major delete&replace

Delete the following current section in its entirety (deletions are shown struck through).

~~.01 Stormwater System Performance Standards~~

~~A. Stormwater Management~~

~~1. Design Requirements~~

- ~~All projects that modify land cover, land use, hydrologic condition, or modify existing drainage patterns, no matter what size, must consider stormwater management with the goal of improving existing stormwater conditions and preventing new flooding and/or impairments.~~
- ~~All projects shall include a stormwater management plan that meets the requirements of the most recent applicable municipal stormwater management ordinance.~~
- ~~Projects that trigger a National Pollution Discharge Elimination System (NPDES) permit for earth disturbance activities shall also meet applicable PaDEP stormwater requirements; however, the methods used to meet PaDEP volume requirements must be pre-approved by OPP's Division of Energy and Engineering, Engineering Services (from here on referred to as Engineering Services).~~
- ~~Under no circumstances shall surface water be directed towards a building. All designs shall include gravity flow away from building entrances in the event that all inlets are clogged.~~
- ~~The University has developed peak runoff rate requirements that exceed local and State regulations in some University Park Campus drainage basins, which must be adhered to as indicated below. Where the University's special requirements below are triggered, but would not normally trigger a submission to the municipality, the design will be submitted directly to Engineering Services for review and approval.~~

  ~~**Main Campus Drainage Basin**: In the entire Main Campus drainage basin, all redevelopment projects over 0.5 acres of total disturbance shall assume that 100% of the existing impervious areas are meadow in good condition for the consideration of peak runoff rate computations for determining extended detention storage requirements, when there is a land use/cover change proposed. Computations for water quality or volume shall use existing impervious areas. Any project that increases imperviousness by 1,000 sf shall provide peak runoff rate control for the new imperviousness (refer to section 33 40 00.01.B.5. for design guidelines). Using impervious area credits in the Main Campus drainage basin are prohibited.~~

Fox Hollow Drainage Basin: Any project upslope of storm manhole #252 (STMH252) located at the intersection of Park Ave and Shortlidge Road in the Fox Hollow drainage basin over 1.0 acre of total disturbance shall assume that 100% of the existing impervious areas are meadow in good condition for the consideration of peak runoff rate computations for determining extended detention storage requirements, when there is a land use/cover change proposed. Computations for water quality or volume shall use existing impervious areas.

West Campus Drainage Basin: No future major development is permitted within the pond's drainage area without the West Campus Pond being improved or reconstructed. Major development is defined as any "new" building, building addition, parking lot, or road. Only minor sidewalk work or maintenance activities will be permitted without triggering this requirement.

Bathgate Drainage Basin: The Bathgate dam was designed as a drainage basin peak runoff rate and water quality control facility and currently has reserve capacity. All increases will be tracked by Engineering Services and proposed impervious area must first be approved in writing by Engineering Services.

2. Recommended Stormwater Practices
   - The University promotes foremost the use of conservation design practices that preserve and use natural critical hydrologic areas, including, but not limited to, floodplains, wetlands, streams, minor drainageways, natural recharge areas, carbonate closed depressions and sinkholes. Therefore, site designers shall make every effort to preserve these areas, and any disturbance is only permitted at the approval of Engineering Services.
   - Filling in low areas or closed depressions to spoil project fill or remove ponding in natural or landscaped areas is discouraged and is only permitted at the approval of Engineering Services.
   - The University promotes the use and application of sound science in our stormwater management practices and Low Impact Development (LID) practices where appropriate; however, it does not believe that every BMP or LID method can be used anywhere, or that we can engineer replacements to complex natural hydrologic areas. Therefore, site designers shall set up a pre-design kick off meeting with Engineering Services to determine what stormwater practices are permitted in the project area.
   - Adequate treatment must be accomplished prior to stormwater runoff being injected into an engineered infiltration BMP or areas where infiltrated runoff can rapidly bypass the soils and enter fractures or the groundwater. Water quality pretreatment facilities must be visible and accessible to provide a means to monitor their efficiency, and replace if necessary in case of failure.

