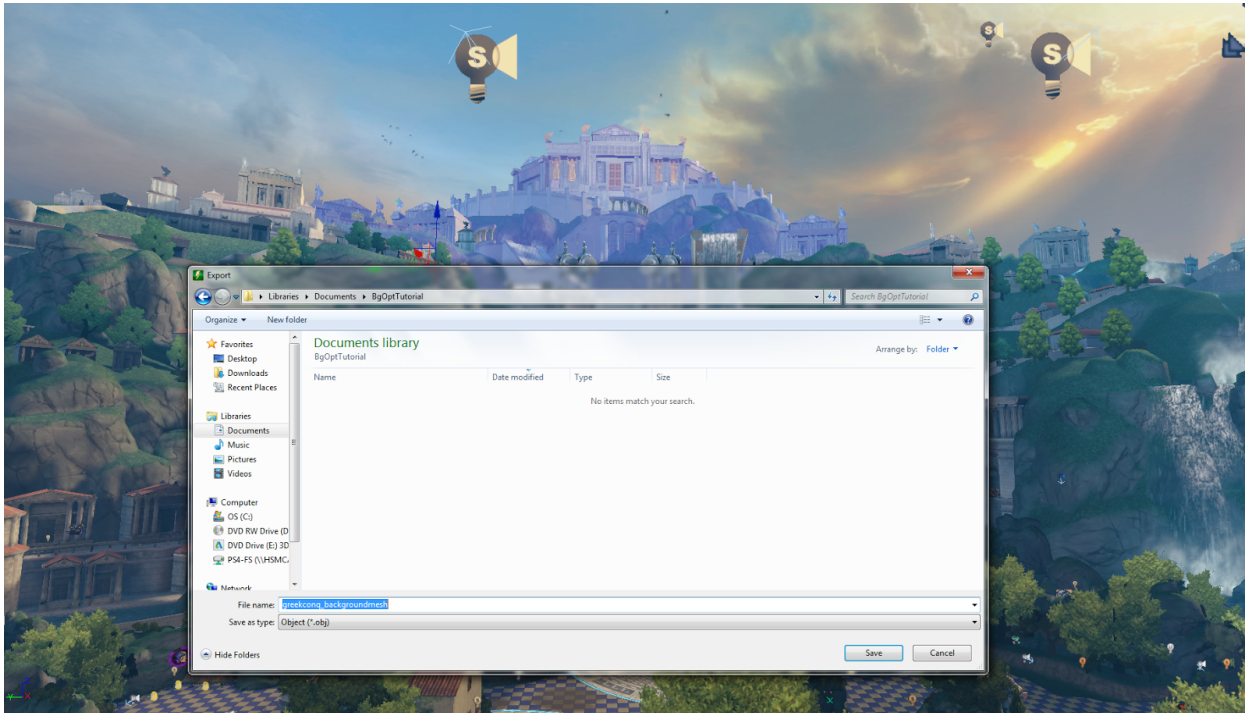


# Massive LOD

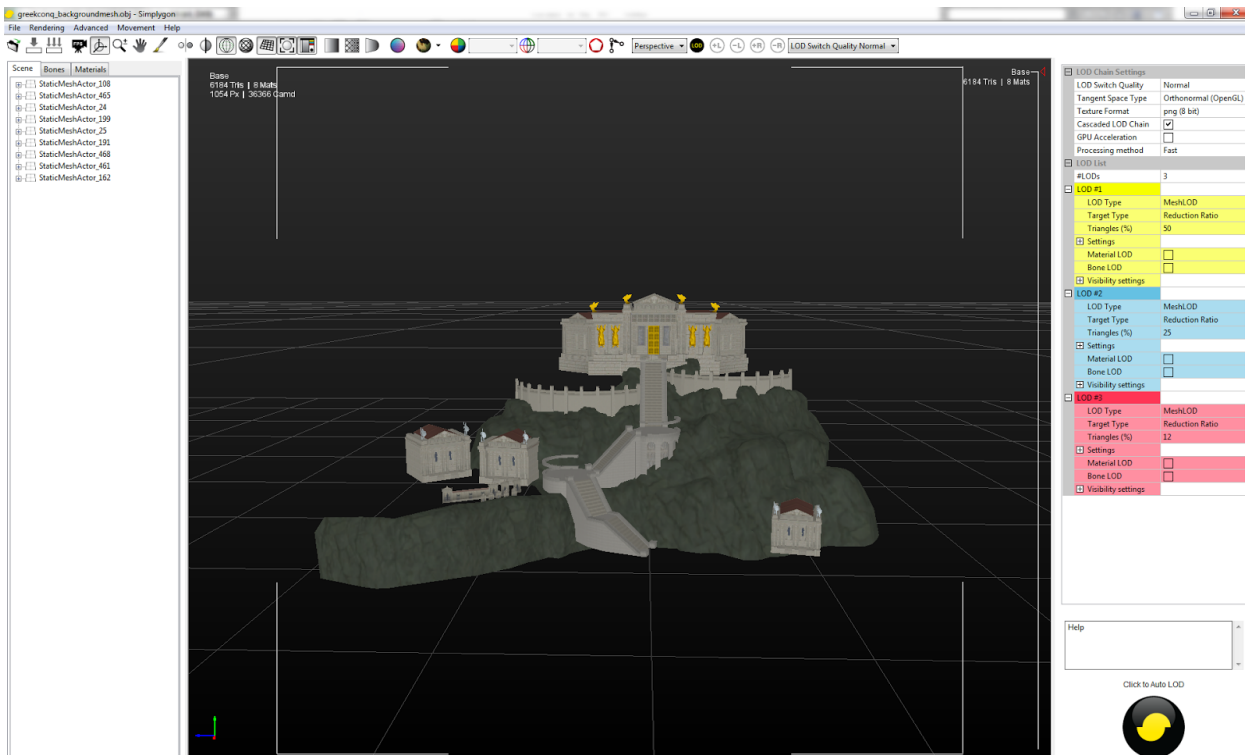
Introduction: This process takes a combination of background assets with any number of materials and creates a single mesh, single material LOD version to replace all of the individual pieces at a distance. There also is an option to further LOD that version to create a lower poly version that shares the one combined material.

**Step 1:** Select the group of meshes that you wish to combine in the editor. Go to File->Export->Selected Only... and export them as .obj (for some reason Simplygon rotates fbx files strangely). If it asks to export 'materials as images' say Yes.



**Step 2:** Open Simplygon and go to Open the .obj you exported from Step 1. (fbx does not export textures, obj does - neither export complex materials like up-vector grass).

Note: Simplygon crashes if you try to open an OBJ over an already opened OBJ so make sure you save if you need to re-import.



You should see something similar to below. It will bring textures in. You will notice the rock is noticeably darker and without grass. Complex materials/vertex colors do not export so the composite texture will have to be adjusted by either painting in Photoshop or doing a Top/Bottom material in Max by bringing in the grass texture. The darkness will still need photoshop adjusted to color match. Unlit screenshots on the same monitor side-by-side work for comparisons. We'll cover that later.

