



February 6, 2019

Mr. Jaime Favila
California State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA 95812-100

Re: Application for Trash Treatment Control Device - Bio Clean® Deflective Screening Device (DSD)

Dear Mr. Favila,

Bio Clean® is pleased to submit this application for the Deflective Screening Device (DSD) for Certification as a Full Capture System - Trash Treatment Control Device. Documentation for this application is being submitted in accordance with the California State Water Resources Control Board *Trash Treatment Control Device Application Requirements* document that includes the following minimum requisite sections:

1. Cover Letter
2. Table of Contents
3. Physical Description
4. Installation Information
5. Operation and Maintenance Information
6. Reliability Information
7. Field/Lab Testing Information and Analysis

Please contact me with any questions or should additional information be required. Thank you for your consideration of this application.

Regards,

Zachariha J. Kent
Vice President of Product Development & Regulatory Compliance
Bio Clean®, A Forterra Company

1.0 COVER LETTER

1.A. A general description of the Device;

The Bio Clean[®] Deflective Screening Device (DSD) is an inline, stormwater treatment system utilizing screening, hydrodynamic separation and sedimentation to capture trash, floating and neutrally buoyant debris, suspended sediments and hydrocarbons. The Device is highly reliable, as it has no moving parts and provides great longevity due to the use of highly durable materials. The DSD utilizes a unique and effective non-blocking screening design that ensures high treatment flow rates are maintained between maintenance intervals. The special screen has opposite facing openings from the flow direction of incoming stormwater. As water enters the treatment chamber, it spins in a clockwise direction which creates a continuous cleaning effect against the surface of the screen. Design flows must pass through the non-blocking screen which has an aperture not greater than 4.7mm ensuring capture of all particles 5mm in size or larger. Captured trash and debris are sequestered within the internal components of the Device to prevent resuspension and re-entrainment of these pollutants. In addition to efficient trash capture, the design allows for 80% TSS removal efficiencies for a particle size distribution typically found in stormwater runoff. The Device also provides for internal bypass and efficient capture and retention of non-emulsified oils.

1.B. The applicant's contact information and location;

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William.Harris@forterrabp.com

Corporate Contact:

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Zach.kent@forterrabp.com

1.C. The Devices' manufacturing location;

The stormwater division of Bio Clean[®] is supported through manufacturing by its parent company Forterra Building Products. Forterra Building Products currently has 88 manufacturing locations throughout the country. Three facilities currently provide support for the California market and are listed below:

Forterra Building Products
Drainage Pipe and Products Division
7020 Tokay Avenue
Sacramento, California 95828

Forterra Building Products
Drainage Pipe and Products Division
26380 Palomar Road
Menifee, California 92585

Forterra Building Products
BioClean Stormwater Management Systems
398 Via El Centro
Oceanside, California 92058

1.D. A brief summary of any field/lab testing results that demonstrates the Device functions as described within the application;

Bio Clean[®] conducted laboratory testing on the proprietary non-blocking screen material utilized in the DSD. Bio Clean[®] conducted this testing to empirically determine the unique properties of the screen including the Effective Open Area (EOA), the Coefficient of Discharge (C_d), and the flow capacity and characteristics. The results of the testing provided a clear relationship between discharge (Q) and head (h) acting on the screen. The results of the testing have been incorporated into the design of the DSD to determine both the treatment and peak flow rates for the DSD.

The test report has been included in this Application in Appendix F for review by the SWRCB and interested parties.

1.E. A brief summary of the Device limitations, and operational, sizing, and maintenance considerations;

The DSD is a pre-engineered, hydrodynamic separation and screening system designed to meet site-specific water quality treatment requirements. Conformance with the Engineer's Plans and Specifications is essential to ensure proper operation and function of the Device.

Bio Clean[®] manufactures the DSD using a precast concrete housing, stainless steel, and durable plastic internal components. The materials selected serve a wide variety of applications and are the most durable materials available for these type devices. Adherence to minimum and maximum installation

depths and installation recommendations are required to ensure the design service life of the Device is maintained.

DSD systems should be sized to meet site and region specific water quality objectives and requirements. Systems that are not designed and installed in conformance within the maximum treatment flow rate and maximum bypass flow rate limits can cause adverse hydraulic conditions. Additionally, non-conformance with the Device design limits may cause non-compliance with the water quality objectives and requirements.

All structural, post-construction Best Management Practices require routine and scheduled inspection and maintenance. Inspection and maintenance is facilitated by manhole covers for access to the treatment chamber and trash and sediment storage areas. System design should consider accessibility of the Device for inspection and maintenance. Design considerations for maintenance frequency should also be a consideration.

1.F. A description or list of locations, if any, where the Device has been installed. Include the name and contact information of as many as three municipality(s) purchasing the Device, and

Installations of the Trash Capture version of this Device are pending SWRCB Certification.

1.G. The certification below:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Edward Sexe, P.E., Senior Vice President and General Manager

02/06/2019

Date

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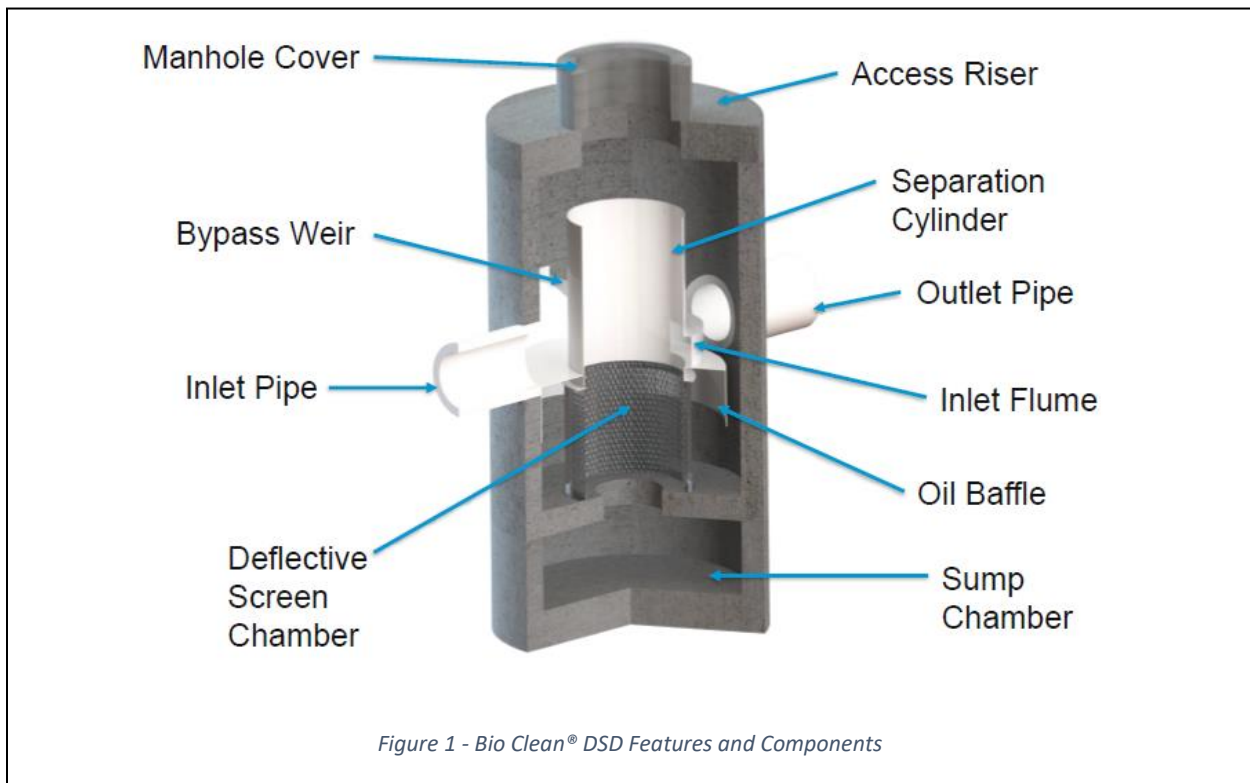
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3.0 PHYSICAL DESCRIPTION

3.A. Description on how the Device works to trap all particles that are 5 mm or greater in size and how it is sized for varying flow volumes;

The Bio Clean® Deflective Screening Device (DSD) is an inline, stormwater treatment system utilizing screening, hydrodynamic separation and sedimentation to capture trash, floating and neutrally buoyant debris, suspended sediments and hydrocarbons. The DSD utilizes a unique and effective non-blocking screening design that ensures high treatment flow rates are maintained between maintenance intervals. The special screen has opposite facing openings from the flow direction of incoming stormwater. As water enters the treatment chamber, it spins in a clockwise direction which creates a continuous cleaning effect against the surface of the screen. Design flows must pass through the non-blocking screen which has an aperture not greater than 4.7mm ensuring capture of all particles 5mm in size or larger. Captured trash and debris are sequestered within the internal components of the Device to prevent resuspension and re-entrainment of these pollutants.

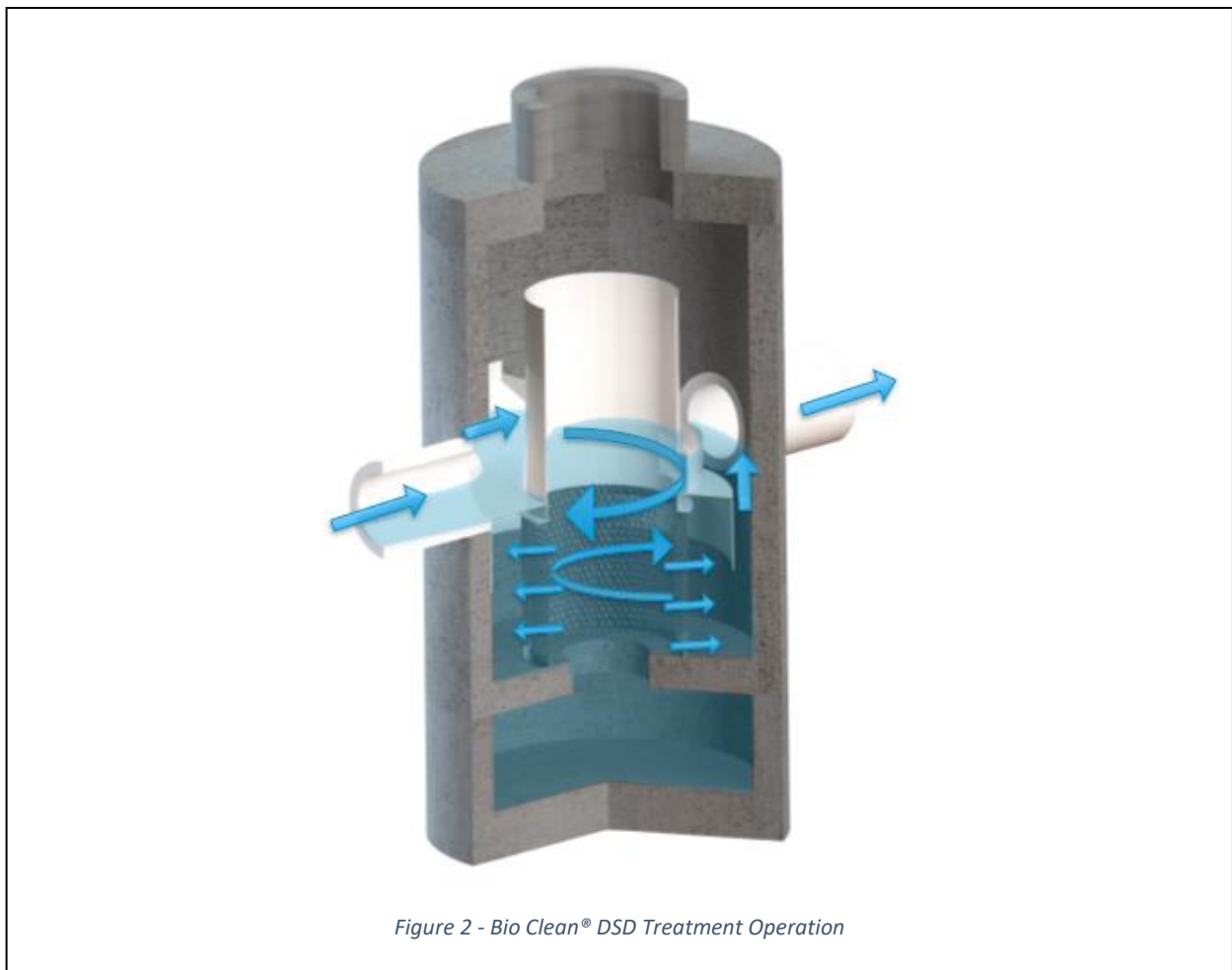
Figure 1 illustrates the features and components of the Bio Clean® DSD. The DSD consists of



three main components which include the structure, the internals, and the screen. The structure provides the housing for the stormwater treatment Device components and interface with the environment and is typically made from a precast concrete manhole. The structure can vary in

size from four feet in diameter up to 12 feet in diameter based on the maximum treated flow requirement. Depths and pipe diameters leading into the structure is site specific and can be varied as necessary. The internal components are made from marine grade fiberglass and are designed to fit within the manhole structure. The internal components have unique features to help direct treated flow, bypass flow and retain pollutants. The cylindrical, non-blocking screen is made from stainless steel and is located in the center of the unit. All flow to be treated is directed to the screen and must pass through the screen prior to exiting the unit. All three of the main components interact together to act as a singular treatment Device.

The treatment process begins when stormwater enters the Device structure through one or more inlet pipes, a grated inlet, or both. See Figure 2. Stormwater first encounters the inlet bay where the curved exterior of the vortex chamber directs the water to the inlet flume. The inlet flume is a curved channel connecting the exterior of the vortex chamber to the interior of the vortex chamber.



The inlet flume acts to increase the velocity of the water and create a vortex in the inlet chamber. The vortex helps to capture all trash and debris, sediment and contains these pollutants on the interior of the chamber and sequesters the pollutants from the exterior.

The only path for the water to take is downward toward the deflective screen chamber. The deflective screen chamber consists of a cylindrical screen manufactured from a proprietary, non-blocking, louver-expanded stainless steel screen. The openings of the screen are made by a process that angles the opening in one direction so that when water and debris encounter the screen a wiping action occurs which pushes both water and debris across the opening rather than through the opening. This perpetual, deflective shielding action minimizes blockages and penetration of debris through the screen opening. The vortex action inside of the deflective chamber further promotes the shielding action. The proprietary, non-blocking screens are made from 20 gauge, type 304 stainless steel with an aperture not greater than 4.7 mm. All design flows must pass through the deflective screen chamber before exiting the device thus ensuring full capture of trash 5mm or greater.

Bio Clean® DSD Characteristics and Capacity Table
California Full Capture Certified Capacities
Table 1

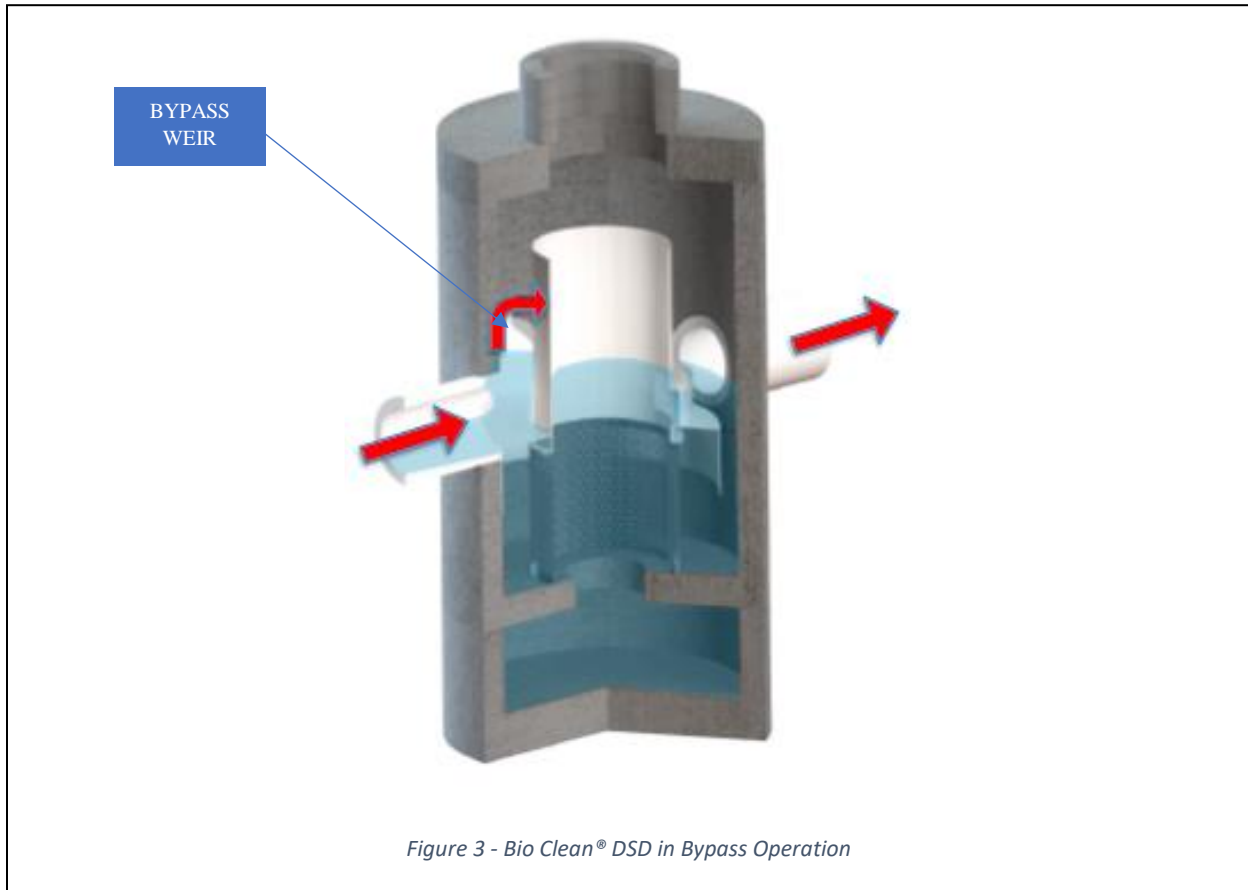
| DSD Model | Diameter | MTFR (Trash/Sediment) | Trash Storage Capacity | Sediment Storage Capacity |
|---------------|----------|--------------------------|------------------------------|---------------------------------|
| | (ft.) | (cfs) | (ft ³) | (ft ³) |
| DSD-48-2418 | 4 | 0.7 | 2.4 | 14.1 |
| DSD-60-2424 | 5 | 1.1 | 3.1 | 22.1 |
| DSD-60-2430 | 5 | 1.6 | 3.9 | 22.1 |
| DSD-72-3624 | 6 | 2.0 | 7.1 | 31.8 |
| DSD-72-3636 | 6 | 3.0 | 10.6 | 31.8 |
| DSD-96-4836 | 8 | 4.5 | 18.8 | 56.2 |
| DSD-96-4848 | 8 | 6.0 | 25.1 | 56.2 |
| DSD-120-6758 | 10 | 11.0 | 59.1 | 88.0 |
| DSD-120-6764 | 10 | 14.0 | 65.3 | 88.0 |
| DSD-144-8484 | 12 | 25.0 | 134.6 | 126.6 |
| DSD-144-94102 | 12 | 38.0 | 204.7 | 126.6 |

3.B. Design drawings for all standard Device sizes including dimensions, and alternative configurations;

Design drawings for all standard devices and configurations are included in Appendix A.

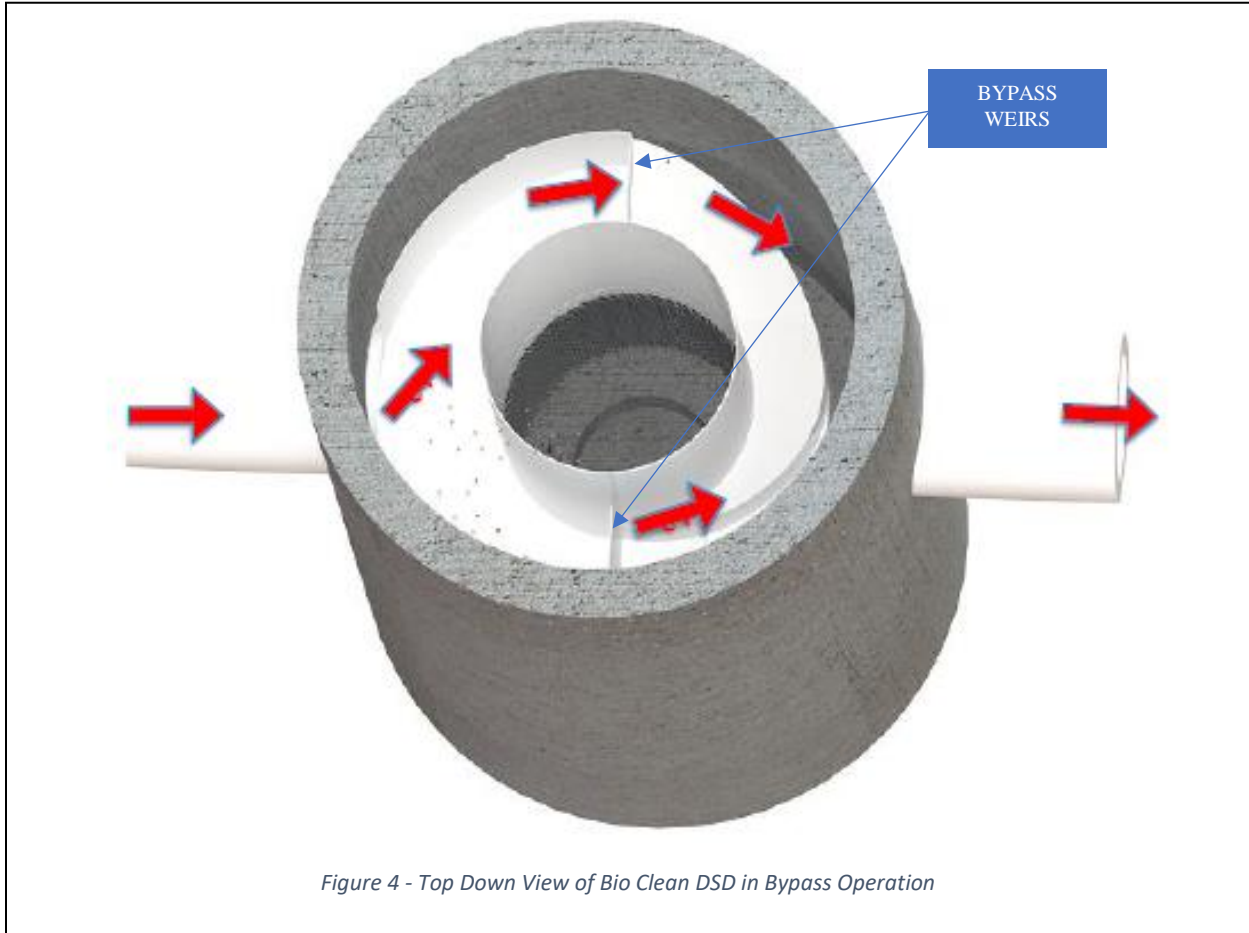
3.C. If the Device is designed with an internal bypass, explain how the bypass only operates with flows greater than the design storm;

The DSD is designed for online operation and is configured with an internal bypass that allows for operation in bypass without re-entrainment of previously captured trash and debris. Figure 3 and 4 illustrate the operation of the DSBB while in treatment and while in bypass.



When a drainage system is hydraulically sized to the MTFR (Trash/Sediment) listed in Table 1, the water elevation in the Device will not exceed the elevation of the bypass weirs located at the sides of the vortex chamber. All flows at or below the MTFR (Trash/Sediment) must pass through the non-blocking deflective screen which have an aperture not greater than 4.7mm ensuring capture of all particles 5mm in size or larger for these flows. The retained trash and debris is considered hydraulically offline while contained within the separation cylinder thus preventing the resuspension and re-entrainment of this material.

Should a storm event occur that would cause a flow in excess of the MTR (Trash/Sediment), the water surface level in the Device would rise above the top of the bypass weirs as shown in Figure 4. Under these conditions, new trash and debris entering the vault could bypass the separation chamber and deflective screen although treatment is still occurring. All previously removed trash



is retained in the separation chamber. Bypass can continue to occur up to the maximum flow capacity of the storm drain.

3.D. Engineering plans/diagrams for a typical installation;

Typical installation details are included in the Installation Manual located in Appendix C.

3.E. Photographs, if any, of pre- and post-installation examples; and

Photographs of the Modular Wetlands® in various stages of installation and operation are included below:



Figure 5 – DSD Delivery to Job Site



Figure 8 – DSD Treatment Section Offload



Figure 6 – DSD Sump Section Offload and Set



Figure 9 – DSD Treatment Section Placed



Figure 7 – DSD Sump Section Placed



Figure 10 – DSD Installed Waiting for Backfill

3.F. The Device maximum trash capture capacity;

Table 1 lists the trash capture volume (ft³) retained by each Bio Clean[®] DSD model. The trash capture volumes listed are maximum volumes that can be removed without a reduction in treatment performance and considers full retention of trash with no re-entrainment under peak flow conditions.

3.G. The Device hydraulic capacity (flow in cfs) at its maximum trash capture capacity for all standard Device sizes;

The maximum hydraulic capacity at the maximum trash capacity is listed as the MTFR (Trash) in Table 1.

3.H. Each material and material grade used to construct the Device (stainless steel, plastic, etc.);

The Bio Clean[®] DSD is constructed of high strength, durable materials and components that ensure a long design and service life for the Device. Appendix B of this submittal includes a detailed Specification for the DSD which includes material specifications. Key materials and components are additionally listed below:

- Structure – The Bio Clean[®] DSD and all of its components are self-contained within a concrete structure conforming to ASTM C478, C857, or C85 and are constructed with a minimum 28 day compressive strength of 4,000psi or greater, with reinforcing steel per ASTM A 615, Grade 60, and is designed to support a minimum loading of H-20 per AASHTO.
- Screens – The screens are manufactured from Type 304 Stainless Steel, louver-expanded metal with openings equal to or less than 4.7mm in size.
- Hardware – The mounting and installation hardware is manufactured from Type 304 Stainless Steel conforming to ASM A320.
- Separation Cylinder/Inlet Flume – The one piece internal component is made from marine grade fiberglass.

3.I. Conditions under which the Device re-introduces previously trapped trash;

The Bio Clean[®] DSD has been designed to remove and permanently retain all trash and debris (and other pollutants) that are 5mm in size or larger. Conditions under which the Device re-introduces previously trapped trash are listed below:

- If the device is not properly maintained and trash and debris are allowed to accumulate beyond the prescribed maximum allowable level in the screen chamber, conditions will be present that could cause a re-introduction of trash into the storm drain flows via the bypass mechanism.

- Broken or damaged screens may cause an adverse condition that would allow re-introduction of trash and debris into the effluent.

3.J. Estimated design life of the Device;

The estimated design life for Bio Clean[®] DSD system is 75 to 100 years. The design life is dependent on the materials utilized as well as the proper application of those materials.

3.K. If the Device is substantially similar to a currently listed Certified Device(s), name the Certified Device(s) and identify the substantial similarities and any minor changes in materials, material thickness, structural assembly, etc. Explain how these minor changes in your Device will impact performance as compared to the substantially similar Certified Device.

The Bio Clean[®] DSD is substantially similar to the Contech Construction Products “Continuous Deflective Separator” (CCP-1HF) as well as the Jensen Stormwater Systems “Jensen Deflective Separator” (Application 5). All three Devices utilize a centralized vortex chamber and separation screen with an isolated sump. Each of the Devices generally operate in the same manner utilizing the same removal mechanism. It is anticipated any of the Devices are an “Or Equal” replacement for the other.

There may be minor differences in dimensions, material utilized, and construction. These changes may affect service life and reliability but there is no anticipated impact to performance as a result of these differences.

4.0 INSTALLATION INFORMATION

4.A. Installation considerations;

Installation considerations for the Bio Clean[®] DSD are included in the Installation Manual in Appendix C of this Application.

4.B. Device installation procedures; and

Installation requirements and procedures are detailed in the Bio Clean[®] DSD *Installation Manual* which has been included in Appendix C of this submittal. The guidelines include requirements and procedures for:

- Delivery & Unloading/Lifting
- Inspection
- Site preparation

- Installation
- Wetland Media Install/Planting
- Installation Details
- Weights and Lifting Details
- Connection Details

In general terms, installation of the Bio Clean® DSD system is similar to installation of precast storm drain manhole structures. The components unique to the Bio Clean® DSD that make it full capture capable and that provide other pollutant removal capabilities are housed internally in the DSD manhole structure. These internal components are pre-installed at the factory or are sometimes post-installed on site by the manufacturer. No Contractor or Owner installation of these components is required.

Post installation inspection of the Bio Clean® DSD is strongly advised. A representative from Bio Clean® is available for on-site inspection as support for the Owner. Inspection should determine if the DSD was installed properly as well as provided in a clean condition with no defects as a result of the installation.

Installation for Trash Capture in association with Full Capture programs, Trash TMDLs, or the Statewide Trash Amendment are often retrofit type installations. Care should be taken to determine existing and as-built conditions to determine if the DSD must be supplied in a unique configuration to meet the retrofit conditions. Consideration must be given to any unique configurations for flow, treatment, and installation.

4.C. Methods for diagnosing and correcting installation errors.

Bio Clean® has a process for design and manufacturer that includes checks and balances to minimize and eliminate errors in the design and manufacturing processes for the Bio Clean® DSD Device. This process involves a formal submittal and review of the design and fabrication details for each unit. The Owner has and should take this opportunity to review the proposed Device prior to installation. This process helps to reduce or eliminate errors during installation. In the event an installation error does occur, the error should be documented and reviewed with Bio Clean® and the Contractor immediately upon determination of the error.

Bio Clean® recommends preparing an installation checklist for use during and after installation of the DSD system. The checklist should include key criteria for determination of proper installation. This checklist should be reviewed in its entirety at the completion of the installation and kept as documentation of proper installation. If during the checklist review an error is determined, the documented error should be reported to Bio Clean® as well as the Owner and Engineer. The checklist should include key criteria such as:

- Inlet/Outlet Pipe Size
- Inlet/Outlet Pipe Diameter
- Inlet/Outlet Pipe Material
- Inlet/Outlet Pipe Elevations
- RIM Elevation

- Bedding Elevation
- Bedding and Backfill Type and Compaction
- Manhole Sections Properly Sealed
- Concrete Condition
- Internal Component Condition
- Manhole Protected from Construction Runoff

Additionally the Bio Clean[®] DSD can be inspected after commencement of operation to determine proper operation.

5.0 OPERATION AND MAINTENANCE INFORMATION

5.A. Device inspection frequency considerations and inspection procedures;

The Bio Clean[®] DSD *Maintenance Manual* is included with this submittal in Appendix D. This manual includes detailed requirements and recommendations for inspection of the Bio Clean[®] DSD when used as a Full Capture Trash Treatment Control Device. A summary of the requirements and recommendations are listed below:

Inspection Summary

- Inspect Inlet Bay.
- Inspect Outlet Bay.
- Inspect Screen Chamber.
- Inspect Screen.
- Typical inspection interval is six to twelve months.
- Typical inspection time is approximately 15 minutes.

Note:

- Pollutant loading varies greatly from site to site and no two sites are the same. Therefore, the first year requires inspection monthly during the wet season and every other month during the dry season in order to observe and record the amount of pollutant loading the system is receiving.

Inspection Procedures

The Bio Clean[®] DSD system can be inspected through visual observation without entry into the Device. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with any open access hatches or manholes. Once these access covers have been safely opened, the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info.
- Visually observe the conditions of the inside of the Device in each of the treatment chambers noting any anomalies or non-conforming conditions.
- Assess and quantify the amount of trash, debris, and sediment that has accumulated in the pre-treatment chambers and record this information on the inspection form.
- Maintenance should be initiated should any of the following conditions be present;
 - Missing or damaged internal components.
 - Obstruction in the system or at the inlet or outlet.
 - Excessive accumulation of trash and debris in any chamber.
 - Excessive accumulation of sediment in the sump or inlet bay.
 - Standing water in the inlet bay.

5.B. Maintenance frequency considerations, maintenance procedures, and a description of necessary equipment and materials for maintenance;

A full description of the maintenance procedures can be located in the Bio Clean[®] DSD *Maintenance Manual* included with this submittal in Appendix D. A summary of the key components of the procedures is listed below:

Maintenance Summary

- Remove Sediment from the Sump –Typical maintenance interval is 36 to 72 months – Typical service time is 120 minutes.
- Remove Trash and Debris from Screen Chamber – Typical maintenance interval is 6 to 12 months – Typical service time is 15-30 minutes per cartridge.

Maintenance Procedures

The Bio Clean[®] DSD is designed to be maintained from ground level with no manned entry into the Device required. All necessary pre-maintenance steps must be carried out before maintenance occurs, especially traffic control and other safety measures to protect the maintenance personnel and near-by pedestrians from any dangers associated with an open access hatches or manholes.

- Remove all access hatches (requires traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened access cover and lower into the center of the separation cylinder.
- Remove all floating debris, standing water and sediment in the separation cylinder down through the deflective screen chamber and into the sump chamber. A power washer can be used to assist if sediment has become hardened and stuck to the walls, separation cylinder, deflective screen surfaces or the floor of the chamber.
- All removed debris and pollutants shall be disposed of following local and state requirements.

- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.

Record Keeping Maintenance Procedures

- Following maintenance and/or inspection, the maintenance operator shall prepare a maintenance/inspection record. The record shall include any maintenance activities performed, amount and description of debris and sediment collected, and condition of the system and its various filter mechanism.
- The Owner shall retain the maintenance/inspection record for a minimum of five years from the date of maintenance. These records shall be made available to the governing municipality for inspection upon request at any time.

Maintenance Equipment and Materials

The following equipment is helpful when conducting a Bio Clean[®] DSD system inspection and maintenance:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar
- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Confined space entry equipment (if necessary)
- Vacuum truck
- Pressure washer
- 7/16" open or closed end wrench

5.C. Effects of delayed maintenance on Device structural integrity, performance, odors;

Standardized maintenance frequencies that are suitable for most sites are detailed in Section 5.A. and 5.B. Maintenance frequency however is very site specific depending on pollutant loading. Records from inspections and prior maintenances should be periodically reviewed to assess the appropriateness of the prescribed maintenance frequency.

