

## Tactics: Map1 v Map2 + Material Scrub

After our initial baseline tests, we believe it's best to have the Map2 board (+ some future optimizations like texture lodbias pass, lods, materials, etc. ) as the benchmark/target for map perform below is some more data from both maps to show differences.

TL;DR - Both of these e-mail sections are in Wiki/Document form: [Map1 vs. Map2 Performance Comparison AND 11/4 Material Optimization Suggestions](#)

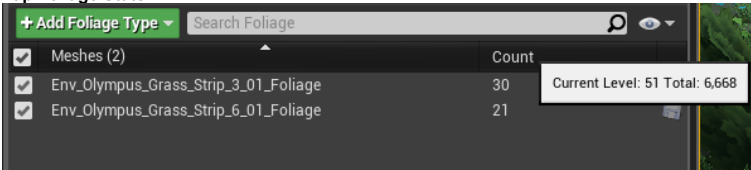
### Map2 Map

Count	Inst Sections	Tris	Sum Tris	Size	VC	Inst VC	Avg LM	Avg OL	Sum Avg	Cost
413	444	190 729	363 027	15 445.125	51.805	0	5 285	0.209	0	0

### Map1 Map

Count	Inst Sections	Tris	Sum Tris	Size	VC	Inst VC	Avg LM	Avg OL	Sum Avg	Cost
574	673	833 713	1 039 161	5 163 550	51.805	0	3 857	0.145	0	0

### Findings

- The Map2 map has 200 less objects in the scene.
- The Map1 map is 3x the tri count, a majority coming from the **700k+** tri Landscape. (Given the board-like nature of the grounds, we can reasonably create gorgeous static mesh ground Landscape at all).
- Map2 map does not use landscape.
- The Map1 map uses 17MB in lightmaps vs. only 6.5mb for Map2.
  - Map1 map uses *Env\_Olympus\_Tree\_01* a total of **64 times (the most used asset in the level outside of foliage)**. Each of these 64 instances has a **256 Lightmap!** (This con the **17.8mb total of lightmaps**). Lightmaps should reasonably reduce to 64 or even 32 on this mesh.
    - It would be smart to do a lightmap resolution reduction pass game-wide. We can likely reduce large lightmap settings, like above, to much lower numbers with little-to-no
    - This mesh also contributes 71k tris to the scene and does not have LODs.
- Map1 Map Foliage Stats**

  - Map1 map has **6,668 grass instances that combine into 51 clusters, all with world position offset** (wind, which should be dropped on low). Each instance has a **4x4 lightmap** be reduced to 1 or 2 (this will essentially define if a grass sprite is in Light v. Shadow).
    - Depending on the Art Direction, we should consider reducing grass density, at minimum, on areas of the board obstructed or dense with other objects.
- Map2 Map Does not use foliage
- Per Diana's email Map1 sits **100-400mb higher** in memory than Map2.
  - I attempted to do a 'stat memory' capture in Tactics Dev, but it did not work. The numbers in editor I did not find to be useful or accurate.
- I do not think UE4's prim stats properly reports 'Size' when Landscape is used, as that would indicate Map1 is 5.1gb. My educated guess is that adaptive tessellation on Landscape thro stat, but obviously it is still much higher.
  - Our memory numbers in Diana's baseline performance sheet should provide more of an indicator of map "size" differences.
- Both maps have overdraw FX planes in multiple layers over most of the screen, handicapping shader complexity performance/overdraw off-the-bat.

These are the primary, major differences I see between the construction of these two maps. Cross-check this list versus our previous performance suggestions e-mail and there should be a g tackle all of these discoveries. Let us know how we can help.

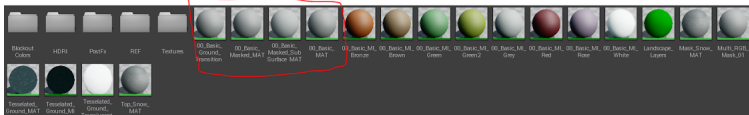
## 11/4/2016 Material Scrub

Looking at the body of work, it would be efficient to tackle these in passes and see what can be cut with minimal visual change. The estimated times are roughly based on if these were my as guidelines/little guesswork (like not dropping normals on low). The passes are roughly in order of "biggest win" levels working down to more specific optimizations. We could perform these pa: characters later as well, if needed.