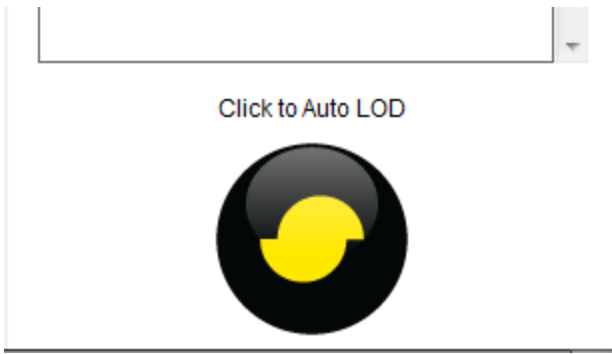
### Getting a composite mesh/material into 3ds Max

**Step 1:** Configure your Simplygon settings similar to below and click the SimplyGon button at the bottom right. This will combine everything to one mesh and one material and let you save out those textures and mesh.

[-] LOD Chain Settings	
LOD Switch Quality	Normal
Tangent Space Type	Orthonormal (OpenGL)
Texture Format	tga (8 bit)
Cascaded LOD Chain	<input checked="" type="checkbox"/>
GPU Acceleration	<input type="checkbox"/>
Processing method	Fast
[-] LOD List	
#LODs	1 <input type="text"/>
[-] LOD #1	
LOD Type	MeshLOD
Target Type	Reduction Ratio
Triangles (%)	50
[+] Settings	
[-] Material LOD <input checked="" type="checkbox"/>	
Automatic size	<input type="checkbox"/>
Width	1024
Height	1024
Sampling Quality	High
User weights	<input type="checkbox"/>
[+] Unwrap UVs	
[+] Cast Channels	
Bone LOD	<input type="checkbox"/>
[+] Visibility settings	

**#LODs:**

The number of automatic LODs to be created from the base model.

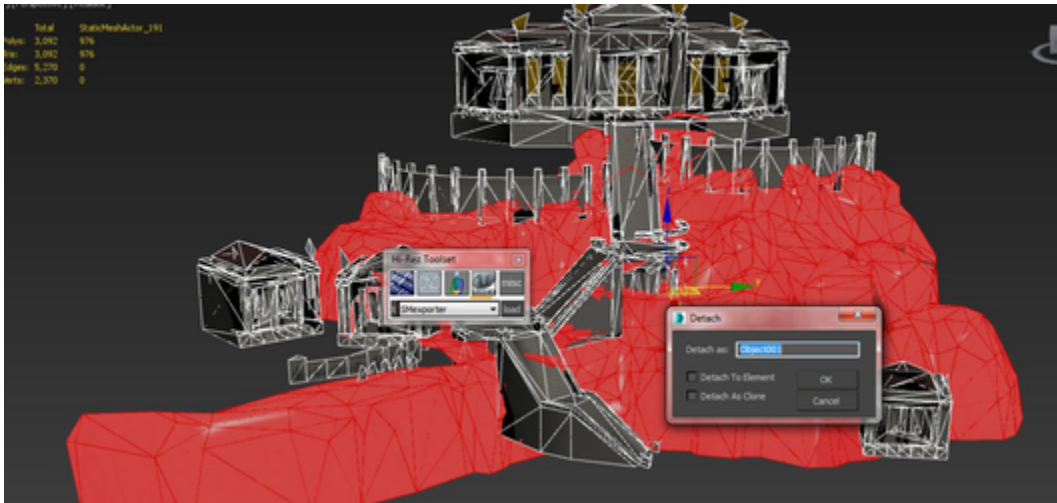


Note: Make sure you check Material LOD to get the texture settings. You could also do 2048 and down-res later.

**Step 2:** Go to File>Save All and save out either an fbx or obj (doesn't matter for this). Import this mesh into 3ds Max.

**Step 3:** You will notice there is no grass on top, as mentioned before. So we will attempt to re-create the effect in Max using masks. (Tests on just projecting diffuse maps off of multi-materials created black artifacts on the mesh).

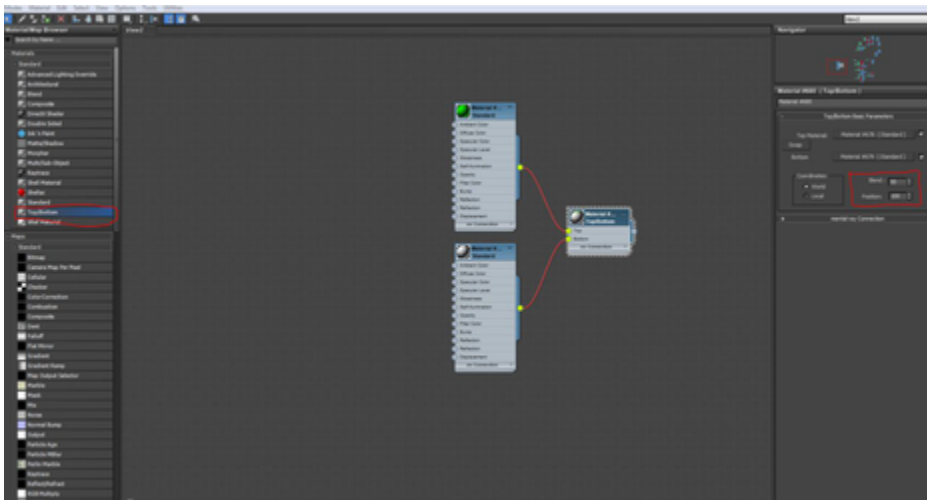
Select the element that is missing the up-vector from UDK and detach it.



**Step 4:** Open the material editor in Max



**Step 5:** Drag out a Top/Bottom material from the 'Standard' Materials toolbar on the left



Double click the two materials and set them to highly contrasting colors (first one green or pink, second one white or black).

