



Development Services Department  
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**DEVIATION REVIEW  
 AND DECISION FORM**

Procedure # R-FM-051-07  
 Issue Date: 12/31/07  
 Revision Issued: 00/00/00

DSD FILE NO.:

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**General Property Information:**

Address of Subject Property (Street Number/Name): Parcel E, Deer Creek Road, Monument, CO 80132

Tax Schedule ID(s) #: 71114-04-111 and 71114-00-007

Legal Description of Property: Southeast portion of Section 11, Township 11 South, Range 67 West of the 6<sup>th</sup> Principal Meridian, El Paso County, CO

Subdivision or Project Name:  
North Bay at Lake Woodmoor

Section of ECM from Which Deviation is Sought: Appendix I – Stormwater Quality Policy and Procedures  
 Specific Criteria from Which a Deviation is Sought: Section I.7.2, BMP Selection

Proposed Nature and Extent of Deviation: Proposing an alternative permanent BMP than the six standard types of BMPs outlined in ECM for providing treatment of the WQCV.

**Applicant Information:**

Applicant: Lake Woodmoor Holdings, LLC Email Address: TTaylor@laplatalc.com  
 Applicant is:  Owner  Consultant  Contractor  
 Mailing Address: 1755 Telstar Drive, Colorado Springs State: CO Postal Code: 80920  
 Telephone Number: (719) 867-2250 Fax Number: \_\_\_\_\_

**Engineer Information:**

Engineer: Christopher J. Castelli, P.E. Email Address: ccastelli@kiowaengineering.com  
 Company Name: Kiowa Engineering Corporation  
 Mailing Address: 1604 South 21<sup>st</sup> Street, Colorado Springs State: CO Postal Code: 80904  
 Registration Number: 38842 State of Registration: CO  
 Telephone Number: (720) 330-2553 Fax Number: \_\_\_\_\_

**Explanation of Request (Attached diagrams, figures and other documentation to clarify request):**

Section of ECM from Which Deviation is Sought: Appendix I – Stormwater Quality Policy and Procedures  
 Specific Criteria from Which a Deviation is Sought: Section I.7.2, BMP Selection

Proposed Nature and Extent of Deviation: Proposing an alternative permanent BMP (Stormceptor with slotted grate) than the six standard types of BMPs outlined in ECM for providing treatment of the WQCV.

Reason for the Requested Deviation: Physical layout and geometry of the site (space limitations). Also, concern of providing a permanent BMP that relies on stormwater infiltration in close proximity to foundations of the adjacent proposed buildings. Woodmoor Water and Sanitation District understands the site constraints and regards the Stormceptor as an acceptable alternative.

Comparison of Proposed Deviation to ECM Standard: Self-contained unit that provides the same function of treating the WQCV as the standard BMPs outlined in ECM.

Applicable Regional or National Standards used as Basis: U.S. EPA, Clean Water Act, NPDES Permit for Stormwater Discharges, MS4 Permit.

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**Application Consideration:**

**CHECK IF APPLICATION MEETS CRITERIA FOR CONSIDERATION**

**JUSTIFICATION**

The ECM standard is inapplicable to a particular situation.

Porous Pavement Detention is only applicable standard BMP given the site constraints. However, there is concern of its effectiveness for a street with a longitudinal slope of 4%, and infiltration of captured stormwater in close proximity to proposed building foundations.

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Topography, right-of-way, or other geographical conditions or impediments impose an undue hardship on the applicant, and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility.

Use of a Stormceptor unit is ideal in this situation, given the space limitations and concerns outlined above. The self-contained unit would accomplish the same result.

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A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.

**If at least one of the criteria listed above is not met, this application for deviation cannot be considered.**

**Criteria for Approval:**

**PLEASE EXPLAIN HOW EACH OF THE FOLLOWING CRITERIA HAVE BEEN SATISFIED BY THIS REQUEST**

The request for a deviation is not based exclusively on financial considerations.

Cost was not a consideration when selecting the proposed alternative permanent BMP.

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The deviation will achieve the intended result with a comparable or superior design and quality of improvement.

The Stormceptor unit is sized for the specific site parameters such as drainage area, percent imperviousness and target TSS removal. Significant levels of sediment and pollutants such as heavy metals and oils are prevented from entering the downstream drainageway. A detailed sizing report is included in the drainage report.

The deviation will not adversely affect safety or operations.

The Stormceptor unit is easily accessible through the flush-mounted grate at the surface.

