

Designing for Maintenance – Stormwater BMPs and Maintenance Program

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BMPs

- Devices which are **designed** to improve stormwater quality and quantity
- Purpose
 - ❖ Wide range of goals and objectives
 - ❖ Single parameter approach e.g., flood control or pollutant removal
 - ❖ Ecological sustainability of receiving systems
 - ❖ Filtering Practices
 - ❖ Open channel Practices
 - ❖ Non-Structural Practices

Why Maintenance

- ❖ Critical to the functioning of BMPs as designed
- ❖ Host of problems
- ❖ Aesthetic value
- ❖ Take pride in your facilities
- ❖ “An ounce of prevention is worth a pound of cure.”
- ❖ Legal requirement
- ❖ Enforcement actions
- ❖ Managed Acreage Credits
- ❖ Retrofits – Less monies spent

How do you maintain this BMP?



Is this a design issue?

Or this car?



Designing for Maintenance

- Access
- Public Safety
- Vegetative Maintenance
- Ground water and In-situ soils – Suitability and sustenance
- Debris Management
- Sediment Management
- Dam and Structural Stability

Construction verification is key

Access

Vehicular Access

- ❖ A 20-ft wide maintenance access easement should be provided from the right-of-way or public access to the top of the dam.
- ❖ A travel way should be provided from the right-of-way or public access (i.e., parking lot, etc.) to the top of the dam. The maximum allowable centerline grade and cross-slope should be 20% and 10%, respectively.

Personnel Access

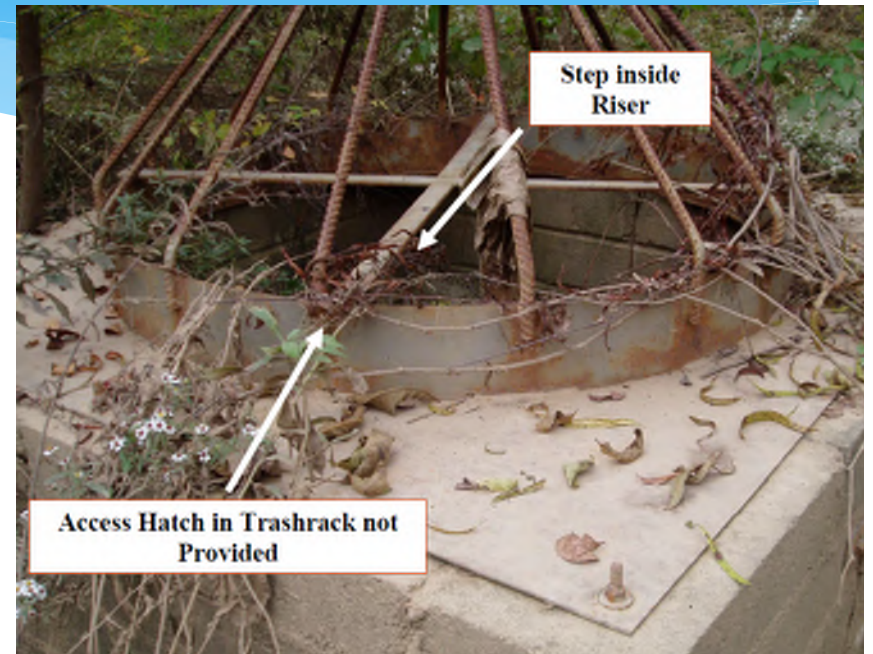
- ❖ Access for maintenance personnel should be provided to the top and inside of the riser structure. Access hatches and manhole lids should align with any steps or ladders.
- ❖ In addition, a rising stem/flywheel and an operating platform (if practical) for each low-level drain should be considered