- Construction practices must be utilized so as to minimize the compaction of existing soils. In addition, a) soil at grade should be managed and b) vegetative cover and organic amendments should be utilized to enhance the restoration of infiltration capacity of disturbed soils. However, the use of soil amendments or restoration as a NPDES permitted activity that would be required for perpetuity under a NPDES permit is prohibited. In other words, soil protection or amendments are encouraged, but they shall not be made part of a NPDES permit.
- The University's recommended practices for land development activities shall be based on a thorough understanding of the watershed, soils, geology, site density, existing conditions, and the local regulatory requirements. Examples of recommended practices are available for the University Park Campus from Engineering Services.
- The use of porous (asphalt) pavement is prohibited at the University Park Campus for parking lots, driveways, or roads. Porous (asphalt) pavement may be used for recreational surfaces, such as basketball courts, if approved by Engineering Services.
- Stormwater use will be evaluated for projects using the University's **Design Guidance for Harvesting and Use Design Manual**.
- The use of structural stormwater best management practices that replace existing subsoils with inert material or gravel are discouraged unless it can be documented that the remaining soils are stable and can renovate pollutants in the stormwater.
- Engineering Services will determine the level of acceptable risk on all University Park Campus projects for ponds, bioswales, rain gardens, or other volume control facilities; and if the facility should be lined or unlined.
- Where multiple stormwater BMPs are used on a project site, only those BMPs specifically required to meet NPDES permit requirements will be included as part of the permit. The plans and PCSM reports will clearly state which practices are voluntary and can be removed or replaced by the University at will.
- Where storm drain conveyance systems are undersized, the University will not simply increase pipe sizes to solve the problem. Such actions are counterproductive to the goals of the University and result in pushing more flooding downstream (flood transference) to both University and non-University properties. In these cases, detention storage or other methods will be used to reduce overall peak runoff rates.

3. Supporting Documentation
   - All stormwater management final reports and plans shall be provided directly to Engineering Services by the design professional within 30 days after the approval by the reviewing agency. In addition to the stormwater reports required by a municipality and/or PaDEP, the professional must fill out and submit the **Penn State Stormwater Management Facility**

Summary Sheets, and the **Penn State Green Roof Summary Sheets,** if applicable. Final payment can be held until documentation is received.

- Digital as-built surveys in AutoCAD format of all stormwater management facilities, including but not limited to, surface ponds, underground detention facilities, BMPs, and conveyance pipes will be provided directly to Engineering Services.
- All stormwater BMPs need to be properly installed, operated, and maintained. The professional shall provide the University with copies of all stormwater Operations and Maintenance Manuals. Additionally, the designer shall fill out the **Penn State Stormwater Operations and Maintenance Summary Sheet**, for each BMP.
- All copies of NPDES stormwater facilities certifications of critical BMPs shall be provided directly to Engineering Services by the design professional.
- Copies of all approvals of testing required by these standards shall be submitted directly to Engineering Services by the design professional.
- As a nationally recognized institution of higher learning, the University requires comprehensive computations that defend a design's function above and beyond those required for regulatory approval in order to protect health, safety, and welfare. Fox example, where a stormwater BMP is designed using PaDEP worksheets to meet regulatory requirements, the designer is still required to provide comprehensive hydrologic and hydraulic computations and a summary of the BMP's permitted volume, and the drainage basin characteristics including overall imperviousness that drains specifically to the BMP.