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The deviation will not adversely affect maintenance and its associated cost.

The alternative BMP is easily maintained from the surface using a vacuum truck. Manufacturer recommended operation and maintenance guidance will be provided to the development's HOA.

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The deviation will not adversely affect aesthetic appearance.

Stormceptor unit is self-contained, and equipped with a 2'x2' slotted grate in a sump condition. The grate is the only portion visible from the surface.

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**Owner, Applicant and Engineer Declaration:**

To the best of my knowledge, the information on this application and all additional or supplemental documentation is true, factual and complete. I am fully aware that any misrepresentation of any information on this application may be grounds for denial. I have familiarized myself with the rules, regulations and procedures with respect to preparing and filing this application. I also understand that an incorrect submittal will be cause to have the project removed from the agenda of the Planning Commission, Board of County Commissioners and/or Board of Adjustment or delay review, and that any approval of this application is based on the representations made in the application and may be revoked on any breach of representation or condition(s) of approval.

Michael S. Dunham \_\_\_\_\_ 4/12/18 \_\_\_\_\_  
Signature of owner (or authorized representative) Date

\_\_\_\_\_  
Signature of applicant (if different from owner) Date

Christopher J. Castelli \_\_\_\_\_ 04/09/18 \_\_\_\_\_  
Signature of Engineer Date

Engineer's Seal



**Review and Recommendation:**  
**APPROVED by the ECM Administrator**

\_\_\_\_\_ Date \_\_\_\_\_  
This request has been determined to have met the criteria for approval. A deviation from Section \_\_\_\_\_ of ECM is hereby granted based on the justification provided. Comments:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_ Additional comments or information are attached.

**DENIED by the ECM Administrator**

\_\_\_\_\_ Date \_\_\_\_\_  
This request has been determined not to have met criteria for approval. A deviation from Section \_\_\_\_\_ of ECM is hereby denied. Comments:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_ Additional comments or information are attached.

### Detailed Stormceptor Sizing Report – North Bay at Lake Woodmoor

Project Information & Location			
<b>Project Name</b>	North Bay at Lake Woodmoor	<b>Project Number</b>	5256
<b>City</b>	Monument	<b>State/ Province</b>	Colorado
<b>Country</b>	United States of America	<b>Date</b>	11/20/2017
Designer Information		EOR Information (optional)	
<b>Name</b>	brian schram	<b>Name</b>	Chris Castelli
<b>Company</b>	rinker materials	<b>Company</b>	Kiowa
<b>Phone #</b>	303-918-1628	<b>Phone #</b>	720-330-2553
<b>Email</b>	briank.schram@rinkerpipe.com	<b>Email</b>	ccastelli@kiowaengineering.com

#### Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

<b>Site Name</b>	
<b>Recommended Stormceptor Model</b>	STC 450i
<b>Target TSS Removal (%)</b>	80.0
<b>TSS Removal (%) Provided</b>	91
<b>PSD</b>	Fine Distribution
<b>Rainfall Station</b>	GREENLAND 9 SE

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	% TSS Removal Provided
STC 450i	91
STC 900	95
STC 1200	95
STC 1800	95
STC 2400	96
STC 3600	97
STC 4800	98
STC 6000	98
STC 7200	98
STC 11000	99
STC 13000	99
STC 16000	99
StormceptorMAX	Custom



**Stormceptor**

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor’s patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

**Design Methodology**

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM’s precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor’s unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis	
<p>PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour). Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.</p>	

Rainfall Station			
<b>State/Province</b>	Colorado	<b>Total Number of Rainfall Events</b>	6202
<b>Rainfall Station Name</b>	GREENLAND 9 SE	<b>Total Rainfall (in)</b>	909.4
<b>Station ID #</b>	3579	<b>Average Annual Rainfall (in)</b>	15.7
<b>Coordinates</b>	39°6'16"N, 104°43'43"W	<b>Total Evaporation (in)</b>	156.0
<b>Elevation (ft)</b>	7480	<b>Total Infiltration (in)</b>	132.8
<b>Years of Rainfall Data</b>	58	<b>Total Rainfall that is Runoff (in)</b>	620.6

