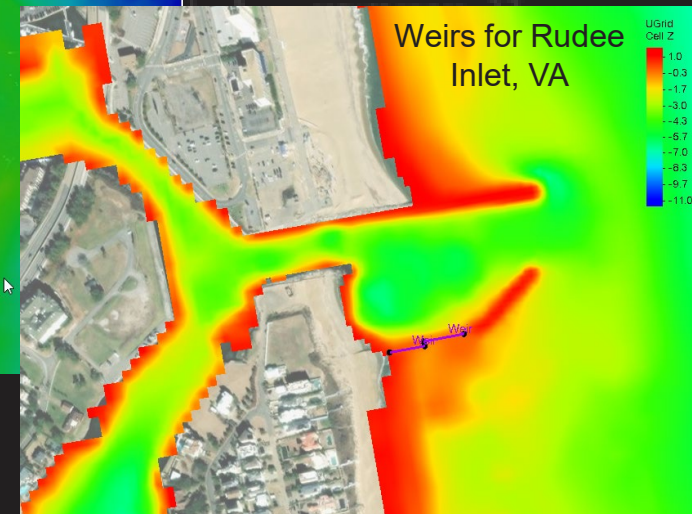
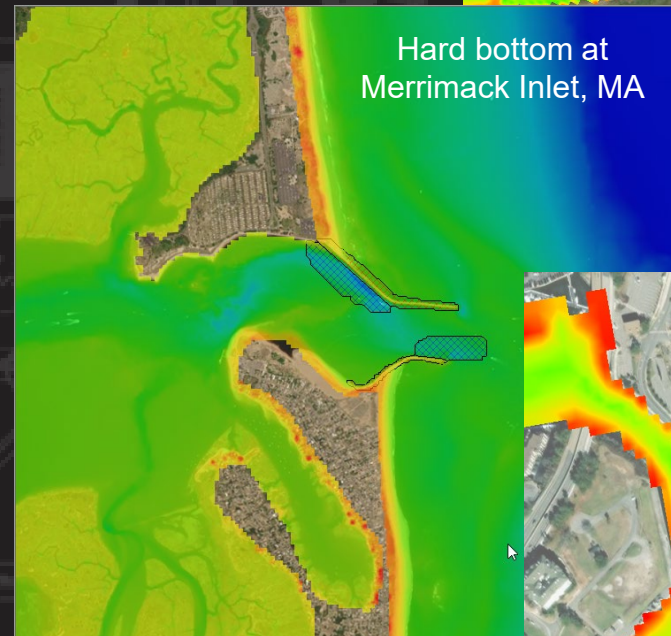
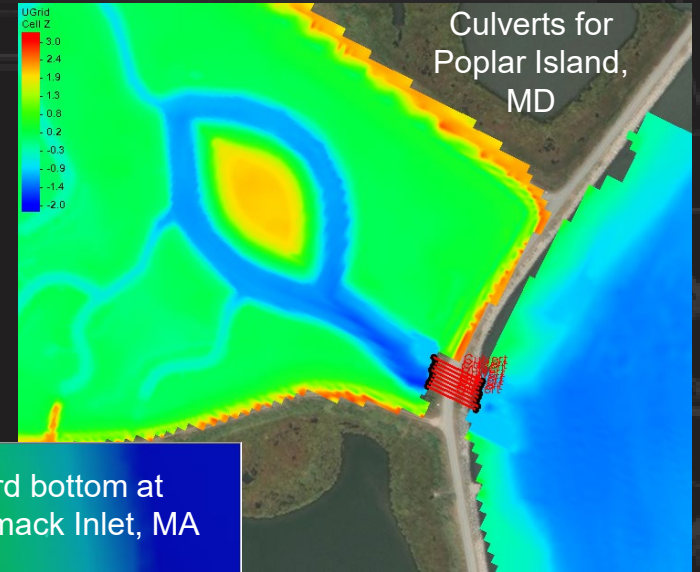


UPDATES MADE IN SMS 13.4 FOR NEW AND IMPROVED CAPABILITIES

Mitchell Brown

Coastal & Hydraulics Laboratory
US Army Engineer Research and Development
Center (ERDC)

CIRP Tech Discussion
11 February 2025



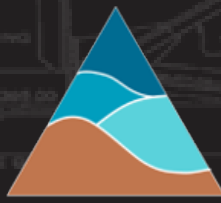
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SMS 13.4 – NOW AVAILABLE AS BETA

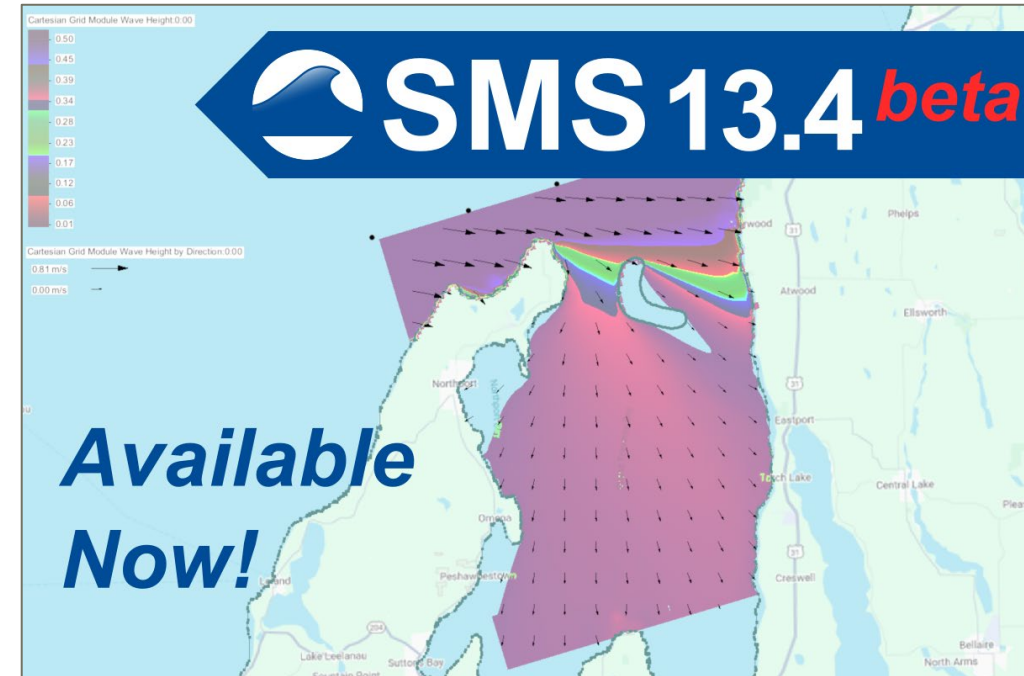


Unavailable through the USACE App-Portal/Software Catalog

- Typically, Beta versions do not get approved for the App Portal
- Expected full release in April and on the App Portal shortly after.

