

NEW BRITAIN - HARTFORD BUSWAY

NEW BRITAIN, CT

PERMITTING SUBMISSION

JANUARY 2010

EAST MAIN STREET STATION

State Project No. 88-H039



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S E A

SEA CONSULTANTS INC.
Scientists/Engineers/Architects

1.	<u>INTRODUCTION</u>	<u>2</u>
1.0.	PROJECT DESCRIPTION	2
1.1.	PURPOSE OF REPORT	2
1.2.	DATA COLLECTION.....	2
2.	<u>ANALYSIS METHODOLOGY</u>	<u>2</u>
2.0.	DESIGN CRITERIA	2
2.1.	DESIGN METHODOLOGY.....	3
2.2.	ASSUMPTIONS	3
3.	<u>STATION ANALYSIS AND SUMMARIES</u>	<u>4</u>
3.0.	EAST MAIN STREET STATION.....	4
3.0.1.	EXISTING CONDITION – SOUTHBOUND PLAZA	4
3.0.2.	EXISTING CONDITION – NORTHBOUND PLAZA	4
3.0.3.	PROPOSED CONDITION – SOUTHBOUND PLAZA.....	5
3.0.4.	PROPOSED CONDITION – NORTHBOUND PLAZA	6
3.0.5.	ENVIRONMENTAL ISSUES AND STORMWATER TREATMENT.....	7
3.0.6.	SOIL EROSION AND SEDIMENTATION CONTROL	7
4.	<u>APPENDIX A: DESIGN CHECKLIST</u>	<u>8</u>
5.	<u>APPENDIX B: WATERSHED MAPPING AND EXHIBITS</u>	<u>9</u>
6.	<u>APPENDIX C: HYDROLOGIC AND HYDRAULIC CALCULATIONS</u>	<u>10</u>
7.	<u>APPENDIX D: DRAINAGE, GRADING, AND SOIL EROSION AND SEDIMENTATION CONTROL PLANS.....</u>	<u>11</u>
8.	<u>APPENDIX E: CTDOT PRELIMINARY DESIGN COMMENT RESPONSES...</u>	<u>12</u>
9.	<u>APPENDIX F: HARTFORD – NEW BRITAIN BUSWAY TABLE.....</u>	<u>13</u>

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.

URS, Contract No. 88-H035, will be responsible for all downstream design analysis and coordination with the City of New Britain relative to the connection within East Main Street. Any existing drainage issues and concerns will be addressed by URS.

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 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

As a result of the multiple design contracts within the project, detailed coordination of the drainage system analysis is required. In most cases, the stations site drain to the mainline busway drainage systems. This report provides data for confirmation of both the on-site and the mainline design flows.

StormCAD V8 XM software by Bentley was utilized to conduct the drainage calculations for this report.

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 and 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. East Main Street Station

3.0.1. Existing Condition – Southbound Plaza

East Main Street Station is proposed at the intersection of East Main Street and the busway in New Britain. The station platforms and plaza areas are separated by East Main Street. The parcel located on the southwest corner of the intersection is the proposed location of the southbound busway platform and plaza. Currently, the site contains a commercial enterprise. This area drains towards the Department of Public Works yard to the east and to the north to an existing drainage system in East Main Street (Exhibit 3.1-A).

A portion of the site and the south side of East Main Street drain to a catch basin located near the intersection of the street with the proposed busway alignment. This drainage area is entirely paved and has a c value of 0.9. The area totals approximately 0.59 acres and the discharge is summarized as follows:

Storm Frequency	Q _{PRE} (cfs)
2-year	2.47
10-year	3.22
25-year	3.59
100-year	4.18

The two existing catch basins within the DPW yard will be removed as part of the busway construction and were therefore not analyzed.

3.0.2. Existing Condition – Northbound Plaza

The parcel located on the northeast corner of the intersection is the proposed location of the northbound busway platform and plaza. This area currently drains to the adjacent properties on the north and east. This sheet flow traverses the city block and is collected by a catch basin on Smalley Street (Exhibit 3.1-B). The design point selected for analysis of pre- and post-development flows is the boundary of the Teti parcel. A composite c value for this drainage area is 0.52. The area tributary to this location is approximately 0.42 acres and the discharge is summarized as follows:

Storm Frequency	Q _{PRE} (cfs)
2-year	1.03
10-year	1.35
25-year	1.60
100-year	1.75

3.0.3. Proposed Condition – Southbound Plaza

The proposed drainage area to the existing system within East Main Street is comprised of two components. The plaza area accounts for 0.32 acres. Drainage from this area is collected by yard drains and ultimately connects to a catch basin proposed by Contract No. 88-H035. Pavement area within East Main Street along with a small portion of plaza area accounts for 0.33 acres that will remain draining by sheet flow to the proposed catch basins. These inlets connect to the existing system within East Main Street. The total area tributary to this system has increased from 0.60 acres in the pre-development condition to 0.65 acres (Exhibit 3.1-C). Although this represents an increase in area of 0.05 acres, the composite c-value has been reduced from 0.90 to 0.70.

The first component of the drainage contribution to the system within East Main Street is stormwater from the station plaza area that is collected by inlets within the lawn area, CB-1 and CB-2. The site inlet, CB-1, is designed to capture the 10-year storm. Inlet CB-2 is provided to capture any overflow that occurs due to clogging of CB-1 or during larger storm events to minimize flooding/icing conditions on the platform and plaza area. A shallow swale carries the flow through the site to these inlets. The outlet pipe is proposed to connect to a catch basin proposed as part of the mainline drainage system, System Seven, located at Station 505+95, 28 ft right.

The Drainage Design Report dated December 15, 2009 by Contract No. 88-H035 describes the drainage system at East Main Street as System Seven. Catch basin at Station 505+95, 28 ft right is a new inlet and the catch basin at Station 506 + 83, 13 ft right will be reset. Both basins will be part of the City owned system within East Main Street.

The catch basin at Station 505+95, 28 ft right provides a 12-inch RCP stub approximately 10 feet long for connection of the station drainage. Currently, the report indicates that no flows or areas were delineated for the contribution for the station within System Seven.

The proposed pipe flow from the station site to the catch basin at Station 505+95, 26 ft right is summarized as follows:

Storm Frequency	Q _{POST} (cfs)
2-year	0.72
10-year	0.94
25-year	1.05
100-year	1.22

From page 141 of the H035 Drainage Design Report, a tailwater elevation equal to the crown of pipe was assumed at Station 506+79. At the connection of the station drainage system to the catch basin at Station 505+95, 28 ft right, the tailwater elevation was assumed to equal the crown elevation of the pipe. URS will be

responsible for all downstream design analysis and coordination with the City of New Britain relative to this connection.

The second component of the drainage system that contributes to the existing system within East Main Street consists of approximately 0.32 acres of pavement within East Main Street as shown on Exhibit 3.1-C. This area will continue to sheet flow to catch basins within East Main Street, following existing drainage patterns.

The sum of these two components is the total discharge contributing to the existing system within East Main Street. This total discharge is summarized, as follows:

Storm Frequency	Q _{PRE} (cfs)	Q _{POST} (cfs)	ΔQ (cfs)
2-year	2.47	2.10	-0.36
10-year	3.22	2.74	-0.47
25-year	3.59	3.06	-0.53
100-year	4.18	3.56	-0.62

The cover for the proposed pipes is less than required by the CTDOT Drainage Manual. The invert provided by URS for the connection of the station drainage system (elevation 141.92 ft) to the busway drainage system did not provide adequate cover for the pipes within the station site when sloped at the stated minimum of 0.005 ft/ft. The pipes at minimum slope also affect the velocities in the proposed pipes connecting the inlets to the mainline drainage system. These velocities are lower than required by the CTDOT Drainage Manual. Given the need to maximize cover, the small flow rates from the station site and the desire to collect nuisance flows at the station, it is not feasible to meet the velocity minimums. Alternative pipe materials and size reduction will be investigated during final design may result in more favorable conditions.

3.0.4. Proposed Condition – Northbound Plaza

The platform area has been designed to drain towards the busway and be collected by the drainage system proposed as part of Contract 88-H035. A small portion of the site will continue to drain to the neighboring properties, as occurs in the existing condition. However, the grading has been designed to reduce the area and peak storm runoff directed to the adjoining properties. The tributary area totals approximately 0.44 acres and has a composite c value of 0.50. No drainage structure is proposed to collect flows within the site. A sheet flow drainage pattern similar to the existing condition will remain (Exhibit 3.1-D). The peak discharge at this design point has been reduced. The discharge at the Teti parcel boundary is summarized as follows:

Storm Frequency	Q _{PRE} (cfs)	Q _{POST} (cfs)	ΔQ (cfs)
2-year	1.03	0.92	- 0.11
10-year	1.35	1.20	- 0.15
25-year	1.50	1.34	- 0.16
100-year	1.75	1.56	- 0.19

3.0.5. Environmental Issues and Stormwater Treatment

No Department flagged wetland areas are located within the station site boundaries. No impacts are proposed.