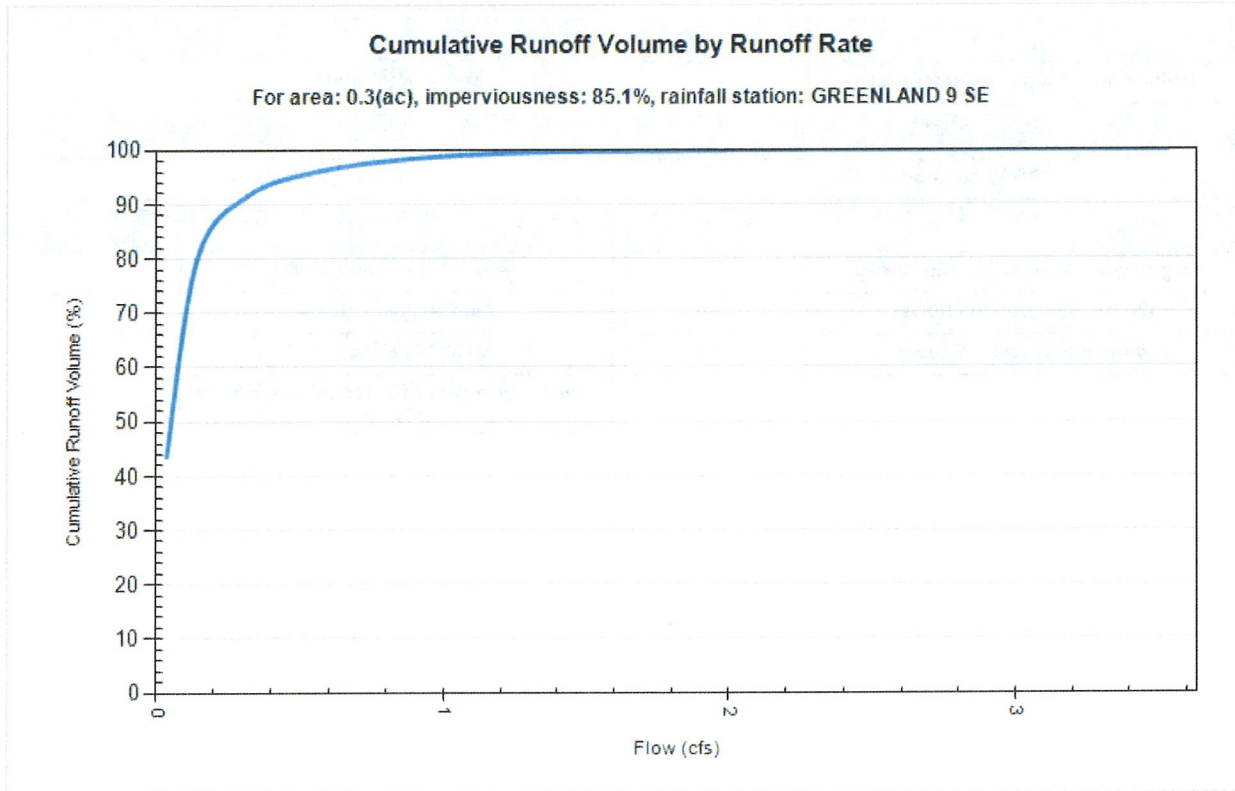
Notes	
<ul style="list-style-type: none"> <li>• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.</li> <li>• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.</li> <li>• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.</li> </ul>	

Drainage Area		Up Stream Storage			
Total Area (acres)	0.3	Storage (ac-ft)	Discharge (cfs)		
Imperviousness %	85.1	0.000	0.000		
Water Quality Objective		Up Stream Flow Diversion			
TSS Removal (%)	80.0	Max. Flow to Stormceptor (cfs)	0.00000		
Runoff Volume Capture (%)		<th colspan="2">Design Details</th>		Design Details	
Oil Spill Capture Volume (Gal)				Stormceptor Inlet Invert Elev (ft)	
Peak Conveyed Flow Rate (CFS)				Stormceptor Outlet Invert Elev (ft)	
Water Quality Flow Rate (CFS)				Stormceptor Rim Elev (ft)	
				Normal Water Level Elevation (ft)	
		Pipe Diameter (in)			
		Pipe Material			
		Multiple Inlets (Y/N)	No		
		Grate Inlet (Y/N)	No		

Particle Size Distribution (PSD)		
Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.		
Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