CIRP-related additions covered in this presentation:

- CMS-Flow Hard Bottom coverage and tool.
- Support for three CMS-Flow structures added.
 - Culverts
 - Weirs
 - Tide Gates
 - Rubble Mounds (already supported)
- Modernized GenCade user interface (old interface retained until next full version)



For non-USACE computers, SMS 13.4 beta is available from:

<https://downloads.aquaveo.com/f.php5?s=sms&v=13.4&p=full64>



HARD BOTTOM – SMS BACKGROUND

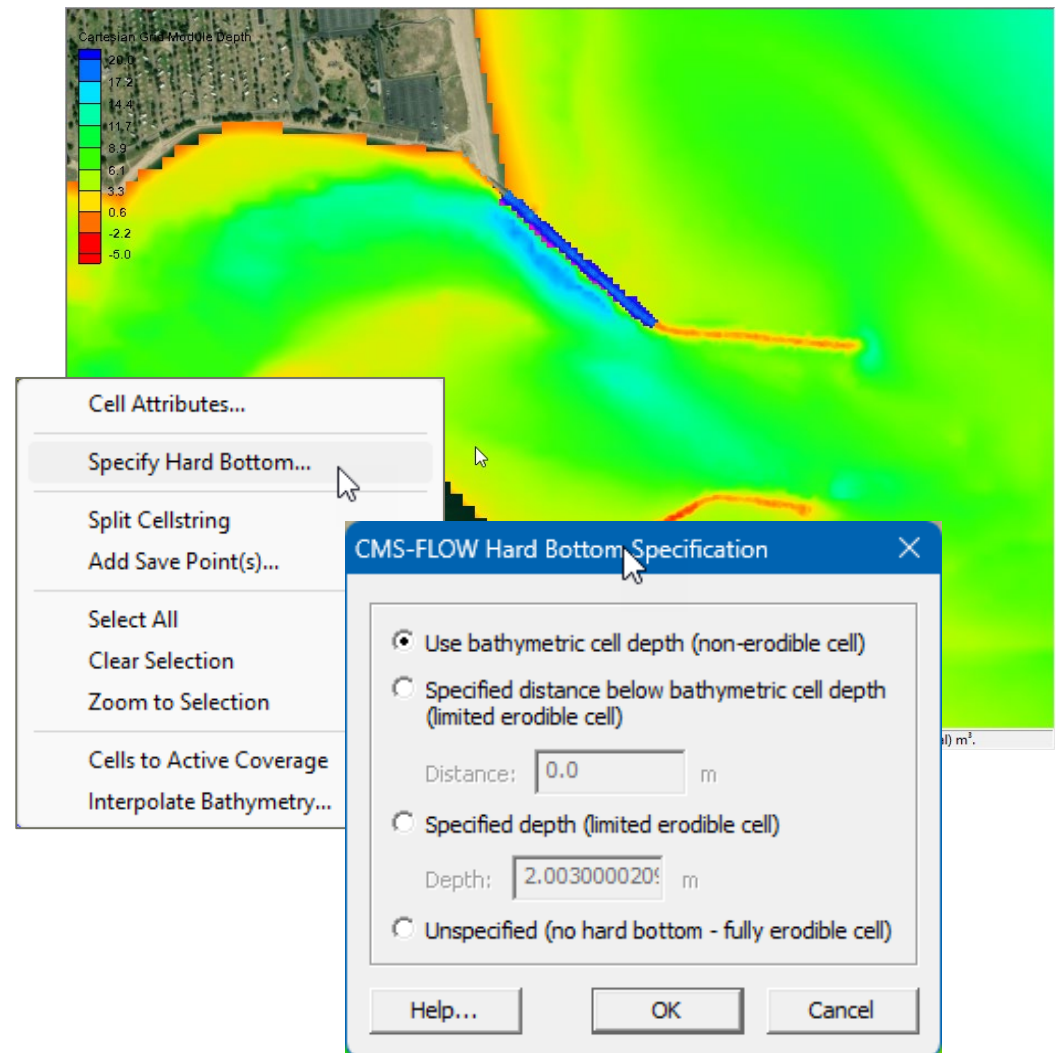


Tool for assigning hard bottom in SMS version 10 to 11.2, was no longer available when SMS 12 was released. This remains missing through SMS 13.3

Allowed users to select group of cells and then choose how to specify the hard bottom values:

- Use bathymetric cell depth (non-erodible cell)
- Specified distance below bathymetric cell depth (limited erodibility)
- Specified depth (limited erodibility)
- Unspecified (fully erodible)

SMS would then use those selections to write out the correct values for the CMS-Flow hard bottom dataset






SMS 13.4 – HARD BOTTOM COVERAGE



With the release of SMS 13.4, users now have a replacement workflow to get back this capability using a hard bottom coverage for definition

1. Users should create a New coverage, then choose *Models | CMS-Flow | Hard Bottom* from the choices.
2. Once the coverage is in the data tree, create new feature arc that closes on itself that surrounds the regions where the user wants to make a choice.
3. Click the Build Polygons tool from the list of icons. 
4. Double click when selecting the polygon to display the options:
 - Non-erodible cell
 - Specified **distance** erodible cell
 - Specified **elevation** erodible cell
 - Note: Any cells not covered by a polygon of one of these three types will be declared as “fully erodible” by default.