Access

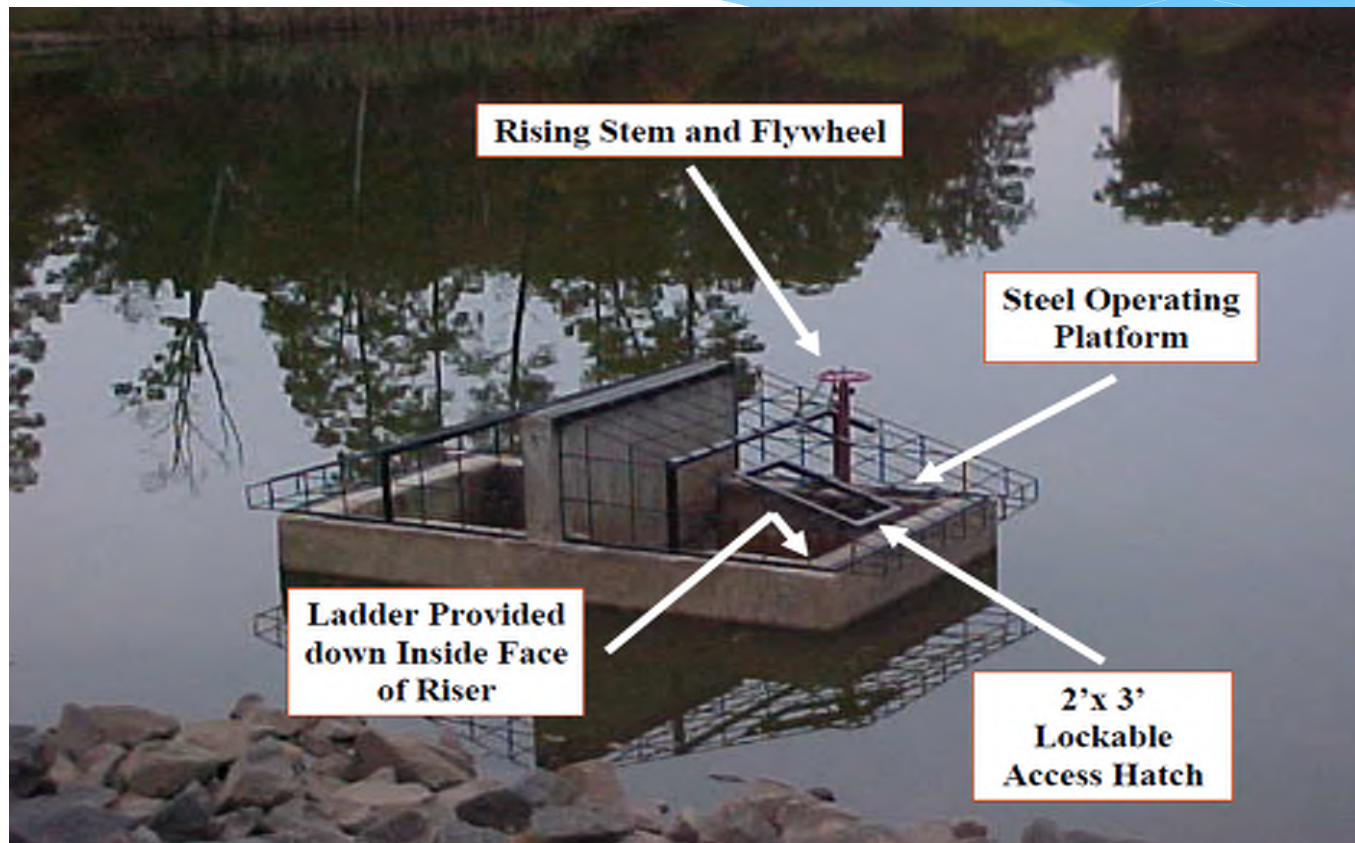


**Access Route Blocked by
a Forested Area**

Access



Access



Public Safety

Emergency Spillways

- ❖ The best assurance against dam overtopping is the provision of an adequate emergency spillway—adequate in terms of hydraulic performance and physical stability during activation.

Aquatic Benches

- ❖ To protect pedestrians from falling through and slipping below the ice, an aquatic bench should be provided.