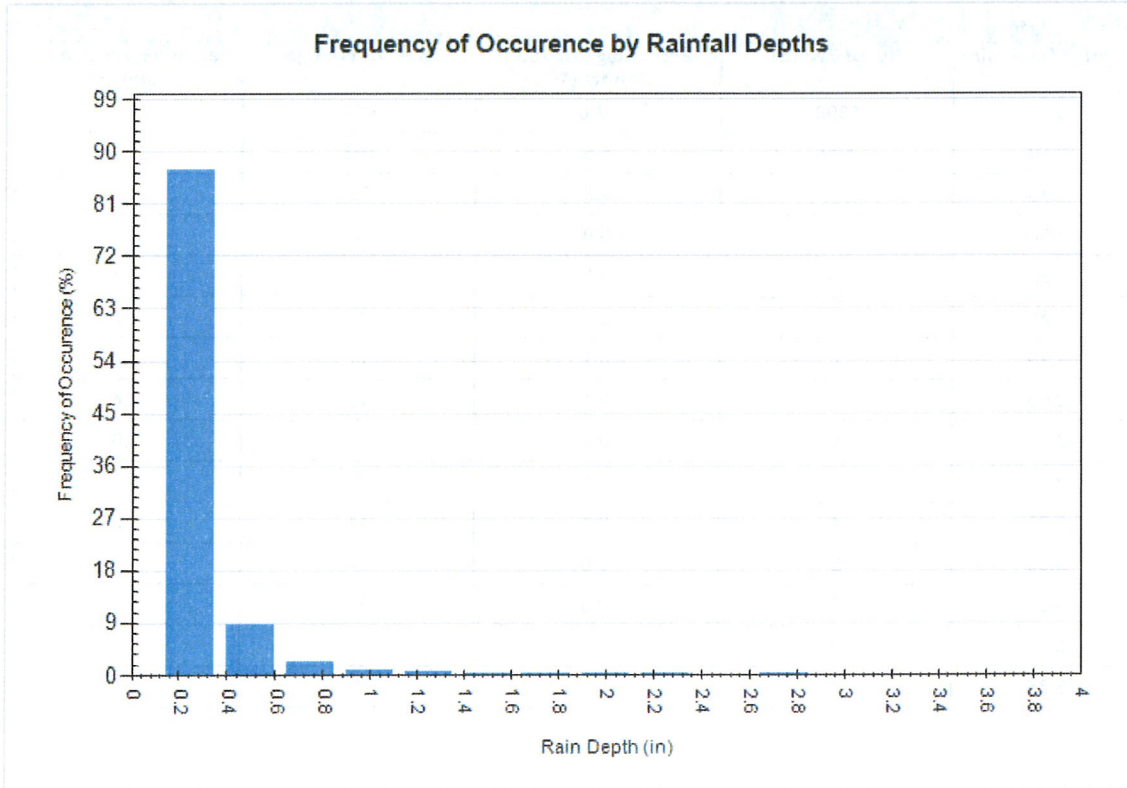
Site Name			
<b>Site Details</b>			
<b>Drainage Area</b>		<b>Infiltration Parameters</b>	
Total Area (acres)	0.3	Horton's equation is used to estimate infiltration	
Imperviousness %	85.1	Max. Infiltration Rate (in/hr)	2.44
<b>Surface Characteristics</b>		Min. Infiltration Rate (in/hr)	0.4
Width (ft)	229.00	Decay Rate (1/sec)	0.00055
Slope %	2	Regeneration Rate (1/sec)	0.01
Impervious Depression Storage (in)	0.05	<b>Evaporation</b>	
Pervious Depression Storage (in)	0.2	Daily Evaporation Rate (in/day)	0.1
Impervious Manning's n	0.015	<b>Dry Weather Flow</b>	
Pervious Manning's n	0.25	Dry Weather Flow (cfs)	0
<b>Maintenance Frequency</b>		<b>Winter Months</b>	
Maintenance Frequency (months) >	12	Winter Infiltration	0
<b>TSS Loading Parameters</b>			
TSS Loading Function		Build Up/ Wash-off	
<b>Buildup/Wash-off Parameters</b>		<b>TSS Availability Parameters</b>	
Target Event Mean Conc. (EMC) mg/L	125	Availability Constant A	0.05
Exponential Buildup Power	0.40	Availability Factor B	0.04
Exponential Washoff Exponent	0.20	Availability Exponent C	1.10
		Min. Particle Size Affected by Availability (micron)	400

