**Minimum Design Criteria (MDC) Team  
09/22/2014  
Triangle J COG, Durham**

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| **Attendees** | | | | | |  |
| ***Team Members*** | |  | | |  | ***Others*** |  |
| Eban Bean  Bradley Bennett  Jonathan Bivens Tim Clinkscales Tracy Davis Boyd Devane Hunter Freeman Mike Gallant Joe Hinton  Marc Houle Ron Horvath Bill Hunt  Linda Lewis |  | | Brian Lipscomb Annette Lucas  Mike MacIntyre Todd Miller  Cameron Moore Tom Murray Robert Patterson Derek Pielech Peter Raabe Larry Ragland  JD Solomon Virginia Spillman Toby Vinson Rob Weintraub |  | | Julie Ventaloro, NC DEMLR  Mike Randall, NC DEMLR |

**Note on minutes from last meeting**Joe H – Saw where group was talking about using Styrofoam chips. These are a problem with septic systems where there are fats, oils and grease. Chips will disintegrate if certain material comes into contact with them. At a restaurant, for example, cannot use Styrofoam chips -- that is a problem for infiltration basins.

Annette – Okay. We’ll talk about this further when we talk about dry ponds.

**Presentation by Laura Merriman, NC State - Constructed stormwater wetlands (A Glimpse into the Future).**   
Today, stormwater wetlands are sized mainly based on volume. There is also a water quality component, but footprint is based on volume in 1-foot zone. Other design feature is outlet structure, 2-5 day drawdown. New way to size systems to better reflect how they work.

Dr. Jon Hathaway studied cells in series; 80% of all reduction was happening in Cell One.   
Monitoring site in New Bern, NC; site sees both base flow and storm flow. All of water from creek is diverted into the system which operates on switches; storm flow will kick on with 1 to 1.5” event. Majority of treatment happened in first cell except for nitrogen. Sometimes actually saw small increase in second cell. Over 80% reduction in first 600 feet of flow path.

For water quality purposes, are we sizing stormwater wetlands too big? Looked at tanks-in-series model which mimics short circuiting and stagnant flow areas. Can it work? Yes. But we want to make sure it can work here in NC with temperature, rain patterns. Still collecting results and will be adding light agricultural sites. At end of this, we will do a design case study. Will likely choose a site in NC using traditional sizing methods, and also figure what sizing would be with this new modeling system, then compare these.

**Stormwater Wetlands**   
Annette – Met with Larry and talked about wetland plants. One challenge is plants are not living. Another challenge is wetlands need to be so big b/c we only allow 12” ponding depth right now. We suggest that we increase ponding depth to 18”. In shallow water zone (inundated at 3-6”), plants might dry out during summer. Plants can only tolerate 3-4 days of being dry. We want to give nature a chance to introduce wetland plants.  
  
**Item 1 – Siting**  
 Todd M – Maybe these systems should not dewater natural wetlands at all?  
Annette – Our interest is that we do not want people to dewater natural wetlands. This guidance will be used by many, including local governments.  
Todd M – Can we add something about under certain circumstances, it shall not dewater natural wetlands? Nothing in that explains why we have this rule.   
Annette – Could put an explanation for each of these in the BMP Manual.  
Todd M – But this is the minimum requirement. If something is 55 feet back, you still wouldn’t want to allow it. So not dewatering natural wetland should be a minimum requirement.  
Mike G - One or two meetings ago, we said it was very unlikely that we would get dewatering at that distance.  
Tim – Did 50 feet just come up in last 30 minutes?  
Annette – We had written it before for stormwater detention ponds.  
Bill H – I think maybe the discussion should go along with what Todd said. Under different types of soil, different driving heads, the separation is different. I think we should just say don’t dewater, then clue people into tool based on Skaggs’ Method.  
Mike G – If we don’t list just a distance, we need to require a calculation method.  
Bill H – The Skaggs’ tool is publicly available.  
