Memorandum

DATE:	September 13, 2019		
PROJECT:	1800613-Gardiner Middle School	**SUBJECT:**	Stormwater Drainage Management Memo
TO:	Rebecca Sewer-Beamer BRIC Architecture	**FROM:**	Adam Roth KPFF Consulting Engineers
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This memorandum outlines the stormwater management and treatment of runoff from new impervious surfaces associated with the Gardiner Middle School project in accordance with the Oregon City Stormwater and Grading Design Standards (July 2019).

I. Project Overview and Description

The new middle school campus is located at 180 Ethel Street in Oregon City, Oregon. There is an existing middle school building that occupies the north half of the approximately 19.5 acre site. The south half of the existing site includes a football field and track. The project will be completed in two phases so that the existing middle school can remain active while the new 150,000 square-foot school building is constructed on the south portion of the site. Phase 2 will include demolition of the existing school and the addition of play fields.

II. Existing Conditions

As noted above, the total project site is approximately 19.5 acres and consists of a large open grassy area, a football field, school buildings and parking area. The impervious surfaces include roof areas, parking lots, play areas and a running track. A significant amount of the existing site is unpaved grass area with a few trees throughout.

Generally, the site slopes gradually from west to east, with varying topography along the southern property line. The church property to the southwest is 10 feet higher than the school and PGE's property to the southwest is 10 feet lower than the school. The surface runoff in the paved areas is collected by a network of catch basins and pipes that convey drainage to a 15-inch public storm main that runs west to east in the middle of the site. This storm main carries stormwater runoff from the existing site and several upstream properties through the site to a natural resource area east of the property. Ultimately, the system flows to Newell Creek about one mile downstream.

Site Soils

According to the Natural Resource Conservation Service (NRCS) Soil Survey, the site soils are Bornstedt Silt Loams with fine textured soils. The soil's hydrologic group is class "C", which typically has a very low permeability and a high runoff potential.

A geotechnical investigation was completed by GeoEngineers to evaluate the site soils and provide recommendations for the proposed improvements. Field boring investigations performed and analyzed by GeoEngineers encountered silt to clayey silt throughout the site, consistent with the NRCS soil survey. Greater sand contents were encountered as depths approached 15-20 feet below ground surface.

Infiltration tests resulted in a variety of rates, from 0-7.5 inches/hour. Some of the tests encountered local shallow perched groundwater, which affected these results. Overall, the average infiltration rate for the site was calculated to be 4.2 inches/hour.

Groundwater levels throughout the site are expected to vary seasonally due to rainfall events. When the report was completed, groundwater depths were generally 12-14 feet below ground surface. Perched groundwater was encountered as high as 4 ½ feet below ground surface.

III. Proposed Onsite Improvements

The proposed site includes the new 150,00 square foot school building, bus drop off lane, parking lots, new play fields, and a new track and natural turf football field. There are separate bid-alternates for both the football field and the multi-use field to be artificial turf.

The proposed grading and drainage systems have been coordinated with the site improvements to collect and convey site runoff from new impervious surfaces to stormwater management facilities. The proposed improvements will maintain existing drainage patterns and enhance water quality prior to discharge to the storm main that runs through the project site.

Drainage Basin

The drainage runoff of the entire site is located in the Newell Creek Basin. The site itself is split into two major subbasins. The western half of the site drains to a series of infiltration rain gardens that overflow to the existing storm main. The eastern half of the site drains to a detention pond located near the east edge of the site with an overflow to the existing storm main. The artificial turf alternates for both fields will require additional infiltration chambers to manage the turf area, which is considered impervious for detention calculations. There is also a small infiltration rain garden to manage an isolated parking lot in the northwest corner of the site.

The project results in a net increase of impervious area as summarized in Table 1 below.

TABLE 1: Summary of impervious areas.