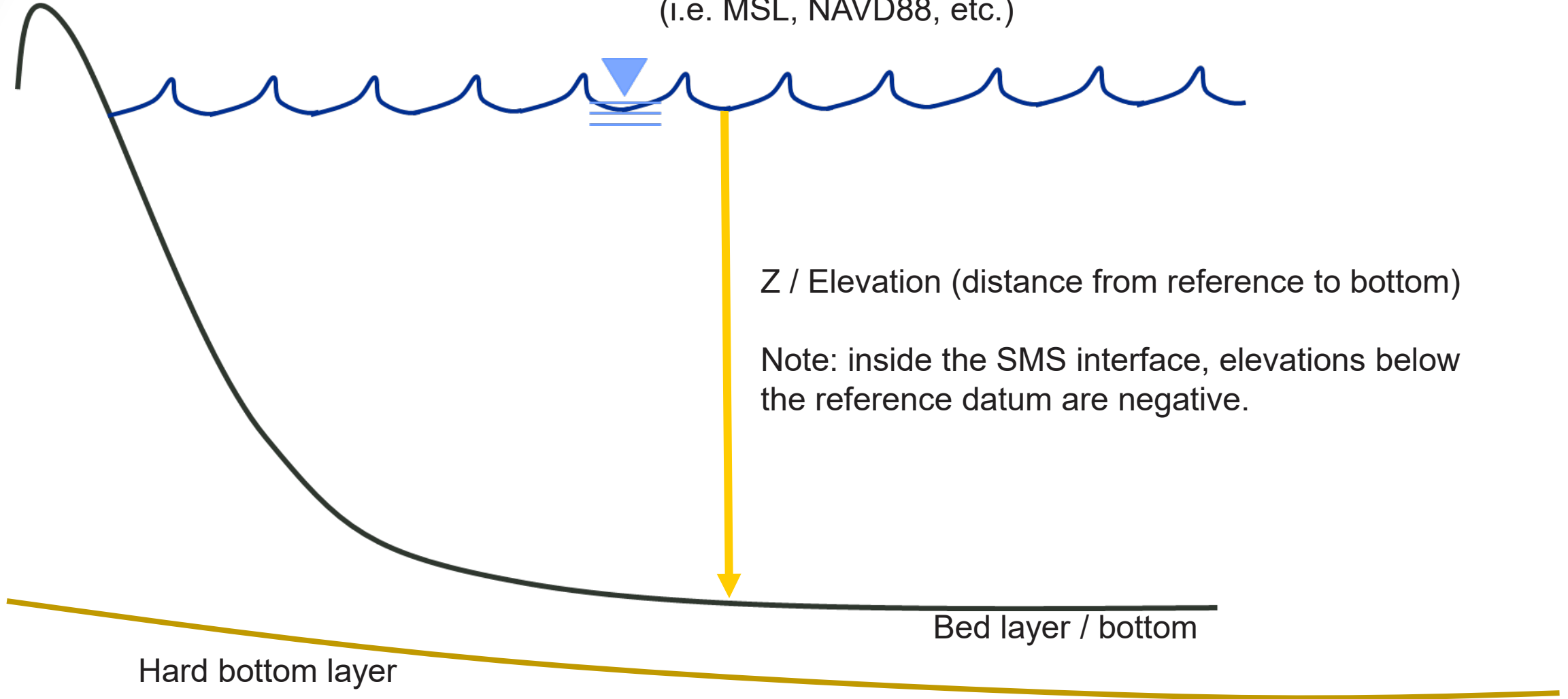
The screenshot displays the 'Coverage Type' dialog box on the left, which is a tree view of model categories. The 'Hard Bottom' option under 'CMS-Flow' is selected. Below the tree is a text field for 'Coverage Name' containing 'Hard Bottom'. To the right is a bathymetric map showing a river or channel with a blue polygon overlaid on a specific area. In the foreground, the 'Polygon Properties' dialog box is open, showing three options: 'Non-erodible cell' (unchecked), 'Specified distance erodible cell' (unchecked), and 'Specified elevation erodible cell' (checked). The 'Specified elevation (negative down):' field contains the value '-7.0'. At the bottom of the dialog are 'OK', 'Cancel', and 'Help' buttons.



HARD BOTTOM – REFERENCE



Reference water level for project
(i.e. MSL, NAVD88, etc.)

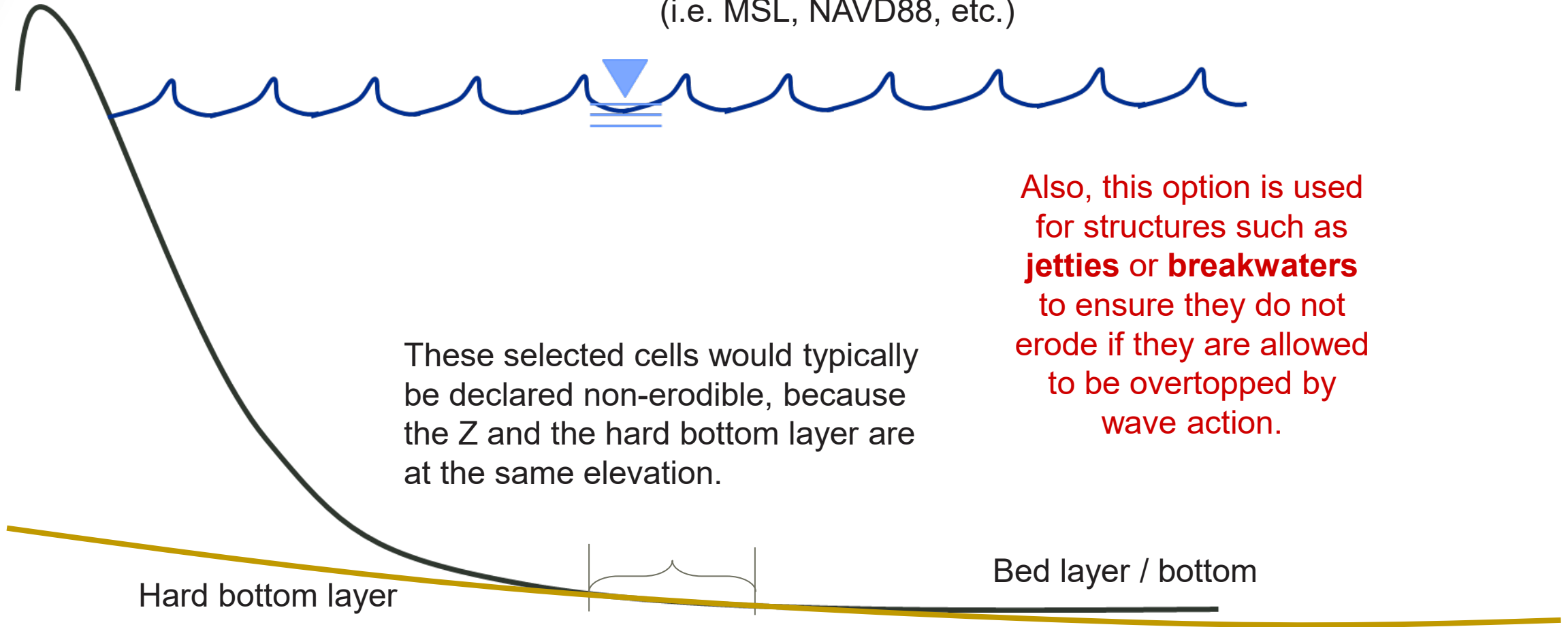




HARD BOTTOM – NON-ERODIBLE EXAMPLE



Reference water level for project
(i.e. MSL, NAVD88, etc.)