The site has been graded in such a way to provide a long flow path in a shallow swale through each portion of the site. This design maximizes the infiltration opportunity for stormwater to promote groundwater recharge.

3.0.6. 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. Construction of the station is likely to occur during construction of the busway, Contract No. 88-H035. Further details and plans will be developed as the construction packaging and scheduling is established.

4. Appendix A: Design Checklist

Project No. 88-4039
 Roadway East Main Street
 Town New Britain
 Date 1/26/2010
 Designed By SEA Consultants
 Signature of Engineer E. Dealy

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 m³/s (50 ft³/s) and less or HEC-11 for discharges in excess of 1.42 m³/s (50 ft³/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

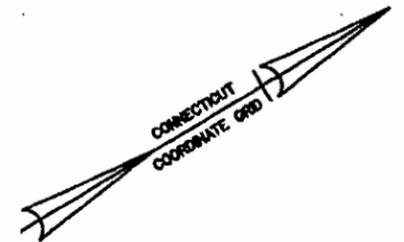
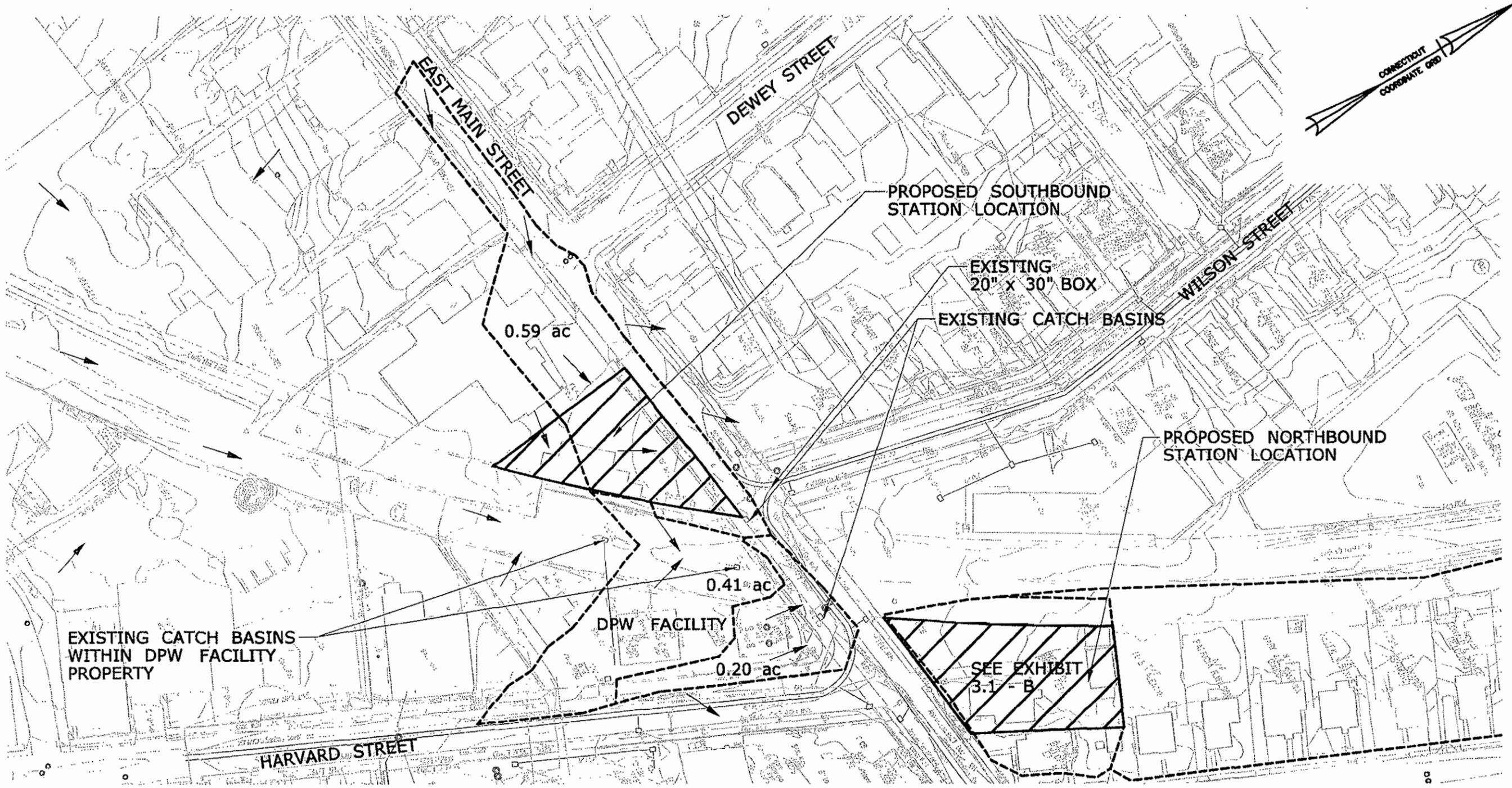
1. The existing and proposed storm drainage shown to their outlets.
 Included Not Included Not Applicable
2. Size and type of existing drainage pipes/structures and disposition of pipes/structures to be abandoned.
 Included Not Included Not Applicable
3. Properties affected by diversions should be shown 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 km² (1 mi²)

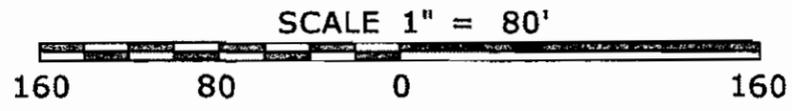
1. Draft hydraulic design report.
 Included Not Included Not Applicable
2. Draft scour report when the proposed structure spans the waterway.
 Included Not Included Not Applicable
3. Draft floodway report.
 Included Not Included Not Applicable
4. Draft SCEL report.
 Included Not Included Not Applicable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

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

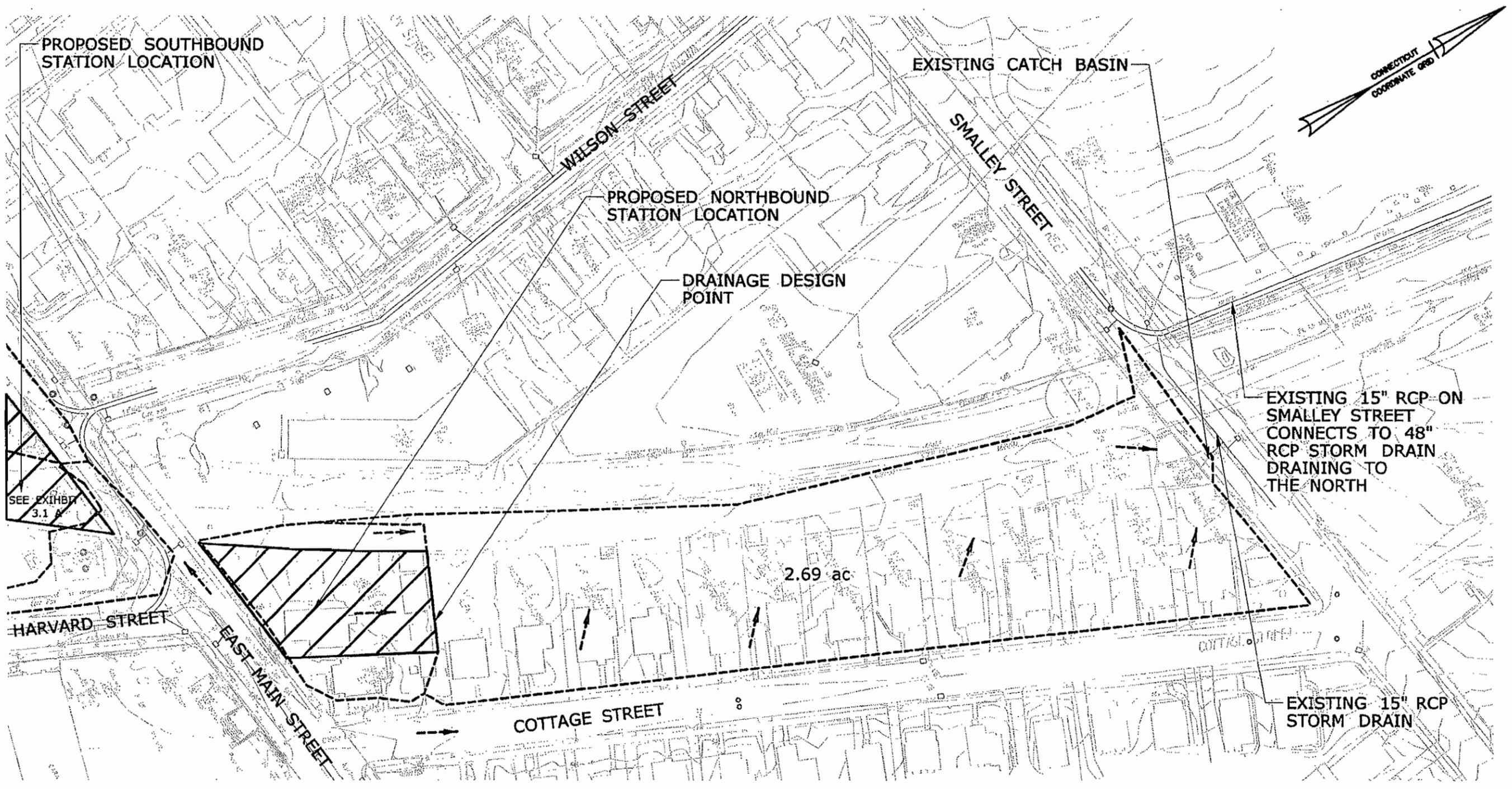
5. Appendix B: Watershed Mapping and Exhibits



