



# PROJECT ISLAND

Open World Urban Environment Art

This project that was done for my final year project at the University for the Creative Arts aims to create a seamless and dynamic urban open-world environment that allows many types of gameplay and narratives.

This document includes a short making process and behind-the-scenes breakdown.

More screenshots and videos are available at:

<https://www.therookies.co/entries/33352>

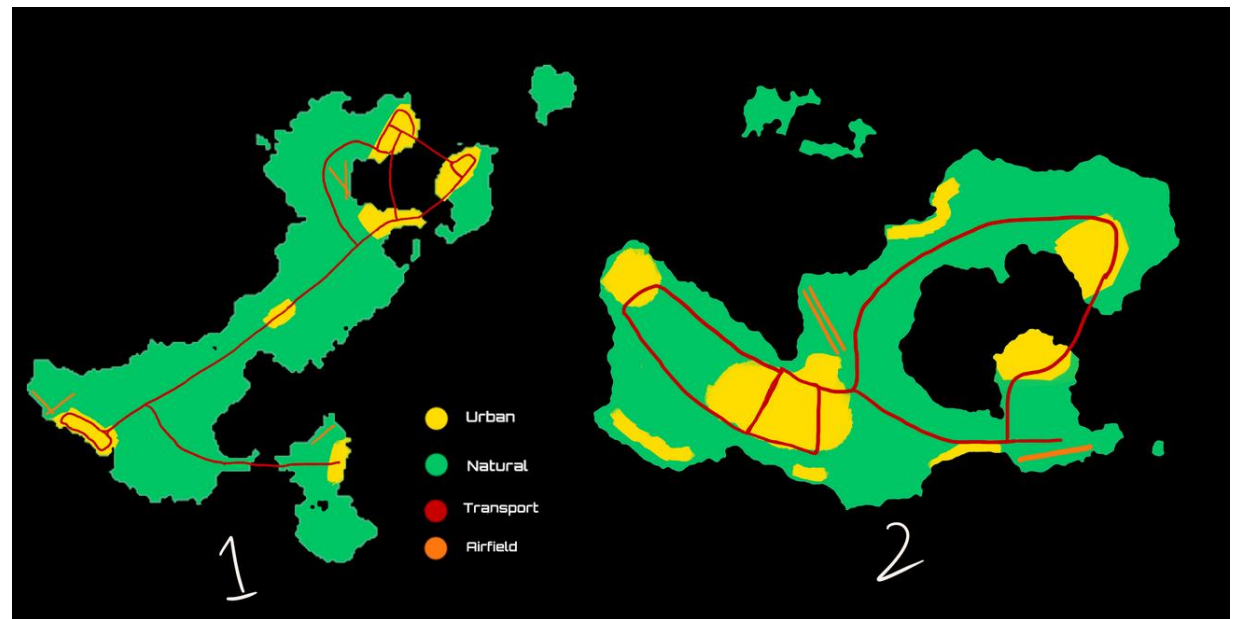
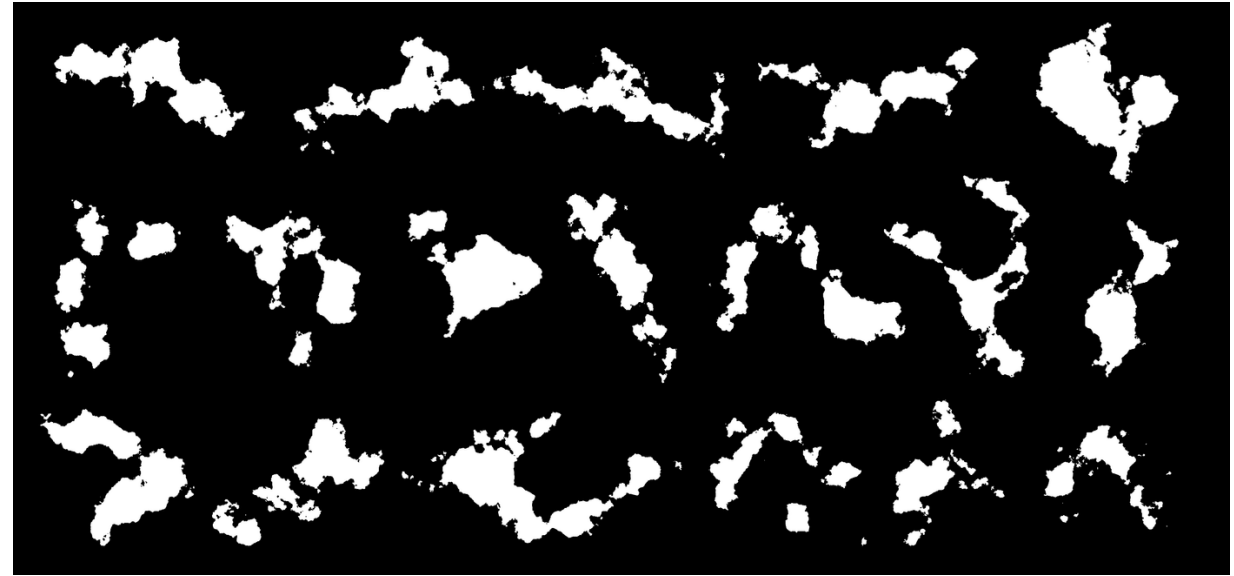
<https://www.artstation.com/ks741119>

<https://www.youtube.com/@syiastudios>

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At the pre-production stage, a number of random land shapes were generated using Perlin noise. Then, started to think about the overall layout of the roads and structures.





Smoothing out edges using filters



Defining zones



Adding basic road layout



Adding advanced roads



Adding buildings and places

## Map Design Procedure

Started by zoning the island and then drawing a basic road outline followed by connecting towns with motorways as well as designing an appropriate intersection depending on the location. Finally, buildings and facilities were added according to the zones and the surroundings.





Finished concept map

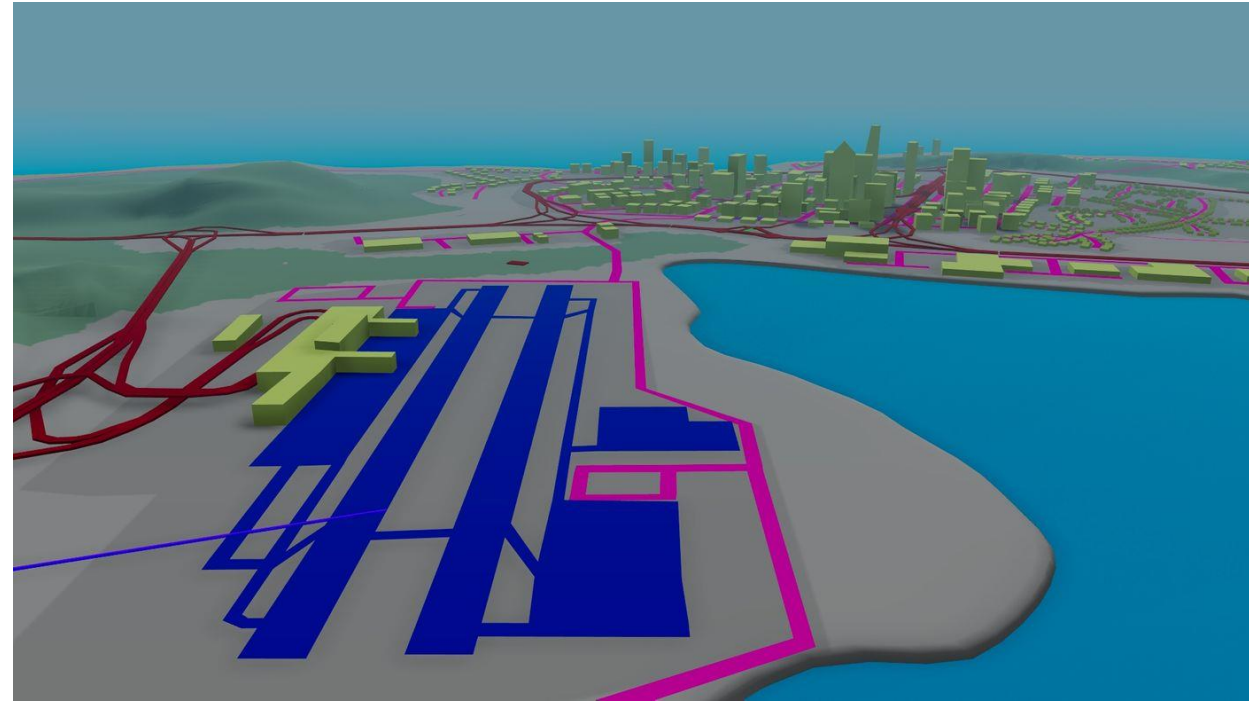
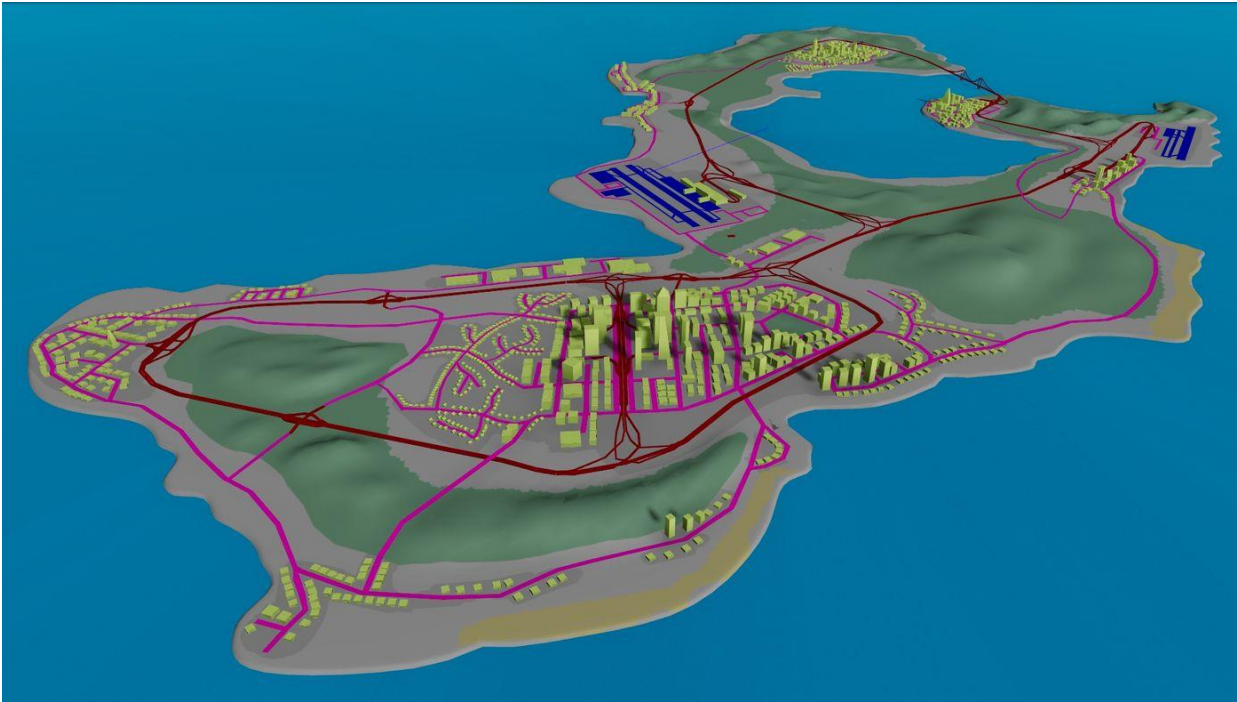