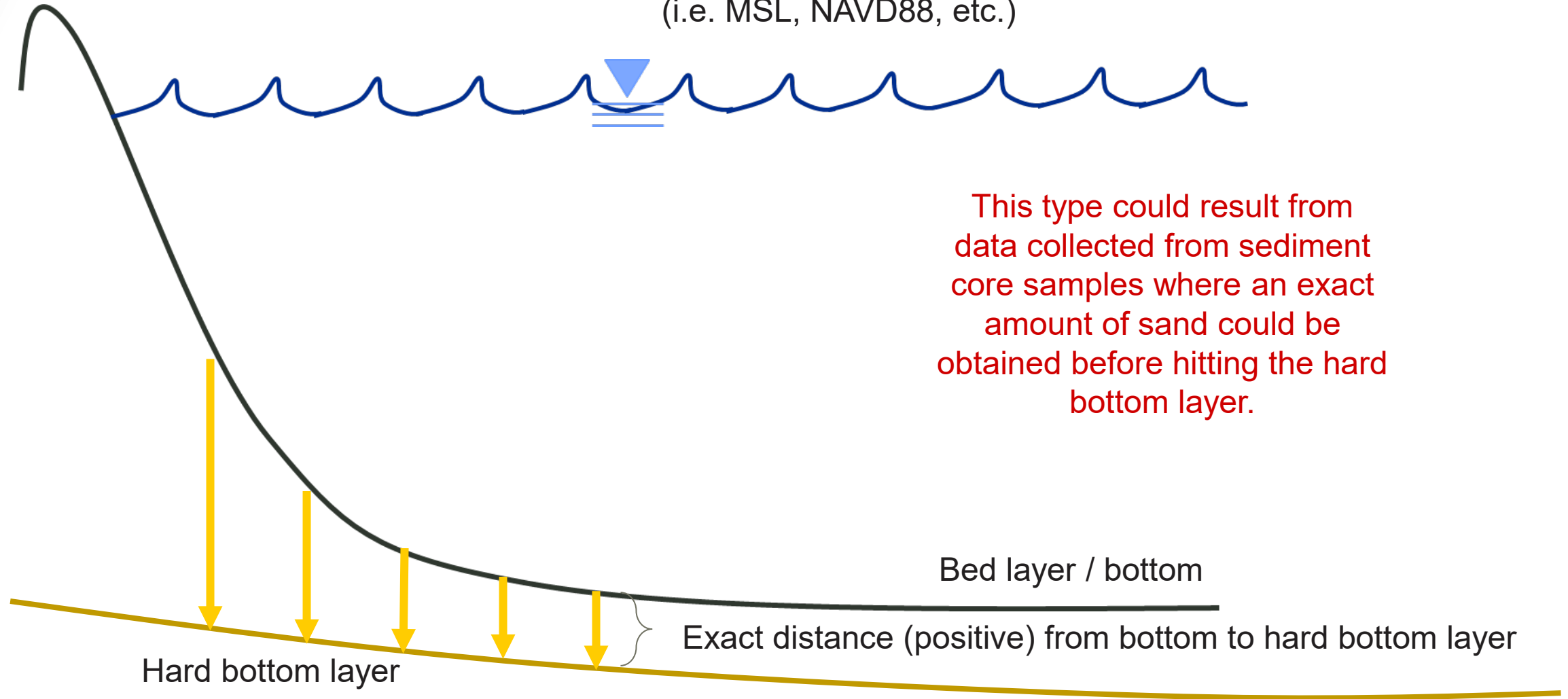
Note: No erosion is allowed below the hard bottom layer. However, accretion may occur above which is allowed to then be eroded back down to the HB layer.



HARD BOTTOM – SPECIFIED DISTANCE EXAMPLE



Reference water level for project
(i.e. MSL, NAVD88, etc.)

