Displacement Map Baking

This workflow guide shows how to bake a height/displacement map with the V-Ray BakerTool.

Overview

Displacement map baking with V-Ray in Houdini is possible through the V-Ray BakerTool.

The creation process is done in two render steps: first, we create a render element that contains information about the position of each point of the lowRes object in space. Then, we make a render element with information about the normals of the lowRes object.

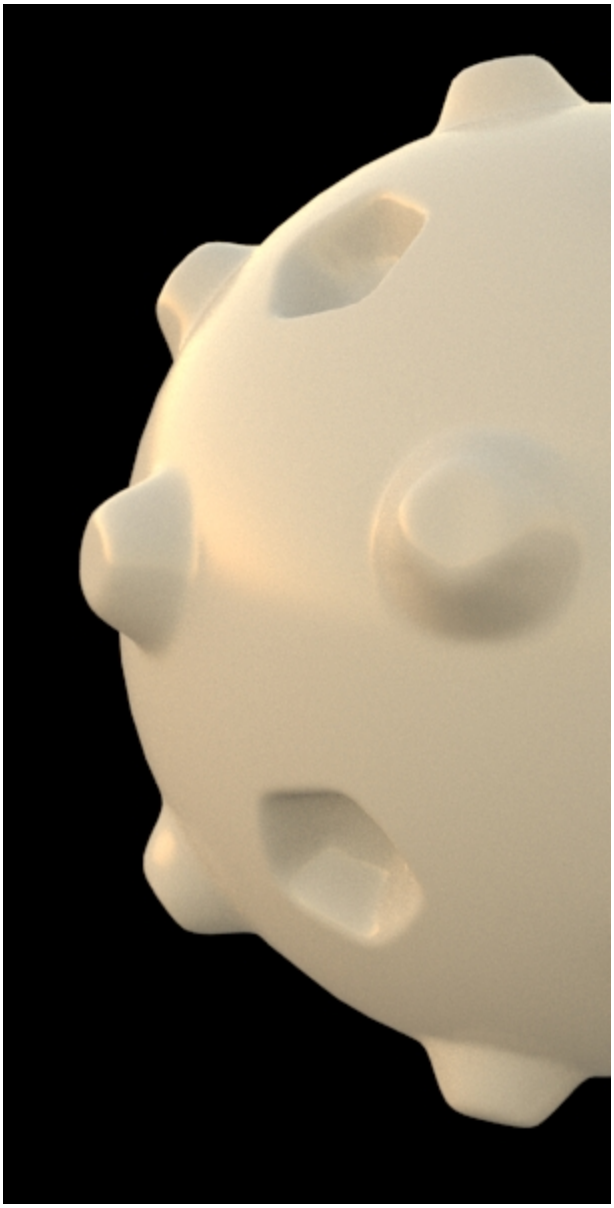
As a final step, we render the HighRes object displacement map onto the LowRes object.

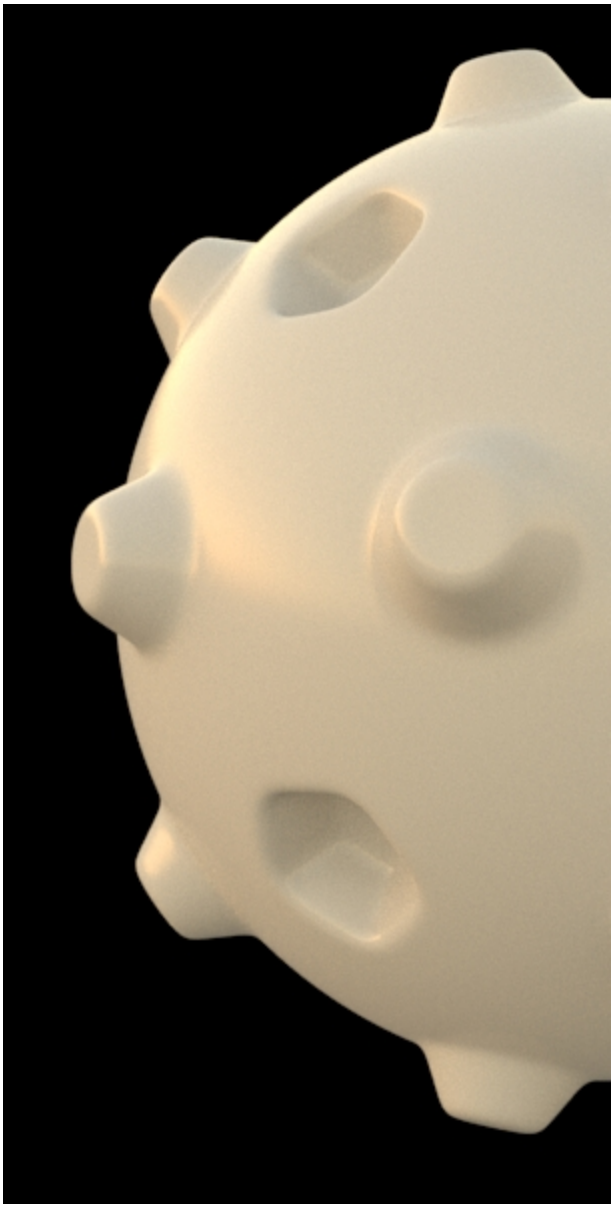
The geometry creation process is not a subject to this tutorial.

You can download an example scene from the download button below.

