NEW BRITAIN – HARTFORD BUSWAY

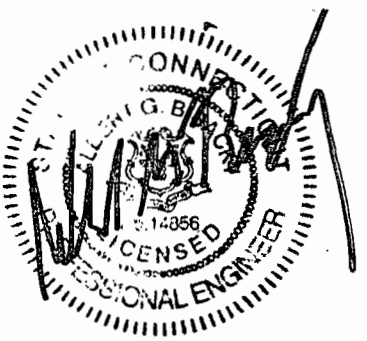
HARTFORD, CT

PERMITTING SUBMISSION

NOVEMBER 13, 2009

SIGOURNEY 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 was sent again.

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. Similarly, an assumed clogging factor of 75 was applied to all yard and area drains.

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.

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.

3. Station Analysis and Summaries

3.0. Sigourney Street Station

3.0.1. Existing Condition

The Sigourney Street station is proposed on a portion of a site presently used as employee parking for Aetna Insurance. The site is almost entirely paved, approximately 89.36% impervious. In general, the site drains from west to east. A portion of the runoff, approximately 0.44 acres, sheet flows across the site and continues towards the railroad tracks. No collection structure was found in the near vicinity. See Exhibit 3.9-A. This sheet flow is Design Point A and is summarized, as follows:

Storm Frequency	Q_{PRE} (cfs)
2-year	1.82
10-year	2.38
25-year	2.65
100-year	3.09

Another portion of the runoff is collected against a curb located along the eastern property line and directed to a catch basin at the northeast corner of the site, Design Point B. The area tributary to this point is approximately 0.50 acres. The discharge to this catch basin is summarized, as follows:

Storm Frequency	Q_{PRE} (cfs)
2-year	1.79
10-year	2.34
25-year	2.61
100-year	3.04

3.0.2. Proposed Condition

The stormwater from the site will be collected in a series of area drains, catch basins, and trench drains that will connect to the proposed mainline busway drainage system, Hartford South Contract No. 63-H137.

The area tributary to the station drainage system totals approximately 0.50 acres. The area to each inlet is shown in Exhibit 3.9-B. No peak flow attenuation is proposed prior to discharge into the mainline drainage system. The site discharge tributary to the mainline system connection is summarized, as follows:

Storm Frequency	Q_{Post} (cfs)
2-year	1.80
10-year	2.39
25-year	2.67
100-year	3.09

Due to the grade changes across the site and its layout, 0.15 acres will not be collected on site, but drain directly to the mainline drainage system. A small area, approximately 0.04 acres, at the north end of the site will drain to Hawthorn Street and be collected by two basins proposed as part of the Hawthorn/Sigourney realignment project (portion of Contract No. 63-H137).

A manhole is proposed at Station 452+80, 6.0 ft right which will be the tie-in location for the station discharge. Electronic correspondence from Dennis Mullaney of Lochner dated September 1, 2009, indicates the tailwater elevation at this location for the 10-year storm event is 44.77 which is well below the connection pipe invert.

In general, the velocities through the pipes meet the CTDOT minimum velocity criteria with the exception of pipes connecting yard, area drains, or inlets with a relatively small flow. Pipes connecting these inlets are not flowing full and are already at the CTDOT minimum pipe diameter of 12 inches. Pipe slopes have been determined by balancing cover requirements with the elevation invert constraints.

No stormwater is proposed to sheet flow off the site or flow to the existing catch basin at the northeast corner of the site, Design Points A and B. These design points are within the limits of Contract No. 63-H137.

3.0.3. Environmental Issues and Stormwater Treatment

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

There is no feasible location within the station site for the installation of a hydrodynamic separator or other stormwater quality treatment.

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	SIGOURNEY ST. STATION
Town	HARTFORD
Date	9/29/2009
Designed By	SEA CONSULTANTS
Signature of Engineer	

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

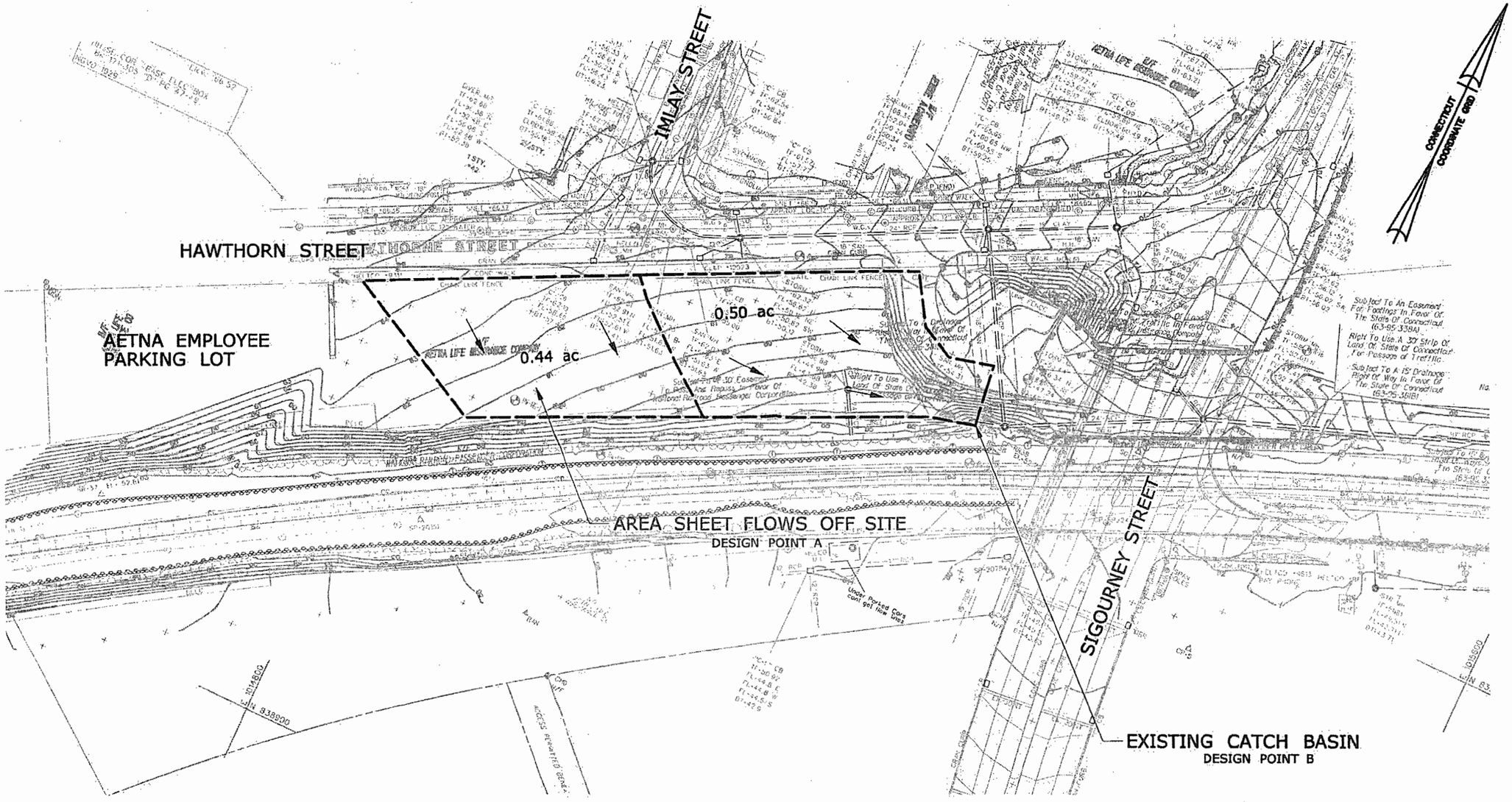
1. The existing and proposed storm drainage shown to their outlets.
   ☒ Included ☐ Not Included ☐ Not Applicable
2. Size and type of existing drainage pipes/structures and disposition of pipes/structures to be abandoned.
   ☐ Included ☐ Not Included ☒ Not Applicable
3. Properties affected by diversions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