Photobashed map

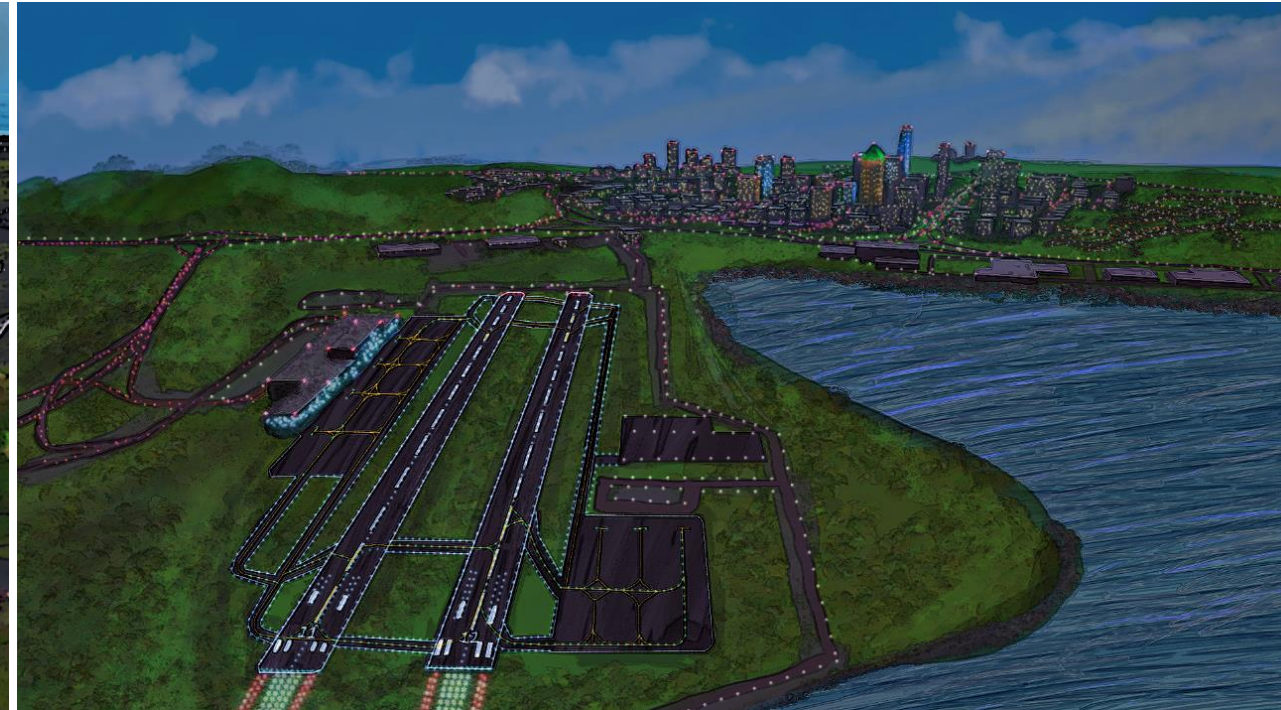


Influence map



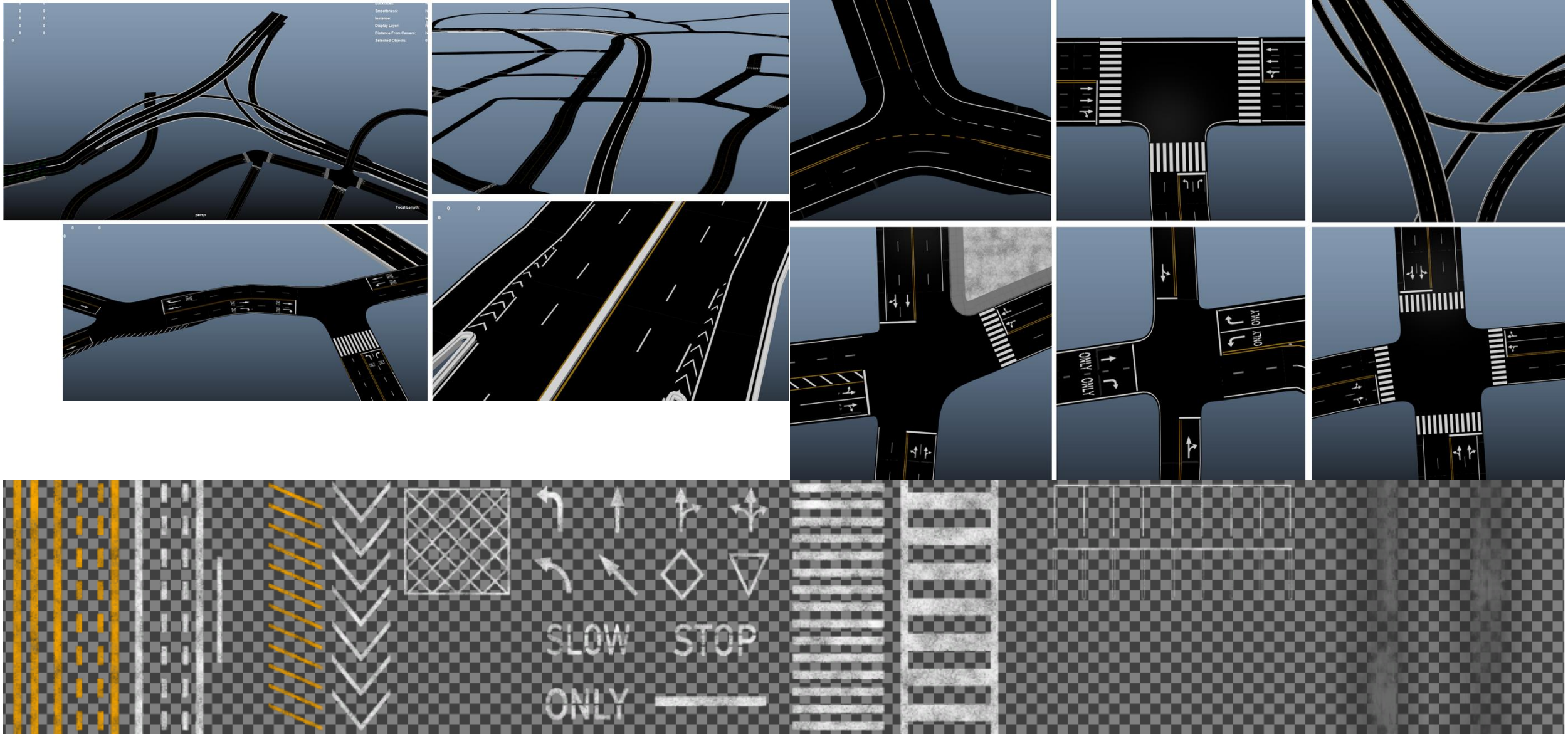


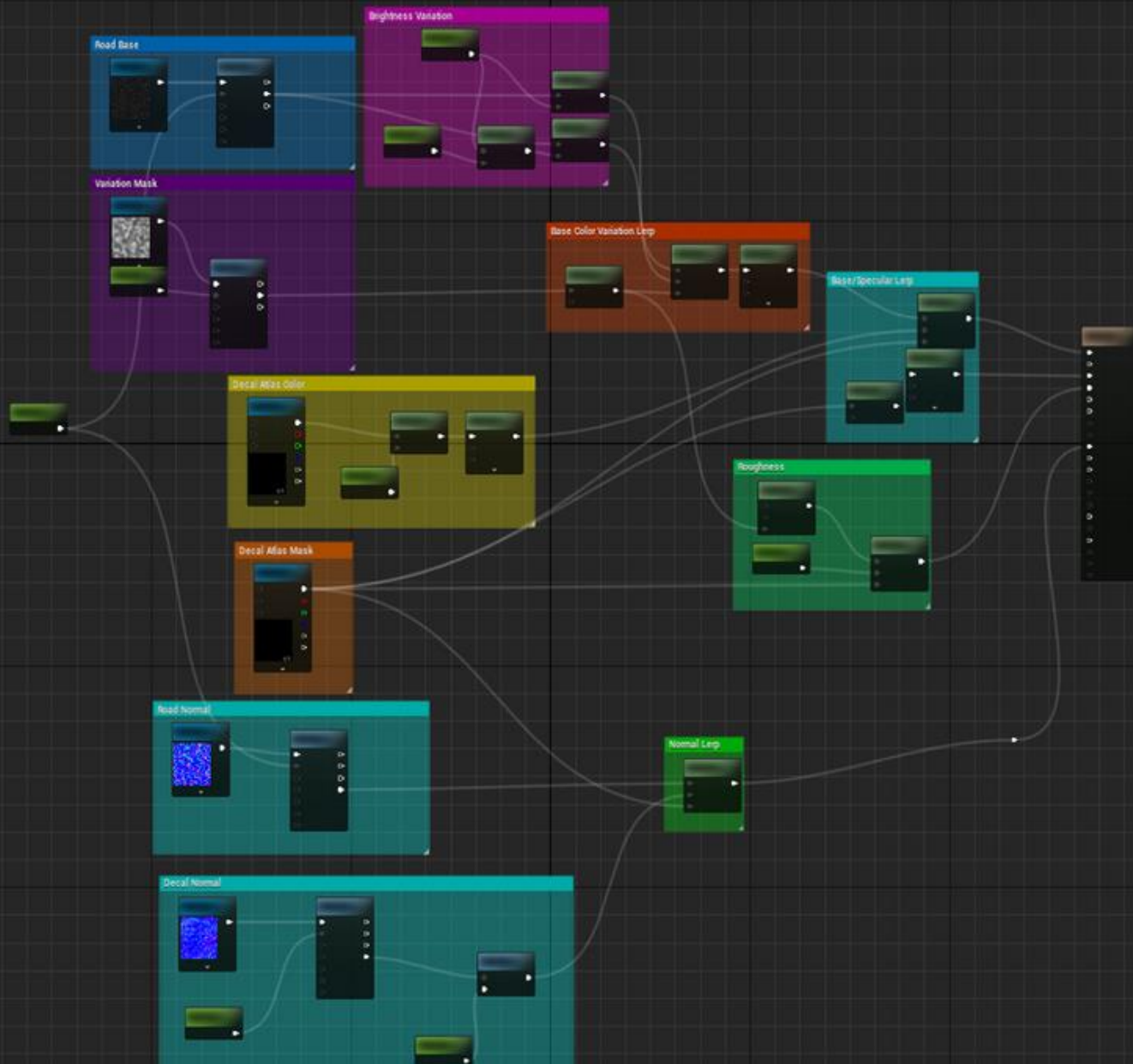
3D Greyboxing



Concept Paintings







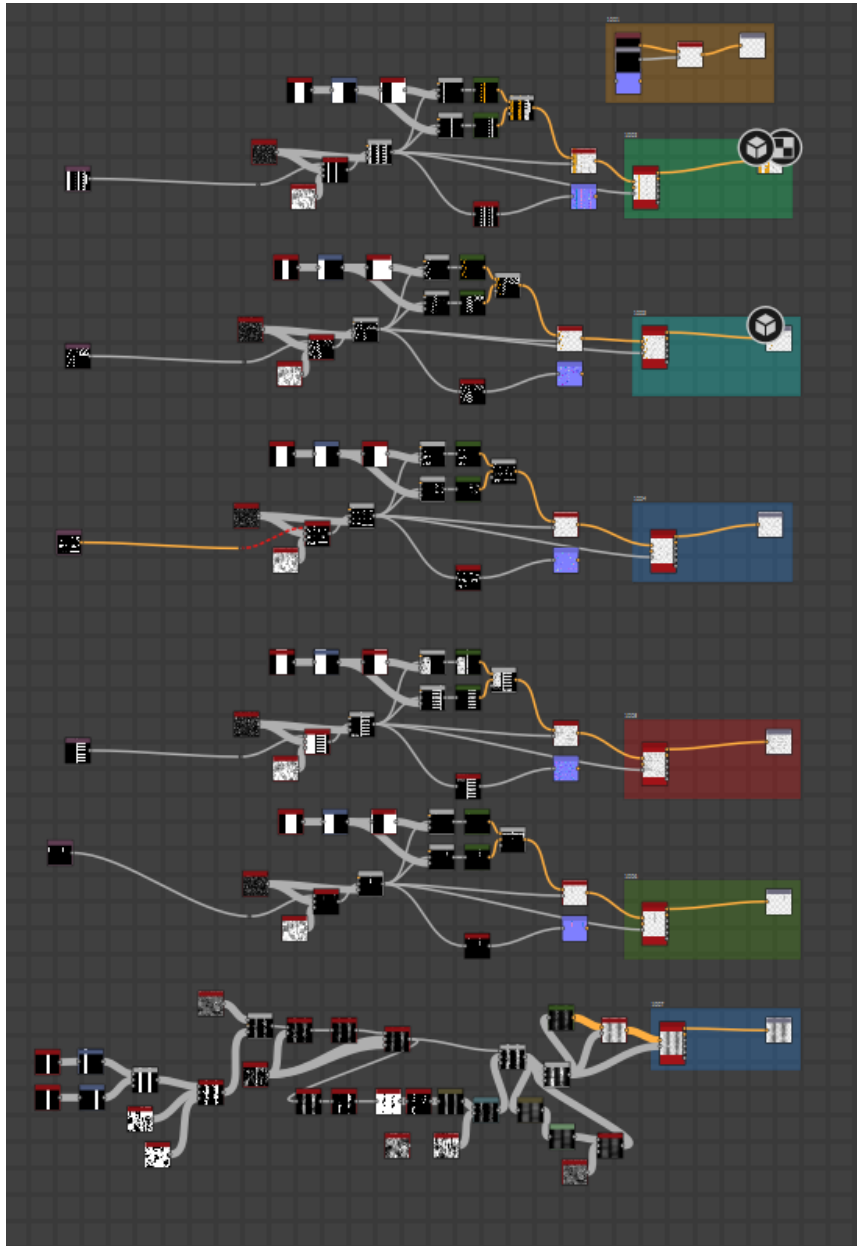
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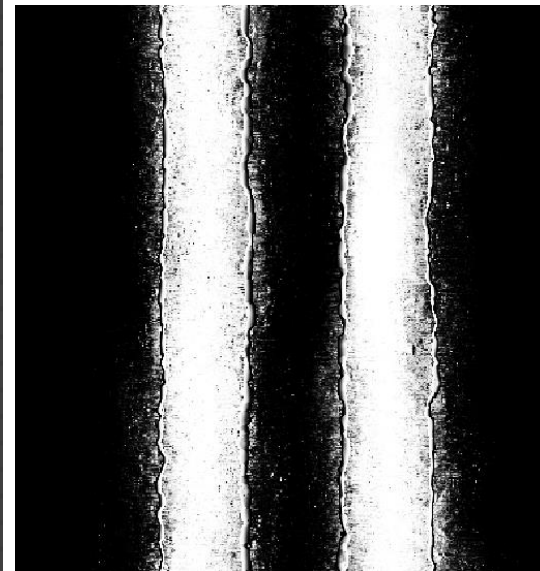
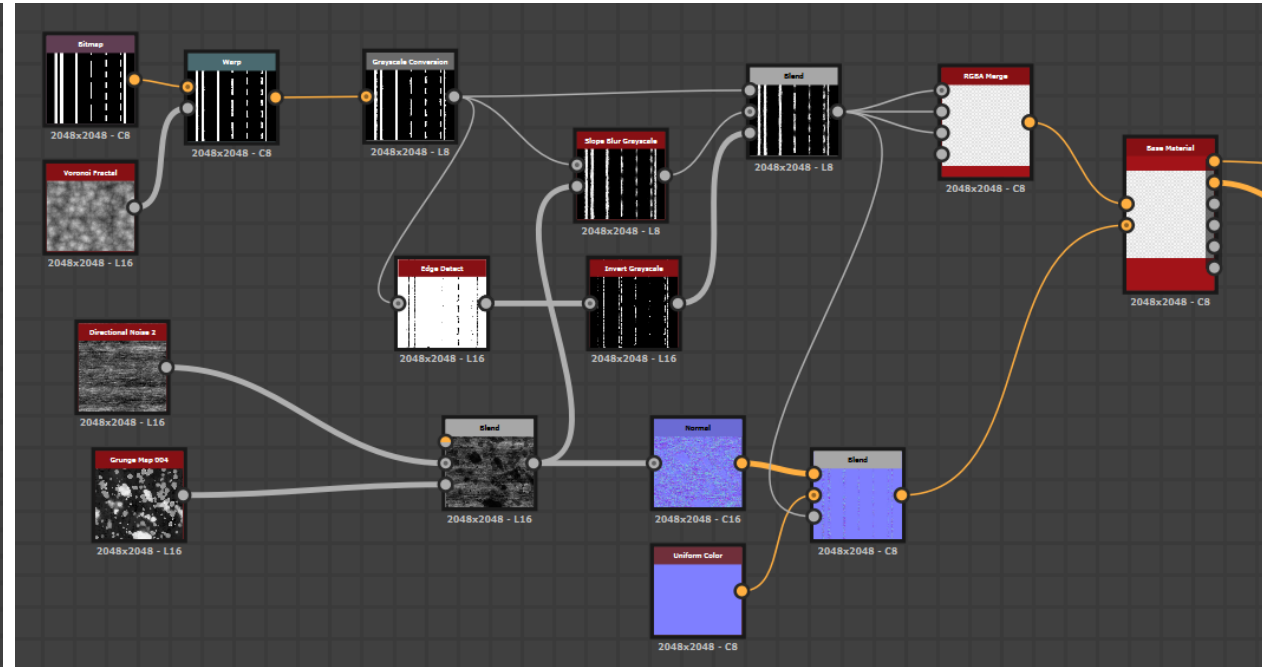


## Road Material

This material uses 2 worlds aligned tileable textures for base colour and normal and masked by decal atlas and noise grunge mask textures. Scalar parameters can be adjusted for different color variations/contrast



Texture assembly



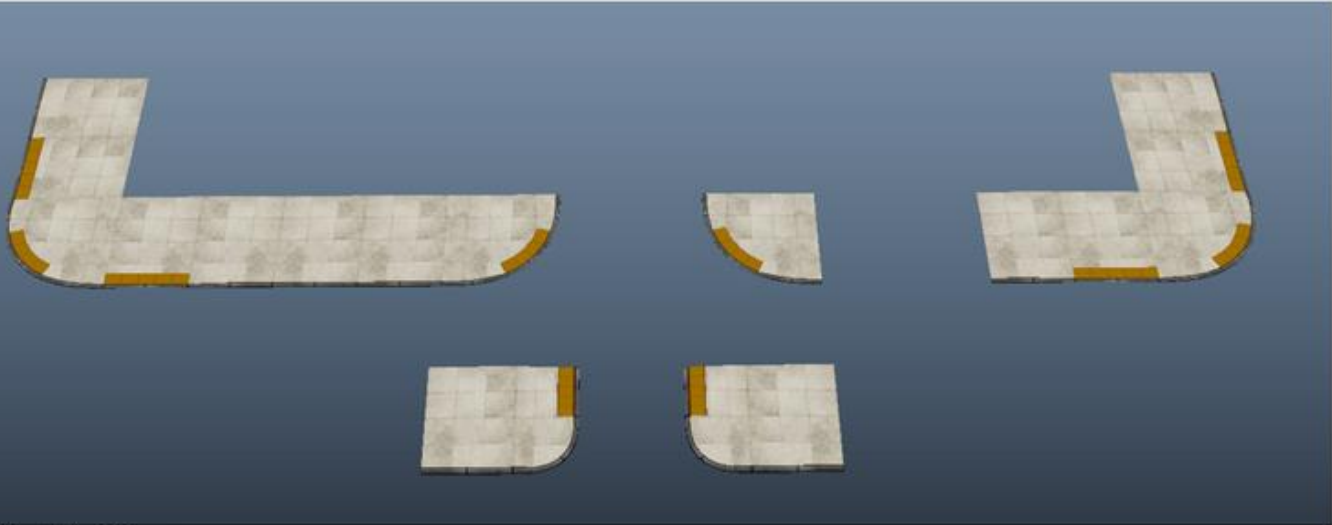
Preview details



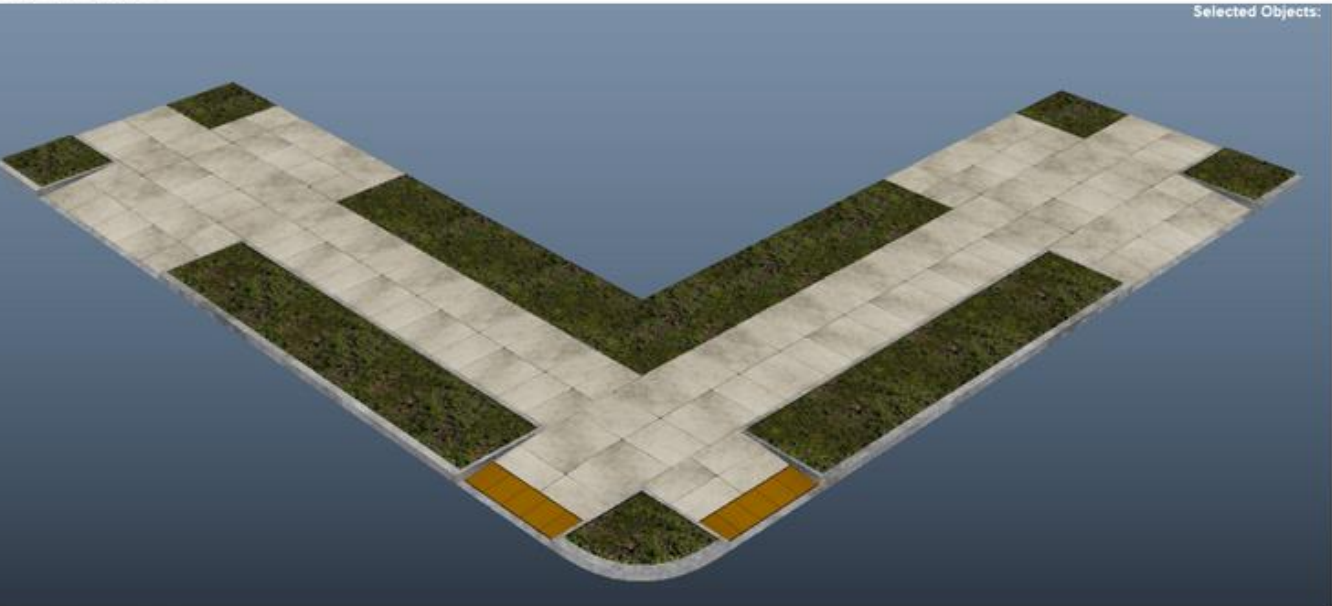


A finished road construction along with proxy buildings.