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (cfs)	Runoff Volume (ft³)	Volume Over (ft³)	Cumulative Runoff Volume (%)
0.035	306669	396210	43.6
0.141	561978	140925	80.0
0.318	643567	59317	91.6
0.565	675726	27149	96.1
0.883	691412	11456	98.4
1.271	699280	3585	99.5
1.730	701571	1293	99.8
2.260	702613	251	100.0
2.860	702864	0	100.0
3.531	702864	0	100.0



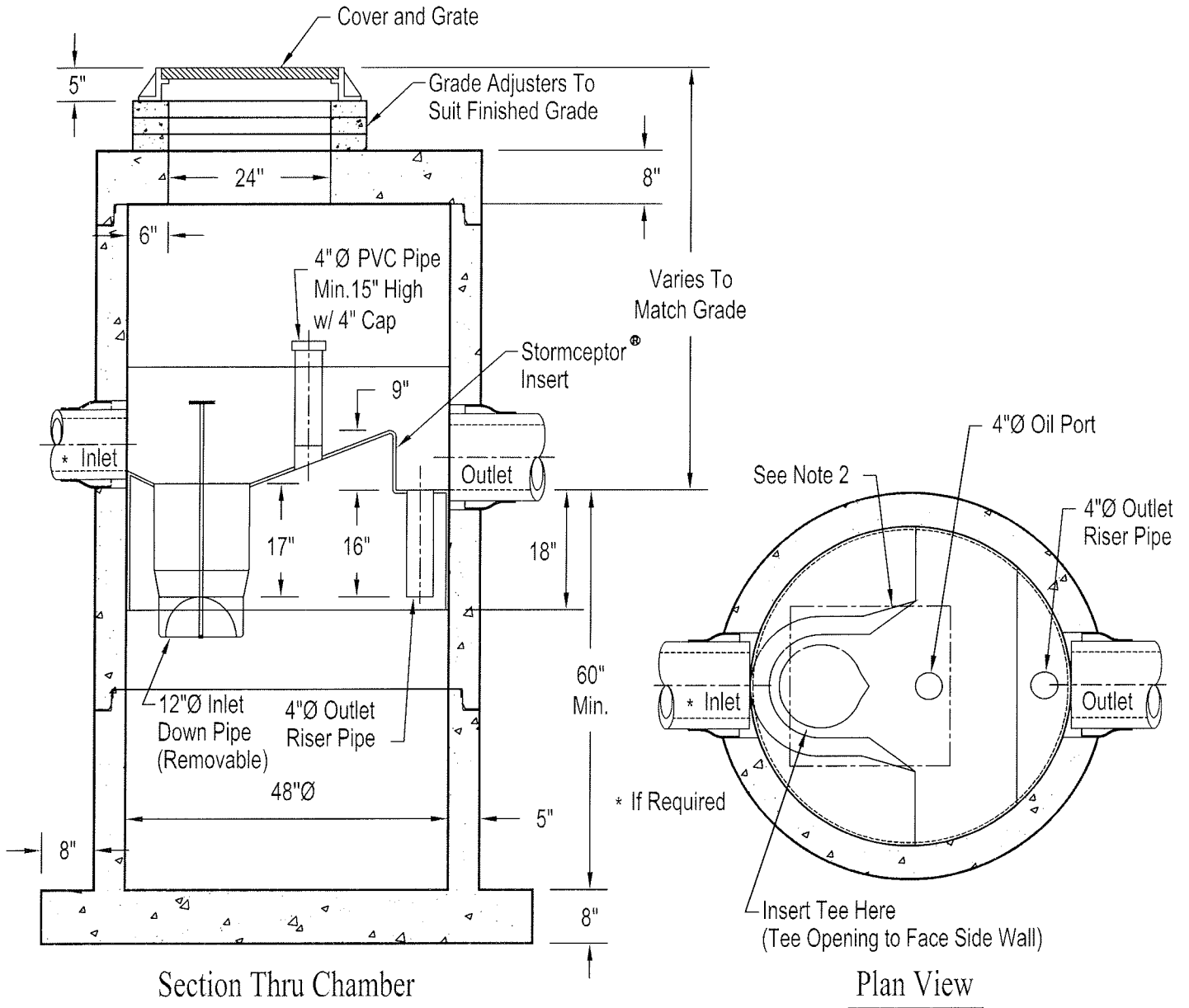


Rainfall Event Analysis				
Rainfall Depth (in)	No. of Events	Percentage of Total Events (%)	Total Volume (in)	Percentage of Annual Volume (%)
0.25	5398	87.0	459	50.5
0.50	529	8.5	193	21.2
0.75	141	2.3	88	9.7
1.00	55	0.9	48	5.3
1.25	34	0.5	38	4.2
1.50	18	0.3	24	2.7
1.75	7	0.1	11	1.2
2.00	7	0.1	13	1.4
2.25	4	0.1	9	0.9
2.50	1	0.0	2	0.3
2.75	4	0.1	11	1.2
3.00	2	0.0	6	0.6
3.25	2	0.0	6	0.7
3.50	0	0.0	0	0.0
3.75	0	0.0	0	0.0