B. Collection Systems

1. Pipes, Culverts and, Conveyance Systems
   - All storm pipes, culverts, conveyance channels, and appurtenances shall conform to Pennsylvania Department of Transportation Standards for Roadway Construction (RC), and Publication 408 specifications with exceptions as noted below.
   - Storm drain pipe and culvert material shall be either corrugated metal pipe (CMP), reinforced concrete (RCP), duel walled high density polyethylene (HDPE), polyvinyl chloride (PVC), high performance polypropylene (HPPP), or ductile iron pipe (DIP). CMP is only permitted to be used to match existing CMP systems. If CMP is used, a minimum of 14 gauge shall be used and the pipe must be coated with bituminous or aluminized, and use gasketed pipe collars. PVC pipe is only permitted up to 10" in diameter. HDPE is prohibited for roof drains or in diameters smaller than 12" in diameter unless perforated pipe is being used. Single wall polyethylene is prohibited except for athletic field drain line applications.
   - Storm drain pipes inside occupied structures shall be in accordance with the most recent building codes.

- ~~Pipe material used for pipes or culverts greater than 24" diameter shall be at the exclusive direction of Engineering Services and RCP should always be initially assumed from an initial cost estimate perspective.~~
- ~~Ductile iron pipe (DIP) shall be used for storm drains wherever storm drains cross steam or condensate lines closer than 3'-0". The DIP shall run from structure to structure.~~
- ~~Reinforced concrete pipe (RCP) shall be used for all pipes crossing roadways, except where steel casings are used.~~
- ~~All pipes shall have watertight joints, except where the pipes are intentionally perforated. Pipes considered "soil tight" by the manufacturer are prohibited.~~
- ~~Wherever possible, the pipe material and diameter shall remain constant between inlets and/or manholes.~~
- ~~The minimum size storm drains conveyance lines shall be fifteen (15) inch, with the exception of underdrains, BMP distribution systems, and properly sized roof leaders. Where the lines tie into a smaller existing downstream storm drain, the storm drains can be reduced to a minimum size of eight (8) inches.~~
- ~~The minimum pipe slope for new storm drains shall be 0.5% (0.005ft/ft).~~
- ~~The crowns of all storm drain lines shall be a minimum of 2 feet below grade and meet manufactures depth recommendations.~~
- ~~Any structure placed on an existing storm line equal to or greater than a 24" diameter, or an existing RCP pipe shall use a "dog box" structure. Under no circumstance shall these pipes be cut and repaired for the structure installation without the written approval of Engineering Services.~~
- ~~Foundation or footer drains are prohibited from tying directly into storm lines unless it can be guaranteed that backwater conditions in the storm lines cannot back flood the drains.~~
- ~~Trench plugs are to be included along storm lines as required to prevent the migration of water along the pipe bedding. Impervious trench plugs should be employed prior to any utility entering a building underground.~~
- ~~All pumps, including sump pumps, are prohibited on the storm drain system with the exception of sump pumps located inside buildings.~~
- ~~Some storm drains may require exfiltration testing where there are known sinkholes. Coordinate with Engineering Services.~~
- ~~Provide cleanouts/inspection ports at the end of all pond, bioswale, or rain garden underdrains.~~
- ~~All storm pipe or culvert outlets must have stable erosion resistant energy dissipaters. Where hydraulically possible, outlets should use sumped pre-formed scour holes.~~
- ~~Any new storm culvert or pipe outlet must have a concrete endwall and/or endsection.~~
- ~~All storm drain hydraulic computations must be done in accordance with the Federal Highway Administration's Urban Drainage Design Manual, Hydraulic Engineering Circular No. 22 (HEC-22). Hydraulic grade lines~~

for all new storm drain lines must be computed and included in final stormwater management reports.

- All new minor storm drains shall be designed to pass the 10-year event discharge without surcharging. Surcharging is defined as the maximum permissible water surface elevation in a manhole or inlet one (1) foot below the top of grate elevation.
- All new major storm drains (generally greater than or equal to 24" diameter) shall pass the design event defined by Engineering Services.
- Vegetated stable open channels shall be used whenever possible. All channels greater than or equal to 10% slope shall be designed by shear stress methods.