### Suggested Passes (in order)

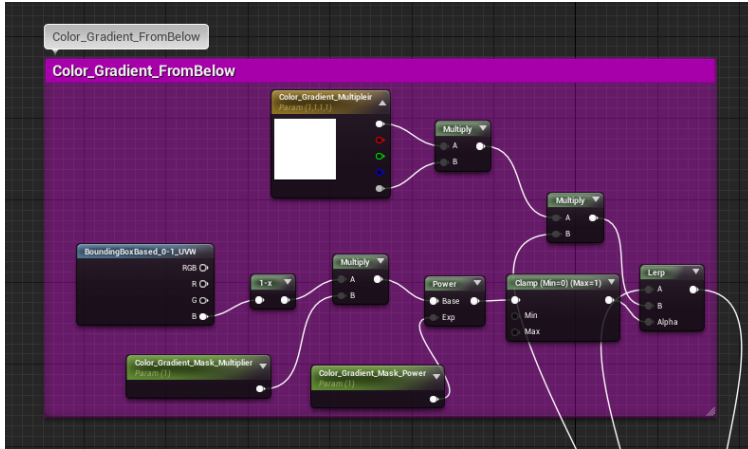
- Master material optimization. Estimated Time: 16-24 man hours**
  - Drop all unnecessary/unused options/bloat that provides expensive flexibility that's seldom used.
  - Quality switch node networks/channels that do not need to exist on low.
    - The best example is dropping Wind on foliage on low.
  - Presently, master materials have a packed roughness/metallic/AO texture that could be dropped most of the time and swapped for scalars either on all settings or on low.
- Sub-Pass: MIC Comb/Adjustments. Estimate Time: See point below**
  - Its possible to optimize the Master Mats in a way that preserves a lot of the parameters so NO MIC work is required. But there may be cases where scalar/Vector3 values need t closer look. So this could take NO extra time or maybe 2-3 more days.
- Texture LOdBias setting pass. Estimated Time: 4-8 man hours**
  - Comb through all environment textures and set LOdBias textures to set default Mip levels for assets that don't need 2048 base textures (even though we're keeping them aroun
- Unique material optimization. Estimated Time: 16-24 man hours**
  - There are 34 non-Master materials in Environment folders. These appear to have a wide range of uses. Some of them could take 5 minutes to look over and need 1 or 2 tweaks Some may be more involved and take some time to preserve quality.
    - Ex: the *Top\_Snow\_Mat* material is fairly complex, using up-vector to create snow topped materials. This material would take more experimentation/time than say a simple

In general, all of the map's assets use materials (usually MICs) that are children of these 4 Master Materials with a few other special cases:



Within these 4 master materials there are a few common node networks I think could be **dropped** with no quality change OR can be done in textures outside of editor:

- Drop the 'Ambient Occlusion' channel. I don't think assets are ever seen closely enough to warrant per-material AO as a channel. AO is already calculated, per-object, as part of post-p baked into diffuse maps.
- "From Below" Color Gradient



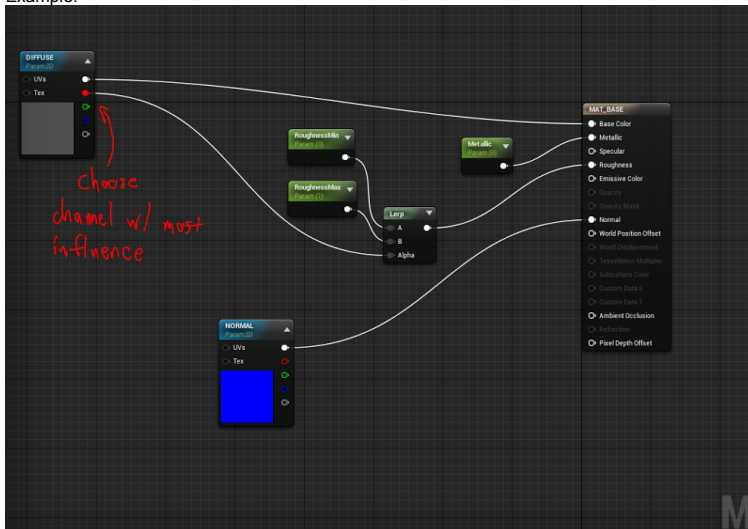
- While this is common practice to have some gradient treatment on assets, with their screen space, this can be safely dropped.
- If Art Direction calls for a ground-up gradient for grounding purposes, it can be done in the texture (using a 3d painter like Substance painter or 3d coat) easily.
- This network adds **18 instructions**.