**For Stormceptor Specifications and Drawings Please Visit:  
<http://www.imbriumsystems.com/technical-specifications>**

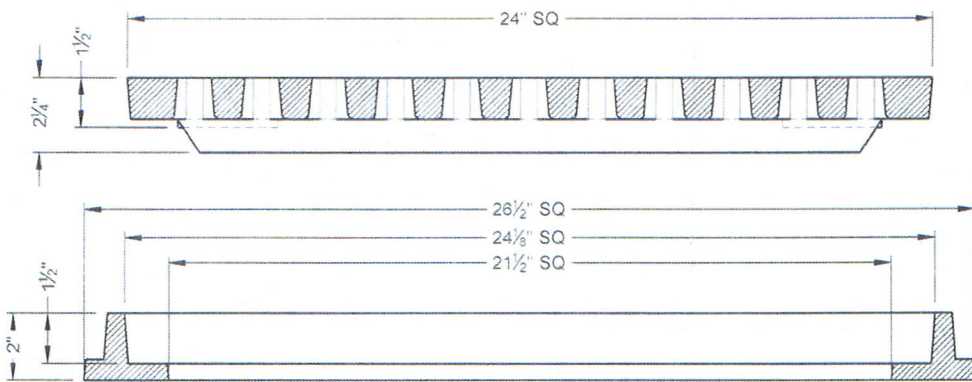
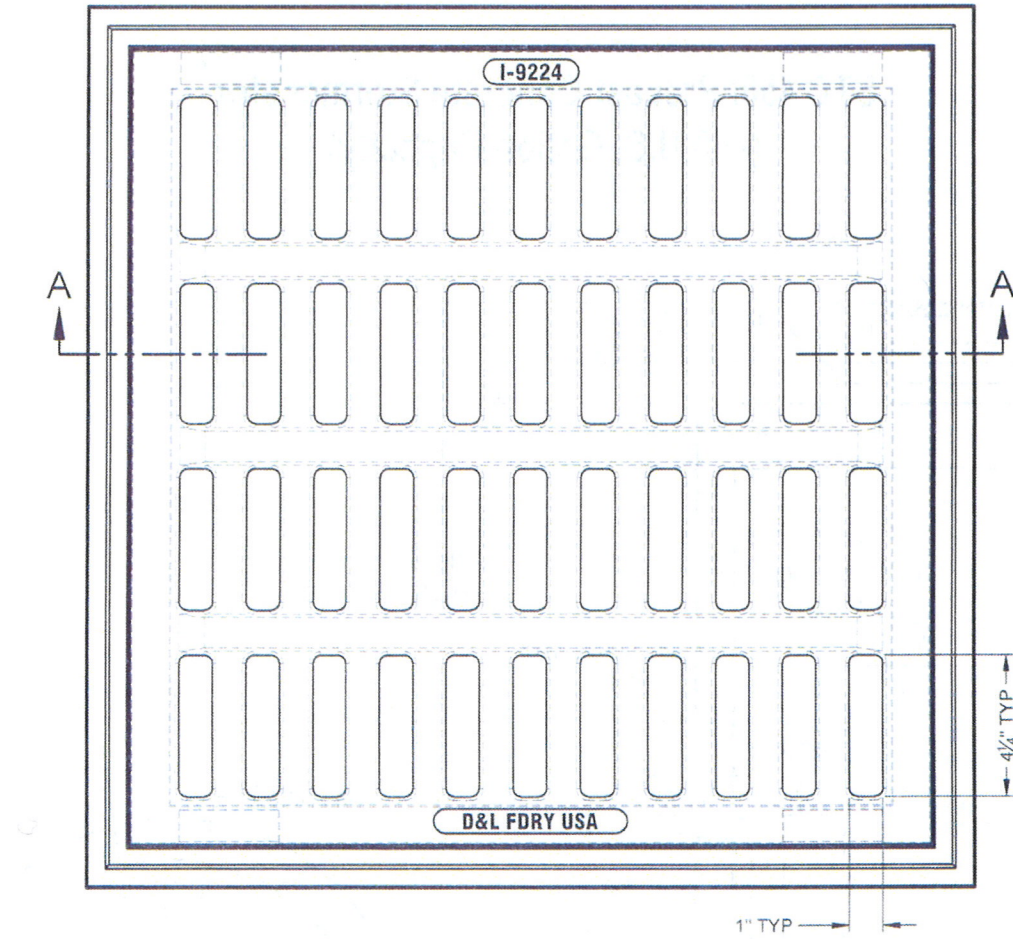
### STC 450i Precast Concrete Stormceptor® (450 U.S. Gallon Capacity)