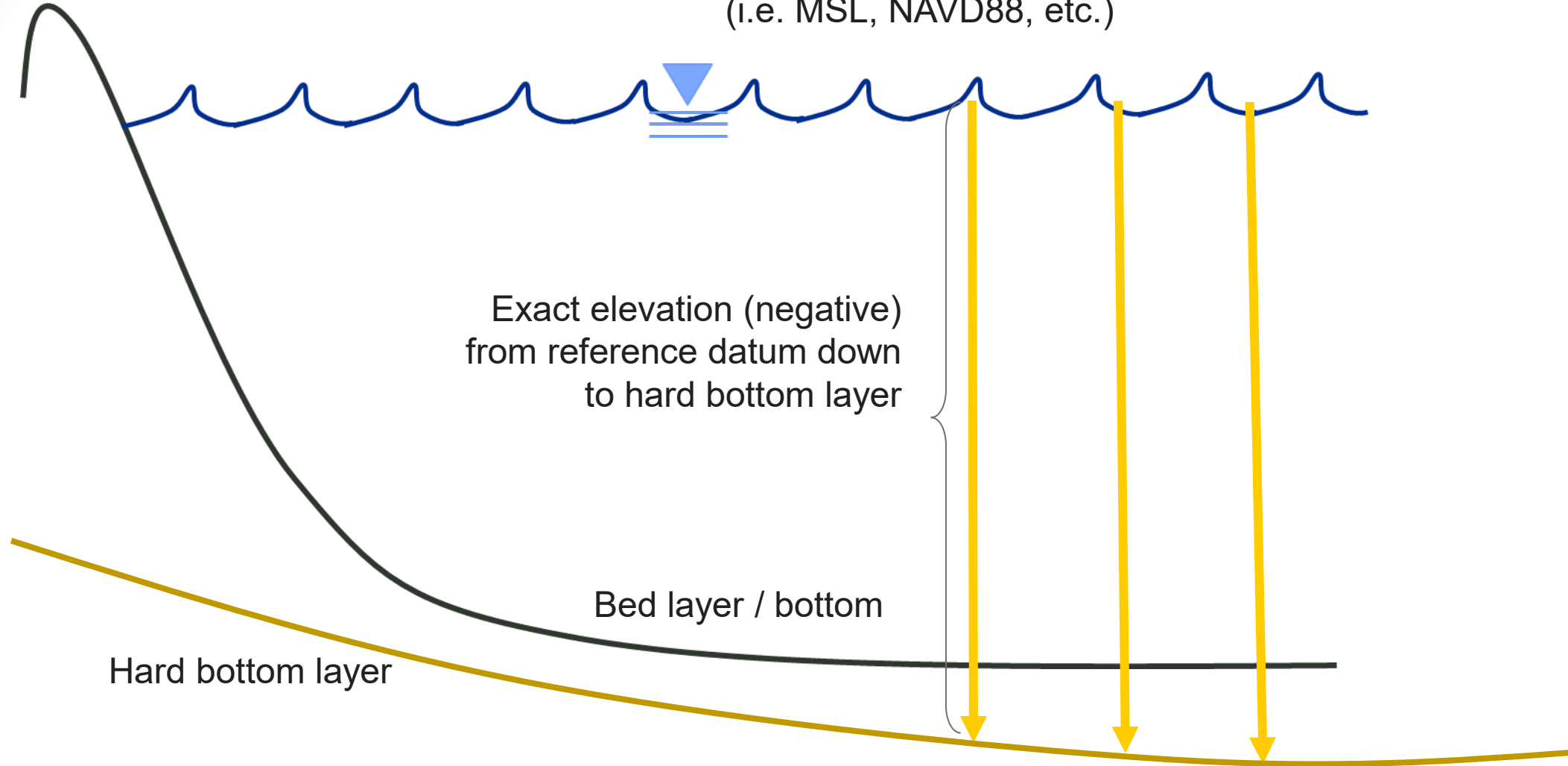




HARD BOTTOM – SPECIFIED ELEVATION EXAMPLE



Reference water level for project
(i.e. MSL, NAVD88, etc.)






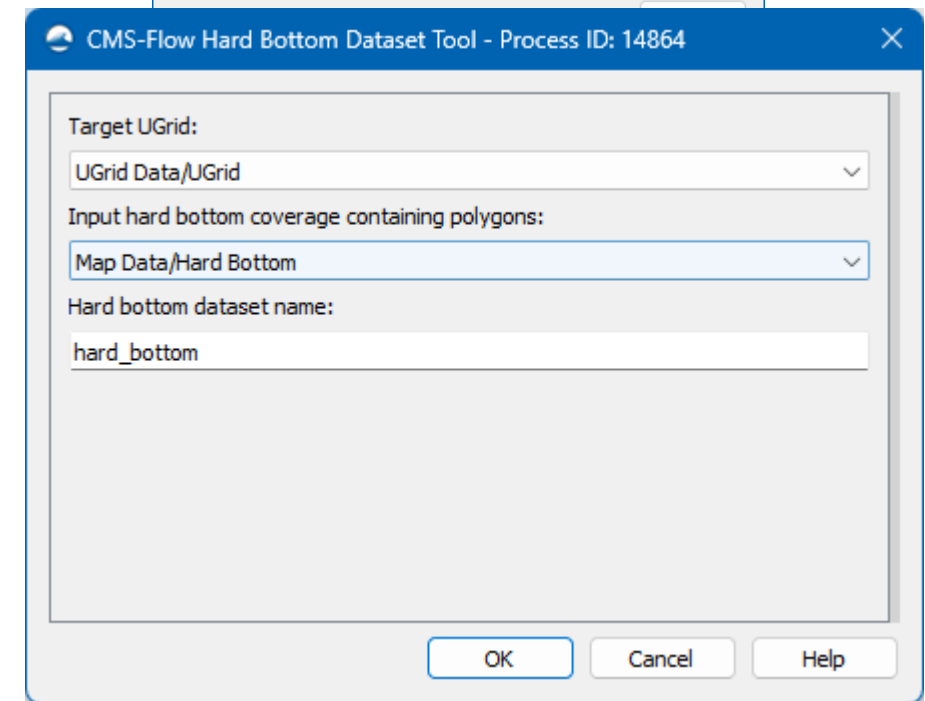
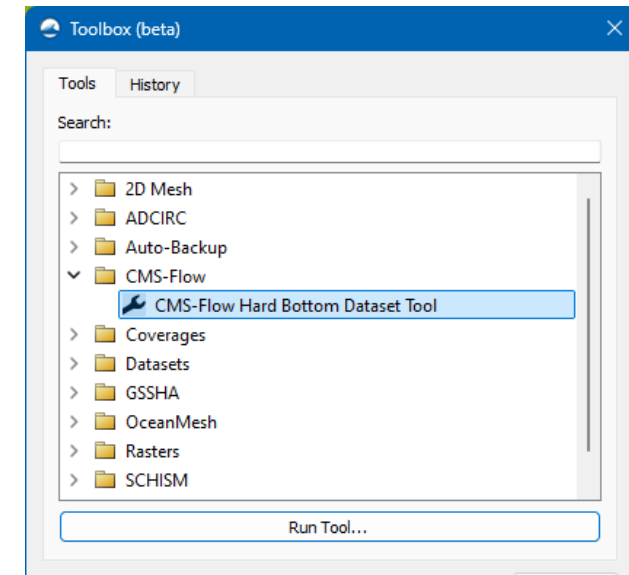
SMS 13.4 – HARD BOTTOM TOOL



Once all polygons have been adequately specified in the Hard Bottom coverage, CMS-Flow needs to have a dataset which defines the desired set up. There is a new tool placed into the Toolbox which is used to create this new dataset.

1. Users should click the Toolbox icon from SMS 13.4. 
2. Expand the CMS-Flow section, choose the *Hard Bottom Dataset Tool* and then “*Run Tool*” at the bottom.
3. When the tool runs, the user should then provide a response to the arguments:
 - Target UGrid (this is the CMS-Flow grid)
 - Input hard bottom coverage (the coverage just created)
 - Hard bottom dataset name (desired name for the dataset)
4. Click OK and a new dataset will show up in the data tree.
5. The user must then link that dataset to the Hard Bottom option in Model Control.