Download Scene

lowPoly
highPoly



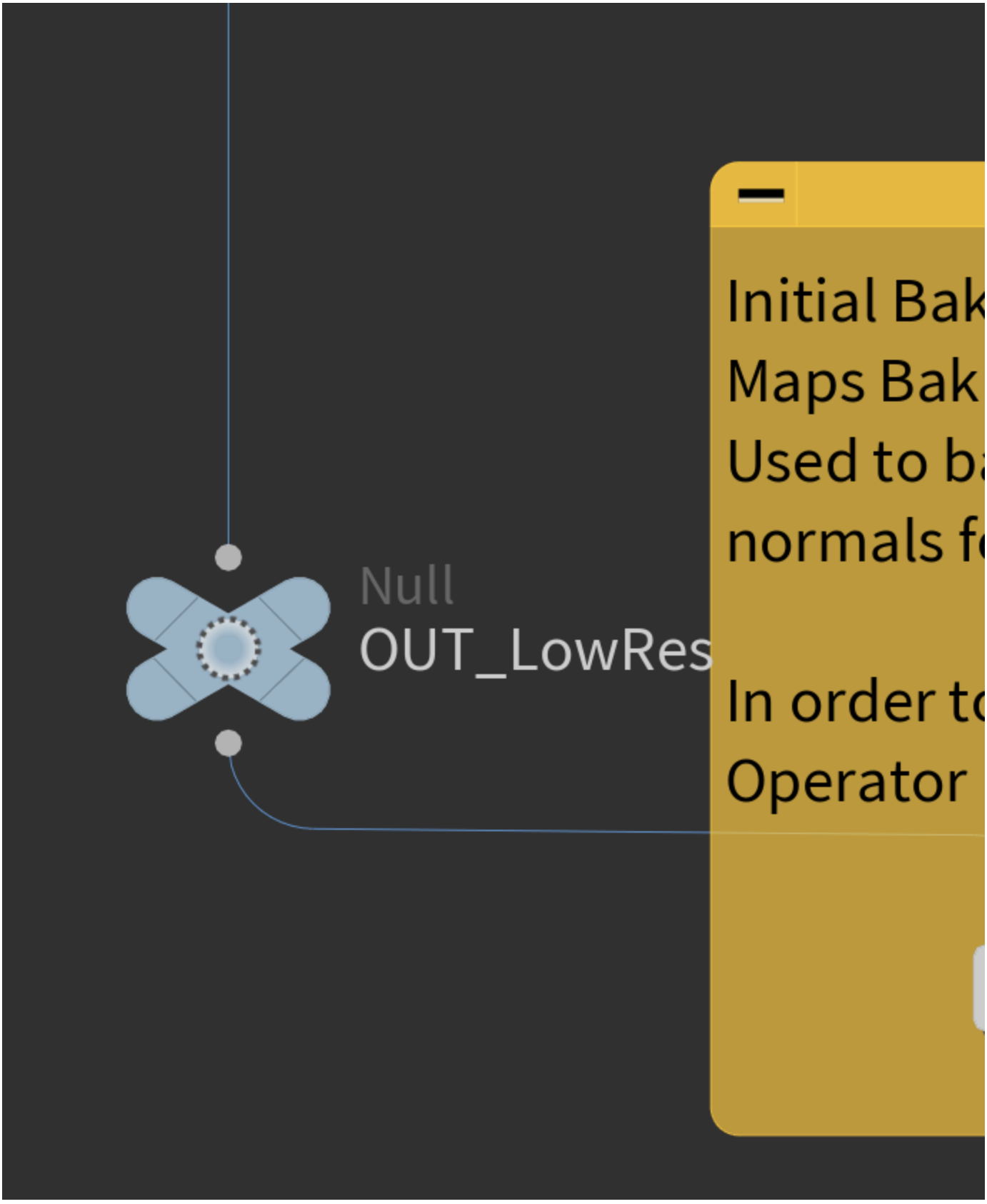


Step 1: First Render

Let's start with the first render settings.

Connect the LowRes object node to the left input of the V-Ray BakerTool node.

For this purpose, the lowRes object needs to have UVs and normals. The V-Ray BakerTool needs to be in Baking mode "Maps Baking".



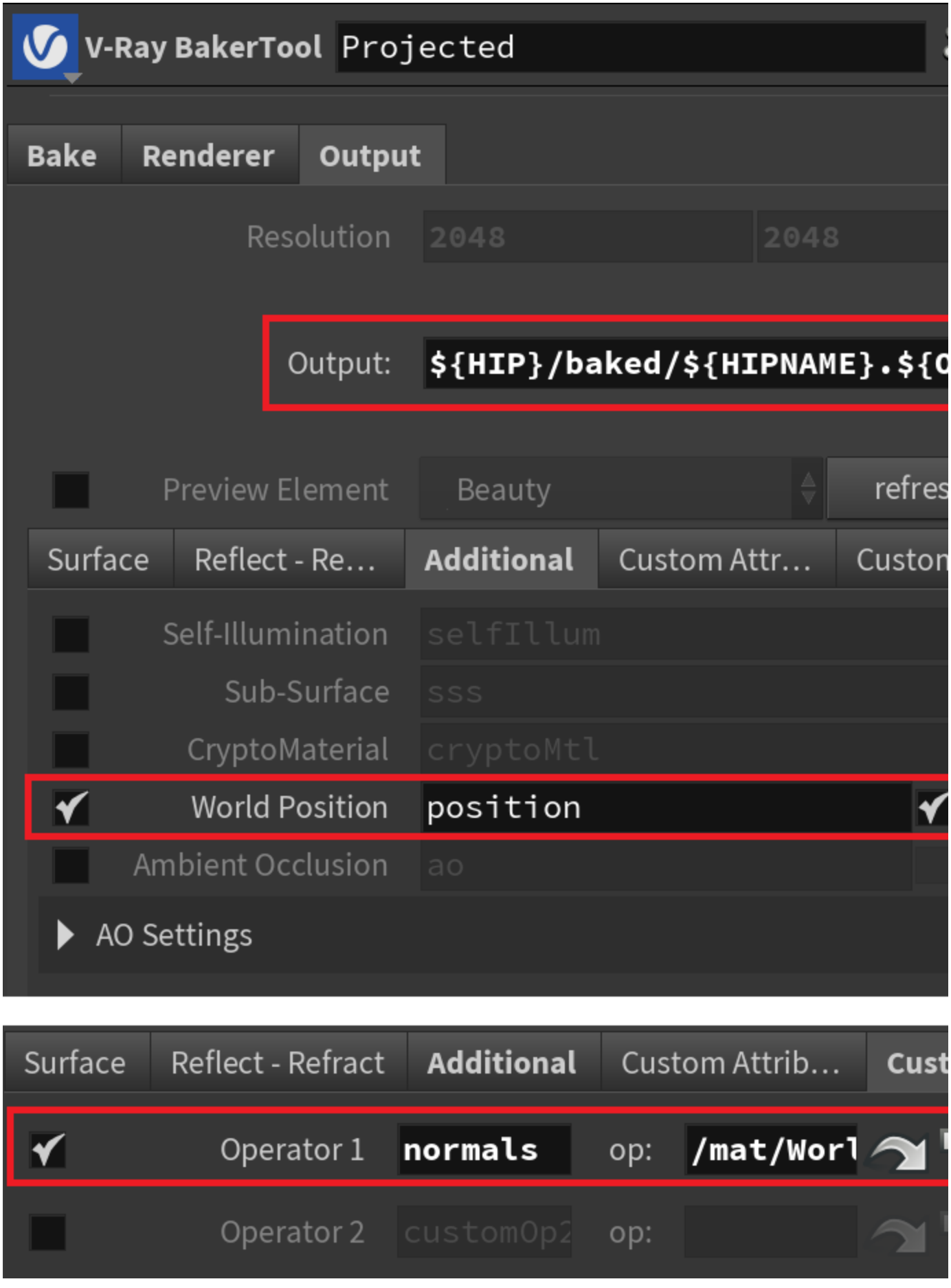
Render Element

Go to the V-Ray BakerTool node.