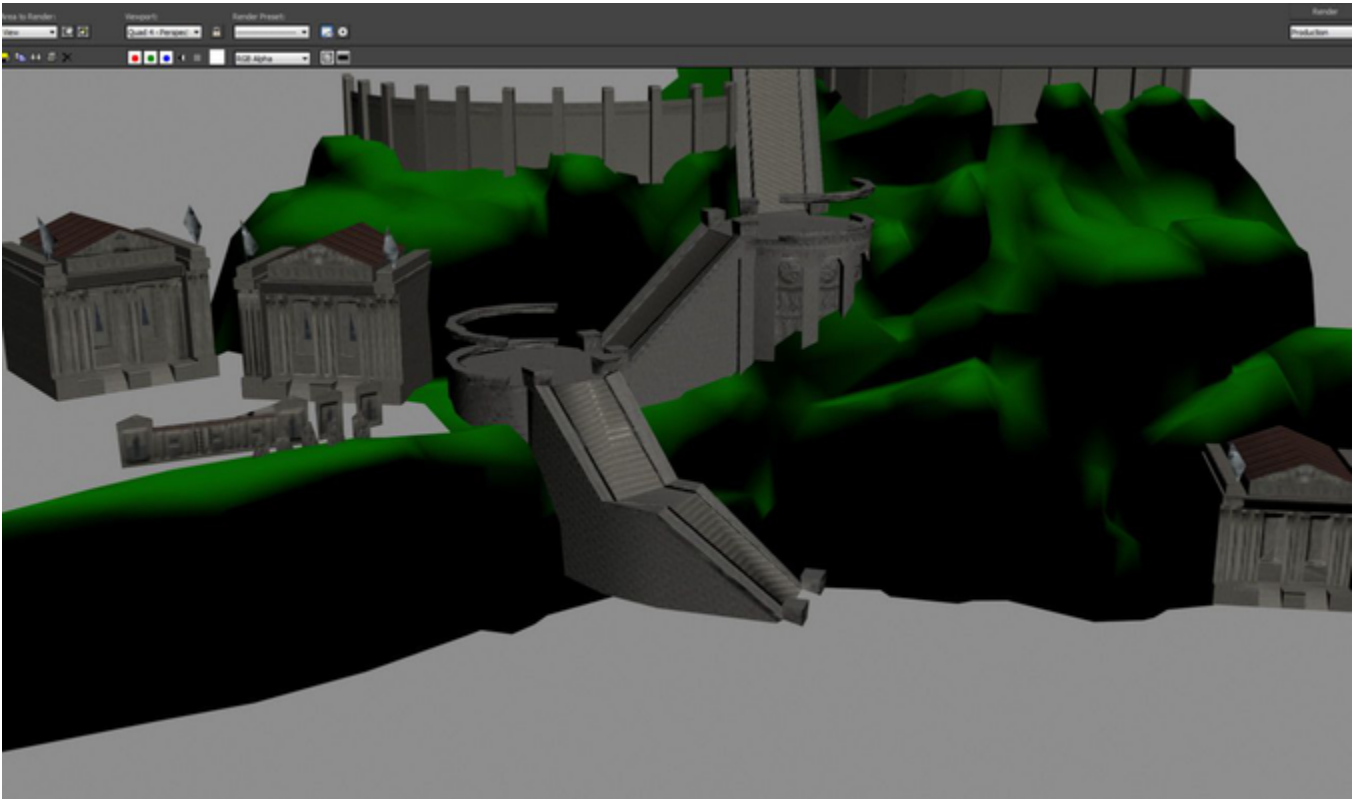
Double click the Top/Bottom material and set the Blend/Position settings to something similar to Above.

**If you're going to be normal packing your mask and using it in engine use White for top, Black for bottom.**

**Step 6:** Apply the Top/Bottom Material to the rock mesh you separated in early steps. Right click Assign Material to Selection

*Note: It will appear green (or the Top color). Top/Bottom materials do not preview in the viewport. Press 9 to bring up Render Setup and click Render to preview.*

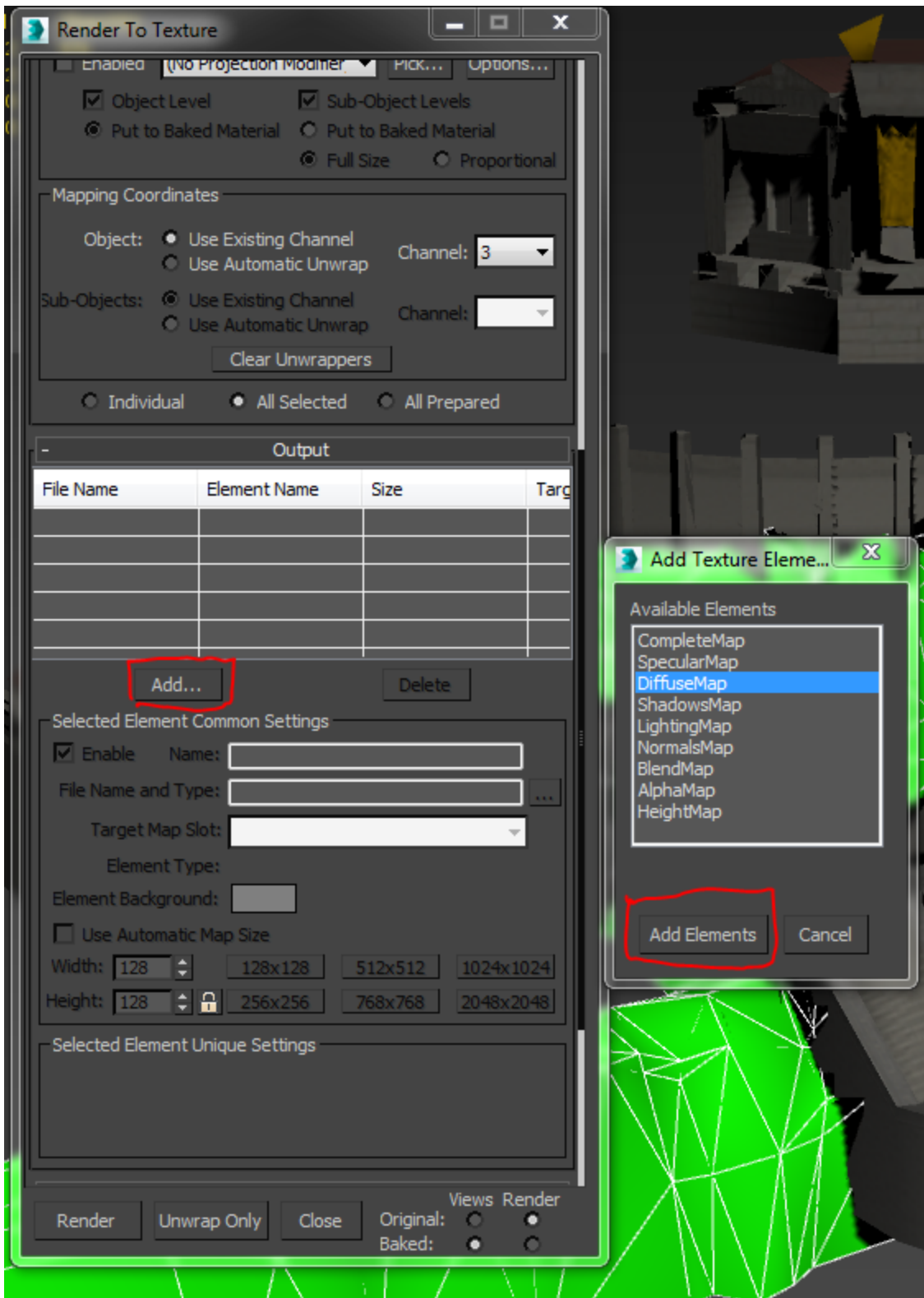
**Step 7:** Tweak the blend/position settings until you're happy with the result. *Note: you will likely have to edit in photoshop to get a harder mask but this process facilitates manual editing as much as possible.*