5. Appendix B: Watershed Mapping and Exhibits

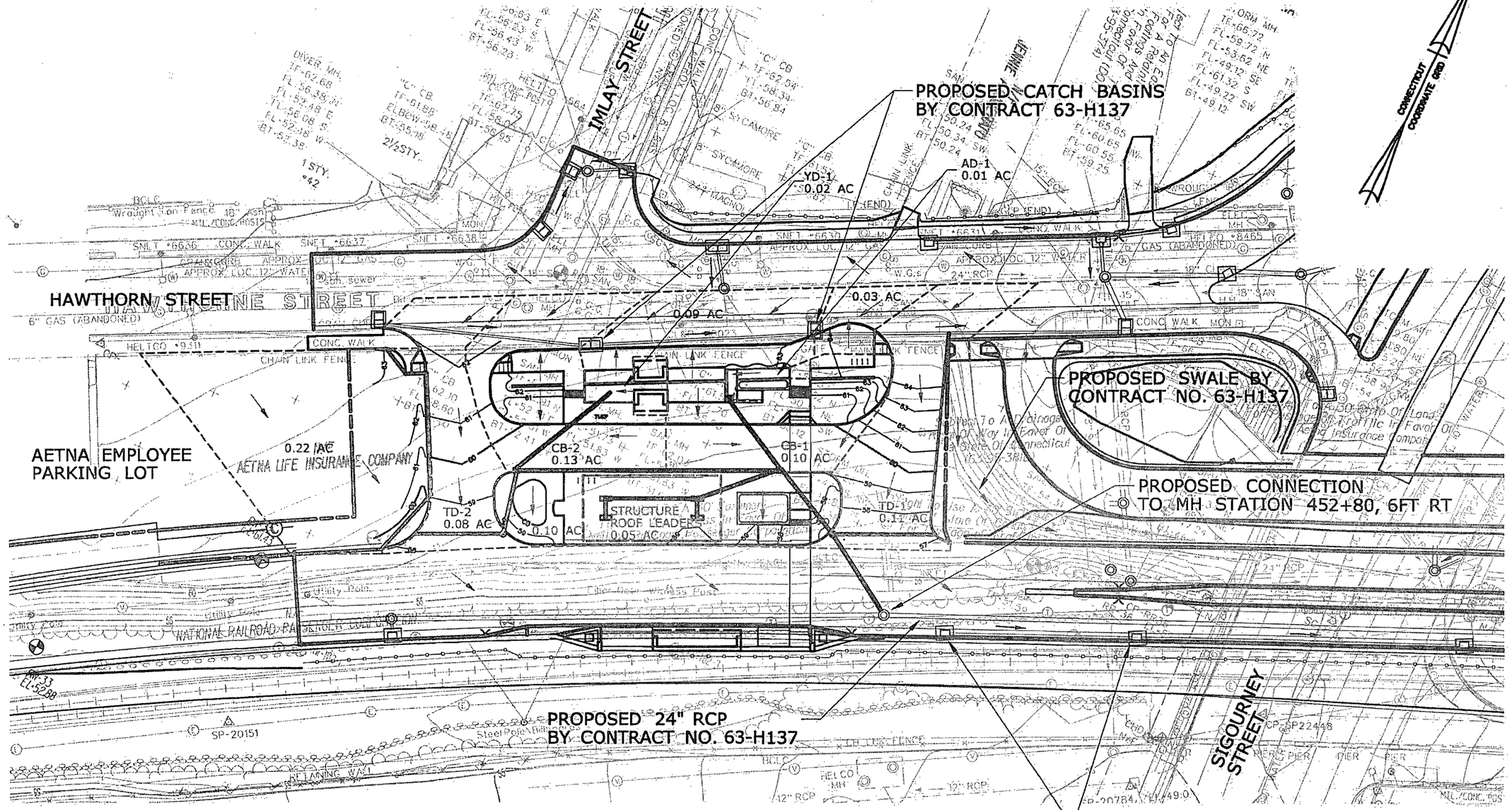


EXISTING CONDITIONS

SCALE 1" = 80'

160 80 0 160

STATE PROJECT NO.: 88-H039 COUNTY: HARTFORD CITY/TOWN: HARTFORD	APPLICATION BY: STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING SCALE 1=80	DATE: NOVEMBER 2009 SITE: SIGOURNEY ST. STATION EXHIBIT: 3.9-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: NOVEMBER 2009
COUNTY: HARTFORD			SITE: SIGOURNEY ST. STATION
CITY/TOWN: HARTFORD		SCALE 1=50	EXHIBIT: 3.9-B

6. Appendix C: Hydrologic and Hydraulic Calculations

SEA Consultants, Inc.
Scientist/Engineers/Architects
200 Corporate Place
Rocky Hill, Connecticut 06067

PROJECT:	New Britain - Hartford Bus Rapid Transit Stations		
PROJECT NO.	88-H039	SHEET NO.	1
CALCULATED BY:	KSR	DATE:	11/3/2009
CHECKED BY:		DATE:	

Runoff Calculations for the 2, 10, 25, 100 Year Storms
Sigourney Street Station

System: Sheet flow off site toward railroad tracks

Pre- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
A	0.44	0.90	4.60	6.00	6.70	7.80	1.82	2.38	2.65	3.09
						Total Q =	**1.82**	**2.38**	**2.65**	**3.09**

Post- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
A	0.00	0.00	4.60	6.00	6.70	7.80	0.00	0.00	0.00	0.00
						Total Q =	**0.00**	**0.00**	**0.00**	**0.00**
						Delta =	**-1.82**	**-2.38**	**-2.65**	**-3.09**

System: Existing catch basin at northeast corner of the site

Pre- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
B	0.50	0.78	4.60	6.00	6.70	7.80	1.79	2.34	2.61	3.04
						Total Q =	1.79	2.34	2.61	3.04

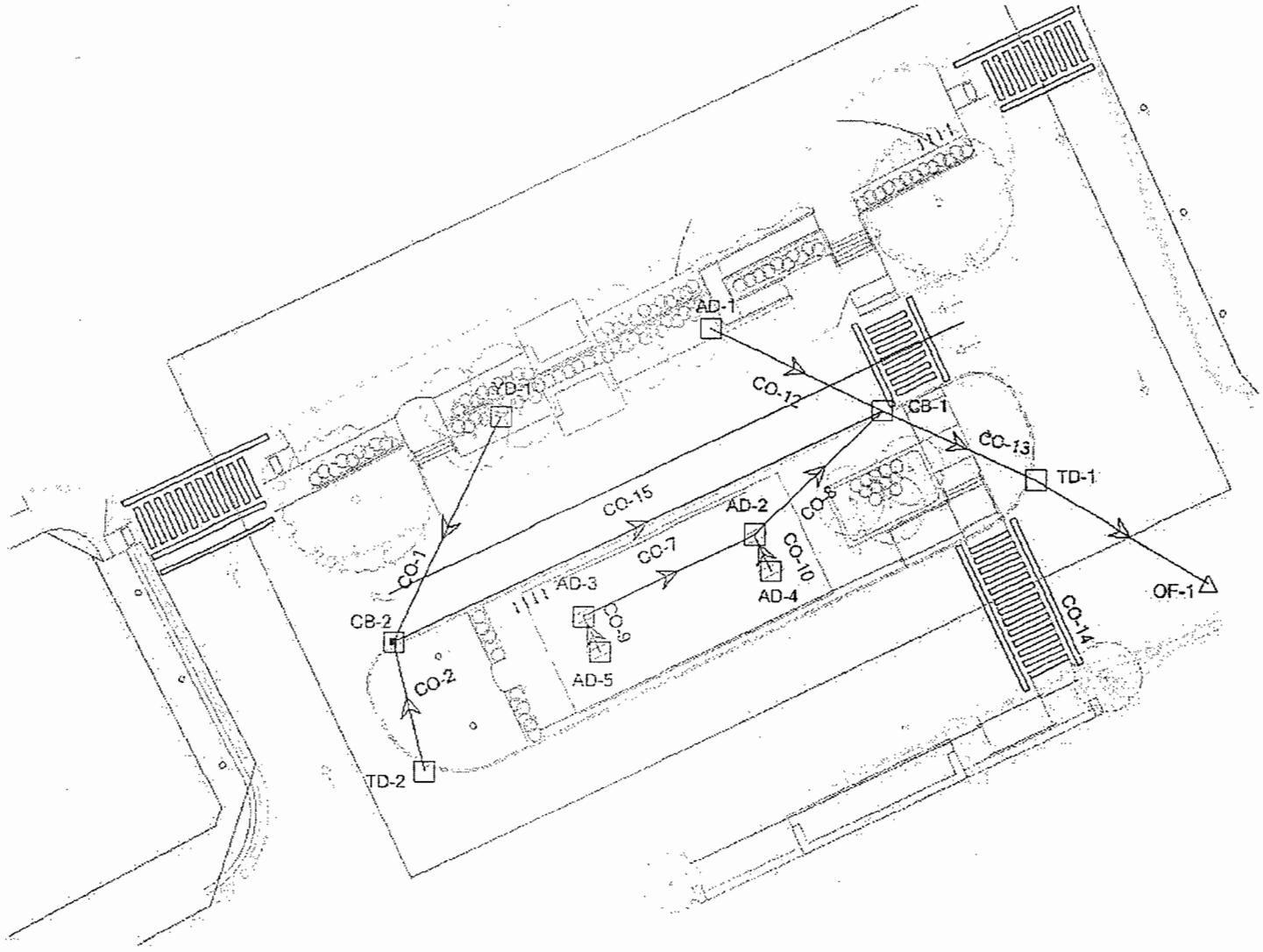
Post- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
B	0.00	0.00	4.60	6.00	6.70	7.80	0.00	0.00	0.00	0.00
						Total Q =	**0.00**	**0.00**	**0.00**	**0.00**
						Delta =	**-1.79**	**-2.34**	**-2.61**	**-3.04**