City Modules

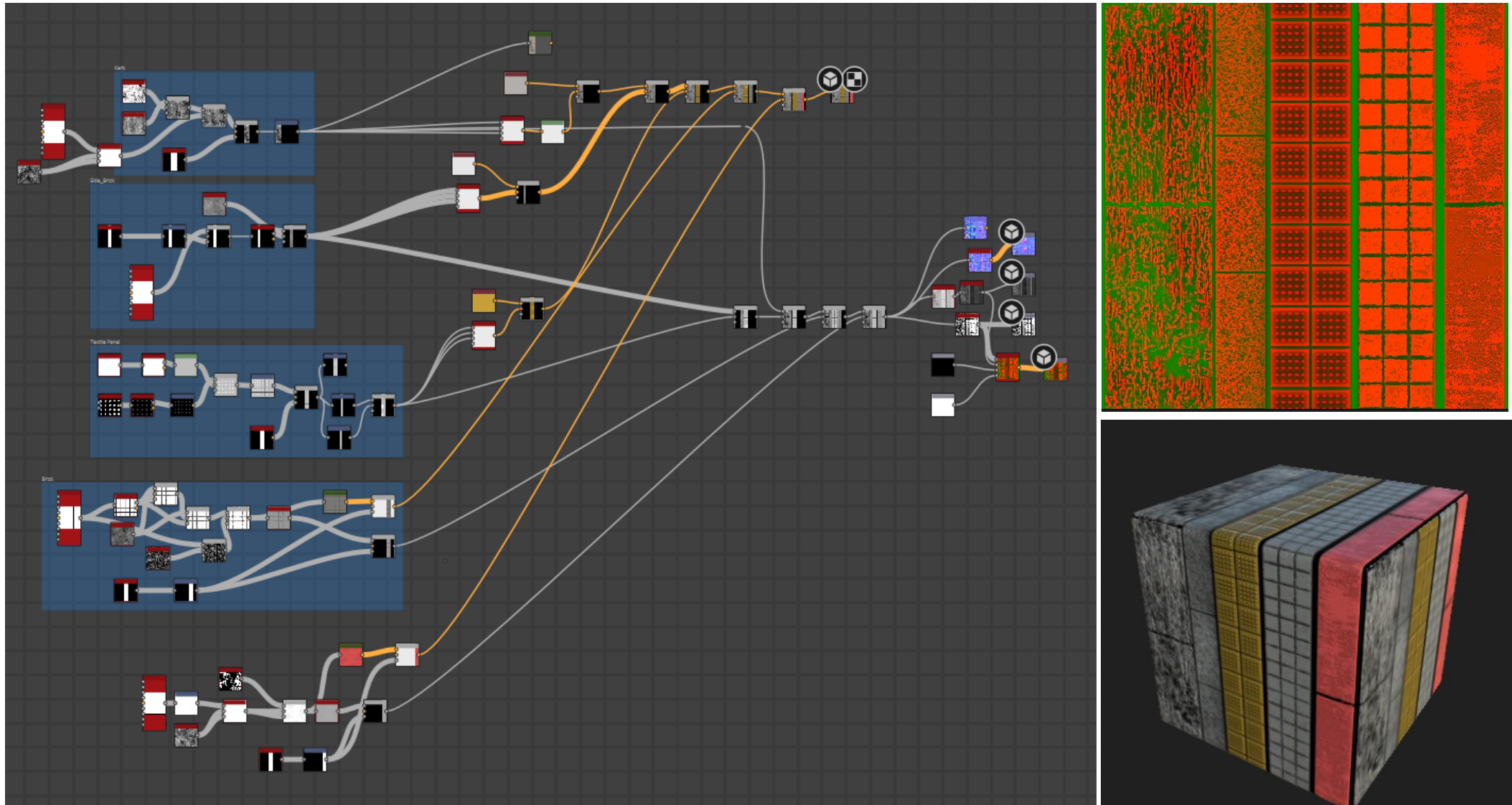


Suburb Modules



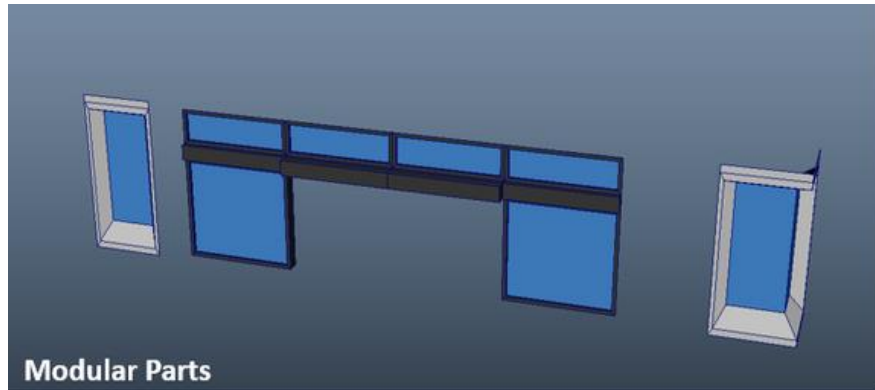
Example

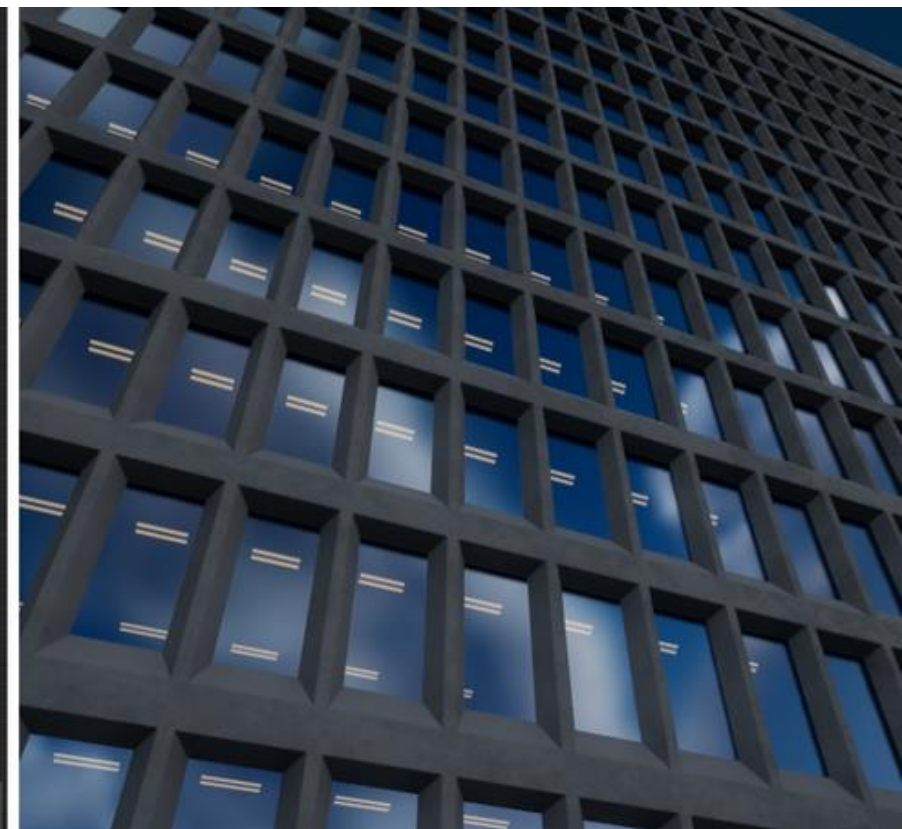
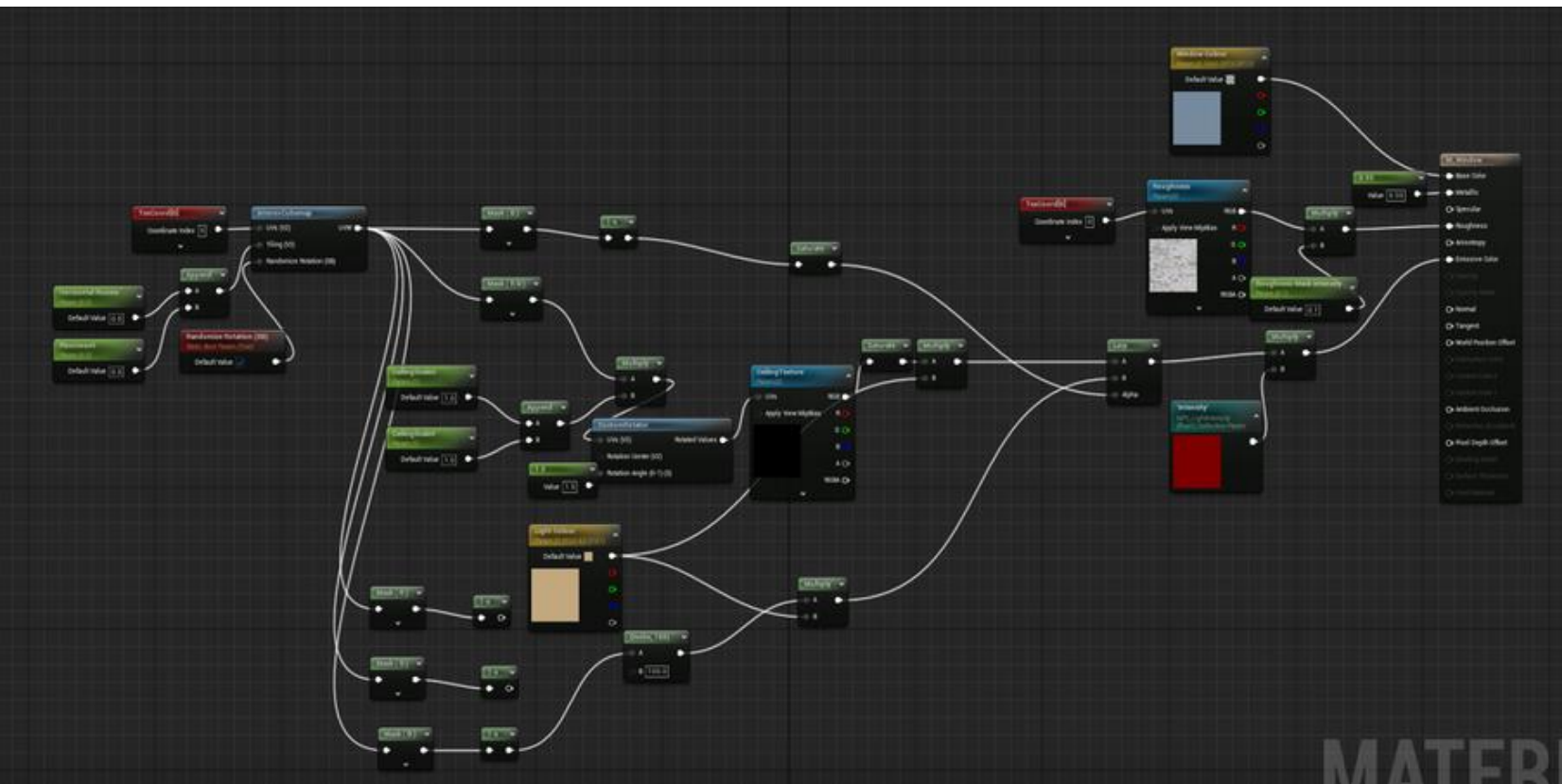
Modular pavement models



Texture structure (MRO packed)

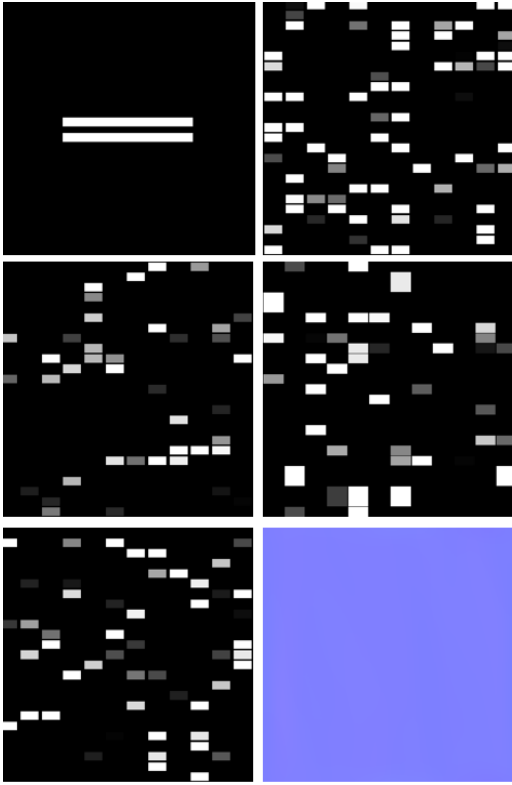




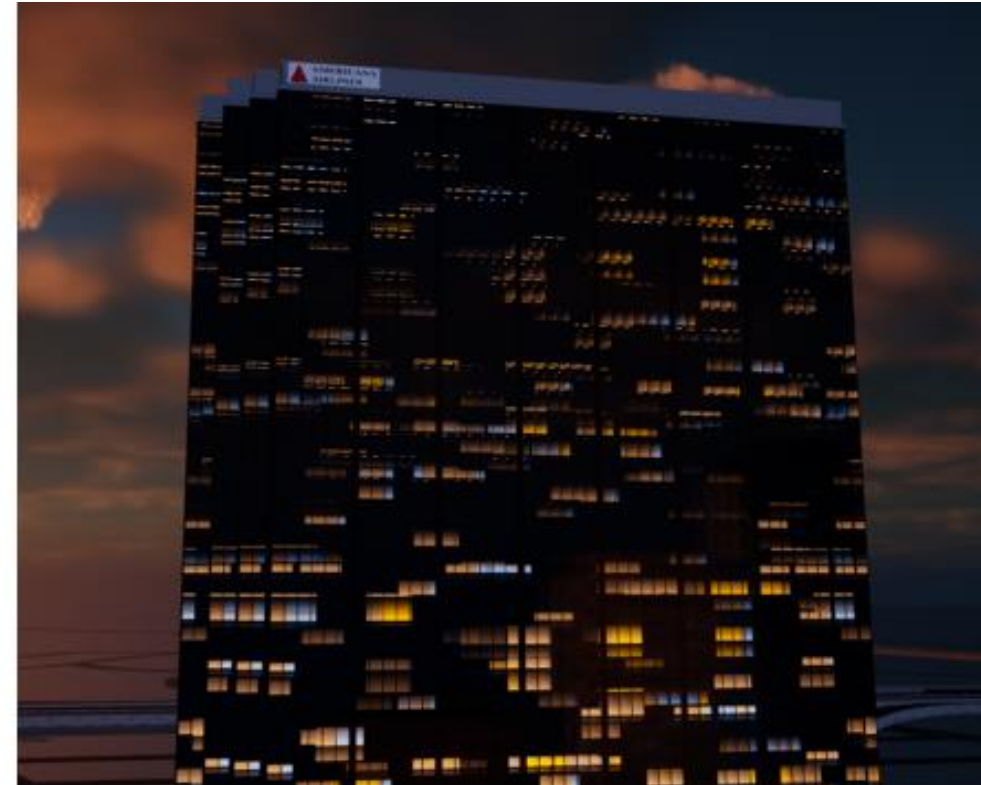


Buildings were modelled by assembling modular parts. The glass shader includes interior cubemap function which creates a fake depth to a flat surface.





Input Maps



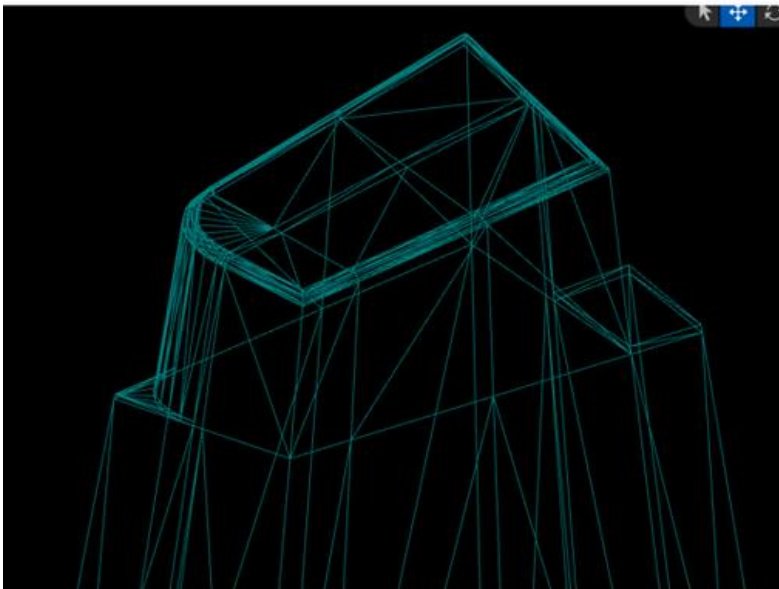
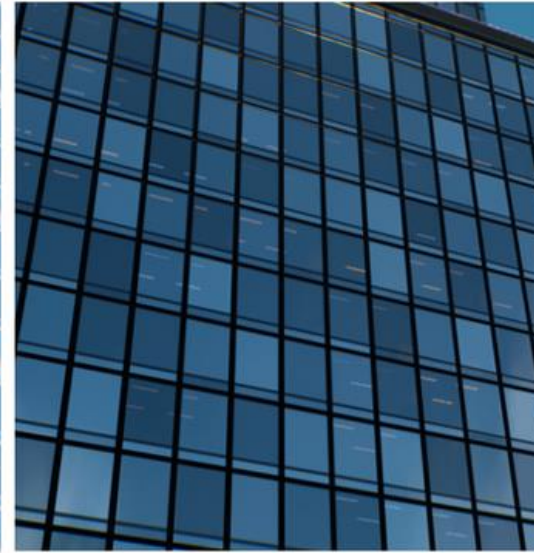
The building shader has various input maps, creating distorted reflections and colour variations.