Jonathan - Undercutting the wetland is what the Skaggs’ rules are based on. We use it all the time for borrow pits. ACOE has signed off on it and are good with it. It produces reasonable numbers. Been in use for 4, 5 or 6 years now. All we put is we’re not dewatering; that elevation is the threshold. In eastern NC, at 65, 70-foot range, we can go down 15 feet below wetlands without it showing wetland deterioriation. In Piedmont, got virtually no impact. Takes into account soil type, elevation type, and calculates based on distance. So far, ACOE and end users are satisfied with its use.   
Joe H – If put that in there, they’re going to make you use Skaggs’ method every time.  
Jonathan – Rule on DOT pits is 400 feet; if you’re within 400 feet of regulated wetland, ACOE requires to use Skaggs’ method. Only if you’re dewatering. If elevation is below wetland, and you’re below 400 feet, you have to use Skaggs’.  
Joe H – If I’m 100-feet elevation away --  
Jonathan – If you’re below wetland then you don’t have to use it.  
Tim – I think it should be zero feet if you don’t dewater wetlands, shouldn’t have to show anything. If you’re equal to or above wetland, you shouldn’t have to spend time, money to do it. Not in the statutes.  
Larry – Say below “wetland” elevation, not SHWT elevation. SHWT doesn’t matter unless you’re below the wetland.  
JD – On one hand, we say we have standard of Skaggs’ method or 50 feet, then we’re putting a performance standard on top of that. Don’t think we need to use Skaggs’ AND don’t dewater the wetlands. Asking people to decide which is more important. Use Skaggs’ method to meet intent of not dewatering the wetland.  
Hunter – On other MDCs, did we remove the calculation method from the MDC itself? I think we did. We put the calculation method in a separate calculation section.  
Annette – For wet ponds, calculation method is in the MDC.  
Jonathan – We should separate them. First sentence, don’t dewater; second sentence, use Skaggs’ method if excavates below wetland elevation. Agree with JD – don’t need triple jeopardy.  
Annette – If Skaggs’ method is easy to use and readily available, maybe that’s the way to go.  
Mike G – We need to point people to the method either in Manual or on DENR website.  
JD – When engineer uses Skaggs’ method and it does dewater wetland, are we liable for it? If that’s not what we mean, we just need to say ‘don’t dewater the wetlands.’  
Tim – There are other methods we could use.  
Annette – JD brings up a good point. What if someone uses another reputable method, and still inadvertently dewaters the wetland?   
Bill H- Those methods will often fail.  
Peter – From permitting standpoint, want to avoid that, but if it’s the best available, like they say, stuff happens.  
Jonathan – Skaggs’ came about because Corps said “You’re going to dewater that wetland.” We said, “Prove it.” Wilmington district was looking for 400 feet of every buffer. They accepted Skaggs’ method. That’s how it came about. No other simple or easy method for getting it done.  
Eban – Say another method comes along. Should this be made a recommendation?  
Jonathan – I’m okay with that. Skaggs’ method may be used. It’s not absolute, but it’s an accepted method.  
Annette – If we kept whole thing as MDC, imperative that shall not dewater wetland, but keep Skaggs’ method either as recommendation or separate in Manual.  
Robert – If that’s the method the Corps accepts --  
Jonathan – May still need soil scientist or geologist to get good numbers to plug in.  
Annette – How about: Stormwater systems shall be designed to not dewater naturally-occurring wetalnds. Skaggs’ Method may be used to analyze the potential impact of a stormwater wetland that is proposed to be excavated below the wetland elevation (provide a link in BMP manual to Skaggs’ Method).  
Todd M – If wetlands dry up, can you fix it, enforce it?  
Bradley – We’ll have to take this back to our wetlands folks and check with them.  
Rob W – We’re looking at minimum design criteria. One hurricane ruins more than 95% of whatever we do. Skaggs’ method works in 95% of cases -- that’s as good as we can get. We’re going to lose a few wetlands. I’ve seen it where wetlands will grow towards constructed wetlands.   
Annette – So you’re just telling us to lighten up a little bit?  
Bill H – Skaggs name is Skaggs, not Skagg.  
Bradley – We’ve tried to use Skaggs’ method in other applications. Want to be sure he would say this method is okay for this application.  
Bill H – Skaggs told me he felt comfortable for this being used for side-of-road ditches.  
Annette – Is everyone okay with this?  
Group voted yes.  
  
