

Stormwater Inspector's Guidebook

Certified Construction Reviewers

DELAWARE

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Stormwater Construction Inspection Guidebook For Delaware

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Minnesota Pollution Control Agency



TETRA TECH, INC.

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1.0 Introduction

1.1 Certified Construction Reviewer Roles and Responsibilities

The primary role of a Certified Construction Review (CCR) is to determine conformance with Delaware’s *Sediment and Stormwater Regulations* and evaluate the proper installation of sediment and erosion control practices used on a construction site. This is primarily accomplished by reviewing on-site activities in comparison to the approved Sediment and Stormwater Plan.

Construction cannot begin until this plan has been approved and signed by the appropriate Delegated Agency and a pre-construction meeting is held. Any revisions that are made to the plan must be re-approved by the Delegated Agency, and the most current plan must be kept on-site at all times.

Generally, CCR inspections are required once every seven days during active construction and within 24 hours after a rainfall event that results in runoff. In addition to regular inspections and inspections following a rain event, there are certain times when it is crucial for a CCR to be on site. For example, an inspector should be on site during pond construction to ensure proper pipe and embankment installation. Monitoring sequencing of installation is another crucial role of the CCR and is especially important to avoid a potential future blow-out.

When conducting an inspection and writing the report, the facts are to be noted and reported completely, accurately, and objectively. If an inspection report indicates that a particular sediment or erosion control measure, such as a sediment basin, is not properly functioning, it is the CCR’s responsibility to contact the delegated agency to determine if a design change is needed. Also, be sure to facilitate the approval process for the proposed revisions.

1.2 Preconstruction Meeting

After the Sediment and Stormwater Plans have been approved by the Delegated Agency and a Notice of Intent has been submitted by the owner/developer, a preconstruction meeting must be held. Participants should include the CCR, a representative from the Delegated Agency, contractor, any subcontractors, owner/developer, and designated Responsible Person (Blue Card holder) at that particular site.

Items to Address at the Preconstruction Meeting:

- ___ Project size and sequence of construction/phasing
- ___ Primary erosion prevention and sediment controls used on-site
- ___ Permanent stormwater management practices

- _____ Pollution prevention practices
(especially for fueling, solid waste, hazardous materials, and vehicle washing)
- _____ Discharge points from the project to surface waters and wetlands
- _____ Construction access and easements
- _____ Permits and restrictions
- _____ Conflicts or requested changes to the approved plan with the contractor before construction begins
- _____ Method of communication for inspection reports (ie. e-mail)
- _____ Fill out the CCR application while all parties are present

2.0 The Inspection

2.1 Pre-Inspection Preparation

In preparing for an inspection, you should review available files such as copies past inspection reports, CCR reports, and other correspondence such as maintenance records on the construction sites you will be inspecting. Have past inspection reports with you in order to verify that problems have been corrected.

Also be sure to review the approved Sediment and Stormwater Plan before entering the site.

Before the Inspection:

- _____ Identify potential pollutant sources and Best Management Practices (BPM) that you want to inspect.
- _____ Do a quick check of the plan.
 - Approval and signatures
 - Notification of Construction Start
 - Names, phone, addresses of contacts
 - Certification Blocks Signed
 - Limit of Disturbance
 - Sequence of Construction
 - Basin and Trap drainage areas
 - Appropriate perimeter controls
 - Outlet points controlled
 - Standards and specifications for each practice used

___ Highlight important features of the plan (such as silt fence location, sediment basins, slope stabilization, material storage areas, etc.).

On a map, locate all the construction sites that you plan to inspect that day.