Delayed or deferred maintenance can cause diminished pollutant removal, re-entrainment of pollutants, in Device and upstream hydraulic impacts, and impacts to water quality.

5.D. Vector Control Accessibility:

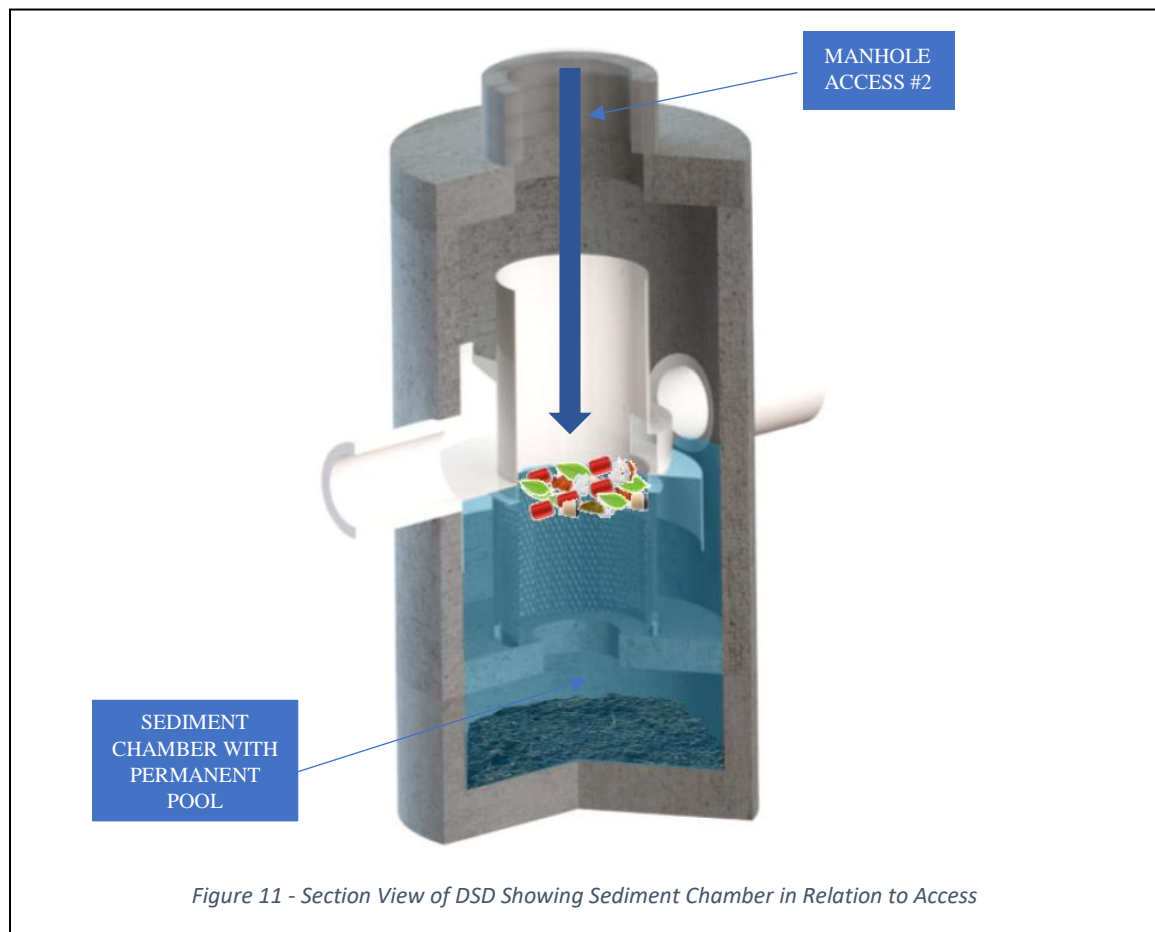
As with many storm water treatment Devices the Bio Clean® DSD requires a permanent pool of water to facilitate removal of pollutants. The DSD utilizes a single chamber with a single pool of water. While this standing water has the potential to attract and facilitate Mosquito/Vector breeding, Bio Clean® designed the DSD to minimize this potential. Additionally, in the event that Mosquito/Vector access occurs Bio Clean® designed the DSD with access that facilitates access for inspection and treatment for Vector/Mosquito.

1. **Include the date the Device application was submitted to the Mosquito Vector Control Association of California Review Team for input on the Device design via email (MVCAC<Trashtreatment@mvcac.org>);**

The application was submitted to the MVCAC Review Team on the same date as the application was submitted to the SWRCB Review Team.

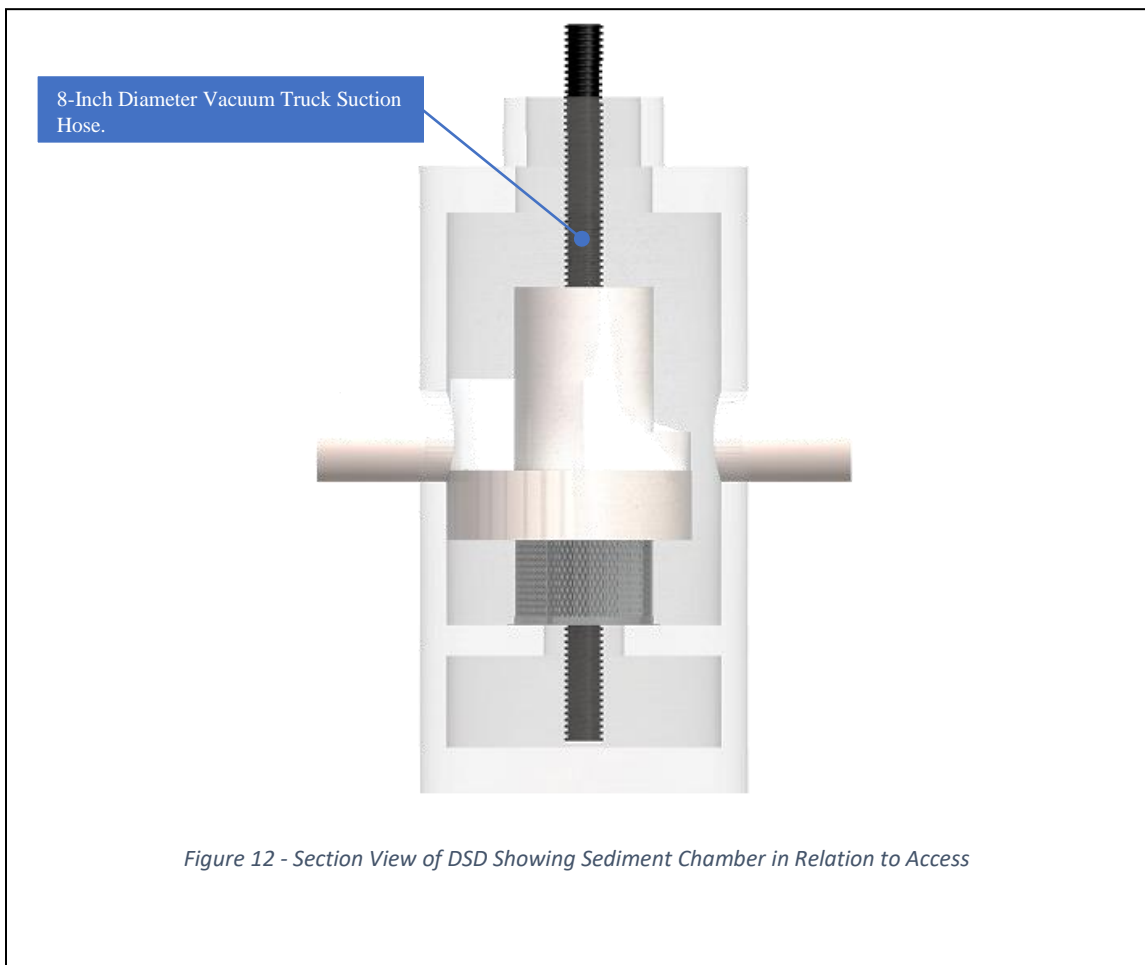
2. **Provide a video link or depict and describe how mosquito vector control personnel can readily access the bottom of the Device and/or storm water vault for visual observation and mosquito treatment; and**

All Bio Clean® DSD Devices are designed to have one or more manhole covers or access hatches located directly above the sediment chamber so that direct access is provided to each sediment chamber and the associated permanent pool of water. Figure 11 illustrates the direct relationship between access and the sediment chamber. When the access cover



or hatch is opened there is a direct line of sight provided to the sediment chamber and the standing water in the chamber for inspection of the presence of mosquito and/or vector. Liquid or solid material can be placed directly into the chamber for Mosquito/Vector control with no obstructions.

Figure 12 further illustrates the accessibility of the sediment chamber. In this detail, the DSD is shown with a vacuum truck suction nozzle inserted into the sediment chamber. The vacuum truck suction nozzle has a minimum diameter of 8-inches. The DSD is designed to allow the vacuum suction nozzle to be inserted unrestricted to the bottom of the sediment chamber for easy removal of the accumulated sediment. With such access provided for the vacuum suction nozzle it is clear that access for Mosquito/Vector control is more than adequate.



The DSD also contains design features that prevent mosquito and vector access. All manhole covers and access hatches are supplied with gasketed lids that seal the DSD from mosquito and vector access. See Figure 13. Additionally, the manhole covers are designed with closed pick points. The pick point is a depression or hole in the cover for a tool to be inserted to help remove the cover. In many cases, the pick point is an open hole. For the

DSD the pick point is a depressed slot that serves the same function but does not allow an open hole and access into the Device. Mosquito and Vector are therefore prevented from entering and escaping through the access points of the DSD.

The influent and effluent pipes and connections, although below ground and often times long distances from daylight, can be access points for Mosquito and Vector. These influent and effluent pipes must remain open while the DSD is in service. As such, these locations can be access points for Mosquito and Vector. Flap gates, pinch valves, and collapsible tubes have been used with some success in a variety of applications to prevent Mosquito and Vector access. The local Mosquito and Vector control agency should be contacted to determine which if any exclusion type device can be utilized in their District. In addition to exclusion devices, water agitators have been used with success to prevent Mosquito from breeding. The local Mosquito District should be contacted to determine if water agitators can be used in lieu of exclusion devices.

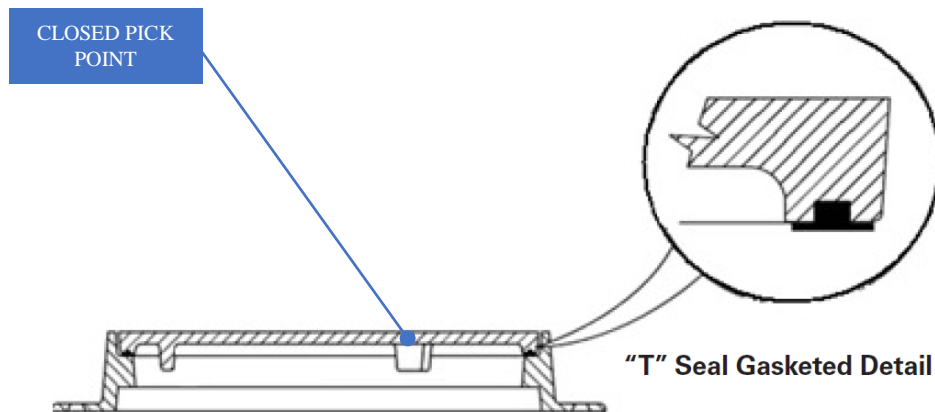


Figure 13 - Manhole Access Frame and Cover with Gasket and Sealed Pick Point

- 3. Provide a letter of verification from the Mosquito Vector Control Association of California when available, verifying the system is readily accessible for observation and treatment or that the System does not require mosquito vector control accessibility.**

A letter of verification from the MVCAC verifying the Device is readily accessible for observation and treatment has been requested.

5.E. Repair procedures for the Device's structural components.

The Device's structural components are designed for extended service life and the need for repair is not expected. Should damage to any structural components occur, Bio Clean should be contacted to evaluate the condition and to provide a formal repair procedure.

6.0 RELIABILITY INFORMATION

6.A. Estimated design life of Device components before major overhaul;

As previously noted in Section 3.J., the estimated design life for Bio Clean® DSD system is 75 to 100 years. The design life is dependent on the materials utilized as well as the proper application of those materials. The estimated design life for the major individual components of the Device are listed below

| Component | Minimum Expected Life | Maximum Expected Life |
|--|-----------------------|-----------------------|
| Concrete Structure | 75 yrs. | 100 yrs. |
| Access Covers | 75 yrs. | 100 yrs. |
| Internal Components (plastic/fiberglass) | 50 yrs. | 75 yrs. |
| Internal Components (SS) | 25 yrs. | 50 yrs. |

6.B. Device sensitivity to loadings other than trash (i.e., leaves, sediment, etc.);

The Bio Clean® DSD is designed to treat a variety of pollutants including sediment, hydrocarbons, and trash and debris. The presence of pollutant loadings other than trash have no effect on the trash capture performance of the Device. In addition, the cylindrical, non-blocking screen is designed such that the water flow over the screen filters and wipes the screen clean in the same action. The Device is self-cleaning through the action of the water through the Device thus minimizing clogging and impacts from other pollutants. Areas with higher than average volumes of leaves and sediment should be monitored and maintenance frequencies adjusted accordingly.

6.C. Warranty Information; and

Bio Clean provides a five year limited warranty for the Bio Clean® DSD system per the conditions listed in the warranty document included in the application in Appendix E.

6.D. Customer support information.

Bio Clean® is a California based company and has three facilities to provide Customer Support within the State.

Bio Clean® Corporate Office

398 Via El Centro

Oceanside, CA 92058

Phone: (760) 433-7640

Office Fax: (760) 433-3176

info@BioCleanEnvironmental.com

Maintenance@BioCleanEnvironmental.com

7.0 FIELD/LAB TESTING INFORMATION AND ANALYSIS.

Bio Clean[®] conducted laboratory testing on the proprietary non-blocking screen material utilized in the DSD. Bio Clean[®] conducted this testing to empirically determine the unique properties of the screen including the Effective Open Area (EOA), the Coefficient of Discharge (C_d), and the flow capacity and characteristics. The results of the testing provided a clear relationship between discharge (Q) and head (h) acting on the screen. The results of the testing have been incorporated into the design of the DSD to determine both the treatment and peak flow rates for the DSD.

The test report has been included in this Application in Appendix F for review by the SWRCB and interested parties.

APPENDIX A

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | | ø30" | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | | 1.1 | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | | 7.0 | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 4.00 | 12.56 | 2.00 | 25.12 |

TREATMENT NOTES

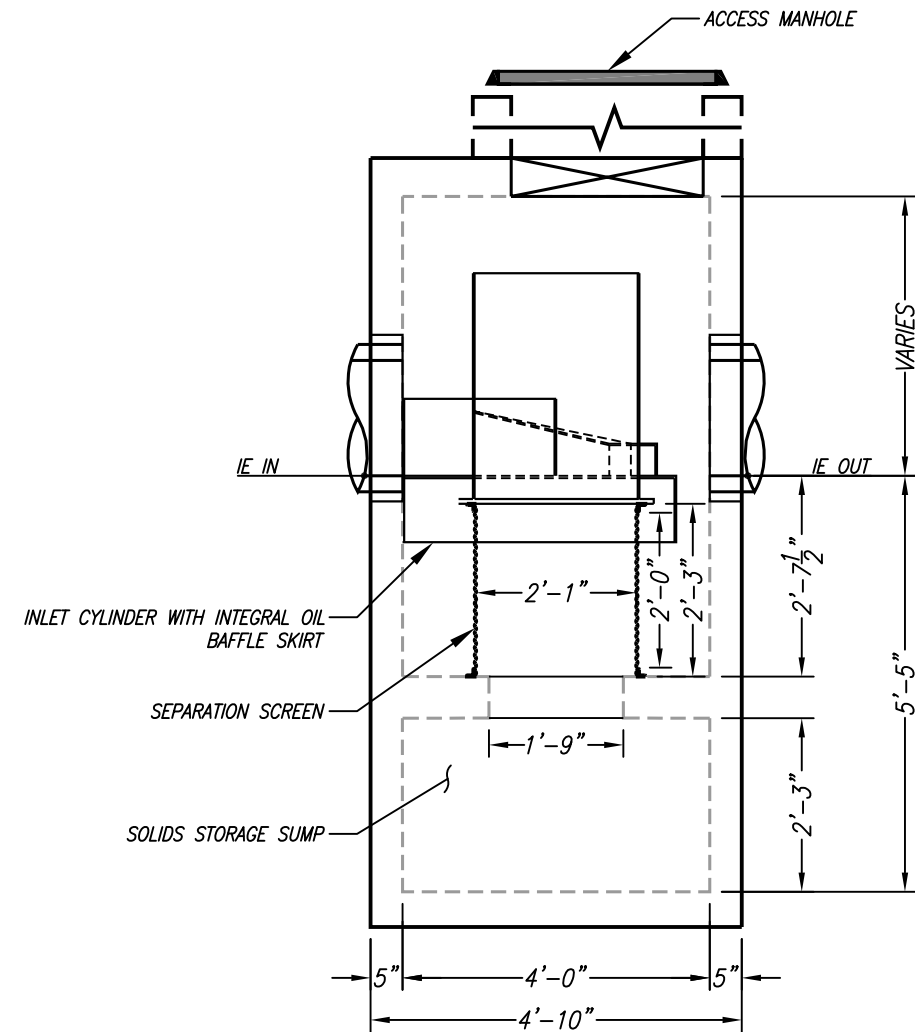
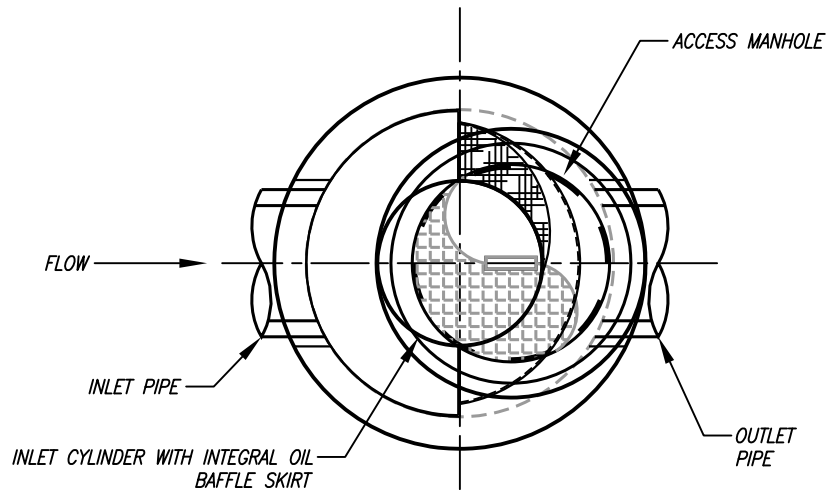
1. 100% CAPTURE OF TRASH & DEBRIS.
2. MEETS FULL CAPTURE REQUIREMENTS.
3. BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
4. CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.

GENERAL NOTES

1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

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2. MANUFACTURER RECOMMENDS A 6"-12" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. ALL GAPS AROUND PIPES SHALL BE SEALED WATERTIGHT WITH A NON-SHRINK GROUT PER MANUFACTURER'S STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.



PROPRIETARY AND CONFIDENTIAL:

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DSD-4-2424
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | | ø30" | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

GENERAL NOTES

- BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
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- ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

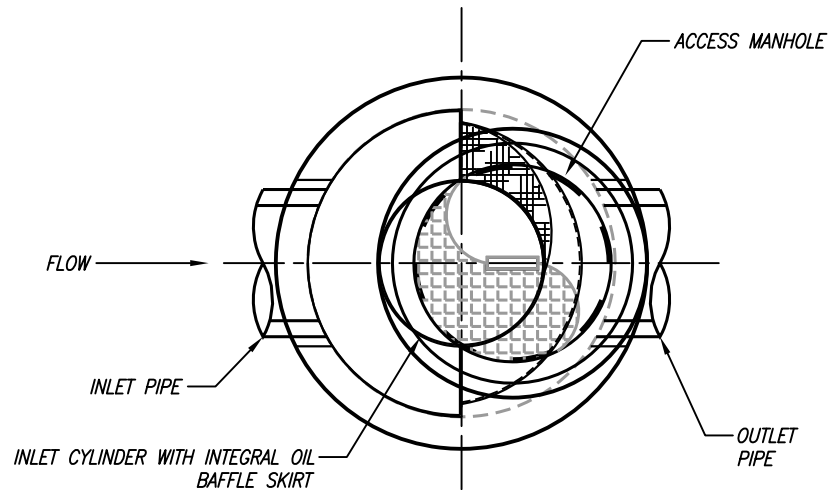
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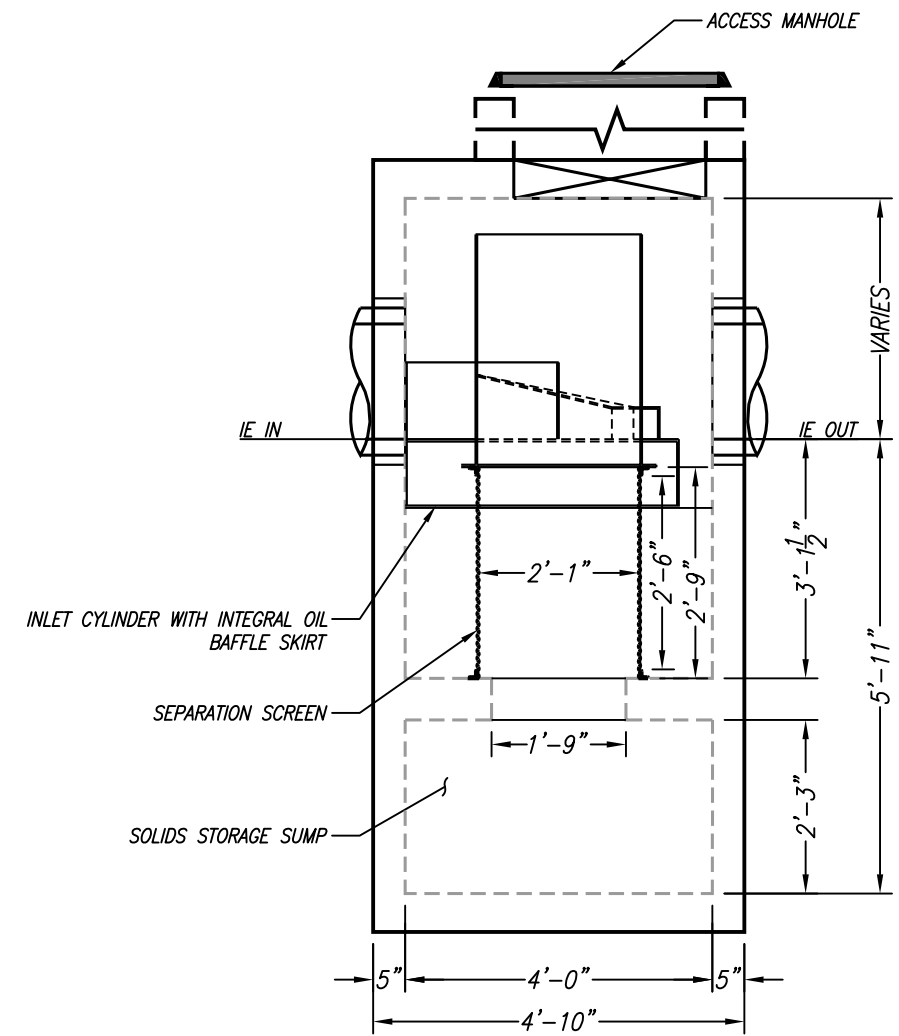
| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | | 1.6 | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | | 7.0 | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 4.00 | 12.56 | 2.00 | 25.12 |

TREATMENT NOTES

- 100% CAPTURE OF TRASH & DEBRIS.
- MEETS FULL CAPTURE REQUIREMENTS.
- BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
- CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.



PLAN VIEW
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ELEVATION VIEW
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DSD-4-2430
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | | ø30" | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | | 0.7 | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | | 10.0 | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 5.00 | 19.63 | 2.00 | 39.25 |

TREATMENT NOTES

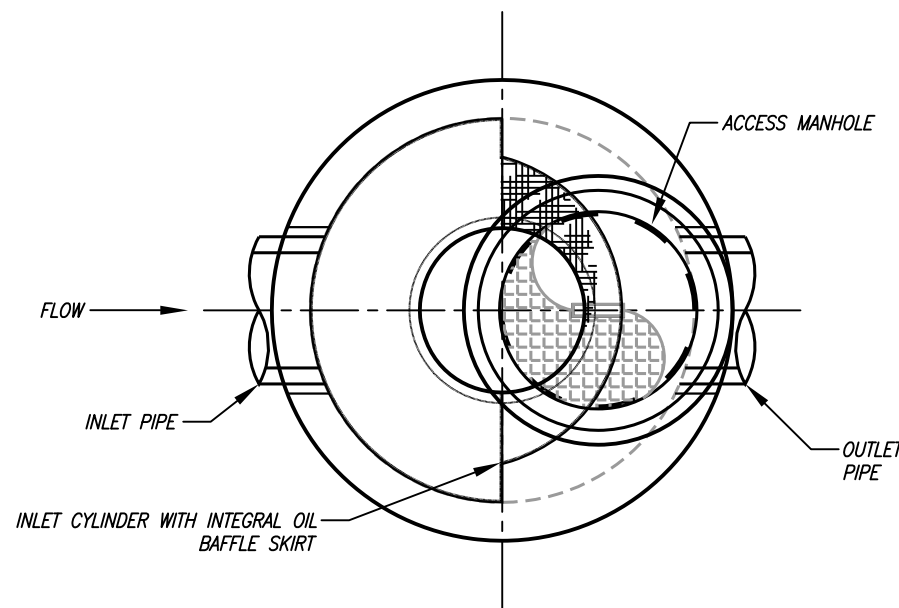
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3. BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
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GENERAL NOTES

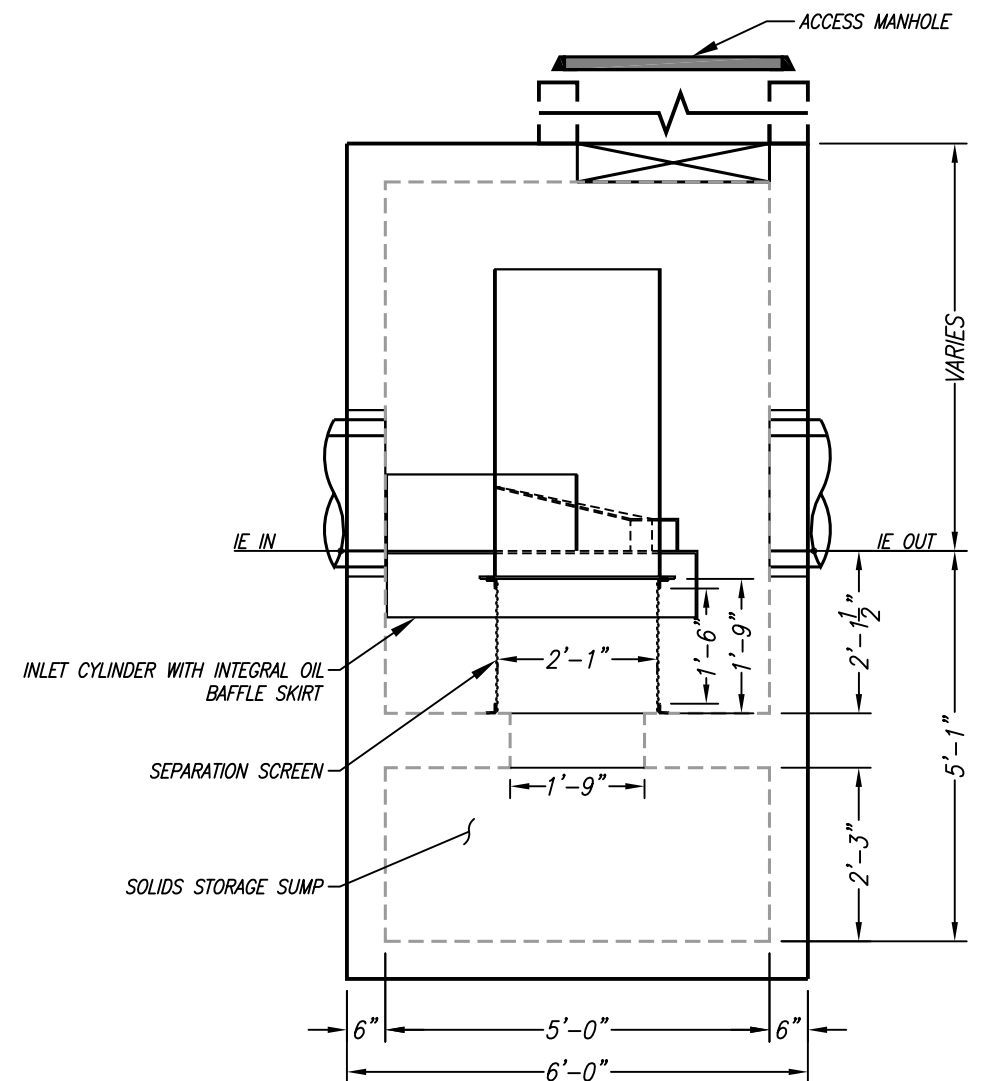
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PLAN VIEW
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ELEVATION VIEW
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DSD-5-2418
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

1/3/19GSCHIPPER

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | ø30" | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

GENERAL NOTES

1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
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3. ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

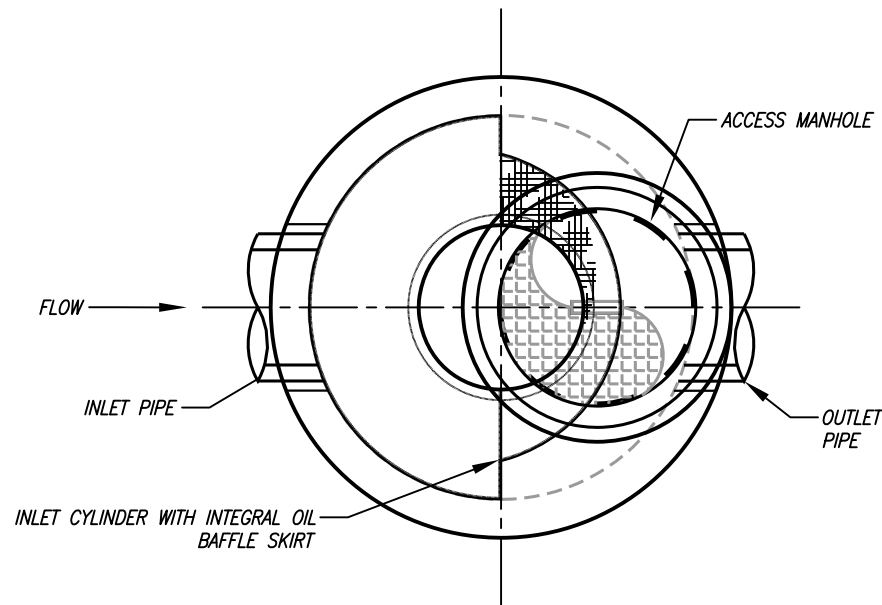
INSTALLATION NOTES

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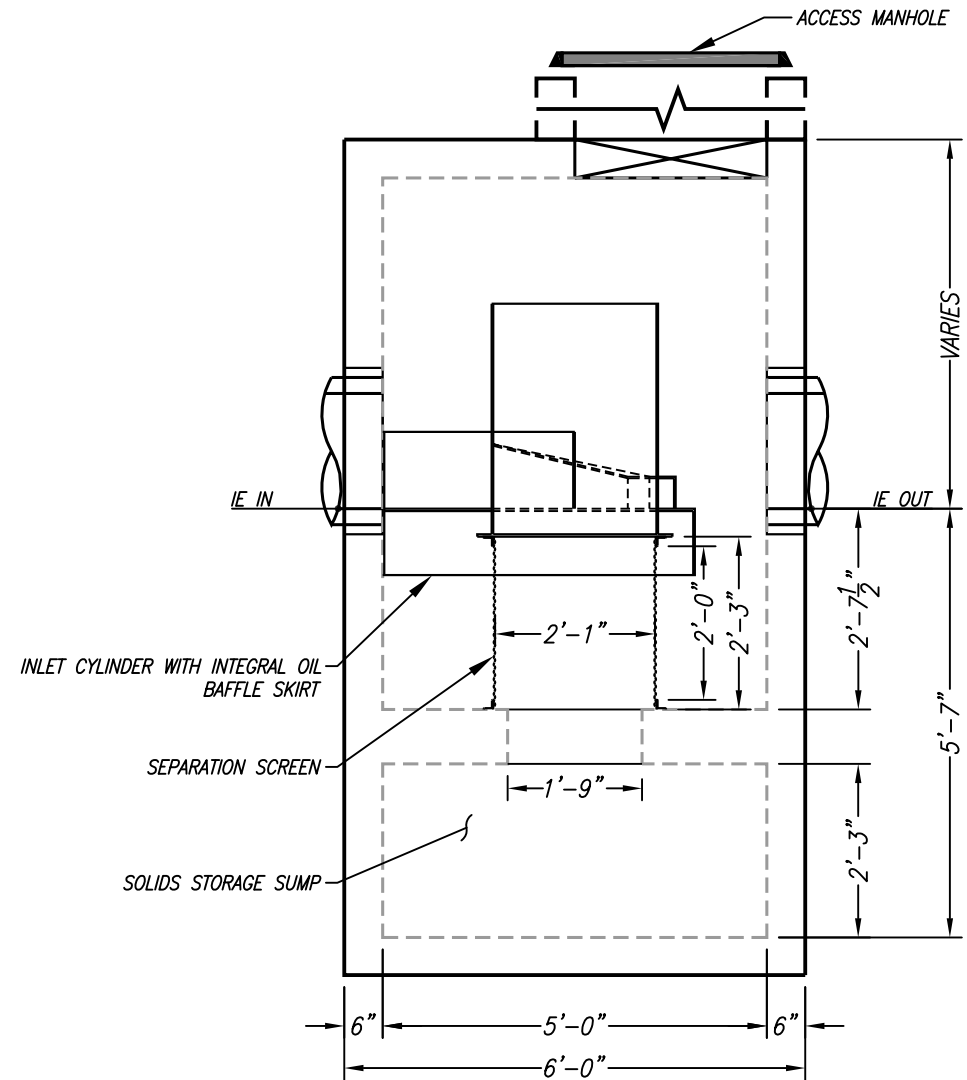
| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 1.1 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 10.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 5.00 | 19.63 | 2.00 | 39.25 |

TREATMENT NOTES

1. 100% CAPTURE OF TRASH & DEBRIS.
2. MEETS FULL CAPTURE REQUIREMENTS.
3. BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
4. CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.