The benefit of doing hard bottom with a **coverage** is that the hard bottom dataset can be reproduced very quickly if changes need to be made.



CMS-FLOW STRUCTURES



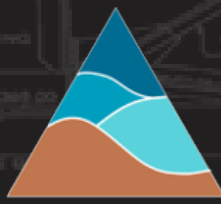
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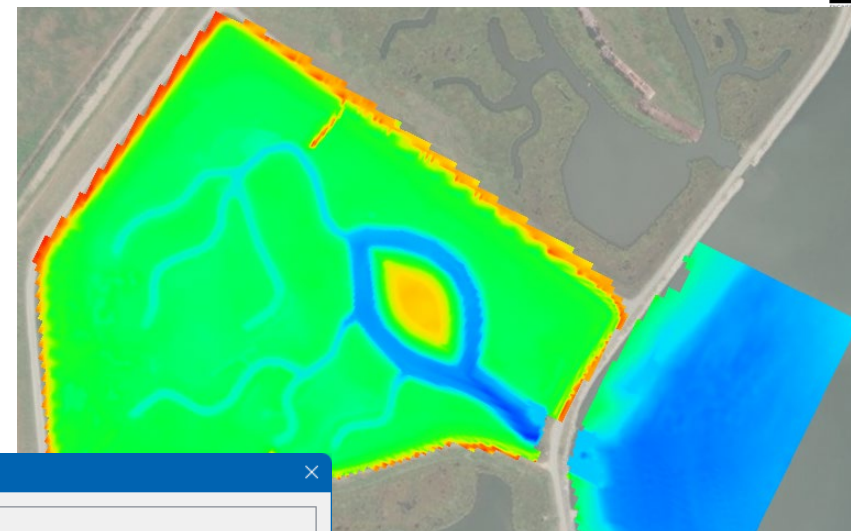
CMS-FLOW STRUCTURES – CULVERTS



Structures for CMS-Flow have been possible since ~2011, but no implementation for the SMS GUI was developed until ~2018 with SMS 13.1 for Rubble Mound structures only.

For the Culvert implementation, feature arcs are used from the Models | CMS-Flow | Structures coverage.

1. Culvert arcs **must** be created starting from the bay-side toward the sea-side.
 - Enable direction arrows in Display Options | Map | Annotations | Options
2. Right-click each culvert arc to access properties to define.
3. Once all culvert arcs are properly defined, right-click on the coverage to add to the CMS-Flow simulation.



Arc Properties - Process ID: 25352

Culvert
 Tide Gate
 Weir

Type of culvert:
 Box

With flap gate

Width:
 1.0

Height:
 0.9

Length:
 30.8

Darcy-Weisbach friction coefficient for the culvert fully occupied by flow:
 0.04