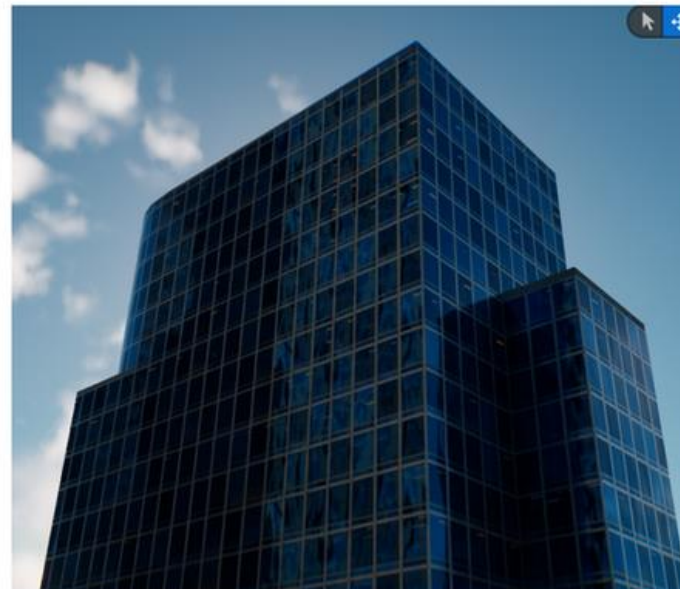
Light Mask Example



Colour Variation Mask Example



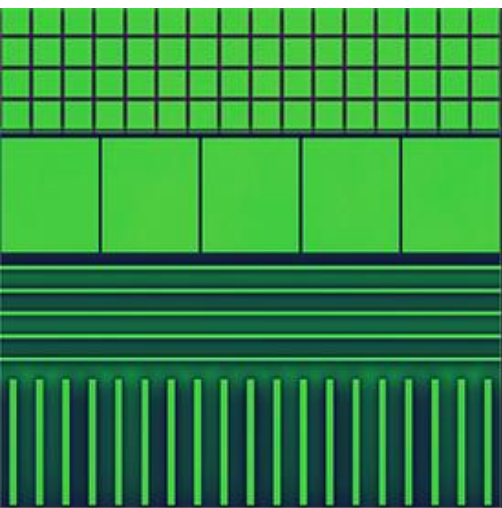
Wireframe



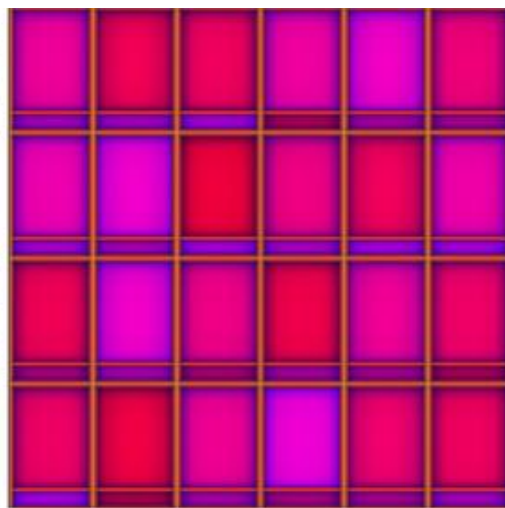
Lit

Tileable textures and trim sheets using packing method is extremely useful for creating variations and reducing polycounts of the assets as seen in these examples

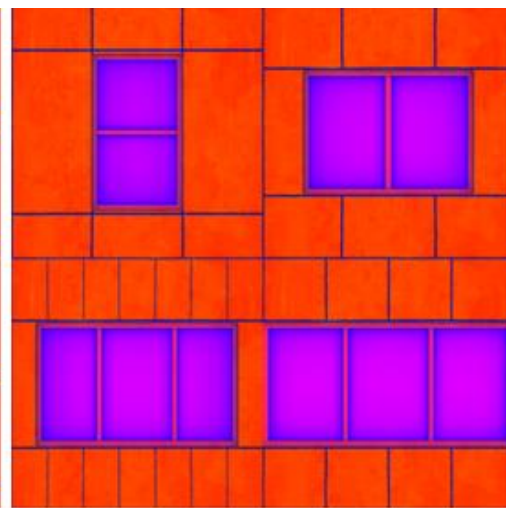




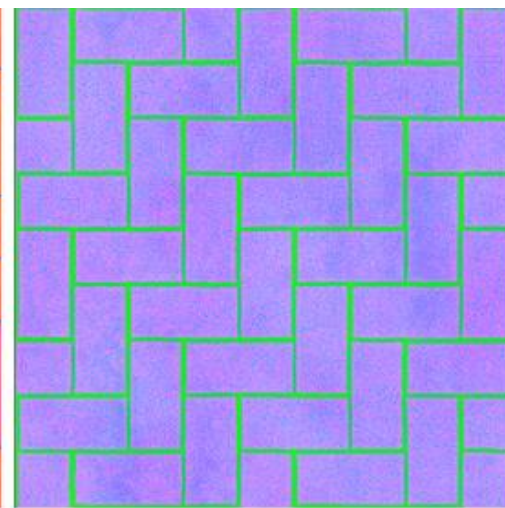
Building Tiles



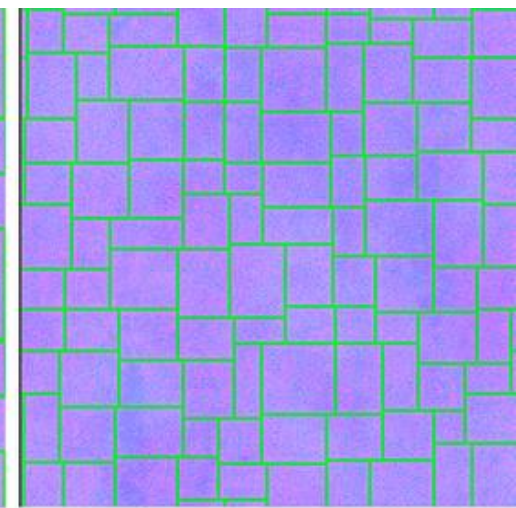
Glass Tile



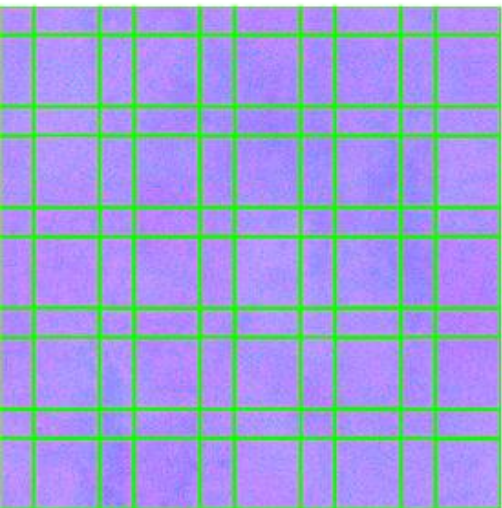
Modern Windows



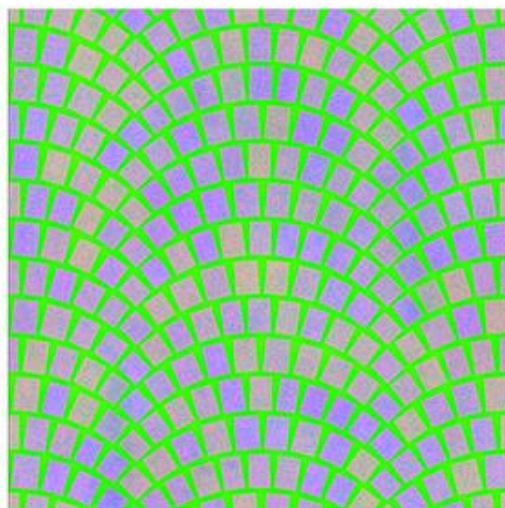
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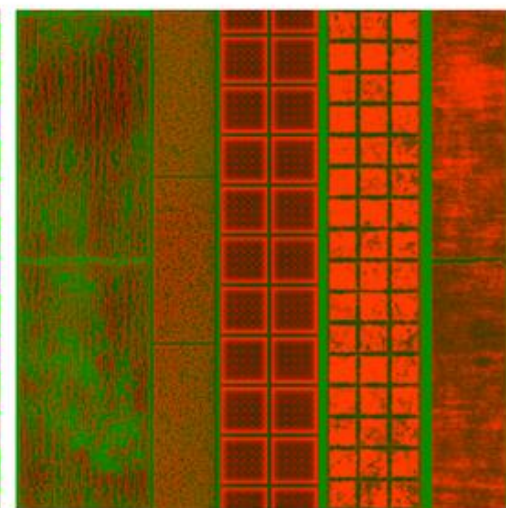
Patterned Pavement 2



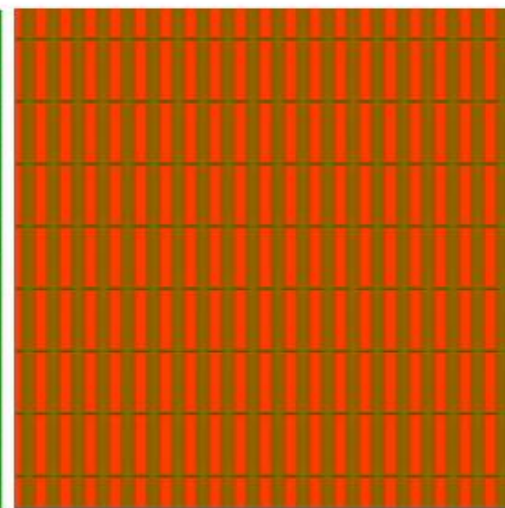
Patterned Pavement 3



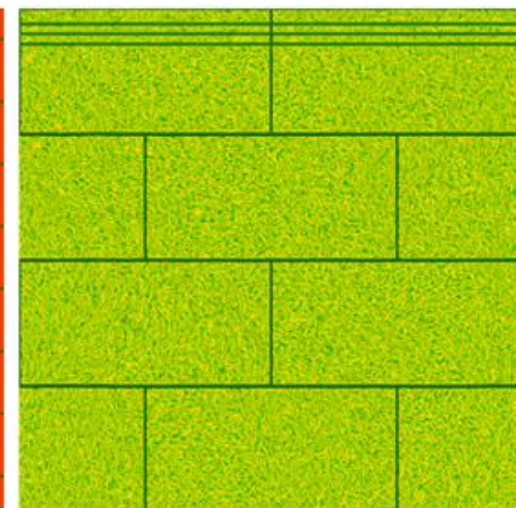
Patterned Pavement 4



Kerb Trims

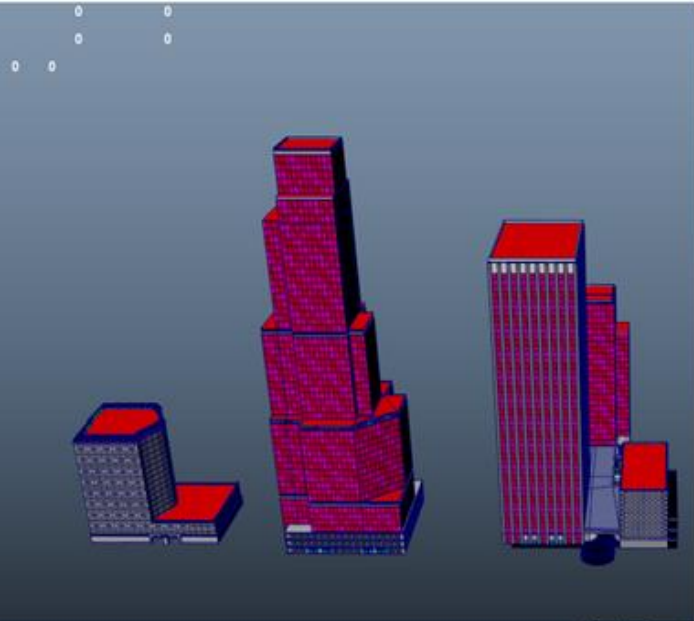


Roof Tile

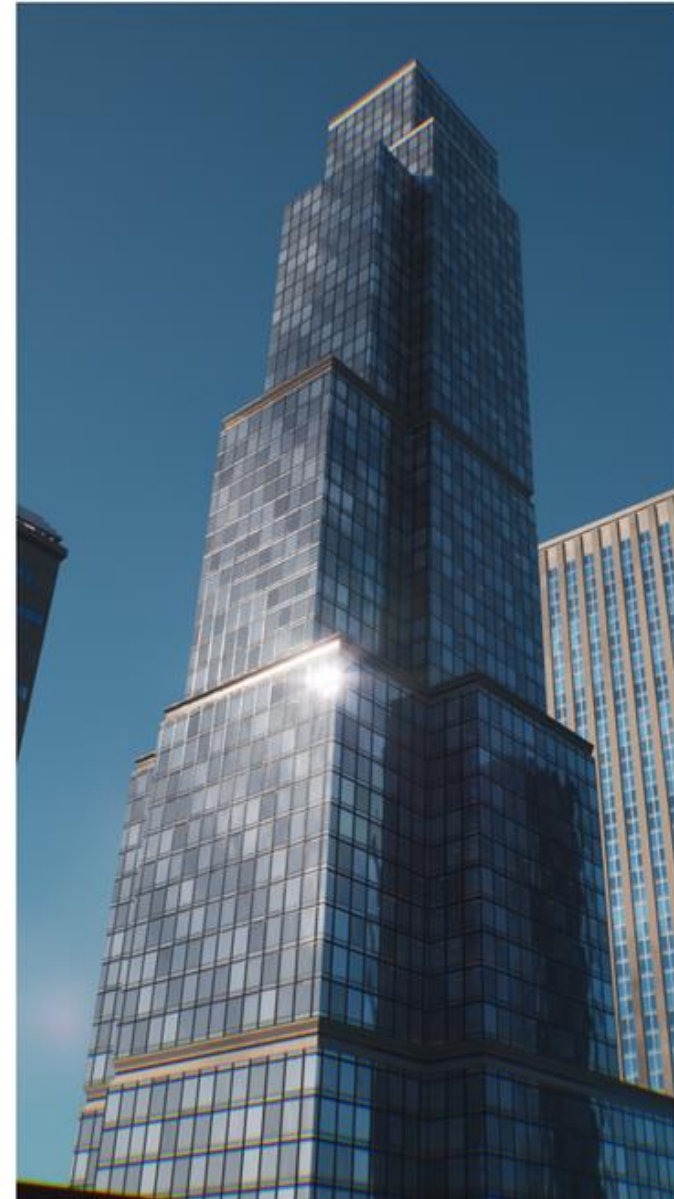
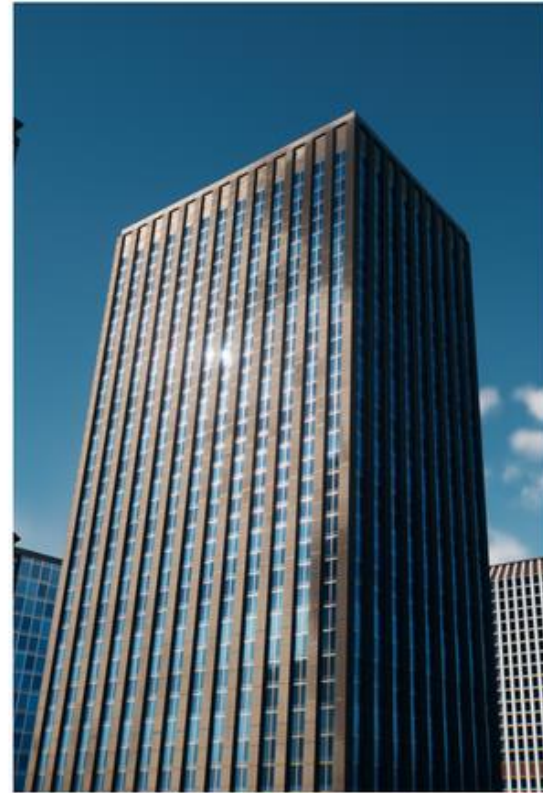
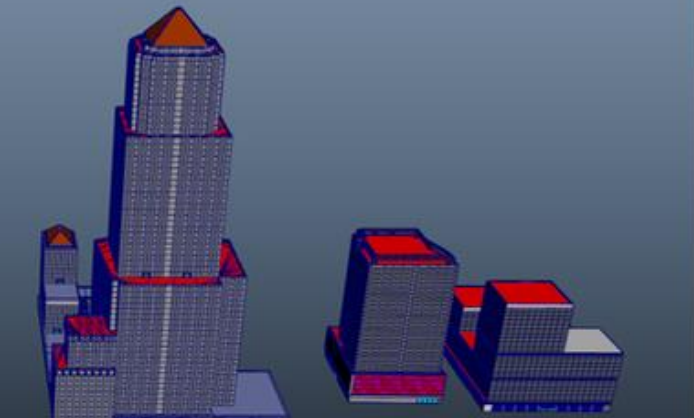