PLAN VIEW
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DSD-5-2424
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | ø30" | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

GENERAL NOTES

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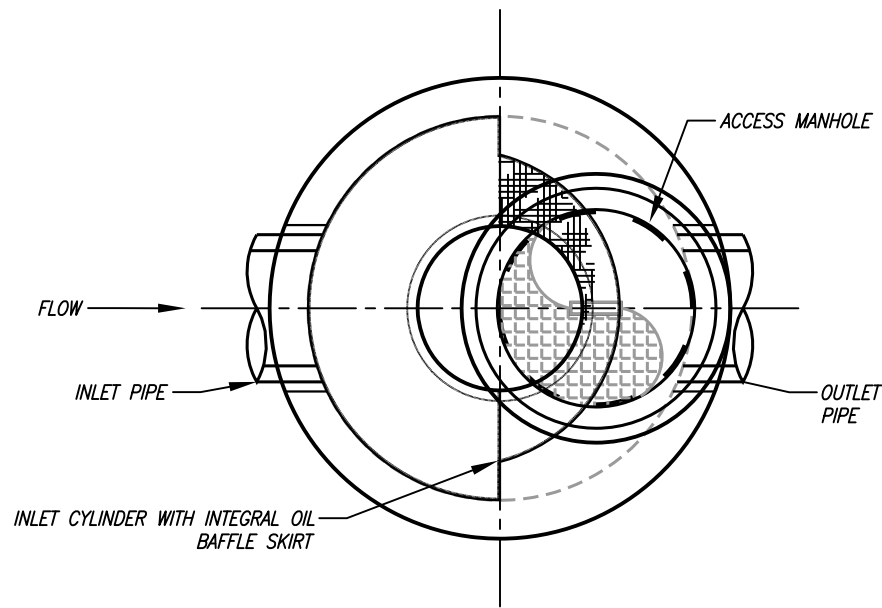
INSTALLATION NOTES

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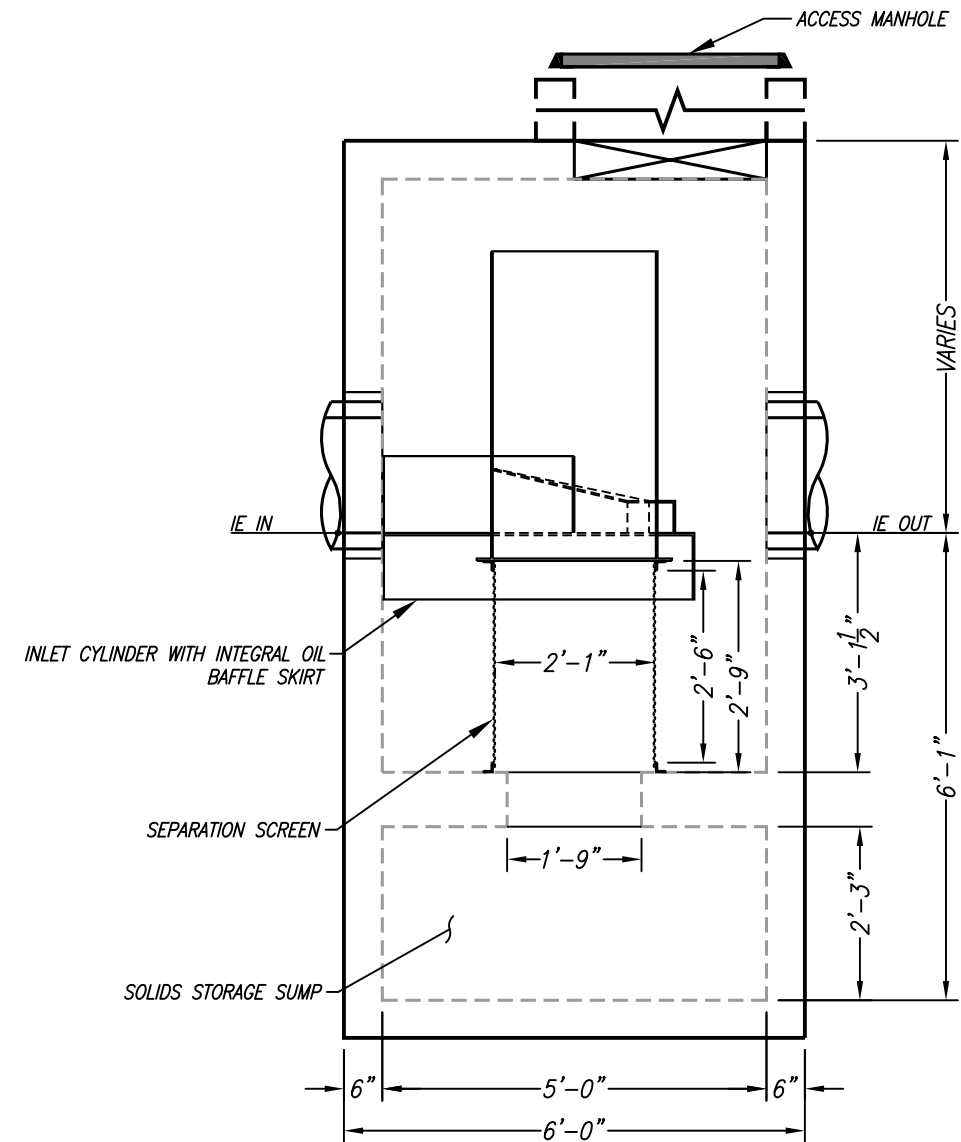
| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 1.6 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 10.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 5.00 | 19.63 | 2.00 | 39.25 |

TREATMENT NOTES

- 100% CAPTURE OF TRASH & DEBRIS.
- MEETS FULL CAPTURE REQUIREMENTS.
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PLAN VIEW
NTS



ELEVATION VIEW
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DSD-5-2430
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | | ø36" | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | | 2.0 | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | | 14.0 | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 6.00 | 28.26 | 2.00 | 56.52 |

TREATMENT NOTES

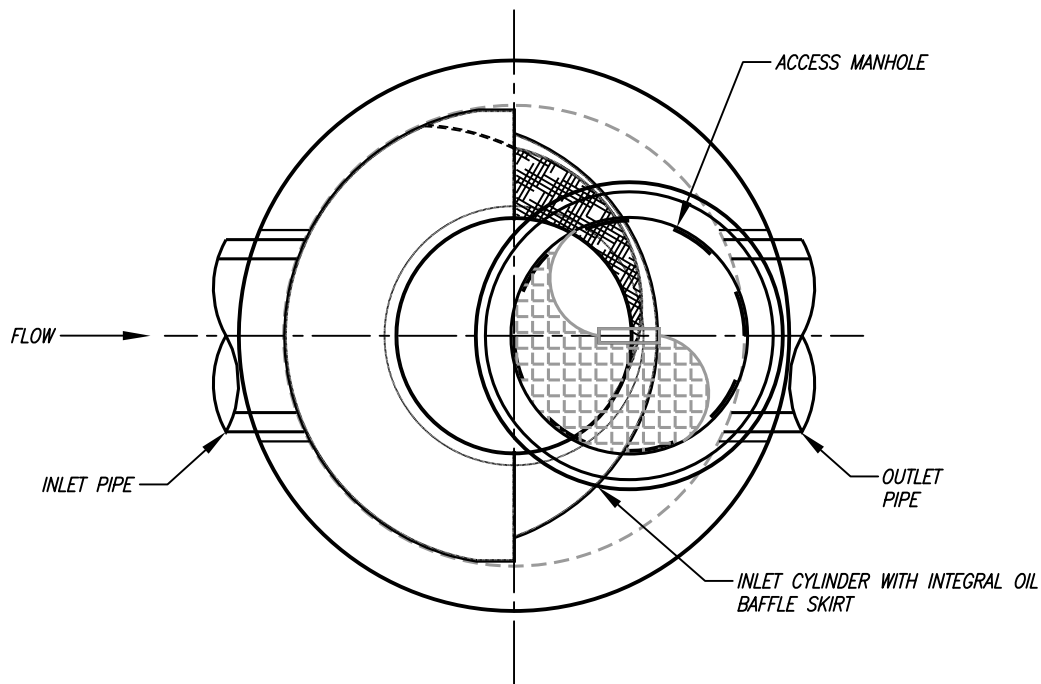
1. 100% CAPTURE OF TRASH & DEBRIS.
2. MEETS FULL CAPTURE REQUIREMENTS.
3. BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
4. CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.

GENERAL NOTES

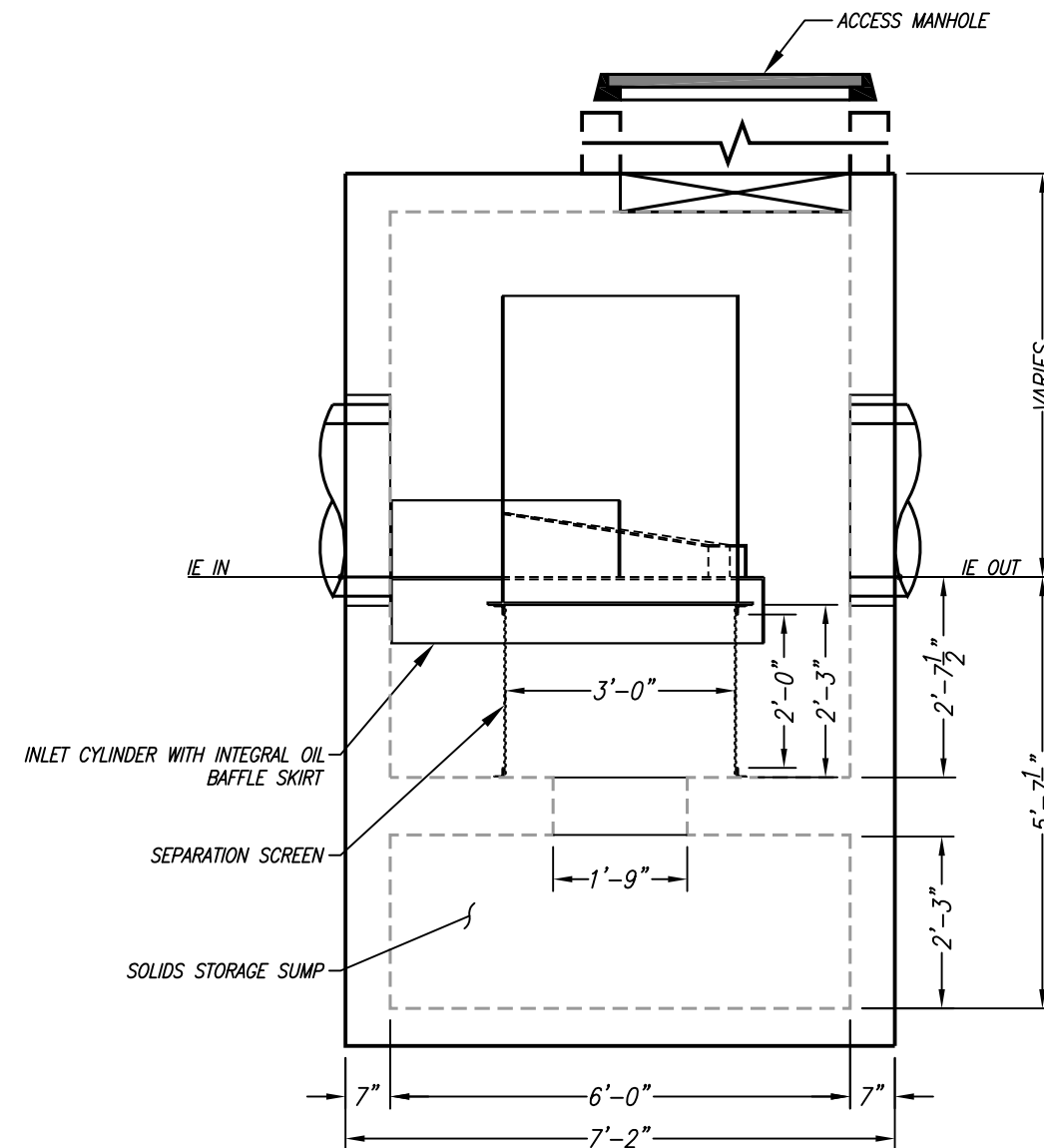
1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

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2. MANUFACTURER RECOMMENDS A 6"-12" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. ALL GAPS AROUND PIPES SHALL BE SEALED WATERTIGHT WITH A NON-SHRINK GROUT PER MANUFACTURER'S STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.



PLAN VIEW
NTS



ELEVATION VIEW
NTS

PROPRIETARY AND CONFIDENTIAL:

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF BIO CLEAN ENVIRONMENTAL SERVICES, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF BIO CLEAN ENVIRONMENTAL SERVICES, INC. IS PROHIBITED.



DSD-6-3624
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | ø36" | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 2.4 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 14.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 6.00 | 28.26 | 2.00 | 56.52 |

TREATMENT NOTES

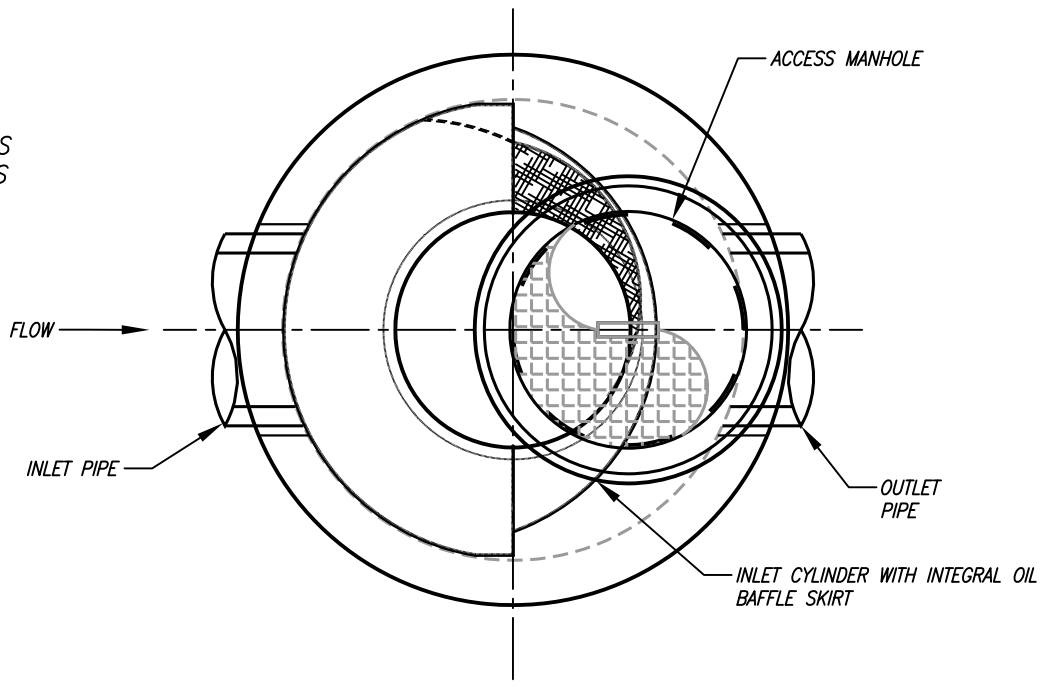
1. 100% CAPTURE OF TRASH & DEBRIS.
2. MEETS FULL CAPTURE REQUIREMENTS.
3. BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
4. CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.

GENERAL NOTES

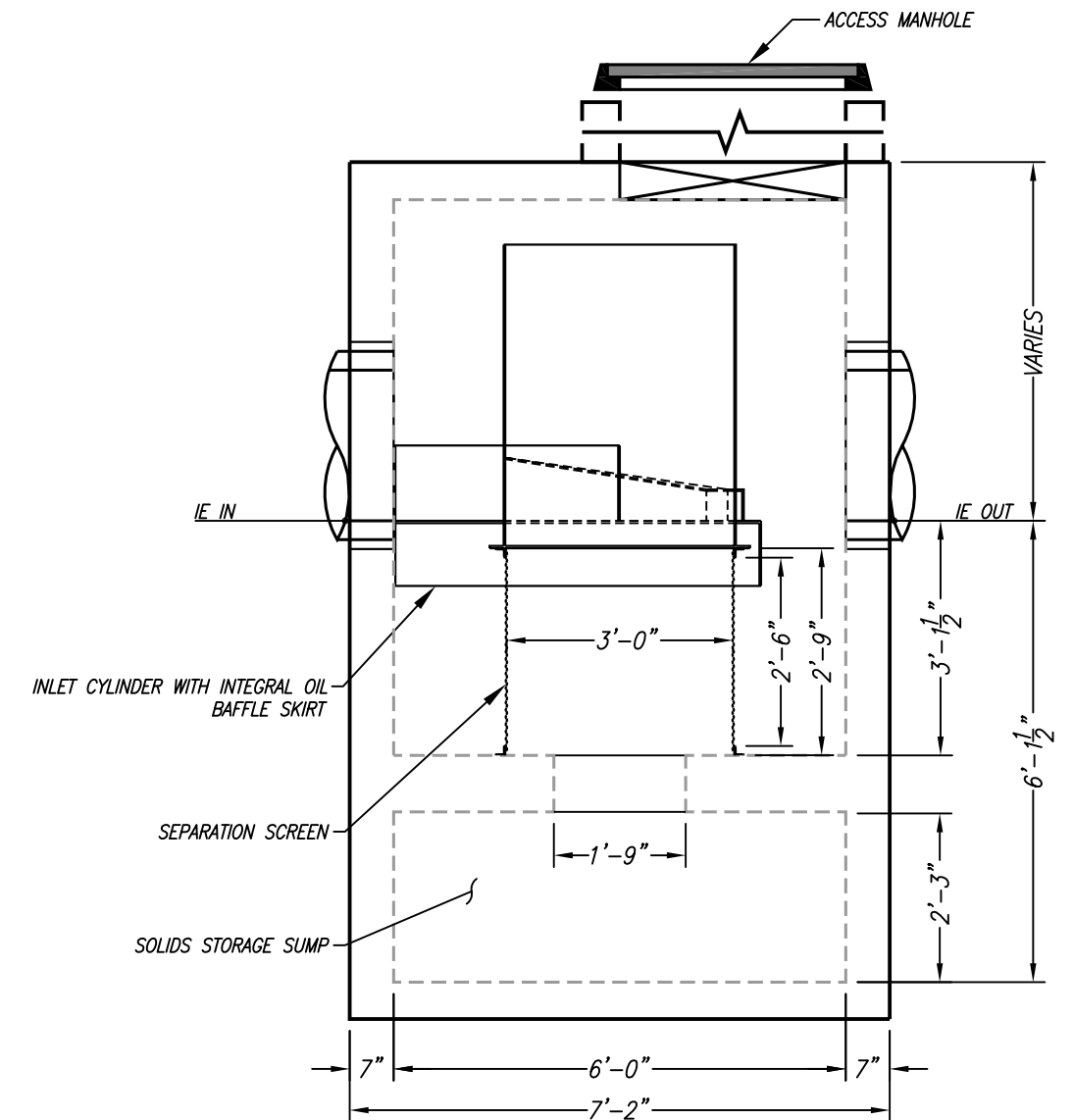
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PLAN VIEW
NTS



ELEVATION VIEW
NTS

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DSD-6-3630
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

1/3/19/01/EE

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | ø36" | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 3.0 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 14.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 6.00 | 28.26 | 2.00 | 56.52 |

TREATMENT NOTES

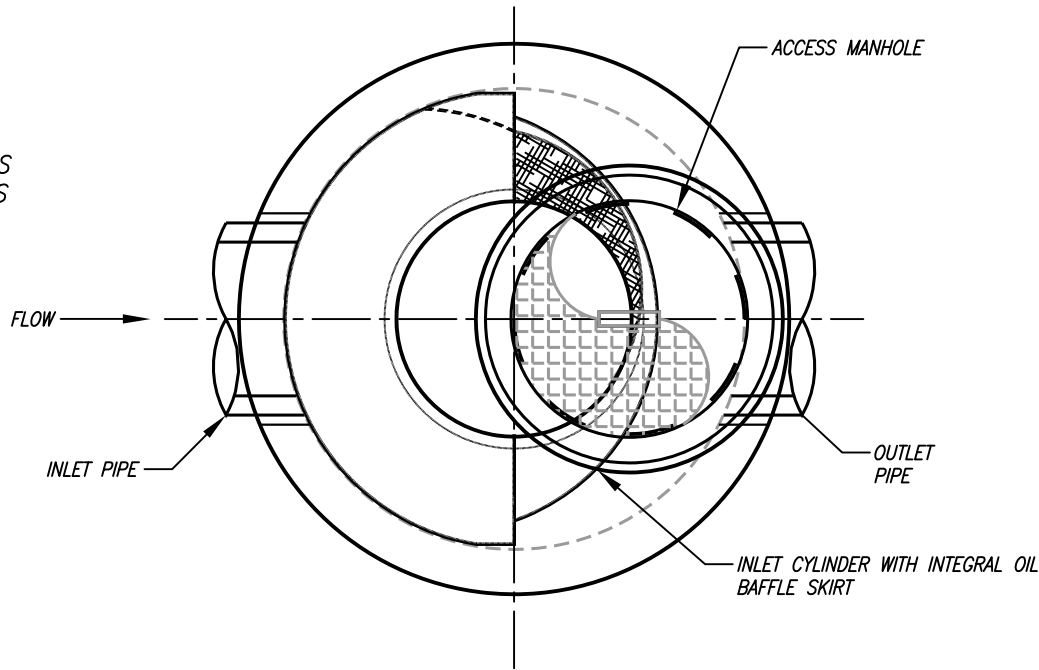
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GENERAL NOTES

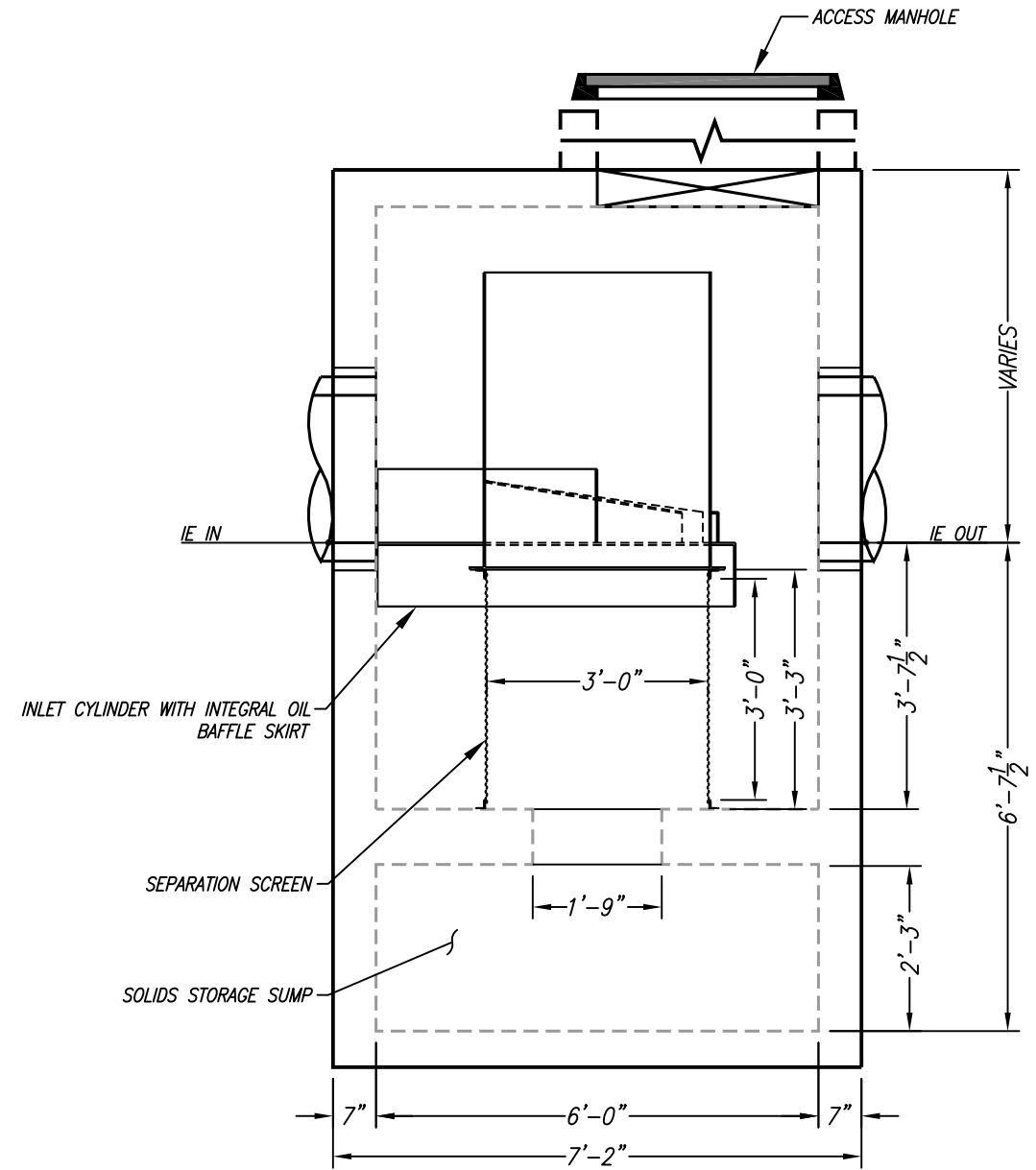
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PLAN VIEW
NTS



ELEVATION VIEW
NTS

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DSD-6-3636
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

1/3/19/01/EE

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | ø36" | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 3.8 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 14.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 6.00 | 28.26 | 2.00 | 56.52 |

TREATMENT NOTES

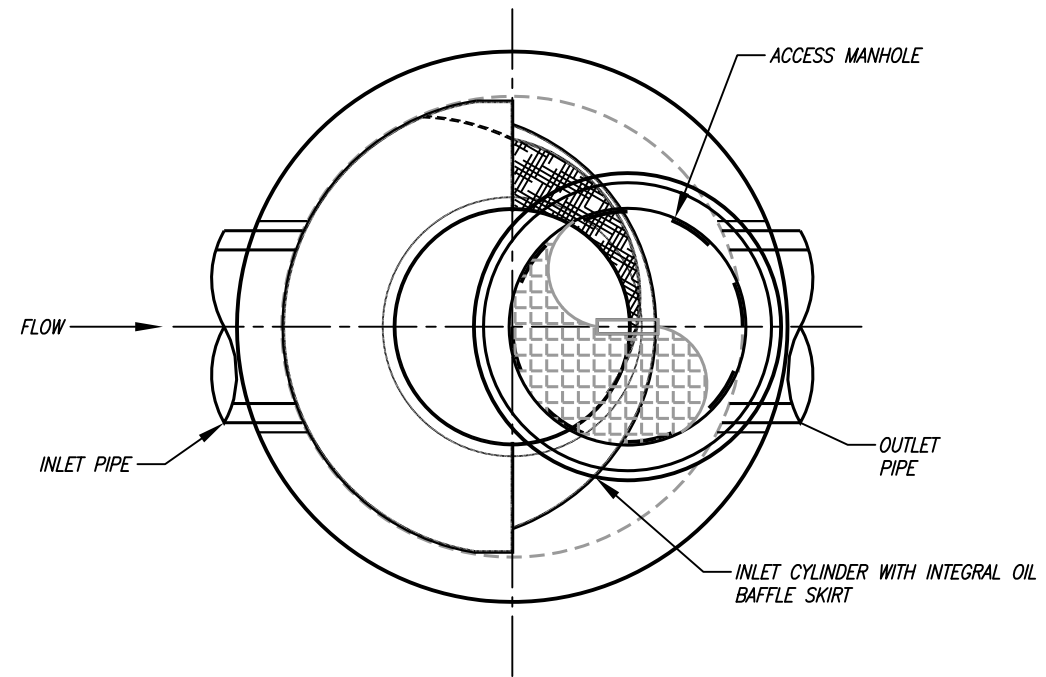
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GENERAL NOTES

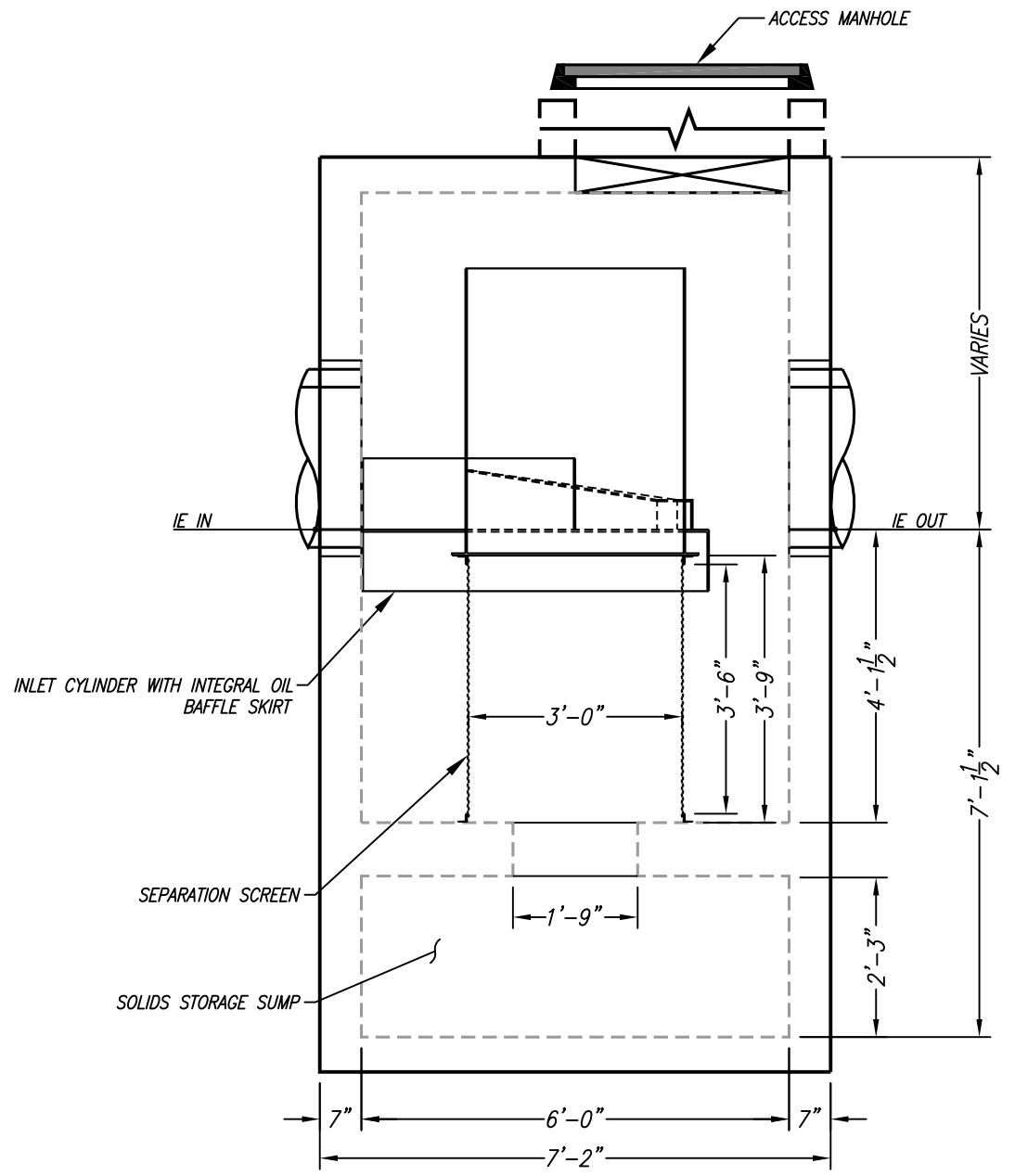
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PLAN VIEW
NTS



ELEVATION VIEW
NTS

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DSD-6-3642
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

1/3/19/01/EE

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | ø36" | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 2.7 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 14.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 7.00 | 38.47 | 2.00 | 76.93 |