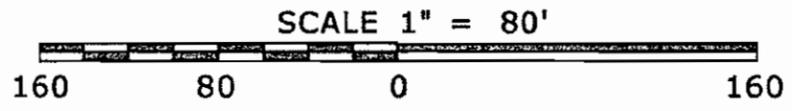
EXISTING SOUTHBOUND STATION AREA CONDITIONS



STATE PROJECT NO.: 88-H039 COUNTY: HARTFORD CITY/TOWN: NEW BRITAIN	APPLICATION BY:  STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING  SCALE: 1"=80	DATE: JANUARY 2010 SITE: EAST MAIN ST. STATION EXHIBIT: 3.1-A
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EXISTING NORTHBOUND STATION AREA CONDITIONS



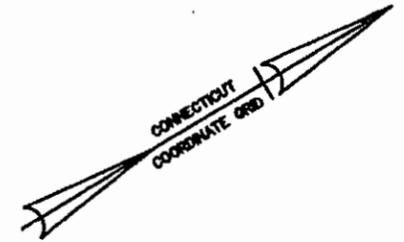
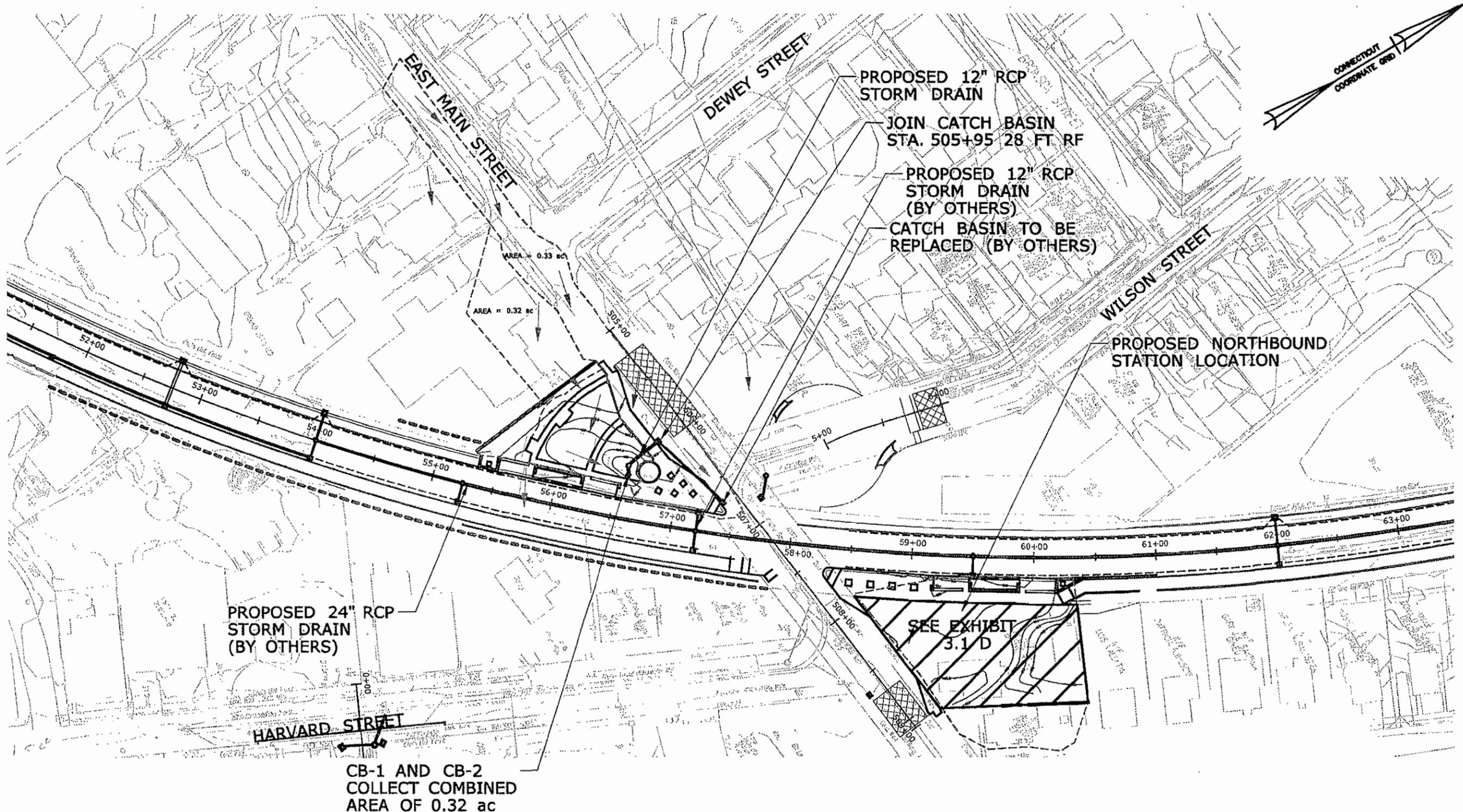
STATE PROJECT NO.: 88-H039
 COUNTY: HARTFORD
 CITY/TOWN: NEW BRITAIN

APPLICATION BY:

STATE OF CONNECTICUT
 DEPARTMENT OF TRANSPORTATION

OFFICE OF ENGINEERING

 DATE: JANUARY 2010
 SITE: EAST MAIN ST. STATION
 EXHIBIT: 3.1-B
 SCALE: 1=80

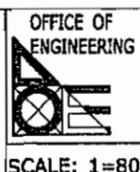


PROPOSED SOUTHBOUND STATION AREA CONDITIONS



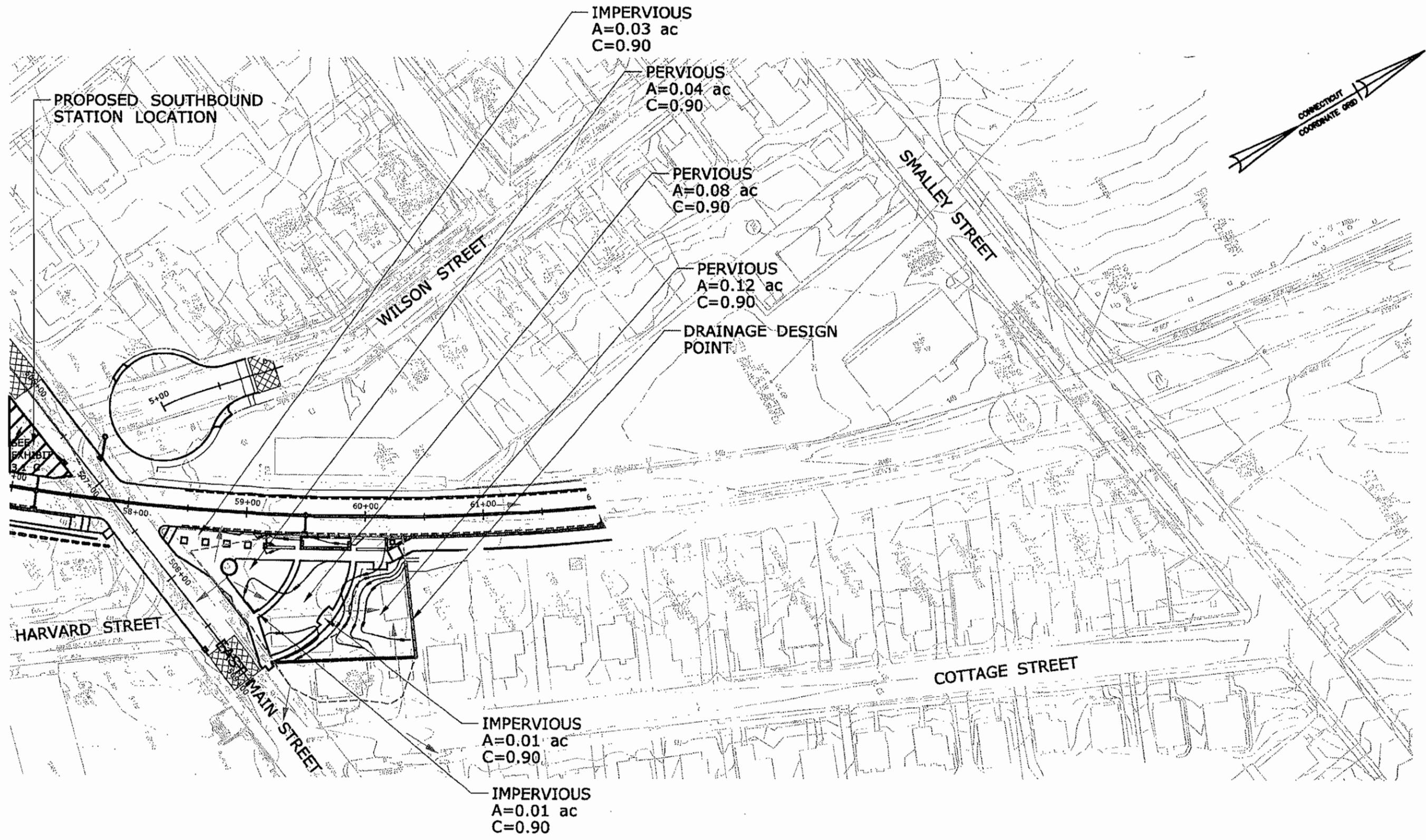
STATE PROJECT NO.: 88-H039
 COUNTY: HARTFORD
 CITY/TOWN: NEW BRITAIN

APPLICATION BY:
STATE OF CONNECTICUT
 DEPARTMENT OF TRANSPORTATION

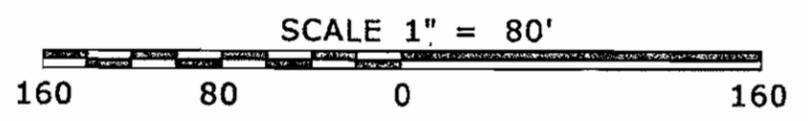


DATE: JANUARY 2010
 SITE: EAST MAIN ST. STATION
 EXHIBIT: 3.1-C

SCALE: 1=80



PROPOSED NORTHBOUND STATION AREA CONDITIONS



STATE PROJECT NO.: 88-H039	APPLICATION BY: STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING 	DATE: JANUARY 2010
COUNTY: HARTFORD			SITE: EAST MAIN ST. STATION
CITY/TOWN: NEW BRITAIN		SCALE: 1=80	EXHIBIT: 3.1-D

6. Appendix C: Hydrologic and Hydraulic Calculations

**BRT Station Preliminary Drainage Design
DOT Report**

Label	Node Upstream Downstream	Upstream Inlet C	Upstream GA (acres)	Ground Upstream Downstream	HGL Upstream Downstream	System Rational Flow (ft ³ /s)	Length (ft)	Velocity (Average) (ft/s)	System Intensity (in/hr)
CO-1	CB-2	(N/A)	0	145.7	142.94	0	8	0	6
	CB-1			145.6	142.94				
CO-3	CB-1	0.486	0.156	145.6	142.94	0.94	30	2.98	6
	OF-1			146.41	142.92				

**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-1	0.031	0.3	0.009	5	CB-1	0.06
CM-2	0.059	0.9	0.053	5	CB-1	0.32
CM-3	0.01	0.9	0.009	5	CB-1	0.05
CM-4	0.006	0.9	0.005	5	CB-1	0.03
CM-5	0.057	0.3	0.017	5	CB-1	0.1
CM-6	0.014	0.9	0.012	5	CB-1	0.07
CM-7	0.011	0.9	0.01	5	CB-1	0.06
CM-8	0.134	0.3	0.04	5	CB-1	0.24

**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)
CB-1	145.6	140.07	0.486	Grate Type C-L Single Grate - Grate Type A	2.88	2.88	1.23	0	142.95	142.95	2.4
CB-2	145.7	140.21	(N/A)	Grate Type C-L Single Grate - Grate Type A	2.74	2.74	0	0	142.95	142.95	0

**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-2	CB-1	142.21	142.17	12 inch	0	8	0.005	2.52	145.7	145.6	2.49	2.43	0
CO-3	CB-1	OF-1	142.07	141.92	12 inch	0.94	30	0.005	2.52	145.6	146.41	2.53	3.49	2.98

SEA Consultants, Inc.

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

PROJECT: EAST MAIN STREET RUNOFF CALCS.
PROJECT NO. 88-H039 SHEET NO. 1 OF 8
CALCULATED BY: KSR DATE: 1/25/2010
CHECKED BY: EAD DATE: 1/25/2010

**Runoff Calculations for the 2 year storm
Southbound Plaza**

The Southbound Plaza is located at the intersection of East Main Street and the busway in New Britain. The parcel located on the southwest corner of the intersection presently drains towards an existing drainage system within East Main Street.

Pre- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
25,941	0.60	0.90	4.60	2.47
Total Q =				2.47

Post- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
StormCad				0.72
14,543	0.33	0.90	4.60	1.38
Total Q =				2.10

Delta = -0.36 cfs

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200 Corporate Place
Rocky Hill, Connecticut 06067

PROJECT: EAST MAIN STREET RUNOFF CALCS.
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CALCULATED BY: KSR DATE: 1/25/2010
CHECKED BY: EAD DATE: 1/25/2010

Runoff Calculations for the 2 year storm Northbound Plaza

The Northbound Plaza is located at the northeast corner of the intersection of East Main Street and the busway in New Britain. The parcel drains to the adjacent properties to the north and east and ultimately drains to catch basins on Cottage Street and Smalley Street.

Pre- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
38	0.00	0.9	4.60	0.00
182	0.00	0.9	4.60	0.02
144	0.00	0.9	4.60	0.01
1,319	0.03	0.9	4.60	0.13
1,797	0.04	0.3	4.60	0.06
269	0.01	0.9	4.60	0.03
599	0.01	0.9	4.60	0.06
2,928	0.07	0.9	4.60	0.28
1,487	0.03	0.9	4.60	0.14
9,873	0.23	0.3	4.60	0.31
Total Q =				1.03

Post- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
38	0.00	0.9	4.60	0.00
182	0.00	0.9	4.60	0.02
144	0.00	0.9	4.60	0.01
1,319	0.03	0.9	4.60	0.13
1,797	0.04	0.3	4.60	0.06
5,345	0.12	0.3	4.60	0.17
3,286	0.08	0.3	4.60	0.10
1,668	0.04	0.3	4.60	0.05
636	0.01	0.9	4.60	0.06
290	0.01	0.9	4.60	0.03
3,035	0.07	0.9	4.60	0.29
Total Q =				0.92

Delta = -0.11 cfs

SEA Consultants, Inc.

Scientist/Engineers/Architects

200 Corporate Place

Rocky Hill, Connecticut 06067

PROJECT: EAST MAIN STREET RUNOFF CALCS.

PROJECT NO. 88-H039 SHEET NO. 3 OF 8

CALCULATED BY: KSR DATE: 1/25/2010

CHECKED BY: EAD DATE: 1/25/2010

**Runoff Calculations for the 10 year storm
Southbound Plaza**

The Southbound Plaza is located at the intersection of East Main Street and the busway in New Britain. The parcel located on the southwest corner of the intersection presently drains towards an existing drainage system within East Main Street.

Pre- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
25,941	0.60	0.90	6.00	3.22
Total Q =				3.22

Post- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
StormCad				0.94
14,543	0.33	0.90	6.00	1.80
Total Q =				2.74

Delta = -0.47 cfs

SEA Consultants, Inc.