Items Needed:

- ___ Road map/GPS (optional)
- ___ Rain gear (if needed that day)
- ___ Personal protective equipment (wear jeans, steel-toed shoes, hard hat, safety vest, sun block, safety glasses, tick and mosquito spray)
- ___ Cell phone
- ___ Inspection credentials such as a certification card or ID badge
- ___ Digital camera and spare batteries
- ___ Clipboard and pencils
- ___ Blank copies of inspection report
- ___ Field notebook for taking notes
- ___ An up-to-date copy of the approved Sediment and Stormwater Plan

2.2 Conducting the Site Inspection

A keen eye, an understanding of the construction sequencing process and accurate documentation are the keys to an effective construction site inspection. Use the CCR Inspection Report, and take notes regarding the location and condition of BMPs, discharge points, and inlets. Refer to 3.0 for more details on inspecting BMPs. Use photos to document concerns and how the site appears (See 2.3 for more information on the photo log). Keep a written field notebook of preliminary findings during your inspection to facilitate your exit interview.

1. *Enter the construction site*

- ___ Observe the surroundings and various stages of construction.
- ___ View construction site vehicle entrance/exit locations.
- ___ Indicate on the inspection form the date/time and weather conditions.
- ___ Review all postings and be aware of moving equipment.
- ___ Wear your protective gear such as your hardhat.
- ___ Report to the construction trailer and ask for the project manager/foreman.
- ___ Identify yourself and your purpose.
- ___ Display your credentials (current CCR card).
- ___ Ask that the Responsible Person (Blue Card holder) or site foreman accompany you on the site visit.
- ___ Note the names of the individuals with whom you meet.
- ___ Inform the individual of the typical sequence of events for the inspection (records review, site inspection, exit interview, report preparation and weekly report submission).
- ___ Ask if there are any specific safety issues or requirements for this site.

2. *Ask to see the plan*

- ___ Ask to see the approved Sediment and Stormwater Plan. If the approved plan is not available, ask why and note the response in your report. Inform the project manager that the approved plan is required to be on-site at all times and available for review.

____ Verify that the plan has been signed by the Delegated Agency.

____ Include the following in your field book:

- The most recent date of the approved plan, and who prepared it
- General narrative of the current construction activity in your notes (i.e., construction of 5 single family homes on 2.5-acre parcel)
- Ask the project manager to describe the project as you review the approved plan. Some questions you can ask may include:
 - Have there been any design changes from the original approved plan? If so, has a new plan been developed and approved (marked with a signature) by the Delegated Agency?
 - Do they store or use hazardous materials or waste fluids on-site? Do they refuel vehicles or equipment on-site?
 - Does this project include concrete pouring, and how do they handle washout of concrete trucks?
 - What procedures do they institute in advance of forecasted rain events?

3. *Inspect discharge points and downstream, off-site areas for signs of impact*

____ Begin inspection at the low point of the construction site.

____ Observe all discharge points.

____ Consider the current sequence of construction phasing.

____ If sediment has left the site, walk downstream to document the extent of offsite sediment travel.

____ Inspect down-slope municipal catch basin inlets to ensure that they are adequately protected.

____ Trace all sediment discharges back to the sources and determine corrective actions to specifically eliminate the discharge.

4. *Document deficiencies*

____ Note all environmental impacts on your inspection report.

____ Use prescriptive writing, not just descriptive.

Descriptive – describes the situation only. Example: silt fence is damaged.

Prescriptive – describes the situation and prescribes actions to be taken to alleviate the problem. Example: silt fence near construction entrance is

damaged. Re-install new silt fence, making sure to trench in and wrap ends. Use silt fence as specified on the approved Sediment and Stormwater Plan.

_____ Document with photographs when possible (See 2.3 for more information on the photo log).

5. *Inspect perimeter controls*

_____ Walk the entire perimeter of the project and note the type of perimeter controls, making certain that they meet the Delaware specification. Also be sure that the perimeter controls have been properly installed (ie. silt fence has been properly trenched in).

_____ Inspect the construction entrance to determine if there is excessive sediment tracking of from the site or whether the stone is laden with sediment.

_____ Check all sediment controls. All storm drains must be protected, temporary stockpiles must have sediment controls, and exposed soil areas must have temporary erosion protection or permanent cover.