### Specific Master Material Suggestions

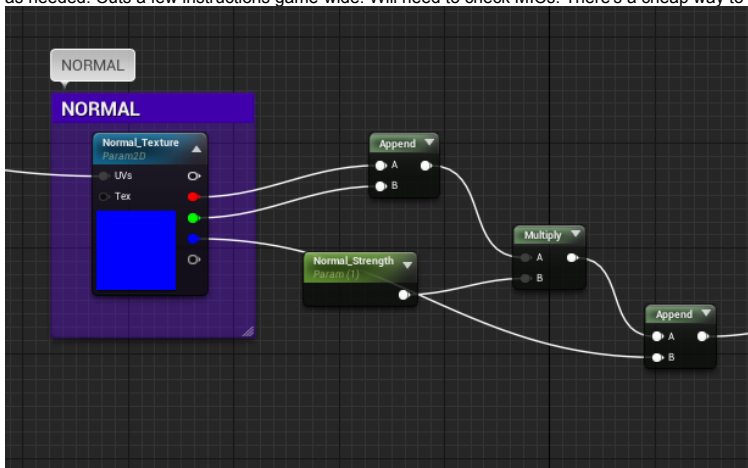
Here are some suggestions per-master material (NOT already listed above). There's more than just these but at that stage, it'd be more time-efficient to just do the work than suggest every ar

#### 00\_Basic\_MAT

- Uses a packed texture for Spec/Roughness/Metallic/AO. For most assets, I don't think this is needed in most cases. Specular has very little effect in UE4 (it affects non-metallic areas v visual change) compared to UE3 (where Spec basically handled Roughness/Metallic & Specularity combined). If there's a small number of metallic props that scalars can't handle we based master (or static switch this one). [Diamond skins in Smite had a similar setup for texture-based spec vs. scalar/vector based).
  - We'd have to dig deeper into what MIC's use from this, but if we already drop AO and go with a scalar approach, as suggested before, we should be able to basically cut this do roughness/metallic with Scalars.
  - Example:



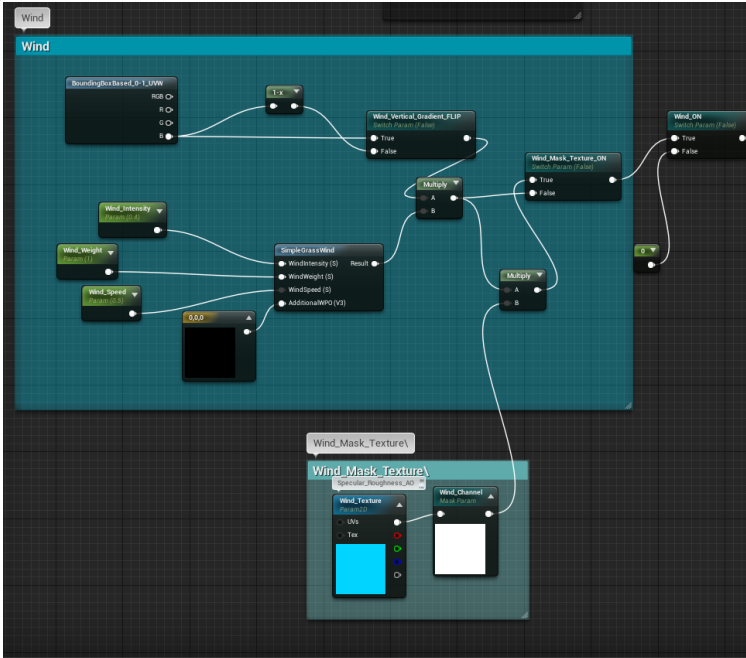
- The Normal map channel network appends itself back into a normal map. This is a redundant, bad way to offer "Normal Intensity" control. It can just be multiplied by a Vector3 and incr Green as needed. Cuts a few instructions game-wide. Will need to check MICs. There's a cheap way to still use the Normal\_Strength scalar if it's used widely.



- There are some other options with Desaturation/Color change options that may not be fully used. These should be assessed and removed if not used enough. You can desaturate/color side in most cases. (Unless doing tileable MIC changes).