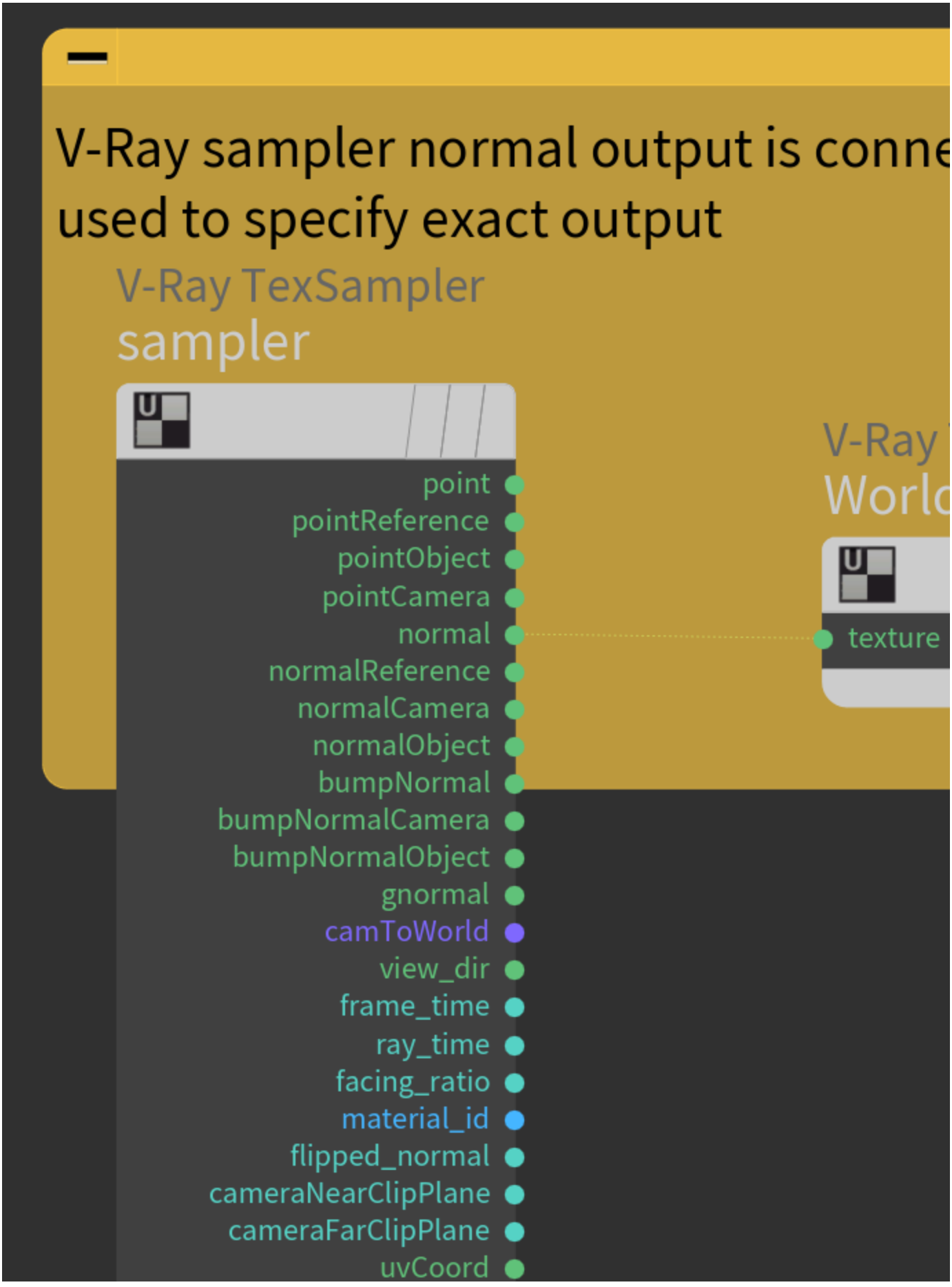
In the Output tab, enable the **World Position** option.

Enable a **Custom Operator** as well and make sure that both of those options are saved in 32-bit format.

The render Output has to be saved in an *.exr* format.


V-Ray BakerTool
Projected
Bake
Renderer
Output
Resolution
2048
2048
Output:
${HIP}/baked/${HIPNAME}.${O
Preview Element
Beauty
refres
Surface
Reflect - Re...
Additional
Custom Attr...
Custon
Self-Illumination
selfIllum
Sub-Surface
sss
CryptoMaterial
cryptoMtl
World Position
position
Ambient Occlusion
ao
AO Settings
Surface
Reflect - Refract
Additional
Custom Attrib...
Cust
Operator 1
normals
op:
/mat/Worl
Operator 2
customOp2
op:

The Custom Operator is a V-Ray Color texture with input tied to the normal output of a V-Ray TexSampler.


V-Ray sampler normal output is conne
used to specify exact output
V-Ray TexSampler
sampler
point
pointReference
pointObject
pointCamera
normal
normalReference
normalCamera
normalObject
bumpNormal
bumpNormalCamera
bumpNormalObject
gnormal
camToWorld
view_dir
frame_time
ray_time
facing_ratio
material_id
flipped_normal
cameraNearClipPlane
cameraFarClipPlane
uvCoord
texture