6. *Compare BMPs in the approved Sediment and Stormwater Plan with construction site conditions*

_____ Evaluate whether BMPs have been adequately installed and maintained (see section 3.0 for more information on inspecting BMPs).

_____ Describe in your notes any concerns and their location.

_____ Look for areas where BMPs are needed, but are missing and are not included in the approved plan.

7. *Inspect total disturbed areas and areas not being worked*

_____ Document estimation of total area disturbed and verify that it is within the approved number of acres disturbed.

_____ Document any areas that have not been worked for 14 calendar days. These areas must be seeded with temporary vegetation and mulch. Unseeded and/or unmulched bare soil areas that have been “dormant” for more than 14 calendar days should be noted on the inspection report as being non-compliant with the plan.

8. *Inspect areas for permanent stabilization*

- ___ Inspect areas that have been stabilized to ensure that excessive erosion is not occurring.
- ___ Estimate whether the site has been stabilized with uniform perennial vegetative cover.
- ___ Estimate that mulch has been applied at a rate that achieves 100% coverage
- ___ Verify that temporary BMPs in areas with final stabilization have been removed.
- ___ Verify that sediment has been cleaned out of all conveyances and temporary sediment basins that will be used as permanent water quality management basins.
- ___ Verify that areas where temporary BMPs have been removed are stabilized and seeded.
- ___ Upon project closeout, verify that a 70% vegetated cover with no bare soil has been achieved.

9. *Communication is critical*

- ___ If possible, walk the site with the person designated as the “owner representative.”
- ___ After the inspection, communicate with the owner representative about any site deficiencies.
- ___ Communicate with the Delegated Agency with ongoing unresolved inspection items.

2.3 Importance of the Photo Log

Digital photographs should be taken to document your findings and provide you with a site overview as you write your report. Take photos of the site entry sign, areas of concern, and a general view of the construction site.

- _____ Include photos that illustrate general construction site conditions.
- _____ Provide photos for all areas of concern.
- _____ Include photos that may reveal off-site sediment discharges and their sources.
- _____ Provide photos above and below the project, if impacting a waterbody.
- _____ On the site map, indicate approximate locations of where you took photos, and the direction of the photograph.
- _____ Keep notes on each photograph you take, as you may need to describe problem areas in your report.
- _____ Each photograph submitted with the inspection report should include the following:
 - Construction site name
 - Approved plan number
 - CCR's name and office phone
 - Inspection date
 - Photo caption

2.4 Exit Interview

- _____ Debrief the person in charge (project manager) and the Responsible Person (Blue Card holder) of the site.
- _____ Explain the results of the inspection and the identified deficiencies, including any areas of concern and the correction deadline.
- _____ Provide the project manager and Responsible Person (Blue Card holder) with compliance assistance or technical information.
- _____ If there is a critical deficiency, immediately notify a project manager to correct the problem.
- _____ Notify the delegated agency immediately regarding urgent matters.

2.5 Report Writing, Submission, and Follow-up

Remember that your inspection report is a legal document. Write legibly, accurately, and objectively. Report all items of non-compliance at the site, and cite the section of the approved plan that pertains to the non-compliance, if possible. Be careful not to include any information that you are unsure of (i.e., product names).

- _____ Be consistent when writing your inspection reports.
- _____ Identify potential problem areas in such a way that another inspector can take your report and locate the problem area easily.
- _____ Be specific when you describe your observations.
- _____ For each item in the report, state what measures must be taken to fix the problem and a corrective action deadline.
- _____ Note all environmental impacts on your inspection report.
- _____ Use prescriptive writing, not just descriptive.

Descriptive – describes the situation only. Example: silt fence is damaged.

Prescriptive – describes the situation and prescribes actions to be taken to alleviate the problem. Example: silt fence near construction entrance is damaged. Re-install new silt fence, making sure to trench in and wrap ends. Use silt fence as specified on the approved Sediment and Stormwater Plan.