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

PROJECT:	EAST MAIN STREET RUNOFF CALCS.		
PROJECT NO.	88-H039	SHEET NO.	4 OF 8
CALCULATED BY:	KSR	DATE:	1/25/2010
CHECKED BY:	EAD	DATE:	1/25/2010

**Runoff Calculations for the 10 year storm
Northbound Plaza**

The Northbound Plaza is located at the northeast corner of the intersection of East Main Street and the busway in New Britain. The parcel drains to the adjacent properties to the north and east and ultimately drains to catch basins on Cottage Street and S

Pre- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
38	0.00	0.9	6.00	0.00
182	0.00	0.9	6.00	0.02
144	0.00	0.9	6.00	0.02
1,319	0.03	0.9	6.00	0.16
1,797	0.04	0.3	6.00	0.07
269	0.01	0.9	6.00	0.03
599	0.01	0.9	6.00	0.07
2,928	0.07	0.9	6.00	0.36
1,487	0.03	0.9	6.00	0.18
9,873	0.23	0.3	6.00	0.41
Total Q =				1.35

Post- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
38	0.00	0.9	6.00	0.00
182	0.00	0.9	6.00	0.02
144	0.00	0.9	6.00	0.02
1,319	0.03	0.9	6.00	0.16
1,797	0.04	0.3	6.00	0.07
5,345	0.12	0.3	6.00	0.22
3,286	0.08	0.3	6.00	0.14
1,668	0.04	0.3	6.00	0.07
636	0.01	0.9	6.00	0.08
290	0.01	0.9	6.00	0.04
3,035	0.07	0.9	6.00	0.38
Total Q =				1.20

Delta = -0.15 cfs

SEA Consultants, Inc.

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

PROJECT: EAST MAIN STREET RUNOFF CALCS.
PROJECT NO. 88-H039 SHEET NO. 5 OF 8
CALCULATED BY: KSR DATE: 1/25/2010
CHECKED BY: EAD DATE: 1/25/2010

**Runoff Calculations for the 25 year storm
Southbound Plaza**

The Southbound Plaza is located at the intersection of East Main Street and the busway in New Britain. The parcel located on the southwest corner of the intersection presently drains towards an existing drainage system within East Main Street.

Pre- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
25,941	0.60	0.90	6.70	3.59
Total Q =				3.59

Post- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
StormCad				1.05
14,543	0.33	0.90	6.70	2.01
Total Q =				3.06

Delta = -0.53 cfs

SEA Consultants, Inc.

Scientist/Engineers/Architects

200 Corporate Place

Rocky Hill, Connecticut 06067

PROJECT: EAST MAIN STREET RUNOFF CALCS.

PROJECT NO. 88-H039 SHEET NO. 6 OF 8

CALCULATED BY: KSR DATE: 1/25/2010

CHECKED BY: EAD DATE: 1/25/2010

**Runoff Calculations for the 25 year storm
Northbound Plaza**

The Northbound Plaza is located at the northeast corner of the intersection of East Main Street and the busway in New Britain. The parcel drains to the adjacent properties to the north and east and ultimately drains to catch basins on Cottage Street and S

Pre- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
38	0.00	0.9	6.70	0.01
182	0.00	0.9	6.70	0.03
144	0.00	0.9	6.70	0.02
1,319	0.03	0.9	6.70	0.18
1,797	0.04	0.3	6.70	0.08
269	0.01	0.9	6.70	0.04
599	0.01	0.9	6.70	0.08
2,928	0.07	0.9	6.70	0.41
1,487	0.03	0.9	6.70	0.21
9,873	0.23	0.3	6.70	0.46
Total Q =				1.50

Post- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
38	0.00	0.9	6.70	0.01
182	0.00	0.9	6.70	0.03
144	0.00	0.9	6.70	0.02
1,319	0.03	0.9	6.70	0.18
1,797	0.04	0.3	6.70	0.08
5,345	0.12	0.3	6.70	0.25
3,286	0.08	0.3	6.70	0.15
1,668	0.04	0.3	6.70	0.08
636	0.01	0.9	6.70	0.09
290	0.01	0.9	6.70	0.04
3,035	0.07	0.9	6.70	0.42
Total Q =				1.34

Delta = -0.16 cfs

SEA Consultants, Inc.

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

PROJECT: EAST MAIN STREET RUNOFF CALCS.
PROJECT NO. 88-H039 SHEET NO. 7 OF 8
CALCULATED BY: KSR DATE: 1/25/2010
CHECKED BY: EAD DATE: 1/25/2010

**Runoff Calculations for the 100 year storm
Southbound Plaza**

The Southbound Plaza is located at the intersection of East Main Street and the busway in New Britain. The parcel located on the southwest corner of the intersection presently drains towards an existing drainage system within East Main Street.

Pre- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
25,941	0.60	0.90	7.80	4.18
Total Q =				4.18

Post- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
StormCad				1.22
14,543	0.33	0.90	7.80	2.34
Total Q =				3.56

Delta = -0.62 cfs

SEA Consultants, Inc.

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

PROJECT: EAST MAIN STREET RUNOFF CALCS.
PROJECT NO. 88-H039 SHEET NO. 8 OF 8
CALCULATED BY: KSR DATE: 1/25/2010
CHECKED BY: EAD DATE: 1/25/2010

Runoff Calculations for the 25 year storm Northbound Plaza

The Northbound Plaza is located at the northeast corner of the intersection of East Main Street and the busway in New Britain. The parcel drains to the adjacent properties to the north and east and ultimately drains to catch basins on Cottage Street and

Pre- Development

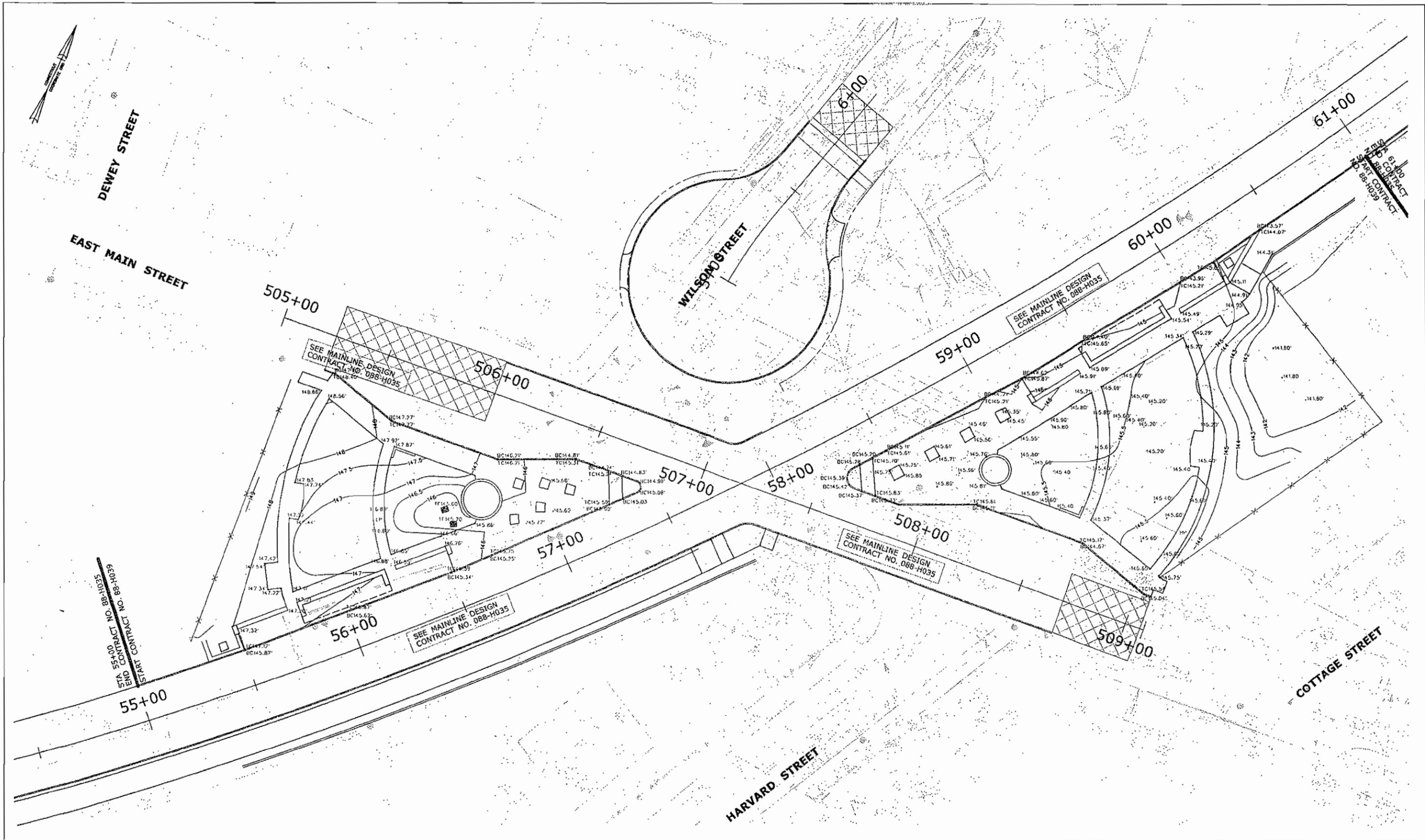
Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
38	0.00	0.9	7.80	0.01
182	0.00	0.9	7.80	0.03
144	0.00	0.9	7.80	0.02
1,319	0.03	0.9	7.80	0.21
1,797	0.04	0.3	7.80	0.10
269	0.01	0.9	7.80	0.04
599	0.01	0.9	7.80	0.10
2,928	0.07	0.9	7.80	0.47
1,487	0.03	0.9	7.80	0.24
9,873	0.23	0.3	7.80	0.53
Total Q =				1.75