TREATMENT NOTES

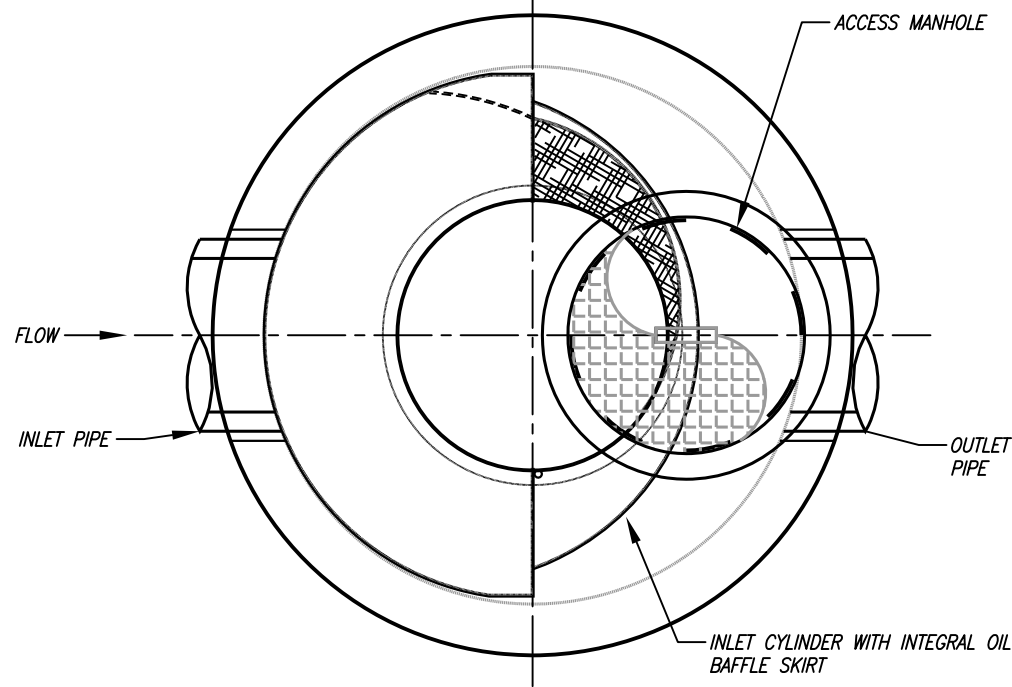
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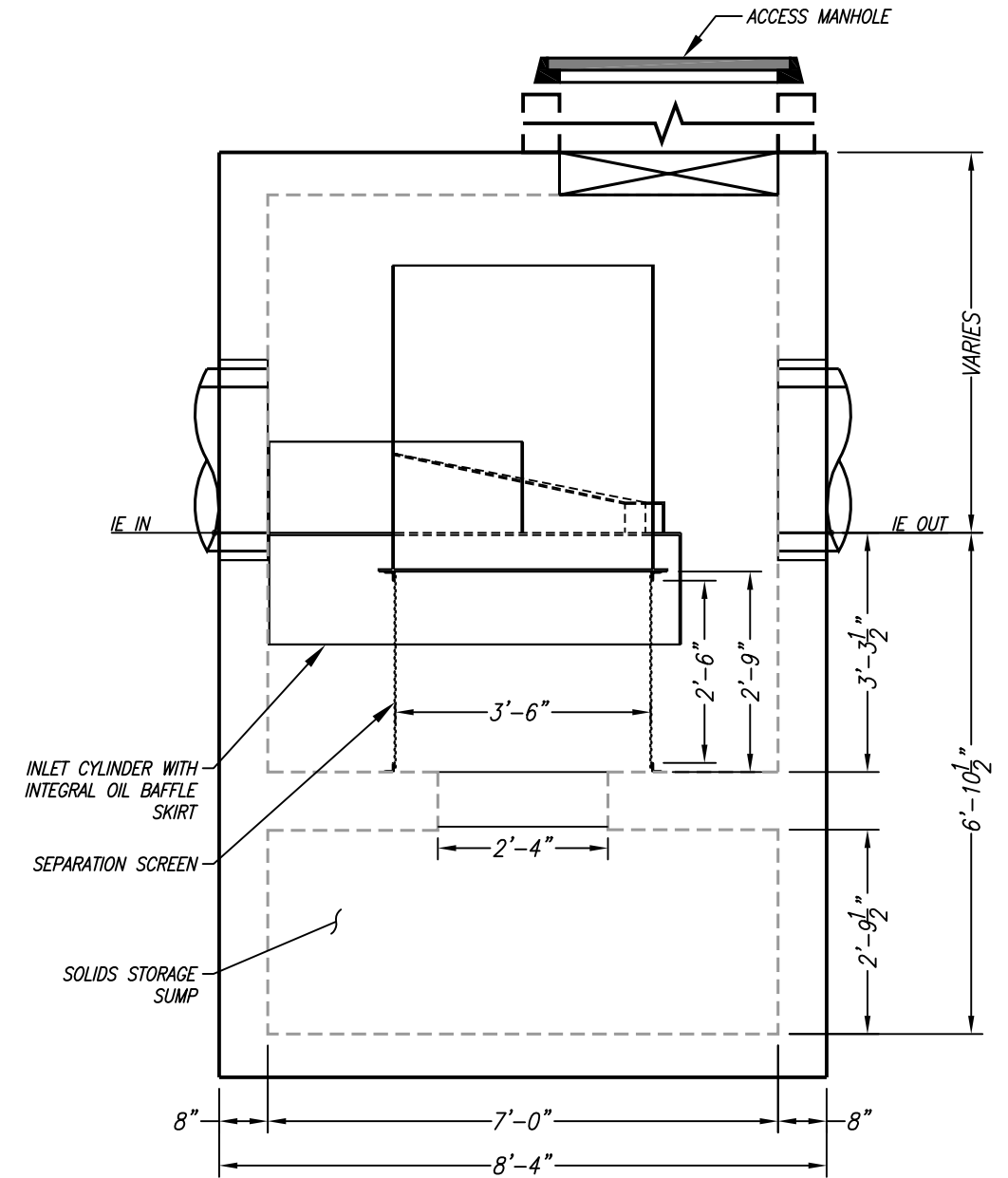
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PLAN VIEW

NTS



ELEVATION VIEW

NTS

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DSD-7-4230
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | | |
|-------------------------------|------|----------|----------|--|
| PROJECT NUMBER | | | | |
| PROJECT NAME | | | | |
| PROJECT LOCATION | | | | |
| STRUCTURE ID | | | | |
| WATER QUALITY FLOW RATE (CFS) | | | | |
| PEAK FLOW RATE (CFS) | | | | |
| PEAK STORM DURATION (YEARS) | | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER | |
| INLET PIPE 1 | | | | |
| OUTLET PIPE 1 | | | | |
| RIM ELEVATION | | | | |
| SUMP ELEVATION | | | | |
| SURFACE LOADING REQUIREMENT | | | | |
| FRAME AND COVER | | ø36" | | |
| KNOWN GROUNDWATER ELEVATION | | | | |
| NOTES: | | | | |
| *PER ENGINEER OF RECORD | | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | | 3.6 | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | | 14.0 | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 7.00 | 38.47 | 2.00 | 76.93 |

TREATMENT NOTES

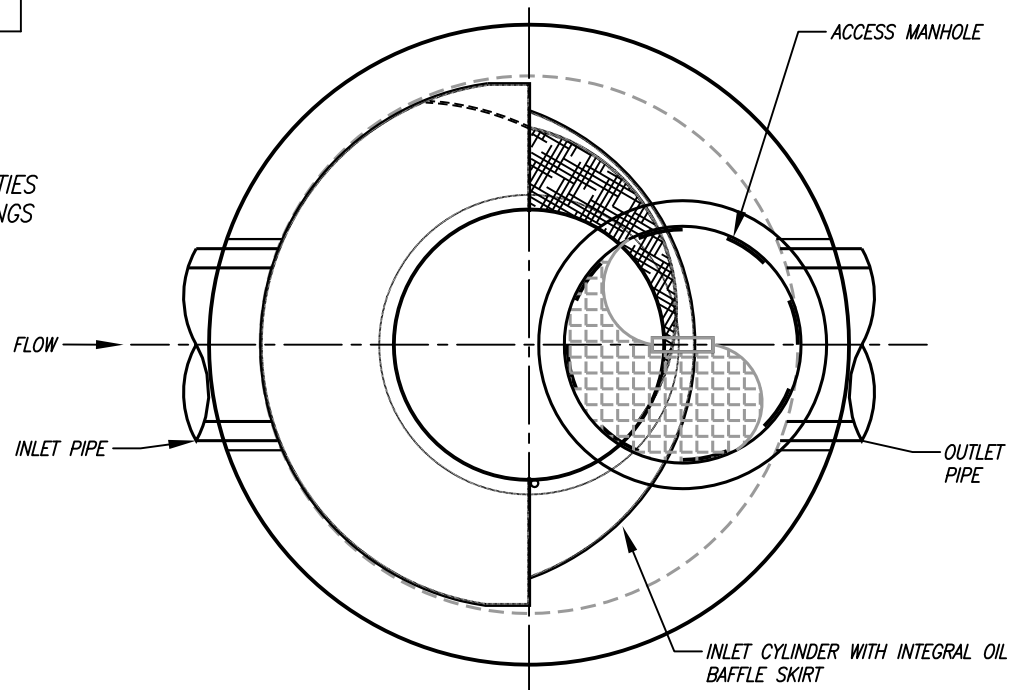
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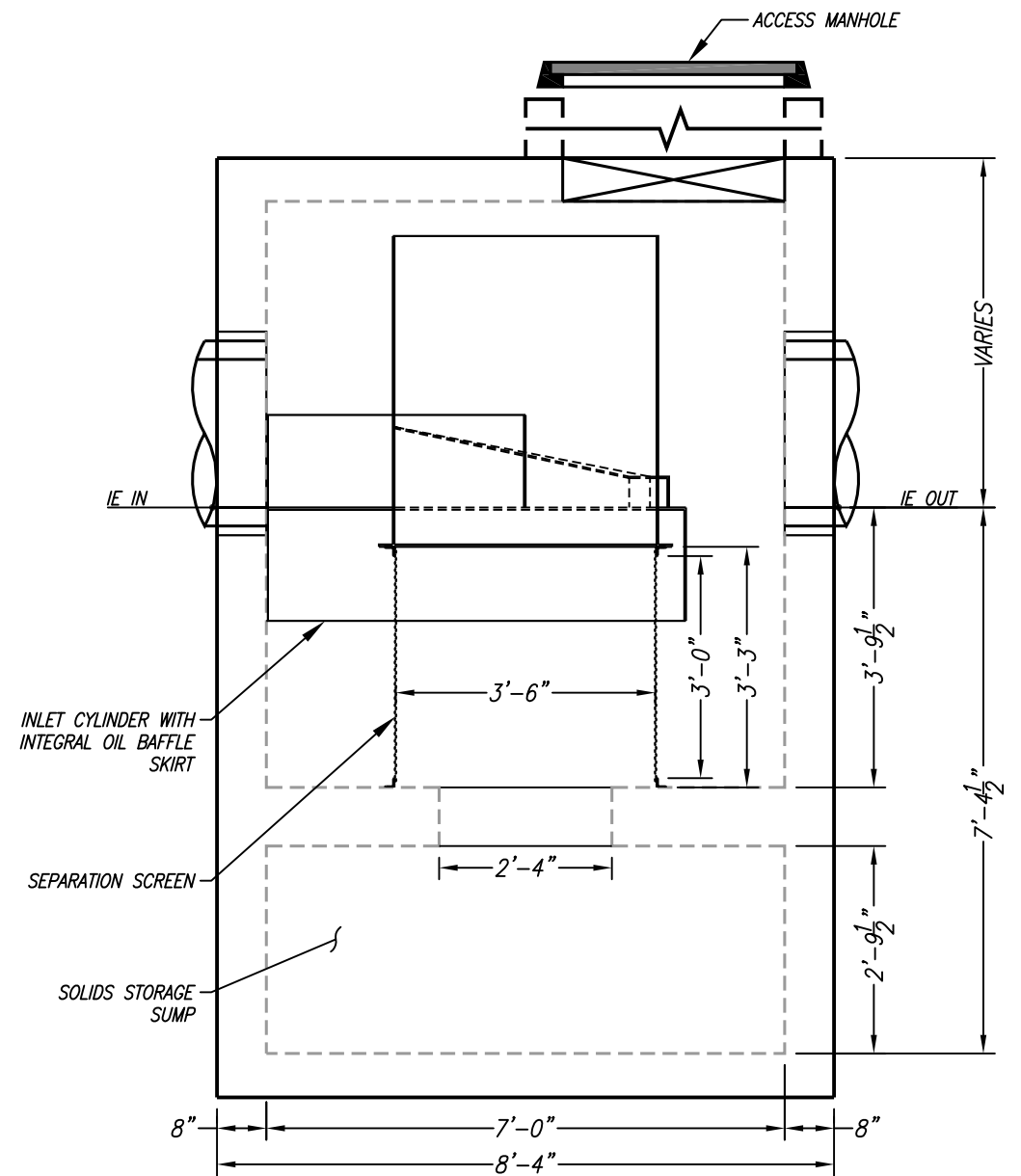
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PLAN VIEW
NTS



ELEVATION VIEW
NTS

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DSD-7-4236
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | | ø36" | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | | 4.4 | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | | 14.0 | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 7.00 | 38.47 | 2.00 | 76.93 |

TREATMENT NOTES

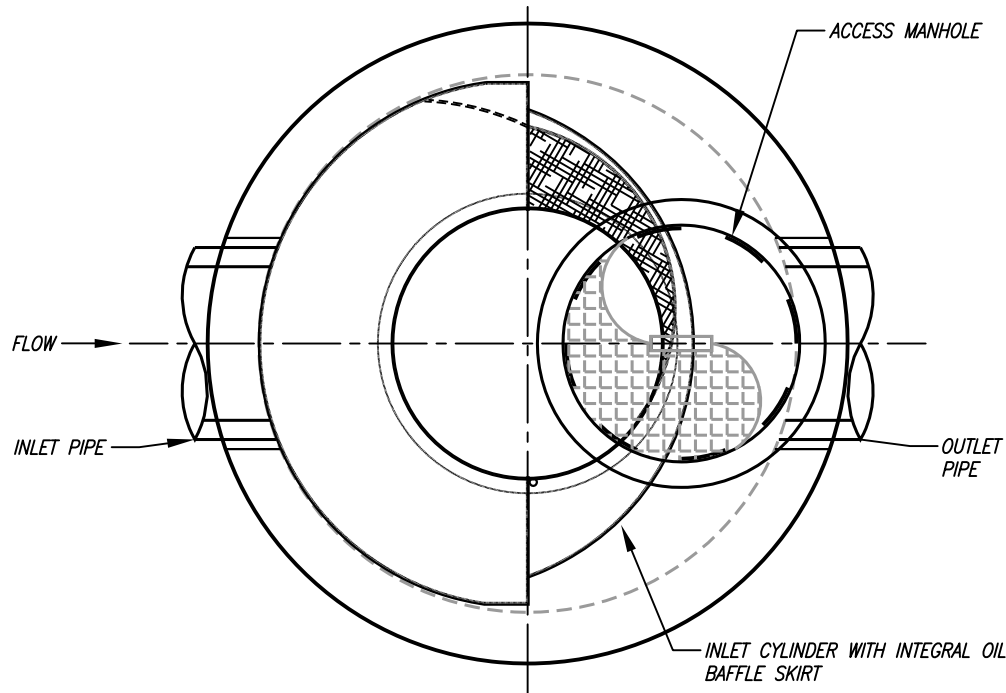
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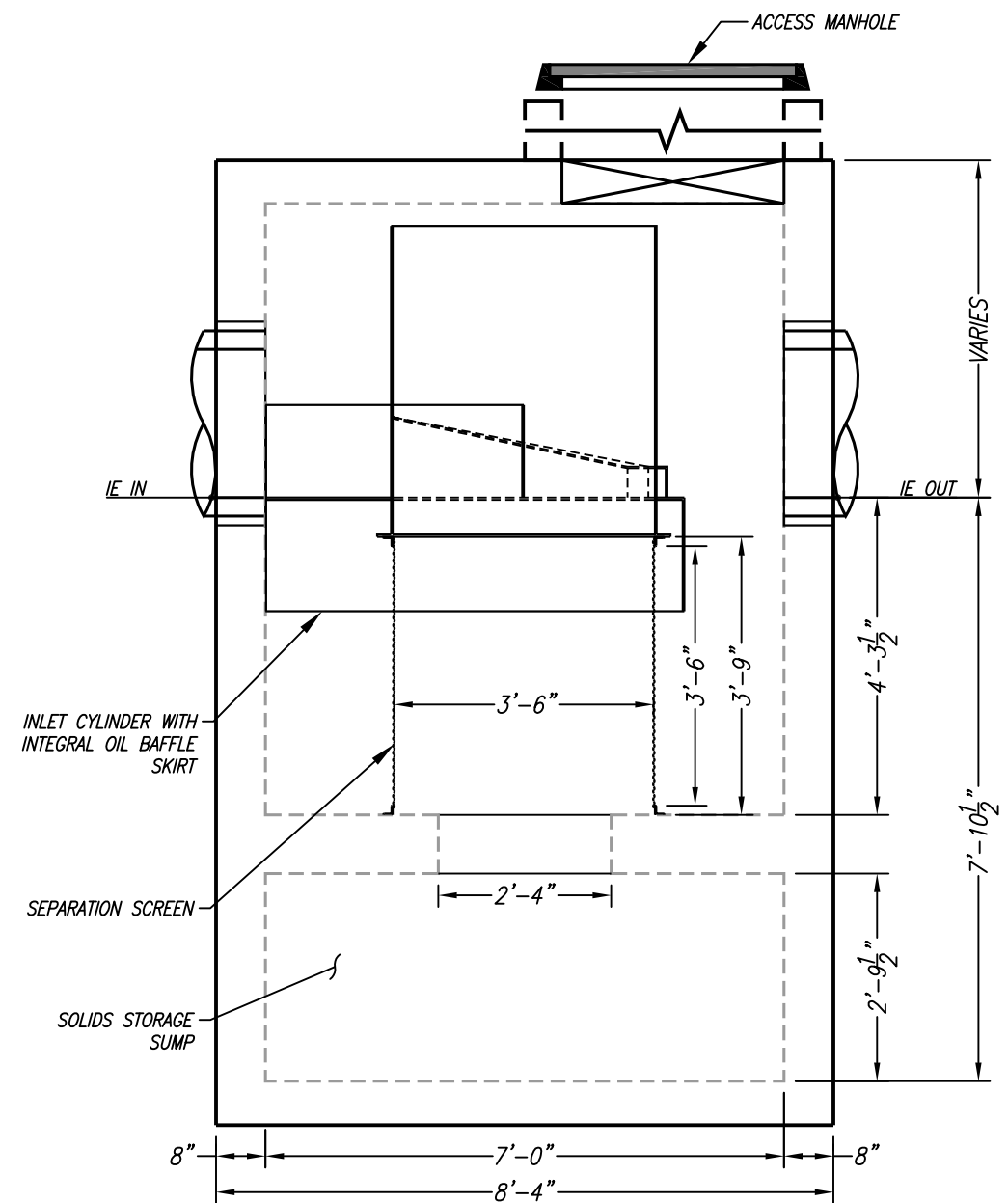
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2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
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PLAN VIEW
NTS



ELEVATION VIEW
NTS

PROPRIETARY AND CONFIDENTIAL:

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF BIO CLEAN ENVIRONMENTAL SERVICES, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF BIO CLEAN ENVIRONMENTAL SERVICES, INC. IS PROHIBITED.



DSD-7-4242
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | ø36" | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 5.5 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 14.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 7.00 | 38.47 | 2.00 | 76.93 |

TREATMENT NOTES

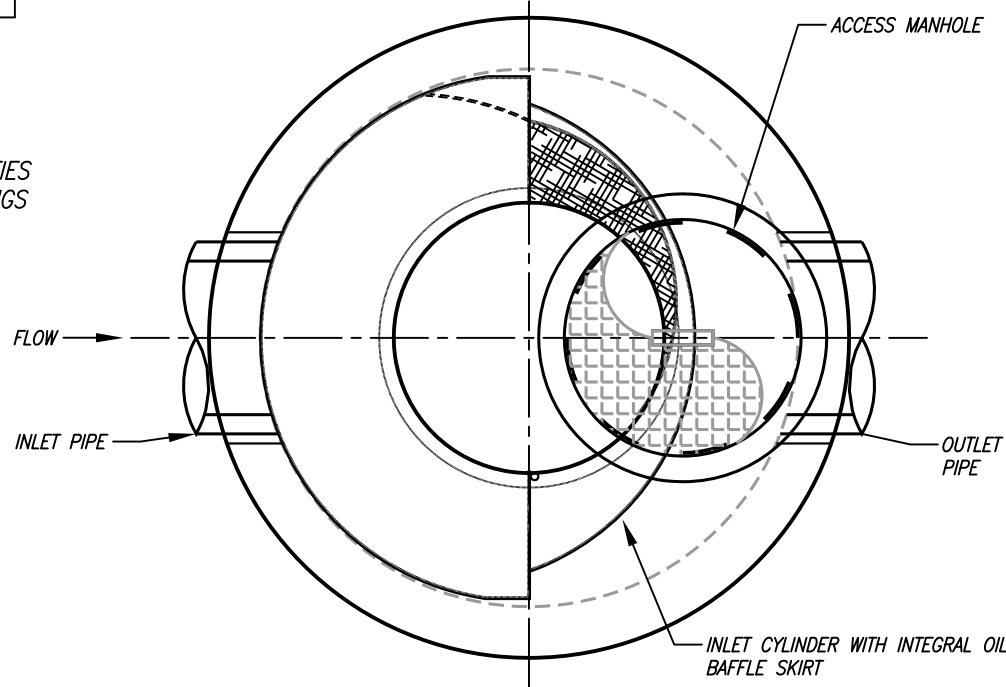
1. 100% CAPTURE OF TRASH & DEBRIS.
2. MEETS FULL CAPTURE REQUIREMENTS.
3. BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
4. CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.

GENERAL NOTES

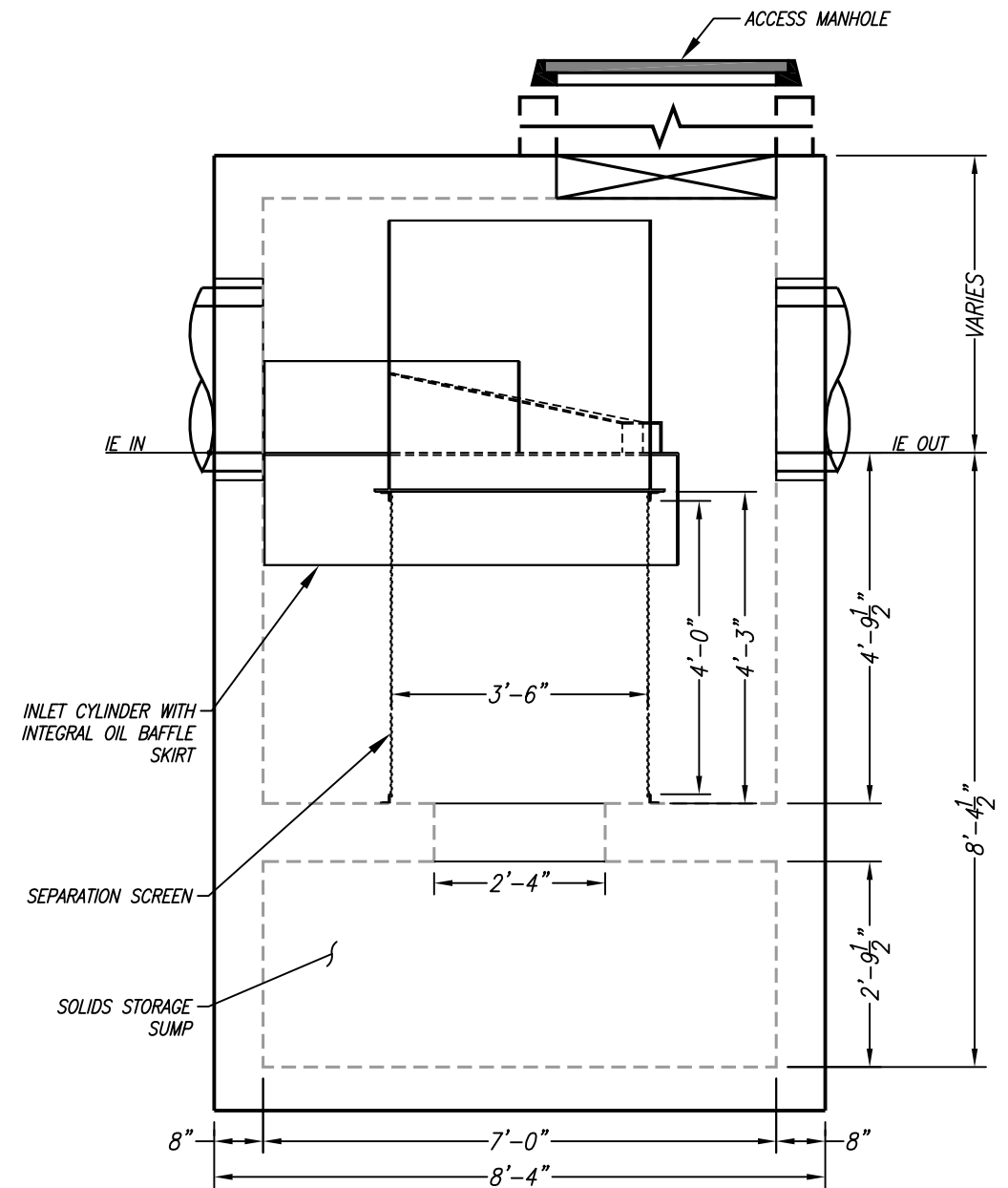
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PLAN VIEW
NTS



ELEVATION VIEW
NTS

PROPRIETARY AND CONFIDENTIAL:

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DSD-7-4248
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|----------------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | (2) $\phi 24"$ | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 4.5 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 20.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 8.00 | 50.24 | 2.00 | 100.48 |

TREATMENT NOTES

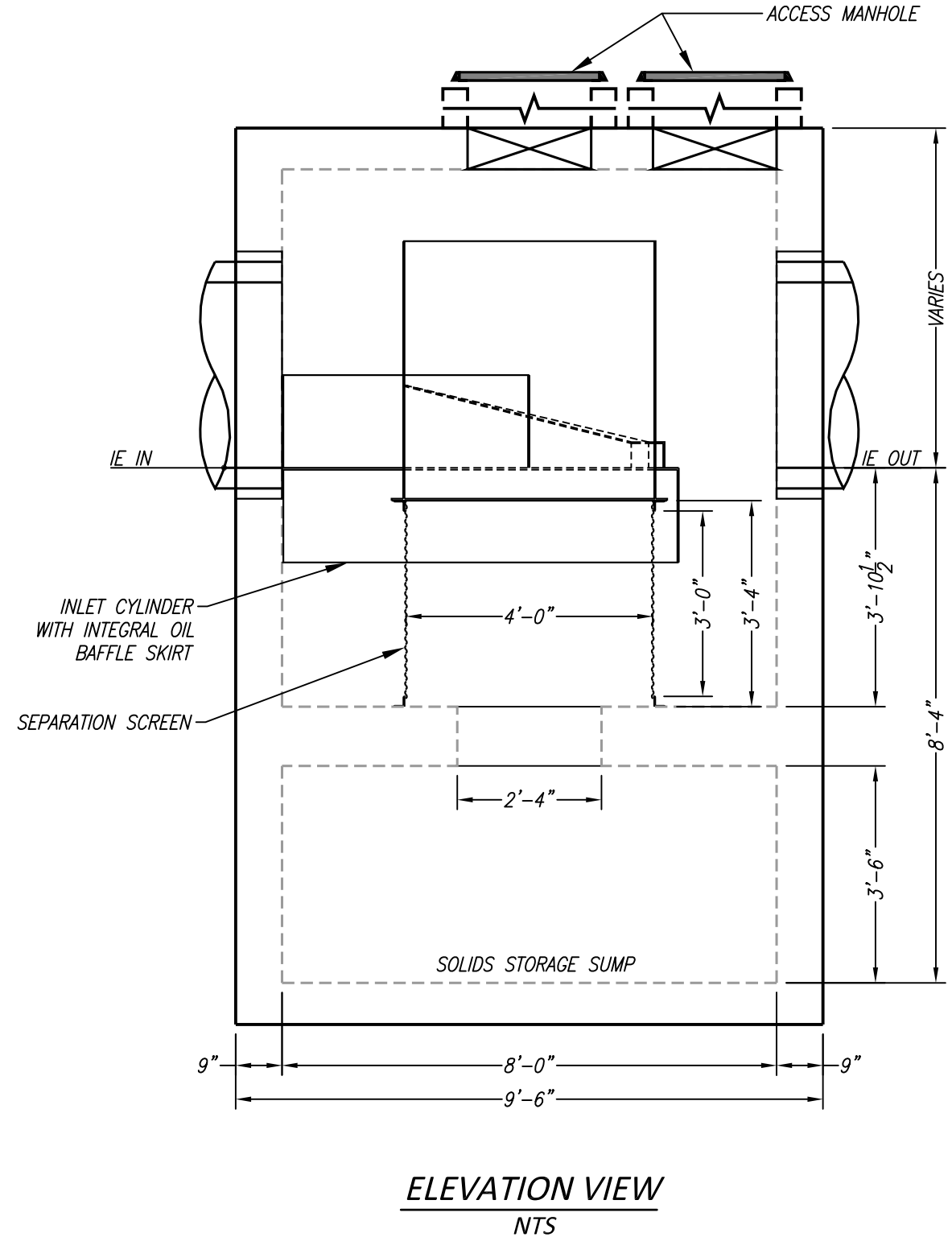
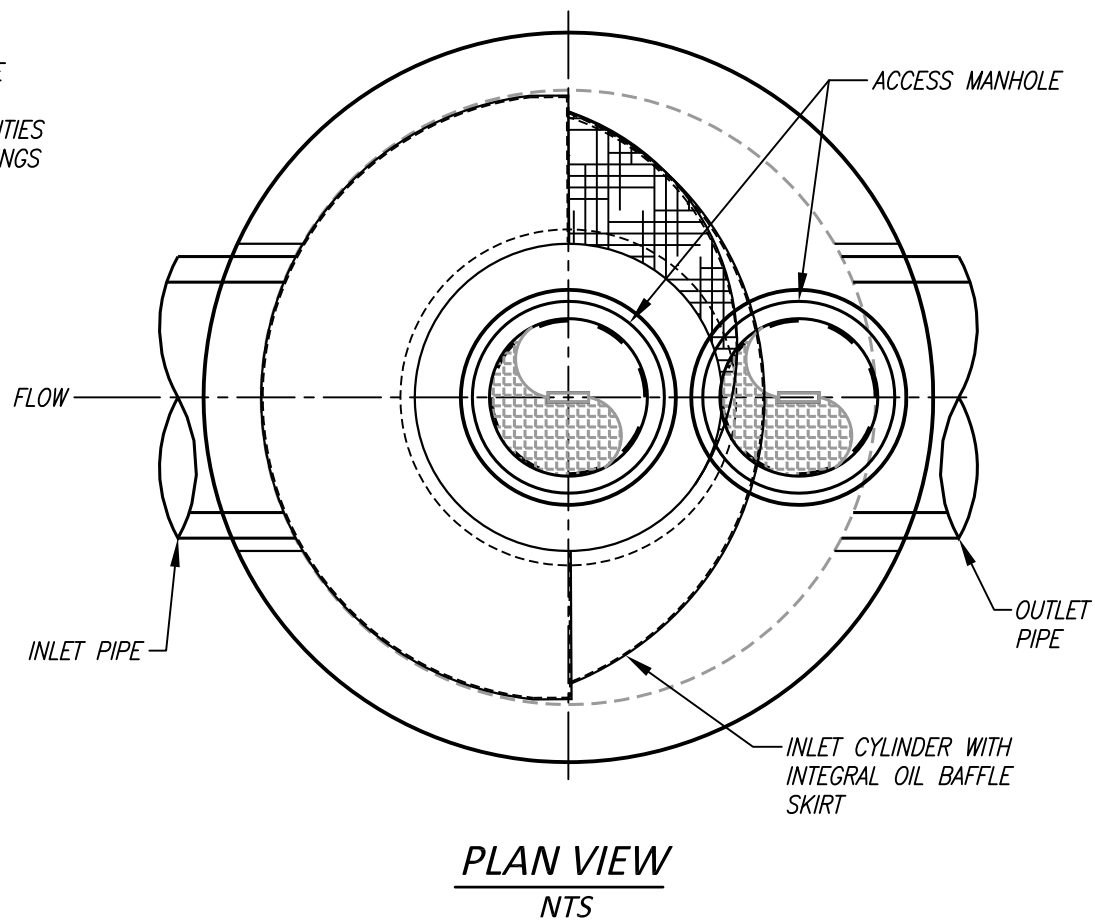
1. 100% CAPTURE OF TRASH & DEBRIS.
2. MEETS FULL CAPTURE REQUIREMENTS.
3. BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
4. CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.