- _____ Attach the photo log to the inspection report.
- _____ Have the report signed and sealed by a Professional Engineer certified in the State of Delaware.
- _____ Distribute the report to the following individuals on a weekly basis:
 - Site owner/developer
 - Project manager/foreman
 - Project engineer
 - Delegated Agency (for commercial and private projects)
 - DNREC (for state projects, federal projects, and enforcement projects only)
 - Responsible Person (if applicable)
 - Others as identified in the preconstruction meeting
- _____ Always submit signed copy of the report, even if submitted digitally.

2.6 Common Compliance Issues at Construction Sites

Compliance issues most commonly found at many construction sites:

Issue #1 – Out of sequence with the plan

There is a sequence of construction specified on the approved plan that must be strictly followed. If there is any discrepancy from the plan regarding phasing or sequencing, note this in your inspection report.

Issue #2 – Dewatering at the construction site

Does the sediment trap have a proper dewatering device in place, such as a skimmer, and is it installed properly? If the trap is being dewatered, the water must be filtered properly before discharging. For example, the water should be filtered through a properly sized geotextile dewatering bag (ie. Dirt Bag TM). If the discharge is turbid, the water may need to be treated with flocculants before discharging from the site. Also make certain that measures have been taken to ensure that the pumped discharge is not causing erosion.

Issue #3 – No temporary or permanent stabilization

Open disturbed areas that remain idle for more than 14 days must be temporarily or permanently stabilized. This must be adhered to no matter what the time of year. If the site has more than 20 acres of open ground without the proper approval, schedule a site meeting to determine the stabilization efforts that will take place to get the site back into compliance.

Issue #4 – No sediment control for temporary stock piles

Install silt fence around all temporary stockpiles. If a stockpile is left disturbed (without active grading) for more than 14 calendar days, it must be stabilized with temporary stabilization measures by seeding and mulching.

Issue #5 – No sediment controls on site

Perimeter controls must be installed properly, and inspected before any land disturbing activity can take place. Once the perimeter controls are approved, the contractor proceeds to the next item on the sequence of construction.

Issue #6 – No inlet protection

All storm drain inlets that receive a discharge from the construction site must be protected before any land disturbing activity begins, and they must be maintained until the drainage area is stabilized. Verify that inlet protection is installed in accordance with the approved plan.

Issue #7 – No BMPs to minimize vehicle tracking onto the road

All construction sites are required to maintain a stabilized construction entrance to minimize vehicle tracking on roadways. If the stabilized construction entrance is properly installed but tracking is still occurring, street sweeping is required.

Issue #8 – Sediment on the road

If BMPs are not adequately keeping sediment off the street, tracked sediment must be removed (e.g., street sweeping), as needed. Washing streets down with water is not acceptable if the runoff enters directly into a storm conveyance system.

Issue #9 – Improper solid waste or hazardous waste management

Solid waste must be disposed of properly, and hazardous waste (including oil, gasoline, and paint) must be properly stored. Ensure that waste collection occurs frequently enough to prevent dumpsters from overflowing.

Issue #10 – Concrete washout in stormwater conveyance system

Concrete trucks are not permitted to washout in a stormwater conveyance system or pond. Ensure that there is a properly installed concrete truck washout area designated on site to reduce the risk of water pollution.

2.7 Enforcement

As a CCR, it is not up to you to refer a project to DNREC. Your job is to simply report your findings, and distribute the reports to the appropriate parties. Only a Delegated Agency can refer a project to DNREC for enforcement action. If you continue to report repeated deficiencies, schedule a meeting with all involved parties such as the site foreman, contractors, owner/developer, and the Delegated Agency to try to resolve the issues at hand. If these issues are not resolved within a certain time frame, the Delegated Agency may take local-level steps to have the issues resolved. One example of local action is to have building permits withheld. At any time, the Delegated Agency has the option request compliance assistance from DNREC and discuss the severity of the violations that could lead to enforcement action.

