



RIFT TD TUTORIAL
EMBANKMENT MODELLING
FIRST PRINCIPLES

INTRODUCTION

In this tutorial you will develop an embankment from first principles. This entails:

- Defining crest strings.
- Interpolating nodes along the crest strings.
- Generating toe point nodes using the crest strings.
- Triangulating the nodes to generate a surface.
- Deleting redundant triangles.

A copy of the **Rift TD** Users Manual may be useful when working through this tutorial. It is installed during **Rift TD** installation, but can also be downloaded from our [download page](#).

TUTORIAL COMPONENTS

This tutorial comprises:

- This instruction set.
- Rift TD Data Files:
 - Base Model.rft: The surface on which the embankment is generated.
 - Embankment Nodes.rft: The embankment nodes.
 - Final Model.rft: The base surface with the embankment.
- ASCII Data Files:
 - Embankment String.txt: The ASCII file defining the embankment crest.
 - Survey Data.txt: Topography survey data.

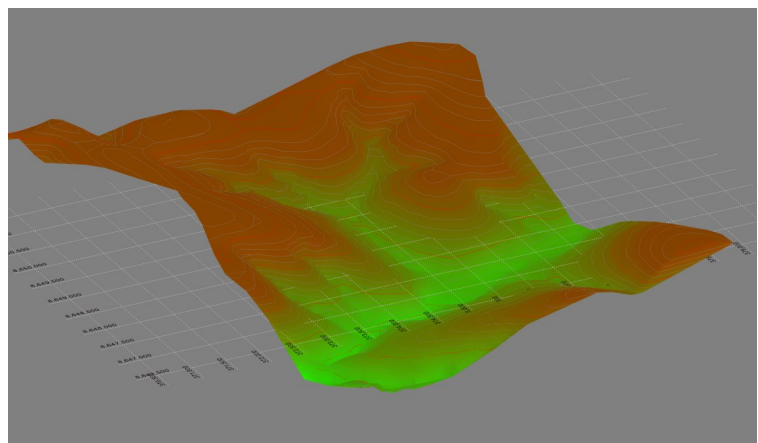
BASE TOPOGRAPHY

Base topography was generated using an ASCII data file.

You can download a tutorial outlining initial surface development from our tutorial download page.

This tutorial provides the **Rift TD data file**, **Base Model.rft**, as a starting point:

- **Click File > Open.**
- **Select Base Model.rft.**
- **Click Open.**



EMBANKMENT DEVELOPMENT

To generate the embankment you will:

- Generate strings defining the upstream and downstream embankment crests
- Interpolate nodes along the crest strings.
- Generate toe point nodes using the crest strings.
- Triangulate the nodes to generate the embankment.
- Delete redundant triangles.

DEFINE EMBANKMENT CRESTS

Define the **Upstream Crest**:

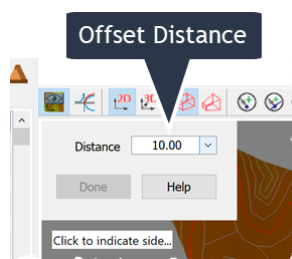
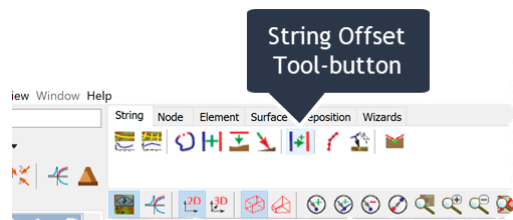
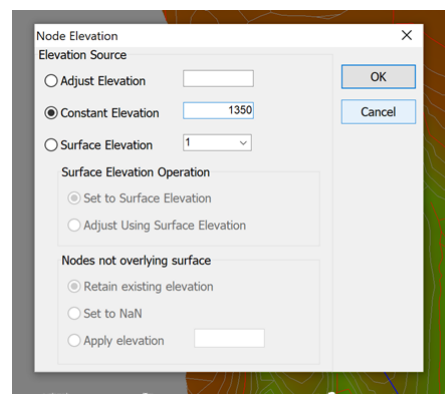
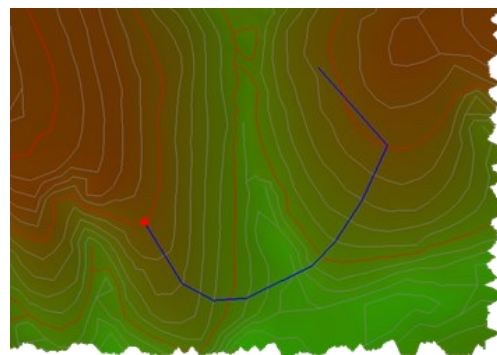
- **Activate** the **String data type**:
 - **Click** the **String tool-button**; or
 - **Click** **Edit > Strings**.
- **Define** the **String** on the **DTM View**:
 - **Click** the **View Add Tool-button**; or
 - **Right click** on the **DTM View** and **click** **Data > Add**; or
 - **Click** **Data > Edit in View > Add**.
- **Click** on the **DTM View** to add the **String Crest Nodes**.
- **Press** **Esc** when done to **cancel** the **Add Operation**.