Note:

1.) Calculations based on Rational Method, Q = CiA
2.) Design Points designated on Exhibit 3.9-A and 3.9-B

Sigourney Street Station



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-1	YD-1	0.69	0.01	60.30	56.23	0.07	58.00	2.67	6.00
	CB-2			59.20	54.66				
CO-2	TD-2	0.90	0.09	58.50	54.66	0.57	31.00	2.73	6.00
	CB-2			59.20	54.66				
CO-7	AD-3	0.90	0.02	59.77	55.09	0.13	44.00	2.81	5.99
	AD-2			59.77	54.70				
CO-8	AD-2	0.90	0.04	59.77	54.63	0.26	41.00	3.43	5.94
	CB-1			59.30	54.15				
CO-9	AD-5	0.90	0.01	59.77	55.23	0.07	9.00	2.30	6.00
	AD-3			59.77	55.11				
CO-10	AD-4	0.90	0.01	59.77	54.69	0.07	9.00	2.30	6.00
	AD-2			59.77	54.70				
CO-12	AD-1	0.90	0.01	61.18	55.60	0.04	44.00	2.49	6.00
	CB-1			59.30	54.16				
CO-13	CB-1	0.70	0.30	59.30	53.93	1.75	39.00	6.82	5.79
	TD-1			57.50	52.53				
CO-14	TD-1	0.88	0.41	57.50	52.73	2.39	47.00	7.21	5.76
	OF-1			56.50	51.17				
CO-15	CB-2	0.82	0.19	59.20	54.57	1.12	126.00	3.12	5.93
	CB-1			59.30	54.16				

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)
AD-1	61.18	53.54	0.9	Area Drain	2.06	2.06	0.04	0	55.6	55.6	0.5	0
AD-2	59.77	52.37	0.9	Area Drain	2.33	2.26	0.07	0	54.7	54.63	0.7	0
AD-3	59.77	52.91	0.9	Area Drain	2.23	2.18	0.07	0	55.14	55.09	0.7	0
AD-4	59.77	52.38	0.9	Area Drain	2.31	2.31	0.07	0	54.69	54.69	0.7	0
AD-5	59.77	53.1	0.9	Area Drain	2.13	2.13	0.07	0	55.23	55.23	0.9	3.8
CB-1	59.3	51.37	0.703	Combination Type C Single Grate - Grate Type A - Other Curb	2.79	2.56	0.38	0.06	54.16	53.93	1	4.3
CB-2	59.2	52.2	0.818	Combination Type C Single Grate - Grate Type A - Other Curb	2.46	2.37	0.5	0.13	54.66	54.57	1.2	4.9
TD-1	57.5	50.07	0.875	Trench Drain 1	2.66	2.66	0.68	0	52.73	52.73	0.6	2.6
TD-2	58.5	52.33	0.9	Trench Drain 2	2.41	2.33	0.57	0	54.74	54.66	0.5	2.1
YD-1	60.3	54.13	0.693	Yard Drain	2.1	2.1	0.07	0	56.23	56.23	0.7	0

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-3	0.08	0.9	0.07	5	TD-2	0.44
CM-4	0.02	0.3	0.01	5	CB-2	0.03
CM-6	0.05	0.9	0.045	5	CB-2	0.27
CM-7	0.06	0.9	0.06	5	CB-2	0.33
CM-8	0.01	0.9	0.009	5	YD-1	0.06
CM-9	0.005	0.3	0.002	5	YD-1	0.01
CM-10	0.012	0.9	0.011	5	AD-2	0.07
CM-11	0.01	0.9	0.01	5	AD-4	0.07
CM-12	0.01	0.9	0.01	5	AD-3	0.07
CM-13	0.01	0.9	0.01	5	AD-5	0.07
CM-14	0.005	0.3	0.001	5	TD-1	0.01
CM-15	0.068	0.9	0.061	5	TD-1	0.37
CM-16	0.04	0.9	0.04	5	TD-1	0.23
CM-17	0.007	0.9	0.006	5	AD-1	0.04
CM-18	0.026	0.3	0.008	5	CB-1	0.05
CM-19	0.07	0.9	0.06	5	CB-1	0.38
CM-20	0.003	0.3	0.001	5	CB-1	0.01
CM-21	0.005	0.3	0.002	5	CB-1	0.01

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	YD-1	CB-2	56.13	54.2	12 inch	0.07	58	0.033	6.5	60.3	59.2	3.17	4	2.67
CO-2	TD-2	CB-2	54.33	54.15	12 inch	0.57	31	0.006	2.71	58.5	59.2	3.17	4.05	2.73
CO-7	AD-3	AD-2	54.91	54.47	6 inch	0.13	44	0.01	0.73	59.77	59.77	4.36	4.8	2.81
CO-8	AD-2	CB-1	54.37	53.95	6 inch	0.26	41	0.01	0.74	59.77	59.3	4.9	4.85	3.43
CO-9	AD-5	AD-3	55.1	55.01	6 inch	0.07	9	0.01	0.73	59.77	59.77	4.17	4.26	2.3
CO-10	AD-4	AD-2	54.56	54.47	6 inch	0.07	9	0.01	0.73	59.77	59.77	4.71	4.8	2.3
CO-12	AD-1	CB-1	55.52	53.47	12 inch	0.04	44	0.047	7.69	61.18	59.3	4.66	4.83	2.49
CO-13	CB-1	TD-1	53.37	52.17	12 inch	1.75	39	0.031	6.25	59.3	57.5	4.93	4.33	6.82
CO-14	TD-1	OF-1	52.07	50.73	12 inch	2.39	47	0.029	6.02	57.5	56.5	4.43	4.77	7.21
CO-15	CB-2	CB-1	54.1	53.47	12 inch	1.12	126	0.005	2.52	59.2	59.3	4.1	4.83	3.12

S E A Consultants Inc.
Scientists/ Engineers/ Architects

Project: New Britain – Hartford Busway
Calculated by: KSR Dated: 08-20-2009
Checked by: AGB Dated: 09-29-2009

Trench Drain Design for Sigourney Street Station

There are two steps to determine the size required for trench drains.

1. Determine grate size to capture 100% of the flow.

Neenah Foundry has the type of trench drain desired. The R-4999 Vane type L series is heavy duty, bolted, and has the ability to remove significant amounts of sheet flow from streets, parking lots and industrial lots (see attached product information). To determine the percent capture of the grate, Neenah Foundry provides each grate with a K chart (see attached K chart for product R-4999-L3). This chart uses the relationship between longitudinal gutter slope (in percent) and the flow (in cfs/ft) to determine the percent captured.

Trench Drain 1:

The drainage area leading to trench drain 1 has a longitudinal gutter slope of 6%. From the K chart, the maximum flow for the R-4999-L3 Vane type inlet to capture 100% of the flow is 0.30 cfs/ft. The total flow from the drainage area to the trench drain is 0.013 cfs/ft. Therefore, the R-4999-L3 Vane type will capture 100% of the designed flow.

Trench Drain 2:

The drainage area leading to trench drain 2 has a longitudinal gutter slope of 4%. From the K chart, the maximum flow for the R-4999-L3 Vane type inlet to capture 100% of the flow is 0.40 cfs/ft. The total flow from the drainage area to the trench drain is 0.011 cfs/ft. Therefore, the R-4999-L3 Vane type will capture 100% of the designed flow.

For both trench drains, the R-4999-L2 will be used. The grate width of the R-4999-L3 and the R-4999-L2 are the same allowing the use of the L3 K chart for the L2. The difference between these grates is that the overall casting width of the L2 is 10", compared to L3's 12".

2. Determine required depth of trench drain.

Manning's equation is used to determine the required depth of the trench drain. FlowMaster is used to perform the calculations.