Site Condition	Impervious Area (SF)	Pervious Area (SF)	Total Area (SF)
Existing	252,104	548,462	800,566
Proposed	346,144	454,422	800,566
Net	**+94,040**	**-94,040**	**N/A**

Storm Water Management Methodology

Surface runoff from the new impervious areas will be managed and conveyed in accordance with the 2019 Oregon City Stormwater and Grading Design Standards. This will be accomplished by verifying the proposed facility sizing with the Best Management Practices (BMP) Sizing Tool created by the Clackamas County

Water Environment Services (WES). This tool confirms proper facility sizing with input of the site parameters and drainage basin size. See Figure 1 below for a snapshot of the BMP Sizing Tool Report.

WES BMP Sizing Report

Project Information

Project Name	Gardiner Middle School
Project Type	Commercial
Location	180 Ethel Street, Oregon City, OR 97045
Stormwater Management Area	22500
Project Applicant	Oregon City School District
Jurisdiction	OutofDistrict

Drainage Management Area

Name	Area (sq-ft)	Pre-Project Cover	Post-Project Cover	DMA Soil Type	BMP
IMP-WEST-RG	51,710	Forested	ConventionalConcrete	C	West-Rain-Garden
PERV-EAST-POND	393,726	Forested	LandscapeBsoil	C	Detention-Pond
IMP-EAST-POND	322,785	Forested	ConventionalConcrete	C	Detention-Pond
PERV-WEST-RG	26,977	Forested	LandscapeBsoil	C	West-Rain-Garden
IMP-NW-RG	5,367	Forested	ConventionalConcrete	C	NW-Rain-Garden

LID Facility Sizing Details

LID ID	Design Criteria	BMP Type	Facility Soil Type	Minimum Area (sq-ft)	Planned Areas (sq-ft)	Orifice Diameter (in)
West-Rain-Garden	FlowControlAndTreatment	Rain Garden - Infiltration	B2	4,186.2	4,315.0	0.0
NW-Rain-Garden	FlowControlAndTreatment	Rain Garden - Infiltration	A1	268.4	550.0	0.0

Pond Sizing Details

Pond ID	Design Criteria(1)	Facility Soil Type	Max Depth (ft)(2)	Top Area (sq-ft)	Side Slope (1:H)	Facility Vol. (cu-ft)(3)	Water Storage Vol. (cu-ft)(4)	Adequate Size?
Detention-	FCWQT	B1	7.50	14,867.0	3	75,412.3	62,072.9	Yes

FIGURE 1: Snapshot of WES BMP Sizing Tool.

Drainage from all new or improved impervious surfaces must be routed through storm facilities that provide water quality treatment and flow control before leaving the site.

Treatment

All facilities onsite will be sized to provide water quality treatment. Water quality facilities are designed to capture and treat 80 percent of the average annual runoff volume to the maximum extent possible, with the goal of 70 percent total of suspended solids removal. The BMP Sizing Tool factors this into the outputted minimum facility sizes.

Flow Control/Detention

All facilities will be designed to provide flow control prior to conveying stormwater runoff offsite. These facilities will be designed so that the duration of peak flow rates from post-development conditions shall be less than or equal to the duration of the peak flow rates from pre-development conditions for all peak flows between 42 percent of the 2-year flow rate up to the 10-year peak flow rate. The BMP Sizing Tool addresses these flow control requirements to size stormwater management facilities.

Stormwater Management Facility Types

There are 3 stormwater management facility types that will be used:

1. Rain gardens – Rain gardens will be used to provide water quality treatment as well as flow control for stormwater in the western side of the site. These facilities will be designed to infiltrate stormwater. Per the geotechnical engineer's recommendation, they are also designed with an emergency overflow to the existing storm main running through the site. Refer to land use plans for details.
2. Detention Pond – A single detention pond will be used to provide water quality treatment and flow control for stormwater in the eastern portion of the site. The detention pond system includes an overflow inlet structure as well as a flow control manhole prior to conveying stormwater to the existing storm main. Refer to land use plans for details.
3. Infiltrator (Alternates only) – A below grade pipe system will be used to provide additional retention for the additional artificial turf area for the alternates. This system includes below grade chambers that store stormwater and a flow control manhole that slowly releases stormwater to the existing public storm main. Refer to exhibit B for details.