Set the **Embankment Crest Elevation (1,350 m)**:

- **Right Click** on the **Data Grid**.
- **Click** **Set Node Elevations**.
- **Select** **Set Node Elevations**
- **Enter** a **Constant Elevation** of **1,350 m**.
- **Click** **Ok**

Generate an **offset string** to **define** the **Downstream Crest**:

- **Click**:
 - The **String Offset Tool-button**; or
 - **Strings > Offset/Parallel**.
- **Set** an **offset distance** of **10 m**.
- **Click** on the **DTM View** to set the **Downstream Crest** offset side.
- **Click** **Done**.



GENERATE EMBANKMENT NODES

Interpolate Nodes along the **Upstream Crest String**:

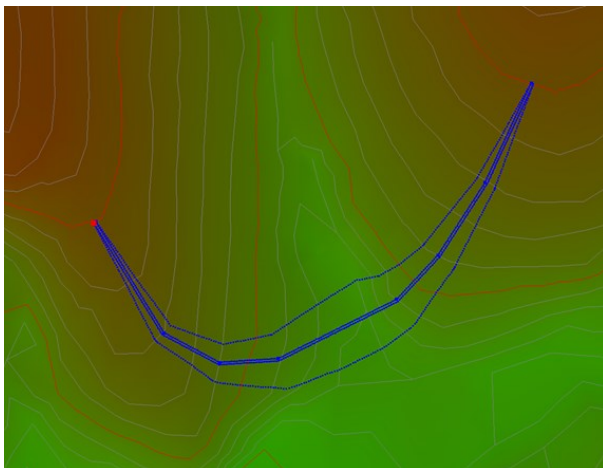
- Either:
 - Click the **Interpolate Nodes Tool-button**; or
 - Click **Strings > Interpolate Nodes**.
- Click close to the **Upstream Crest String** to select it.
 - Set **Add Nodes to Surface No. 2**.
 - Set a **Node Spacing of 10 m**.
 - Click **Ok**.

Repeat to Interpolate Nodes along the **Downstream Crest String**.

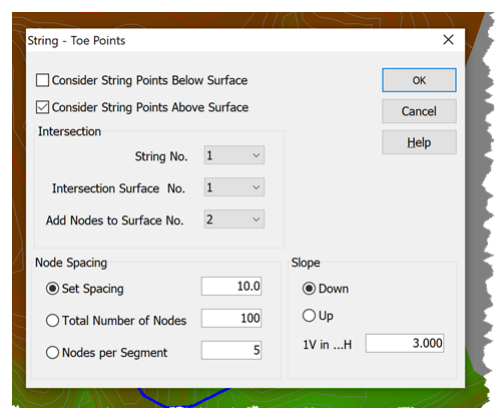
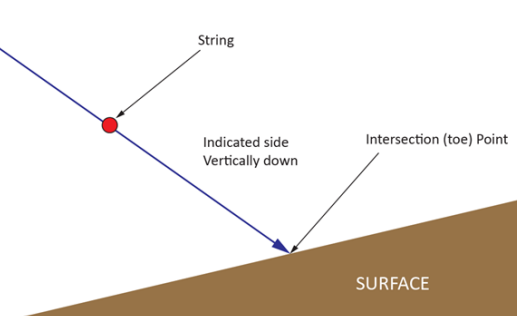
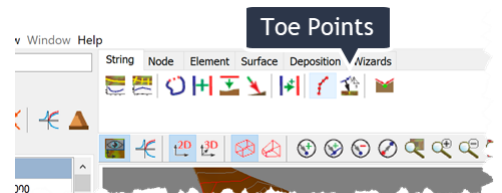
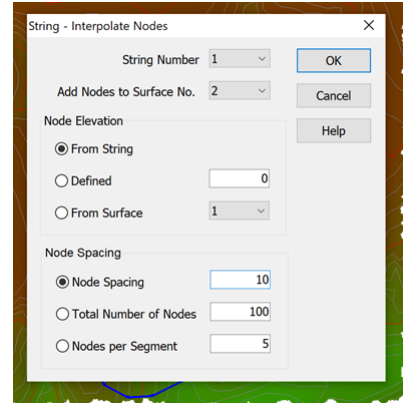
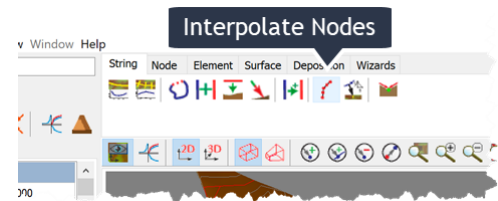
Generate Upstream Toe Points:

- Either:
 - Click the **Toe Points Tool-button**; or
 - Click **Strings > Toe Points**.
- Click close to the **Upstream Crest String** to select it.
- Click on the **Upstream String Side** to indicate the **Toe Point Side**.
- On the Toe Point Dialog:
 - **Uncheck Consider String Points Below Surface**.
 - **Ensure** that the **Intersection Surface** is set to **Surface No. 1**.
 - Set **Add Nodes to Surface No. 2**.
 - Set a **Node Spacing of 10 m**.
 - Set the **slope direction to Down**.
 - Set a **Slope of 1V:3.5H**.

Repeat to Generate Downstream Toe Points.



Embankment Nodes



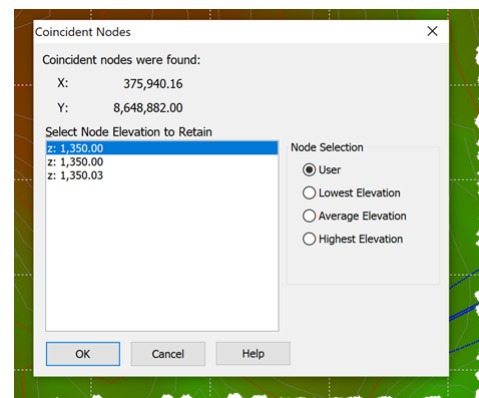
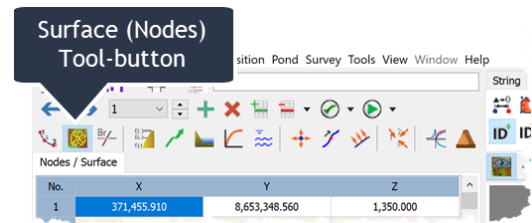
TRIANGULATE THE NODES

Triangulate the **Nodes** to generate the **Embankment**:

- **Activate** the **Surface Data Type**:
 - Click **Edit > Nodes**; or
 - Click the **Surface Tool-button**.
- **Triangulate** the **Nodes**:
 - Click **Surface > Elements > Triangulate**; or
 - Click the **Triangulate Tool-button**.
- If coincident Nodes are found:
 - **Select** an **elevation**.
 - Click **Ok**.

You can also select an option if additional coincident nodes are found:

- User: The Coincident Node dialog is displayed.
- Lowest elevation: The lowest elevation is always retained.
- Average elevation: The average elevation is always retained.
- Highest elevation: The highest elevation is always retained.



DELETE REDUNDANT ELEMENTS

The triangulation generates some redundant elements on the interior of the embankment. You can delete these elements by either:

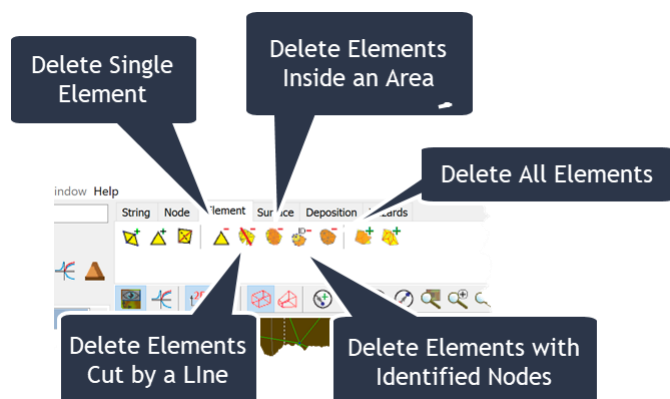
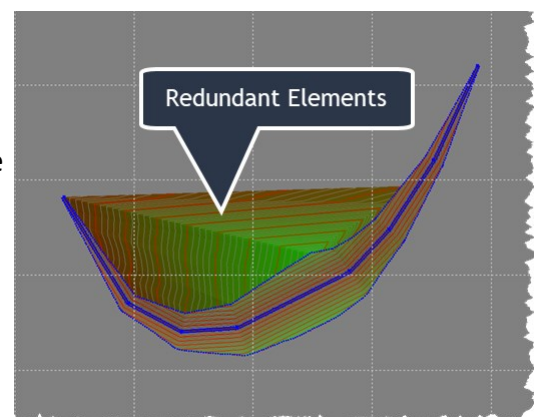
- Auditing the boundary elements; or
- Manually deleting the elements.

Rift TD provides several options to **manually delete elements**:

- A Single Element.
- Elements Cut by a Line.
- Elements Inside an Area.
- Elements Connected to Identified Nodes.
- All Elements.

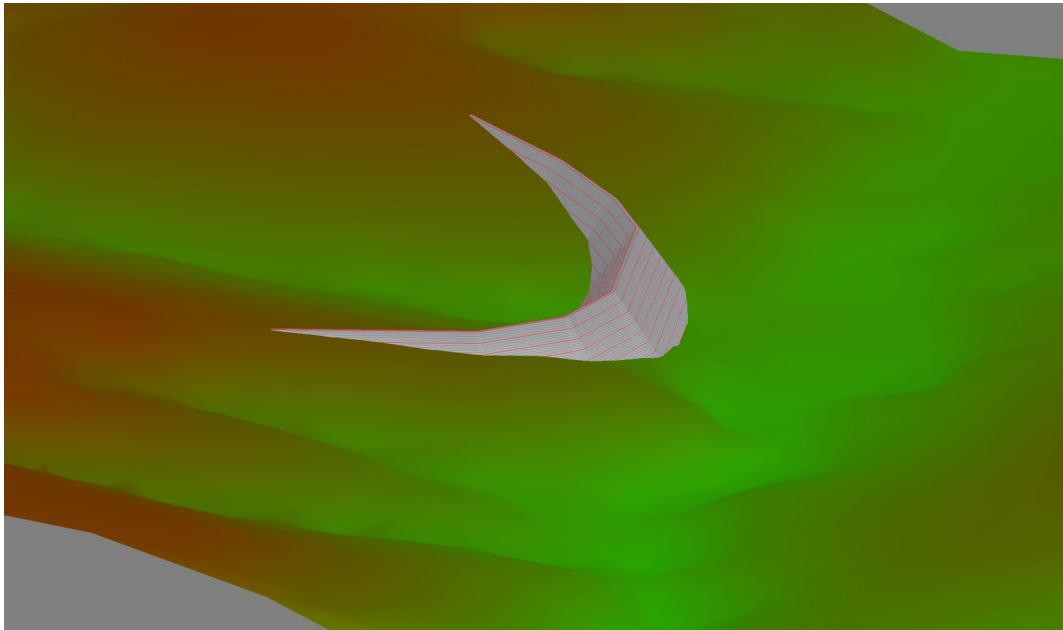
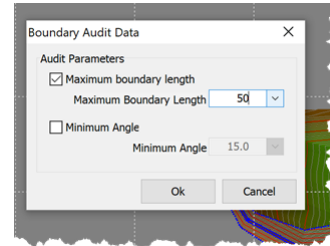
You can access these operations either:

- Via the **main menu**: **Surface > Elements > Delete**; or the
- **Element Toolbar**.



In this tutorial we will **Audit the Boundary Elements**:

- Click **Surface > Elements > Audit Boundary Elements**.
- On the **Boundary Audit Dialog**:
 - Check **Maximum Boundary Length**.
 - Enter a value of **20 m**.
 - Uncheck **Minimum Angle**.
- Click **Ok**.



Embankment Model

After generating the **Embankment** you can:

- Calculate embankment **volumes**.
- Merge the **Embankment** into the **Base Model**.
- Extract **longitudinal sections** through the **Embankment** and the **Base Model**.

These are addressed in separate tutorials that you can [download from RiftXone.com](http://www.riftxone.com).