Post- Development

Area (SF)	Area (Acres)	C Value	Rainfall (in/hr)	Q (cfs)
38	0.00	0.9	7.80	0.01
182	0.00	0.9	7.80	0.03
144	0.00	0.9	7.80	0.02
1,319	0.03	0.9	7.80	0.21
1,797	0.04	0.3	7.80	0.10
5,345	0.12	0.3	7.80	0.29
3,286	0.08	0.3	7.80	0.18
1,668	0.04	0.3	7.80	0.09
636	0.01	0.9	7.80	0.10
290	0.01	0.9	7.80	0.05
3,035	0.07	0.9	7.80	0.49
Total Q =				1.56

Delta = -0.19 cfs

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



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

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: 1/26/2010

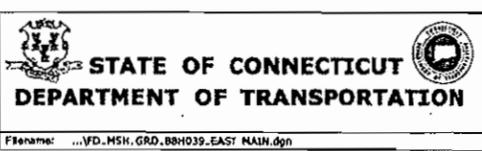
DESIGNER/DRAFTER:
KRV

CHECKED BY:

SCALE IN FEET

0 20 40

SCALE 1" = 20'



SIGNATURE/BLOCK:

OFFICE OF ENGINEERING

APPROVED BY: DATE:

PROJECT TITLE:
**NEW BRITAIN - HARTFORD
BUS RAPID TRANSIT STATIONS**

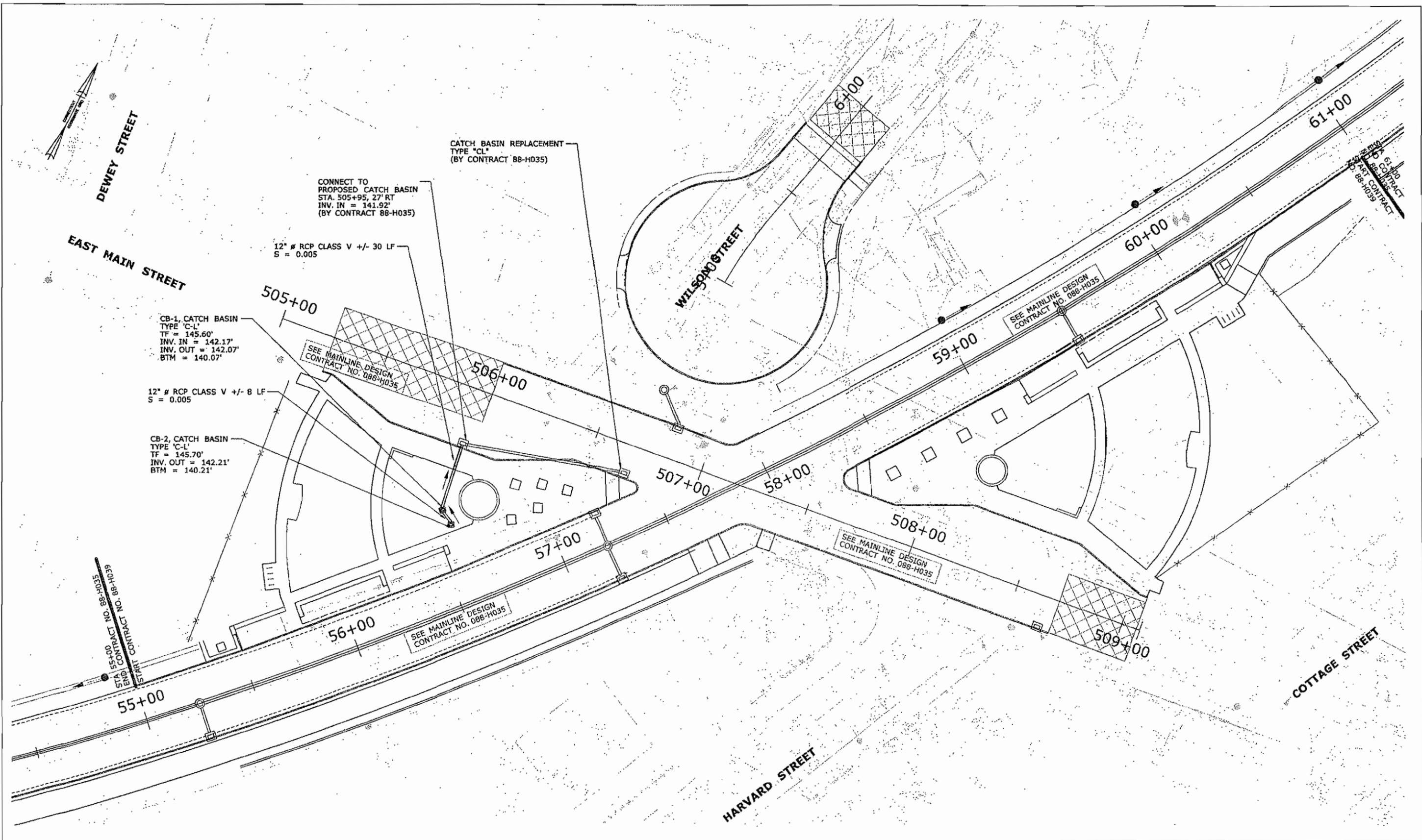
TOWN:
NEW BRITAIN

DRAWING TITLE:
**EAST MAIN ST. STATION
GRADING PLAN**

PROJECT NO.
88-H039

DRAWING NO.
GRD-XX

SHEET NO.
\$\$\$



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: 1/26/2010

DESIGNER/DRAFTER: **KSR**

CHECKED BY:

SCALE IN FEET

0 20 40

SCALE 1"=20'



SIGNATURE/BLOCK:

PROJECT TITLE:
**NEW BRITAIN - HARTFORD
BUS RAPID TRANSIT STATIONS**

TOWN:
NEW BRITAIN

DRAWING TITLE:
**EAST MAIN ST. STATION
DRAINAGE PLAN**

PROJECT NO.
88-H039

DRAWING NO.
DRG-XX

SHEET NO.
\$\$



DESIGN COORDINATION REQUIRED
 PROPOSED WORK BY CONTRACT NO. 88-H035
 DATED APRIL 2009

SCS
 INLET PROTECTION (TYP.)

CONSTRUCTION ENTRANCE

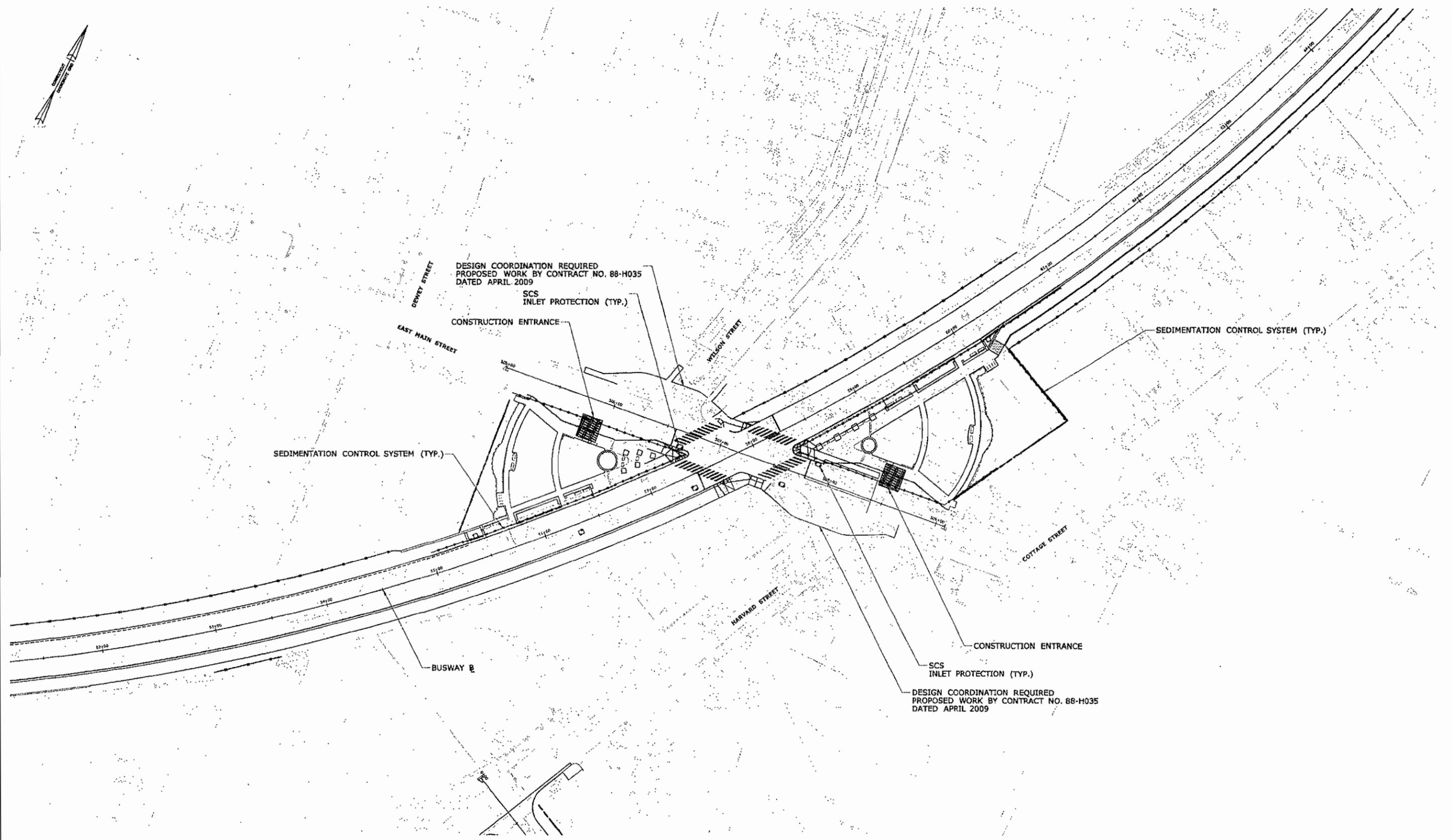
SEDIMENTATION CONTROL SYSTEM (TYP.)