3.0 Inspecting BMPs

The following information includes inspection tips for commonly implemented BMPs.

3.1 Storm Drain Inlet Protection

Storm drain inlet protection prevents sediment from entering a storm drain by surrounding or covering the inlet with a filtering fabric. This fabric captures the larger sediment particles before allowing the runoff to enter the storm drain.

Several types of filters are commonly used for inlet protection. The type of filter used will depend on inlet type (curb inlet, drop inlet), slope, and amount of flow. There are many different commercial inlet filters available; some are placed in front of or on top of an inlet, others are placed inside the inlet and under the grate. Most importantly, be certain that the filter fabric used in the field meets the specifications in the Delaware Erosion and Sediment Control Handbook and the inlet protection detail on the approved plan.

Inspection tips:

- All storm drain inlets must be protected during all phases of construction. Inlet protection is only removed when approved by DNREC or the Delegated Agency.
- Inlet protection must be inspected to ensure integrity and effectiveness. If the inlet protection is not functioning properly, it must be repaired, replaced, or supplemented with functional BMPs.
- Inlet protection is a secondary BMP! Make sure that erosion controls such as temporary or permanent stabilization and street sweeping are being done to remove sediment before runoff reaches a storm drain inlet.
- Inlet protection should be in place immediately after storm drains are installed (or before land disturbance activities begin in an area with existing storm drains).
- Sediment accumulation should be removed after each storm event if it impedes flow through the filter.
- Make sure there are no “gaps” allowing unfiltered stormwater to enter an inlet.
- Silt fence material is not to be used as a substitute fabric for drop inlets (Figure 1) or under grates.
- There are many types of inlet protection that can be used. Figure 2 shows a silt bag, the preferred method, but it is not applicable in all cases.



Figure 1. Drop inlet as inlet protection



Figure 2. Silt bag as inlet protection

3.2 Stabilized Construction Entrance

A rock construction entrance (Figure 3) can reduce the amount of sediment transported onto paved roads by vehicles. The proper construction entrance knocks mud off the vehicle tires before the vehicle enters a public road.

Inspection tips:

- Vehicle tracking of sediment from the construction site must be minimized by BMPs such as a stabilized construction entrance, concrete or steel wash racks, or equivalent systems. Street sweeping (Figure 4) must be used if such BMPs are not adequate to prevent sediment from being tracked onto the street.
- Be sure that aggregate is replaced when needed.
- Make certain that the construction entrance is long enough to remove mud from the tires (as specified on the approved plan), and a minimum of 50 feet.
- Make sure that stone is the right size (DE #3 stone) and is underlain with geotextile fabric (Type GS-1).
- Vehicle traffic must travel the entire 50-foot length of the stabilized entrance.



Figure 3. Stabilized construction entrance



Figure 4. Street sweeping as an effective BMP

3.3 Silt Fence

A silt fence is a down-gradient barrier intended to intercept sheet flow runoff and settle out sediment while allowing runoff to filter through. It is not intended to control concentrated flow.

Inspection tips:

- Be sure that the proper silt fence is used, as specified on the approved plan. According to the Delaware Erosion and Sediment Control Handbook, Delaware specifications for silt fence include a reinforcing strip on the back of each stake and fencing with posts on 6-foot centers. Figure 5 shows an example of a properly trenched silt fence; the backfill must be compacted on both sides of the fabric. When two pieces of silt fence are joined together, make sure that the ends are wrapped to create a watertight barrier.
- Make sure that repairs are made to the silt fence, when necessary. Torn or degraded silt fence fabric should be replaced immediately.
- Silt fence should be installed along the contour (on a level horizontal plane).
- At the terminus of the silt fence, make sure the ends are turned up slope to help pond the water behind the fabric.
- In instances where silt fence may be adjacent to wetlands or other environmental features, the approved plan may require reinforced silt fence or super silt fence (Figure 6).
- Silt fence must remain in place until final stabilization has been established, and either DNREC or the Delegated Agency has approved its removal.