2. Storm Inlets and Storm Manholes
   - All inlet and manholes criteria shall conform to Pennsylvania Department of Transportation Standards for Roadway Construction (RC), and Publication 408 specifications with exceptions as noted below.
   - The maximum spacing between storm drain manholes or inlets shall be 300 ft.
   - Inlet spacing on new roadways in curbed sections should be based on an allowable spread of ½ the travel lane or a maximum of 6' during a 10 year return period event.
   - All storm drain inlet grates located in travel areas or lawns to be PennDOT bicycle safe.
   - Inlets shall not contain weep holes.
   - All yard drains, including those in landscaped areas, shall be concrete with minimum interior dimensions of 12" x 12" and shall be H20 load rated. Yard drains located in landscaped areas with material other than concrete shall be used only when approved by Engineering Services.
   - The use of plastic combination yard drains/pipes are prohibited except for use as single yard drains or in minor landscaped areas. Where used, the designer must still provide for rover type camera access from at least one side of the pipe run.
   - All storm drain structures including manholes and inlets deeper than four (4) ft shall have access steps per the PennDOT Roadway Construction standards, and Publication 408 specifications. The top step shall be a maximum of 18" from the top of grate/manhole cover.
   - Provide manholes or inlet boxes at all horizontal or vertical changes of direction for storm drain lines except for roof leader collection systems made from PVC or ductile iron. Roof leader systems will provide cleanouts at every other bend or junction. Where a project conducts work in an area that existing blind connections exist, reasonable effort should be made to install a structure to remove the blind connection.
   - All manholes and inlet boxes shall have a smooth flow line channel formed of cast-in-place 3500 psi concrete for all storm drains 24 inch or larger. The channel shall be smooth and accurately shaped to conform to

the inside surfaces of the incoming and outgoing pipes for ½ the pipe diameter.

- Under certain conditions, Engineering Services may request 24 inch manhole covers be placed on inlet boxes.
- Under no circumstance is an inlet or manhole permitted to be buried (prohibiting access) without the approval of Engineering Services.
- Sumped inlets on roads or other critical areas should have at least one flanking inlet in the event of clogging.
- Under no circumstance is spray foam to be used anywhere near a storm drain structure. Where used "temporarily" by the contractor, all foam must be removed prior to backfill.
- A maximum of three riser sections are permitted on inlets or manholes. Only one layer of bricks and mortar is permitted for grade adjustment.
- The use of porous concrete bricks is strictly prohibited on any storm drain structure for any purpose. All bricks must meet AASHTO M91.
- All structure openings shall be sealed with AASHTO M91bricks and parged on both sides.
- Manholes shall be fitted with 30" diameter non-locking type or locking type (as required by service and indicated on drawings) heavy frame and cover. The word "STORM" shall be cast in each cover in three (3) inch high letters.
- Openings required that are not cast in the manholes must be machine core bored if concrete. All material that falls into a manhole or inlet due to a penetration must be removed. Utility Services reserves the right to bill contractors for material not removed or that may be carried down pipes.

3. Water Quality Inlets and Hydrodynamic Devices
   - Specialized water quality inlets or hydrodynamic structures (such as CDS units, Baysavers, Stormceptors, Ecostorm Plus, Snouts, etc.) are permitted to meet water quality criteria; however, they must be constructed water tight. Structure leakage will be tested by OPP.
   - Concrete septic tank type systems are permitted for use where appropriate. Structure leakage will be tested by the contractor per section 33 40 00.01.C.2.
   - Permanent inlet bags or basket type inlet inserts are prohibited without the written approval of Engineering Services.
   - Under no circumstance are systems that use replaceable filters, cartridges, or replaceable soil media, etc. to be used for any project.
   - Structural plant type systems (such as Filterra, BioFilter, Modular Wetlands, etc.) are permitted to be used on Campus with the approval of Engineering Services; however, they will never be included as a permanent component of an ordinance requirement or NPDES permit.
   - All water quality inlets and hydrodynamic devices must be accessible on a permanently stabilized surface by vacuum trucks that are the approximately the size and weight of a fully loaded concrete truck.