Stairs Tile

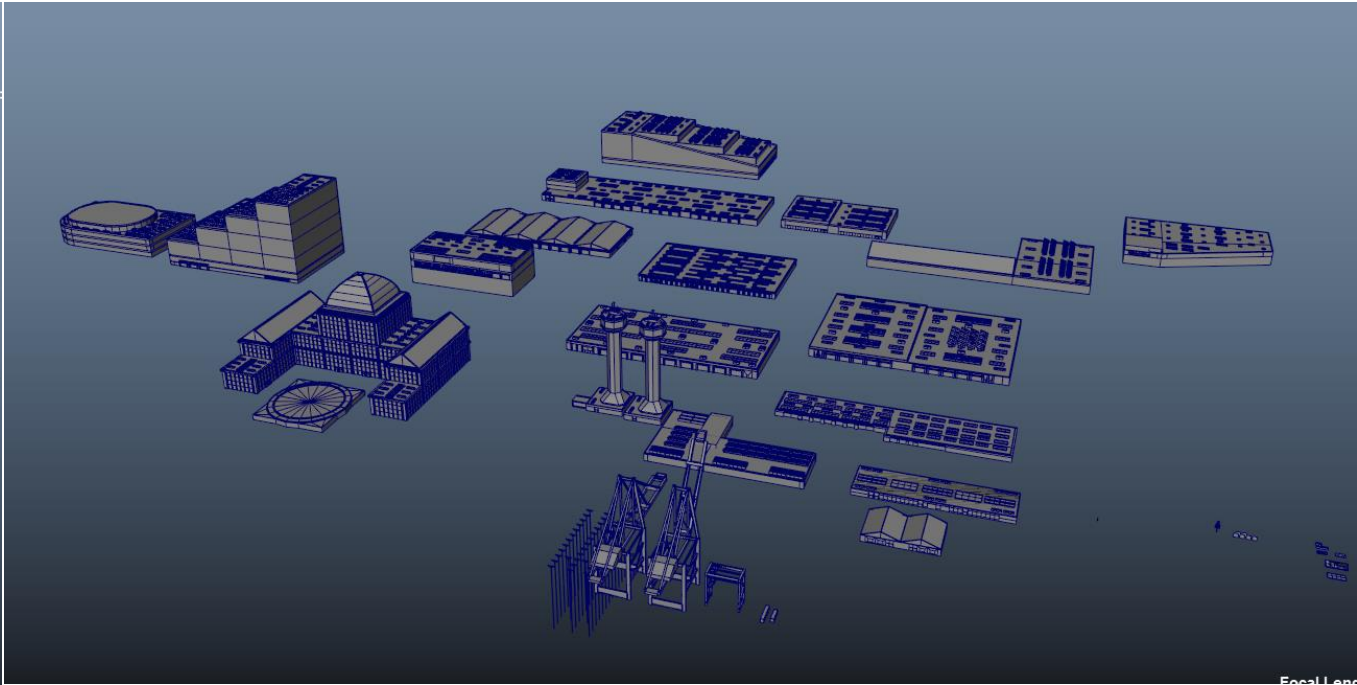
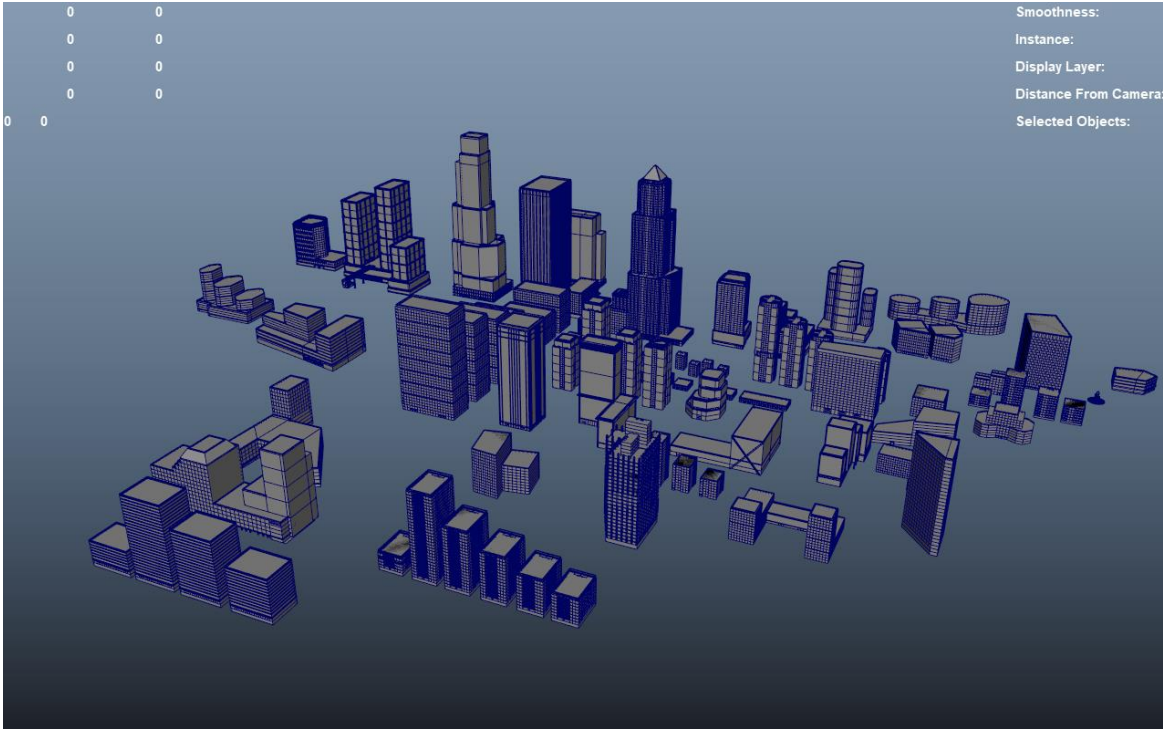


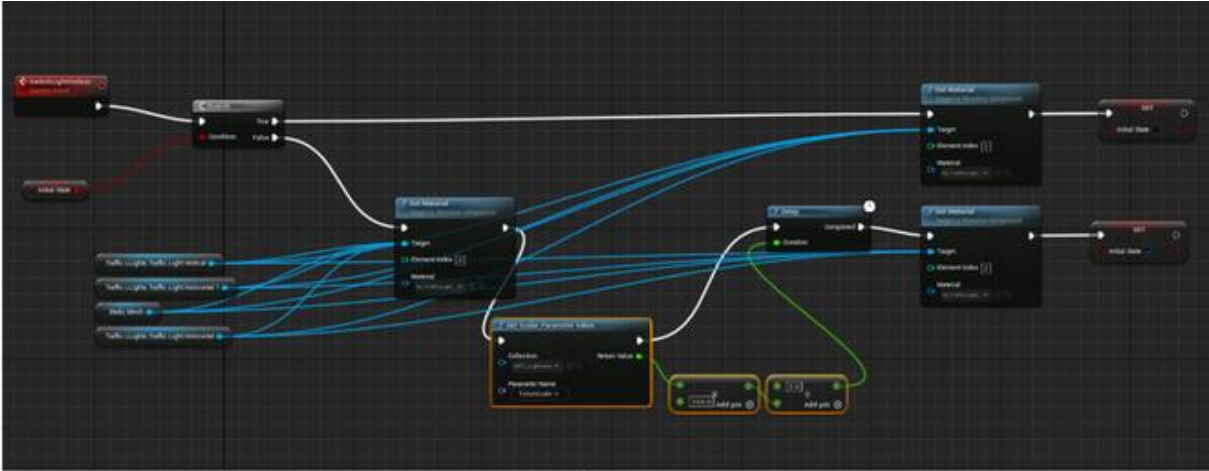


Display Layer:  
Distance From  
Selected Object

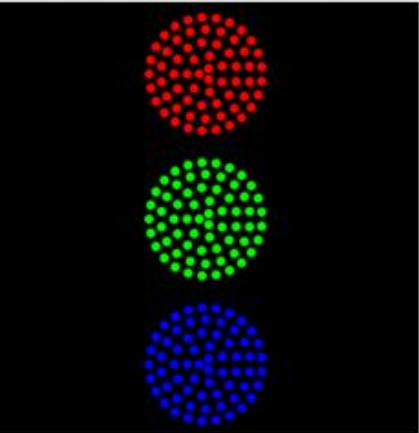




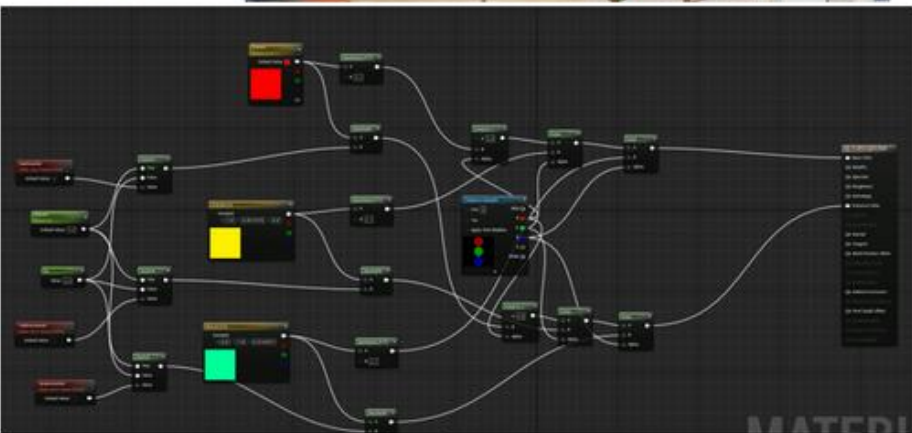




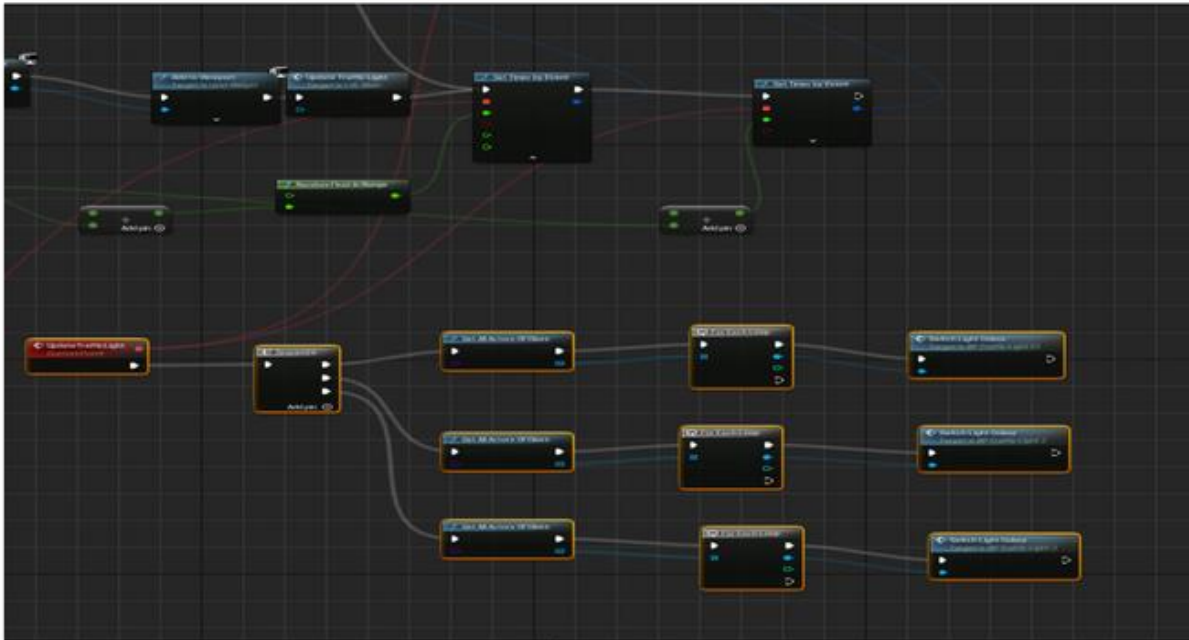
Switch BP



Mask

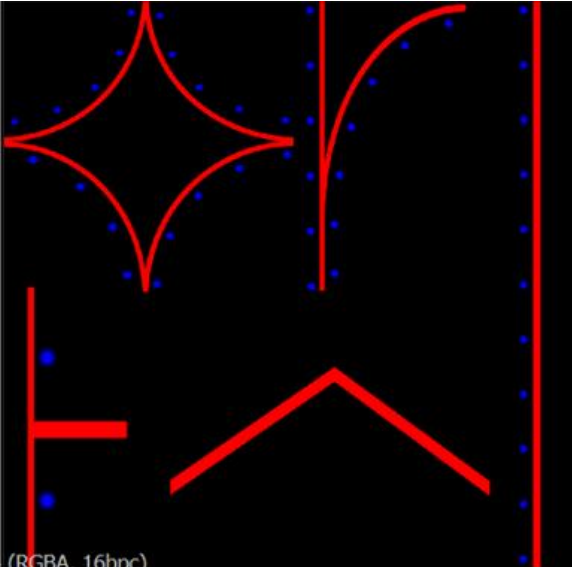
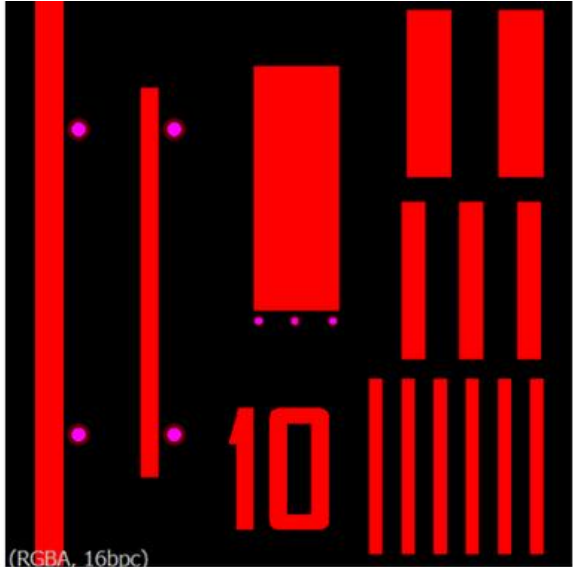
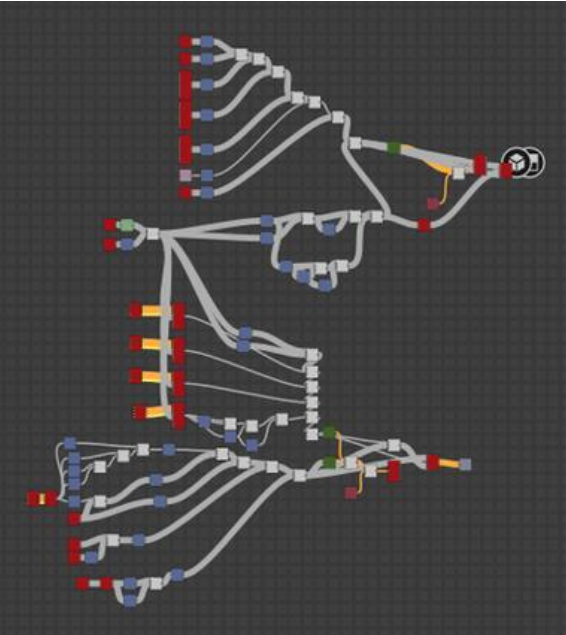


Shader

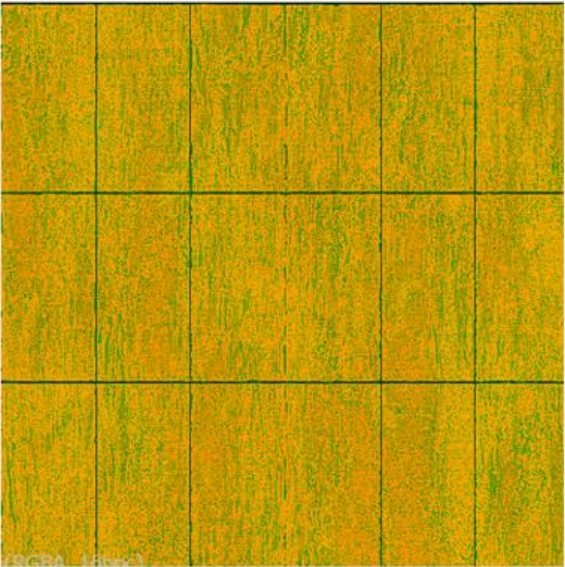
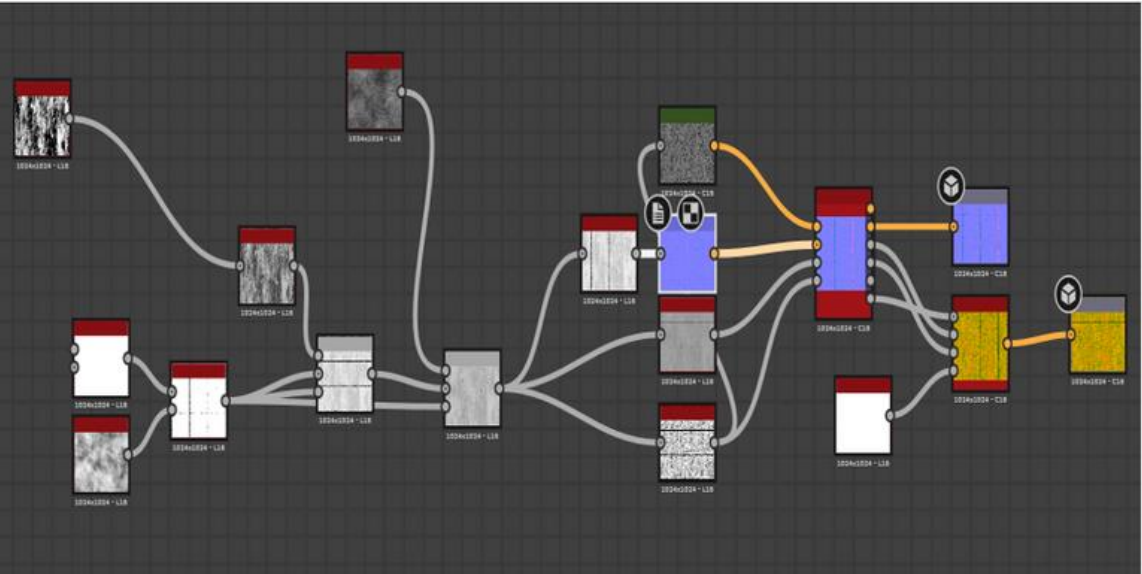