**Item 2 - Temporary ponding depth and surface area**Bill H – There will be periods during storm event where flow rate exceeds treatment flow rate. Idea is you have a treatment flow rate that over the course of a year, 80-90% of the water is exposed to. Unlike now, we expose that amount of the water to some detention, then slow withdrawal.  
Annette – You’re saying that wetland plants don’t need 2-5 days to do their job of removing pollutants?   
Bill H – For wq volume, 90% of water over a year, if you can expose 90% to treatment, then I think – I’m happy with that. We’re taking away we’ve got to capture rain for 1 to 1.5” event for 2-5 days. We’re subjecting droplets of water to sufficient detention time in the wetland which is what will make these more curvaceous, sinuous. Get away from requiring 15, 18” of ponding. Ones that do best have 6-8” ponding at normal pool.  
Rob W – What you’re talking about is a whole new approach. Are these 25 items or whatever – are we going in the wrong order now if we’re going to have a different approach when we’re done?  
Annette – We could take an approach where we have two different methods. Use it as a shallow wet pond, grade it differently or what Bill is suggesting -- treating it almost like a VFS-level spreader, flow- through device. Would it be valuable to have two different tracks? Shallow pond or flow-through approach?  
Mike G – When does the methodology become available for that?  
Bill H – My hunch is Christmastime, we can unveil it. Laura’s in the middle of it right now.  
Rob W – Do we want to switch this to a December topic, or do we keep going through this without knowing what we’ll have in December?  
Annette – Depends on what you all want. If you think folks would like to have two ways to design it, shallow detention wetland vs flow-through wetland, then worth having this conversation now.  
Mike G – Worth keeping the original method, at least for now, so people can get used to it.  
Ron – Agree with Bill. Don’t want stuff dying on me in the first year. Until we can dig into this more --  
Larry – Didn’t you express that 15” might work?  
Bill H – I personally could live with 15”.  
Annette – My opinion is we should have a detention wetland track, then discuss the flow through wetland track in January.  
Larry – I think going from 12” to 15” would have a tremendous footprint impact.   
Mike G – One of the reasons we don’t see more of these around is because of the large footprint, so anything we can do to make them smaller --  
Todd – Item 3, where we talk about reducing infiltration, how does all of this work together and still get that drawdown? Looks like you’re installing things to reduce infiltration rate.  
Annette – We’re suggesting removing that.  
Todd – Can we get drawdown of 15” in 2-5 days?  
Annette – Yes. It’s all about how you size your outlet device.  
Group voted to change ponding depth to 15”.  
Annette – Would we be okay allowing larger storms to be ponded for flood control?  
Bill H – Can mitigate big storms in wetland just like with a pond.  
Robert – The 12” to 15” is such a small difference. A guy on excavator – do we really think he’s going to hit that?  
Jonathan – If he’s on average going for 12, but his statistical average should be reachable. You’re going to have variation. I think the target value is what you’re looking for.  
Robert – If target is 15, but you end up with 18, then you’re screwed.  
Jonathan – If it’s all 3 inches deeper, then yeah.  
Bill H – One of the things the engineering community is not practicing enough is that outlet structures have adjustability.   
Larry – Although that adds to the maintenance factor.  
Peter – Should that be a recommendation?  
Bill H – After first year, when plants have taken hold, would like to be able to move outlet structure up.  
Hunter – You’re talking about adjusting normal pool?  
Bill H – Normal pool stays same, but temporary ponding is adjusted. In Charlotte, they use adjustable outlet structures.  
Mike M – We don’t have too many wetlands.  
Bill H –In Charlotte, they unscrewed it, moved the plate down, drilled holes again, screwed it back in. Orifice was 2 or 3 inches.  
Hunter – So they moved normal pool up and down.  
Bill H – You’re right. My bad. I’m arguing temporary pool can also be adjusted.  
Larry – If you change so you can bury some other elevations, they’ve got to check out the worse-case scenario.  
Bill H [Drew schematic of adjustable outlet structure on whiteboard.] During first growing season, you do not want to expose them to 12, 15” of ponding. Want it to be 4, 5”. Trade off is only treating 4” equals 50% of water that first year.  
Hunter – My biggest problem with that is it might work with Charlotte, Raleigh, but State does not have follow up with inspections. Chance of that change getting made is really low.  
Joe H – What size pipe is that?  
Bill H – This could be 12 inches.  
Joe H – We use that with septic systems to force it back. It’s not that complicated. It clicks up and down. I can control flow with that.  
Bill H – After one year, a correction should be made with these systems if you really want plants to take. Not just my opinion, but a number of us at NC State. Want to have a growing season-specific ponding depth, then have it ramp up. Say contractor messes up by a few inches, allows plate to be adjusted as well.  
Hunter – But you’re out on the sites all the time. In the permit world, I don’t get a contract to go look at this five years from now. Once I get C/O, I’m done. I know you hit this in your maintenance classes. Highest common denominator is okay if we have control.  
Bill H – What fraction of practices are put into high denominator communities? A lot.  
Hunter – But they don’t have to follow MDC.  
Bill H – But don’t most, save Charlotte?  
Robert – We do at least what’s in the BMP Manual, but some permits get written outside that.  
Group agreed to add recommendation: OUTLET. An adjustable outlet structure is recommended to assist with vegetation establishment and to permanently set the temporary pool elevation and height of the drawdown orifice. Adjustable outlet structures require appropriate oversight and implementation.  
Todd - How long can plants stay flooded until they die? What about with repetitive storm events?  
Larry – Highly dependent on plants, but most woody ornamentals can take 48 hours. If you’re planting in wetland area, use plants tolerant of wet feet. Whether or not upper part of plants can take flooding -- some can drop foliage but come right back.

