MHFD-Detention Workbook – Instructional Videos

Below summarizes MHFD-Detention instructional videos available on our website. New users should watch videos in the order presented below. Experienced users can look for key topics in each video and skip ahead to topics of interest. MHFD-Detention Technical Reference Manual is also available on the MHFD website to help answer more detailed questions.

1. Workbook Overview (11:56)
- Overview of complete workbook (all five worksheets).
  - Basin worksheet
  - Outlet Structure worksheet including Summary Results table and user overrides.
  - Remaining worksheets including References, User Tips and Tools, and BMP Zone Images.

2. Basin Worksheet, Example Part 1 (6:51)
- Detailed example of how to use the *Basin* worksheet w/ a Full-Spectrum EDB
  - Example includes a 20-acre watershed at 65% imperviousness and detention basin is designed with three zones that represent full spectrum detention (WQCV, EURV, 100-yr Flood Control). Basin geometry is defined with a total depth of 6 feet and includes an initial surcharge volume (ISV) and trickle channel.
- Reviews the calculated basin geometry and resulting stage-area-volume relationship.

3. Outlet Structure Worksheet, Example Part 2 (9:31)
- Continues detailed example from *Basin* worksheet above by demonstrating how to use the *Outlet Structure* worksheet to size the various components of an outlet structure and create a stage-discharge relationship that satisfies allowable release rate criteria.
  - Example uses a water quality orifice plate to drain the WQCV and EURV and uses an overflow weir with dropbox, grate and outlet pipe with restrictor plate to control the 100-year discharge.
  - How to use the automated sizing buttons to determine the size of the orifice plate openings and outlet pipe/restrictor plate configuration.
- Works through modifying the outlet structure dimensions to help alleviate issues with drain times.

4. Routed Hydrograph Results Table (5:10)
- Builds on Outlet Structure Example Part 2 above but starts with several modified input parameters that result in various pink highlighted cells in the results table.
- Includes user modified WQCV, EURV, inflow hydrographs, and predevelopment peak flows that are all highlighted pink.
- Works through how to modify the outlet structure components to eliminate pink cells.

- o Changing the orifice plate opening size to satisfy a 40-hour WQ drain time and the 5-yr 72-hour drain time for water rights.
  - o Modifying the overflow weir dropbox and grate dimensions to reduce grate velocities below 2 feet per second for safety reasons.
  - o Matching the 100-year predevelopment peak flow rate by lowering the restrictor plate on the outlet pipe.
- Comparing 100-year maximum storage depth and maximum volume from routed hydrographs against empirical estimates calculated on *Basin* worksheet.

5. Frequently Asked Questions and Common Mistakes (15:41)

- <u>User Tips and Tools</u> – recommends checking this sheet for FAQ and common mistakes.
- <u>Tributary Watershed Inputs</u> – Explains why these parameters are required even when the user has a complex watershed and will provide user-override inflow hydrographs.
- <u>Approximate vs. Routed Stage and Volume</u> – Explains empirical depth and storage volume estimates on *Basin* worksheet as compared to depths and storage volumes determined using routed hydrographs on the *Outlet Structure* worksheet.
- <u>Storage Volume Zone Selection</u> – Discusses not skipping zones when selecting volumes (e.g. don't leave Zone 2 blank and pick a Zone 3 volume).
- <u>Program Sluggish Response Time</u> – Provides tips to avoid slowing down the program computations which automatically update every time a cell is changed.
- <u>Sizing Button Visibility</u> – Explains the various input scenarios required in order for each automated sizing button to be visible in the workbook.
- <u>User Input Stage-Discharge</u> – Describes how to enter a user-defined stage-discharge relationship on the *Outlet Structure* worksheet.
- <u>Brim Full Capacity</u> – Discusses the brim full capacity approach used for the WQCV and EURV versus the inflow hydrographs used for design storm return periods. Also explains how when sizing for just WQCV, the EURV results may not make sense.

6. Underground Storage (6:41)

- Discusses how to evaluate underground storage for water quality and flood control.
- Provides example of how to convert a known stage-volume relationship to an approximate stage-area relationship for use on the *Basin* worksheet by using the automated tool on the *User Tips and Tools* worksheet.
- Works through example of a Stormtech chamber to account for the storage volume on the *Basin* worksheet and the controlled release rates on the *Outlet Structure* worksheet.

7. Hydrology Overrides (11:39)

- <u>Watershed Information</u> – Provides watershed example with multiple tributary subcatchments and open channel conveyance that is modeled separately using CUHP and EPA SWMM to develop a composite inflow hydrograph at the detention basin.

- <u>Rainfall Depth Overrides</u> – Demonstrates how to provide user-defined rainfall depths.
- <u>Zone Volumes and Basin Geometry</u> – Discusses the need for area-weighted watershed information in order to calculate WQCV and EURV using empirical equations and to generate approximate storage volumes for sizing the basin geometry.
- <u>User-Defined Pre-Development Peak Flows</u> – Shows how to enter user-defined values from external model results that represent complex watershed or historic conditions that may have already been partially developed.
- <u>User-Defined Inflow Hydrographs</u> – Demonstrates how to copy user-defined inflow hydrographs from EPA SWMM to the Detention workbook.
- <u>Outlet Structure Sizing</u> – Discusses outlet configuration and compares results from user-defined hydrology relative to the default storage volumes and release rates calculated using the empirical equations built into the workbook.

8. Volume Override (9:46)
- <u>Watershed Information</u> – Example includes two adjacent subcatchments that each have a detention facility. The first provides WQCV/EURV detention only while the second provides FSD (WQCV/EURV/100yr) and also over detains to account for the flood control volume and allowable release rate not provided in the first detention facility.
- <u>User-Defined Zone Volumes</u> – Demonstrates where to override WQCV and EURV values and how to enter a user-defined 100-year storage volume in Zone 3 to account for the additional flood storage volume not provided in the adjacent detention facility.
- <u>User-Defined Stage-Area Relationship</u> – Demonstrates how to enter override values for the stage-area relationship to develop the stage-volume relationship.
- <u>User-Defined Pre-Development Peak Flow</u> – Explains how to override the 100-year allowable release rate to compensate for the un-detained 100-yr release rate from the adjacent detention facility.
- <u>Outlet Structure Sizing</u> – Discusses outlet structure configuration and explains how the second detention facility over detains to compensate for the lack of flood control in the first detention facility.