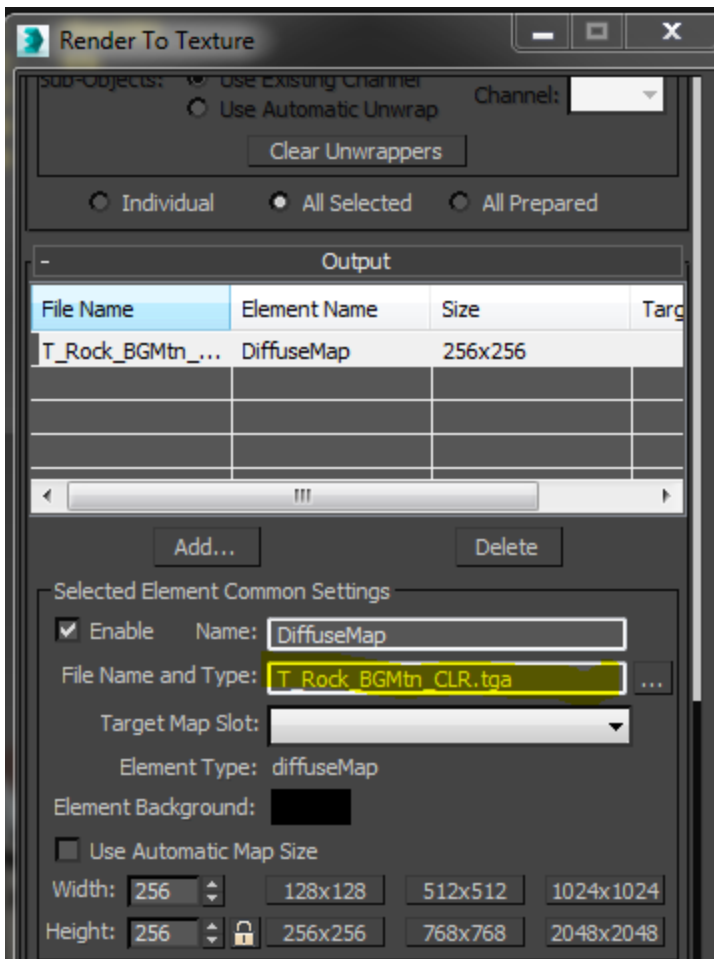
*Pro-Tip: The render BG is black by default. Press 8 to bring up the Environment settings and change it to a mid grey to see your mask preview better.*

*Pro-Tip #2: Click render in the top right of your actual render screen to re-render after material tweaks without having to move back to the Render Setup.*

**Step 8:** With the rock mesh selected - Press 0 to open Render to Texture. Set a Output Path to an easy to navigate to folder; scroll down and click 'Add' and add a DiffuseTexture as shown below:



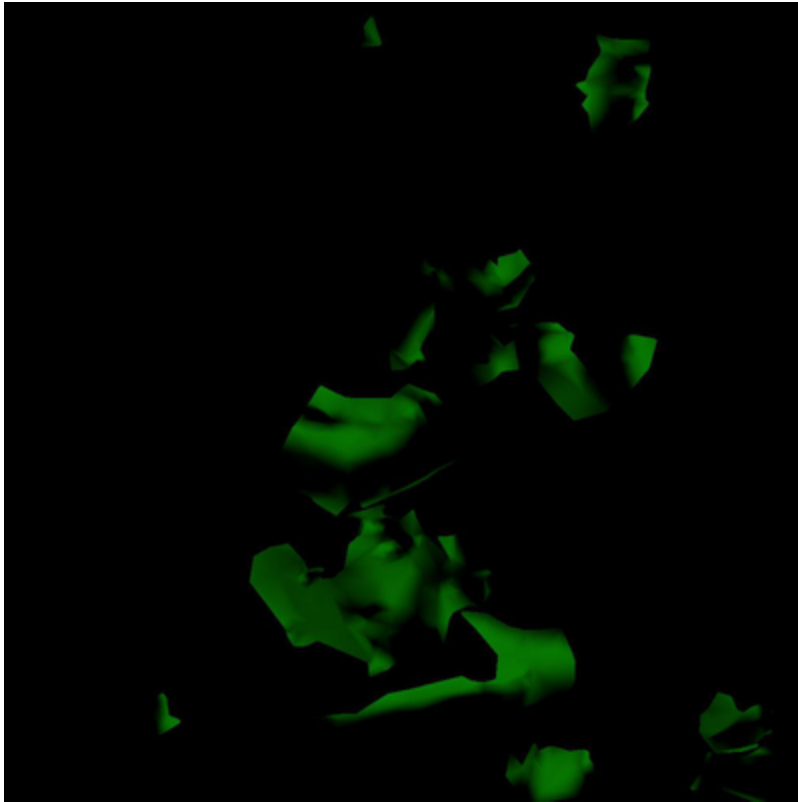
**Step 9:** Give your texture a name and set the size to the same as your other maps:



**Step 10:** Go to Create > Lights > Standard Lights > Skylight and insert one into your scene. Make sure 'Cast Shadows' is checked off. Now right click on your cliff mesh and go to 'Object Properties' and check OFF Cast Shadows here too.

**Step 11:** Click 'Render' at the bottom\*. Go to your Output path and open that file in Photoshop. You should see something similar to below:

\*- The render preview is not always indicative of the actual render result.



This map will serve as a color selection to use as either part of a RGB packed mask to tile grass using a LERP in engine or as a selection mask to do it manually in the diffuse in Photoshop.