Trigger BP



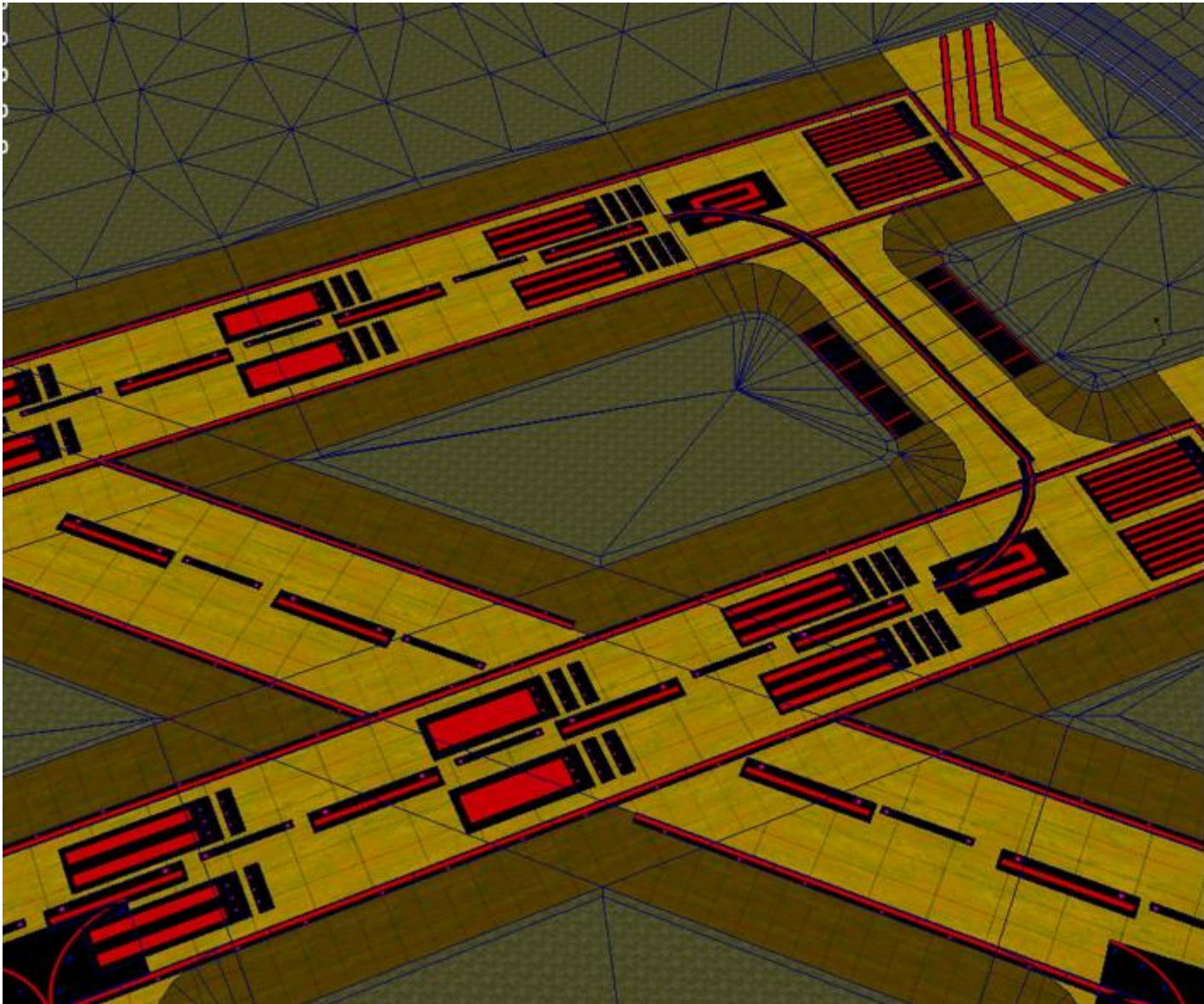


Runway Decal Mask Textures

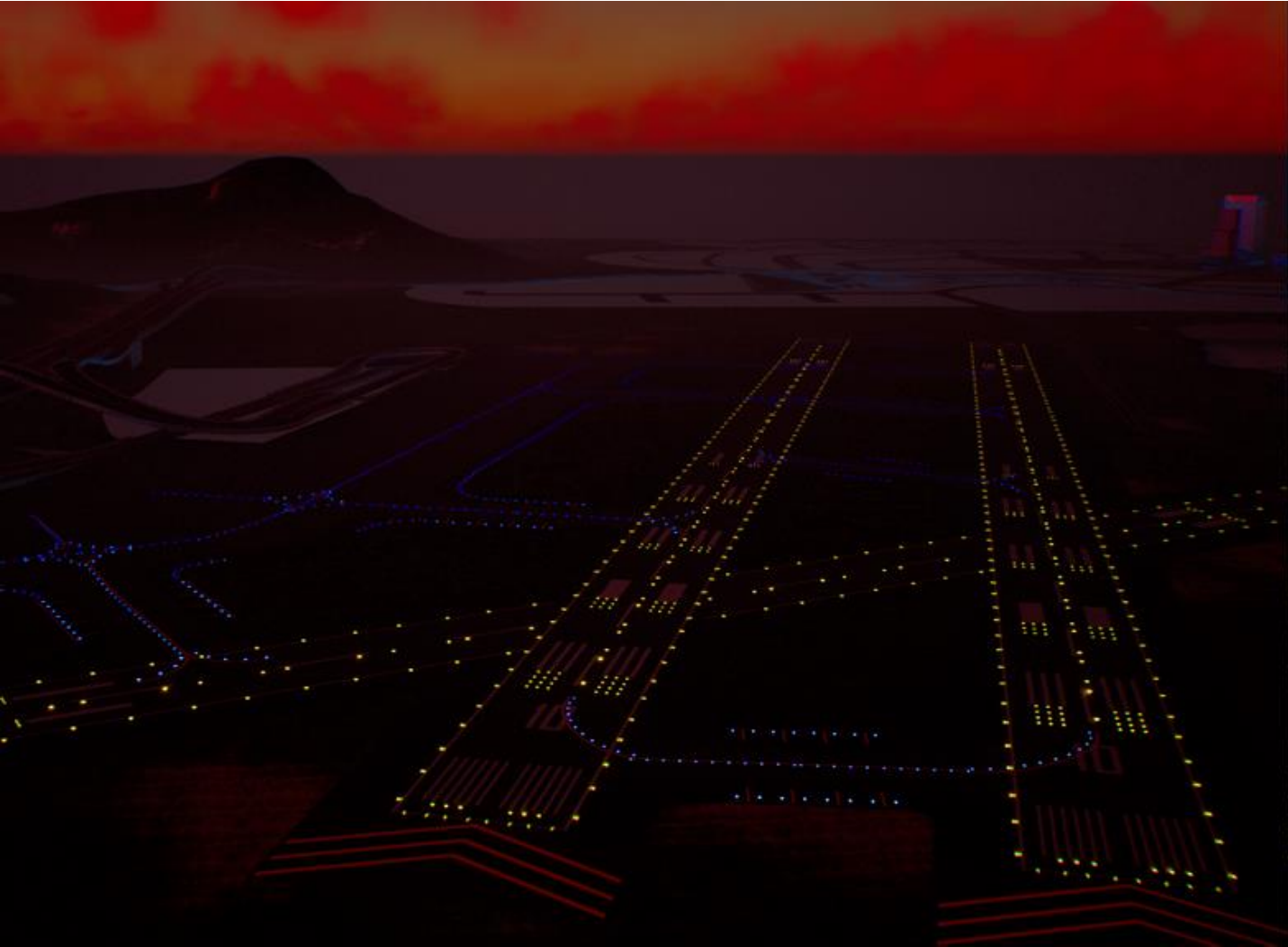


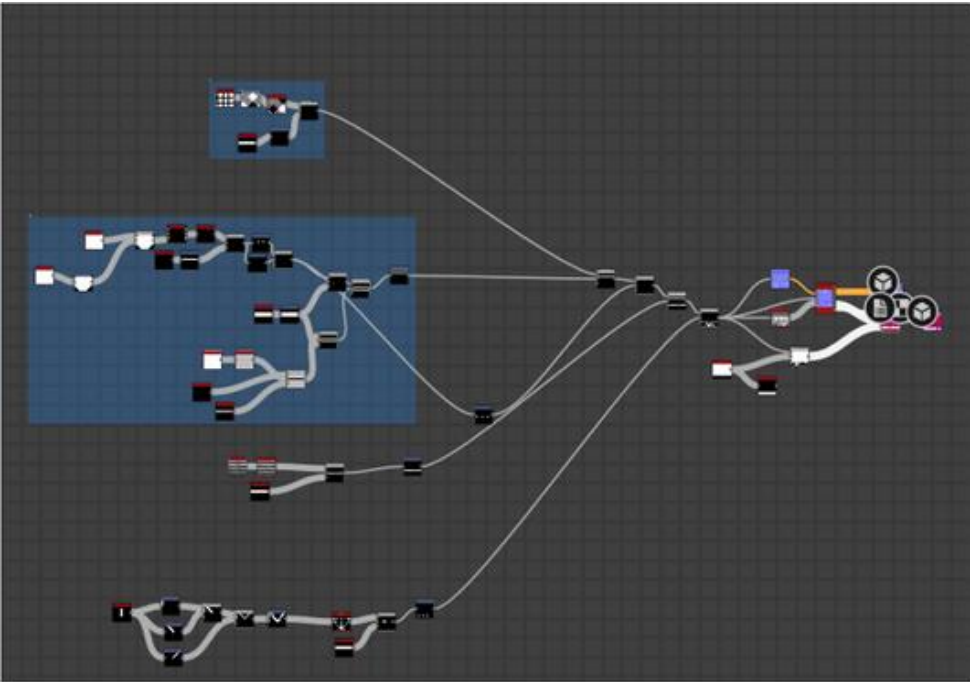
Runway Panel Texture



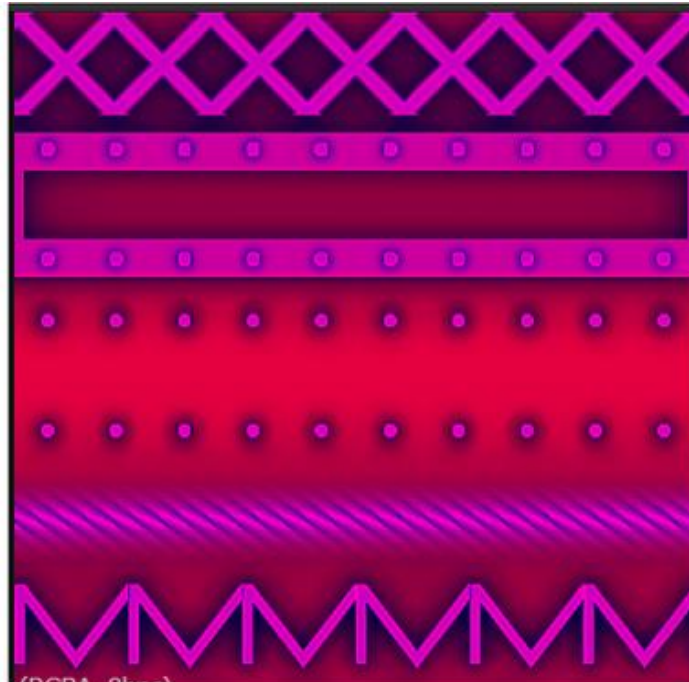




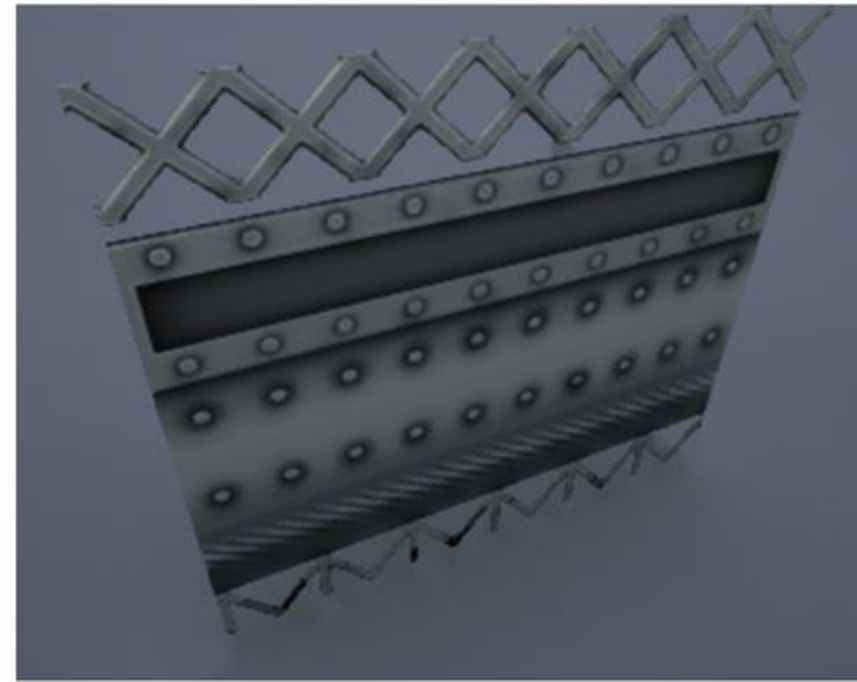




Bridge Trim Sheet



R: AO A: Opacity

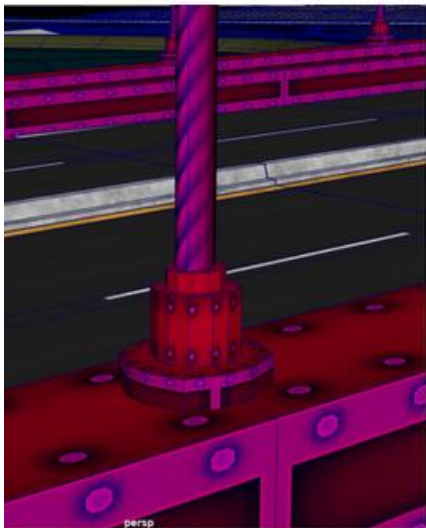


Material Preview

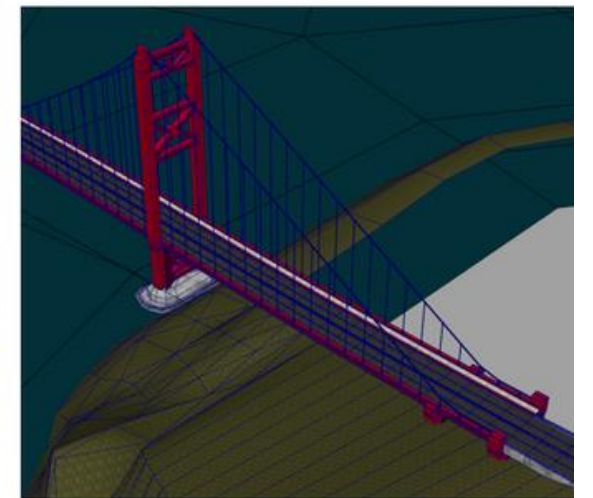
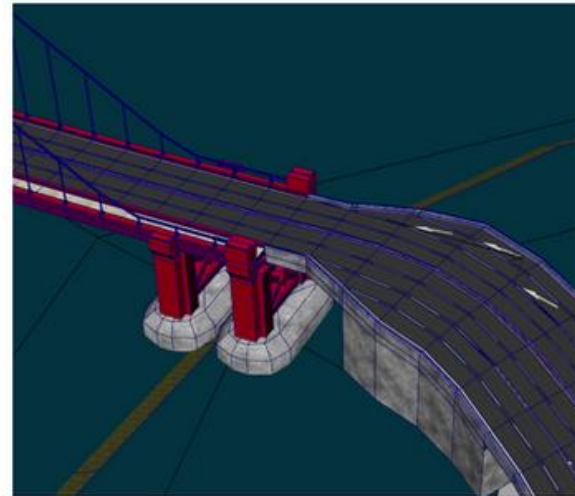