Figure 5. Trenched in silt fence



Figure 6. Super silt fence

3.4 Diversions/Berms

Diversions (Figure 7) or berms (Figure 8) direct off-site runoff away from unprotected slopes or direct sediment-laden runoff to a sediment trapping structure. A diversion ditch can be located at the upslope side of a construction site to prevent surface runoff from entering the disturbed area. Diversions may be used to convey water around a work area such as a stream crossing. The design of a diversion or berm should ensure that the diverted water is released through a stable outlet and does not cause downstream flooding or erosion.

Inspection tips:

- Make sure the berm is properly compacted and stabilized to minimize erosion.
- Make sure the diversion discharges to a stable outlet or channel.
- Check dams may be necessary if high velocity flows are present.



Figure 7. Diversion



Figure 8. Well compacted berm

3.5 Soil Stabilization Matting and Mulches

Soil stabilization matting and mulches are used for temporary or permanent stabilization and establishing vegetation of disturbed soils. Soil stabilization matting is typically used on slopes or channels while mulches are effective in helping to protect the soil surface and foster the growth of vegetation. In most cases, soil stabilization matting biodegrades over time once the vegetation has had an opportunity to become established. This type of matting is used on slopes less than a 3:1 ration and areas that do not have concentrated flow. For steeper slopes (greater than 3:1) and flow channels, turf reinforcement matting (TRM) is used to interlock the permanent mat with the root structure of the vegetation. Figure 9 is an example of both types of matting; the flow channel has a TRM installed, while the slopes are matted with a biodegradable product.

Inspection tips:

- The matting must have intimate contact with the soil.
- The edge of the matting at the top of the slope must be trenched in (there should be no evidence of water flowing under the matting).
- Loose mulch should not be placed in concentrated flow areas.
- Check to see if erosion is occurring in the mulched area (more mulch may need to be applied). When used, mulch should be applied at a rate which will achieve 100% coverage.
- Check matting to see if sections are overlapped adequately and staples are in accordance with the manufacturer's specifications.
- There are a variety of erosion control products to choose (Figures 9-13); verify that the proper matting or blanket is installed, as specified on the approved plan.



Figure 9. Matting applied in channel



Figure 10. Turf reinforcement matting

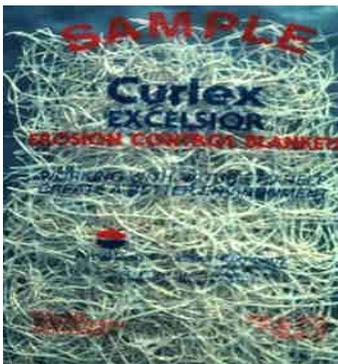


Figure 11. Curled wood fiber



Figure 12. Straw



Figure 13. Coconut fiber

3.6 Temporary Sediment Trap or Basin

A temporary sediment trap (Figure 14) or basin is a temporary ponding area formed by constructing an earthen embankment with an outlet across a swale or by excavating a pit. Temporary sediment traps are intended to detain sediment-laden runoff from small, disturbed areas long enough to allow the majority of the sediment to settle out. A sediment basin is different than a sediment trap in that a sediment basin will be converted to the permanent stormwater management facility, while the sediment trap is only temporary.

Inspection tips for sediment traps and basins:

- Check the location of the sediment trap. Failure of the trap should not pose a risk to life or property.
- Accumulated sediment in the trap should be removed after it reaches about 1/2 the design volume.
- The trap should not be installed in a main stream or near culvert outlets.
- Check the outlet for needed maintenance.
- Slopes of sediment traps and basins are required to be stabilized.



