook Tributary	~~2.78~~ 2.73	~~4.46~~ 4.41	~~6.90~~ 6.84
#6 (Does not include AAR or New Britain Ave.flows)	Prop. culvert (Sta 298+88) discharging to New Britain Ave. drainage system	~~3.44~~ 3.27	~~5.59~~ 5.38	~~8.58~~ 8.36
#7	Elmwood Bus Station drainage system (Sta 308+10 Lt)	~~2.94~~ 3.01	~~4.34~~ 4.41	~~6.14~~ 6.20
#8 (Includes SPN. 155-H025 flows, Does not include AAR flows)	Prop. culvert (310+10) discharging to Trout Brook (309+23 Rt)	5.81	9.42	14.55