**Item 3 Maintenance of the permanent pool**  
Annette – Larry and I suggest removing this all together. Let water infiltrate if it wants to?  
Derek – What happens to plants in inundation zone?  
Annette – Shallow water zone of 3-6” -- let’s not worry about planting plants in shallow water zone.  
Robert – So what do you plant then? Can’t just be bare earth in temporary inundation zone --  
Larry – This is the shallow water zone we’re talking about.  
Peter – Essentially, there wouldn’t be a permanent pool anymore?  
Mike G – Just don’t plant anything in the deep zone. Stuff will grow there eventually.  
Annette – Have herbaceous plants between TPE and PPE. Trees and shrubs at top of shallow inundation zone. Then , if water’s infiltrating into ground, causing PPE to get lower, then we won’t have these plants die. What do you all think of this idea?  
Larry – That zone is usually flat, broad area.  
Bill H – I don’t like it.  
Robert – Not seeing issue of plants dying in wetlands, unlike wet ponds.  
Bill H – As an example, pickerelweed can handle being dry for months at a time. If those plants can make it through that, I rest my case.  
Boyd – If soil can infiltrate, force them to do infiltration basins.  
Bill H – That’s where nitrogen gets removed, at water-soil interface. There’s a reason why constructed wetlands are largely shallow water, because that’s where the nitrogen gets removed. Also, arrowhead (two kinds), bulrush. A lot of plants make it; have photos to back that up. My hunch is that the systems went extremely dry because they were put in sandy soil areas, and they might have been trying to establish during the drought, and that’s why they died. I just think it’s a bad idea.  
Jonathan – I’m trying to follow all this discussion. General comment is as you go out, we encounter natural wetlands at all different elevations on a given piece of property, why are we worried about putting in a liner? Liner is an expense that I don’t think we’re getting bang for the buck out of it. Even on a big tract, there are different soil types. I’ve seen wetland plants develop up on their own. I don’t think we need to require liner. We need to look at plant types, give people leeway to design things that will work. Liners are very difficult to maintain. People coming to do maintenance don’t have skills to repair the liners.  
Mike G – I feel like the same argument is true of wet ponds. If you’re infiltrating water, get better treatment for bacteria, other pollutants.   
Jonathan – Agree. Depends what pollutants you’re going for. If it’s a pond to collect hazardous materials, you’ve got to line them. If we just want to get silts, nutrients, we want them to get in the ground and keep out of running water.  
Annette – I’m hearing folks say don’t want to line wetland, and don’t want to be restricted to keeping PPE plus/minus 6” of SHWT. Do you agree to remove Item 3?  
Most of Group agreed to remove Item 3.  
Bill H – I don’t think whole Item 3 should stay. Predators of mosquitos like deep pools. If you can guarantee me that deep pool will remain deep during drought, then okay. But if not, you’re opening up your wetland to become mosquito breeding ground. I don’t have an issue lining a deep pool if I’m not convinced I can dig down deep enough if I’m not sure water table will stay. Most of the time, the deep pools do retain some amount of water and provide some predator refuge. Idea behind this item, in part, was mosquito prevention. Maybe we can address this somewhere in here.  
Annette – How would a designer know when they hit the mark of having wet enough deep pool?  
Bill – As long as it would have 4 inches in it during a drought? I look at where the NPE should be based on long term water table, then I allow for a lot of infiltration and evapotranspiration during a 10-year drought, then calculate out infiltration loss and ET loss.   
Hunter – I agree with Boyd and Bill. If it can infiltrate, then we should make people design it as an infiltration system. Equitable system where have most appropriate BMP for a site. I don’t want someone designing a wetland that won’t stay wet. On wet pond, didn’t scare me as much allowing infiltration, because we’re not depending on a wetland community there, spending that money.   
Annette – What about a *recommendation* for a deep pool permanent pool if wetland will be below SHWT and mosquitos are likely to be a concern on or near the site, then deep pool will need to be sufficiently deep to retain water to provide habitat for mosquito predators?  
Bill H – Wetlands might be perched above water table; those would be the ones most apt to need liners. In clay soils, deep pools will probably hold water. In coastal areas, dig down deep enough to hit water table, so water stays in there.  
Annette – So is recommendation okay?  
JD – I’m thinking liability. Are we saying if don’t put liner in, we don’t care about mosquitos? Maybe we rephrase it.   
Annette – We can work on the wording.  
Jonathan – If we’re worried about mosquitos, we have to think about it with all our devices.  
JD – right, but this is the first time we’ve brought up mosquitos.  
Joe H – Mosquitos can live on a cupped leaf if water stays there long enough.  
Bill H – This is the practice people most associate with mosquitos.  
Group agreed to remove Item 3.  
 **Item 4**Annette – Larry and I suggest removing this item and replacing with: SOIL AMENDMENTS. Soil amendments that enhance the water-retaining capacity of the soil shall be incorporated into the top 12 inches of the soil in the temporary inundation zone.  
Hunter – Agree with intent, but not sure about wording.  
Rob W – Performance criteria – if it’s not alive, it’s not going to get accepted. I’m concerned when you start looking at amendments -- we could be here for hours.   
Larry – pH adjustment is the most critical amendment to get any plant to grow.  
Hunter – My thing is compaction. Tight clays get too tight. Topsoil has helped in the past, but not saying we stick with this item. To Rob’s point, the idea that we wait and see if plants are healthy before we certify hasn’t worked for me in the past. If these are erosion control devices, they are planted day or two before C/O is issued.  
Rob W – We still have BMP that says if everything’s dead, it’s not going to work.   
Annette – Is there a published standard for amending soil somewhere that people use?  
Larry – Plenty of landscape specs that define topsoil first. Then have soil amendments for planting media.  
Bill H – Does DOT have an amendment spec for certain areas like rest stops?  
Brian L – Not sure. Have specs on topsoil, compost.   
Joe H – Our office does a lot of testing. Anything that’s on top of the ground is topsoil. Percent of sand, silt, clay in it.  
Jonathan – What do you need to grow the plants is what you’re looking for. DOT has a pH requirement for plants on shoulders, slopes. We need to be very broad, either suitable for growing soil – maybe a recommendation that we hit a pH range. Need to amend it if it’s not in that pH range. How deep a plant bed do you want? You take a cut slope, you just walk it, won’t get a lot of grass to grow. Nothing’s growing in fully-compacted soil either.  
Rob w – In Town of Cary, they wanted soils type at the design approval step. When it’s built, they’ll use a different type of soil. But inspectors say this is what you have, this is what you need to use. We need to keep this broad.  
Peter – Seems like 12” is right depth for root growth. I like the pH standard. We don’t need to bring topsoil in if we have good soil.  
Annette – How about PLANTING SOIL. Within the first 12 inches of the soil surface in the wetland planting areas, the pH, compaction, and other attributes of the soil shall be adjusted if necessary to provide for optimal plant health [provide more specific recommendations in BMP manual.]  
Marc H – We should keep this broad.  
Hunter – We put planning specs on plan sheets all the time. Could MDC just require that we include this in design specs? Requiring that for first 12”, a soil specification is provided. Right now, on plans, we just write ‘topsoil.’ Considerations for different elevations also. System we have now is not working perfectly. I’m for putting in a planting spec b/c of what landscape architects are telling us.  
Joe H – What is planting soil? How about planting site? What we’re talking about is site where the plants are going, not the soil so much.   
  