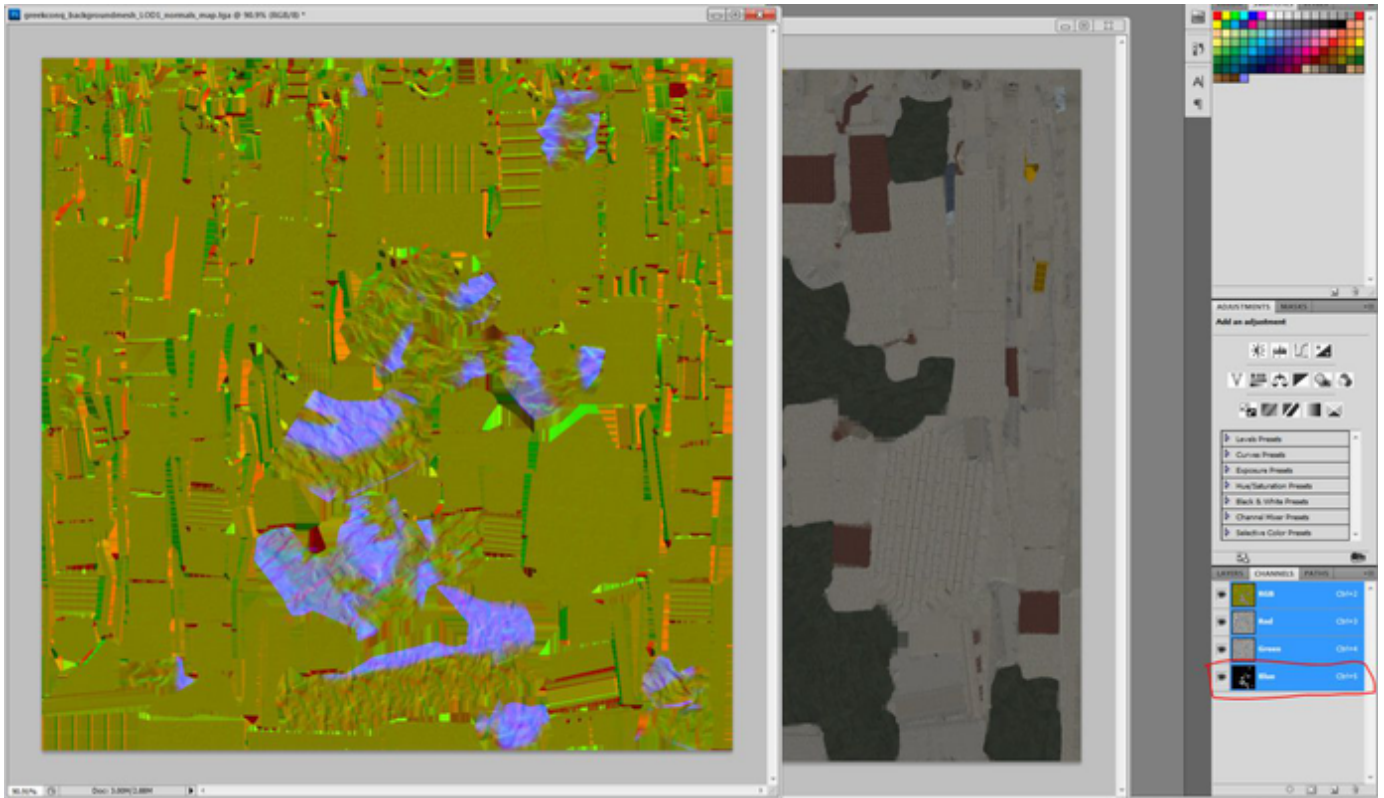
**Investigation/Approach Discussion:** As mentioned above, there's a few ways to approach the rest of the process. The first thing looked at here was which is the least time consuming and can it deliver good enough results to not lead to a jarring visual change when it loads the MassiveLOD combo mesh. It is important to note that in this case, 11 meshes, most with their own materials are being condensed into 1 material and 1 mesh.

It's simply impossible to get the exact same look, but because it's being loaded at far distance try your best to match basic values/hues and configure LOD distances to minimize visual change at far range. Trust that fog/distance/immersion/game action will ease the transition like most LOD transitions do. The trade off to cut 11 draws and materials is worth it, now you can have buildings and shapes on Low settings you had to turn off before.

**Step 12:** We're going to export all of our maps and meshes now so we can import into the engine and set up the MassiveLOD transition. First since I'm going to pack my grass mask into the normal map I need to make the rendered mask above black and white. So if you rendered it green or a different color, desaturate it and add a levels and tweak until you get what looks like a good mask similar to below:

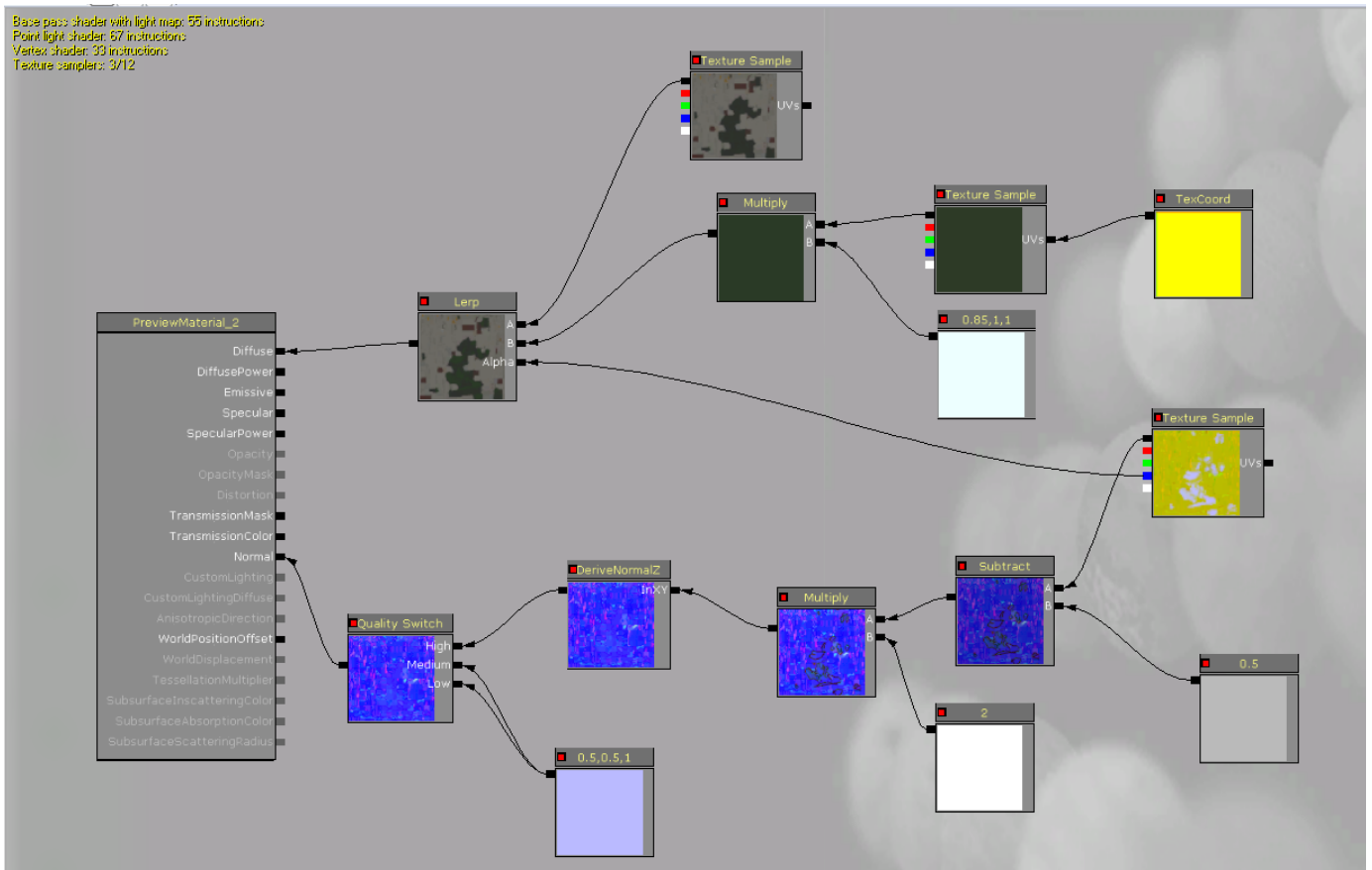


Open your normal map and paste this into the blue channel, it'll look similar to this when you switch back to RGB:



**Step 13:** Re-attach the rock portion to the buildings back in 3ds Max and export that mesh as an ASE or FBX. Make sure to apply one material to the mesh. Now import your textures and mesh to a package and create a material. We're going to borrow the DeriveNormalZ technique from this: [Normal Map Blue Pack](#). This setup also will take the grass texture used on the original mesh and use the blue packed mask and tile it the same amount. We'll breakdown the setup under the image below:

Base pass shader with light map: 55 instructions  
Point light shader: 67 instructions  
Vertex shader: 33 instructions  
Texture samplers: 3/12



The green texture sample is the tiling grass. We will compare the MassiveLOD to the default meshes now and make adjustments as the tiling may not be the same and we already know the textures tend to project a little darker for some areas when SimplyGon makes the combo texture.