Emergency Spillway

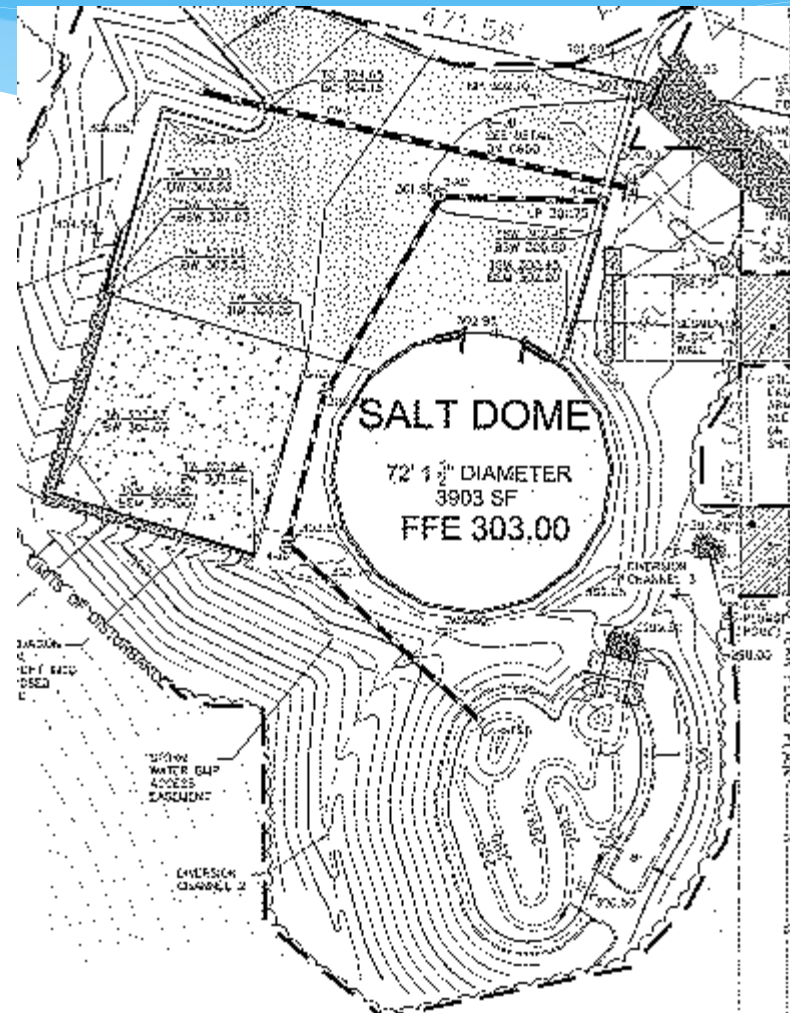


Flooded Basement

**System Downstream of Spillway
Inadequate to Carry Flows
(Walkout Basement of New Home
was Flooded)**

Vegetative Maintenance

- * 3:1 or flatter slopes
- * Suitable or native plants
- * Maintenance Schedule
- * O&M Manual
- * Know your Drainage area



Does WT affect my BMP Design?



Can this be a retrofit?

Picture Courtesy – NC State BAE

Debris Management



Do These work?



Routine maintenance is key

Maintenance Program- Key Elements

- Certification- Business opportunity
- BMP Hand-off
- Routine and Non-routine costs
- Inspections
- Education and Outreach
- Written Protocols
- Inspection Checklist
- O&M Manuals
- Enforcement – Tiered approach

As-built and construction Verification are key

Hand-off Meeting

Meeting between the development's Homeowner Association (HOA), the Developer, and the municipality. This meeting occurs after approval of the BMP as-built drawings.

- Memorialize the transfer of the BMP(s) from the Developer to the HOA
- Provide the HOA with basic information relating to BMPs, stormwater facility agreements, HOA responsibilities and obligations with respect to BMPs, and maintenance requirements.

Maintenance

- * 2 dedicated fund accounts
- * Routine ~ annual maintenance costs of the facility(ies)
- * Non-routine (~1/3 of annual costs) build over time- structural repairs, emergency, failure.
- * Inspection logs – Education
- * O&M Manual – update as needed with inspections

Inspections

Each Item could be graded as:

- ❖ • Fully Functional
- ❖ • Minor Functional Issues
- ❖ • Partially Functional
- ❖ • Not Functional
- ❖ • Monitor
- ❖ • Not Applicable

Inspection Result

Pass/Fail clarification

- ❖ For Fail, provide a defined timeline (e.g., implementation schedule) for corrective actions, and to bring facility back into compliance.
- ❖ Follow-up inspection(s) needed to verify progress per the implementation schedule. Facility can Pass if corrections are made and facility is brought into compliance within 12 months of first inspection.
- ❖ Please use Pass if the Facility needs routine maintenance (RM), or Has Minor Functional Issues (MFI) that could be corrected through RM;
- ❖ Ensure RM is performed with follow-up inspection and note in the database. Note that most vegetative issues could be seasonal, and could take up to 90 days to correct.

Failed Facilities and Conversions

- ❖ Develop and implement engineer modification plan for failed facilities – restoration credits
- ❖ Work with property owners – Aesthetics
- ❖ Minimal review/permitting, paperwork
- ❖ As-built

Take Home Points

- ❖ Keep Maintenance in mind
- ❖ BMP siting
- ❖ Budgeting
- ❖ Visual inspection
- ❖ O&M Manual
- ❖ Inspection logs
- ❖ Education

Maintenance & verification is key- functionality and good working condition



Questions