Initial Construction



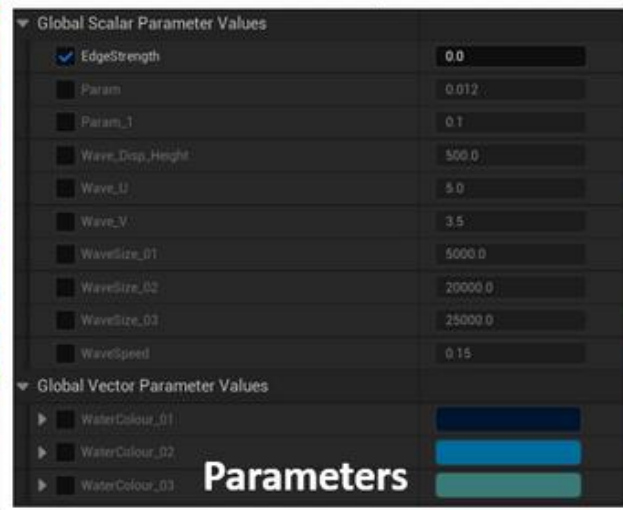
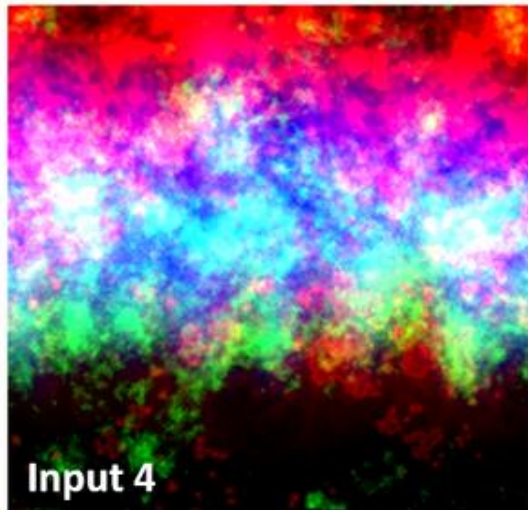
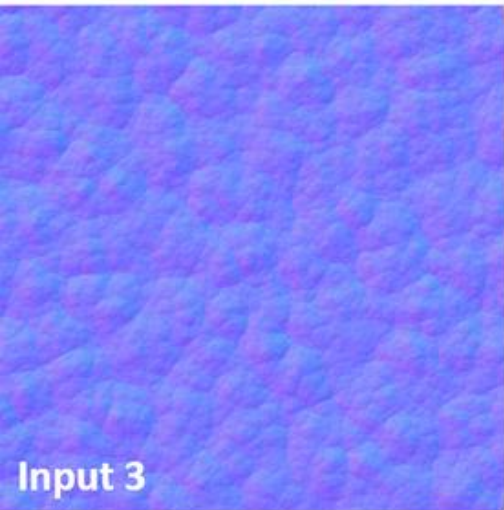
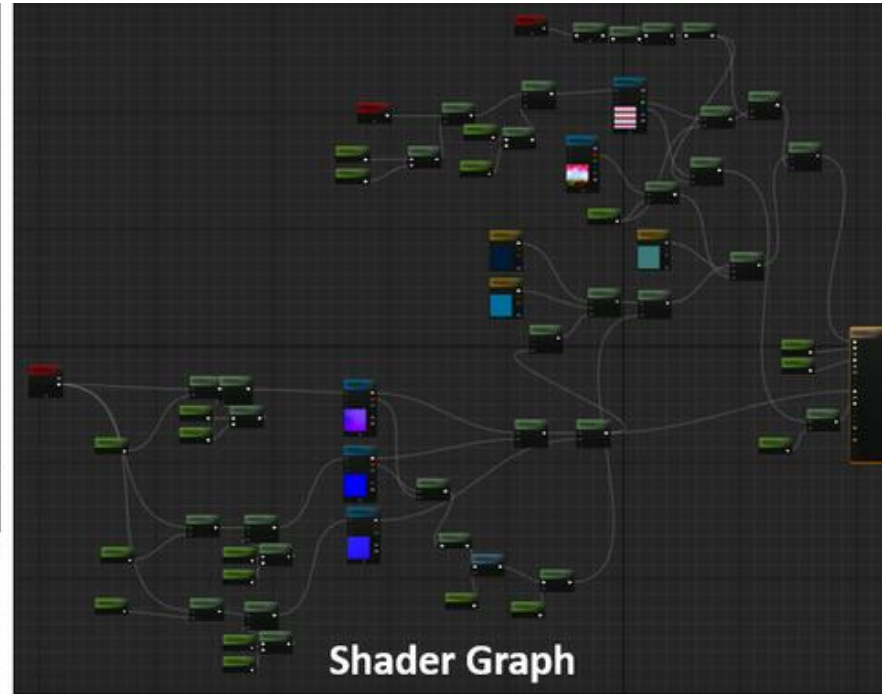
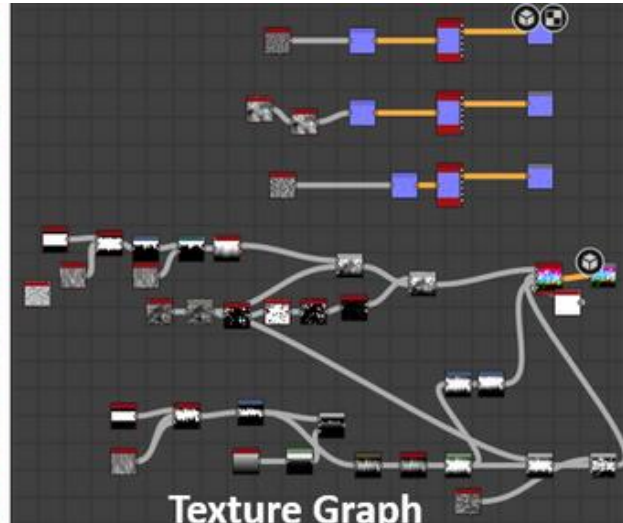
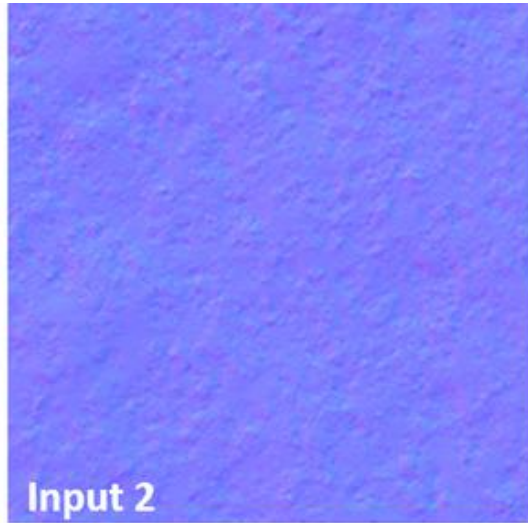
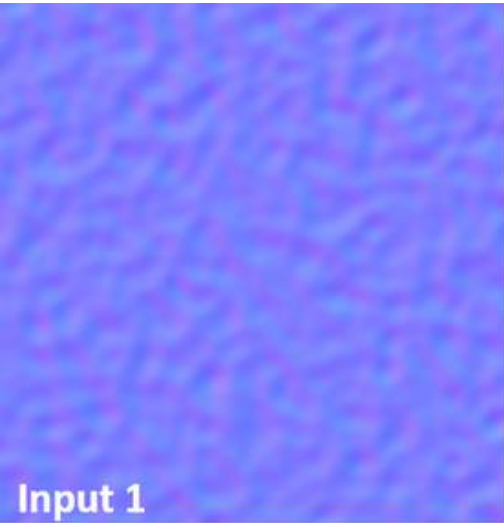
Detailing with trim sheets






Blending with existing roads

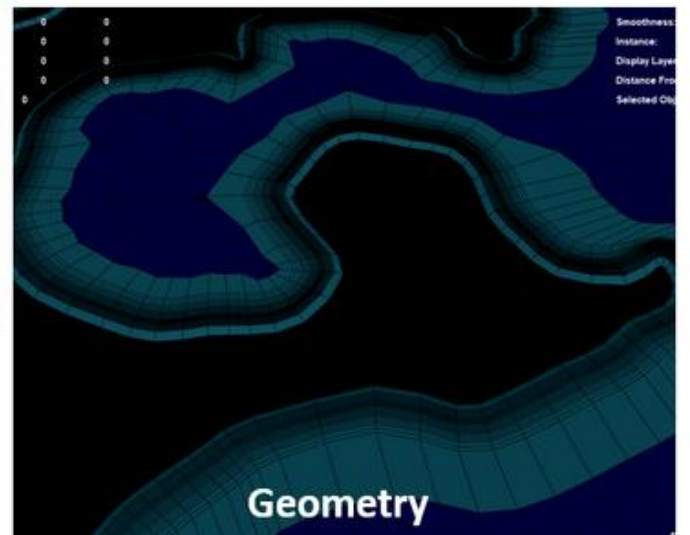






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Global Vector Parameter Values	
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Parameters







## Ocean Shader in Action

This shader features dynamic colours, animated foams, wave textures and displacement.

Multiple macro detail textures were layered and mixed to avoid visible tiling and animated elements were implemented by offsetting UVs

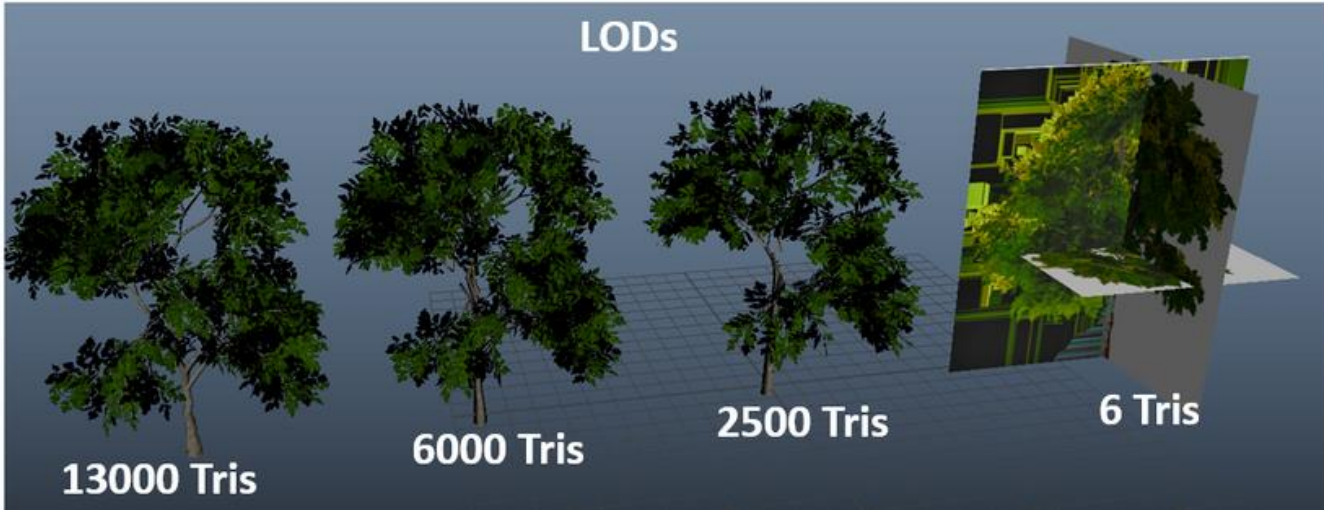


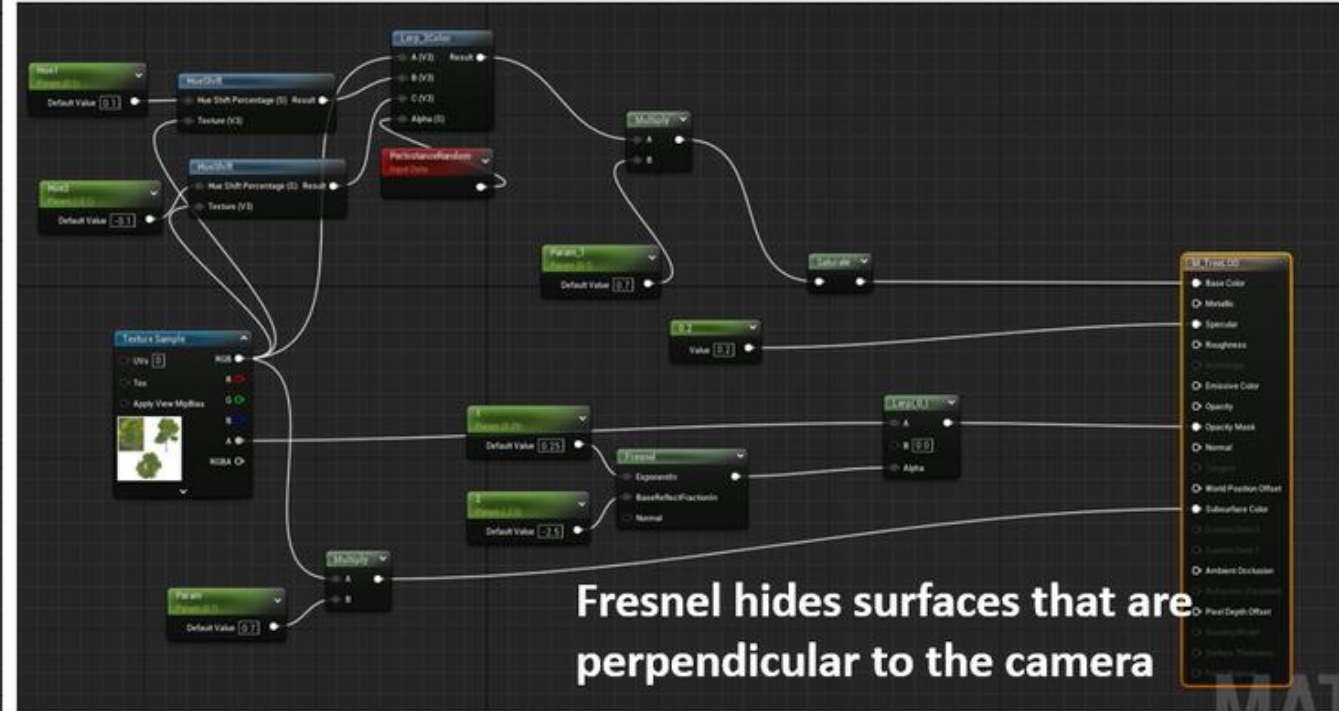
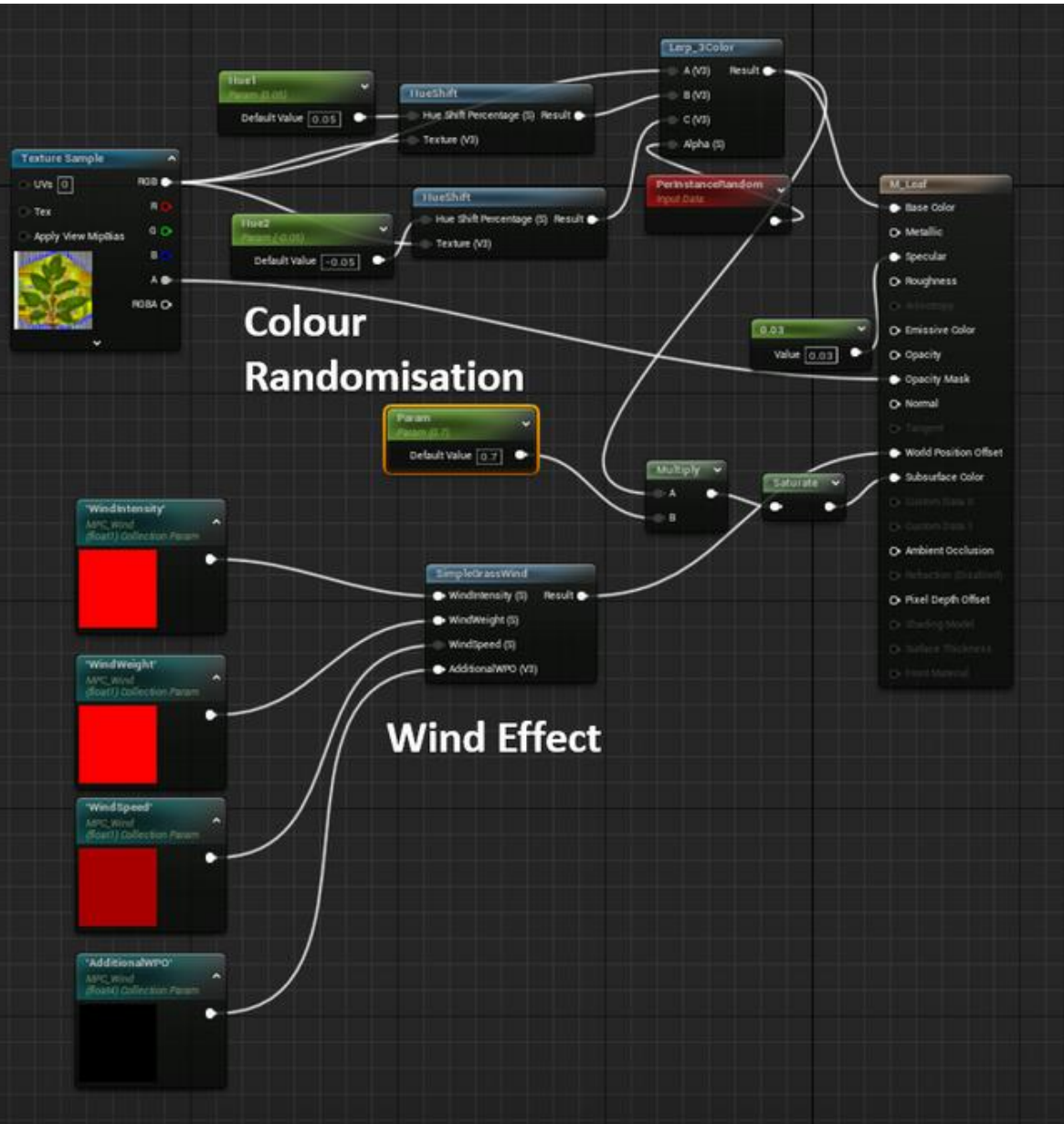