Table 2 below summarizes the stormwater management basins used in design and the required treatment areas. The required areas for the rain gardens (RG) are based on a 4% sizing ratio per the BMP Sizing Tool. The sizing of the Detention Pond (DP) is determined by a continuous simulation of peak flow rates of the design storms (mentioned above) per the BMP Sizing Tool, and varies based on design water depth. Exhibit A provides a graphical representation of the basins and facilities to supplement the information presented in the table.

TABLE 2: Summary of stormwater management basins

BASIN/ AREA	SURFACE TYPE	IMPERVIOUS AREA (SF)	DRAINS TO	MIN. FACILITY AREA (4%) (SF)
A	Road/Sidewalk/Roof	91,466	RG-West	**3,659**
B	Road/Sidewalk	5,366	RG-Northwest	**215**
C	Sidewalk	249,311	DP-East	**N/A**

Refer to the land use plans for details of the proposed stormwater network and how it connects to the existing storm main.

Conveyance

Conveyance calculations will be prepared with the final permit application and will be based on computer modeling of the storm sewer network and storm events outlined by the city code. Pipes will be sized to meet conveyance requirements outlined in the Stormwater and Grading Standards. Rational Method will be used to determine runoff for the design storm. Since the project is less than 40 acres, the design storm is the 10-year, 24-hour storm. Manning's Equation will be utilized for determining pipe size.

Downstream Analysis

As required by Oregon City Stormwater and Grading Design Standards, a downstream analysis has been performed and will be included with the final permit application. The project results in a net increase of impervious area and through the use of filtration rain garden facilities, including a detention pond, the conveyance demands on the downstream system should not have any negative impacts. There are currently no known issues or constraints with the downstream system and the improvements outlined in this project should not create any deficiencies.

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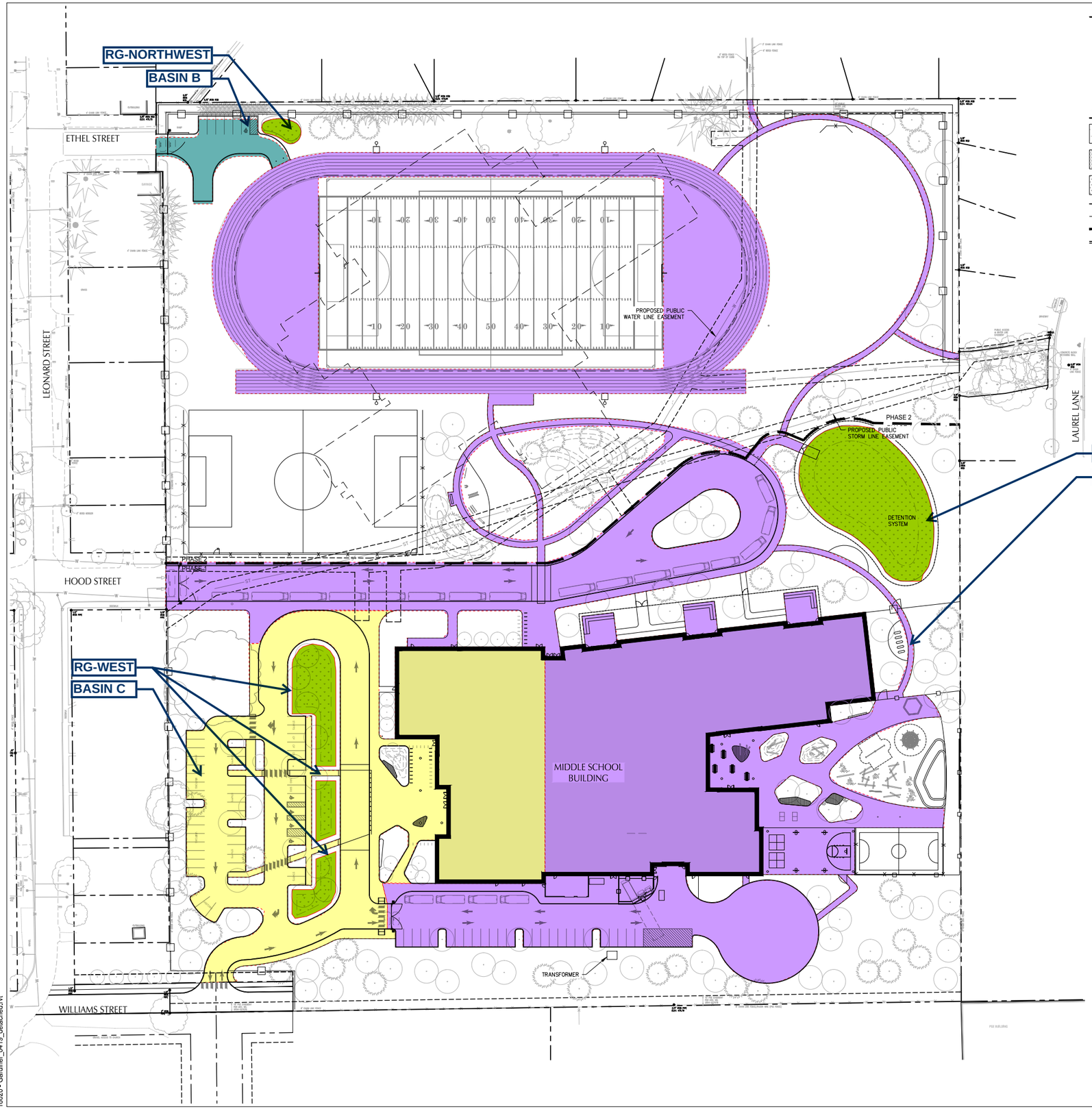
Exhibits