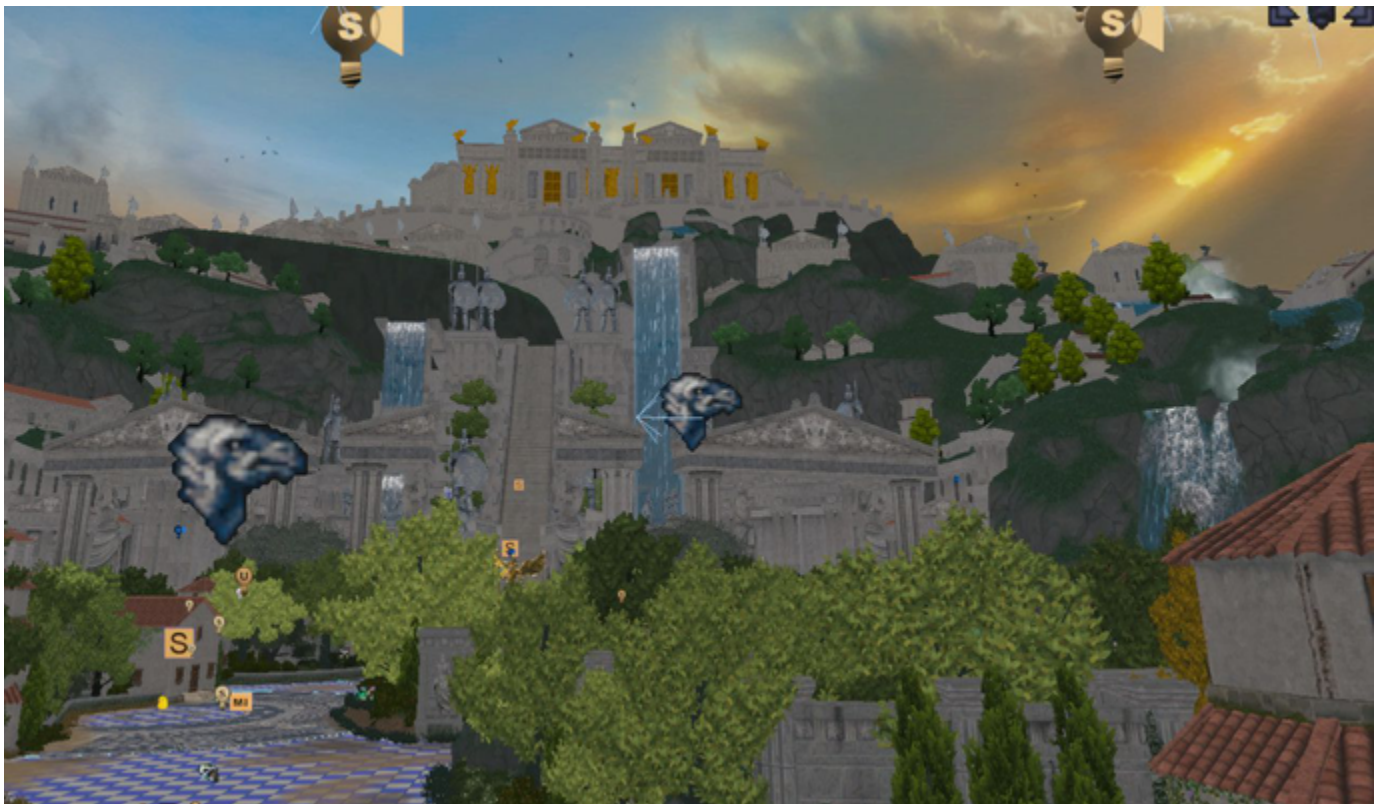
**Step 14:** Place the combo mesh in-game and move it to the right of the default mesh. This is so we can compare the visual differences and start making adjustments. View this in 'Unlit' mode.



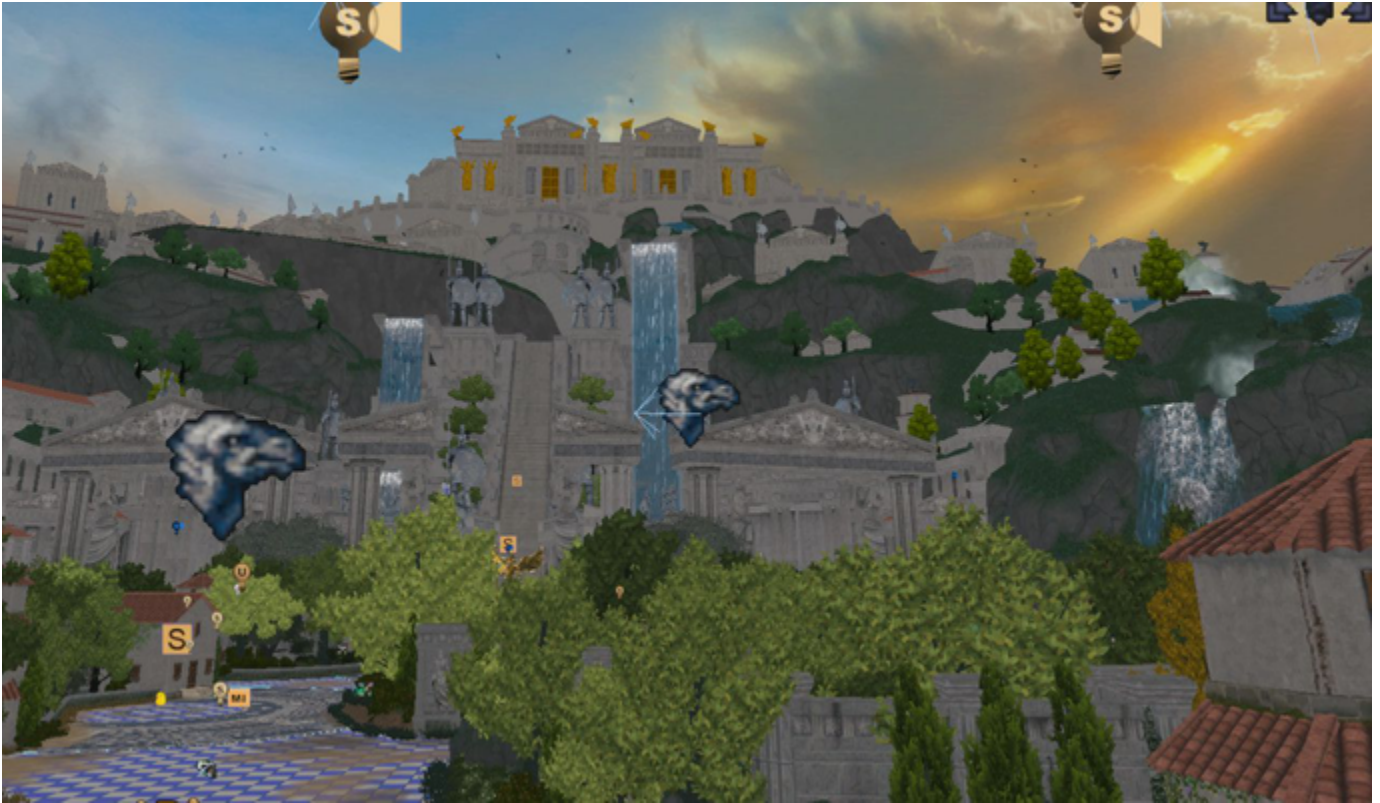
You can see that the grass holds up pretty well (it should its the same one and its tileable). You can see that the rock is lacking detail and is significantly darker. The detail part we're not going to get back, and that's okay because this will be seen only from distances much farther away than the above image. I'm going to take this screenshot into photoshop and do adjustments to it then move those adjustment layers over to the texture and setup a mask on just the rocks.