4. Oil/Water Separators
   - Oil/water separators shall not be used for stormwater management systems except at the direction of Engineering Services. Refer to sections 33 30 00.01.P and 33 56 00 if required.

5. Subsurface Detention Facilities
   - The layout and design of all subsurface detention facilities shall be reviewed by Engineering Services prior to being submitted to outside review agencies.
   - Under no circumstance are any plastic built up types of detention structures permitted with or without liners.
   - All subsurface detention facilities at the University Park Campus are to be constructed from reinforced concrete (Class 3 minimum pipe) or approved equal. Only Engineering Services is permitted to determine what constitutes an approved equal.
   - All subsurface detention facilities are to have access points located on each end of the facility. Access points are to be a minimum of 24" diameter manhole cover or 2ft x 4ft inlet grate. Larger facilities (generally greater than 20ft x 50ft) should have an access point at each corner.
   - The hydraulic control weir should preferably be part of the subsurface detention structure. Contact Engineering Services for typical examples.
   - The control weirs are to have an access immediately on both sides of the weir for cleaning and maintenance.
   - Any low flow orifice 3" or smaller shall have a trash rack per the University's standards. Contact Engineering Services for acceptable trash rack types and details.
   - All subsurface detention systems must be accessible on a permanently stabilized surface by vacuum trucks that are the approximately the size and weight of a fully loaded concrete truck.
   - All subsurface detention systems are to be water tight as defined in 33 40 00.01.C.2. and will be tested by OPP.
   - The University has a pre-designed subsurface detention system for peak runoff rate control of impervious drainage areas from 1,000 sf to 1,500 sf with a total contributing drainage area of less than 2,500 sf. The designer is permitted to use this standard facility without conducting hydrologic and hydraulic routings and computations. Any area greater than 1,500 sf of imperviousness or 2,500 sf total area will require an analysis by the engineer; however, the pre-designed facility concept may be used. Contact Engineering Services for details and the performance calculation summary design requirements which are included in the Water Resource Publication OPP-WRP-SR-SUB:2017.

C. Acceptance and Inspection

1. Inspections

- The design engineer is to conduct a comprehensive punch list of all storm drains components visible from the ground surface including the interior of manholes, inlets, and other structures. The design engineer is not required to enter confined spaces unless previously arranged as part of the contract scope of work. A copy of the punch list and corrective actions completed are to be provided to Engineering Services.
- Subsurface detention systems will be inspected internally by Utility Services or Engineering Services. Deficiencies will be provided to the design engineer for inclusion in the punch list record.
- All storm drain pipes will be inspected and accepted by Utility Services from interior camera inspection after the pipe has been installed and backfilled to approximately final grade for 30 days. Deficiencies will be provided to the design engineer for inclusion in the punch list record. The contractor is to coordinate with Utility Services for on-site access.
  Approval or rejection of storm drains will be based on the following standards, which must be included on the construction document plans or specifications.
  - The maximum allowable deflection of the storm pipe shall be 5% of the pipe's internal diameter.
  - Any pipe belly greater than 1" deep will be rejected.
  - Any adverse (negative or uphill) slopes will be rejected unless installed by design, or with written approval and acceptance by Engineering Services. Under no circumstance are designers, construction representatives, or other University staff permitted to authorize adverse sloped storm pipes at utility or other conflicts.
  - Any new storm pipe damaged and repaired by any method other than approved by the manufacturer will be rejected. In all instances, OPP reserves the right to submit the information to the manufacturer to determine if they stand by the original warranty following the damage.
  - Any joint not completely seated or where bedding material can be observed at or inside the joint will be rejected.
  - Any joint observed to leak trickle flows will be rejected.
  - Any joint with an offset elevation or misalignment where the downstream pipe can obstruct flow or trap material will be rejected.
  - Any blind connection type joint where a manufacturer approved saddle tee or fitting has not be used will be rejected.