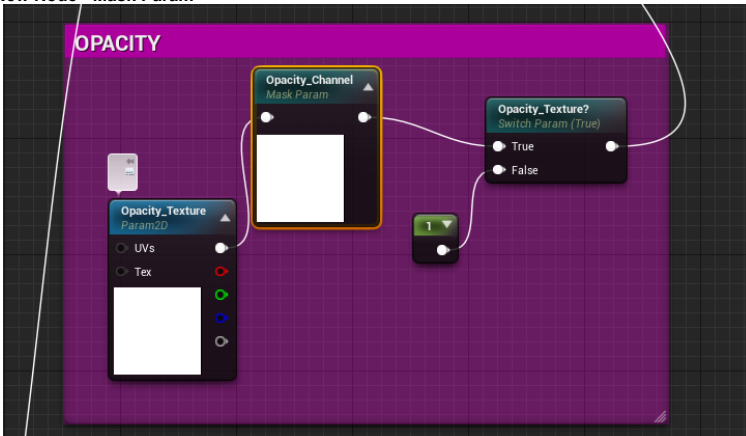
### 00\_Basic\_Masked\_MAT

- This actually has a **BETTER** setup for Metallic and Roughness, but still could use a few tweaks to make the scalars parametric and a little cleaner.
  - Inline image 9
- Quality switch Wind. Should be turned off on Low.



- It would take some experimentation, but this could probably be a cleaner/cheaper network as well on higher buckets.

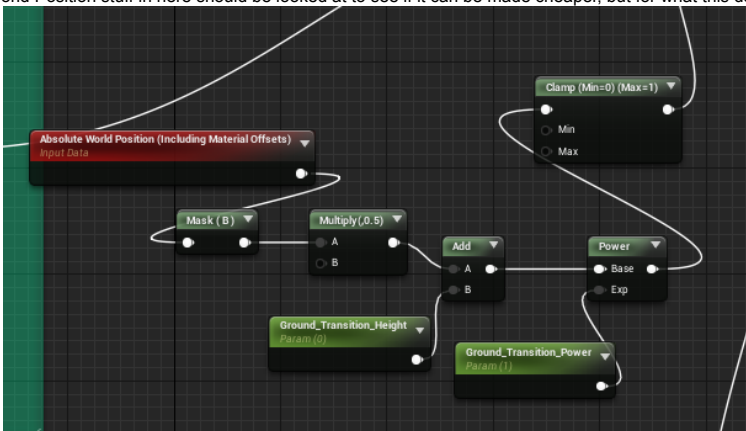
### Cool New Node - Mask Param



- This lets you switch channels of a mask as a parameter for using different RGB masks, in this case for Opacity. Basically a parametric version of Component Mask. Nice setup.
- Needs the universal changes too (AO, color grad).

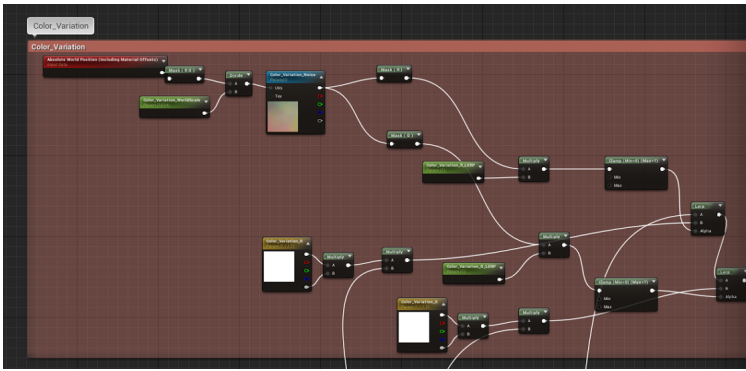
### 00\_Basic\_Ground\_Transition

- This has a lot of shared aspects as 00\_Basic\_Mat.
- Just needs unused/fluff options cleaned up.
- The World Position stuff in here should be looked at to see if it can be made cheaper, but for what this does, it's not super terrible.



### 00\_Basic\_Masked\_SubSurface

- This material is just absurdly unnecessary for what its used on. (tiny grass sprites where you will NEVER see fine, nuanced detail).
- All MICs using this material should have **00\_Basic\_Masked\_MAT** assigned as their parent instead.
- IF we have to keep it (we really shouldn't) this should be removed:



- It doesn't need to be subsurface and at this point after removing the above and subsurface properties it's basically a duplicated of Basic\_Masked anyway.

I know this is a lot of detail, but it should inform and hopefully save us some money w/ contractors and establish some guidelines/approach at the same time. All of this work should take about half of someone good with materials to complete.

--  
**Matthew Canei**  
Senior Artist  
(678)773-8796