Trench Drain 1:

The length of the trench drain is designed to be 44ft. The slope equals 0.5%. From the chosen inlet above, the cross-sectional width is equal to 10" (0.83ft). Manning's roughness coefficient is 0.013 for concrete. Using these values in FlowMaster, the

normal depth required equals 0.29 ft (see attached FlowMaster worksheet). With this depth, the velocity through the trench drain equals 2.47 ft/s. The trench drain will be oversized and designed to have a depth of 0.5 ft for larger storm events.

Trench Drain 2:

The length of the trench drain is designed to be 40ft. The slope equals 0.5%. From the chosen inlet above, the cross-sectional width is equal to 10" (0.83ft). Manning's roughness coefficient is 0.013 for concrete. Using these values in FlowMaster, the normal depth required equals 0.23 ft (see attached FlowMaster worksheet). With this depth, the velocity through the trench drain equals 2.26 ft/s. The trench drain will be oversized and designed to have a depth of 0.5 ft for larger storm events.

Summary:

Two trench drains are proposed to be installed at Sigourney Street Station. Trench Drain 1 is 44 ft in length while Trench Drain 2 is 40 ft. The Neenah Foundry grate chosen for the trench drain is R-4999-L2 (see attached product information for dimensions). The designed depth for both trench drains is 0.5 ft. This design is oversized and will capture 100% of the flow.

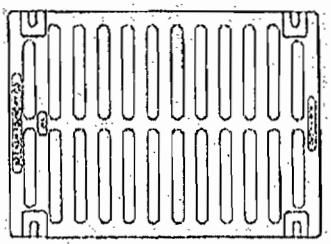
Note: When specifying/ordering grates, refer to "Choosing the proper inlet grate" on pages 117-118.
For a complete listing of FREE OPEN AREAS and WEIR PERIMETERS of all NEENAH grates, refer to pages 306-311.

R-4990 Airport, Port & Heavy Industrial Series
Bolted Trench for Extra Heavy Duty Applications

These trench drains are capable of supporting the heavy wheel loads of today's commercial environments. For larger trench widths or greater loading requirements, please contact our Product Engineering Department.

Grates are bolted to gray iron frames.

For Alternate Frame options, please see the R-4993 and R-4994 Series Trench found on pages 269.



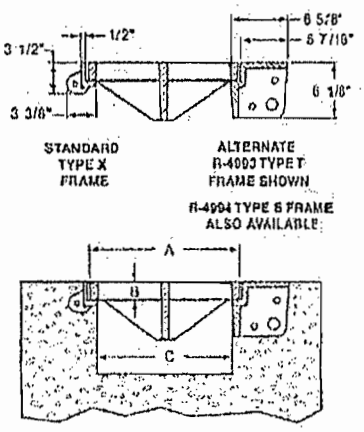
TYPE "A"
GRATE OPENINGS

Suitable for aircraft loading per AC150/5320-6D.

Catalog No.	A	B	C	Grate Matl.
R-4990-AA	8	2	6	Gray Iron
R-4990-BA	10	2	8	Gray Iron
R-4990-CA	12	2	10	Ductile Iron
R-4990-DA * **	14	2	12	Ductile Iron
R-4990-EA *	17	2	15	Ductile Iron
R-4990-FA *	20	2	18	Ductile Iron
R-4990-HA *	26	2	24	Ductile Iron
R-4990-KA2 *	34	2	31	Ductile Iron
R-4990-OA *	51	2	48	Ductile Iron

** Type D solid cover available.*
*** Type C grate available.*

Ductile Iron furnished in Grade 80-55-06.



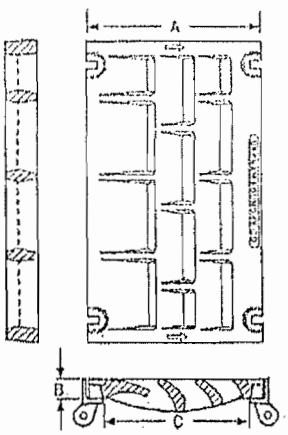
R-4999 Vaned Type L Series
Bolted Transverse Drainage Structure

Heavy Duty

This trench grate series represents Neenah's best hydraulic performance.

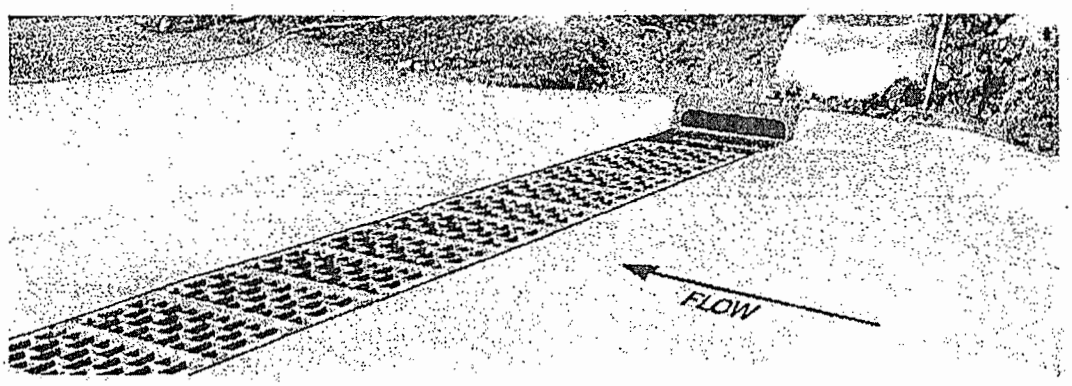
Catalog No.	A	B	C
R-4999-L2 ***	12	1 1/2	10
R-4999-L3 *	14	1 1/2	12
R-4999-L6 **	23 7/8	2	21 7/8
R-4999-L7 *	26 5/8	2	24 5/8
R-4999-L9 ***	29 3/4	2 1/2	26 3/4

** Furnished in 24" sections*
*** Furnished in 12" or 24" sections*
**** Furnished in 18" or 36" sections*



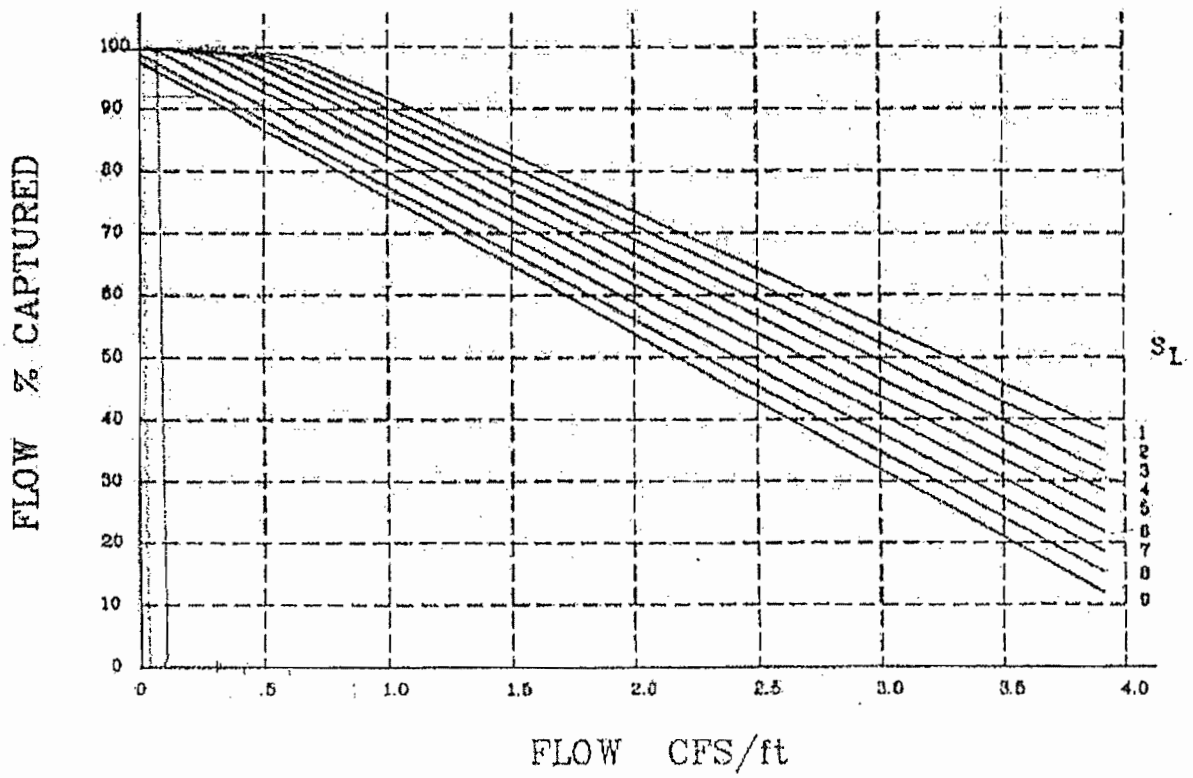
Type "L" vane shaped grates have the ability to remove significant amounts of sheet flow from streets, parking lots and industrial lots.

