**Potential Applications of the new InfoWorks ICM Mesh level Zones**

**Introduction**

Exciting new functionality has been added to InfoWorks ICM version 5.5 to allow improved editing of the 2D mesh. The new functionality is implemented in the form of ‘Mesh Level Zones’. Mesh level zones are objects used as part of the mesh generation process. They can be used to modify mesh element elevations based on ground level elevations or user-defined values. They differ from mesh zones, in that rather changing the mesh to a set level or by a fixed amount, they allow you to edit each vertex individually which provides functionality to add sloped features to the mesh elements, such as when defining road channels and kerb depths for example. They allow the user to add detailed features into the 2D mesh which may not have been present at the time of the collection of the ground model. Mesh Level Zones can also be used to represent various design features (roads, embankments etc) in the 2D mesh for analysis.

The mesh level zone is added much the same as every other polygon. There are 2 type of Mesh Level Zones:

- **Specify (Specify Elevation)**- The elevations at mesh level vertices will be set to a user-defined value, obtained from the ground model or interpolated form other zone vertices as specified in the vertices grid.
- **Adjust (Ground Model Adjusted)**- The elevations at mesh level zone vertices will be set from the ground model and will then be adjusted by the elevation adjustment specified in the vertices grid.

![Figure 1: Mesh Level Zone Property Sheet](image)

Then the vertices field is used to specify the adjustments at each vertex, the resulting table will depend on what type of mesh level zone is used. When Specify is selected the output will be as follows:-
The user can specify the vertex elevation type (whether to use the ground model elevation, set a specific elevation or interpolate based on other vertices). The value can then also be adjusted in the Elevation adjustment column.

When adjust is used, the vertex elevation will be taken from the ground model and an elevation adjustment applied. The dialogue will look as follows:

Once set, the user is required to remesh for the changes to be picked up. The mesh level zone boundaries will act as breaklines. Changes to elevations only do not require a remesh however you
will need to resample the ground model using the **Model-Meshing-Resample 2D Zone Elevations tool**.

**Example Applications**

The first set of examples have been applied to a ground model of a valley without any features, as shown in the below screenshot.

![Figure 4: Original 2D Mesh](image)

- **Specifying a flat road**

Creating a flat road across a floodplain.

Create a mesh level zone for the road of type, “specify”. Specify the required elevation at all vertices, with elevation type of “set”. The software will triangulate a flat surface using the elevations specified.

- **Creating a Slope for a Camber of a Road**

We have a line for the centre of the road, and lines for the kerbs. We want to raise the centre of the road by, say, 0.5m, and keep the kerb at the level given by the ground model. Between the two, we want the adjustment to decay linearly from the centreline to the kerb.

Create a mesh level zone for half the width of the road, of “adjust” type. Vertices along the centreline have an elevation adjustment of +0.1m, and vertices along the kerb have 0.0m. Another mesh elevation zone will be needed for the other half of the road. Levels are taken from the ground model elevations, and then raised by an amount that varies from zero at the kerb to 0.1m at the centre line.
Mesh Level Zones in InfoWorks ICM 5.5

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Figure 5: Modified 2D Mesh with Flat or Cambered Road

- **Create a flat road with a slope from upstream to downstream**

A road across the floodplain with a specified gradient between specified elevations.

Create a mesh level zone object for the road, of “specify” type. Specify elevations for the vertices at the ends of the road, with “Set”. The other vertices should have “Interpolate” selected. The software will interpolate levels along the sides of the road, and then triangulate a surface for the whole road. This will be used instead of the ground model.

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• Create an embanked road

The road this time is raised on an embankment (the same approach could be used for a channel with sloping sides).

Create a mesh level zone as in the above case. Create another one next to it, with type, “specify”. Set the vertices along the toe of the embankment (or top of the bank) to “ground model”. Set the two vertices at the ends of the road to have the appropriate “set” elevations, the rest to “interpolate”. A third mesh level zone is needed for the other bank. The surface of the bank will slope from the ground level up to the road level, which will itself be graded along the road.

Figure 7: Modified 2D Mesh with Embanked Road

The following examples take place with a different mesh which is based in an urban area with flyovers and other urban features.
Mesh Level Zones in InfoWorks ICM 5.5

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Figure 8: Original Urban 2D Mesh before Editing

- Masking part of the ground model, to remove a flyover (for example).

The ground model may contain features that weren’t present when a calibration event occurred, so we may wish to remove them.

Create a mesh level zone enclosing the flyover, of “specify” type. Set all the vertices to “ground model”. The vertices will get elevations from the ground model, and a surface will be triangulated inside the mesh level zone.

Figure 9: Urban 2D Mesh with Flyover Masked
- **Adding new gaps into the embankment**

LiDAR has picked up the first surface (the flyover) but we want to remove the first surface and represent a flow route under the flyover.

Add a mesh level zone of type ‘Specify’ where the vertices are located in the non-raised part of the ground model. Set all vertex types to ‘interpolate’. This will interpolate the values based on the ground model values.

![Without Gap](image1) ![With Gap](image2)

Figure 10: Modified Urban 2D Mesh with Parts of Flyover Masked

**Summary**

The new Mesh Level Zones which have been added to InfoWorks version 5.5, allow the user to be even more creative when editing the mesh. They allow the user to represent a range of features such as slopes, cambers, embankments and to mask features using existing ground levels, which the existing Mesh Zone functionality cannot. This allows the user unprecedented control over the 2D mesh geometry to allow the representation of detail which may not be picked in the ground model, either due to resolution or the age of the ground model, or to allow the design of features within the mesh. The document describes some examples of how the new Mesh level Zones may be used, it is not exhaustive.