2. Subsurface Detention Leak Testing

- All subsurface detention systems at the University Park Campus will have their water tightness measured by Engineering Services over a minimum of 48 hours during periods of no precipitation. Engineering Services will provide the design engineer with the processed elevation data for a final leakage acceptance determination, which is made by the design engineer. The permissible leakage rate for all concrete systems is defined as $1x10^{-5}$ cm/sec over the entire system. The permissible leakage rate for all plastic pipe systems shall be based on ASTM D3212 and shall be measured in the

~~field as meeting a leakage rate less than $1x10^{-6}$ cm/sec over the entire system. Leakage tests are to be conducted at a minimum depth of 12" deep at the shallowest end. Stormwater or potable water may be used for the test and the contractor will be required to fill the structure with water. If potable water is used, it will be tested by the contractor for zero residual chlorine before being released into the storm system. The contractor will also be responsible for plugging the outfall and providing access during testing.~~

- ~~Concrete septic tanks used for small subsurface detention systems will be tested by the contractor using the vacuum testing method in ASTM C-1227. The contractor will coordinate with Utility Services to have the test observed and verified.~~

~~3. Critical Stormwater BMP Certifications~~

- ~~Any stormwater BMP installed as part of a NPDES permit and requiring a Final Certification of the Licensed Professional for inspection of critical stages of implementation associated with the approved PCSM Plan must be submitted to Engineering Services along with Appendix A of the NPDES Notice of Termination Form at the end of the project and prior to final payment.~~

Replace with following text.

.01 Stormwater System Performance Standards

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- Wherever possible, the pipe material and diameter shall remain constant between inlets and/or manholes.
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- Any new storm culvert or pipe outlet must have a concrete endwall and/or endsection.
- All storm drain hydraulic computations must be done in accordance with the Federal Highway Administration's Urban Drainage Design Manual, Hydraulic Engineering Circular No. 22 (HEC-22). Hydraulic grade lines for all new storm drain lines must be computed and included in final stormwater management reports.
- All new minor storm drains shall be designed to pass the 10-year event discharge without surcharging. Surcharging is defined as the maximum permissible water surface elevation in a manhole or inlet one (1) foot below the top of grate elevation.
- All new major storm drains (generally greater than or equal to 24" diameter) shall pass the design event defined by Engineering Services.
- Vegetated stable open channels shall be used whenever possible. All channels greater than or equal to 10% slope shall be designed by shear stress methods.

2. Storm Inlets and Storm Manholes
   - All inlet and manholes criteria shall conform to Pennsylvania Department of Transportation Standards for Roadway Construction (RC), and Publication 408 specifications with exceptions as noted below.
   - The maximum spacing between storm drain manholes or inlets shall be 300 ft.
   - Inlet spacing on new roadways in curbed sections should be based on an allowable spread of ½ the travel lane or a maximum of 6' during a 10 year return period event.
   - All storm drain inlet grates located in travel areas or lawns to be PennDOT bicycle safe.
   - Inlets shall not contain weep holes.
   - All yard drains, including those in landscaped areas, shall be concrete with minimum interior dimensions of 12" x 12" and shall be H20 load rated. Yard drains located in landscaped areas with material other than concrete shall be used only when approved by Engineering Services.