Group agreed to change Item 4 to: PLANTING SITE. Within the first 12 inches of the soil surface in the wetland planting areas, the pH, compaction, and other attributes of the soil shall be adjusted if necessary to promote plant establishment and growth [provide more specific recommendations in BMP Manual.]

**Item 5: Minimum treatment volume**  
Group agreed to eliminate Item 5.

**Item 6 Location of inlet and outlet structures.**  
Annette – RRC attorneys don’t like the term “short circuiting.”  
Jonathan – Why don’t we put “must be located in a manner that ensures treatment”?  
JD – “Short circuiting” is the right word.  
Bradley – If that’s the right term, we can use it.  
Derek – I like the way it’s worded. It’s clear.  
Mike M – How about “length of flowpath shall equal distance of at least the maximum dimension of the facility”?   
Hunter – Makes sense, but I’m fine with “short circuiting.”  
Group agreed to: LOCATION OF INLET AND OUTLET STRUCTURES. The inlet and outlet structures shall be located in a manner that avoids short circuiting in the wetland.  
 **Item 11 Conveyance of storms exceeding the design storm**Annette – RRC attorneys don’t like words “safely” and “catastrophic.”  
Hunter – Isn’t this covered under one of our general MDCs?  
Annette – We do, but this is a little different. This is more for devices that handle larger flooding events.  
Hunter – Doesn’t general MDC say safely handle storms for the entire contributing area?  
Annette – I think general MDC says if site receives offsite drainage that you’re not bypassing, the device must include offsite drainage for treatment. This one is about devices that handle flooding where we might put larger storms to it, we have an emergency spillway.  
Hunter – I still think this is in our general MDCs. If it’s not, it should be.  
Annette- I think you’re thinking of #1, but that’s pertinent to treatment.  
Tim – That’s not a DENR review thing. It’s a designer thing. But what’s the design storm? We’ve had this discussion before. Now we’re saying 100-year event. Not role of DENR, so shouldn’t even be in here.  
Hunter – I think #1 (general MDC) can stand alone and we can get rid of Item 11. I interpreted #1 to include larger storm events, protecting human health and safety.  
Tim – Right. But it shouldn’t be reviewed.  
Annette – Group thought when we talked about wet ponds, that this was part of protecting the device in perpetuity. What I’m saying is RRC doesn’t like the terms “safely” and “catastrophic.” Maybe these should be repeated for every device as general MDC?  
Tim – So, I determine what means failure with a seal, and the reviewer determines it with a comment letter. Which one wins?  
Annette – So are we okay with removing terms “safely” and “catastrophic” and moving it to general MDC?  
JD – I agree we should just strike Item 11 all together and let design community work it out. Instead of making it a requirement, just make designer state what size storm it is.  
Annette – Group agreed that we need something to make sure device functions in perpetuity.  
Tim – But that’s not the job of state stormwater permitting. That’s for water quality. Who says certain size storms protect the device?   
Mike G – If you pick a storm, say 50-year storm, then you have something bigger than that, if there is no standard for that --  
Rob W – I think O&M guidelines address that. Doesn’t matter why it failed. It’s got to be repaired or replaced. At that point, design doesn’t matter. It’s the maintenance.  
Jonathan – I think it’s dangerous to put a duration of storm in there. It goes back to Tim’s standard of care. Our general note already covers it. Let’s strike this and move on.  
Group agreed to strike Item 11.  
Todd M – Is there value in designer stating what size storm the system can withstand?  
Derek – Not at the state level, but maybe local ordinance.  
JD – Not saying have a standard, but just state what it is.  
Todd M – So buyer knows what they’re getting?  
Todd M – If we’re going to take out all this, can we require designer to say what size storm the system is designed for?  
Tim – In words of Rep Millis, you need to prove in code where you have authority to do that. That’s the intent of what his legislation was.  
Todd M – It goes to the maintenance requirements of the system.  
Jonthan – As a matter ofu nderstanding, dams are required to be designed to certain years’ criteria. If any of these devices fall under that standard, they will fall under that. Those are the only ones that can’t be replaced or repaired afterwards regardless of how they were designed.  
Marc H – If you have anything downstream, they can require dams to be called high hazard.  
Jonathan – To Tim’s point, I don’t see adding that to this. This is just claim bait for attorneys and is not going to help anybody.  
Annette – Todd has put suggestion out that folks just simply state as matter of disclosure what size the design storm the system has been designed to. What does group think about this?  
Group voted against including this requirement.  
Ron H – It’s in the calculations. When you run calculations, you use this information.  
Hunter – If owner wants that – I don’t see what value is in State asking for that.  
Todd M – State has to make sure the systems are maintained in perpetuity.   
Ron H – Problem I have is discussion today is about wetlands. We’re migrating away from these large systems. Most of these standards will probably be thrown out as we move into LID, pocket wetlands.  
Hunter – We don’t see many devices built larger than ½ acre these days.  
Annette – Could we require a note about this in O&M agreement? This system was designed to handle up to an xx storm--  
Derek – That’s between owner and designer. No place for State to step in. It has nothing to do with water quality.  
Annette – Owners don’t always look through the calculation package. Owner may not know that device is likely to fail in 10 inch storm, so maybe it would be useful for owner to know.  
Todd – Since the owner is responsible for maintenance of system.  
Bradley – Ultimately, these projects will be in hands of HOA, not owner still working with the engineer, so some of these things become issues later. HOA will come to us or local government saying State should have caught that. With fast-track permitting, that becomes something bigger issue on tail end. Will system function long term? Compliance and enforcement will become greater issue if we’re not reviewing this. That definitely is within our purview – ensuring system will function long term.   
Annette - HB 480 tells us we have to protect water quality standards.  
Rob W – By having a disclosure, you’ll drive everybody insane. State will keep getting calls about what size storm everyone else is using.  
Annette – I think Group is agreeing about not requiring certain design storm.  
Rob W – But I think even disclosure will have same effect.  
Annette – How will device be protected in perpetuity even though we’re not requiring disclosure of size storm?  
Joe H – Just because you state it, doesn’t mean you’re going to do it.  
Bradley – Maybe we just have language in O&M.  
Mike G – In weir or spillway, who’s to say it wasn’t already previously eroded before storm event happened? How would you prove that it was a design error?  
Annette – We have Item 5, General MDC, talks about O&M actions that shall be taken, who is responsible if a failure occurs. So we are requiring restoration of the device.  
Mike M – It’s already too late if you just do that. Water quality impact has already happened. I don’t think we should take this item out. Needs to be protection of downstream streams and property owners.  
Virginia – What are we requiring people to submit with plans? Won’t all this information be on plans? The issue will be for those who don’t know what they’re doing. Seems like we’re overregulating. If we’re going to get all the calculations, but if our expectation is to not get anything, then maybe we need more information.  
Tim – I just give them water quality calculations, no extra paperwork.   
Annette – If we don’t tell you to show that you designed emergency spillway for certain size storm, you’re not providing that?  
Tim – I don’t provide that.  
Peter – Whole thing with licensing. If engineers are doing such a bang-up job, then maybe we just say you have to make sure your device works in perpetuity. Can’t pass if off to HOA or someone else.   
Tim – There are specific rules with licensing boards that limit liability. What we’re trying to determine is what does State have authority to do?  
Mike G – Biggest issue we have is not designing devices to function in perpetuity, but that we turn these over to HOAs and other entities that it shouldn’t be. Hate to say it, but would be better if they were under auspices of a utility. That would solve a lot of these issues, could hold someone with a license accountable.  
Peter – I agree with that.  
Annette – Let’s bring the discussion back to MDCs. We’ve already agreed to delete Item 11, but a few would like there to be some sort of notification about size of design storm. But others are vehemently against this notification.   
Hunter – I don’t think it’s a bad idea, just no value.  
Tim – We don’t have authority.  
Derek – Not State’s job to require it.  
Jonathan – We just have to have a majority.  
Group voted (again) to remove this Item 11.