GENERAL NOTES

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DSD-8-4836
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|----------------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | (2) $\phi 24"$ | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 6.0 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 24.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 8.00 | 50.24 | 2.00 | 100.48 |

TREATMENT NOTES

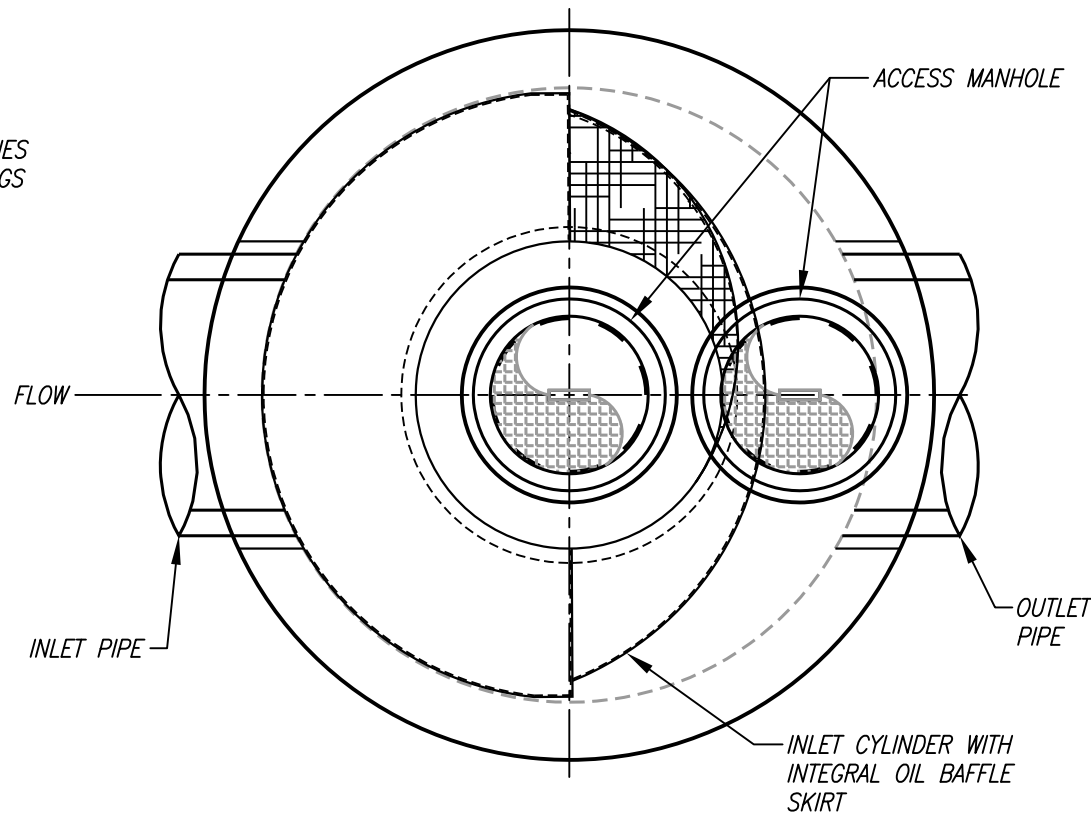
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GENERAL NOTES

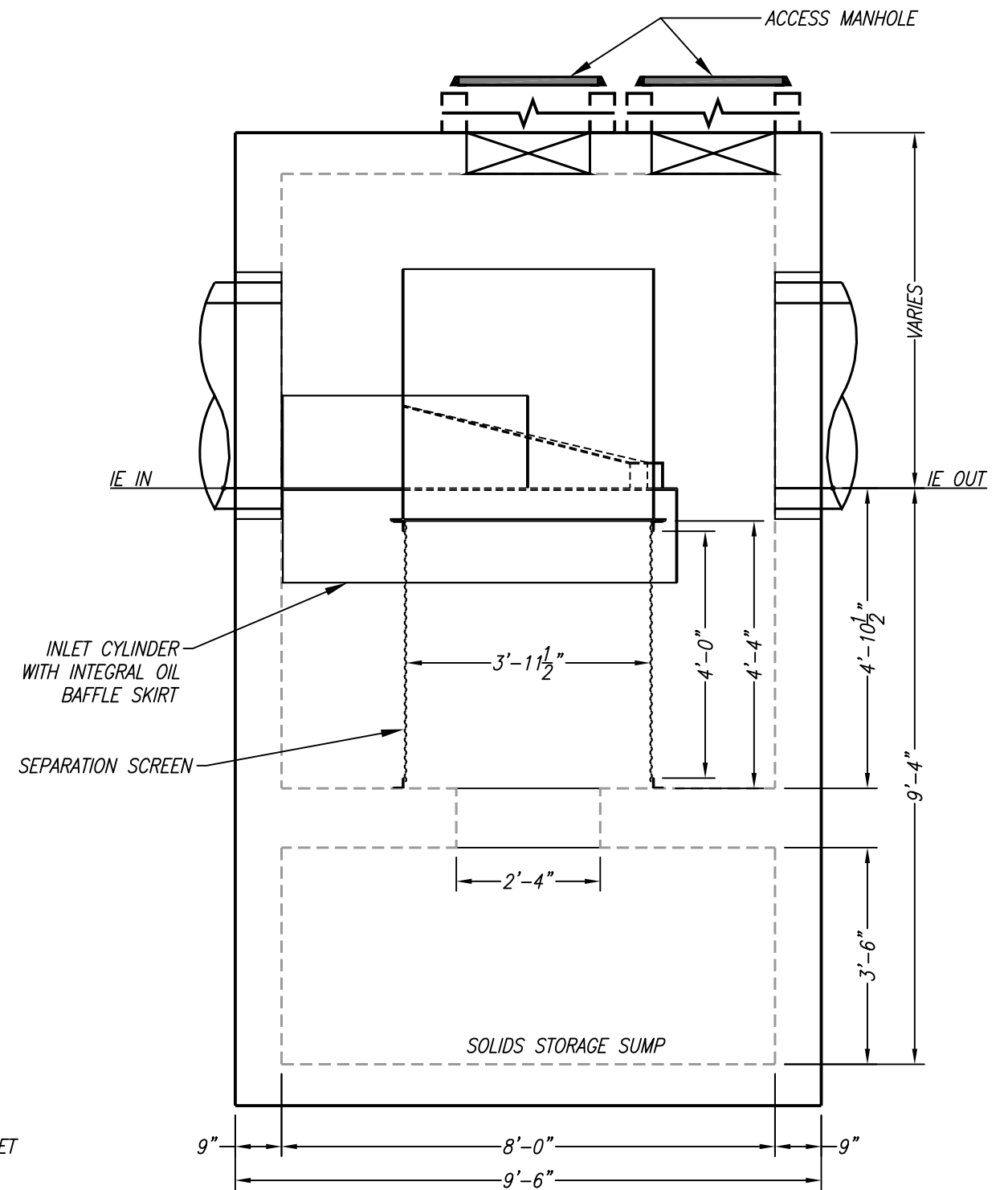
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PLAN VIEW
NTS



ELEVATION VIEW
NTS

PROPRIETARY AND CONFIDENTIAL:

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DSD-8-4848
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

1/1/2008/MTW

| SITE SPECIFIC DATA* | | | |
|-------------------------------|----------------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | (2) $\phi 24"$ | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

GENERAL NOTES

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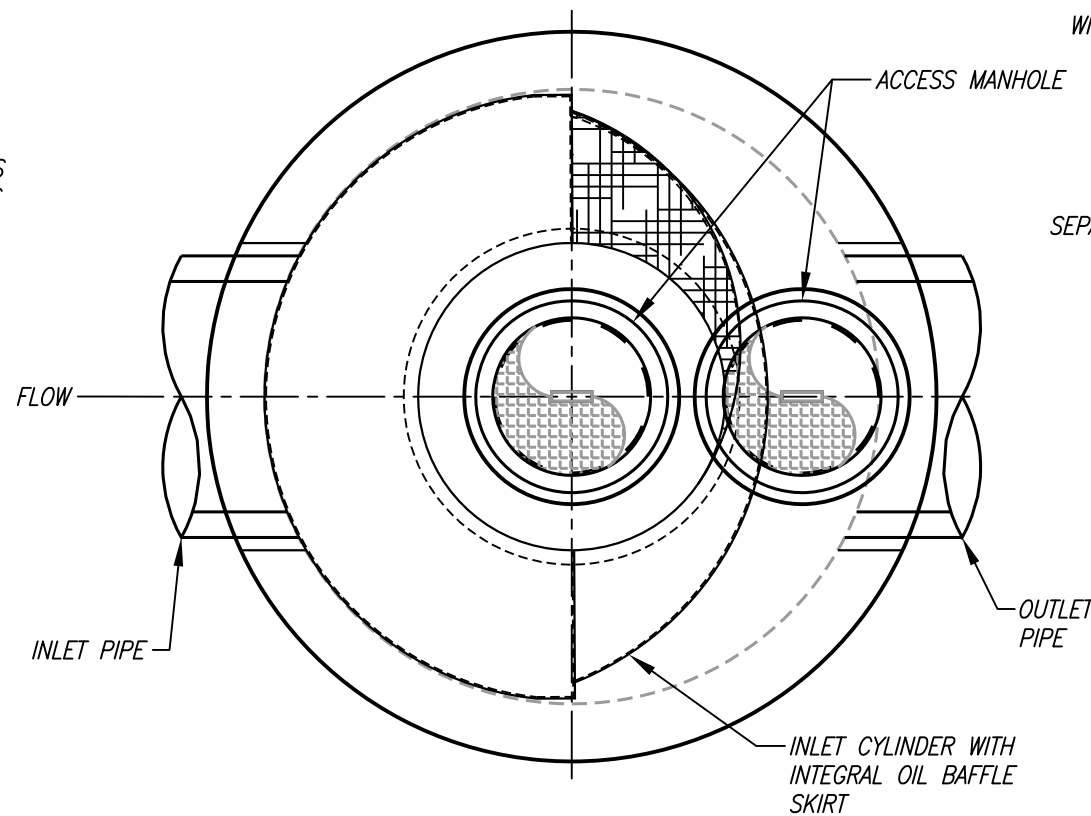
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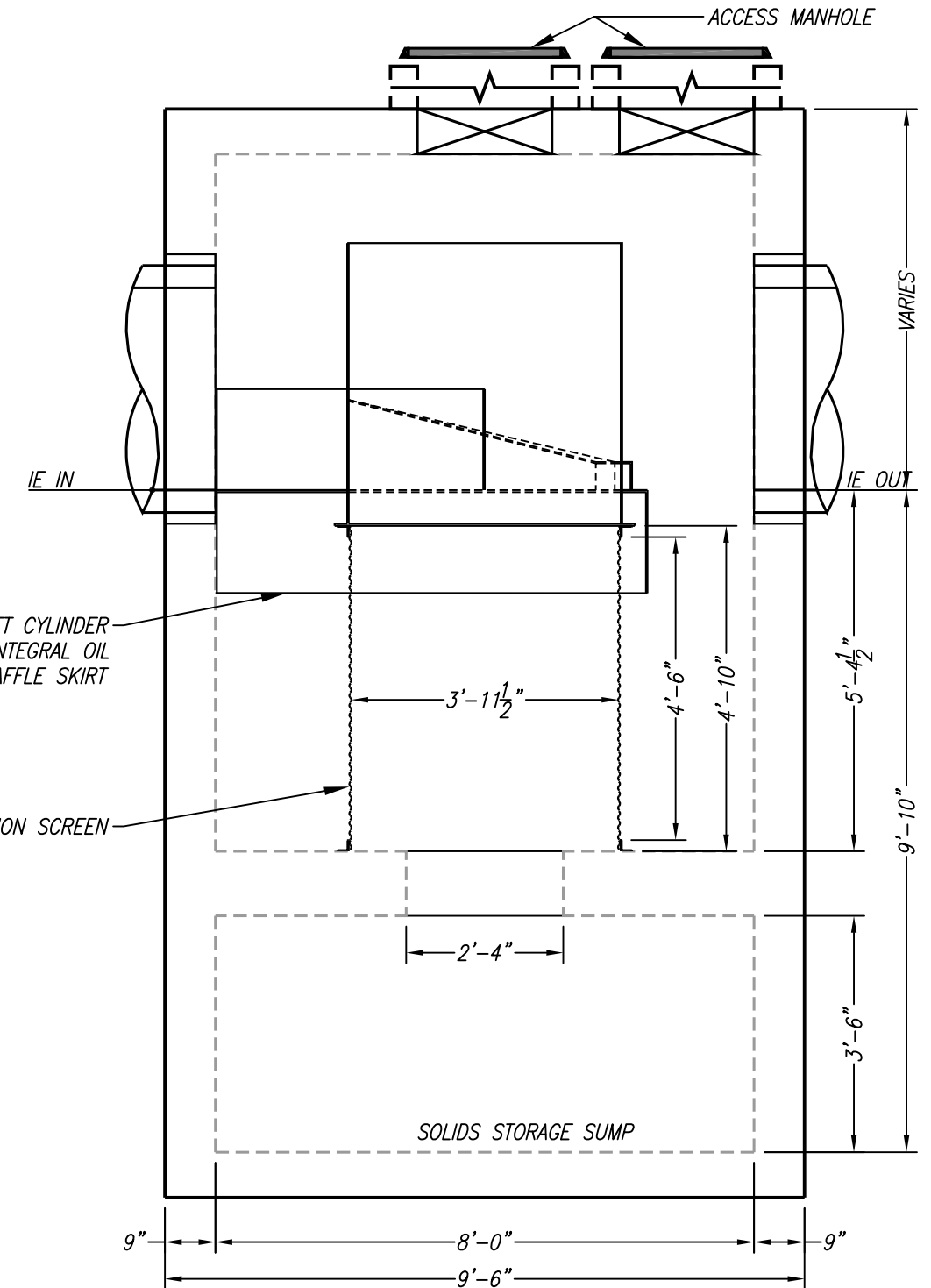
| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 7.5 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 30.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 8.00 | 50.24 | 2.00 | 100.48 |

TREATMENT NOTES

- 100% CAPTURE OF TRASH & DEBRIS.
- MEETS FULL CAPTURE REQUIREMENTS.
- BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
- CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.



PLAN VIEW
NTS



ELEVATION VIEW
NTS

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Bio Clean
A Forterra Company

DSD-8-4854
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|-------------------------------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | (2) $\phi 24"$ (1) $\phi 30"$ | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 9.0 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 50.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 10.00 | 78.50 | 2.00 | 157.00 |

TREATMENT NOTES

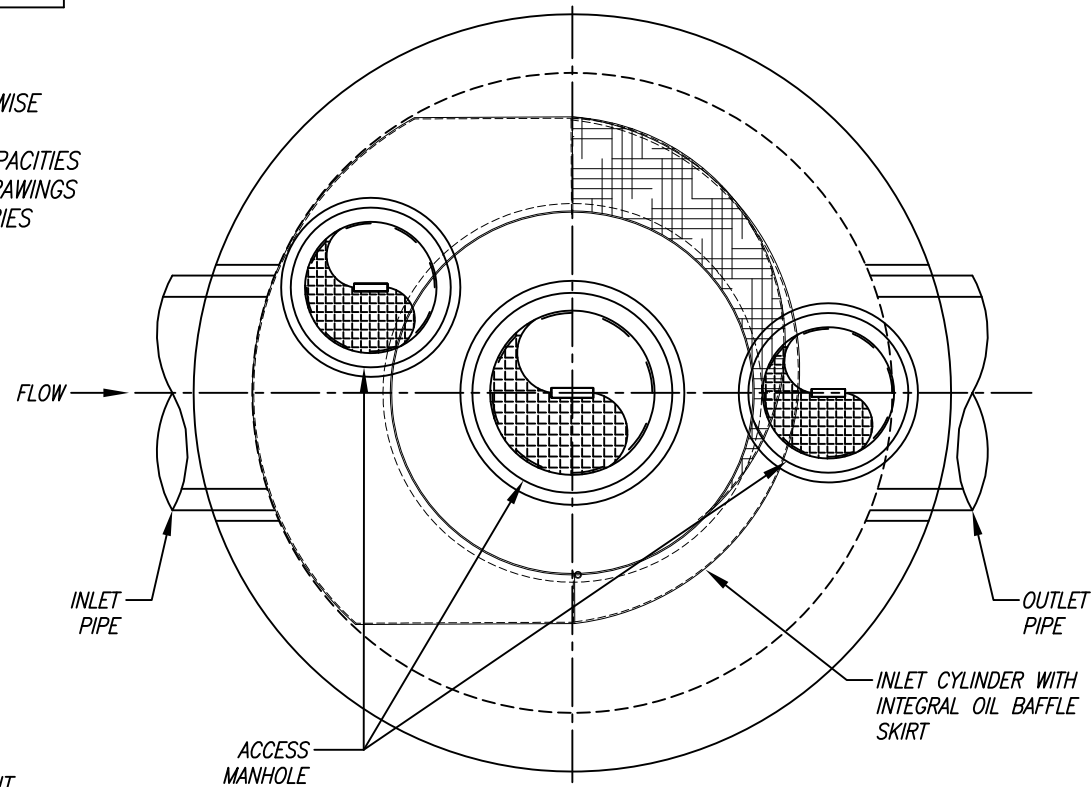
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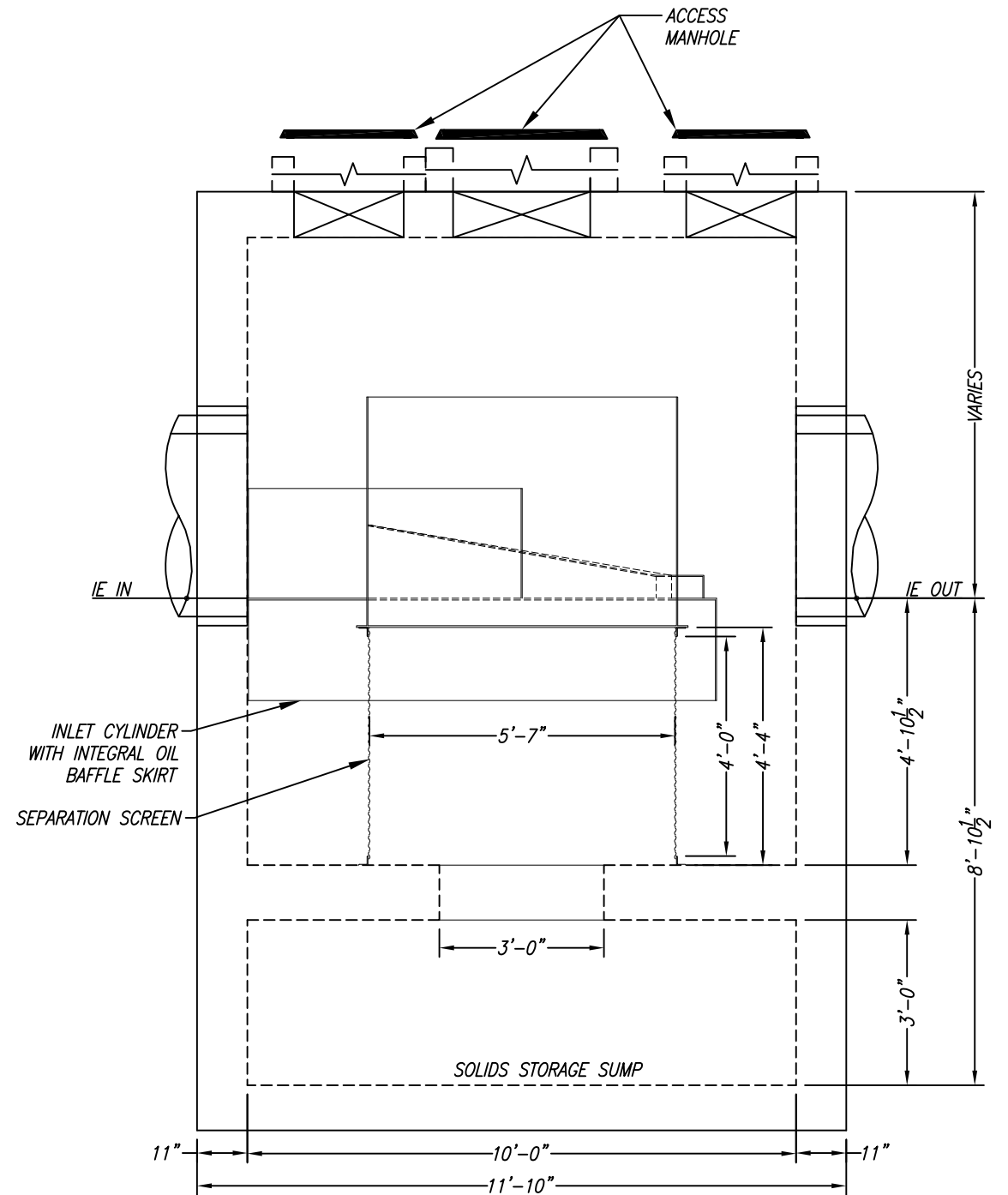
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PLAN VIEW
NTS



ELEVATION VIEW
NTS

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DSD-10-6748
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|-------------------------------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | (2) $\phi 24"$ (1) $\phi 30"$ | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 11.0 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 50.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 10.00 | 78.50 | 2.00 | 157.00 |

TREATMENT NOTES

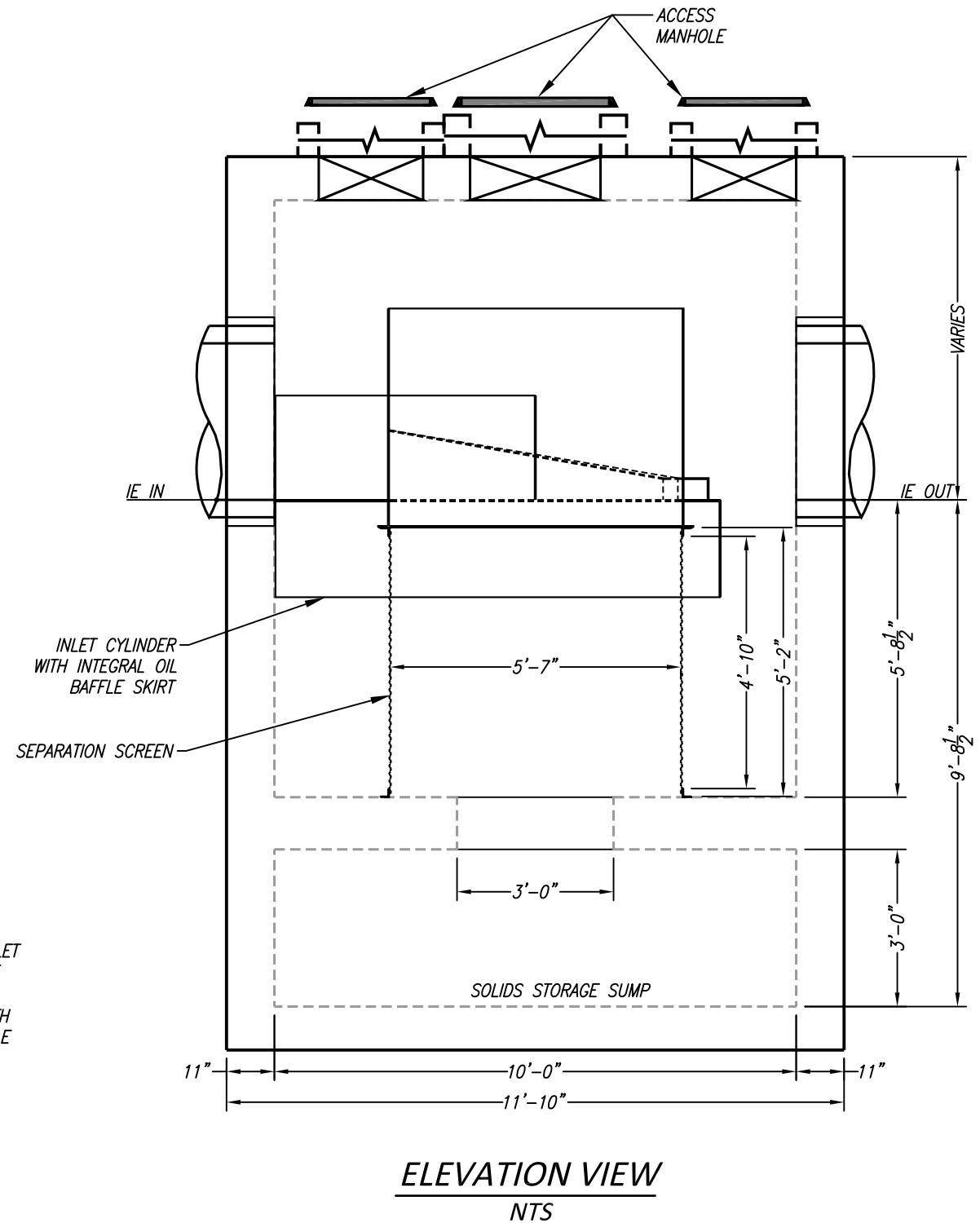
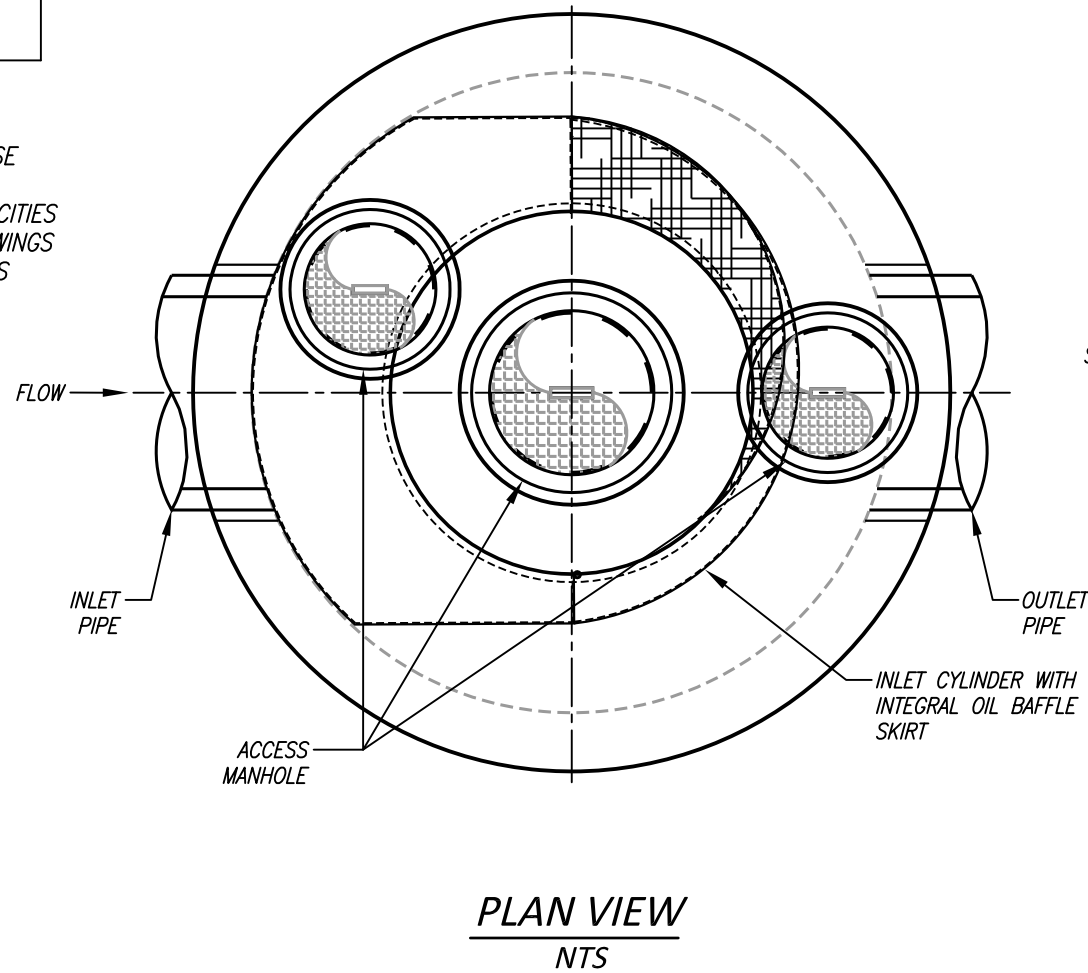
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3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. ALL GAPS AROUND PIPES SHALL BE SEALED WATERTIGHT WITH A NON-SHRINK GROUT PER MANUFACTURER'S STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.



PROPRIETARY AND CONFIDENTIAL:

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF BIO CLEAN ENVIRONMENTAL SERVICES, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF BIO CLEAN ENVIRONMENTAL SERVICES, INC. IS PROHIBITED.



DSD-10-6758
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

1/1/19 DSW/WH

| SITE SPECIFIC DATA* | | | |
|-------------------------------|-------------------------------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | (2) $\phi 24"$ (1) $\phi 30"$ | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 14.0 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 50.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 10.00 | 78.50 | 2.00 | 157.00 |

TREATMENT NOTES

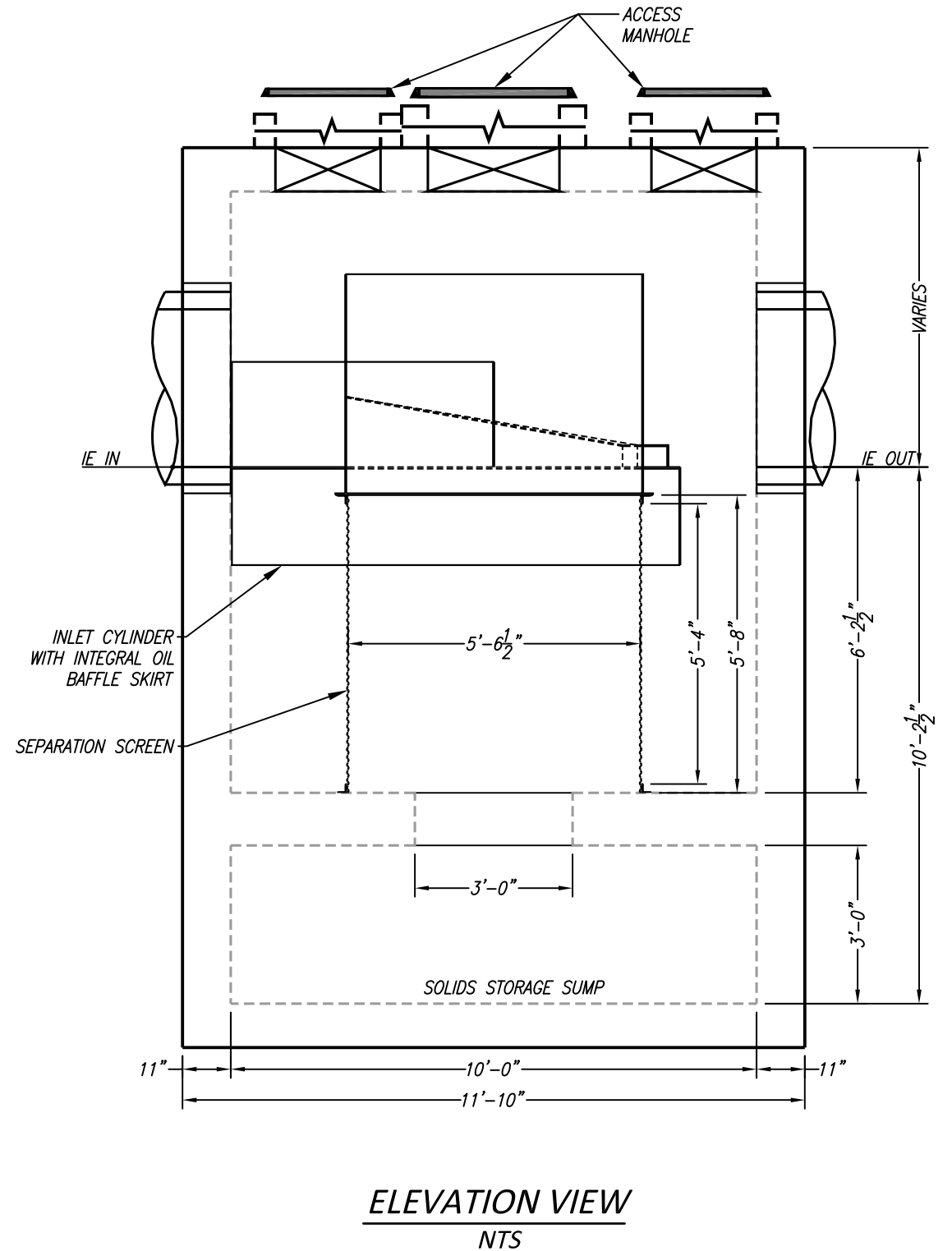
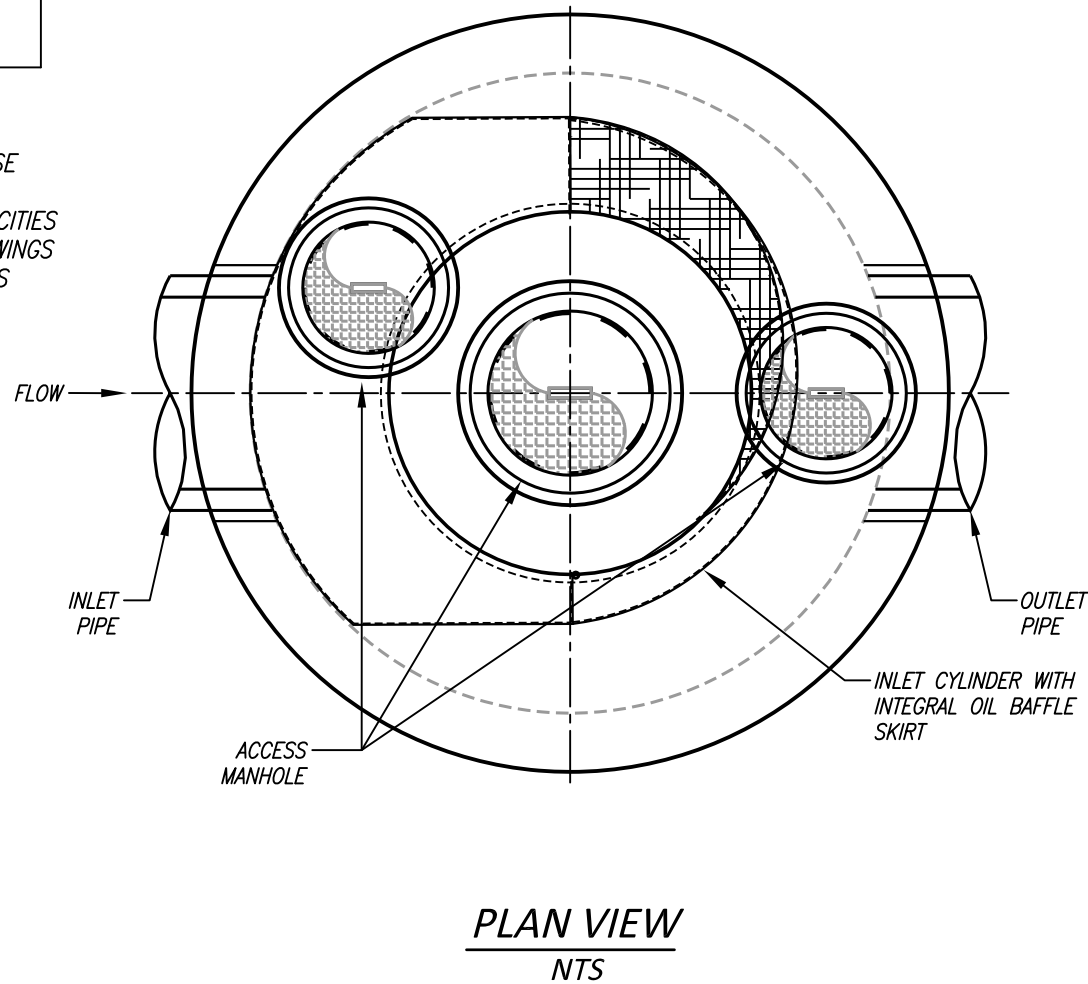
1. 100% CAPTURE OF TRASH & DEBRIS.
2. MEETS FULL CAPTURE REQUIREMENTS.
3. BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
4. CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.

GENERAL NOTES

1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
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3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. ALL GAPS AROUND PIPES SHALL BE SEALED WATERTIGHT WITH A NON-SHRINK GROUT PER MANUFACTURER'S STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.