Figure 14. Temporary sediment trap



Figure 15. Skimmer

Inspection tips for sediment basin conversion to permanent stormwater management pond:

- Make sure that all sediment has been removed, erosion repaired, and slopes graded and properly stabilized.
- Make sure that the skimmer (Figure 15) has been removed.
- The most important component of pond conversion is the proper dewatering by using a geotextile device such as a Dirt Bag™ (Figure 16). Flocculants (Figure 17) should be used if small particles, such as clays, are not removed by a dirt bag.
- When dewatering, make certain that there are no signs of erosion at the discharge.
- Be sure that the trash rack has been added to the outlet structure.
- Make sure that the pond has been constructed to the proper configuration and depth, as indicated on the approved plan. An “As Built” will be required at the both the time of pond construction and project close-out. An “As Built” is a survey that documents final pond elevations and volumes.



Figure 16. Geotextile Dewatering Bag (Dirt Bag™)



Figure 17. Flocculant blocks

3.7 Vegetative Stabilization

Vegetative stabilization includes temporary or permanent seeding and sodding. It helps prevent erosion at construction sites by shielding soil from rainfall and runoff, as well as binding soil with an extensive root system. Of course, native grasses are always preferred over introduced/non-native grasses.

Inspection tips for vegetative stabilization:

- Check for signs of erosion in vegetated areas.
- Mulch must be applied at a rate which achieves 100% coverage. Mulch anchoring (crimping or tacking) is also required.
- Concentrated flows should not be allowed across newly seeded slopes.
- No more than 20 acres can be left disturbed at one time. Make sure that the project centers around good sequencing, where soil disturbance is followed by vegetative stabilization (either temporary or permanent).
- Note the condition of temporary stockpiles. If a stockpile is idle for more than 14 calendar days, it must be stabilized.
- If vegetation does not sufficiently establish, re-stabilization is required.
- Check under the mulch layer to ensure that seed has been applied at an acceptable rate.

3.8 Selected Permanent Stormwater Management Systems

Sites containing significant amounts of impervious surfaces will most likely have one or more permanent stormwater management components. The designs for all of these facilities will be specified on the approved plan. It is crucial that a CCR is on-site when permanent stormwater management features are being constructed. It is the CCR's responsibility to complete the stormwater facility construction checklist during construction.

Wet pond inspection tips:

- Be on-site during pond construction.

- There must not be any deviation from the approved plans, especially with substitution of materials such as pipes.
- Order of construction is crucial. If it is an embankment pond, be sure that the pipes and outfall are in place first before constructing the embankment. Never cut through the embankment to construct the outlet. This will weaken the embankment and may lead to failure.
- Be sure that there are water tight seals at all pipe joints.
- Make certain that anti-seep collars are installed. Omitting these features can lead to failure.
- Complete the applicable stormwater facility construction checklist during construction.
- Make sure that the pond has been constructed to the proper configuration and depth, as indicated on the approved plan. An “As Built” will be required at the both the time of pond construction and project close-out. An “As Built” is a survey that documents final pond elevations and volumes.
- Be sure that the trash rack has been added to the outlet structure.

Dry pond inspection tips:

Dry ponds are not approved in Delaware to address water quality requirements, but they do meet water quantity requirements when another water quality practice is used.

- Be on-site during pond construction.
- Be sure that there are water tight seals at all pipe joints.
- Make certain that anti-seep collars are installed. Omitting these features can lead to failure.
- Complete the applicable stormwater facility construction checklist during construction.

Infiltration basin inspection tips:

- Be on-site during basin construction.
- Infiltration basins should only be constructed from the side, so that compaction does not occur.
- Large equipment should never be parked over an area that is intended to be used as an infiltration basin. Marking the limits with orange construction fence at the beginning of the project can help to lessen this probability.
- Once completed, if the basin is not functioning properly (draining within a 48-hour period), the design needs to be reviewed. Lower infiltration rates than were originally tested can result in basin failure. If a design change is necessary, be sure that the new Sediment and Stormwater Plan has been resubmitted to the Delegated Agency for approval.
- Avoid using infiltration basins as sediment traps if possible. If they must be used as a sediment trap, leave the bottom at least 12 inches higher during construction, and excavate down to the final elevation toward the end of construction so that they retain their capacity to infiltrate.
- Complete the applicable stormwater facility construction checklist during construction.