SEDIMENTATION CONTROL SYSTEM (TYP.)

CONSTRUCTION ENTRANCE
 SCS
 INLET PROTECTION (TYP.)

DESIGN COORDINATION REQUIRED
 PROPOSED WORK BY CONTRACT NO. 88-H035
 DATED APRIL 2009

BUSWAY



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: 11/3/2009

DESIGNER/DRAFTER:
KRV
 CHECKED BY:
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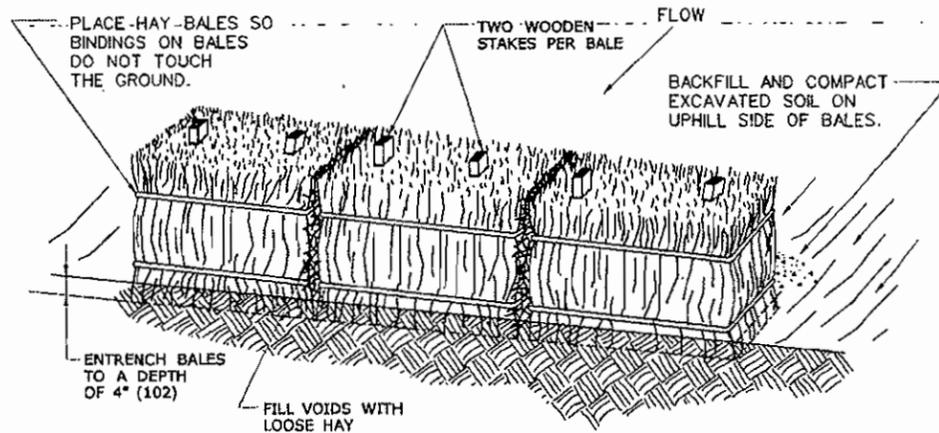


SIGNATURE/
 BLOCK:
OFFICE OF ENGINEERING
 APPROVED BY: DATE:

PROJECT TITLE:
**NEW BRITAIN - HARTFORD
 BUS RAPID TRANSIT STATIONS**

TOWN:
NEW BRITAIN
 DRAWING TITLE:
**EAST MAIN ST. STATION
 SEDIMENTATION CONTROL**

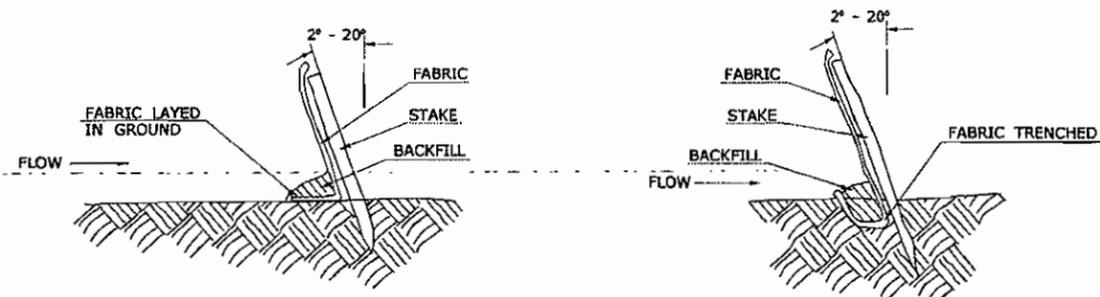
PROJECT NO.
88-H039
 DRAWING NO.
SED-XX
 SHEET NO.
\$\$\$



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 TOGETHER. 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**

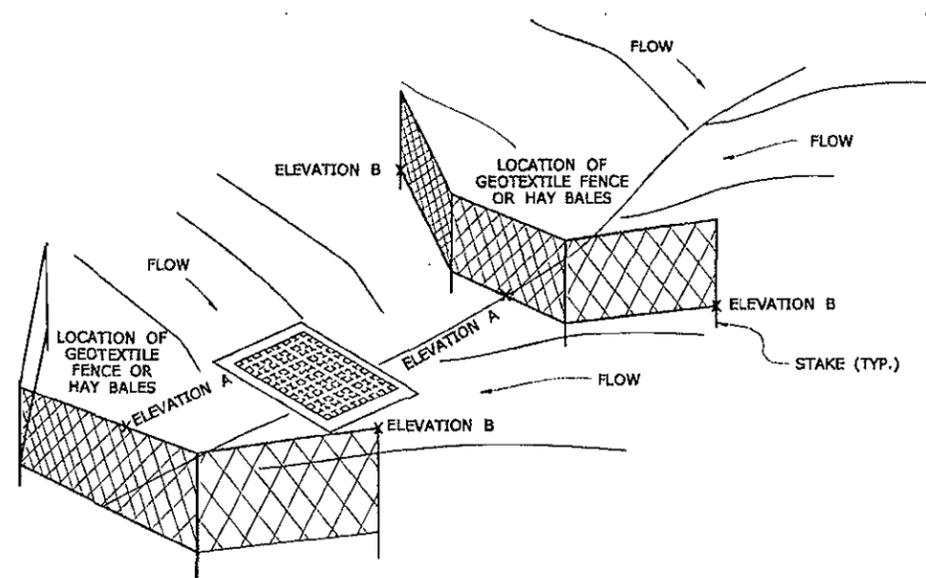
GEOTEXTILE FENCE SYSTEM

GENERAL NOTES:

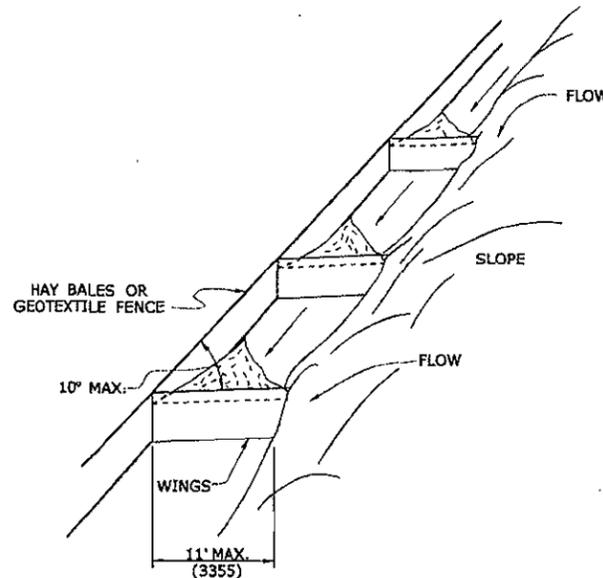
1. GEOTEXTILE FENCE SHOULD BE PLACED SO THE FENCE LEANS TOWARD THE SOURCE OF SEDIMENT.
2. MAXIMUM SPACING FOR WOODEN STAKES OR STEEL POSTS IS 10.0' (3048).
3. WOOD STAKES SHALL HAVE A MINIMUM CROSS-SECTION SIZE OF 1.5" (457) X 1.5" (457) AND MINIMUM LENGTH OF 4 FT. (1219) STEEL POSTS SHALL BE AT LEAST 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