PROPRIETARY AND CONFIDENTIAL:

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DSD-10-6764
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

1/11/2016 10:58:17 AM

| SITE SPECIFIC DATA* | | | |
|-------------------------------|-------------------------------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | (2) $\phi 24"$ (1) $\phi 30"$ | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 15.0 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 50.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 10.00 | 78.50 | 2.00 | 157.00 |

TREATMENT NOTES

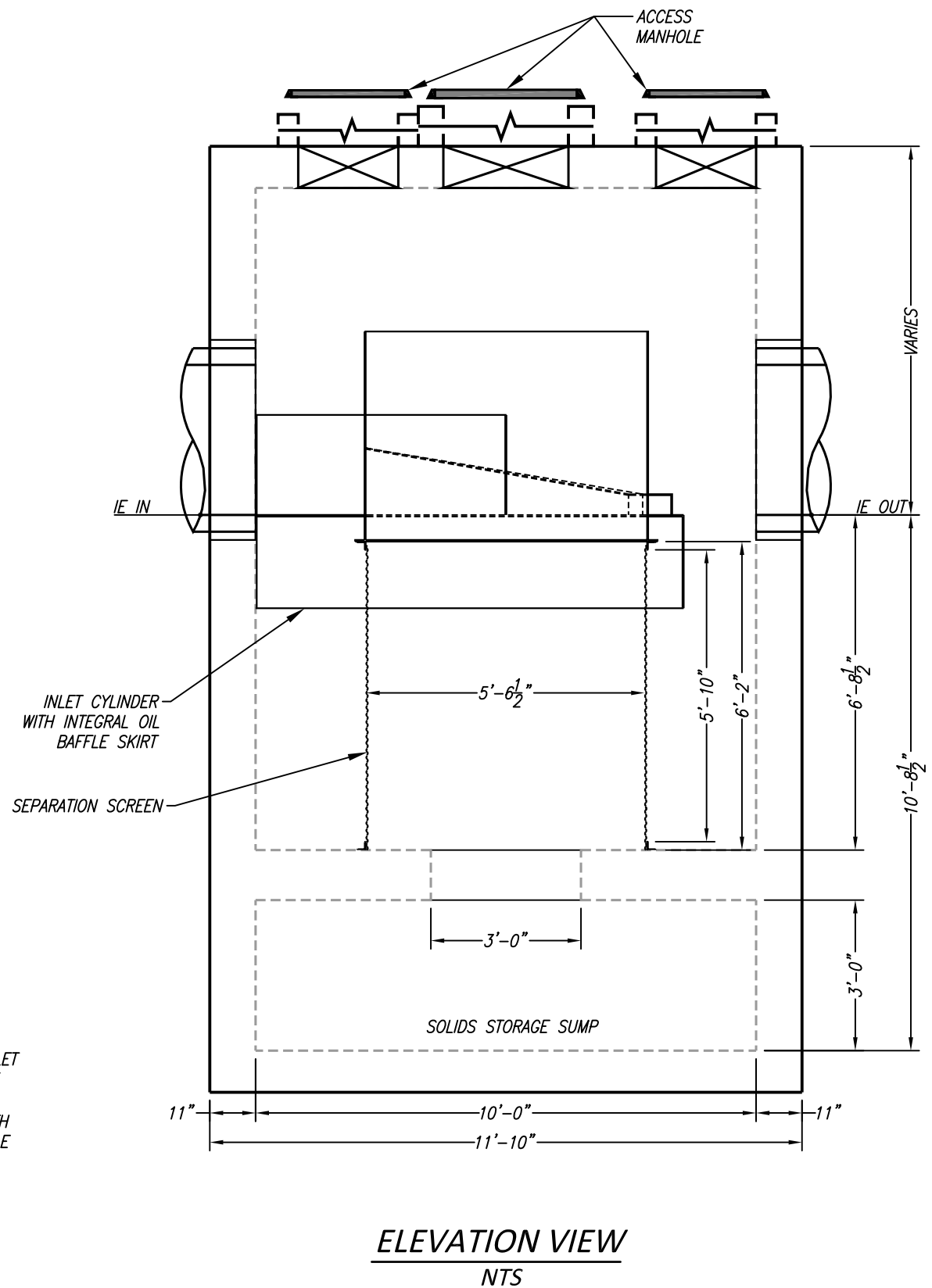
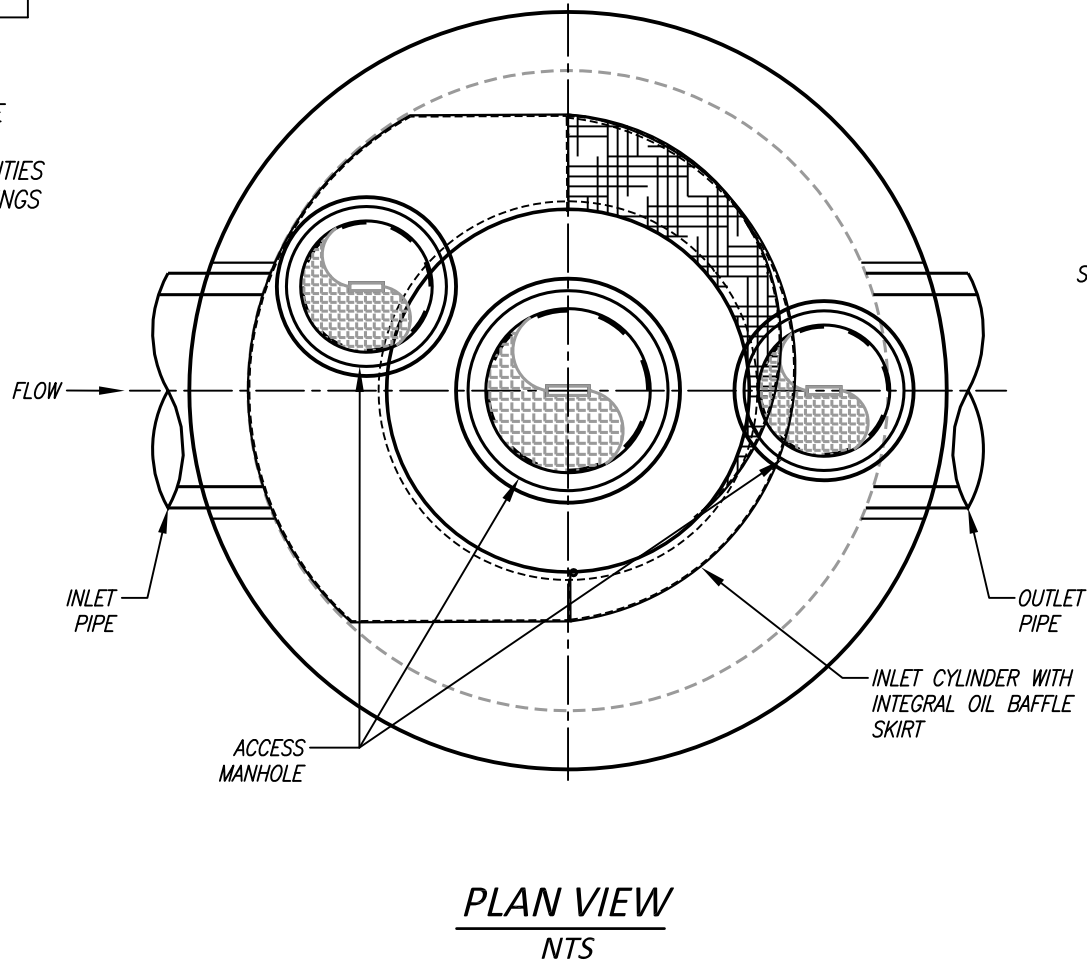
1. 100% CAPTURE OF TRASH & DEBRIS.
2. MEETS FULL CAPTURE REQUIREMENTS.
3. BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
4. CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.

GENERAL NOTES

1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

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DSD-10-6770
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

1/13/19 DSW/WH

| SITE SPECIFIC DATA* | | | |
|-------------------------------|-------------------------------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | (2) $\phi 24"$ (1) $\phi 30"$ | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 19.0 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 50.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 10.00 | 78.50 | 2.00 | 157.00 |

TREATMENT NOTES

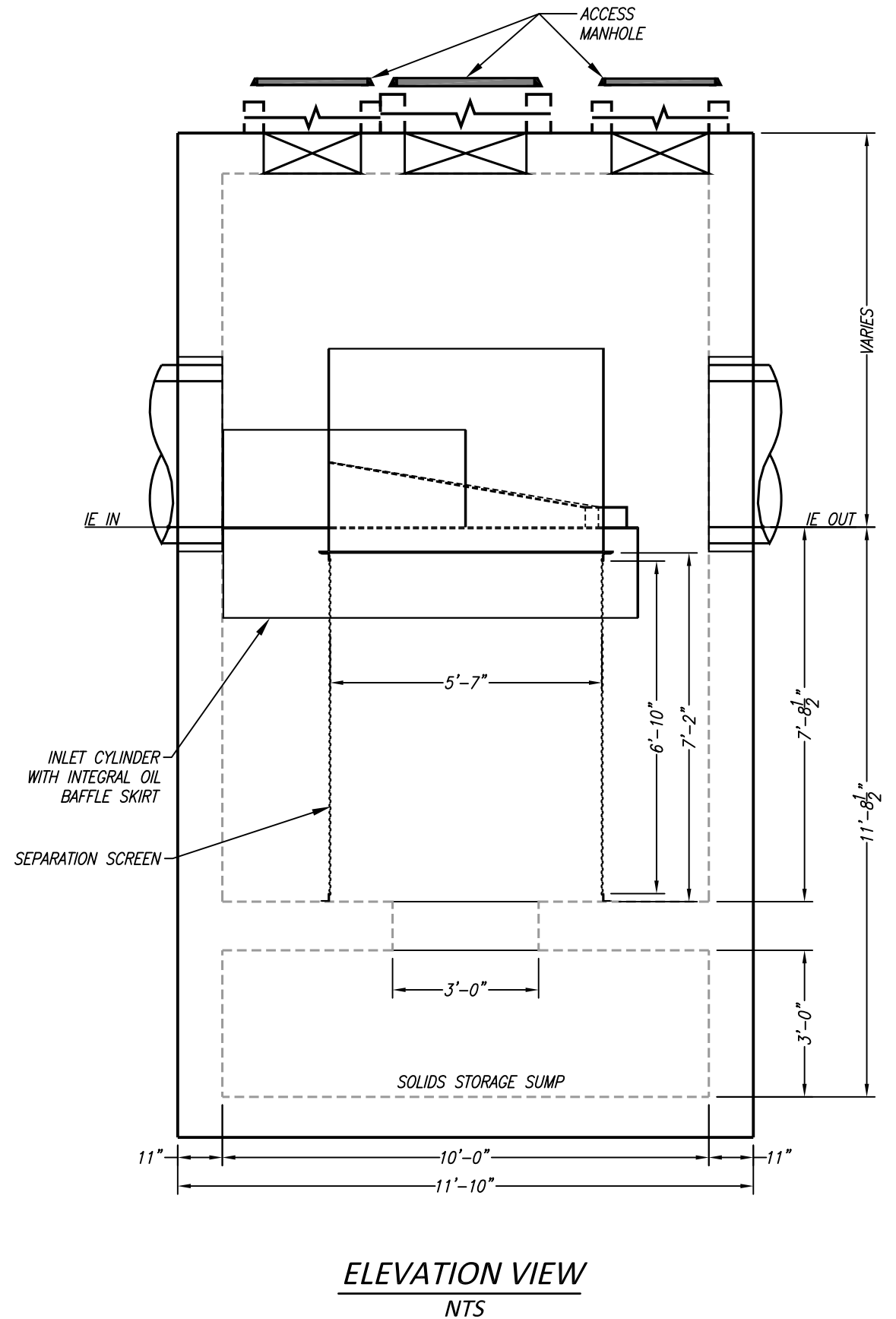
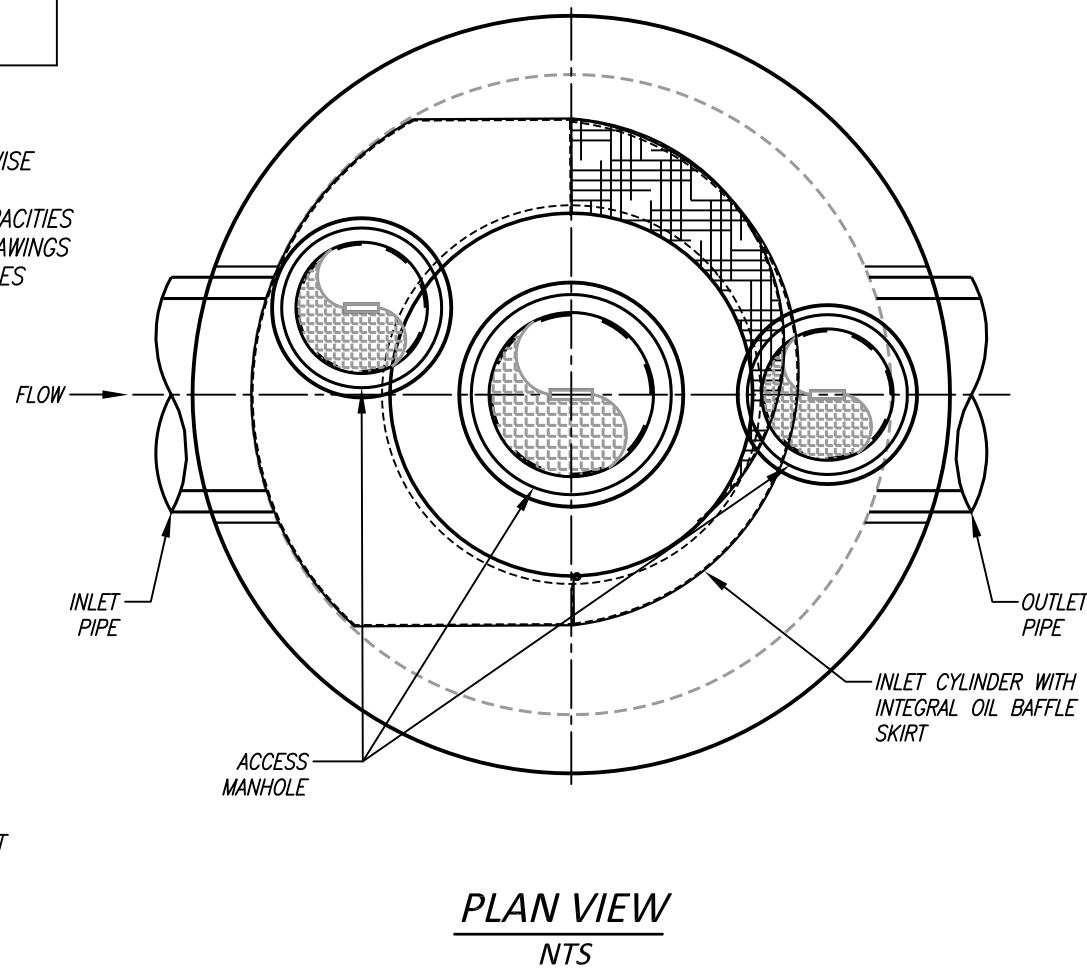
1. 100% CAPTURE OF TRASH & DEBRIS.
2. MEETS FULL CAPTURE REQUIREMENTS.
3. BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
4. CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.

GENERAL NOTES

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DSD-10-6782
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|-------------------------------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | (2) $\phi 24"$ (1) $\phi 30"$ | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 25.0 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 50.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 10.00 | 78.50 | 2.00 | 157.00 |

TREATMENT NOTES

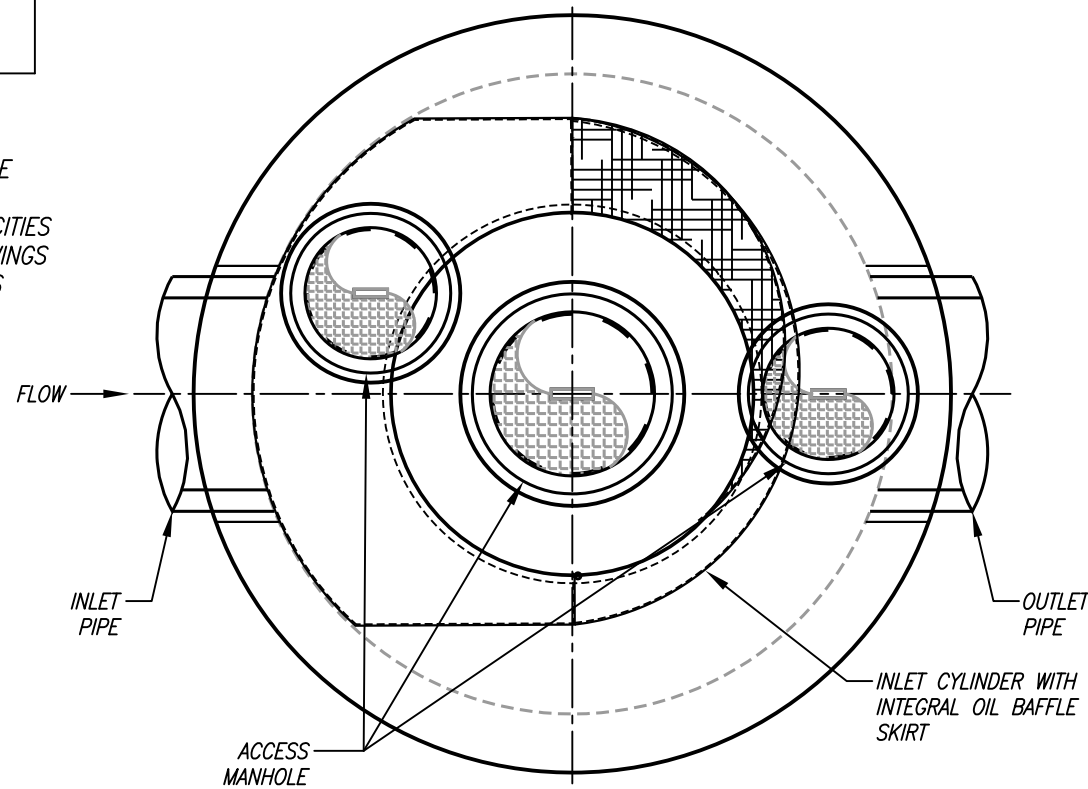
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4. CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.

GENERAL NOTES

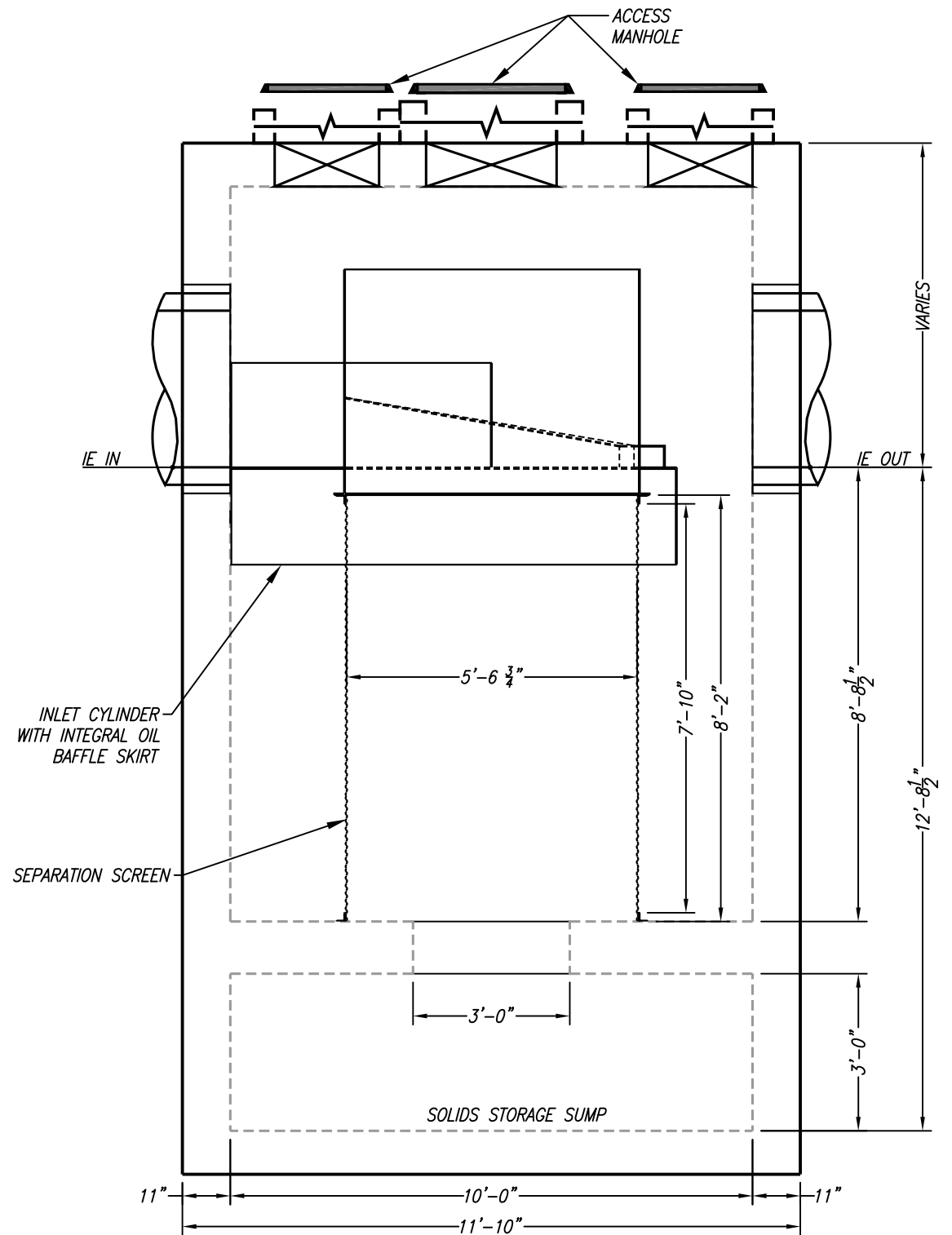
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3. ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

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PLAN VIEW
NTS



ELEVATION VIEW
NTS

PROPRIETARY AND CONFIDENTIAL:

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DSD-10-6794
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

1/13/19 DSW/WH

| SITE SPECIFIC DATA* | | | |
|-------------------------------|----------------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | (3) $\phi 30"$ | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 25.0 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 50.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 12.00 | 113.04 | 2.00 | 226.08 |

TREATMENT NOTES

- 100% CAPTURE OF TRASH & DEBRIS.
- MEETS FULL CAPTURE REQUIREMENTS.
- BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
- CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.

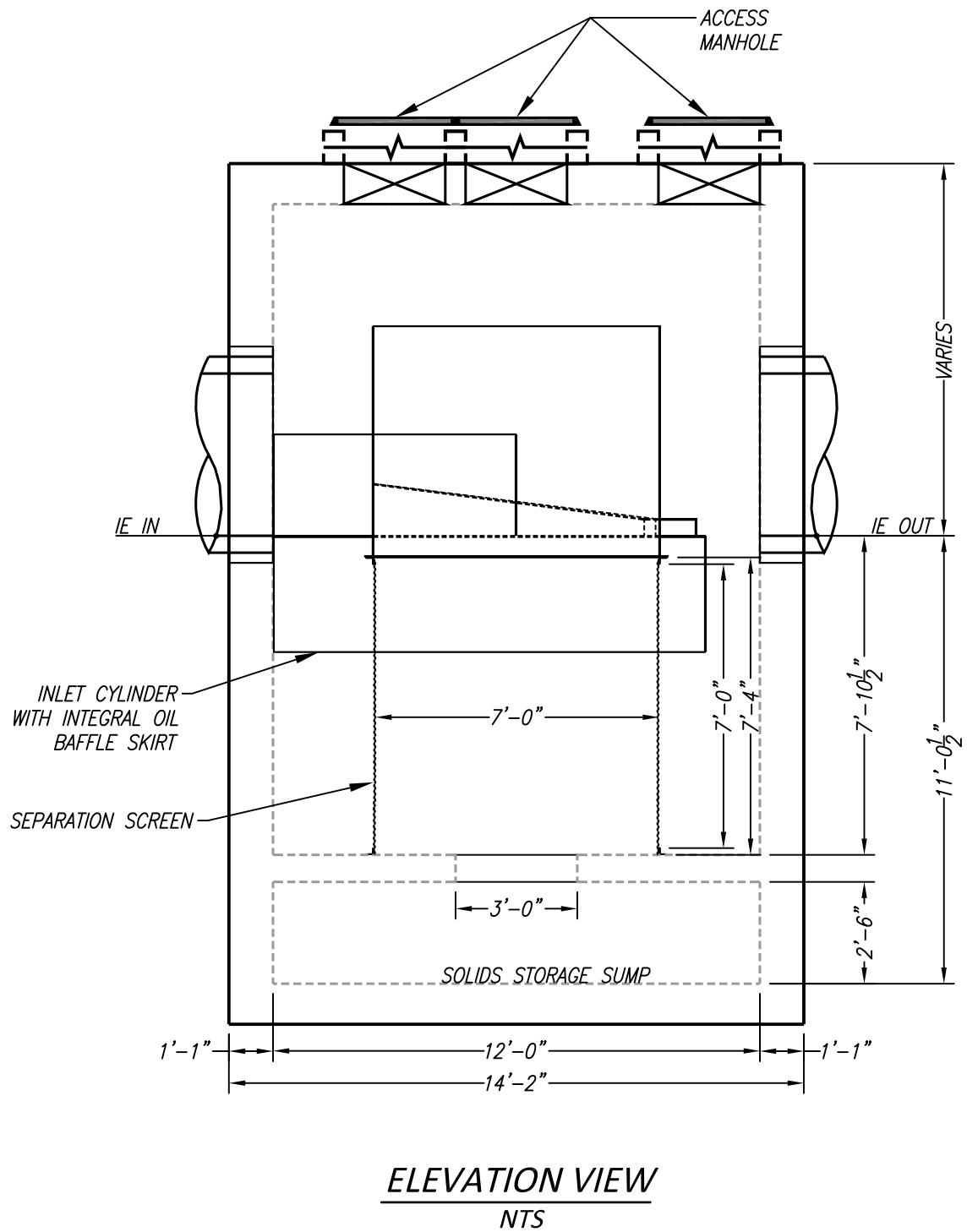
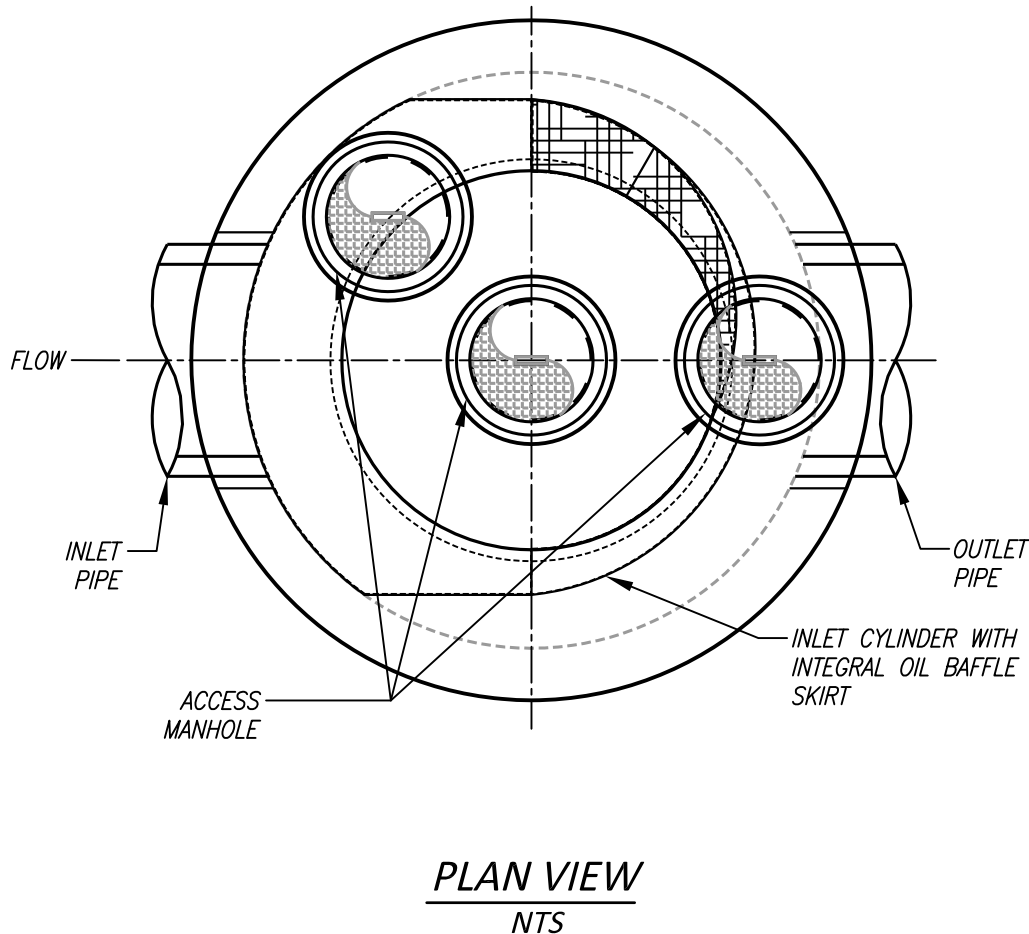
THIS UNIT REQUIRES SPECIAL SHIPPING CONSIDERATION

GENERAL NOTES

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INSTALLATION NOTES

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DSD-12-8484
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|----------------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | (3) $\phi 30"$ | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 26.0 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 50.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 12.00 | 113.04 | 2.00 | 226.08 |

TREATMENT NOTES

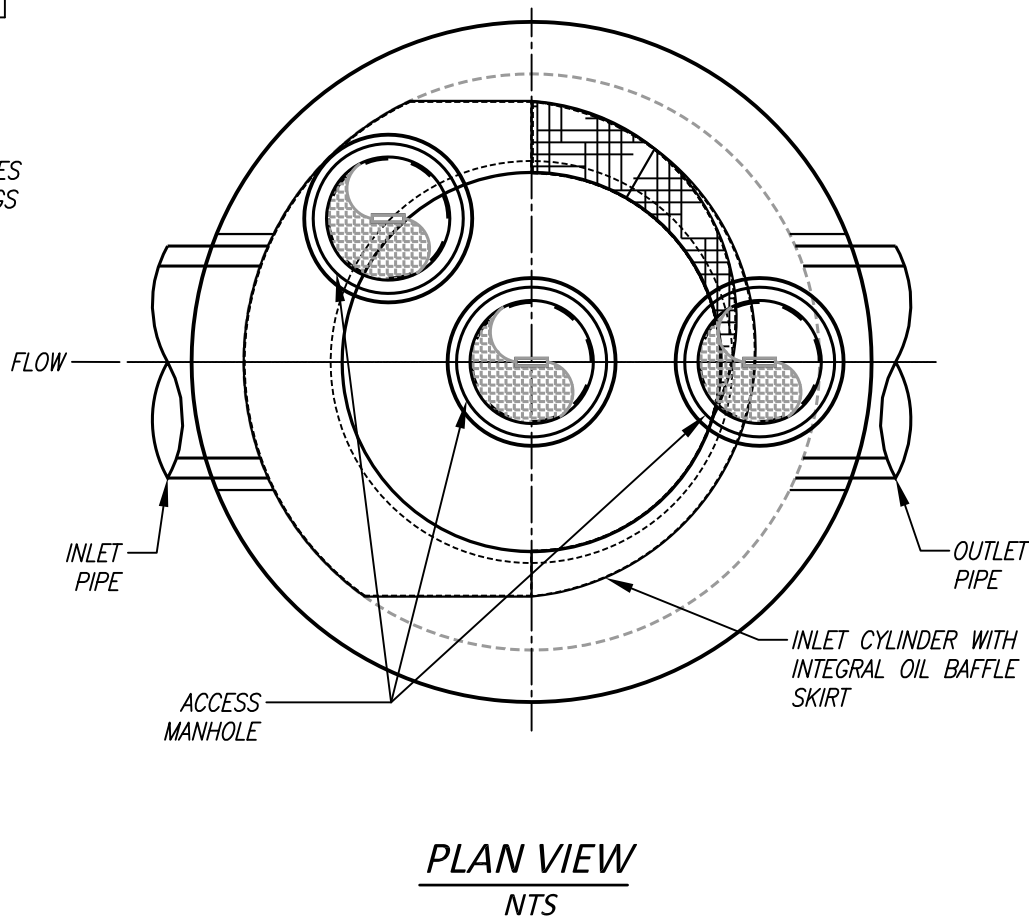
1. 100% CAPTURE OF TRASH & DEBRIS.
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GENERAL NOTES

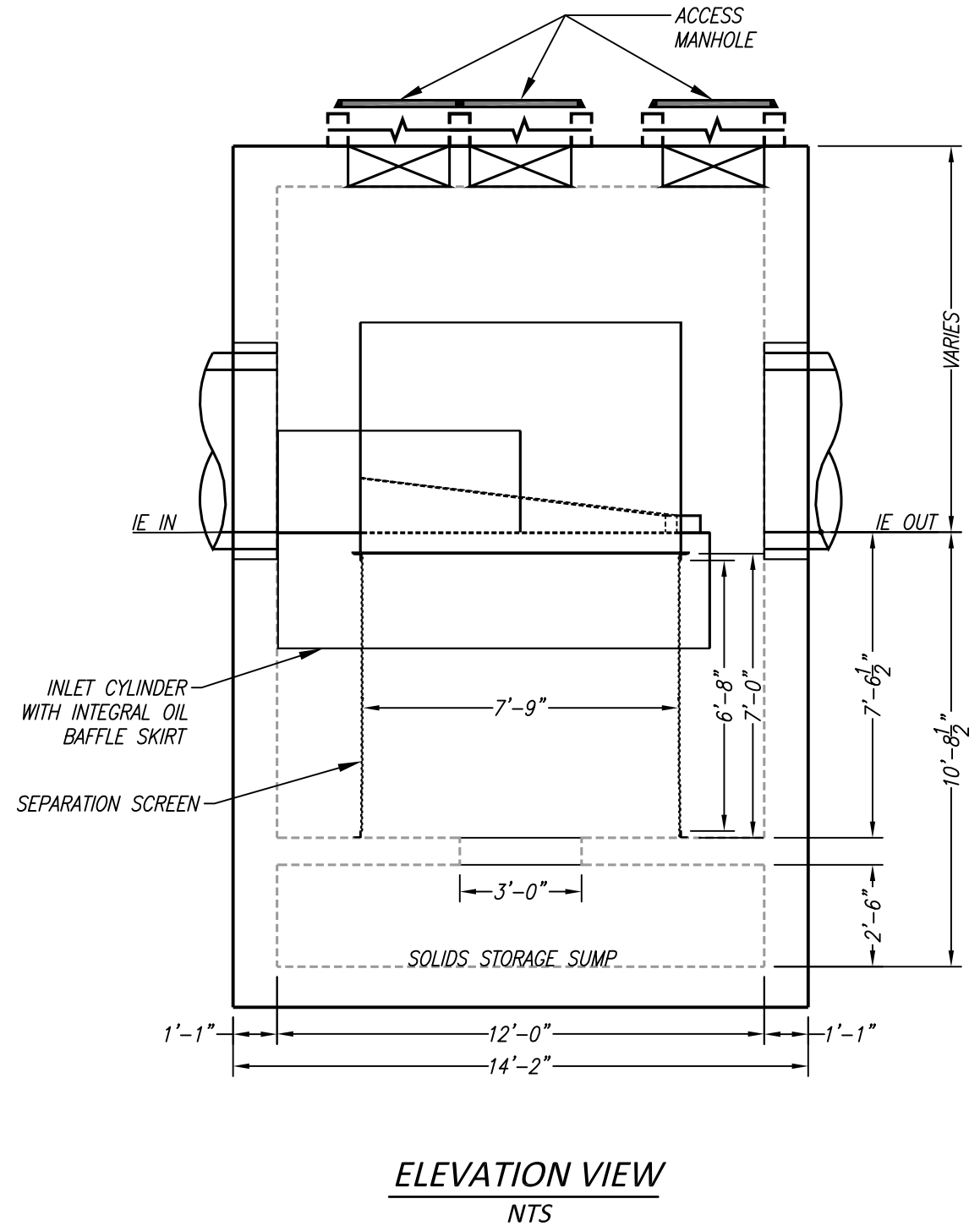
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THIS UNIT REQUIRES SPECIAL SHIPPING CONSIDERATION



PROPRIETARY AND CONFIDENTIAL:

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DSD-12-9480
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

| SITE SPECIFIC DATA* | | | |
|-------------------------------|----------------|----------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | (3) $\phi 30"$ | | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | 38.0 | | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | 50.0 | | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 12.00 | 113.04 | 2.00 | 226.08 |

TREATMENT NOTES

1. 100% CAPTURE OF TRASH & DEBRIS.
2. MEETS FULL CAPTURE REQUIREMENTS.
3. BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
4. CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.