For detailed hydraulic information, visit our website at **www.neenahfoundry.com** and select "Hydraulic Calculator" or contact Neenah Product Engineering.



To print K-chart, click ctrl-P.

R-4999-L3



S T = Transverse Gutter Slope %
S L = Longitudinal Gutter Slope %
K = Grate Inlet Coefficient

TD#1: Flow 0.59/44ft = 0.013 cfs/ft

TD#2: Flow 0.43/40ft = 0.011 cfs/ft

Sizing for Trench Drain, TD-1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.016	
Channel Slope	0.00500	ft/ft
Bottom Width	0.50	ft
Discharge	0.59	ft^3/s

Results

Normal Depth	0.58	ft
Flow Area	0.29	ft^2
Wetted Perimeter	1.65	ft
Hydraulic Radius	0.17	ft
Top Width	0.50	ft
Critical Depth	0.35	ft
Critical Slope	0.01703	ft/ft
Velocity	2.05	ft/s
Velocity Head	0.07	ft
Specific Energy	0.64	ft
Froude Number	0.48	
Flow Type	Subcritical	

GVF Input Data

Upstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Downstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.58	ft
Critical Depth	0.35	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.01703	ft/ft

Sizing for Trench Drain, TD-2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.016	
Channel Slope	0.00500	ft/ft
Bottom Width	0.50	ft
Discharge	0.43	ft³/s

Results

Normal Depth	0.44	ft
Flow Area	0.22	ft²
Wetted Perimeter	1.39	ft
Hydraulic Radius	0.16	ft
Top Width	0.50	ft
Critical Depth	0.28	ft
Critical Slope	0.01562	ft/ft
Velocity	1.94	ft/s
Velocity Head	0.06	ft
Specific Energy	0.50	ft
Froude Number	0.51	
Flow Type	Subcritical	

GVF Input Data

Upstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Downstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.44	ft
Critical Depth	0.28	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.01562	ft/ft

Velocity for Trench Drain, TD-1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.016	
Channel Slope	0.06000	ft/ft
Bottom Width	22.00	ft
Discharge	0.59	ft³/s

Results

Normal Depth	0.02	ft
Flow Area	0.39	ft²
Wetted Perimeter	22.04	ft
Hydraulic Radius	0.02	ft
Top Width	22.00	ft
Critical Depth	0.03	ft
Critical Slope	0.01229	ft/ft
Velocity	1.52	ft/s
Velocity Head	0.04	ft
Specific Energy	0.05	ft
Froude Number	2.02	
Flow Type	Supercritical	

GVF Input Data

Upstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Downstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.02	ft
Critical Depth	0.03	ft
Channel Slope	0.06000	ft/ft
Critical Slope	0.01229	ft/ft

Velocity for Trench Drain, TD-2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.016	
Channel Slope	0.04000	ft/ft
Bottom Width	20.00	ft
Discharge	0.43	ft^3/s

Results

Normal Depth	0.02	ft
Flow Area	0.35	ft^2
Wetted Perimeter	20.03	ft
Hydraulic Radius	0.02	ft
Top Width	20.00	ft
Critical Depth	0.02	ft
Critical Slope	0.01292	ft/ft
Velocity	1.23	ft/s
Velocity Head	0.02	ft
Specific Energy	0.04	ft
Froude Number	1.65	
Flow Type	Supercritical	

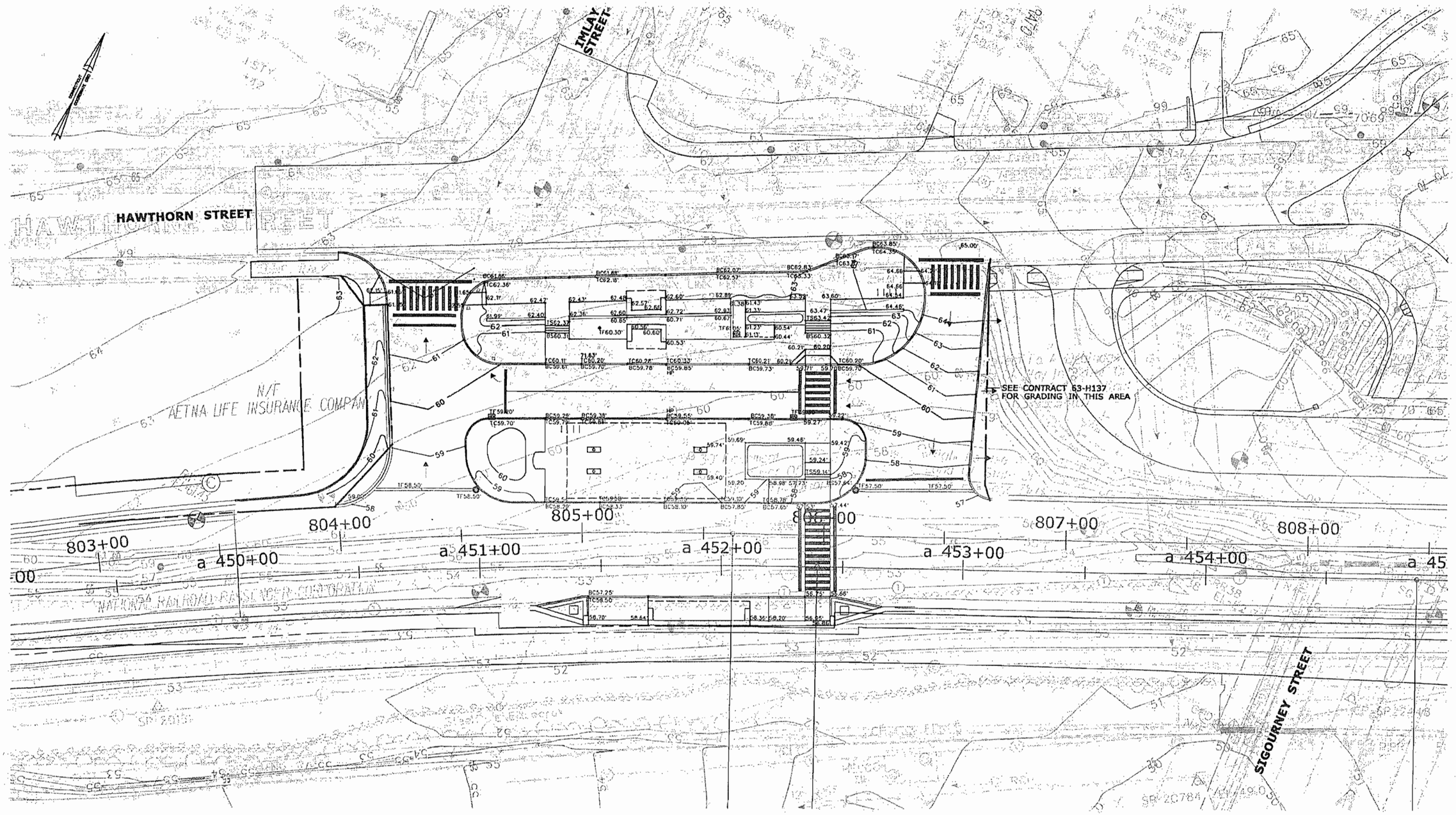
GVF Input Data

Upstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Downstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.02	ft
Critical Depth	0.02	ft
Channel Slope	0.04000	ft/ft
Critical Slope	0.01292	ft/ft

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



ENVIRONMENTAL PERMIT REVIEW

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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: 11/11/2009

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STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD_MSH_GRD_88H039_SIGOURNEY.dgn