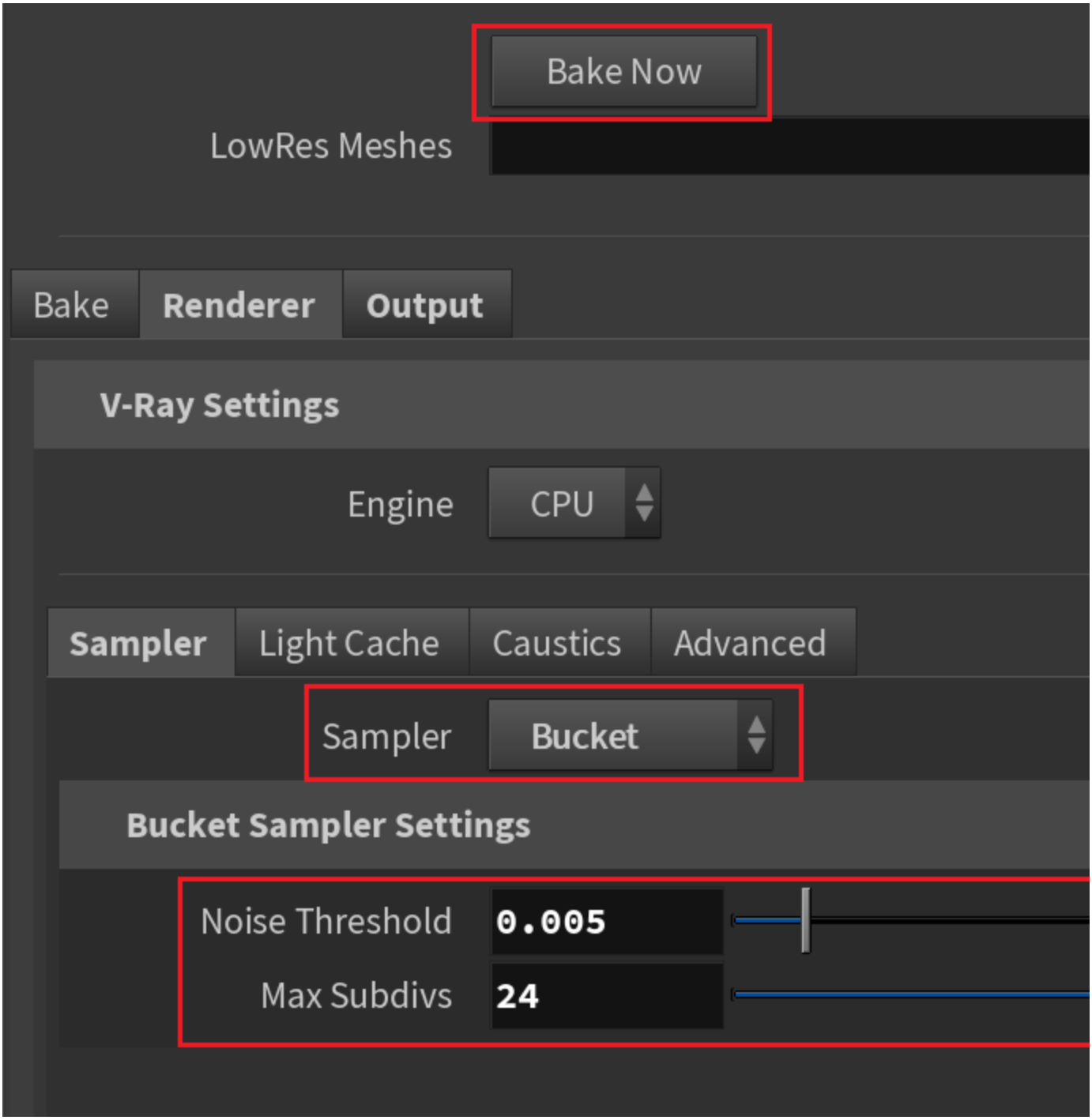
Render Settings

In the Renderer tab of the V-Ray Baker Tool, set the **Sampler** to **Bucket**.

Make sure that the **Noise Threshold** is set to 0.005 and the **Max Subdivs** to 24 - these are the default values.

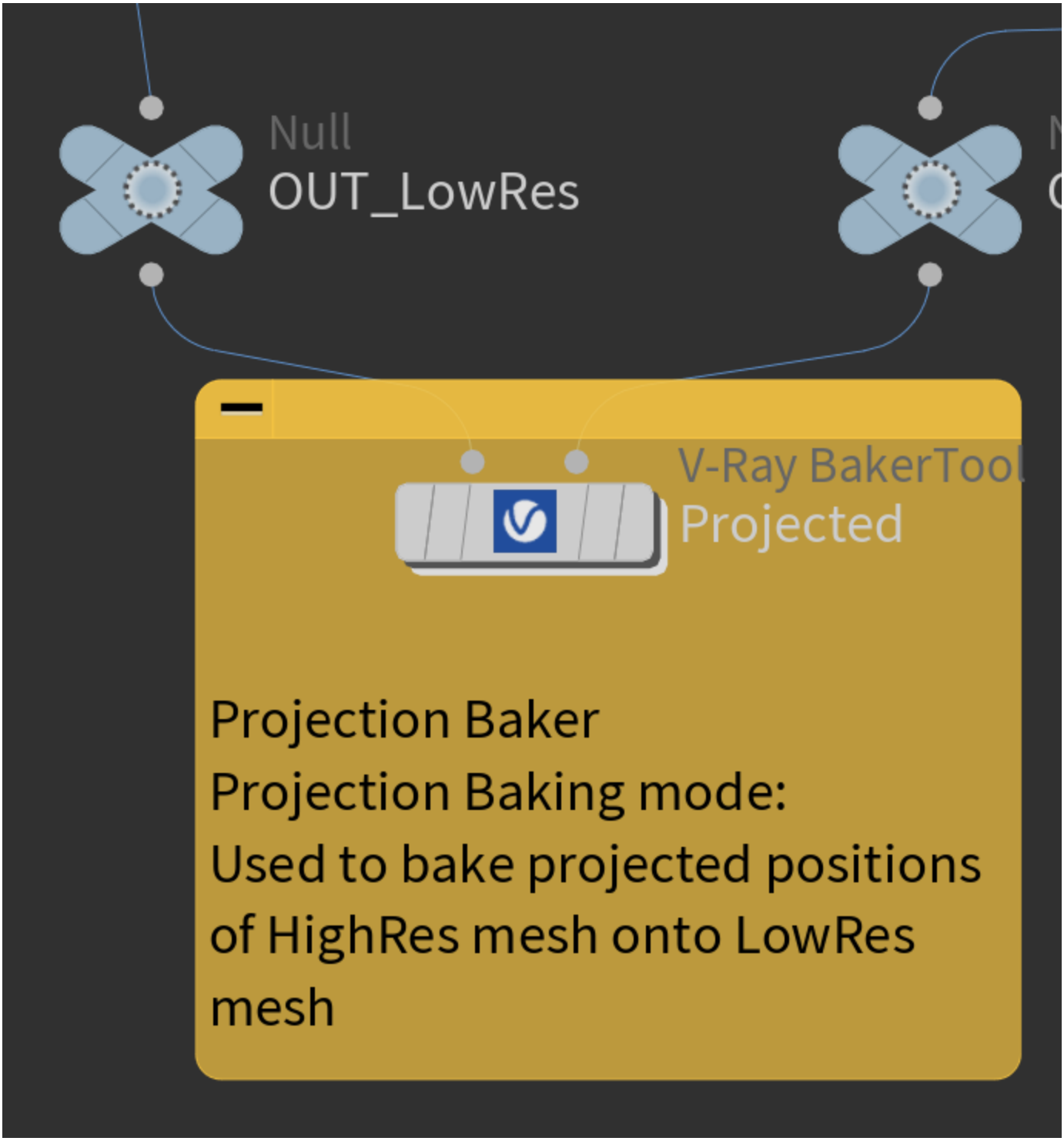
Once done, click the **Bake Now** button.

Wait for the map to be exported.