A – Basin Map

B – Infiltrator Spec Sheet



SHEET NOTES

1. ALL DIMENSIONS ARE TO FACE OF CURB OR FACE OF WALL.
2. PROPOSED FRONTAGE IMPROVEMENTS IN RIGHT-OF-WAY SHOWN FOR REFERENCE ONLY. TO BE PERMITTED UNDER SEPARATE PUBLIC WORKS PERMIT. REQUIRED IMPROVEMENTS TBD.
3. REFERENCE LANDSCAPE PLANS FOR PEDESTRIAN PAVEMENT, ATHLETIC FIELDS AND PLAZA AREAS.
4. DESIGN ON THIS SHEET ASSUMES EXISTING PUBLIC WATERLINE EASEMENT HAS BEEN QUITCLAIMED.

SHEET LEGEND

- CONCRETE PAVEMENT — 3 / C3.00
- ASPHALT PAVEMENT: HEAVY DUTY — 1 / C3.00
- ASPHALT PAVEMENT: LIGHT DUTY — 2 / C3.00
- PROPERTY LINE
- SAWCUT LINE
- PHASE LINE
- RED PAINTED CURB – FIRE LANE

EXHIBIT A

SCALE 1 INCH = 40 FEET
40 0 40 80

BR|IC ARCHITECTURE, INC.

Oregon City School District

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Portland, OR 97204
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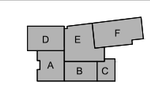
GARDINER MIDDLE SCHOOL