- The use of plastic combination yard drains/pipes are prohibited except for use as single yard drains or in minor landscaped areas. Where used, the designer must still provide for rover type camera access from at least one side of the pipe run.
- All storm drain structures including manholes and inlets deeper than four (4) ft shall have access steps per the PennDOT Roadway Construction standards, and Publication 408 specifications. The top step shall be a maximum of 18" from the top of grate/manhole cover.
- Provide manholes or inlet boxes at all horizontal or vertical changes of direction for storm drain lines except for roof leader collection systems made from PVC or ductile iron. Roof leader systems will provide cleanouts at every other bend or junction. Where a project conducts work in an area that existing blind connections exist, reasonable effort should be made to install a structure to remove the blind connection.
- All manholes and inlet boxes shall have a smooth flow line channel formed of cast-in-place 3500 psi concrete for all storm drains 24 inch or larger. The channel shall be smooth and accurately shaped to conform to the inside surfaces of the incoming and outgoing pipes for ½ the pipe diameter.
- Under certain conditions, Engineering Services may request 24 inch manhole covers be placed on inlet boxes.
- Under no circumstance is an inlet or manhole permitted to be buried (prohibiting access) without the approval of Engineering Services.
- Sumped inlets on roads or other critical areas should have at least one flanking inlet in the event of clogging.
- Under no circumstance is spray foam to be used anywhere near a storm drain structure. Where used "temporarily" by the contractor, all foam must be removed prior to backfill.
- A maximum of three riser sections are permitted on inlets or manholes. Only one layer of bricks and mortar is permitted for grade adjustment.
- The use of porous concrete bricks is strictly prohibited on any storm drain structure for any purpose. All bricks must meet AASHTO M91.
- All structure openings shall be sealed with AASHTO M91bricks and parged on both sides.
- Manholes shall be fitted with 30" diameter non-locking type or locking type (as required by service and indicated on drawings) heavy frame and cover. The word "STORM" shall be cast in each cover in three (3) inch high letters.
- Openings required that are not cast in the manholes must be machine core bored if concrete. All material that falls into a manhole or inlet due to a penetration must be removed. Utility Services reserves the right to bill contractors for material not removed or that may be carried down pipes.

3. Water Quality Inlets and Hydrodynamic Devices
   - Specialized water quality inlets or hydrodynamic structures (such as CDS units, Baysavers, Stormceptors, Ecostorm Plus, Snouts, etc.) are permitted

to meet water quality criteria; however, they must be constructed water tight. Structure leakage will be tested by OPP.

- Concrete septic tank type systems are permitted for use where appropriate. Structure leakage will be tested by the contractor per section 33 40 00.01.C.2.
- Permanent inlet bags or basket type inlet inserts are prohibited without the written approval of Engineering Services.
- Under no circumstance are systems that use replaceable filters, cartridges, or replaceable soil media, etc. to be used for any project.
- Structural plant type systems (such as Filterra, BioFilter, Modular Wetlands, etc.) are permitted to be used on Campus with the approval of Engineering Services; however, they will never be included as a permanent component of an ordinance requirement or NPDES permit.
- All water quality inlets and hydrodynamic devices must be accessible on a permanently stabilized surface by vacuum trucks that are the approximately the size and weight of a fully loaded concrete truck.

4. Oil/Water Separators
   - Oil/water separators shall not be used for stormwater management systems except at the direction of Engineering Services. Refer to sections 33 30 00.01.P and 33 56 00 if required.

5. Subsurface Detention Facilities
   - The layout and design of all subsurface detention facilities shall be reviewed by Engineering Services prior to being submitted to outside review agencies.
   - Under no circumstance are any plastic built up types of detention structures permitted with or without liners.
   - All subsurface detention facilities at the University Park Campus are to be constructed from reinforced concrete (Class 3 minimum pipe) or approved equal. Only Engineering Services is permitted to determine what constitutes an approved equal.
   - All subsurface detention facilities are to have access points located on each end of the facility. Access points are to be a minimum of 24" diameter manhole cover or 2ft x 4ft inlet grate. Larger facilities (generally greater than 20ft x 50ft) should have an access point at each corner.
   - The hydraulic control weir should preferably be part of the subsurface detention structure. Contact Engineering Services for typical examples.
   - The control weirs are to have an access immediately on both sides of the weir for cleaning and maintenance.
   - Any low flow orifice 3" or smaller shall have a trash rack per the University's standards. Contact Engineering Services for acceptable trash rack types and details.
   - All subsurface detention systems must be accessible on a permanently stabilized surface by vacuum trucks that are the approximately the size and weight of a fully loaded concrete truck.