**Item 7 Forebay and Outlet Pool**  
Annette – Proposing to put these together into one item (some of this was in Item 8 Deep Pools). Rationale: Deep pool at outlet structure keeps plants away from outlet. Deep pools within wetland are to provide habitat for mosquito predators.  
Todd M – Is there ability to have more natural-type wetland that would be less expense and less upkeep?  
Annette – We’ll get into that when we write alternative design criteria. Or we can explain what wetlands alternatives are in the wetlands MDC.  
Group agreed to suggested language: A forebay shall be provided at the inlet to the stormwater wetland and an outlet pool shall be provided adjacent to the outlet structure. The forebay and the outlet pool shall each comprise approximately 10-15% of the wetland surface area. The forebay and outlet pool depths shall be 24-40” deep with respect to the permanent pool. The forebay entrance shall be deeper than the exit.  
Later, during discussion of Deep Pool, group agreed to separate out Forebay and Non-Forebay. *[Need to go back and make sure above language reflect just Forebay.]* **Item 8 Non-Forebay/Deep Pools**Annette – Suggested language: DEEP POOLS. Deep pools shall be provided throughout the wetland. The deep pools shall comprise 10-20% of the wetland surface area and shall be 18-36” deep with respect to the permanent pool.  
Bill H – I don’t think outlet pool needs to be 15%. Purpose of outlet pool is to draw water from deeper in the water column. Don’t need to have 20% to achieve design pools.  
Hunter – Can we say one of the pools shall be located at the outlet?  
Group agreed to keep Item 8 as Non-Forebay.  
Group agreed to: NON-FOREBAY DEEP POOLS. Deep pools shall be provided throughout the wetland. A deep pool shall be located adjacent to the outlet structure to prevent clogging. The non-forebay deep pools shall comprise 5-15% of the wetland surface area and shall be a minimum of 18” deep at the deepest point with respect to the permanent pool.

**Item 9 Shallow Water Zones**  
Larry – We weren’t sure how much shallow water zone contributed to water quality.  
Bill H – Majority of surface flow wetlands across U.S. all had shallow water zones. Nitrogen is removed by vegetation uptake, but it is principly done by microorganisms in root zones. If nitrogen is not an issue, this isn’t as important. But if nitrogen is issue, want to have good size footprint of shallow water. With wet ponds, the amount of shelf that would qualify as shallow water is roughly 50%. So only 5% of wet pond is dedicated to shallow water zone – you cannot tell a difference. But with wetlands, you’d be removing the principle nitrogen-removal feature of the device.  
Larry – How big a difference if shallow water is in full shade vs. sun?  
Bill H – Majority of wetlands that do well will be at least part sun or full sun. Shading will have impact on herbaceous species.  
Larry – My experience is most natural wetland species do better in shade.  
Bill H – Comes down to types of vegetation that are recommended. There are maybe 7 plants that do really well in shallow water zone of constructed wetland, lizards tail, pickerel weed, juncus, arrowhead, woolgrass. . . .  
Larry – From viewpoint of getting plants established, all these are bare root plantings. Can’t use mulch b/c it floats away. First time water comes up, 30% float up b/c media not appropriate. Topsoil allows plants to float around so you lose a lot of the plants.   
Bill H – We tend to plant our plants more densely than what is done across state.  
Larry – That’s a key point. If we want to have a final product so this thing will evolve the way it should, we might need higher number of plants, assuming a 30% loss the first year. And that’s if everything is working right. If someone is monkeying with water levels, will have greater loss than that.  
Keep Item 9 worded the way it is now in the BMP Manual.  
Hunter – We need to verify percentages when we get done with all of these. Need clarification of wetland surface area – is that normal pool, inundation zone?  
Larry – Can we change it to 3-9” to expand types of plants we can use?  
Bill H – We’ve found it hard to get plants established at 9”.  
Larry - If we had 3-9 as permanent design criteria, but allow them to set up a lower permanent pool elevation for the first year, so you have 3-6” first year.  
Bill H – That could help solve the problem. Some wetlands do not have the 12” temporary pool height. They’re around 6”. They’re our best wetlands in terms of vegetation coverage.  
Larry – I do inspections for Wake County school BMPs. I haven’t seen a good wetland solution yet.  
Bill H – I also think that the soils they’re using for the plants are awful.  
Annette – Any wording changes?  
Larry – Just change it to 3-9” and leave the rest like it is. That gives a little more latitude to what plants you can select.  
Hunter – Let’s start dimension at 0”, and end at top of shallow water. We need to have contiguous depth range that covers everything between those. Let others argue about what the top end should be. In current wetlands spec, we have 3” gap and gap between shallow water and deep pool.  
Bill H – We call that the transition zone.  
Annette – Is 9” too deep?  
Bill H – Willing to try that if we allow first growing season to have a lower ponding depth for temp pool. Would be something you’d have to put on the list to do. Cities inspectors would need to verify it’s been done.  
Larry – I think the soils are the majority of the problem.  
Bill H – We usually have more issue with shallow land zone than shallow water zone.  
Annette – Are we okay with shallow water zone 0-6” deep; shallow water plantings may be increased to 0-9” depth with adjustable outlet structure? Group agreed.   
Hunter – Are we calling shallow water 0-9”?  
Annette – Yes.  
-Further discussion-  
 Group agreed to change Item 9 to: SHALLOW WATER ZONES Shallow water zones shall comprise approximately 50% of the non-deep pool wetland surface area and shall be 0-9” deep with respect to the permanent pool. It is recommended to only plant betweenthe 6-9” depth range if there is an adjustable outlet structure to keep the permanent pool at a lower depth during the first year.  
  
**Item 10 Temporary Inundation Zones**   
Larry – How do ranges fit within minimum design criteria?  
Hunter – In order for wetlands to get credits, they have to meet specific design ratio.  
Marc H – I think you can design to those ranges, but with as-built, you get some flexibility.  
BMP Manual calls it “shallow land.”  
Annette – I think “temporary inundation” is more descriptive.   
Group agreed to change Item 10 to Temporary inundation zones shall comprise approximately 30-45% of the surface area of the stormwater wetland. They shall be 0-15” above the permanent pool elevation.  
  
**Item 12 Drawdown time**  
Group agreed to keep wording as it is now in Manual.  
  
**Item 13 Discharge Rate**  
Bill H will send information on pre-development discharge rate to the group by December 1st.