*More Reasonable Viewing Distance for In-Game Purposes (Still Unlit):*

*Make sure to turn OFF fog with 'f' when taking your screenshot for Photoshop.*



**Step 15:** Open the screenshot in Photoshop. Duplicate the layer (Ctrl+J) and paint out everything but the dark rock area. (Or magic wand it). Add a levels to it and adjust it until it matches in value with the default close-up rocks in value. You may need to use Levels and Hue/Saturation. Make sure to add as Adjustment Layers so you can drag them into the actual texture later.



Now it is much closer in value (not perfect because we lost some crack detail because it's many materials becoming one) but it should suffice for a smoother LOD transition. As you can see, the buildings are strikingly close in unlit.

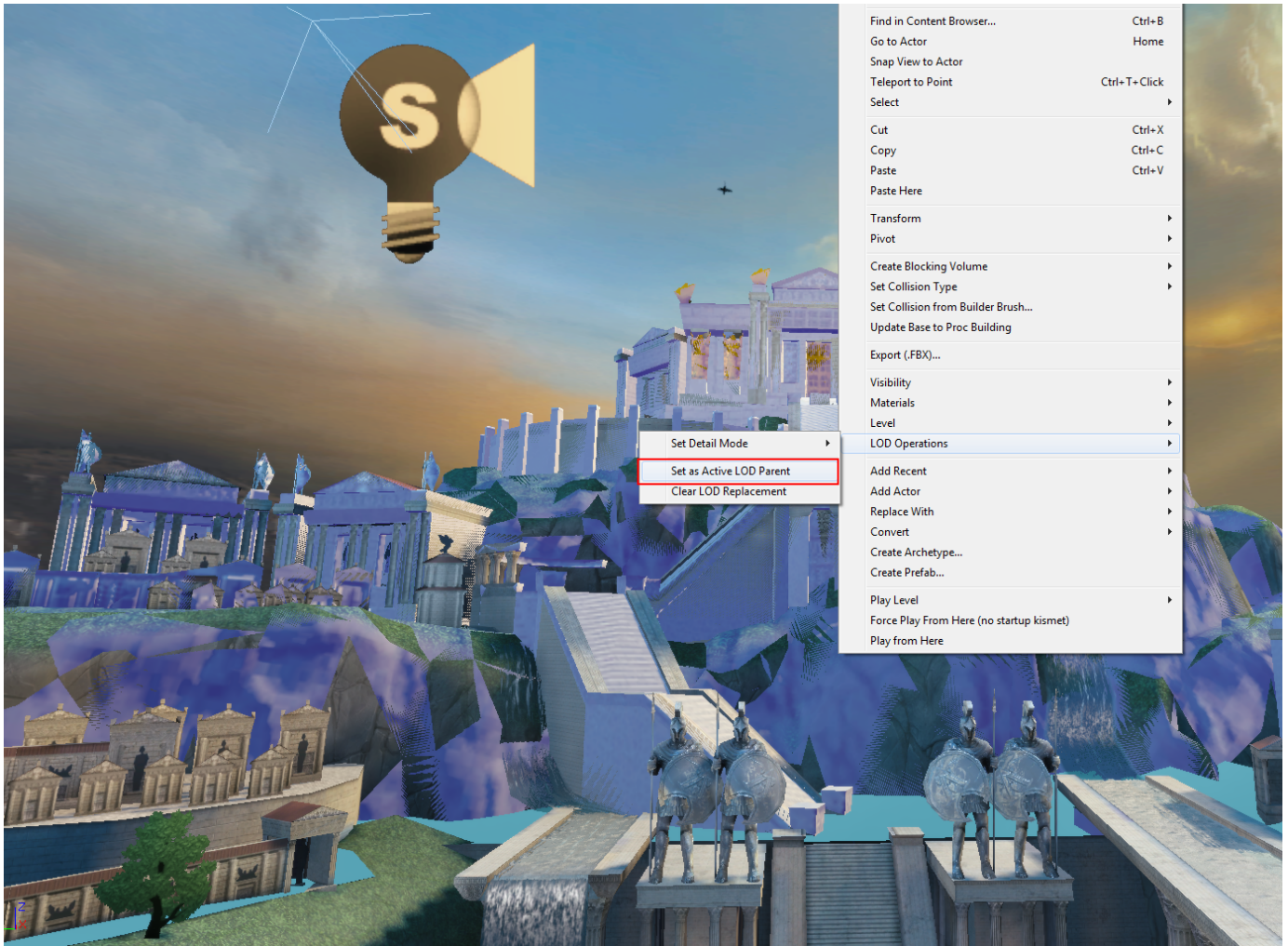
**Step 16:** Open the DIF texture for the combo Mesh and magic wand/lasso select all of the dark grey walk areas then drag over the two adjustment layers from the screenshot you did in the previous step. Delete the layer masks on the adjustment layers then go to LayerLayer MaskReveal Selection. This will put the adjustment layers just on the rock portions. Before/After below:



Reimport the adjusted diffuse back into UE3.