Manning friction coefficient for the culvert partially occupied by flow:
 0.03

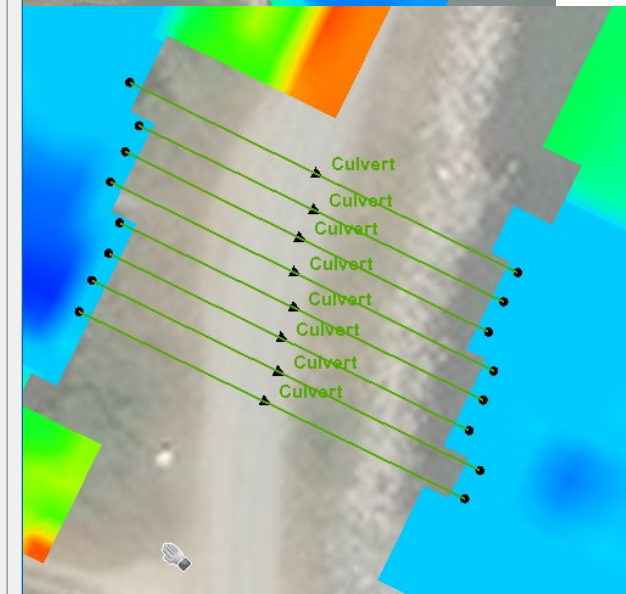
Bay side entrance head loss:
 0.5

Bay side exit head loss:
 1.0

Sea side entrance head loss:
 0.5

Sea side exit head loss:
 1.0

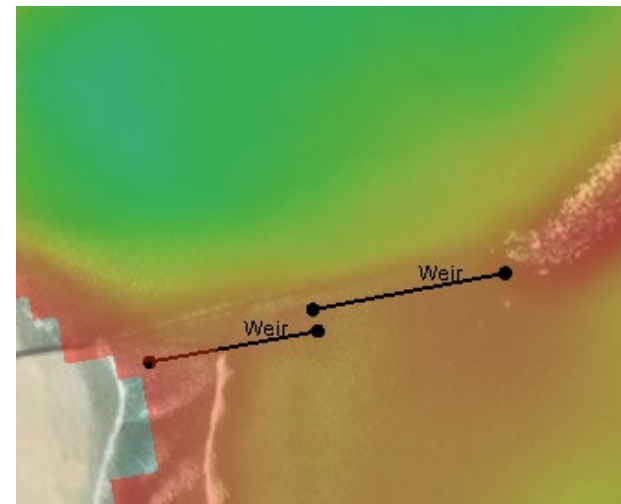
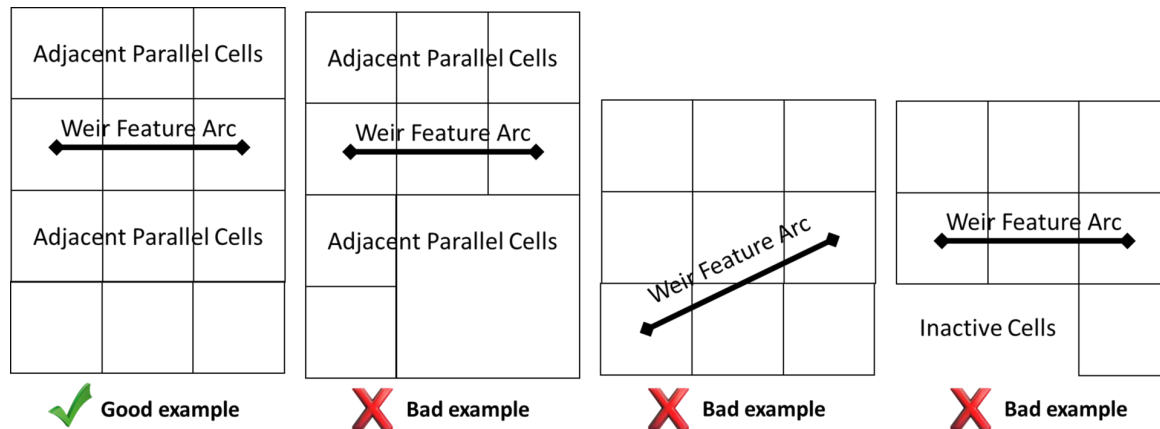
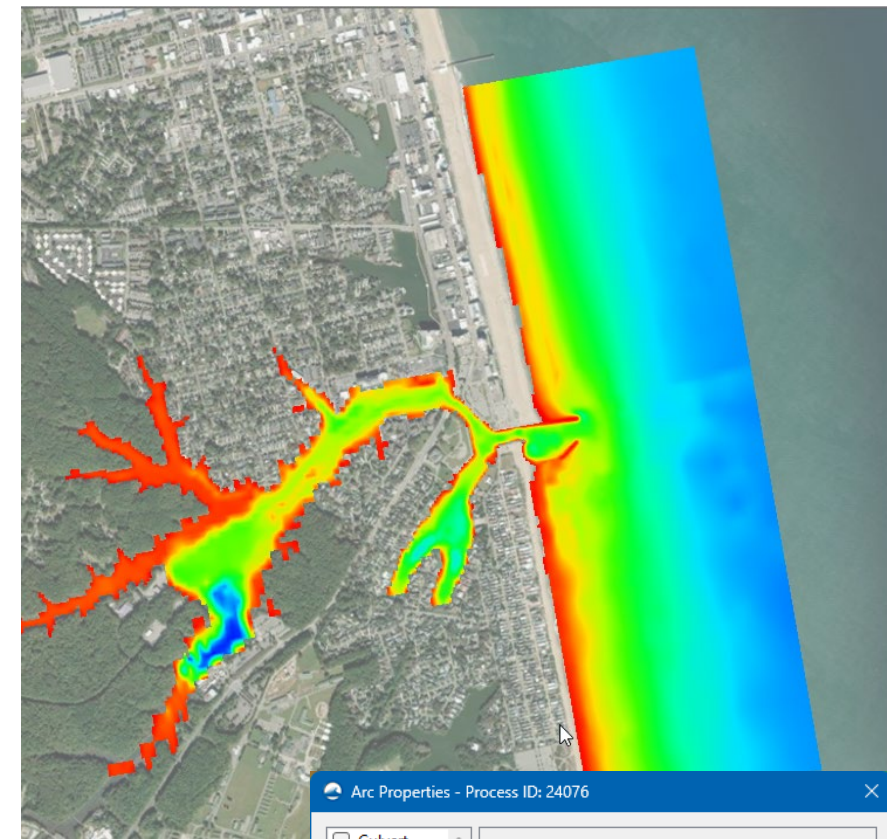
OK Cancel Help



CMS-FLOW STRUCTURES – WEIRS

For the Weir implementation, feature arcs are used from the Models | CMS-Flow | Structures coverage.

1. Direction does not matter how Weir arcs are created.
2. All cells on each weir:
 - And all neighboring cells **must** be Active (computational)
 - And all neighboring cells **must** have same resolution
 - **Must** exist in same row or column
3. Right-click each weir arc to access properties to define.
4. Once all weir arcs are properly defined, right-click on the coverage to add to the CMS-Flow simulation.



Arc Properties - Process ID: 24076

Culvert
 Tide Gate
 Weir

Lateral distribution coefficient: 0.95

Orientation of weir (direction of sea side): South

Type of weir: Sharp-crested

Flow coefficient - bayside to seaside: 0.46

Flow coefficient - seaside to bayside: 0.46

Crest elevation (mean water level): -0.22

Method to calculate flux over the weir: Approach 2

OK Cancel Help



CMS-FLOW STRUCTURES – TIDE GATES

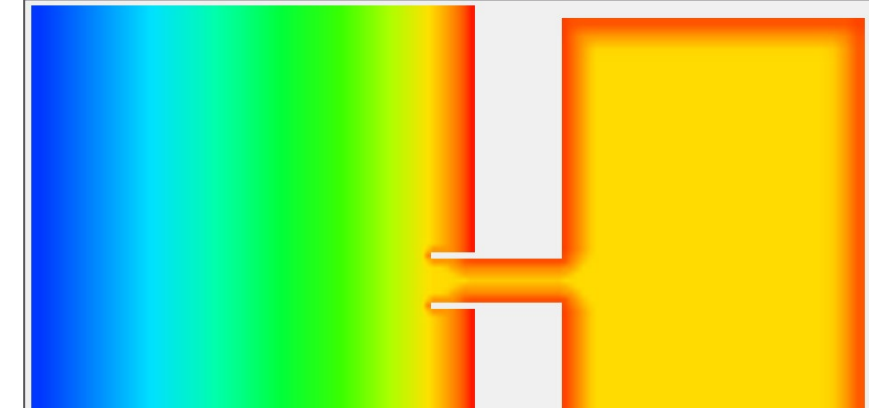


Structures for CMS-Flow have been possible since ~2011, but no implementation for the SMS GUI was developed until ~2018 with SMS 13.1 for Rubble Mound structures only.

For the Tide Gate implementation, feature arcs are used from the Models | CMS-Flow | Structures coverage.

1. Direction does not matter how TG arcs are created.
2. Right-click each TG arc to access properties to define and assign type of gate:
 - Regular time interval
 - Designated times and durations (extra table to complete)
 - Open for ebb, close for flood
 - Uncontrolled
3. Once all TG arcs are properly defined, right-click on the coverage to add to the CMS-Flow simulation.

Additional information on all CMS-Flow structures can be found at <https://cirpwiki.info/wiki/CMS-Flow/Structures>



Arc Properties - Process ID: 23920

Culvert
 Tide Gate
 Weir

Lateral distribution coefficient: 0.95

Orientation of gate (direction of sea side): West

Flow coefficient - bayside to seaside: 0.5

Flow coefficient - seaside to bayside: 0.5

Opening height of tide gate: 2.0

Bottom elevation of tide gate (mean water level): -2.0

Method to calculate flux through tide gate: Approach 1

Schedule operation type: Designated times and durations

Schedule:

Edit Table...