**Item 14 Landscaping Plan**Larry – Why do we have “source of plant materials?”  
Annette – We were thinking about making sure we have plants for local climate.  
Tim – I don’t think source matters.  
Larry – Seems irrelevant. We used to be concerned about bringing up plants from Florida. They didn’t acclimate here very well.  
Rob W – You should say during planning process, sequence and timing including determining and adding soil amendments. You wouldn’t determine it until later.  
Larry – How is sequence for planning activities relevant for MDC?  
Annette – Agency has always asked for that in the past. People need to have this thought out or the plants will not survive. Plants are crucial to function of device. Seems foolish to have people plant at poor time of year.  
Ron – But some can’t get C/O until planting is complete.  
Virginia – They could get bond.  
Jonathan – Not the world that most commercial development lives in, but it makes sense.  
Larry – All look good to me except source and sequence in Item 14. Those don’t relate to end result.  
Jonathan – We’ve already covered soil in Item 4.  
Annette – So maybe we can delete specifications for soil amendments.  
Jonathan – Fine to reiterate it here. Because it’s going to be on the plan. Anything the guy doing work in the field needs to do should to be listed on the plan itself; he’s not going to look at permit application.  
Ron – Guy building it doesn’t care about size storm. Definitely put soil amendments on plan.  
Larry – Are you going to put the pH specification on the plan?  
Hunter – This was rephrased to soil amendment standards, not specifications.  
Larry – What is it we’re putting on the planting plan?  
Jonathan – That he’s got to do that. Who does the owner want to do the soil testing, and when does he want the testing done? Owner should put that on there or ask landscape professional when they want to have this done. But can’t put all that in permit.  
Annette – We said pH, compaction, and other attributes of the planting site. Is that wording --  
Group agreed to change Item 14 as follows (*addt’l changes made after further discussion below*):  
Remove “Source of plant materials” and “Sequence and timing. . . .”  
Change “Specifications . . .” to “Requirements for soil testing as well as pH, compaction and other attributes of the planting site to promote plant growth.”  
Todd M – Why don’t we need sequence of planting?  
Derek – As engineer, certain things we need to have on plans in order for him to stamp it. These are redundant. These are all things he’d put on there anyway.  
Annette – I find planting plans to be lacking. The way our licensing rules work, we can work in our own self-determined area of expertise. If you have a civil who thinks he/she is an expert on plants, that might not actually be his/her area of expertise.  
Tim – We have cross mingling of professionals in this, so let’s not call out engineers.  
Derek – We’re lucky -- we get pretty good landscape plans.  
Larry – Most landscape plans I do, I don’t go into detail notes on the plan. I include those in technical specs that covers where get material, nursery standards, etc. In Florida, they have 5 grades of plants; works differently than in NC. I understand that you’d like to see it, but wouldn’t go on drawing, would go on technical spec.  
Annette – Doesn’t say has to be on drawing.  
Larry – I would interpret that it does.  
Annette – I’ve never commented on a landscaping plan unless it has cattails in it. That’s not my area of expertise. But I like to see that it’s provided for.  
Tim – But it could be totally wrong.  
Annette – It could be, but I just like to see it there because that’s part of the device.  
Larry – If sequencing is related to you’re only going to inundate during period of time, then change it. That would be important functional aspect you would have to put a note on drawing for contractor. In that sense, sequence makes sense, but I don’t think fertilization – that was written in an installation context, not a context like first-year survival conditions.  
Annette – Do you ever have to water wetland plants to establish them?  
Larry – I would hope not. Once it’s planted, you want to close the valves in a time period that allows water to get up to level plants are anticipating.  
Jonathan – In drought period, you would water to ensure survivability. Cheapest thing for us is to run the water truck rather than have to replant two or three times.  
Annette – Where are we? Some people say just stamp of people who feel they have license/expertise should be okay and we don’t need list. Others say they like the list, but need to wordsmith.  
Larry – Plant layout, delineation, total number and sizes demonstrate compliance. Some of these other things -- I’m not sure they apply towards demonstration of compliance.  
Jonathan – I agree. Why do you need specification of supplementary plants? If this is strictly a permit document, keep first three, lose everything else. Will have a construction document that will take care of the rest of this.  
Group agreed to keep top three bullets under landscaping plan; get rid of the rest.  
  
**Item 15 Shallow Water Plantings**  
Bradley – When this part of Manual was developed, we got assistance from our 401 wetlands folks doing restoration.  
Rob W – If you plant them, then a year later, there’s only 40 alive. But each is a foot across, you’ve got coverage. Do you need to specify density or just coverage?   
Larry – You do more damage trying to lower water level and go in and replant. I question the whole reason for this item. Prescriptive rather than performance. What’s the coverage standard? What’s the standard for erosion control?  
Jonathan – You have to have 80% for standard grass, but that’s up for debate as to how you measure that.  
Bill H – Whatever it is, it has to be done after some length of time with a wetland. Evaluation should be after first full growing season.  
Annette – How about After the first growing season, the coverage shall be 60%.  
Larry – At 60%, you have good chance the remaining 40% will fill in.  
Joe H – Minimum of 60%?  
Bill H – You can get 60% coverage with 3-foot center.  
Ron H – I like a performance standard a year after growth. I have a problem with 4” pots, 2-foot centers. But there is a bonding issue if we’re waiting a year. They want to know they’ve reached a point of completeness. I prefer the 60% coverage a year after.  
Larry – Leaving it the way it is is easier to comply. Why can’t it be more or less?  
Bill H – It was based on 2006-ish knowledge based on what it took to get full growth after one full growing season.  
Mike G – For those areas under HOA control, no one is going to go back a year later and say I’ve got this percentage growth. Only thing you can do is specify installation standard.  
Bill H – 3-foot center gets you 60% coverage after a growing season.  
Ron – Is this root material, not potted? We need to at least get rid of the pot requirement.  
Larry – Minimum size has nothing to do with the container size. We call out spread and height.  
Ron – You just call out per plant.  
Larry – Most of it spreads rapidly.  
Bill H – I trust the professional we contract with to tell me what we want to get.  
Annette – If we do away with that, we get plugs. Is that bad?  
Larry – Assuming some percentage loss, maybe you want closer than 2-foot spacing? As a LA, I would have a client saying that’s all that’s required, but 2-foot spacing is a big space for the little plant that you’re getting if half float up first time rains. We’re going to start putting down mat to hold plant down.  
Todd – Growing season is not actually 12 months; I think you better say a year.  
Bill H – I mean after first full growing season. If plant in April, I expect 50% coverage by September. Say first full growing season or year, whichever is first. Tight spacing also helps crowd out cattails. This is okay as long as the device is maintained.   
Brian - How does someone applying for a permit demonstrate that they will be at 60 percent coverage?   
Should 60% coverage be an MDC?  
Group agreed to: SHALLOW WATER PLANTINGS. The shallow water zone shall be planted at a minimum density of 50 herbaceous plants per 200 square feet (equivalent to 2 foot on center spacing). A biodegradable mat is recommended to hold the plantings in place.   
  