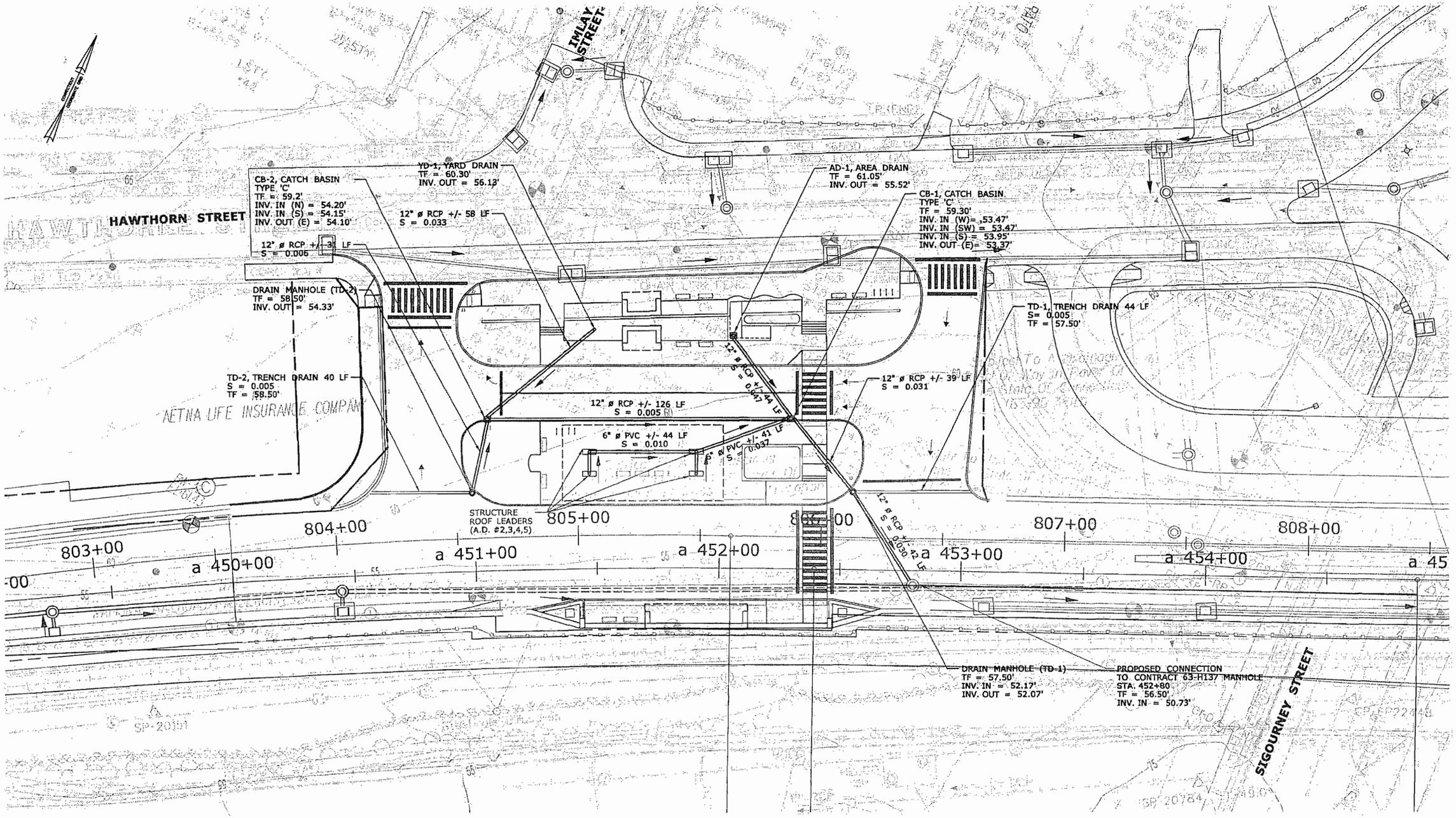
SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY: DATE:

PROJECT TITLE: NEW BRITAIN - HARTFORD BUS RAPID TRANSIT STATIONS

TOWN: HARTFORD

DRAWING TITLE: SIGOURNEY STATION GRADING PLAN

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



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Plotted Date: 11/11/2009

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STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

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APPROVED BY: DATE:

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TOWN: HARTFORD

DRAWING TITLE: SIGOURNEY STATION DRAINAGE PLAN

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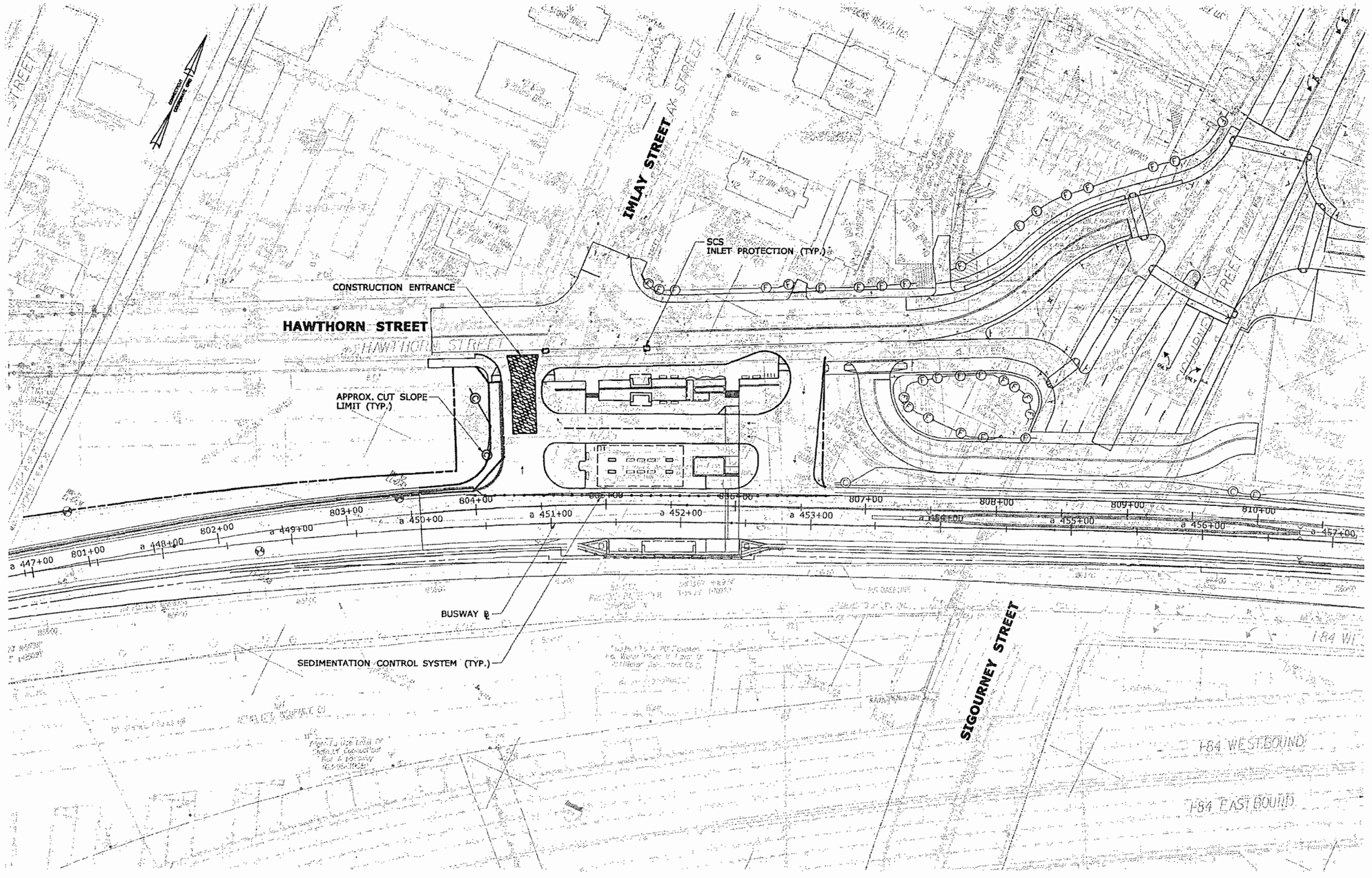

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Plotted Date: 10/22/2009

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DEPARTMENT OF TRANSPORTATION

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APPROVED BY: DATE:

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NEW BRITAIN - HARTFORD
BUS RAPID TRANSIT SYSTEM

TOWN: HARTFORD
PROJECT NO. 88-H039
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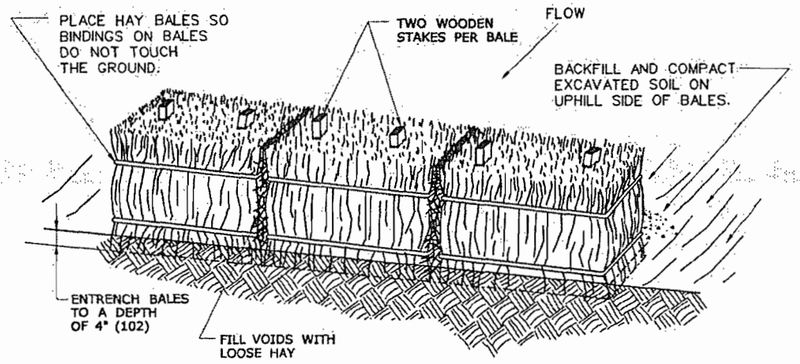
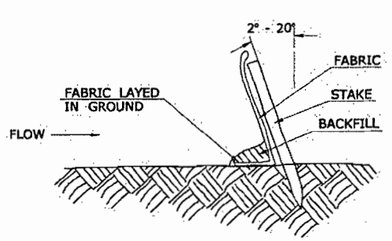
SHEET NO. S