OREGON CITY SCHOOL DISTRICT
180 Ethel Street, Oregon City, Oregon 97045



key plan

revisions

phase	80% DD REVIEW
date	08/30/2019
project	18020

CIVIL SITE PLAN

C3.00

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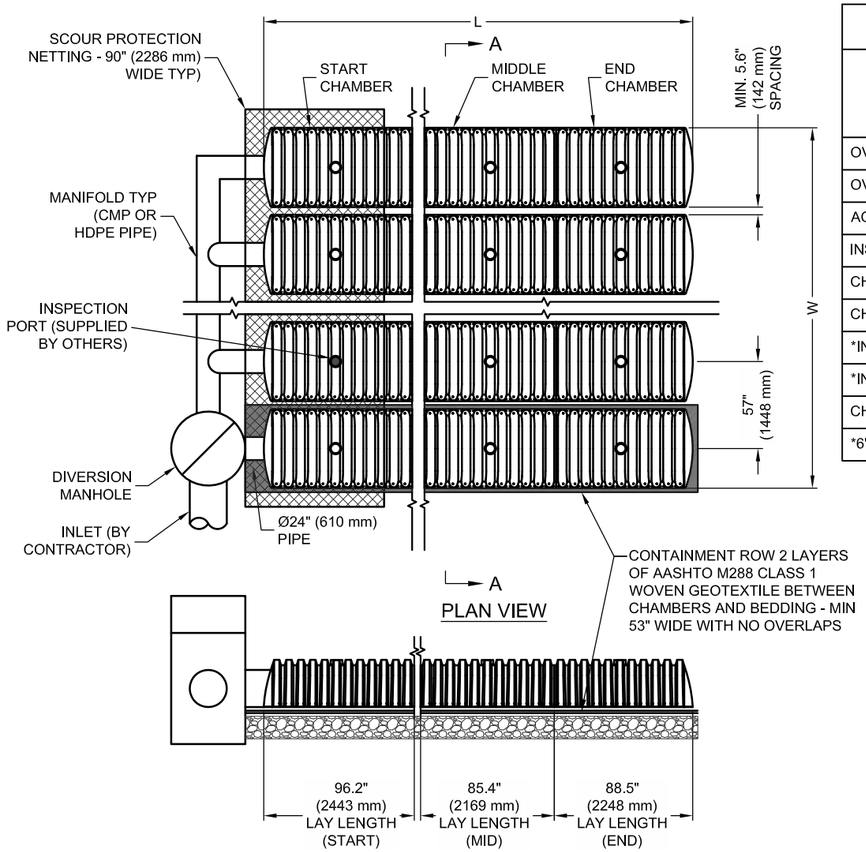


TYPICAL LAYOUT

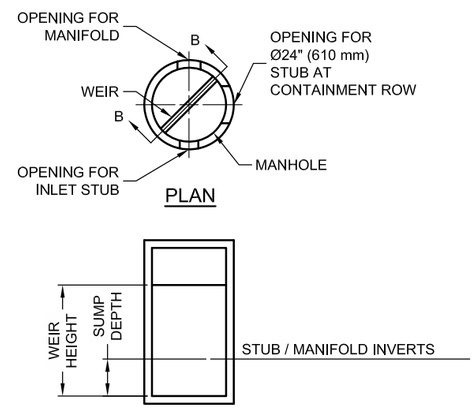
CHAMBERMAXX DESIGN DETAILS

FEATURE	START CHAMBER	MIDDLE CHAMBER	END CHAMBER
OVERALL CHAMBER HEIGHT - IN (mm)	30.3 (770)	30.3 (770)	30.3 (770)
OVERALL CHAMBER WIDTH - IN (mm)	51.4 (1306)	51.4 (1306)	51.4 (1306)
ACTUAL LENGTH - IN (mm)	98.4 (2500)	91.0 (2311)	92.0 (2337)
INSTALLED LAY LENGTHS - IN (mm)	96.2 (2443)	85.4 (2169)	88.5 (2248)
CHAMBER STORAGE VOLUME - CF (m^3)	50.2 (1.421)	47.2 (1.336)	46.2 (1.307)
CHAMBER STORAGE PER LINEAR FOOT - CF/LF (m^3/m)	6.3 (0.582)	6.6 (0.616)	6.3 (0.582)
*INSTALLED CHAMBER VOLUME - CF (m^3)	78.1 (2.211)	75.1 (2.127)	74.1 (2.098)
*INSTALLED CHAMBER VOLUME PER LINEAR FOOT - CF/LF (m^3/m)	9.7 (0.905)	10.6 (0.981)	10.0 (0.934)
CHAMBER WEIGHT - LB (kg)	83 (37.65)	73 (33.11)	76 (34.47)
*6" (152 mm) OF STONE ABOVE AND BELOW CHAMBER, 5.6" (142 mm) CHAMBER SPACING AND 40% POROSITY			