OK Cancel Help

Schedule - Process ID: 23920

	Start time (hour)	Open duration (hour)
1	0	12
2	36	6
3	52	4

+ + - ↑ ↓

OK Cancel

GENCADE INTERFACE UPDATE



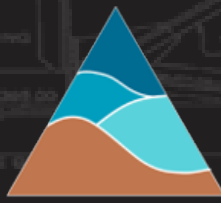
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MODERNIZED GENCADE USER INTERFACE



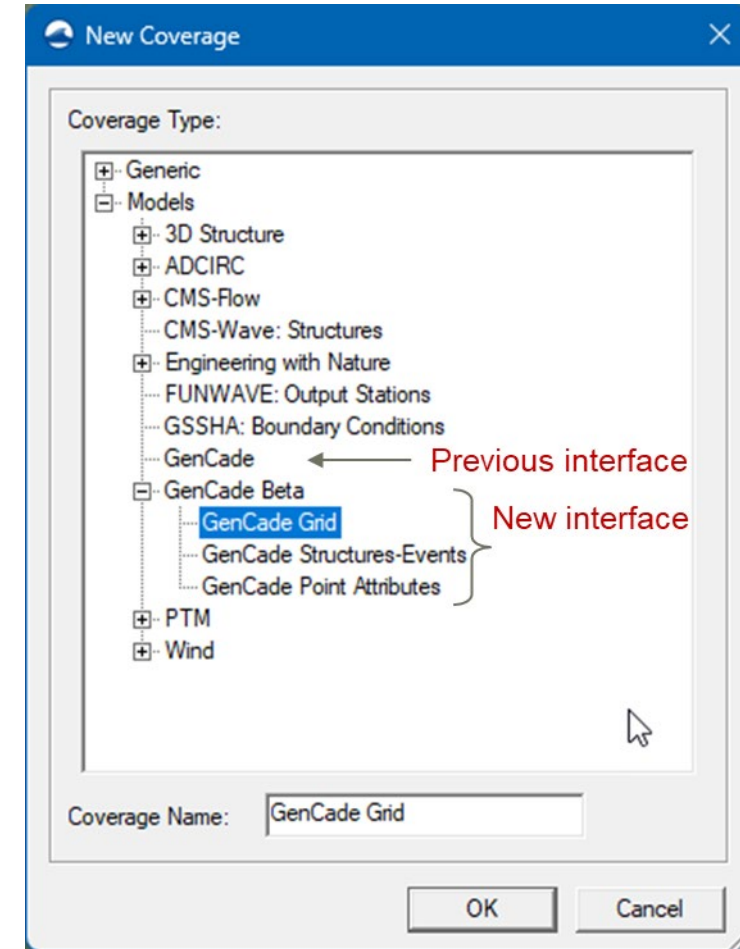
The interface for the GenCade model was introduced in SMS 11.x and has not been significantly updated in 10+ years. A new GenCade interface has been developed and is available in a future update to SMS 13.4.

- Uses three coverages in the map module:
 - **GenCade Grid** (Points defining begin and end of grid as well as grid refinement)
 - **Structures / Events** (Arcs defining structures and bypass/beach fill events)
 - **Point Attributes** (Points defining attribute modification and wave/tide gages)
- The new implementation allows for multiple simulations to be defined and easily modified.

Within SMS 13.4, the old GenCade interface will remain while the new interface (GenCade Beta) will be available (by request) for testing.

For instructions on how to enable and test the new interface, contact Mitch.

Documentation of new interface is located here:
<https://cirpwiki.info/wiki/GenCade2.0>





GENCADE INTERFACE STREAMLINED



Most of the options have stayed the same from the older interface to the new one, however all the various selections for each type of structure have now been consolidated onto the same dialog.

A few enhancements to the new interface:

- Structures and Events
 - Arcs show up better.
 - Labels now appear for each arc.
 - The appearance can now be changed by the user.
- GenCade grid
 - Grid can be defined at any time (old interface, the grid had to be generated last).
 - Easier to define (and redefine) the GenCade grid with a few actions.
 - Refine points are now part of grid creation which is more intuitive.
- Point Attributes
 - Table holding Wave and Tide data are now easier manipulated.
- Other
 - Model Control now includes Monte Carlo and Cross Shore options.
 - Water Level forcing now has a trigger in Model Control.
 - Better visualization of solutions in a stand-alone window.

The screenshot displays the GenCade software interface. At the top, a map shows a shoreline with several points labeled 'From' and 'To'. Below the map, a diagram illustrates an inlet structure with labels: 'Inlet', 'Left Jetty on Inlet', 'Right Jetty on Inlet', and 'Regional Contour'. Two dialog boxes are overlaid on the interface:

GenCade Structures and Events - Process ID: 5884

Arc Options
 Inlet
 Inlets (Reservoir Model and Jetties)
 Name of Inlet: Galveston
 Inlet Shoal Volumes (yd³ or m³):

	Initial	Equilibrium	Coefficient
Ebb Shoal	5000000.0	5000000.0	
Flood Shoal	1000000.0	1000000.0	
Left Bypass	1000000.0	1000000.0	1.0
Left Attachment	500000.0	500000.0	
Right Bypass	1000000.0	1000000.0	1.0
Right Attachment	500000.0	500000.0	

Manage Dredging Events

	Begin Date	End Date	Shoal to
1	1996-01-01	1996-03-01	Ebb

Units for this projection are Imperial.

Point Attributes - Process ID: 6960

Point Type: Wave Gage
 Wave Depth (ft or m): 50.0

Wave Events

	Date/Time	H0 (m)	Period (sec)	Direction (deg)
1	1995-01-01 01:00:00	1.0	5.0	10.02083333
2	1995-01-01 02:00:00	1.0	5.0	10.04166661
3	1995-01-01 03:00:00	1.0	5.0	10.06249982
4	1995-01-01 04:00:00	1.0	5.0	10.0833329

Units for this projection are Imperial.

OK Cancel Help

ANY QUESTIONS?



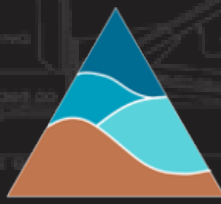
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