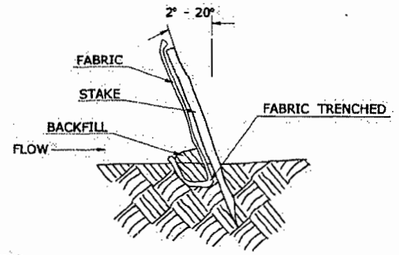


HAY BALE SYSTEM

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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-	-	-	-
-	-	-	-
-	-	-	-
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Plotted Date: 10/28/2009

DESIGNER/DRAFTER: -
CHECKED BY: -
NTS

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD_MSH_DET_88H039_SED_CONTROL1.dgn

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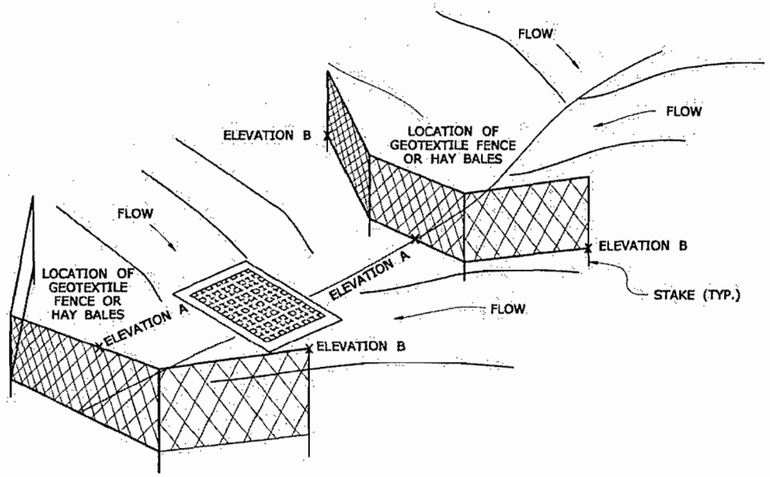
OFFICE OF ENGINEERING
APPROVED BY: DATE:

PROJECT TITLE:
NEW BRITAIN - HARTFROD BUS RAPID TRANSIT STATIONS

TOWN:

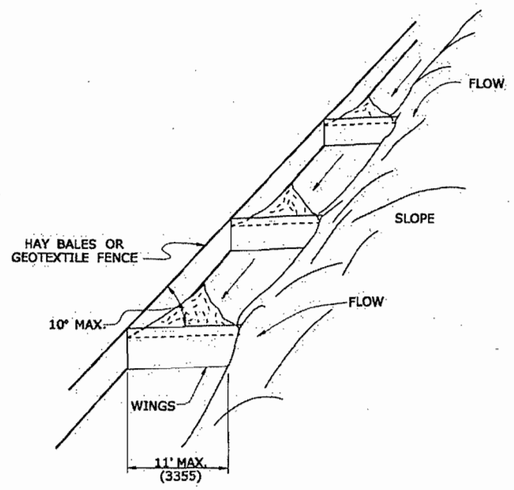
DRAWING TITLE:
SEDIMENTATION CONTROL SYSTEM DETAILS

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



TREATMENT FOR A CATCH BASIN ON A SLOPE

(SEE NOTE 4)

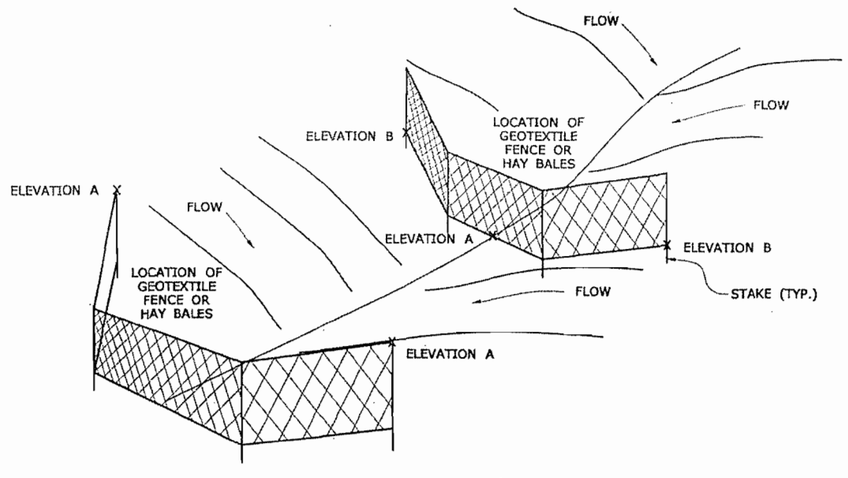


TREATMENT AT TOE OF SLOPE

(SEE NOTE 3)

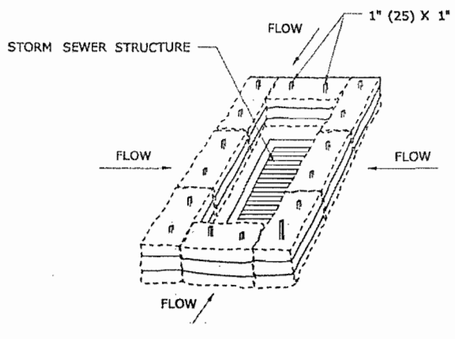
GENERAL NOTES:

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.

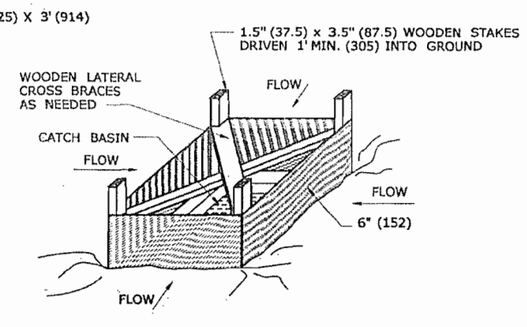


CHECK DAM

(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

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CHECKED BY: -
NTS

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

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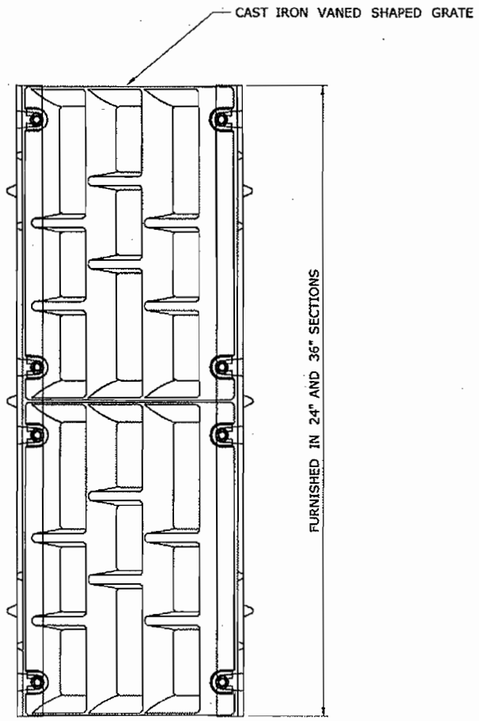
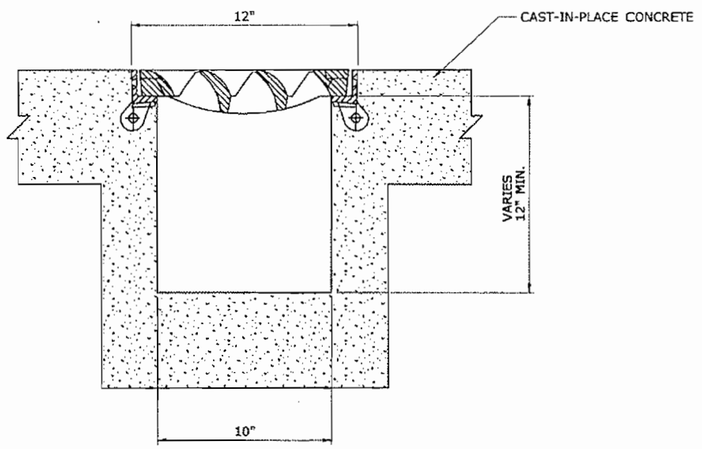
NEW BRITAIN - HARTFORD BUS RAPID TRANSIST STATIONS

TOWN:

DRAWING TITLE:
SEDIMENTATION CONTROL TREATMENT DETAILS

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





TRENCH DRAIN FRAME AND GRATE

GENERAL NOTES:

1. THE GRATE SHOULD NOT PROJECT ABOVE PAVEMENT.
2. DEPTH OF TRENCH DRAIN VARIES. SLOPE BOTTOM TO DRAIN TOWARD OUTFALL PIPE PER PLANS.