Bioretention facility inspection tips:

- Be on-site during bioretention facility construction.
- Bioretention facilities should only be constructed from the side. Equipment should never maneuver through the bioretention area because it will cause soil compaction.
- Large equipment should never be parked over an area that is intended to be used as a bioretention basin.
- Marking the limits with orange construction fence at the beginning of the project can help to lessen this probability.
- Ensure that biosoil mix meets Delaware specifications, and has been mixed by a DNREC-approved supplier or tested using the accepted protocol. Biosoil mix is comprised of the following, by volume: 1/3 sphagnum peat, 1/3 concrete sand, 1/3 hardwood mulch.
- If the bioretention area has an inlet as part of the design, be sure to verify its invert.
- For the top dressing mulch layer, be sure that triple shredded hardwood mulch is used (no substitutes).
- Avoid using bioretention facilities as sediment traps if possible. If they must be used as a sediment trap, leave the bottom at least 12 inches higher during construction, and excavate down to the final elevation toward the end of construction so that they retain their capacity to infiltrate.
- Planting coverage for bioretention facilities should be 25% - 50% of the area.
- The planting regime should be provided by a landscape designer and should be included as part of the approved plan. It will identify the plant species to be used. This plan should be strictly followed. If no planting plan has been provided as part of the approved plan, notify the owner/developer and the delegated agency about the deficiency. No trees should be planted within the biosoil mix.
- Bioretention areas must be protected from sediment during construction and installed after the contributing drainage area has been stabilized.
- Complete the applicable stormwater facility construction checklist during construction.

Biofiltration facility inspection tips:

- Be on-site during biofiltration facility construction.
- Biofiltration facilities should only be excavated and constructed from the side, so that soil compaction does not occur.
- Ensure that the biofiltration facility has a flat bottom.
- Be sure that the proper seed mix has been used and that a good stand of vegetation is established.
- Complete the applicable stormwater facility construction checklist during construction.

3.9 Solid Waste/Hazardous Waste Management

Pollutants, other than sediment, can be extremely problematic on construction sites of all types. These contaminants can cumulatively destroy our waterways, which is why inspection is necessary.

Inspection tips:

- Litter is to be prohibited and solid waste must be disposed of properly (paper, plastic, construction and demolition debris, and other wastes).
- Hazardous materials must be properly stored, including secondary containment, with restricted access to prevent vandalism. Hazardous materials include oil, gasoline and paint.
- Be sure that spills are contained. Absorbent padding should be kept on-site for this purpose. Drip pans and berms can also be useful.
- Waste should be kept out of contact with water.
- Concrete trucks should never be washed out into the storm drain system. Concrete washout and excess concrete should be placed in a pit and allowed to dry. This material should then be discarded in a landfill. Optimally, dried concrete material should be recycled.
- If vehicles or equipment are fueled on-site, the area should be lined with a vapor barrier, bermed, and located far away from receiving waters and storm drains.

4.0 Additional Resources

DNREC Sediment and Stormwater Program

<http://www.dnrec.state.de.us/DNREC2000/Divisions/Soil/Stormwater/StormWater.htm>

DNREC Sediment and Stormwater Regulations with Amendments

List of Delegated Agencies and contact information

Enforcement Policy

Notice of Intent forms to begin construction

Handbook: Delaware Erosion and Sediment Control Handbook

Standards and Specifications for Green Technology BMPs

Center for Watershed Protection's Stormwater Practices for Cold Climates

<http://www.cwp.org/cold-climates.htm>

Describes some of the challenges of implementing stormwater BMPs in cold climates.

International Erosion Control Association

<http://www.ieca.org/>

Association for erosion and sediment control professionals