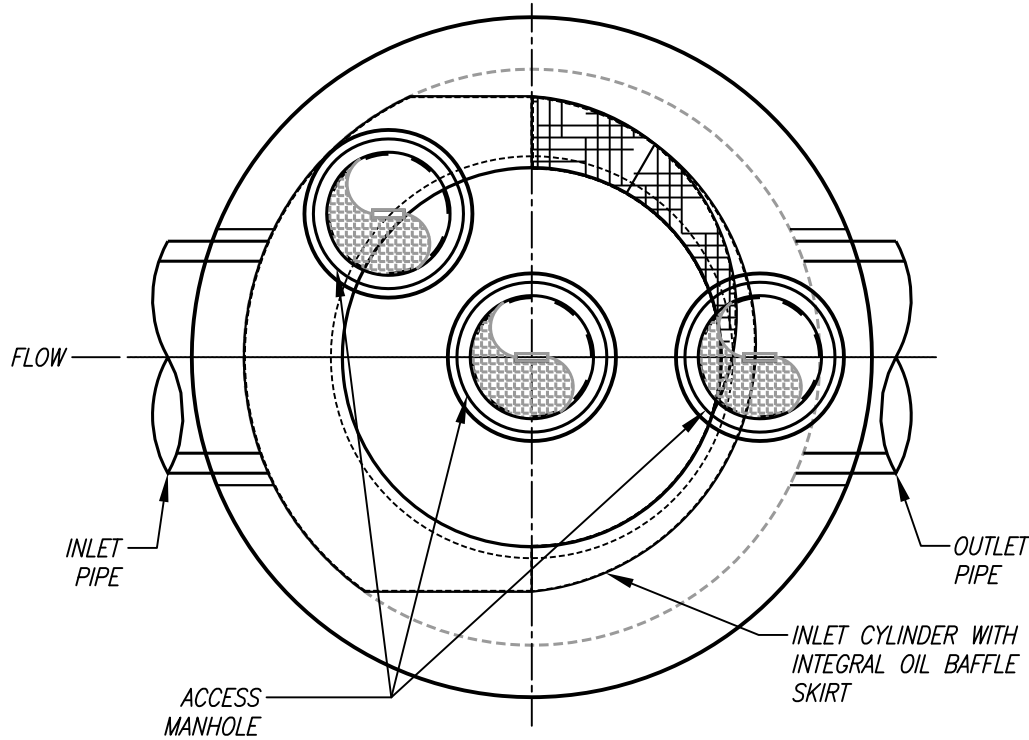
GENERAL NOTES

1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

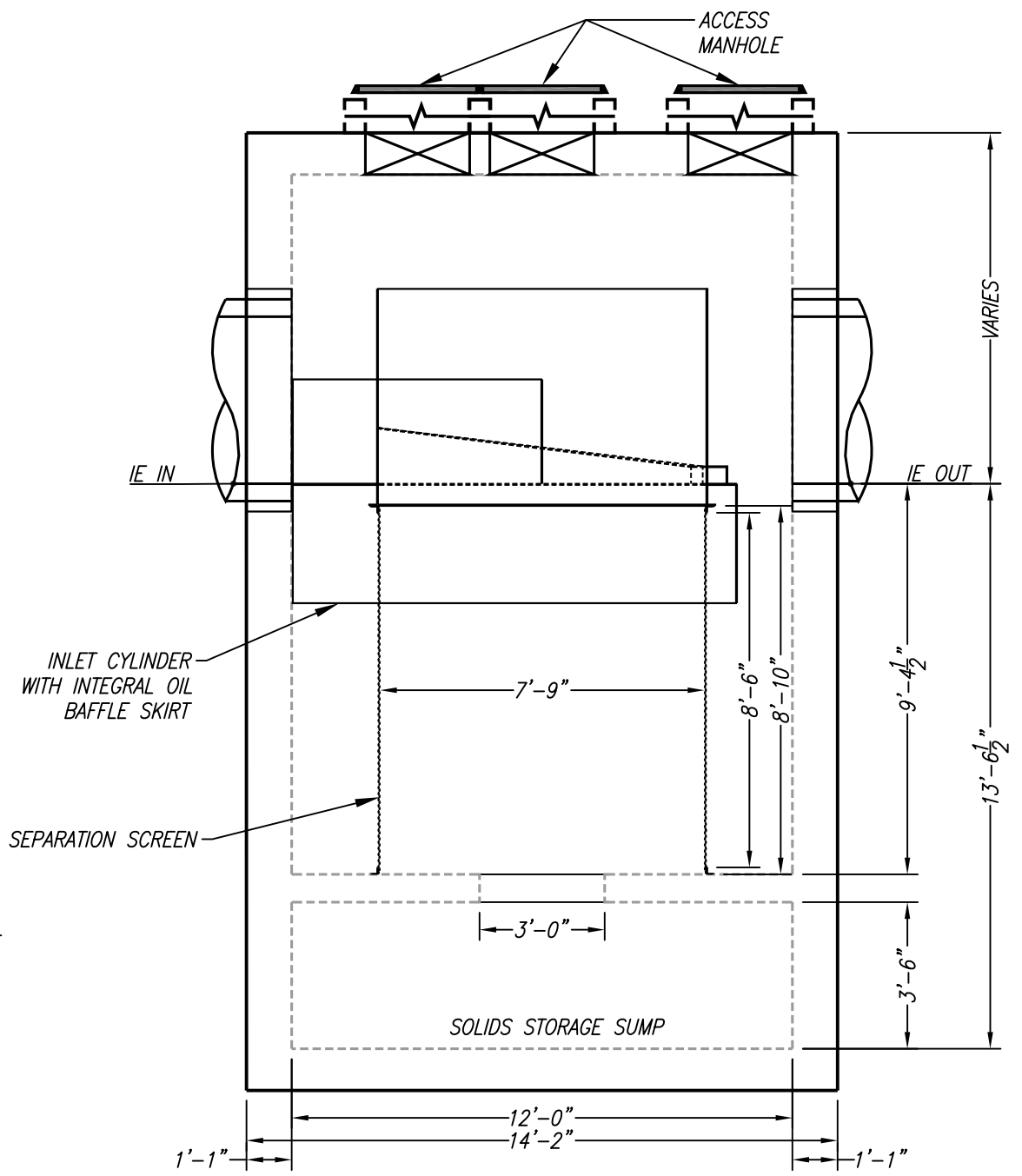
INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. MANUFACTURER RECOMMENDS A 6"-12" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. ALL GAPS AROUND PIPES SHALL BE SEALED WATERTIGHT WITH A NON-SHRINK GROUT PER MANUFACTURER'S STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.

THIS UNIT REQUIRES SPECIAL SHIPPING CONSIDERATION



PLAN VIEW
NTS



ELEVATION VIEW
NTS

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DSD-12-94102
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

1/13/19 DSW/WH

| SITE SPECIFIC DATA* | | | |
|-------------------------------|------|----------------|----------|
| PROJECT NUMBER | | | |
| PROJECT NAME | | | |
| PROJECT LOCATION | | | |
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS) | | | |
| PEAK FLOW RATE (CFS) | | | |
| PEAK STORM DURATION (YEARS) | | | |
| PIPE DATA | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | | | |
| OUTLET PIPE 1 | | | |
| RIM ELEVATION | | | |
| SUMP ELEVATION | | | |
| SURFACE LOADING REQUIREMENT | | | |
| FRAME AND COVER | | (3) $\phi 30"$ | |
| KNOWN GROUNDWATER ELEVATION | | | |
| NOTES: | | | |
| *PER ENGINEER OF RECORD | | | |

| PERFORMANCE DATA | | | | |
|---|---------------|-----------|-------------|------------|
| MAXIMUM TREATMENT FLOW CAPACITY (CFS) | | 44.0 | | |
| SUGGESTED MAXIMUM BYPASS CAPACITY (CFS) | | 50.0 | | |
| STORAGE CAPACITIES | | | | |
| SUMP CHAMBER CAPACITY | | | | |
| | DIAMETER (FT) | AREA (SF) | HEIGHT (FT) | TOTAL (CF) |
| CHAMBER 1 | 12.00 | 113.04 | 2.00 | 226.08 |

TREATMENT NOTES

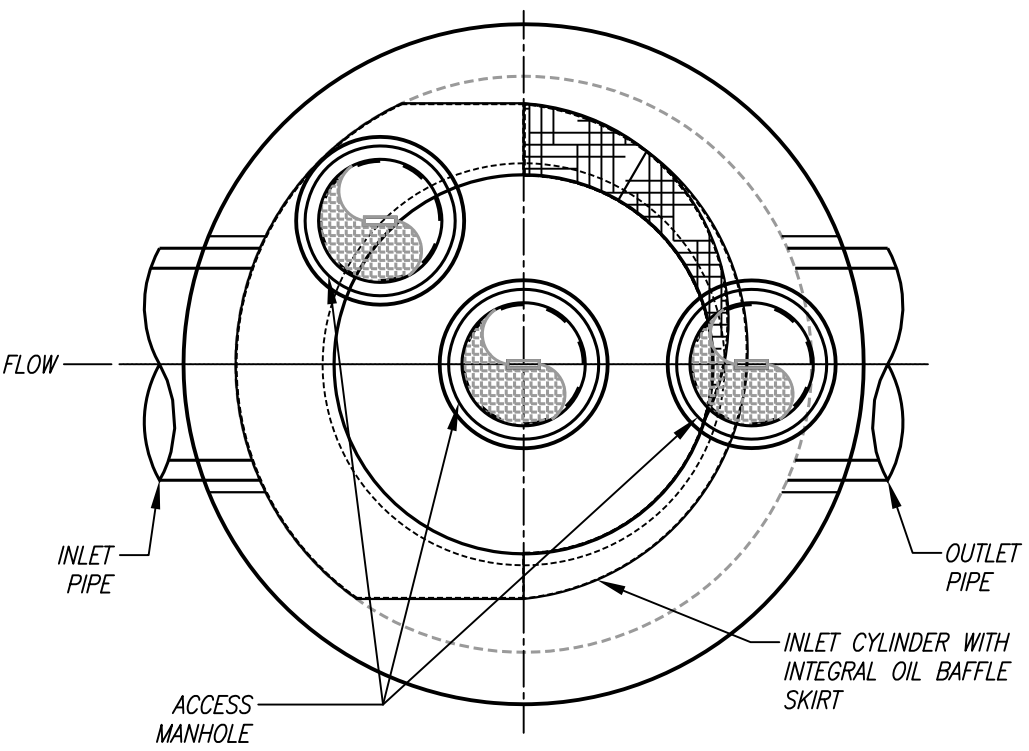
1. 100% CAPTURE OF TRASH & DEBRIS.
2. MEETS FULL CAPTURE REQUIREMENTS.
3. BIO CLEAN DEFLECTIVE SCREEN IS A NON-BLOCKING SCREENING UNIT.
4. CAPTURES TSS (TOTAL SUSPENDED SOLIDS), HEAVY METALS, OILS & GREASE, NUTRIENTS, AND BACTERIA.

GENERAL NOTES

1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

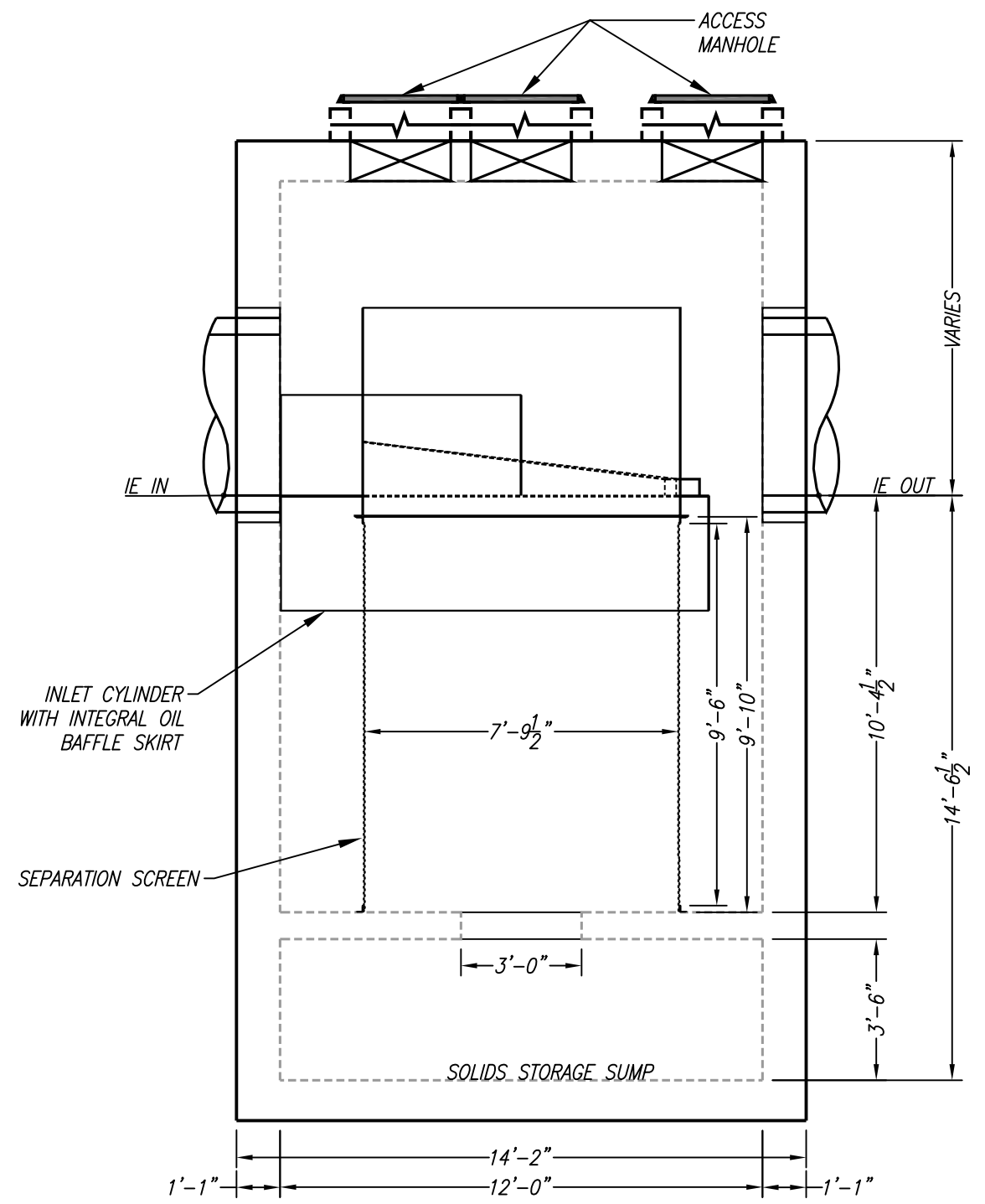
INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
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4. ALL GAPS AROUND PIPES SHALL BE SEALED WATERTIGHT WITH A NON-SHRINK GROUT PER MANUFACTURER'S STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
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PLAN VIEW
NTS

THIS UNIT REQUIRES SPECIAL SHIPPING CONSIDERATION



ELEVATION VIEW
NTS

PROPRIETARY AND CONFIDENTIAL:
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DSD-12-94114
DEFLECTIVE SCREEN DEVICE
STANDARD DETAIL

1/13/19 DSW/WH

APPENDIX B



Deflective Screening Device

A Stormwater Separation Solution



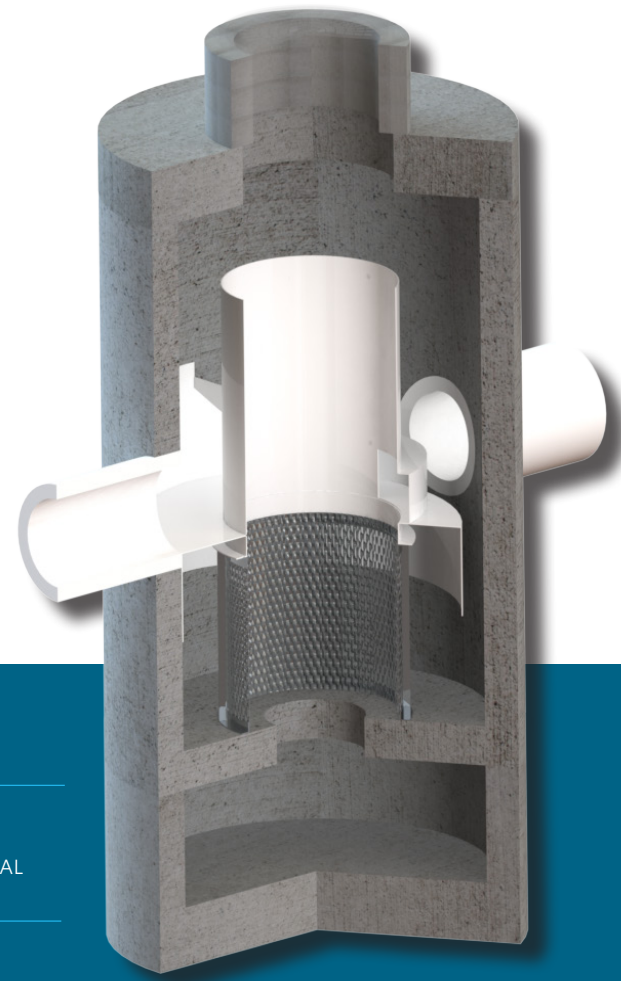
OVERVIEW

The Bio Clean Deflective Screening Device (DSD) is a highly effective screening hydrodynamic separator designed to meet Full Trash Capture requirements along with providing efficient hydrodynamic separation.

The device is highly reliable, as it has no moving parts and provides great longevity due to the use of highly durable materials. The DSD utilizes a unique and effective non-clogging screening design that ensures high treatment flow rates are maintained between maintenance intervals. The special screen has opposite facing openings from the flow direction of incoming stormwater. As water enters the treatment chamber, it spins in a clockwise direction which creates a continuous cleaning effect against the surface of the screen.

In addition to efficient trash capture utilizing a screen that captures 100% of particles down to 5 mm, its simple design allows for 80% TSS removal efficiencies for a particle size distribution typically found in stormwater runoff. The system also offers an internal bypass and efficient capture and retention of free loading oils and floatable trash.

In addition, the system can accept multiple inflow pipes at various angles for easy placement. Designed for easy cleaning, the system can be maintained with a standard vacuum truck from the surface, without having to enter into the system.



PERFORMANCE

| | | |
|------------------------------------|--|---------------------------------|
| 100% REMOVAL OF TRASH | 90% REMOVAL OF HYDROCARBONS | 80% REMOVAL OF TSS |
|------------------------------------|--|---------------------------------|

ADVANTAGES

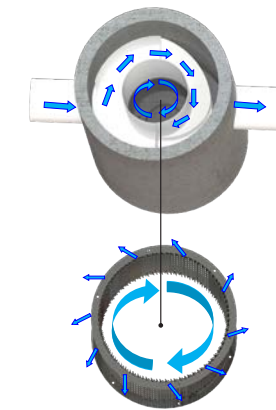
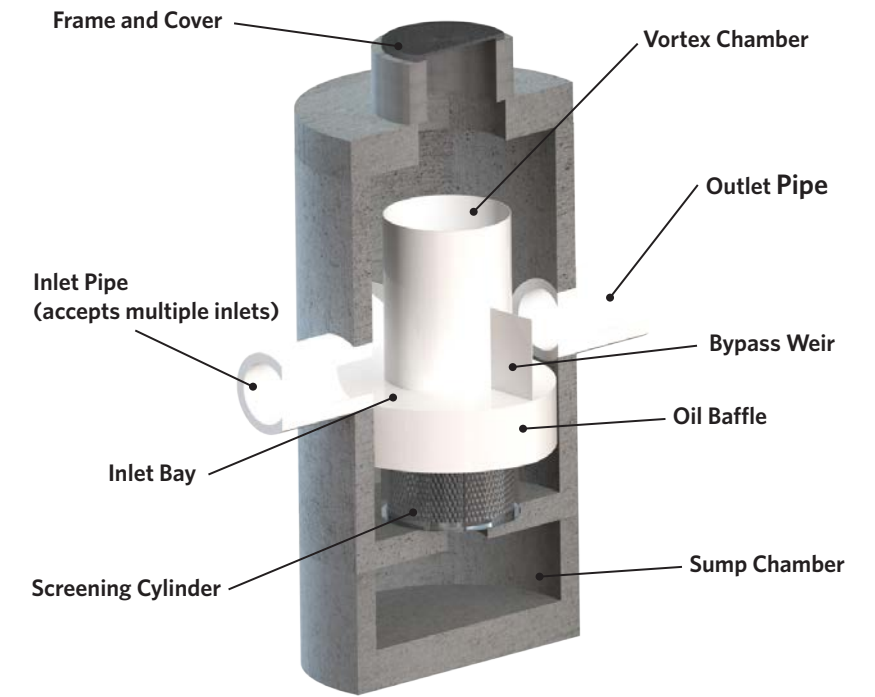
- MEETS FULL TRASH CAPTURE REQUIREMENTS
- EASIEST SEPARATOR TO MAINTAIN WITH EASY ACCESS TO SUMP CHAMBER USING STANDARD VAC HOSE
- NON-CLOGGING SCREENING TECHNOLOGY
- IN-LINE DESIGN ALLOWS FOR INTERNAL HIGH FLOW BYPASS
- 100% NONCORROSIVE INTERNAL COMPONENTS
- LOW COST ALTERNATIVE TO MORE EXPENSIVE DEFLECTIVE SHIELD SEPARATORS
- MADE IN THE USA

OPERATIONS

Stormwater runoff may enter the DSD via one or more inlet pipe or by grated inlet. Water enters the inlet bay where it is directed to the curved inlet channel. This channel is curved and directs flow into the vortex chamber at an increased velocity along its inner wall creating a clockwise -flowing vortex.

This vortex helps to capture all trash, debris, and suspended solids in the center of the chamber. It continues downward into the screening cylinder area of the device. The water flow caused by the vortex creates a "self-cleaning" effect along the surface of the screen preventing clogging of the screen. As treated water passes through the screen, it rises toward the outlet.

The oil baffle traps and retains oils, grease, and other hydrocarbons from flowing toward the outlet. Flows above the screen capacity bypass over the weir and straight to the outlet pipe, preventing any scouring of previously captured trash or sediment during higher flows.



Screening openings face the opposite direction from the flow path preventing clogging of the screens and allowing for continuous self-cleaning.

SPECIFICATIONS

| MODEL # | DIAMETER (ft.) | TREATMENT FLOW RATE (cfs) | SURFACE AREA (sq. ft.) |
|---------------|----------------|---------------------------|------------------------|
| DSD-48-2418 | 4 | 0.7 | 12.6 |
| DSD-60-2424 | 5 | 1.1 | 19.6 |
| DSD-60-2430 | 5 | 1.6 | 19.6 |
| DSD-72-3624 | 6 | 2.0 | 28.3 |
| DSD-72-3636 | 6 | 3.0 | 28.3 |
| DSD-96-4836 | 8 | 4.5 | 50.2 |
| DSD-96-4848 | 8 | 6.0 | 50.2 |
| DSD-120-6758 | 10 | 11.0 | 78.5 |
| DSD-120-6764 | 10 | 14.0 | 78.5 |
| DSD-144-8484 | 12 | 25.0 | 113.0 |
| DSD-144-94102 | 12 | 38.0 | 113.0 |

Additional models available upon request.

INSTALLATION



Installing the DSD is quick and easy. The system is composed of a base section, middle riser with holes for pipe connections and internals pre-installed, a top, risers to bring access to finish surface, and access covers.



Installation of the system follows the same procedures as standard manhole installation. We carry the structures in inventory allowing for short lead times to meet your project schedule.

MAINTENANCE



The DSD can be accessed from the finish surface and cleaned using a standard vacuum truck.

Access into the sump chamber below is provided through the separation cylinder. With trash and sediment centralized in this area, maintenance can be quickly completed to reduce overall cleaning costs.

Bio Clean
A Forterra Company

5796 Armada Drive Suite 250
Carlsbad, CA 92008
855.566.3938
stormwater@forterrabp.com
biocleanenvironmental.com

Section [_____] Storm Water Treatment Device

1.0 GENERAL

- 1.1 This item shall govern the furnishing and installation of the Deflective Screen Device (DSD) by Bio Clean Environmental Services, Inc., complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.
- 1.2 The Contractor shall furnish all labor, equipment and materials necessary to install the storm water treatment device(s) (SWTD) and appurtenances specified in the Drawings and these specifications.
- 1.3 The manufacturer of the SWTD shall be one that is regularly engaged in the engineering design and production of systems deployed for the treatment of storm water runoff for at least five (5) years and which have a history of successful production, acceptable to the Engineer. In accordance with the Drawings, the SWTD(s) shall be a DSD manufactured by:

Bio Clean Environmental Services, Inc.
398 Via El Centro, Oceanside, CA 92058
Tel: 1 760 433 7640

1.4 Related Sections

- 1.4.1 Section 02240: Dewatering
 - 1.4.2 Section 02260: Excavation Support and Protection
 - 1.4.3 Section 02315: Excavation and Fill
 - 1.4.4 Section 02340: Soil Stabilization
- 1.5 All components shall be subject to inspection by the engineer at the place of manufacture and/or installation. All components are subject to being rejected or identified for repair if the quality of materials and manufacturing do not comply with the requirements of this specification. Components which have been identified as defective may be subject for repair where final acceptance of the component is contingent on the discretion of the Engineer.
 - 1.6 The manufacturer shall guarantee the SWTD components against all manufacturer originated defects in materials or workmanship for a period of twelve (12) months from the date the components are delivered to the owner for installation. The manufacturer shall upon its determination repair, correct or replace any manufacturer originated defects advised in writing to the manufacturer within the referenced warranty period. The use of SWTD components shall be limited to the application for which it was specifically designed.

1.7 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer of Record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

2.0 MATERIALS

2.1 Housing unit of stormwater treatment device shall be constructed of pre-cast or cast-in-place concrete, no exceptions. Precast concrete components shall conform to applicable sections of ASTM C 478, ASTM C 857 and ASTM C 858 and the following:

- 2.1.1 Concrete shall achieve a minimum 28-day compressive strength of 4,000 pounds per square-inch (psi);
- 2.1.2 Unless otherwise noted, the precast concrete sections shall be designed to withstand lateral earth and AASHTO H-20 traffic loads;
- 2.1.3 Cement shall be Type III Portland Cement conforming to ASTM C 150;
- 2.1.4 Aggregates shall conform to ASTM C 33;
- 2.1.5 Reinforcing steel shall be deformed billet-steel bars, welded steel wire or deformed welded steel wire conforming to ASTM A 615, A 706, A 185, or A 497.
- 2.1.6 Joints shall be sealed with preformed joint sealing compound conforming to ASTM C 990.
- 2.1.7 Shipping of components shall not be initiated until a minimum compressive strength of 4,000 psi is attained or five (5) calendar days after fabrication has expired, whichever occurs first.

2.2 Internal Components and appurtenances shall conform to the following:

- 2.2.1 Screen and support structure shall be manufactured of Type 304 and 304L stainless steel conforming to ASTM F 1267-01;
- 2.2.2 Hardware shall be manufactured of Type 304 stainless steel conforming to ASTM A 320;
- 2.2.3 Access system(s) conform to the following:
- 2.2.4 Manhole castings shall be designed to withstand AASHTO H-20 loadings and manufactured of cast-iron conforming to ASTM A 48 Class 30.

3.0 PERFORMANCE

3.1 The SWTD shall be capable of capturing and retaining 100 percent of pollutants greater than or equal to 4.7 millimeters (mm) regardless of the pollutant's specific gravity (i.e.: floatable and neutrally buoyant materials) for flows up to the device's rated-treatment capacity. The SWTD shall be designed to retain all previously captured pollutants addressed by this subsection under all flow conditions. The SWTD shall be capable of

capturing and retaining total petroleum hydrocarbons.

- 3.2 The SWTD shall be designed with a sump chamber for the storage of captured sediments and other negatively buoyant pollutants in between maintenance cycles. The boundaries of the sump chamber shall be limited to that which do not degrade the SWTD's treatment efficiency as captured pollutants accumulate. The sump chamber shall be separate from the treatment processing portion(s) of the SWTD to minimize the probability of fine particle re-suspension. In order to not restrict the Owner's ability to maintain the SWTD, the minimum dimension providing access from the ground surface to the sump chamber shall be 16 inches in diameter.
- 3.3 The SWTD shall convey the flow from the peak storm event of the drainage network, in accordance with required hydraulic upstream conditions as defined by the Engineer. If a substitute SWTD is proposed, supporting documentation shall be submitted that demonstrates equal or better upstream hydraulic conditions compared to that specified herein. This documentation shall be signed and sealed by a Professional Engineer registered in the State of the work. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

4.0 EXECUTION

- 4.1 The contractor shall exercise care in the storage and handling of the SWTD components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be borne by the contractor.
- 4.2 The SWTD shall be installed in accordance with the manufacturer's recommendations and related sections of the contract documents. The manufacturer shall provide the contractor installation instructions and offer on-site guidance during the important stages of the installation as identified by the manufacturer at no additional expense. A minimum of 72 hours notice shall be provided to the manufacturer prior to their performance of the services included under this subsection.
- 4.3 The contractor shall fill all voids associated with lifting provisions provided by the manufacturer. These voids shall be filled with non-shrinking grout providing a finished surface consistent with adjacent surfaces. The contractor shall trim all protruding lifting provisions flush with the adjacent concrete surface in a manner, which leaves no sharp points or edges.
- 4.4 The contractor shall removal all loose material and pooling water from the SWTD prior to the transfer of operational responsibility to the Owner.

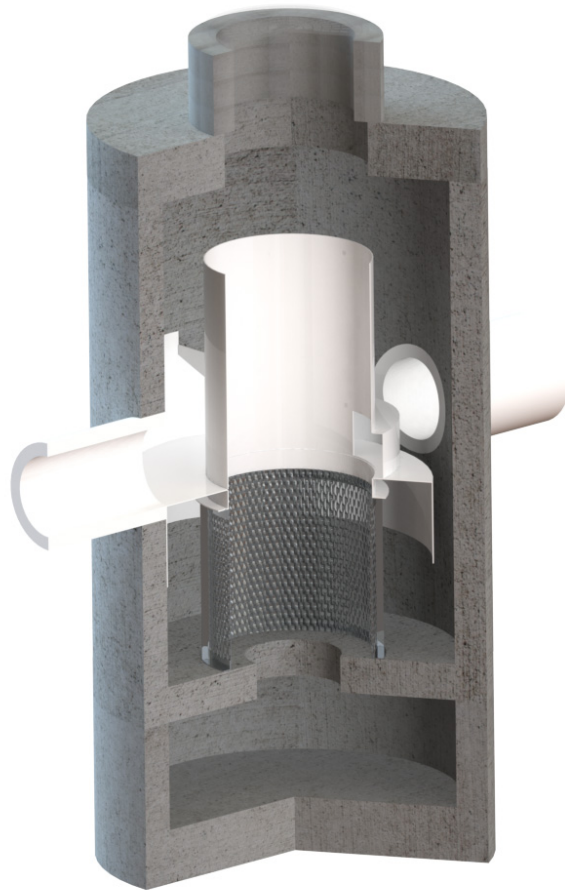
[End of This Section]

APPENDIX C

Deflective Screen Device (DSD)

Bio Clean
A Forterra Company

INSTALLATION MANUAL



INSTALLATION PROCEDURES

The Deflective Screen Device (DSD) Hydrodynamic Separator is designed to remove high levels of trash, debris, sediments and hydrocarbons. The system is housed in a standard precast manhole structure and can be installed at various depths to meet site-specific conditions. Various size units are available from 4' to 12' in diameter. In some areas, 13' and 14' diameter units may be available.

Delivery & Unloading/Lifting

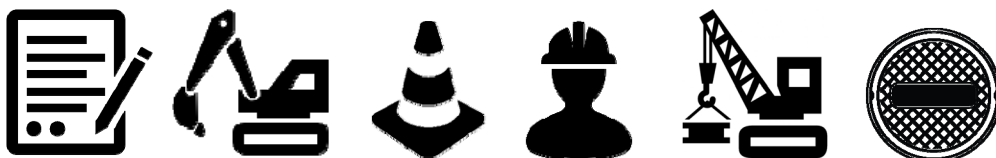
- Bio Clean Environmental Services, Inc. shall deliver the unit(s) to the site in coordination with the Contractor.
- The Contractor may be required to provide spreader bars and chains/cables to safely and securely lift the base section, risers, and top section along with suitable lifting hooks, knuckles, shackles and eyebolts.
- *Please see project specific drawings for weights and lifting details. Contact Bio Clean for additional lifting details. Internal components are pre-installed prior to delivery.*

Inspection

- Inspection of the DSD and all parts contained in or shipped outside of the unit shall be inspected at time of delivery by the site Engineer/Inspector and the Contractor. Any non-conformance to approved drawings or damage to any part of the system shall be documented on the Bio Clean shipping ticket.
- Damage to the unit during and after unloading shall be corrected at the expense of the Contractor. Any necessary repairs to the DSD unit shall be made to the acceptance of the Engineer/Inspector.