* SITE SPECIFIC DATA REQUIREMENTS

FOR DETAILED DESIGN ASSISTANCE REFERENCE CHAMBERMAXX DYODS (DESIGN YOUR OWN DETENTION SYSTEM) SOFTWARE AND CHAMBERMAXX STAGE STORAGE CALCULATOR @ WWW.CONTECHSTORMWATER.COM

TOTAL REQUIRED STORAGE VOLUME (CF OR m^3)	
DEPTH TO INVERT BELOW ASPHALT (FT OR m)	
LIMITING WIDTH (FT OR m)	
LIMITING LENGTH (FT OR m)	
POROUS STONE ABOVE CHAMBER (IN OR mm)	
POROUS STONE BELOW CHAMBER (IN OR mm)	
STONE POROSITY (0 TO 40%)	
MANIFOLD SYSTEM DIAMETER (IN OR mm)	
* PER ENGINEER OF RECORD	



DIVERSION MANHOLE DETAIL

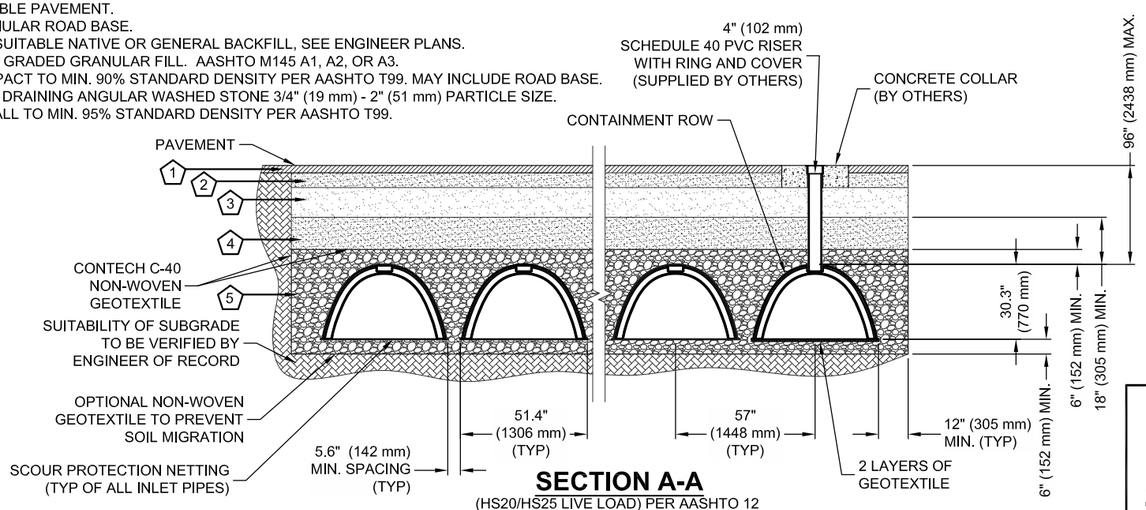
GENERAL NOTES

1. ALL ELEVATIONS, DIMENSIONS AND LOCATIONS OF RISERS AND INLETS SHALL BE VERIFIED BY THE ENGINEER OF RECORD.
2. PRIOR TO INSTALLATION OF THE CHAMBERMAXX SYSTEM A PRE-CONSTRUCTION MEETING SHALL BE CONDUCTED. THOSE REQUIRED TO ATTEND ARE THE SUPPLIER OF THE SYSTEM, THE GENERAL CONTRACTOR, SUB-CONTRACTORS AND THE ENGINEER.
3. CHAMBERMAXX CHAMBERS ARE MANUFACTURED FROM POLYPROPYLENE PLASTIC.
4. CHAMBERMAXX SYSTEM TO MEET AASHTO HS20/HS25 LIVE LOADING, PER AASHTO LRFD SECTION 12.
5. ACCESS COVERS TO MEET AASHTO HS20/HS25 LIVE LOADING.
6. MINIMUM COVER IS 18-INCHES (457 mm) AND MAXIMUM COVER IS 96-INCHES (2438 mm) TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT. FOR COVER HEIGHTS GREATER THAN 96-INCHES (2438 mm) CONTACT YOUR LOCAL REPRESENTATIVE.
7. ALL PARTS PROVIDED BY CONTECH UNLESS OTHERWISE NOTED.
8. FOR INFORMATION ON PRE-TREATMENT SYSTEMS, REFERENCE CONTECH PRE-TREATMENT SYSTEM STANDARD DETAILS OR CONTACT YOUR LOCAL REPRESENTATIVE.
9. CHAMBERMAXX BY CONTECH ENGINEERED SOLUTIONS, LLC

INSTALLATION NOTES

1. CHAMBERMAXX INSTALLATION GUIDE TO BE REVIEWED BY CONTRACTOR PRIOR TO INSTALLATION.