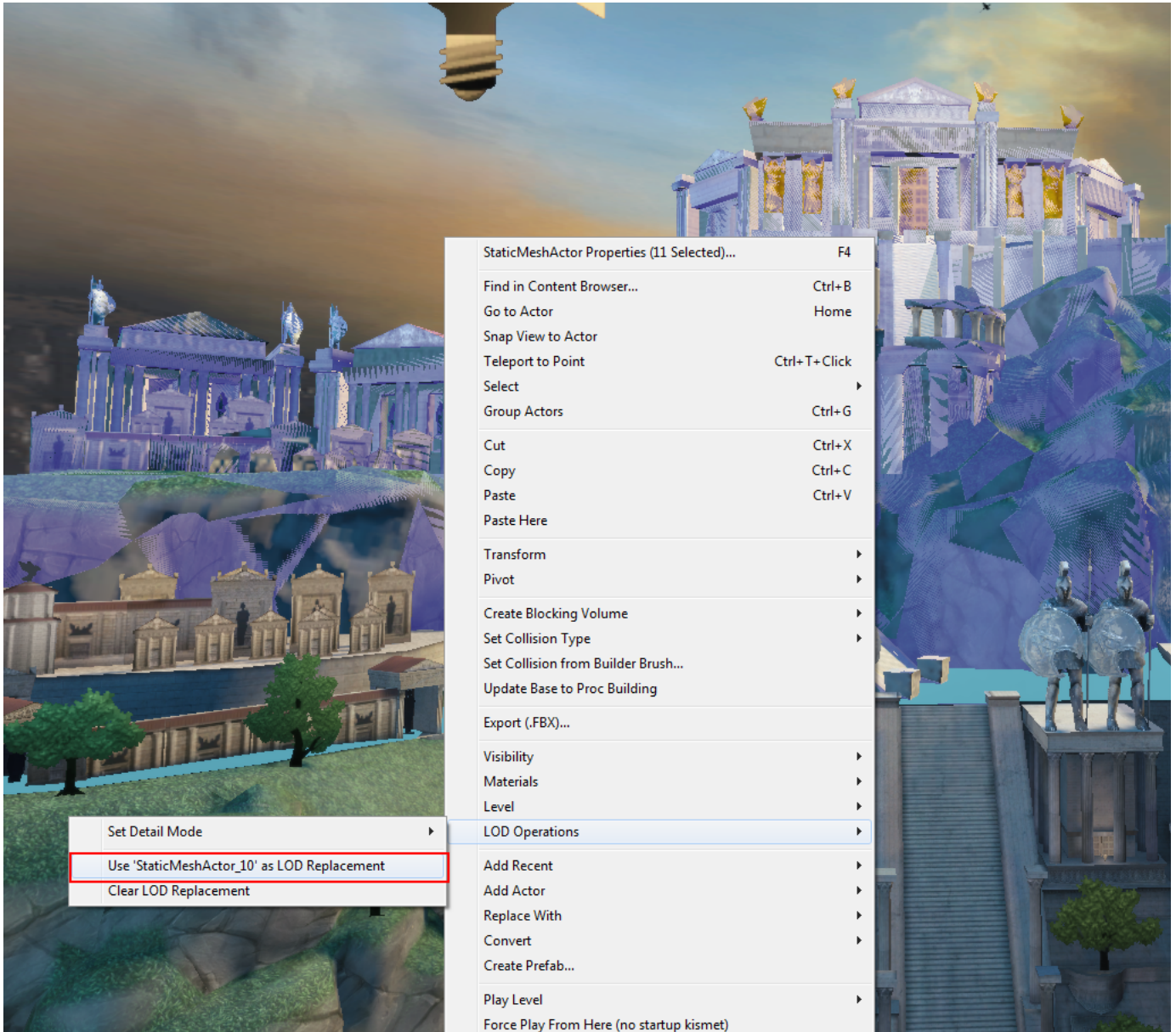
**Now to finally configure the MassiveLOD to swap.**

**Step 1:** Place the MassiveLOD Combo mesh to overlap the meshes it'll replace at far distances (in this case the placement works with 0,0,0 so I set it to that to get it to be in the proper position). Right click and go to LOD OperationsSet As Active Parent with your combo mesh selected.



With the mesh still selected press F4 and find 'Massive LODDistance' under 'Rendering' and set it to 10,000 just for testing purposes. Then press H to hide your combo mesh temporarily.

**Step 2:** Select all of the meshes that will be replaced by the combo mesh, right click and go to Lod Operations Use StaticMesh\_X as LOD Replacement. Now your MassiveLOD is configured, move the camera back until you see it switch and move back and forth to see the difference:



Non-Combo Close range Version (Unlit)



Massive LOD Combo Mesh



*Optional Step:* I notice that the grass mask does not cover enough of the LOD mesh. You may want to go back and change your Top/Bottom material to cover more area (Though it's not quite as good as upvector, it'd be inefficient to try to match it exactly 1:1). Alternatively, you can go to the blue channel of your normal (the grass mask) and run a more compressed 'Levels' adjustment on it to make it more clear and spread as a quicker fix. Which is what I'll do here.

It'll be up to your art director about level of acceptance for margin of error between LODs. The next step you'll fine tune the LOD distance to make

this less obvious. 10,000 was mostly just to make sure it works.

**Step 3:** The 10,000 LOD distance you set before is way too close, and was just to make sure it works. So let's set it to something more reasonable. This is something your AD will need to establish specifically if there is a mandate to minimize far distance popping (obviously you never want it in close ranges but it varies for far distances). I set mine to 18,000. You can change it by selecting the combo mesh, F4 and going to the Massive LODDistance property again. Here's a picture of the switch by taking it right at the transition point. **Note: This is still unlit. We'll cover lighting in the last step.**

Before LOD



After LOD



As you can see, this is a pretty amazing result. Considering that you took ~11 meshes, materials, texture sets, etc. and condensed them into 1 MESH, 1 TEXTURE SET and 1 MATERIAL its pretty phenomenally close all things considered. I turned fog back on for this because it helps cover the transition some.

### MassiveLOD Lighting

**Step 1:** All of the MassiveLOD shots were done in Unlit viewport to get basic configuration done. This is to stay efficient so you're not building lights over and over when the issue is texture-based. Now that you have the transition setup and looking good in unlit, we need to make sure it looks good with lighting. Since this is a combo mesh of many meshes, all with their own lightmaps, you typically will need a larger lightmap to get in the ballpark. You should try to get away with the **smallest** lightmap resolution possible and still get the intended result. This may mean going back to the diffuse to help the lighting or any other artist techniques.

Build lighting and tweak resolutions/textures until you feel comfortable or get AD approval for your end result. It's quite difficult to get lighting looking similar to the default meshes but tweak until you feel comfortable.

Set your Lightmap Coordinate Index to 0. SimplyGon produces unique/non-overlapping UVs in 0,1 space for your combo mesh so you can use channel 0 for lightmaps as well. Tweak your lightmap resolution and do test Preview light builds until you get a result you like. If your entire mesh is coming out too light or too dark you may want to adjust the diffuse in a direction to help the lighting out since its a large background mesh. I ended up settling with a 256 lightmap (though I'd recommend taking the time to try to get away with 128 and adjust the texture instead).

Before LOD (lit)



After LOD