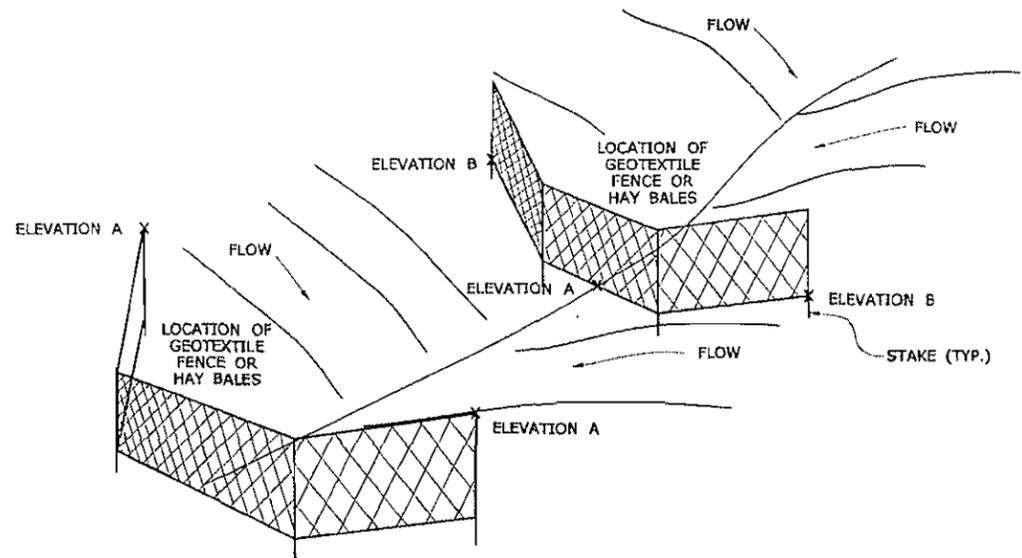
THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.		DESIGNER/DRAFTER: CHECKED BY: NTS	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	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. \$\$\$
REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Printed Date: 10/28/2009	Filename: ...VFD.MSH.DET.88H039.SET.CONTR011.dgn		



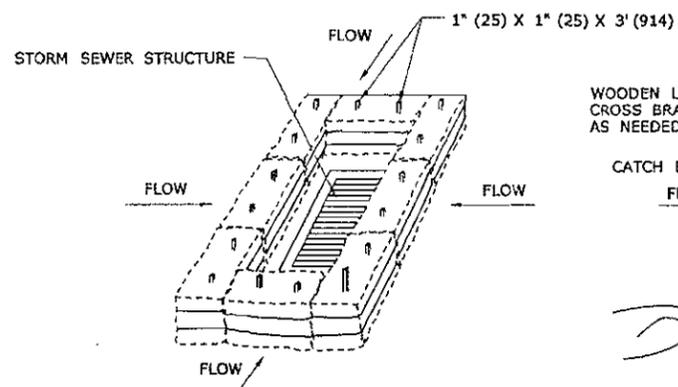
**TREATMENT FOR A
CATCH BASIN ON A SLOPE**
(SEE NOTE 4)



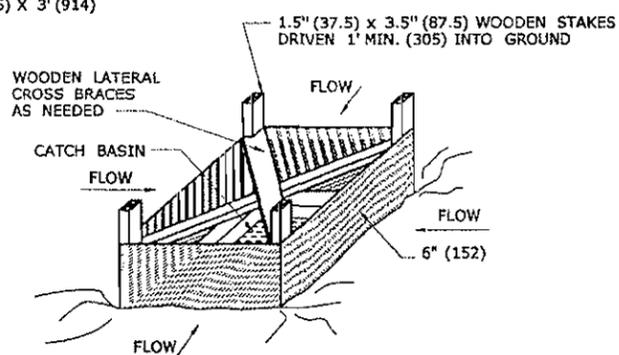
TREATMENT AT TOE OF SLOPE
(SEE NOTE 3)



CHECK DAM
(SEE NOTE 4)



**HAY BALE
AT CATCH BASIN**



**GEOTEXTILE FENCE
AT CATCH BASIN**

**TREATMENT FOR A
CATCH BASIN IN A DEPRESSION**

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.

REV. DATE		REVISION DESCRIPTION		SHEET NO.		Plotted Date: 10/28/2009		DESIGNER/DRAWER: CHECKED BY: NTS		 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION		SIGNATURE/BLOCK: OFFICE OF ENGINEERING APPROVED BY: _____ DATE: _____		PROJECT TITLE: NEW BRITAIN - HARTFORD BUS RAPID TRANSIST STATIONS		TOWN:		PROJECT NO. 88-H039 DRAWING NO. DET-XX SHEET NO. SS\$	
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.								REVISED 9/10/09											
DRAWING TITLE: SEDIMENTATION CONTROL TREATMENT DETAILS																			

**8. Appendix E: CTDOT Preliminary Design
Comment Responses**

Station: East Main
Responder: Liz Sommer, P.E.

Reviewer: Environ. Planning
Date Responded: 2009-09-28

Reviewed Date: 9/14/2009

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

subject: Preliminary Design Submission
88-H039 / 171-305
East Main Street Station
New Britain - Hartford Busway

memorandum
2009

date: September 14, 2009

to from ext.

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

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

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 Shoot #	Comment	Inc.	Not Inc. (If not, WHY)
5	CIV-XX	<ul style="list-style-type: none">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 88-H035 regarding the transition points connecting concrete curbing, RW, drainage, etc...between the busway and platform stations.		
7	DRG	<ul style="list-style-type: none">Since the station will have limited access, the drainage design should consider alternative pipes. Determination should be based on overall cost savings.Why is the design proposing Class V pipe within the Station footprint where there is pedestrian traffic only?		
8	LDS	<ul style="list-style-type: none">Remove Meadow Mix from the project.Be sure to use turf establishment as the proper term in lieu of the term Lawn.		

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 Lesay - Amanda Freitas
Dave Mancini - Bob Reilly
Laurie LaRocca
Mike Masayda - Chong Lung Chow - Yolanda Antoniuk
Jacob Argiro

Reviewer Comment 5a)

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

SEA Response: *Sheets have been updated, as appropriate.*

Reviewer Comment 5b)

- Please coordinate with the project designers of Project 88-H035 regarding the transition points connecting concrete curbing, RW, drainage, etc...between the busway and platform stations.
-

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

Reviewer Comment 7a)

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

SEA Response: *Alternate pipe materials will be considered during final design.*

Reviewer Comment 7b)

- Why is the design proposing Class V pipe within the Station footprint where there is pedestrian traffic only?
-

SEA Response: *Alternate pipe materials will be considered during final design.*

Reviewer Comment 8a)

- Remove Meadow Mix from the project.

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

Reviewer Comment 8b)

- Be sure to use turf establishment as the proper term in lieu of the term Lawn.
-

SEA Response: *Call-outs will be modified for the semi-final submission.*

Station: East Main Reviewer: Environ. Planning Reviewed Date: 8/26/2009
Responder: Liz Sommer, P.E. Date Responded: 2009-09-28

* Utility plans depict water line work. please ensure the timing of this work is included in the sequence of construction.

* Stormwater treatment is not proposed and appears possible. Please investigate possibilities for primary treatment and / or be prepared to explain site limitations as back up material for the permit applications

Station: East Main Reviewer: Environ. Planning Reviewed Date: 8/26/2009
Responder: Liz Sommer, P.E. Date Responded: 2009-09-28

Reviewer Comment 1)

Utility plans depict water line work. Please ensure the timing of this work is included in the sequence of construction.

SEA Response: *Utility work will be further investigated and detailed during final design.*

Reviewer Comment 2)

Stormwater treatment is not proposed and appears possible. Please investigate possibilities for primary treatment and / or be prepared to explain site limitations as back up material for the permit applications.

SEA Response: *Neither primary nor secondary treatment is feasible at the station sites due to space restrictions and elevation/invert restrictions. To the extent practical, the site has been graded to maximize flow paths over pervious surfaces to promote groundwater recharge. The proposed design is significantly more pervious than the existing site.*

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
East Main Street Station	N/A	Unknown (by 88-H035)	Unknown (by 88-H035)	2 total new inlets at Southbound Platform	10 Year Peak = 2.10	0.001 sq. mi (0.65 acres)		The site has been graded to provide a long flow path in a shallow swale through each portion of the site maximizing infiltration.
Site Contribution To Contract No. 88-H035	N/A	Unknown (by 88-H035)	Unknown (by 88-H035)	Contribution from the station site to 2 inlets proposed by Contract No. 88-H039	10 Year Peak (Northbound) = 1.20 10 Year Peak (Southbound) = 0.12	Northbound = 0.006 (0.41 acres) Southbound = 0.00003 (0.02 acres)	Unknown	