Step 2: Second Render

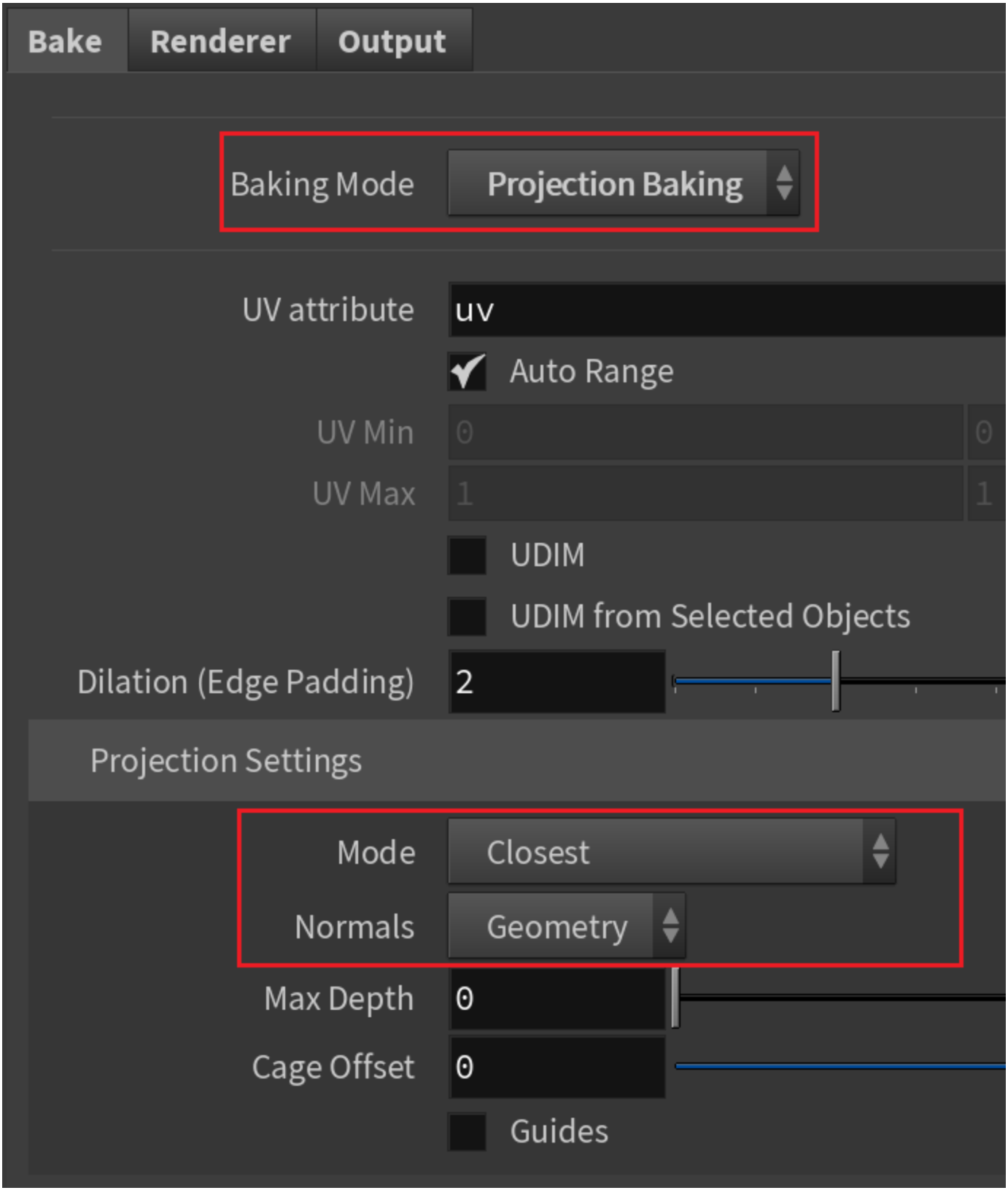
For the second render, connect the LowRes object to the left input of the V-Ray BakerTool and the HighRes object to the right input of the V-Ray Baker Tool.



Baking Settings

Set the Baking Mode to **Projection Baking** as we did for the first render.

Select the **Closest Mode** and set the **Normals** to **Geometry**.

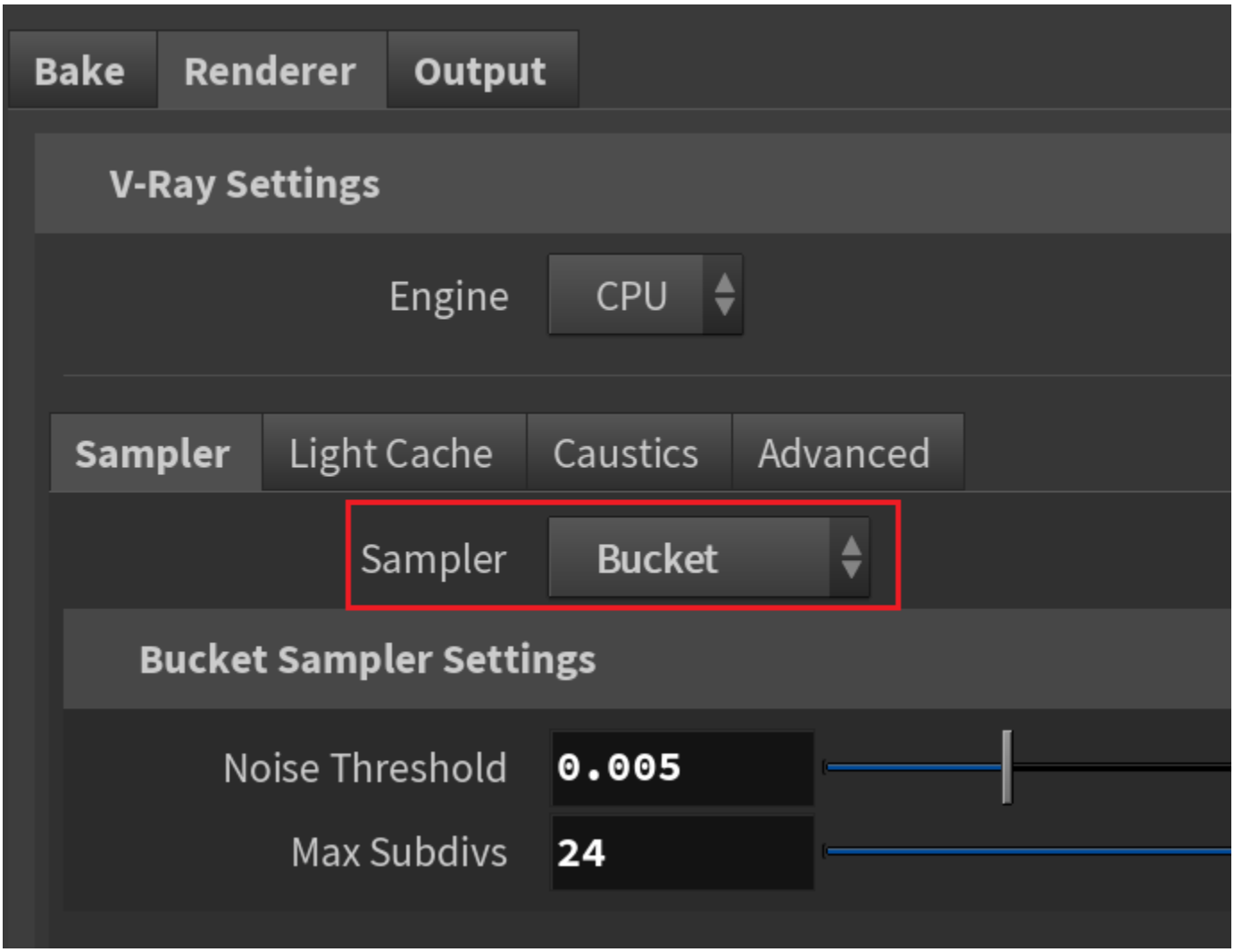


Render Settings

Go to the Render tab and select the **Bucket** Sampler with the same parameters values as those for the first render:

Noise Threshold = 0.005

Max Subdivs = 24

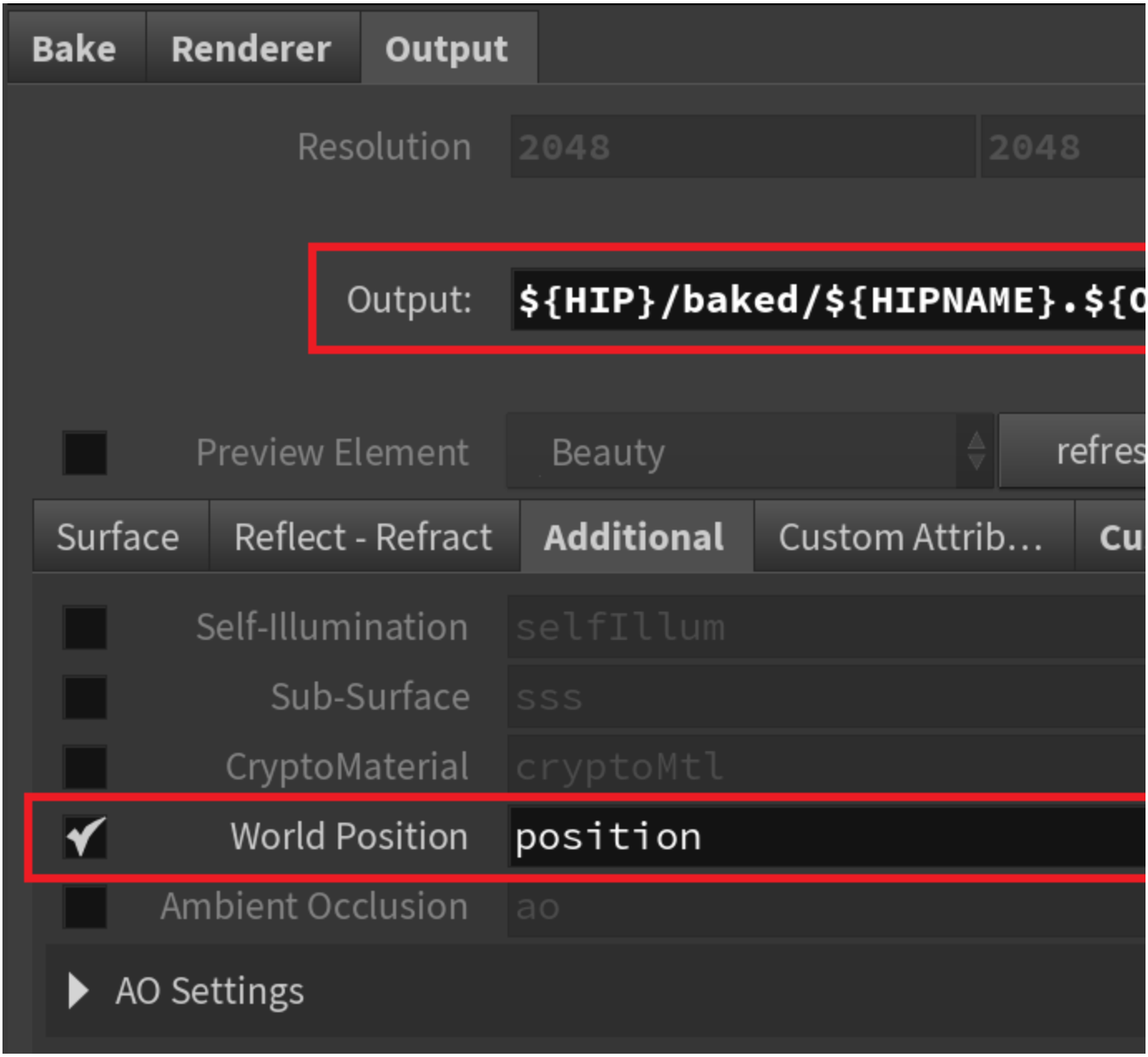


Render Element

Here we need only one render element. Keep the **Output** in an *.exr* format.

In the **World Position** we need to place information about the coordinates of the HighRes projection points onto the LowRes object.

Click the **Bake Now** button and wait for the map to bake.