Site Preparation

- The Contractor is responsible for providing adequate and complete vault protection when the DSD unit is installed prior to final site stabilization (full landscaping, grass cover, final paving, and street sweeping completed).
- The Contractor shall adhere to all jurisdictional and/or OSHA safety rules in providing temporary shoring of the excavation.
- The Contractor or Owner is responsible for appropriately barricading the DSD unit from traffic (in accordance with local codes).



Installation

- Each DSD unit shall be constructed based on the locations and elevations according to the sizes shown on the approved drawings. Any modifications to the elevation or location shall be at the direction of and approved by the Engineer.
- The DSD unit shall be placed on level compacted sub-grade with a minimum 6-inch gravel base. Compact undisturbed sub-grade materials to be per Geotechnical/Soils report. Unsuitable material below sub-grade shall be replaced to site engineer's approval. Place granular sub-base and compact to State and local standards as per the Engineers requirements.
- Once the base piece is set, the riser(s) and top section should be sealed onto the base section before backfilling, using a non-shrink grout, butyl rubber or similar watertight seal.
- Pipe connections shall be aligned and sealed to meet the approved drawings with modifications necessary to meet site conditions and local regulations. The correct connection (inlet/outlet) will be marked on the Bio Clean Vault unit. *NOTE: The inlet and outlet pipe cannot protrude past the structure's I.D. wall as it will interfere with the internal components.*
- Once the DSD unit is set, it should be protected from construction runoff entering it. Contractor will be responsible for cleaning if unit is contaminated by such construction runoff and associated pollutants and damaged (i.e. concrete wash water).
- Backfilling should be performed in a careful manner, bringing the appropriate fill material up in 6-inch lifts on all sides. Precast sections shall be set in a manner that will result in a watertight joint. In all instances, installation of the DSD unit shall conform to ASTM specification C891 "Standard Practice for Installation of Underground Precast Utility Structures" unless specified otherwise in contract documents.
- If applicable, it is the responsibility of the Contractor to provide curb and gutter and transition to the DSD unit for proper stormwater flow into the system through the throat, pipe or grate opening. A standard drawing of the throat and gutter detail is available in the following section; however, the plans and contract documents supersede all standard drawings. Several variations of the standard design are available. Effective bypass for an offline DSD unit is essential for correct operation (i.e. bypass to an overflow at lower elevation).

Pipe Connection Details

- Pipe material selection should be indicated on the Site Plan. Connect the pipe using a Kor-N-Seal, Press Seal, Fernco, or other approved watertight boot connection. In the case of concrete pipes, grout the connection watertight with non-shrink grout.



Example of appropriate pipe connection using a Kor-N-Seal. Note that the pipe and connector do not protrude past the structure's inside wall.

- Inlet pipe(s) shall be stubbed in and connected to the precast manhole according to the Engineer's requirement or specifications. The Contractor is to grout all inlet pipes flush with the interior wall of the structure per plans and specifications.
- Outlet pipe shall be stubbed in and connected to the precast manhole according to the Engineer's requirement or specifications. The Contractor is to grout all inlet pipes flush with the interior wall of the structure per plans and specifications.
- For illustration a BAD example of a pipe installation is included below. The pipe is off-center, the pipe invert is not in the appropriate position, it is protruding beyond the inside wall, the grout is not clean and properly finished. This site was corrected by re-excavating and re-connecting the pipe properly.



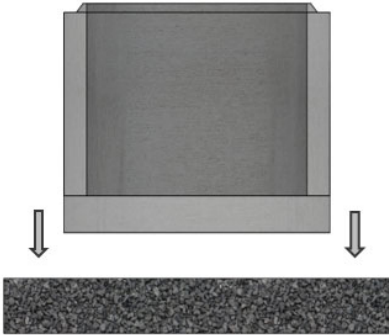
Example of a BAD pipe installation. Protruding past the internal wall of the structure, poor grouting, and wrong position.



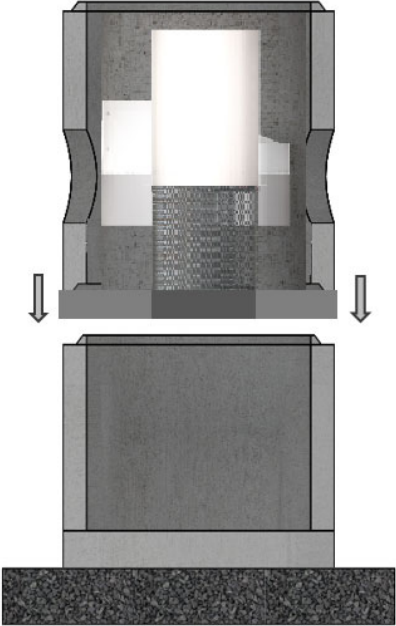
Example of a GOOD pipe installation. Pipe flush with the internal wall of the structure, clean grouting, and proper position.

- Once the pipes are connected, carefully backfill around them, compacting in "lifts" that will not deflect, disturb or damage them.

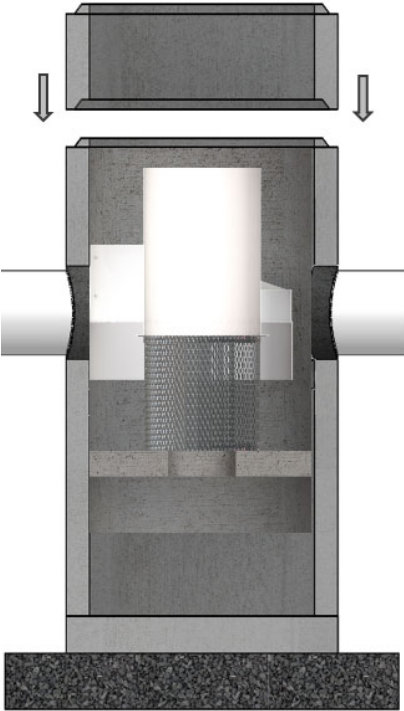
Illustrative Step-by-Step Installation Process



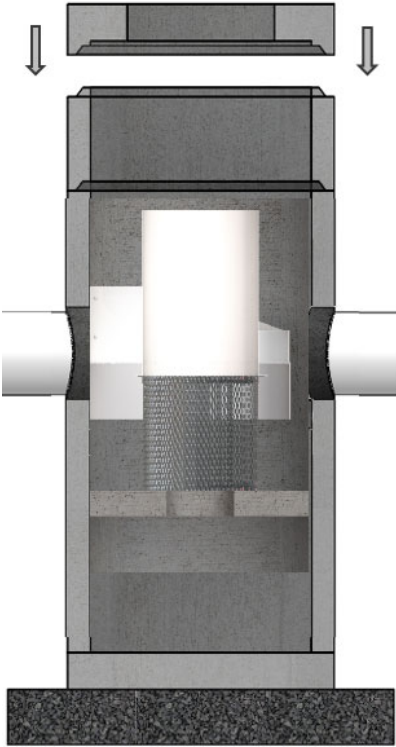
Set the base section of the DSD on solid sub-grade using appropriate rigging and lifting method. Add watertight seal (either mastic rope or rubber gasket). Verify the level and elevation of the base section before adding any additional precast riser sections.



Set riser section(s) on the base section. Set the riser section that contains the DSD components. Verify the outlet pipe elevation using precise survey methods. Be sure to add watertight seal to each riser section. Pipe holes are contained within the riser section. Pipes can be connected at this time if access is required into the vault to grout from the inside.

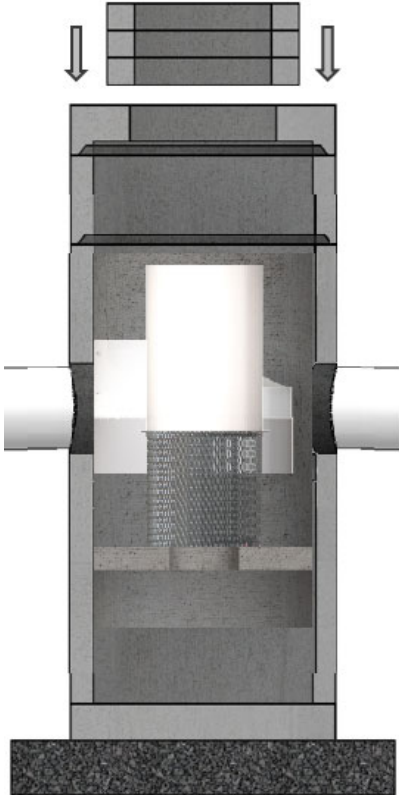


Set any additional riser sections, if required, using the same method as previous section. Be sure to add watertight seal to each riser section.

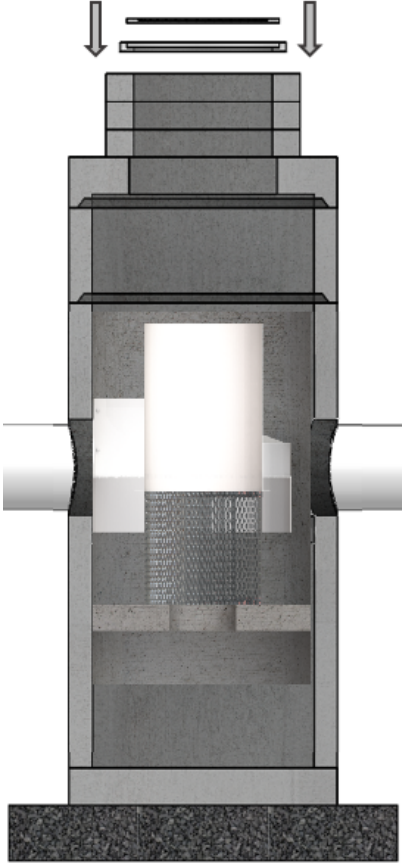


Set the top slab. Note the top slab's orientation. The manhole access opening(s) must be oriented over the inlet and outlet sides per the drawings.

DEFLECTIVE SCREEN DEVICE (DSD)



Set the access risers (if applicable) to bring the manhole frame and covers up to finish surface elevation per the approved drawings and plans.



Set manhole covers over the top of the access risers. Use grout to adjust manhole frames to the proper elevations.



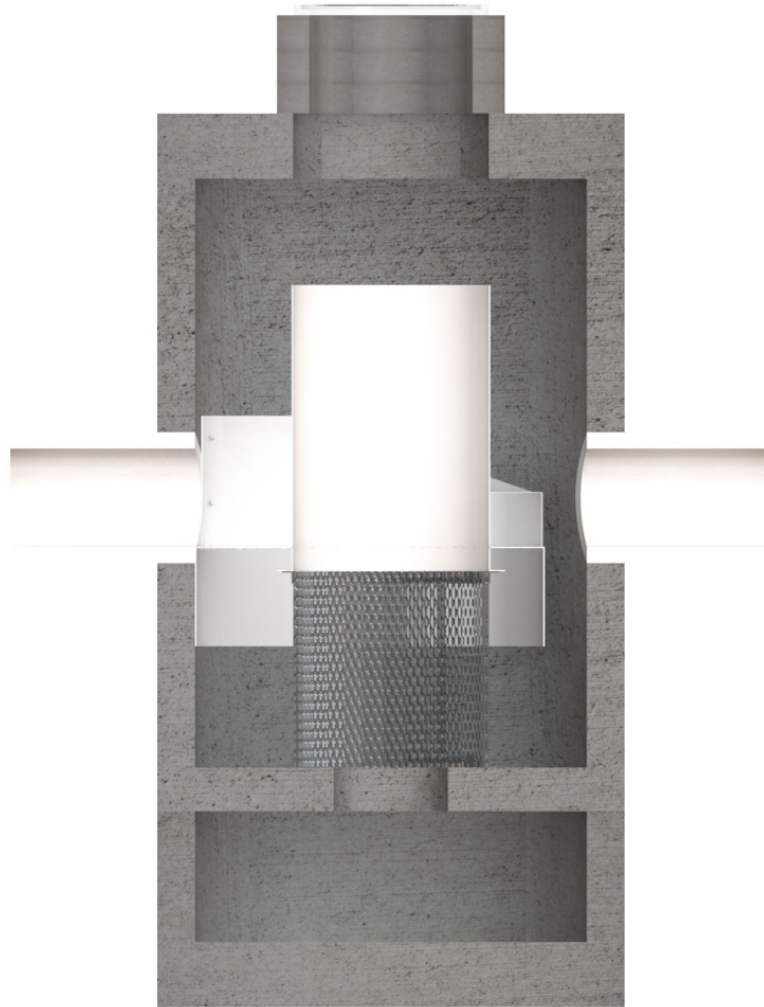
For Installation Support or Information Please Contact Us At:
 760-433-7640
 Or Email: info@biocleanenvironmental.com

APPENDIX D

Deflective Screen Device (DSD)



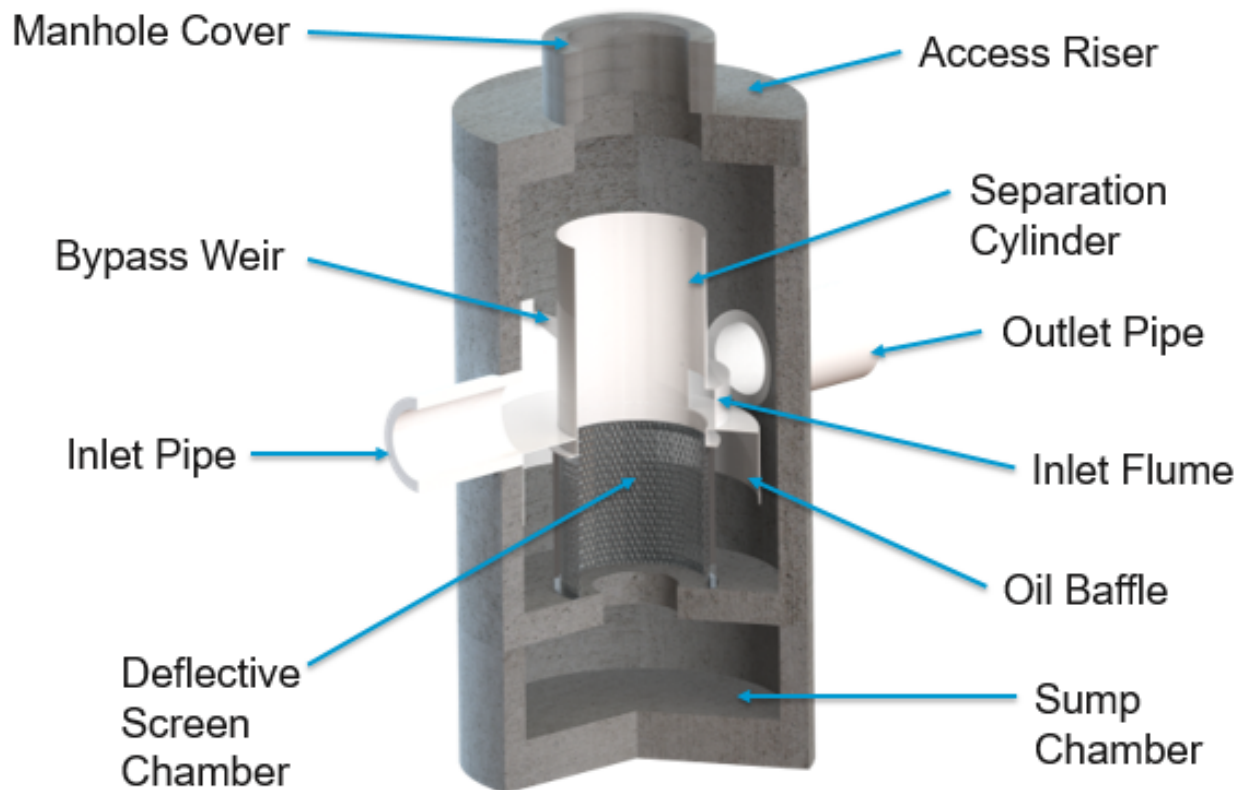
MAINTENANCE MANUAL



OPERATION & MAINTENANCE

The Deflective Screen Device (DSD) Hydrodynamic Separator is designed to remove high levels of trash, debris, sediments and hydrocarbons. The DSD is able to effectively capture and store sediment with no maintenance or loss of treatment capacity for a several years based on annual average loading in most regions.

Yet, as with all stormwater BMPs inspection and maintenance on the DSD Hydrodynamic Separator is necessary. Stormwater regulations require that all BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.

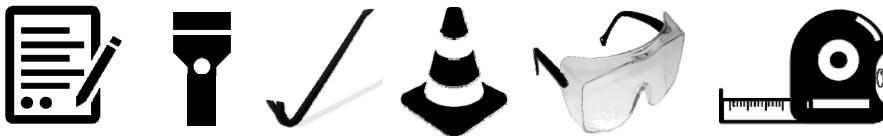


System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the DSD Separator:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Flashlight.
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Measuring pole and/or tape measure.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.



Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the DSD Separator are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The DSD Separator can be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open access hatch or manhole. Once these access covers have been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date and time, unit number and other info (see inspection form).
- Observe the inside of the system through the access hatches. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the system.
- Look for any out of the ordinary obstructions in the inflow pipe, sump chamber, inlet flume, screen, or outflow pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of floatable debris accumulated on the influent side of the inlet chamber. Record this information on the

inspection form. Next utilizing a tape measure or measuring stick estimate the amount of sediment accumulated in the sump. Record this depth on the inspection form.

- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the system or its inlet or outlet.
- Excessive accumulation of floatable in the separation cylinder down into the sump chambers in which the chamber is fully impacted extending down more than 9”.
- Excessive accumulation of sediment in the sump chamber of more than 75% of the depth.

Maintenance Equipment

It is recommended that a vacuum truck be utilized to minimize the time required to maintain the DSD Separator:

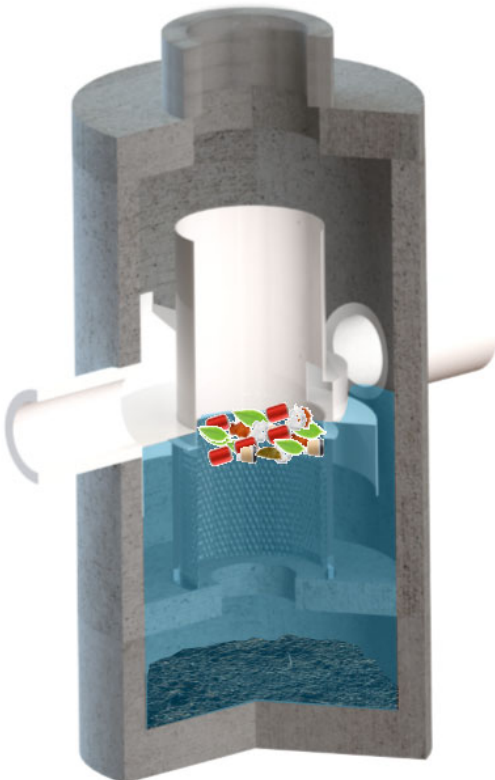
- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Flashlight.
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system.
- Vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

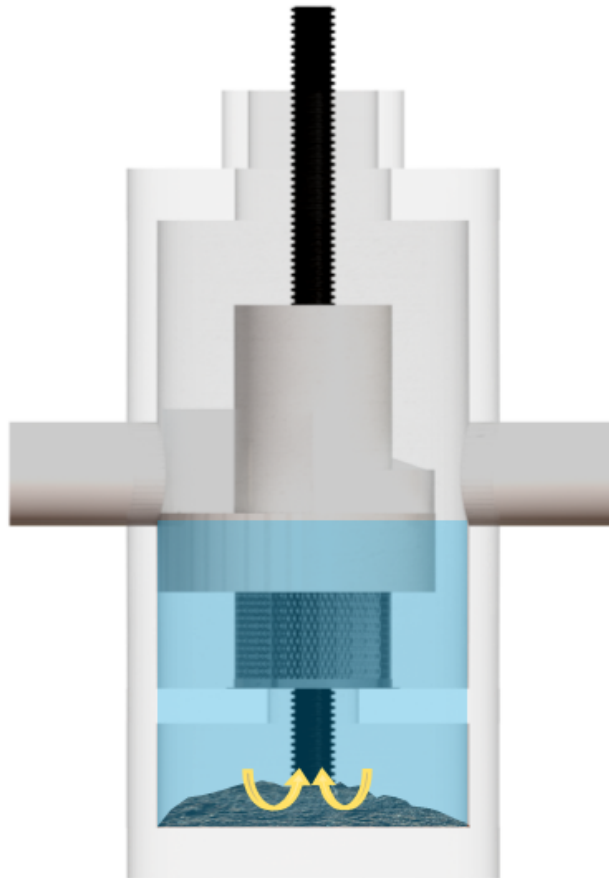
It is recommended that maintenance occurs at least three days after the most recent rain event to allow for drain down of any associated upstream detention systems. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the sump chamber can be performed from finish surface without entry into the vault utilizing a vacuum truck. Once all safety measures have been set up cleaning of the sump chamber can proceed as followed:

- Remove all access hatches (requires traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened access hatch and lower into the center of the separation cylinder.
- Remove all floating debris, standing water and sediment in the separation cylinder down through the deflective screen chamber and into the sump chamber. A power washer can be used to assist if sediments have become hardened and stuck to the walls, separation cylinder, deflective screen surfaces or the floor of the chamber. This completes the maintenance procedure required on the sump chamber and the DSD Separator.
- The last step is to close up and replace all access hatches and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered by the manufacture.

Maintenance Diagram



The DSD can be accessed from finish surface without entry. Once proper traffic control and safety measures have been set up. Remove the access manhole or hatch to gain access to the chamber below.



Insert vacuum hose inside middle chamber and remove all water, trash, debris and sediments. Once completed use a pressure washer to clean off screens and clean out any remaining debris. Ensure all access hatches and manholes are properly replaced.

For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

Inspection and Maintenance Report Bio Clean Debris Separating Baffle Box

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone () - _____

Inspector Name _____ Date ____ / ____ / ____ Time _____ AM / PM

Type of Inspection Routine Follow Up Complaint Storm Storm Event in Last 72-hours? No Yes

Weather Condition _____ Additional Notes _____

For Office Use Only

(Reviewed By) _____

(Date) _____
Office personnel to complete section to the left.

| Site Map # | GPS Coordinates of Vault | Model # | Debris, Trash and Foliage Accumilation Inside Filtration Screens (lbs) | Sediment Accumulation In Sediment Chambers (lbs) & Depth (inches) | Structural Notes | Operational Per Manufactures' Specifications (If not, why?) |
|------------|-------------------------------|---------|--|---|------------------|---|
| | Lat: _____ Long: _____ | | | | | |
| | Lat: _____ Long: _____ | | | | | |
| | Lat: _____ Long: _____ | | | | | |

Comments: _____

APPENDIX E



Product Warranty



DEFLECTIVE SCREENING DEVICE HYDRODYNAMIC SEPARATOR

Bio Clean Environmental Services, Inc. products are engineered and manufactured with the intent to be considered as permanent infrastructure. Bio Clean Environmental Services, Inc. warrants its products to be free of manufacturer's defects for a period of 1 year from the date of purchase. If a warranty claim is made and determined to be valid, Bio Clean Environmental Services, Inc. will either repair or replace the product, at the discretion of Bio Clean Environmental Services, Inc. Warranty claims must be submitted, evaluated, and approved by Bio Clean Environmental Services, Inc. for the claim to be determined to be valid. All warranty work and/or corrective action must be authorized by Bio Clean Environmental Services, Inc. prior to beginning the work not covered by this warranty. There are no other warranties either expressed or implied other than what is specifically specified herein. Abusive treatment, neglect, or improper use of Bio Clean Environmental Services, Inc. products will not be covered by this warranty.

760-433-7640



info@biocleanenvironmental.com

A Forterra Company

APPENDIX F

| | |
|------------------------------------|--|
| CUSTOMER: | Bio Clean Environmental Services & Modular Wetlands 398 Via El Centro Oceanside California 92058 |
| Report Date: | October 06, 2017 |
| Date(s) Analysis Performed: | September 28 - 29 |

Good Harbour Laboratories was asked to determine the head loss that occurs as water passes through a section of expanded metal grating that was supplied by Bio Clean Environmental Services. The screen had a diamond pattern that could be oriented either horizontally or vertically, as well as one side that had raised edges.

The section of screen (Figure 1) was mounted in a wooden frame that exposed a screen face 16-5/8 inches wide and 16-1/2 inches high when the diamonds were in the vertical position. The frame was mounted in a trough and water was passed through the screen. The difference in water height before and after the screen was used to determine head loss.

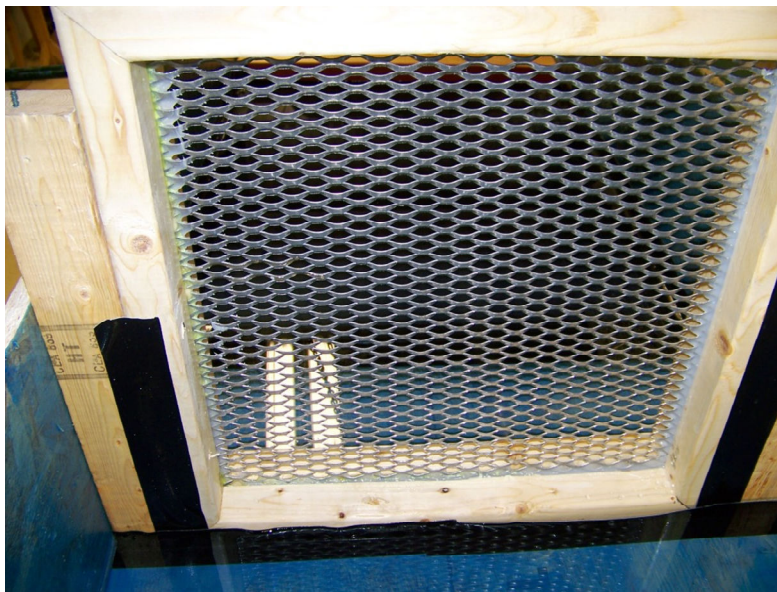


Figure 1: Expanded Metal Screen

TEST RESULTS:

Test 1: Diamond opening placed vertically; raised face on inlet side (against flow).

| Flow rate (gpm) | Water Height ¹ | | Head Loss, ΔH | |
|--------------------|---------------------------|----------------|---------------|------|
| | Inlet (cm) | Outlet (cm) | cm | inch |
| 50 | 5.4 | 1.9 | 3.5 | 1.4 |
| 100 | 8.2 | 2.7 | 5.5 | 2.2 |
| 200 | 12.7 | 3.5 | 9.2 | 3.6 |
| 300 | 16.0 | 4.4 | 11.6 | 4.6 |
| 400 | 19.3 | 5.2 | 14.1 | 5.6 |

Test 2: Diamond opening placed vertically; raised face on outlet side (with flow).

| Flow rate (gpm) | Water Height ¹ | | Head Loss, ΔH | |
|--------------------|---------------------------|----------------|---------------|------|
| | Inlet (cm) | Outlet (cm) | cm | inch |
| 50 | 5.2 | 1.8 | 3.4 | 1.3 |
| 100 | 7.7 | 2.6 | 5.1 | 2.0 |
| 200 | 12.7 | 3.6 | 9.1 | 3.6 |
| 300 | 15.8 | 4.5 | 11.3 | 4.4 |
| 400 | 19.5 | 5.3 | 14.2 | 5.6 |

Test 3: Diamond opening placed horizontally; raised face on outlet side (with flow).

| Flow rate (gpm) | Water Height ¹ | | Head Loss, ΔH | |
|--------------------|---------------------------|----------------|---------------|------|
| | Inlet (cm) | Outlet (cm) | cm | inch |
| 50 | 5.2 | 1.6 | 3.6 | 1.4 |
| 100 | 7.2 | 2.5 | 4.7 | 1.9 |
| 200 | 11.4 | 3.9 | 7.5 | 3.0 |
| 300 | 14.7 | 4.3 | 10.4 | 4.1 |
| 400 | 18.5 | 5.0 | 13.5 | 5.3 |

¹ Water height has been corrected for the thickness of the wood frame.

The above tests were repeated however for the second set of tests, the effluent side of the screen was allowed to free-fall into a receiving tank. The water height on the inlet side of the grating was recorded:

Test 4: Diamond opening placed vertically; raised face on inlet side (against flow).

| Flow rate (gpm) | Inlet Water Height ¹ | |
|--------------------|---------------------------------|------|
| | cm | inch |
| 50 | 5.3 | 2.1 |
| 100 | 7.7 | 3.0 |
| 200 | 12.0 | 4.7 |
| 300 | 15.5 | 6.1 |
| 400 | 19.0 | 7.5 |

Test 5: Diamond opening placed vertically; raised face on outlet side (with flow).

| Flow rate (gpm) | Inlet Water Height ¹ | |
|--------------------|---------------------------------|------|
| | cm | inch |
| 50 | 5.1 | 2.0 |
| 100 | 7.3 | 2.9 |
| 200 | 10.9 | 4.3 |
| 300 | 15.2 | 6.0 |
| 400 | 18.6 | 7.3 |

Test 6: Diamond opening placed horizontally; raised face on outlet side (with flow).

| Flow rate (gpm) | Inlet Water Height ¹ | |
|--------------------|---------------------------------|------|
| | cm | inch |
| 50 | 4.9 | 1.9 |
| 100 | 7.4 | 2.9 |
| 200 | 11.0 | 4.3 |
| 300 | 14.4 | 5.7 |
| 400 | 17.3 | 6.8 |

Results Summary:

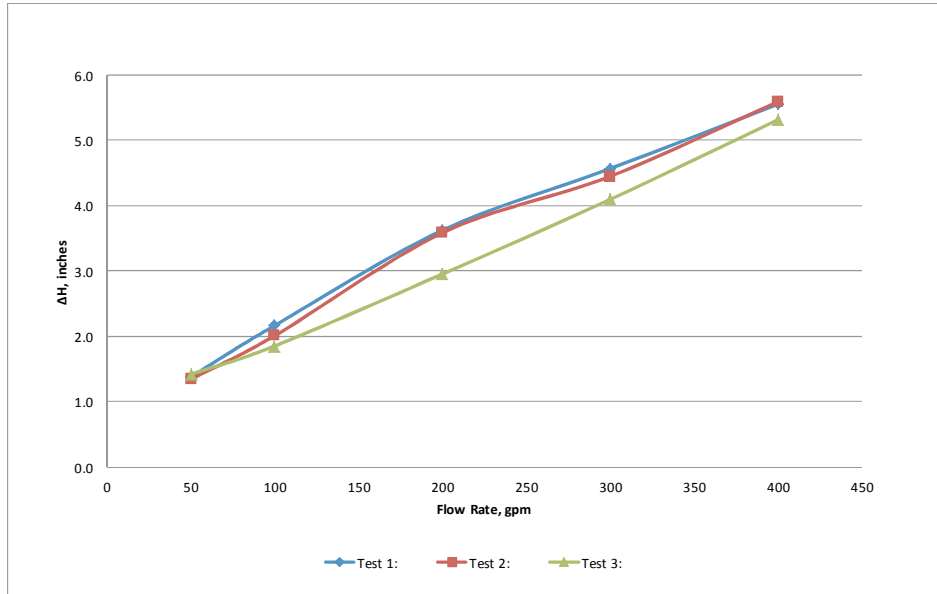


Figure 1: Head loss across expanded metal grating

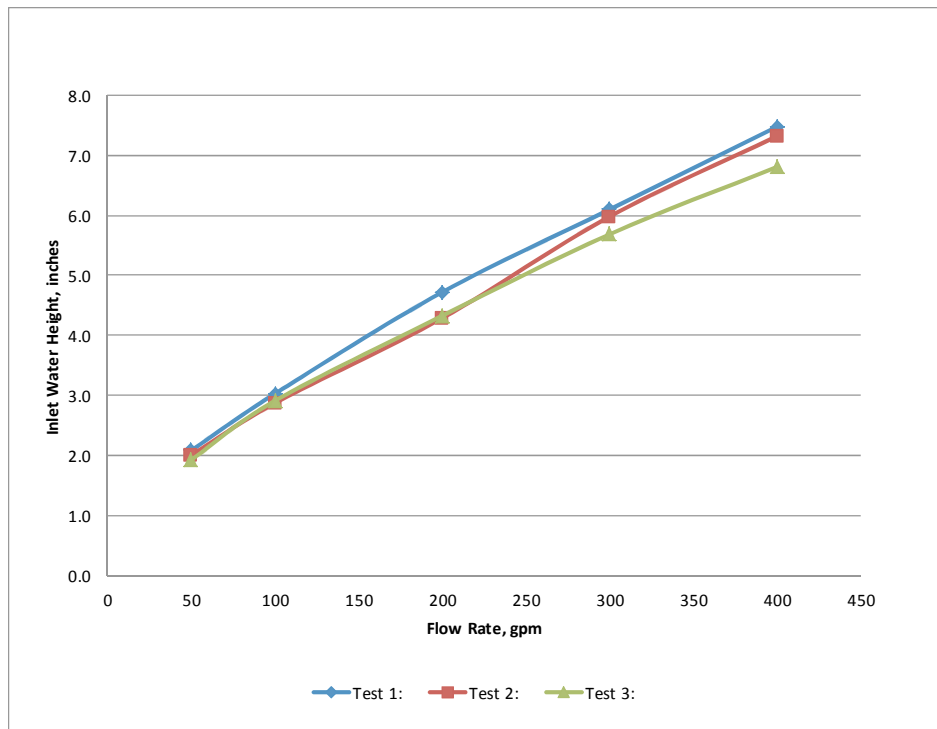


Figure 2: Inlet water height with effluent free-fall



Test Report

2596 Dunwin Drive
Mississauga ON L5L 1J5
Phone: 905.696.7276
Fax: 905.696.7279

Released By:

Joe Costa
Name


Signature

Oct. 06, 2017
Date

Senior Scientist
Title