**Notes:**

1. The Use Of Flexible Connection is Recommended at The Inlet and Outlet Where Applicable.
2. The Cover Should be Positioned Over The Inlet Drop Pipe and The Oil Port.
3. The Stormceptor System is protected by one or more of the following U.S. Patents: #4985148, #5498331, #5725760, #5753115, #5849181, #6068765, #6371690.
4. Contact a Concrete Pipe Division representative for further details not listed on this drawing.

# I-9224



SECTION A-A

4 ROWS x 11 SLOTS  
PER ROW

OPEN AREA =  
 $44 \times (4.25 \times 1) = 187 \text{ sq in.}$

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√ = INDICATES MACHINED SURFACE

DRAWN BY: CDILLEY	DATE: 8/23/2016
PRODUCT NUMBER:	MATERIAL TYPE:
GRATE I-9224-01	GRAY IRON: ASTM A-48 CL 35B
FRAME I-9224-R1	GRAY IRON: ASTM A-48 CL 35B

MEETS H20 WHEEL LOADING

B:\\_DLS DRAWINGS\I-9224\I-9224-01\_I-9224-R1.DWG

KIOWA ENGINEERING CORPORATION

JOB 15073 - NORTH BAY AT LAKE WOODMOOR  
 SHEET NO. 3 OF 3  
 CALCULATED BY CJC DATE 11/29/17  
 CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_  
 SCALE \_\_\_\_\_

TYPE D INLET CAPACITIES (CONT'D.) :

INLET 8 = WQ BASIN 2 OUTLET STRUCTURE ( $Q_{100} = 11.3$  cfs) DP 16.1

FROM FIG. 8-10, ASSUMING 50% CLOGGING FACTOR,

AT  $Q_{100} = 11.3$  cfs  $\times 2 = 22.6$  cfs,  $Y \sim 8.3$  in. (0.7 ft.)

GRATE EL. = 18.0

SPILLWAY CREST = 18.7 ft.

100 YR. ELEV. = 18.0 + 0.7 ft. = 18.7 (0.0' FREEBOARD)

TYPE D INLET  
w/ 2 STD. GRATES

THEREFORE, OUTLET STRUCTURE IS SIZED FOR THE  
100 YR. EVENT PRIOR TO THE SPILLWAY CREST  
BEING OVERTOPPED.

CHECK CAPACITY OF STORMCEPTOR GRATE :

INLET 9 = DP 17 ( $Q_5 = 1.1$  cfs,  $Q_{100} = 2.1$  cfs)

2' x 2' SLOTTED GRATE (D & L SUPPLY NO-I-9224-01 OR EQUAL)

OPEN AREA = 187 in.<sup>2</sup> / 144 = 1.3 SF

$$Q_0 = CA (2gH)^{0.5} \quad \text{ORIFICE EQN.}$$

$$H = \frac{1}{2g} \left( \frac{Q_0}{CA} \right)^2 \quad g = 32.2 \text{ ft/sec}^2$$

$$H_5 = \frac{1}{64.4} \left( \frac{2.2}{0.6(1.3)} \right)^2 \quad C = 0.60$$

= 0.12 ft., ASSUMES A 50% CLOGGING FACTOR

$$H_{100} = \frac{1}{64.4} \left( \frac{4.2}{0.6(1.3)} \right)^2$$

= 0.45 ft., ASSUMES A 50% CLOGGING FACTOR

CHECK FREEBOARD = GRATE EL. = 18.8

LOWEST ADJ. FFE = 21.0

5 YR. F.B. = 21.0 - [18.8 + 0.12] = 2.0 FT. ✓

100 YR. F.B. = 21.0 - [18.8 + 0.45] = 1.75 FT. ✓