Address the following somewhere else in MDCs? Alternative planting plans may be provided if it can be shown that there is a minimum of 60 percent coverage after the first full growing season, or one year, whichever comes first.  
Hunter – Should it be 1 plant per 4 square feet? Why is it 50 per 200 SF?  
  
**Item 16 Temporary Inundation Zone Plantings**  
Annette – We removed the minimum container size as the group wanted.   
Tim – Who became the czar of plantings and chose these numbers? Can we just find out where it came from?  
Eban – Bill said it came from NC State or the wetlands people.  
Tim – It would be interesting to know.  
Annette – We will provide that at the next meeting.  
Mike M – We only require one tree for 1,000 SF. We’re trying to get to 50% for our whole city.  
Marc H – One per 200 SF is a lot of trees.  
Annette – Let’s get you more information and bring it back to the next meeting.   
 **Item 17 Emergent Wetland Plants**  
Derek – We interpret this for diversification purposes. We require 2 or more species in planting plan.  
Annette – Could we instead say how many different species we want?  
Todd – Are we worried about non-native species?  
Group agreed to make Item 17 a recommendation to provide a diversity of wetland plants to improve survivability.

**Item 18 Vegetation 1**  
Annette – Larry and I suggest change to: Trees and woody shrubs with root depths exceeding 12 inches shall not be planted on the dam structure.  
Rob W – I was told things like juniper will inhibit inspection.  
Ron H – A lot of bare soil under things like junipers. Lovegrass is also not a good thing on dam structures. Grasses spread out more, hold soil.  
Larry – Lovegrass tends to clump. Juniper might not be best example. But there are vine shrubs and groundcover that I think should be allowed on a dam slope. Basically we’re limited to grass.  
Ron H – Grass – I’m an advocate of that.  
Larry – With cool season grasses, you have a clumping issue. Plus, grass is high maintenance.  
Ron H – Having to do maintenance gives you chance to look for moles, see what’s going on. Type of grass on it is critical.   
Larry – Most of BMP dams, not under dam safety act, are not being maintained. Allowed to naturalize, but when see pine tree, go in and whack if off. Maintenance on grass areas at school sites are too much.  
Ron H – To me, dam safety is more important.  
Larry – Yes, for wet pond, that is important. But for dry detention, dam failure less of an issue.  
Brian L – We see more failure of dams at dry ponds than wet ponds.  
Virginia – I oppose this because of maintenance and enforcement. How do we know if roots are 12 inches are less?  
Group opposed to allowing trees and woody shrubs; keep Item 18 as is.  
 **Item 19 Vegetation 2**  
Group agreed to keep Item 19 as is (Cattails are not to be planted.)  
Rob W – Is there not a list of approved wetland plants that can be planted?   
Annette – People might view that as list of recommendations rather than requirements.

**Item 20 Vegetation 3**Annette - Most of the group wanted to remove this during wet pond discussion. One member said side slopes might be compromised. I’m suggesting we remove Item 20.  
Ron – As long as tree isn’t planted on dam, I like trees around the basin.  
Group agreed to remove Item 20.

**Item 21 Vegetation 4**Marc – This is saying you can plant them on the interior?  
Group agreed to change Item 21 to: “Turf grass shall be provided on the tops of berms and on the exterior slopes of dams.”

**Item 22 Vegetation 5**  
Group agreed to change Item 22 to: “Weeping love grass shall not be planted on vegetated side slopes. . . . “

**Item 23 Trash Rack**Group agreed to change Item 23 to: “Trash rack or other device shall be provided on piped outlet structures.”  
  
**Stormwater Wetland Recommendations**Annette – Any issues with the recommendations?  
Eban – Bill was not in favor of the last one. The plants themselves can give shade; we don’t need the trees necessarily.  
  
**Outlet 1**  
Group agreed to: A drawdown orifice should be designed to prevent trash. . . .

**Outlet 2**  
Tim – It’s a recommendation; they can put what they want.  
Group agreed to: The outlet design should consider flotation forces.

**Outlet 3**  
[missed some discussion here]  
Group agreed to: Measures should be provided within the dam structure to . . . .   
  
**Soil bioengineering technique**  
Group agreed to eliminate this.

**Temperature recommendation, Shading**  
Group agreed to keep this.

**Outlet** – An adjustable outlet structure is recommended to assist with vegetation establishment and to permanently set the temporary pool elevation and height of the drawdown orifice. Adjustable outlet structures require appropriate oversight and implementation.  
Group agreed to keep this.  
  
**Deep pool permanent pool**Group agreed to keep as is: If the wetland will be below the SHWT. . . .

**Dams** – If the device includes a high hazard dam under state dam safety requirements, then the requirements associated with that program will need to be met.  
Mike M – This sounds more like a note, not a recommendation.  
Group agreed to make this a note.

Group agreed to tackle these topics in November: 1) level spreader/VFS; 2) swales; and time permitting, 3) disconnected impervious surface.

**Action Items**Annette – Send Team additional homework in 2 weeks.  
Annette – Will come prepared to next meeting with information relating to Item 16 *Temporary Inundation Zone Plantings*. Specifically, who came up with the numbers for required plant density?  
Team – Review dry detention chapter and additional homework as assigned.  
Bill H -- Send information on pre-development discharge rate to the Team by December 1st (This is a followup request from 6/23/2014 mtg)

**Next Meeting – October 27, 2014 – 9:30 a.m. to 3:00 p.m.  
Topic(s) -** Dry Detention