2. PRIOR TO PLACING BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, A GEOGRID SHALL BE UTILIZED OR UNSUITABLE MATERIAL SHALL BE REMOVED AND BROUGHT BACK TO GRADE WITH FILL MATERIAL AS APPROVED BY THE ENGINEER OF RECORD. ONCE THE FOUNDATION PREPARATION IS COMPLETE, THE BEDDING MATERIAL CAN BE PLACED.
3. THE SCOUR PROTECTION NETTING TO EXTEND 1'-0" (305 mm) BEYOND OUTSIDE EDGE OF INLET CHAMBERS.
4. COVER ANY OPEN VOID SPACES GREATER THAN ¾" (19 mm) ON CHAMBERS WITH A NON-WOVEN GEOTEXTILE TO PREVENT INFILTRATION OF BACKFILL MATERIAL.
5. STONE EMBEDMENT MATERIAL SHALL BE INSTALLED TO 95% STANDARD PROCTOR DENSITY AND PLACED IN 6-INCH (152 mm) TO 8-INCH (203 mm) LIFTS SUCH THAT THERE IS NO MORE THAN A TWO LIFT DIFFERENTIAL BETWEEN ANY OF THE CHAMBERS AT ANY TIME. GRANULAR BACKFILL MATERIAL SHALL BE COMPACTED TO 90% SPD. BACKFILLING SHALL BE ADVANCED ALONG THE LENGTH OF THE CHAMBER ROWS AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING AND DISPLACEMENT OF THE CHAMBERS. THE MINIMUM CHAMBER SPACING MUST BE MAINTAINED.
6. REFER TO CHAMBERMAXX INSTALLATION GUIDE FOR TEMPORARY CONSTRUCTION LOADING GUIDELINES.
7. IT IS ALWAYS THE CONTRACTOR'S RESPONSIBILITY TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.
8. GENERAL INSTALLATION METHODS AND MATERIALS TO BE IN ACCORDANCE WITH ASTM D2321.

KEY
1. FLEXIBLE PAVEMENT.
2. GRANULAR ROAD BASE.
3. ANY SUITABLE NATIVE OR GENERAL BACKFILL, SEE ENGINEER PLANS.
4. WELL GRADED GRANULAR FILL. AASHTO M145 A1, A2, OR A3. COMPACT TO MIN. 90% STANDARD DENSITY PER AASHTO T99. MAY INCLUDE ROAD BASE.
5. FREE DRAINING ANGULAR WASHED STONE 3/4" (19 mm) - 2" (51 mm) PARTICLE SIZE. INSTALL TO MIN. 95% STANDARD DENSITY PER AASHTO T99.



SECTION A-A

(HS20/HS25 LIVE LOAD) PER AASHTO 12

EXHIBIT B

CHAMBERMaxx®
PATENT PENDING

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CHAMBERMAXX STORMWATER RETENTION STANDARD DETAIL CONTAINMENT ROW OPTION

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