- All subsurface detention systems are to be water tight as defined in 33 40 00.01.C.2. and will be tested by OPP.
- The University has a pre-designed subsurface detention system for peak runoff rate control of impervious drainage areas from 1,000 sf to 1,500 sf with a total contributing drainage area of less than 2,500 sf. The designer is permitted to use this standard facility without conducting hydrologic and hydraulic routings and computations. Any area greater than 1,500 sf of imperviousness or 2,500 sf total area will require an analysis by the engineer; however, the pre-designed facility concept may be used. Contact Engineering Services for details and the performance calculation summary design requirements which are included in the Water Resource Publication OPP-WRP-SR-SUB:2017.

C. Acceptance and Inspection

1. Inspections
   - The design engineer is to conduct a comprehensive punch list of all storm drains components visible from the ground surface including the interior of manholes, inlets, and other structures. The design engineer is not required to enter confined spaces unless previously arranged as part of the contract scope of work. A copy of the punch list and corrective actions completed are to be provided to Engineering Services.
   - Subsurface detention systems will be inspected internally by Utility Services or Engineering Services. Deficiencies will be provided to the design engineer for inclusion in the punch list record.
   - All storm drain pipes will be inspected and accepted by Utility Services from interior camera inspection after the pipe has been installed and backfilled to approximately final grade for 30 days. Deficiencies will be provided to the design engineer for inclusion in the punch list record. The contractor is to coordinate with Utility Services for on-site access.
     Approval or rejection of storm drains will be based on the following standards, which must be included on the construction document plans or specifications.
     - The maximum allowable deflection of the storm pipe shall be 5% of the pipe's internal diameter.
     - Any pipe belly greater than 1" deep will be rejected.
     - Any adverse (negative or uphill) slopes will be rejected unless installed by design, or with written approval and acceptance by Engineering Services. Under no circumstance are designers, construction representatives, or other University staff permitted to authorize adverse sloped storm pipes at utility or other conflicts.
     - Any new storm pipe damaged and repaired by any method other than approved by the manufacturer will be rejected. In all instances, OPP reserves the right to submit the information to the manufacturer to determine if they stand by the original warranty following the damage.

- Any joint not completely seated or where bedding material can be observed at or inside the joint will be rejected.
- Any joint observed to leak trickle flows will be rejected.
- Any joint with an offset elevation or misalignment where the downstream pipe can obstruct flow or trap material will be rejected.
- Any blind connection type joint where a manufacturer approved saddle tee or fitting has not be used will be rejected.

2. Subsurface Detention Leak Testing
   - All subsurface detention systems at the University Park Campus will have their water tightness measured by Engineering Services over a minimum of 48 hours during periods of no precipitation. Engineering Services will provide the design engineer with the processed elevation data for a final leakage acceptance determination, which is made by the design engineer. The permissible leakage rate for all concrete systems is defined as $1x10^{-5}$ cm/sec over the entire system. The permissible leakage rate for all plastic pipe systems shall be based on ASTM D3212 and shall be measured in the field as meeting a leakage rate less than $1x10^{-6}$ cm/sec over the entire system. Leakage tests are to be conducted at a minimum depth of 12" deep at the shallowest end. Stormwater or potable water may be used for the test and the contractor will be required to fill the structure with water. If potable water is used, it will be tested by the contractor for zero residual chlorine before being released into the storm system. The contractor will also be responsible for plugging the outfall and providing access during testing.
   - Concrete septic tanks used for small subsurface detention systems will be tested by the contractor using the vacuum testing method in ASTM C-1227. The contractor will coordinate with Utility Services to have the test observed and verified.

3. Critical Stormwater BMP Certifications
   - Any stormwater BMP installed as part of a NPDES permit and requiring a Final Certification of the Licensed Professional for inspection of critical stages of implementation associated with the approved PCSM Plan must be submitted to Engineering Services along with Appendix A of the NPDES Notice of Termination Form at the end of the project and prior to final payment.

END of revision

Update Commentary:

Section was updated primarily for the following reasons:

1) Delete current section and its entirely and replace with new section.