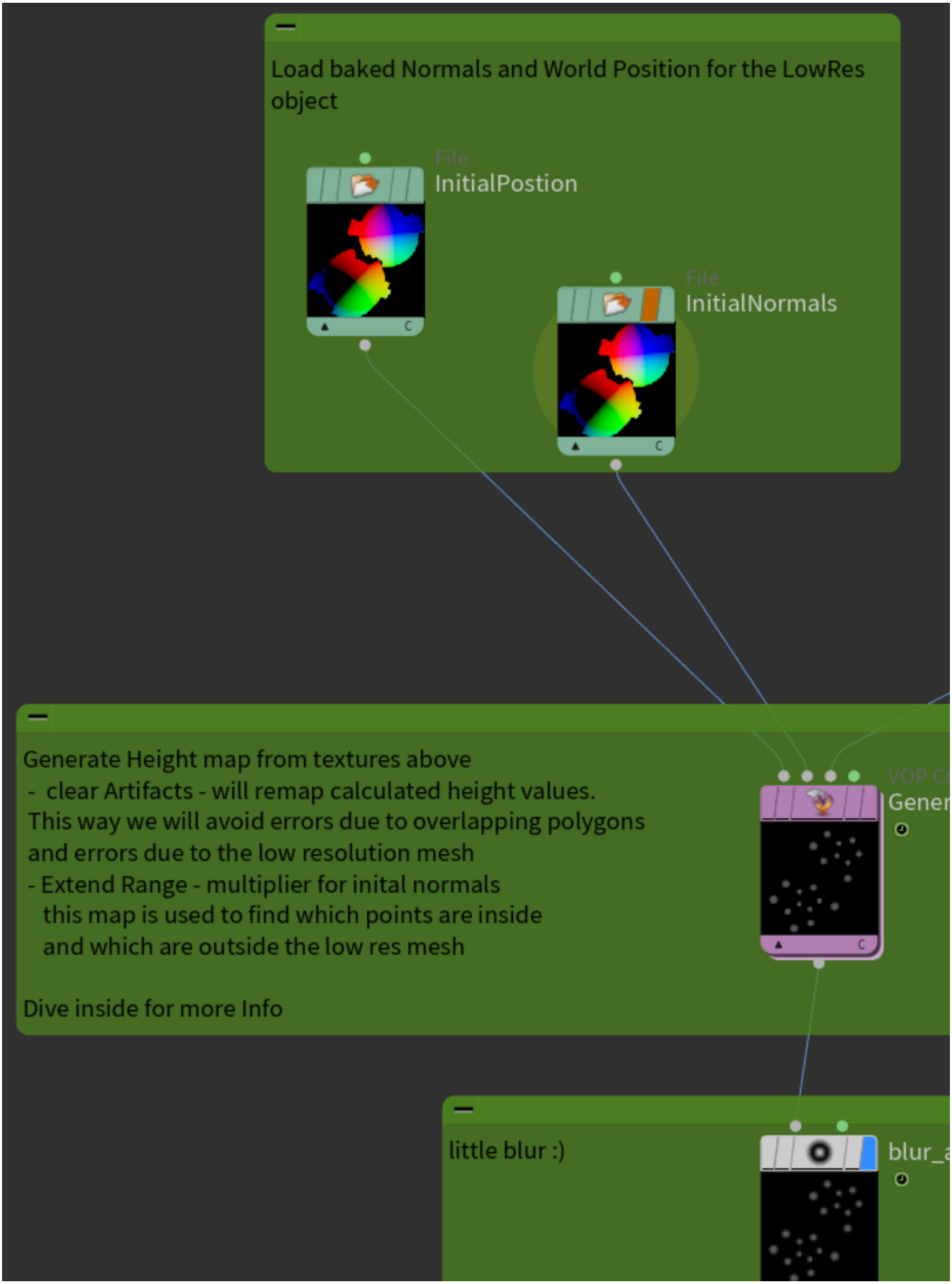


Step 3: Displacement

Now that we have all of the need information baked into .exr images, we can use a **COP** node to get the displacement map.

Go into **/img/calculateHeightMap** and in the three File nodes load the respective render elements:

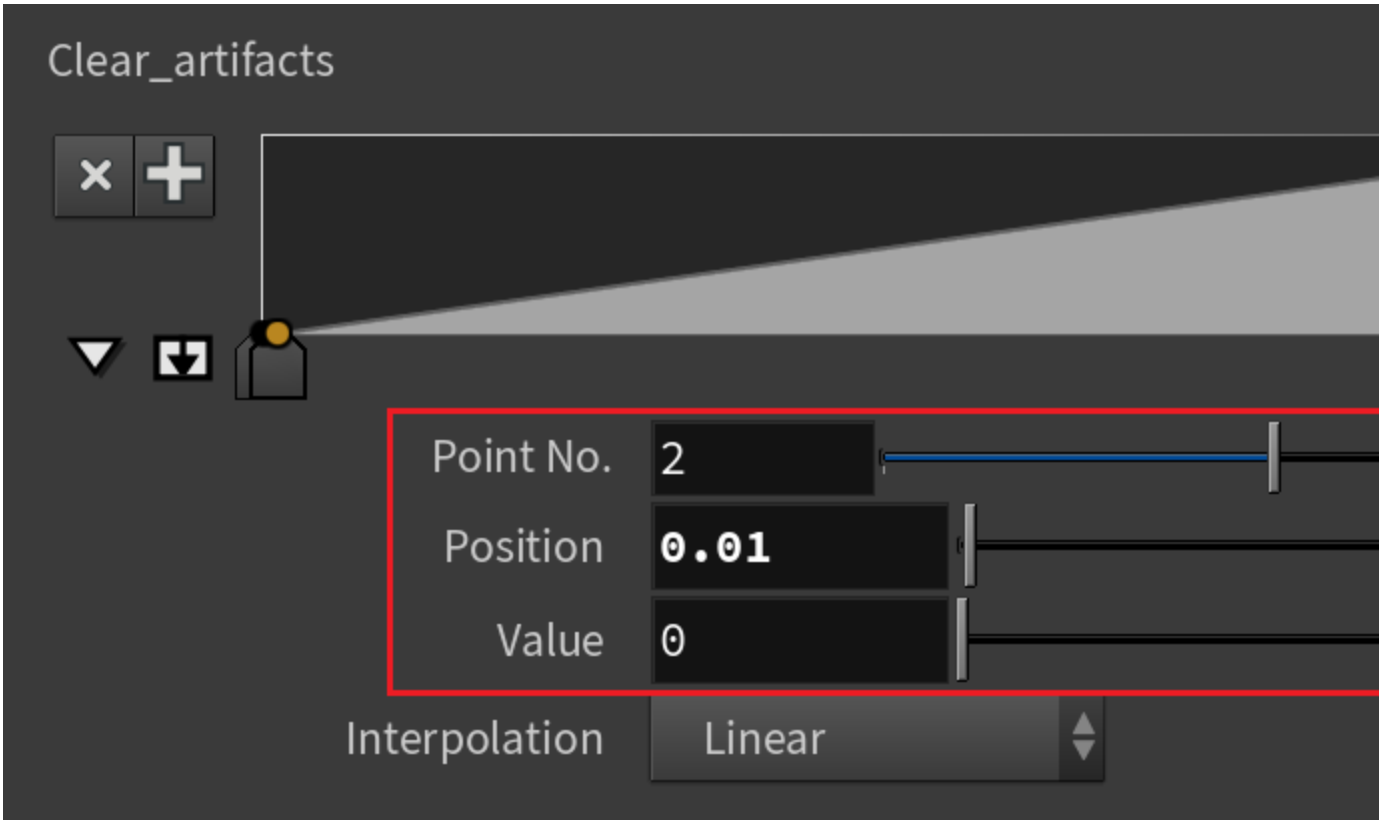
- InitialPosition - load the world position from Step 1;
- InitialNormals - load the custom operator from Step 1;
- ProjectedPositions - load the world position from Step 2.


Load baked Normals and World Position for the LowRes object
File
InitialPostion
File
InitialNormals
Generate Height map from textures above
- clear Artifacts - will remap calculated height values.
This way we will avoid errors due to overlapping polygons
and errors due to the low resolution mesh
- Extend Range - multiplier for inital normals
this map is used to find which points are inside
and which are outside the low res mesh
Dive inside for more Info
little blur :)

The GenerateHeight node is a custom node that takes care of the following settings:

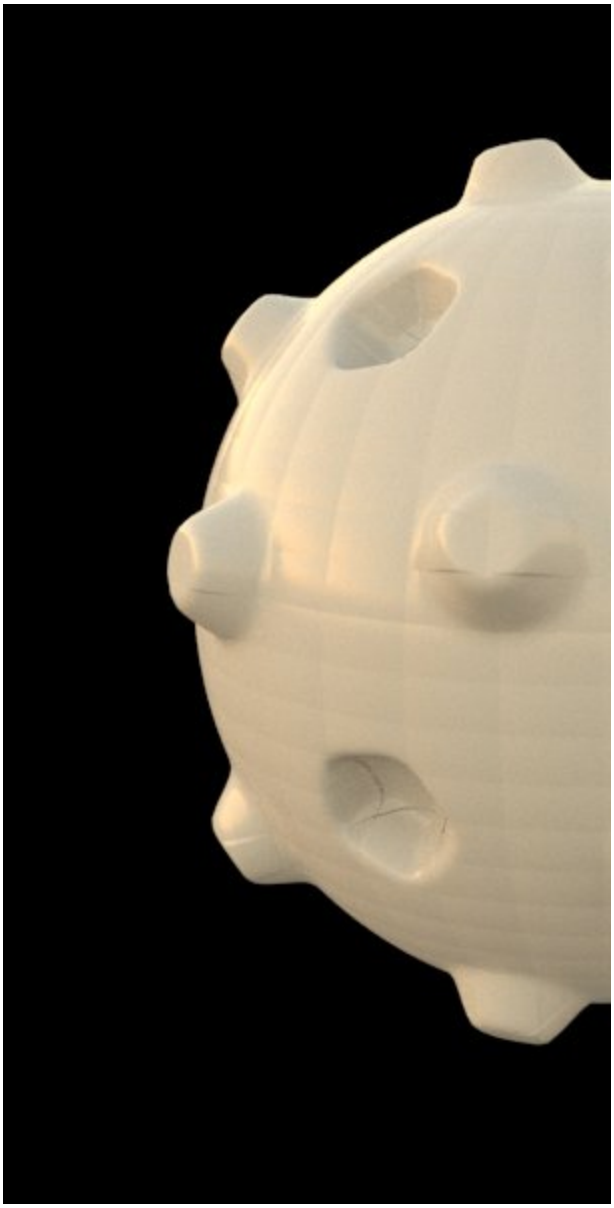
- **Extend Range** - The value here should be higher than the biggest expected distance between the two meshes at any given point.
- **Clear_artifacts** - This remap's purpose is to clear the closest places between the meshes, but because of the difference in the density, that will create an edgy effect. So let's leave the two most distal points (that's 0 and 1) and create a new point with **Position** 0.01. Set its **Value** to 0.

If the Position is bigger than 0.01, the displacement map will be badly clamped.

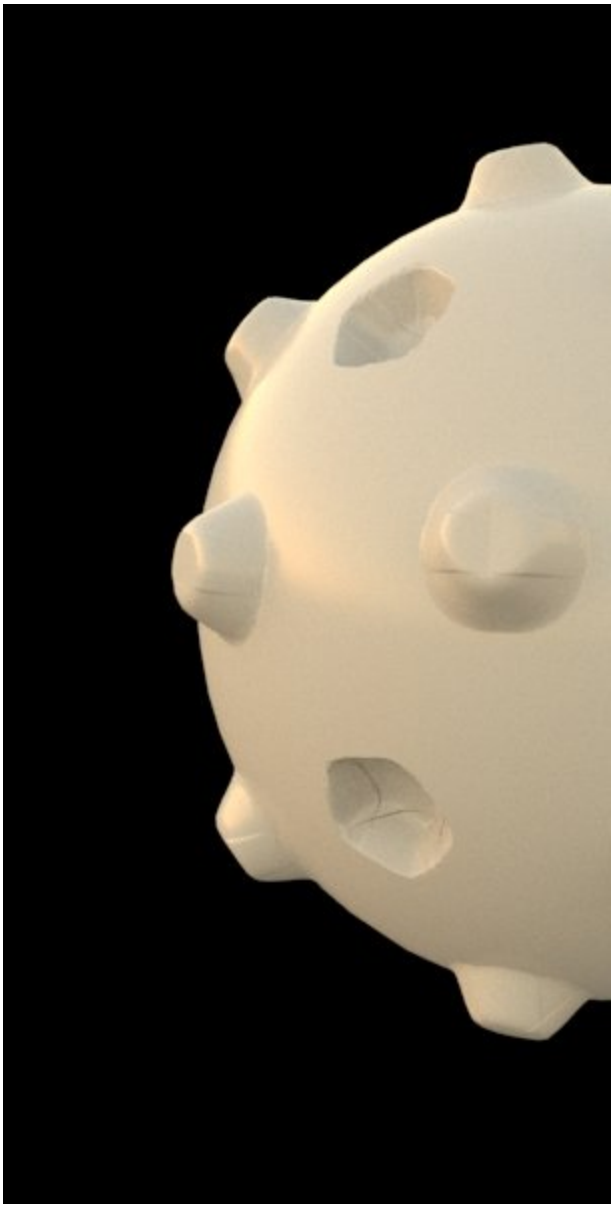


The **Blur** node clears other unwanted artifacts from the displacement caused by the difference of point density between the two meshes.

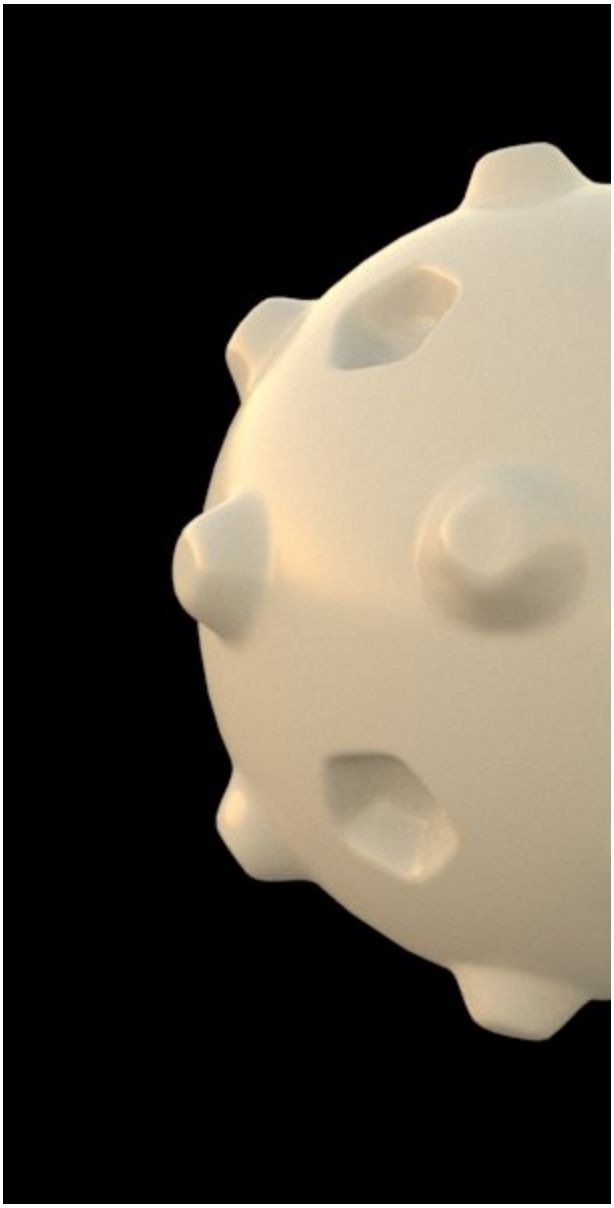
Move the slider to compare the renders with and without blur and Clear_artifacts.



No blur and no Clear Artifacts



No blur, Clear Artifacts enabled



Blur enabled, Clear Artifacts enabled