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 Date: 11/13/2009

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

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD_MSH_DET_88H039_CHECK DAM, TRENCH DRAIN.dgn

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

PROJECT TITLE:
NEW BRITAIN - HARTFORD
BUS RAPID TRANSIT STATIONS

TOWN: -

DRAWING TITLE:
DRAINAGE DETAILS

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

8. Appendix E: CTDOT Preliminary Design Comment Responses

Station: Sigourney Reviewer: Hydraulics & Drainage Reviewer Date: 9/28/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-09-29

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

m e m o r a n d u m

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

date: September 28, 2009

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

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

No.	Comment	Inc.	Not Inc.
1	A yard drain (YD-1) and an area drain (AD-1) are proposed at the western limits of the station. Both are located in grass areas and will collect very small runoff (.07 cfs and .04 cfs respectively). In addition, trees are proposed at these locations and will make the inlets prone to clogging. Consider regrading these areas to eliminate the low spots and allow runoff to discharge onto the pavement. This will eliminate several drainage structures and unnecessary storm drainage pipe.		
2	Two trench drains are proposed on the east side of the station driveways to capture runoff before it discharges to the busway mainline. Trench drains are prone to collect sand and sediment during normal conditions and especially during sanding operations in the winter. Consider installing standard catch basins on each side of the driveway pavement in lieu of the trench drains. Catch basins will be more effective in collecting the pavement runoff and be more conducive to future cleaning and maintenance.		
3	Establish the hydraulic gradeline based on calculations performed by the mainline designer for the busway drainage system rather than assuming a starting water surface elevation.		
4	The proposed contours and spot elevations show that a low point is created in front of the station crosswalk that leads to the northbound busway platform without provision for an inlet. How will this low point drainage be intercepted? Double check other areas to avoid ponding problems.		

Yolanda Antoniak/ya:sd
cc: Joseph J. Obara
Chong Lung Chow
088-H039G

Station: Sigourney Reviewer: Hydraulics & Drainage Reviewer Date: 9/28/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-09-29

Reviewer Comment 1)

A yard drain (YD-1) and an area drain (AD-1) are proposed at the western limits of the station. Both are located in grass areas and will collect very small runoff (.07 cfs and .04 cfs respectively). In addition, trees are proposed at these locations and will make the inlets prone to clogging. Consider regrading these areas to eliminate the low spots and allow runoff to discharge onto the pavement. This will eliminate several drainage structures and unnecessary storm drainage pipe.

S E A Response: ***The Area Drain (AD-1) is located to collect runoff on the handicap access ramp. It is designed to minimize icing conditions on the ramps and improve safety. The Yard Drain (YD-1) is located to minimize runoff over the plaza and pedestrian areas also to minimize icing potential.***

Reviewer Comment 2)

Two trench drains are proposed on the east side of the station driveways to capture runoff before it discharges to the busway mainline. Trench drains are prone to collect sand and sediment during normal conditions and especially during sanding operations in the winter. Consider installing standard catch basins on each side of the driveway pavement in lieu of the trench drains. Catch basins will be more effective in collecting the pavement runoff and be more conducive to future cleaning and maintenance.

S E A Response: ***Trench drains are required at this station site due to the steep grades (west to east). It is not feasible to design an appropriate crown to the road that could direct flows to a standard catch basin at the curb line and meet the busway gutter line. The proposed trench drains will be cast iron to handle the traffic loadings and reduce future maintenance.***

Reviewer Comment 3)

Establish the hydraulic gradeline based on calculations performed by the mainline designer for the busway drainage system rather than assuming a starting water surface elevation.

S E A Response: ***The mainline design has been updated to account for the actual station drainage system connection and provided revised data. The actual HGL for the proposed 63-H137 system has been used in the station design.***

Station: Sigourney Reviewer: Hydraulics & Drainage Reviewer Date: 9/28/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-09-29

Reviewer Comment 4)

The proposed contours and spot elevations show that a low point is created in front of the station crosswalk that leads to the northbound busway platform without provision for an inlet. How will this low point drainage be intercepted? Double check other areas to avoid ponding problems.

S E A Response: ***The curb line in front of the northbound busway platform is sloped to drain from north to south (as designed by Contract 63-H137). The busway cross section is superelevated here from west to east (southbound platform to northbound platform). No low points are shown on the grading plan. Drainage in this area will be collected by an inlet proposed by the mainline near Station 453+10.***

Station: Sigourney Reviewer: Environmental Planning Reviewer Date: 9/14/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-09-28

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

memorandum

, 2009

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

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 Sheet #	Comment	Inc.	Not Inc. (If not, WHY)
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 155-H025 and 63-H143 regarding the transition points connecting concrete curbing, RW, drainage, etc...between the busway and platform stations.		
7	DRG	• 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 to drain grass areas with yard drains? • Couldn't the Station utilized bioretention and rain gardens?		
8	LDS	• Remove Meadow Mix from the project.		

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 Antoniak
Jacob Argiro

Station: Sigourney Reviewer: Environmental Planning Reviewer Date: 9/14/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-09-28

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: ***Additional detail has been added to the plan sheets, as applicable.***

Reviewer Comment 5b.)

- Please coordinate with the project designers of Project 155-H025 and 63-H143 regarding the transition points connecting concrete curbing, RW, drainage, etc...between the busway and platform stations.

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 7a.)

- 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: ***Alternative pipe types will be considered during final design.***

Reviewer Comment 7b.)

- Why is the design proposing to drain grass areas with yard drains?

S E A Response: ***One yard drain (YD-1) is proposed within a grassed area approximately 600 square feet. This area includes the roof runoff from the local shelter. This inlet is proposed to prevent runoff from draining to the plaza/pedestrian area and creating a potentially hazardous icing condition.***

Reviewer Comment 7c.)

- Couldn't the Station utilized bioretention and rain gardens?

S E A Response: ***The limited station footprint and operational needs identified by the Department has precluded bioretention areas and rain gardens.***

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.***

Station: Sigourney Reviewer: Environmental Planning Reviewer Date: 8/26/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-09-28

From: Lesay, Kimberly C [mailto:Kimberly.Lesay@ct.gov]
Sent: Wed 8/26/2009 4:30 PM
To: Jacob Argiro
Cc: Cunningham, Brian T; Alexander, Mark W; Corrente, Paul N
Subject: Sigourney Street Station

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

* The drainage plan depicts "clean water" (underdrain and yard drain) being added into the stormwater system. This unnecessarily adds to the volume of stormwater which must be treated. Please investigate keeping clean water discharges separate.

* Utility plans depict water line work. please ensure the timing of this work is included in the sequence of construction as it may affect water handling.
* Stormwater treatment is not proposed and appears warranted and possible. Please investigate possibilities for primary treatment and / or be prepared to explain site limitations as back up material for the permit applications

Kimberly Lesay
Environmental Planning Division
Department of Transportation
2800 Berlin Turnpike
PO Box 317546
Newington, CT 06131-7546
phone (860) 594-2933
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Kimberly.Lesay@po.state.ct.us

Station: Sigourney Reviewer: Environmental Planning Reviewer Date: 8/26/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-09-28

Reviewer Comment 1a).

The drainage plan depicts "clean water" (underdrain and yard drain) being added into the stormwater system. This unnecessarily adds to the volume of stormwater which must be treated. Please investigate keeping clean water discharges separate.

S E A Response: ***The station drainage system includes collection from one yard drain (YD-1) and roof leaders from the large busway canopy on the southbound platform. No underdrains are proposed. The station site is restricted by the limited footprint and operational requirements and does not allow for an alternative discharge location for these flows.***

Reviewer Comment 1b).

Utility plans depict water line work. please ensure the timing of this work is included in the sequence of construction as it may affect water handling.

S E A Response: ***Utility work will be further detailed during final design.***

Reviewer Comment 1c).

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

S E A Response: *The limited non-paved areas within the station footprint have precluded the inclusion of water quality swales and/or other elements to provide meaningful water quality treatment.*