Photogrammetry textures

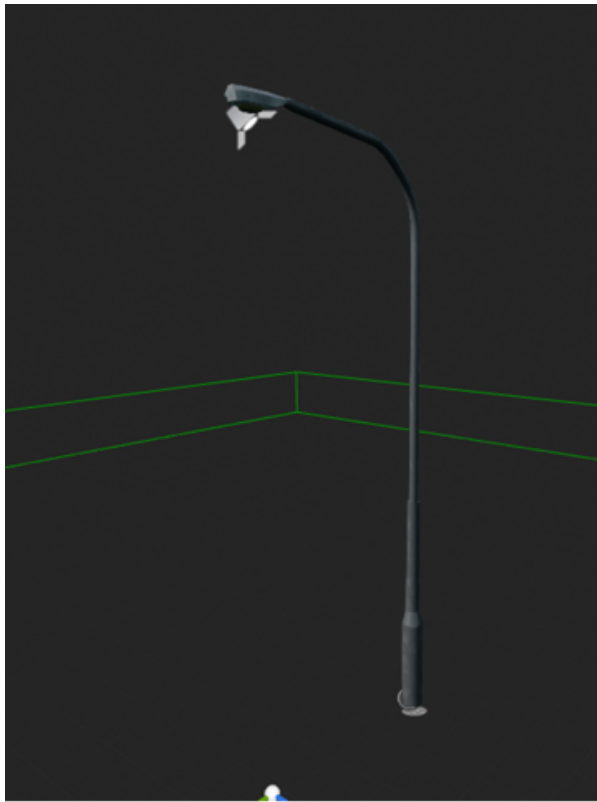


LOD card texture (rendered in Arnold)





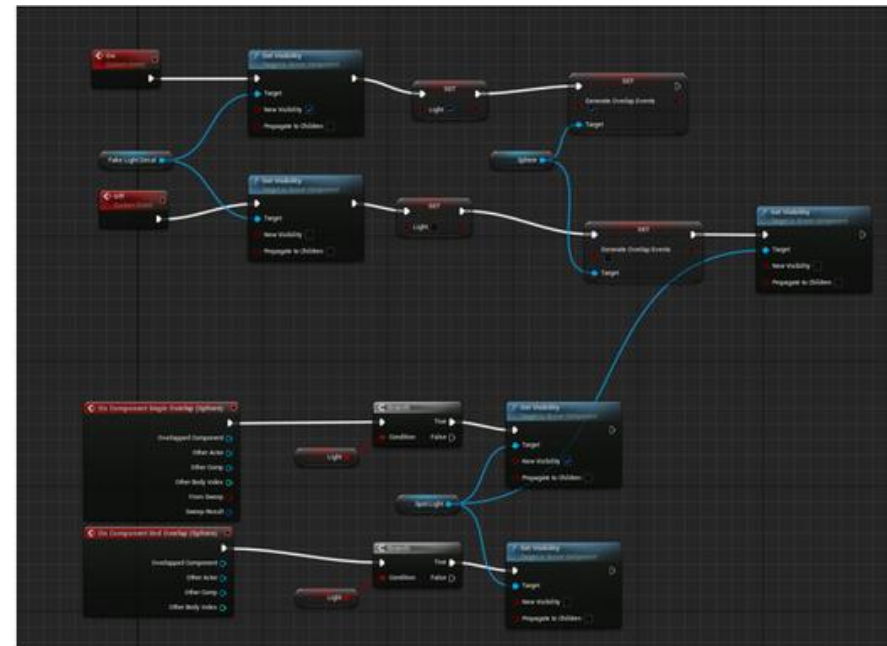
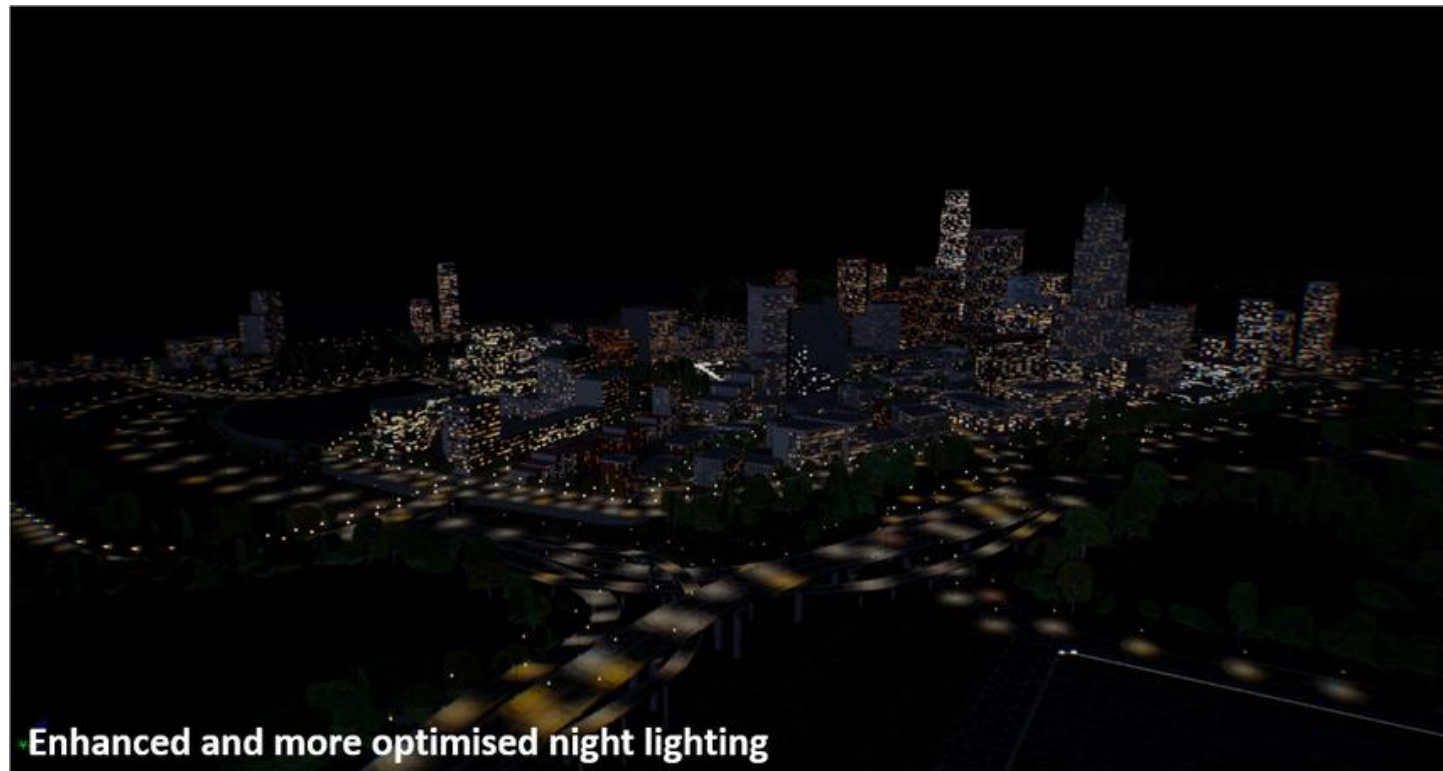




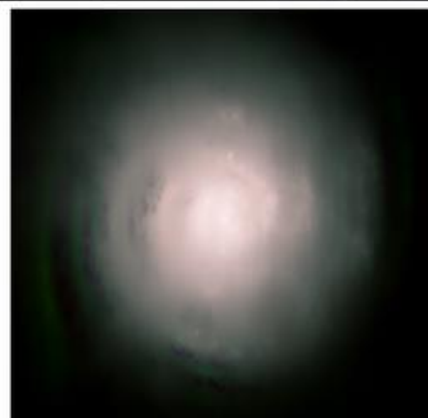
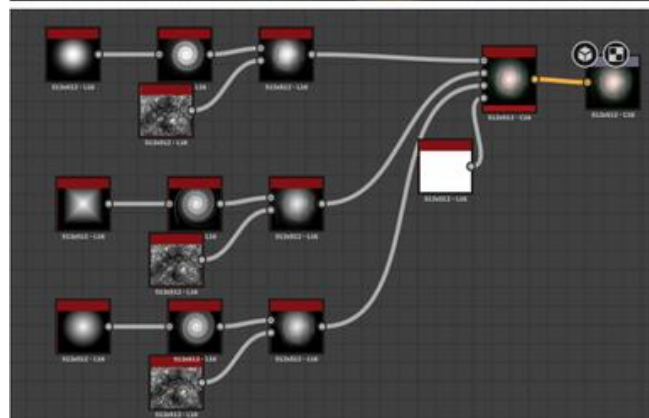
**Blend distance makes decals disappear when too close**

The material graph consists of the following nodes and connections:

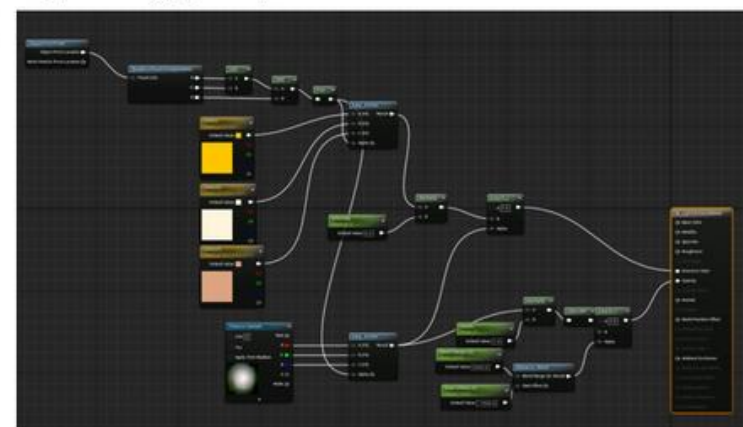
- Colour** (Param (1,0.574,0.1)) - Default Value: Yellow - connected to **Multiply**.
- Intensity** (Param (2)) - Default Value: 2.0 - connected to **Multiply**.
- Multiply** - connected to **Lerp(0,,)** (A: 0.0).
- Texture Sample** (UVs: 0) - connected to **Lerp(0,,)** (Alpha).
- OpacityPower** (Param (0.1)) - Default Value: 0.1 - connected to **Power** (Base).
- Power** (Exp) - connected to **Clamp** (Min: 0.0, Max: 0.1).
- Clamp** - connected to **Lerp(0,,)** (Alpha).
- Blend Range (S)** (Param (2000)) - Default Value: 2000.0 - connected to **Distance\_Blend**.
- Start Offset (S)** (Param (-6000)) - Default Value: -6000.0 - connected to **Distance\_Blend**.
- Distance\_Blend** - connected to **Lerp(0,,)** (Alpha).
- The final **Lerp(0,,)** node is connected to the **Emissive Color** property of the **M\_LightDistanceDecal** material node.



Light Trigger System

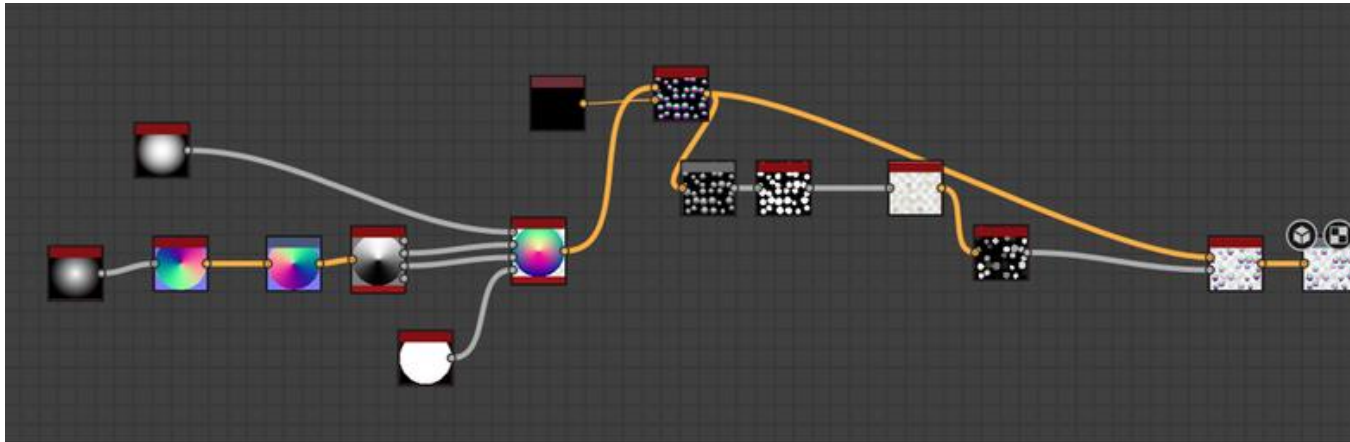


Light Mask

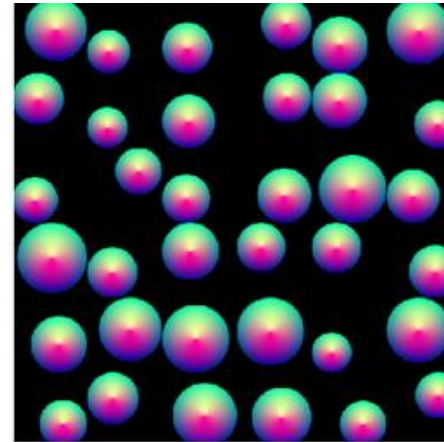


Fake Light Colour Variation

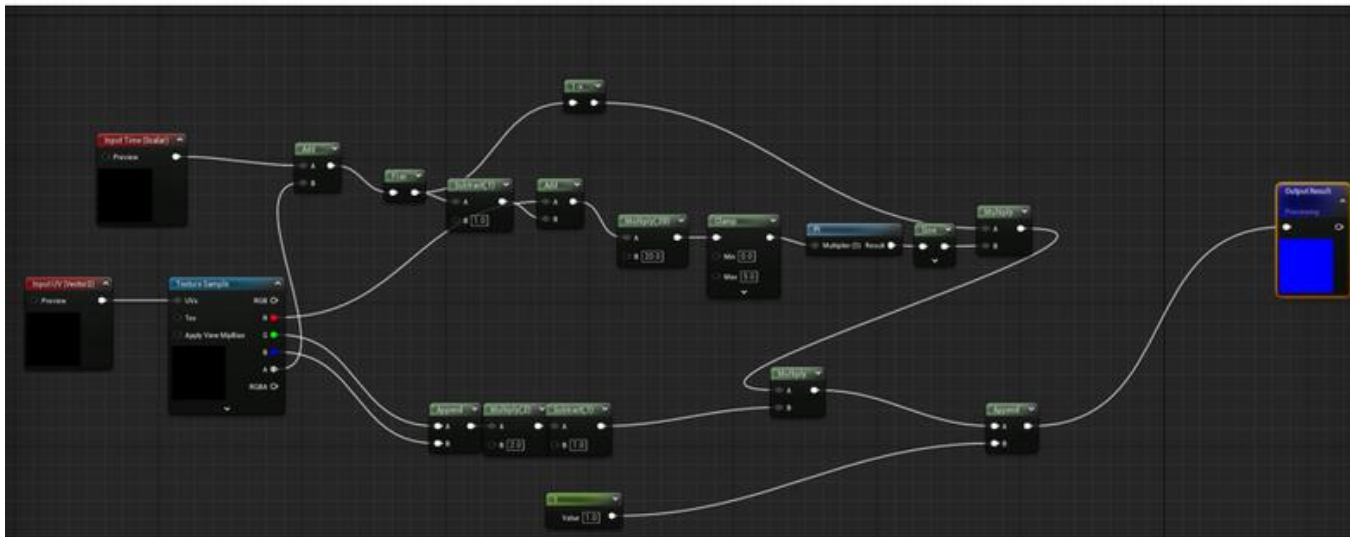




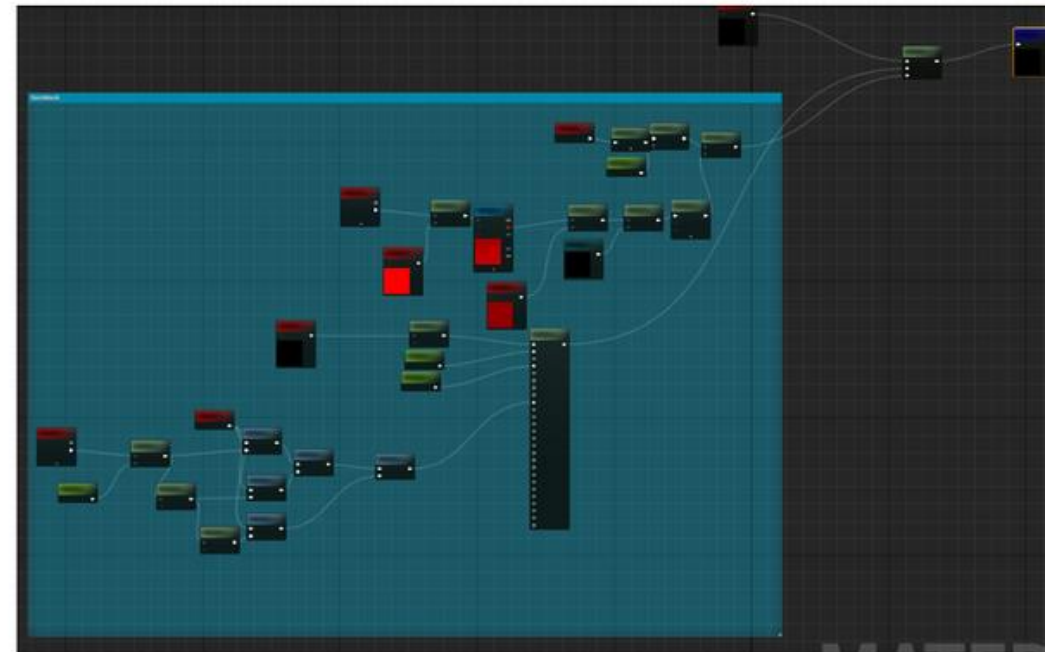
Ripple Mask Graph



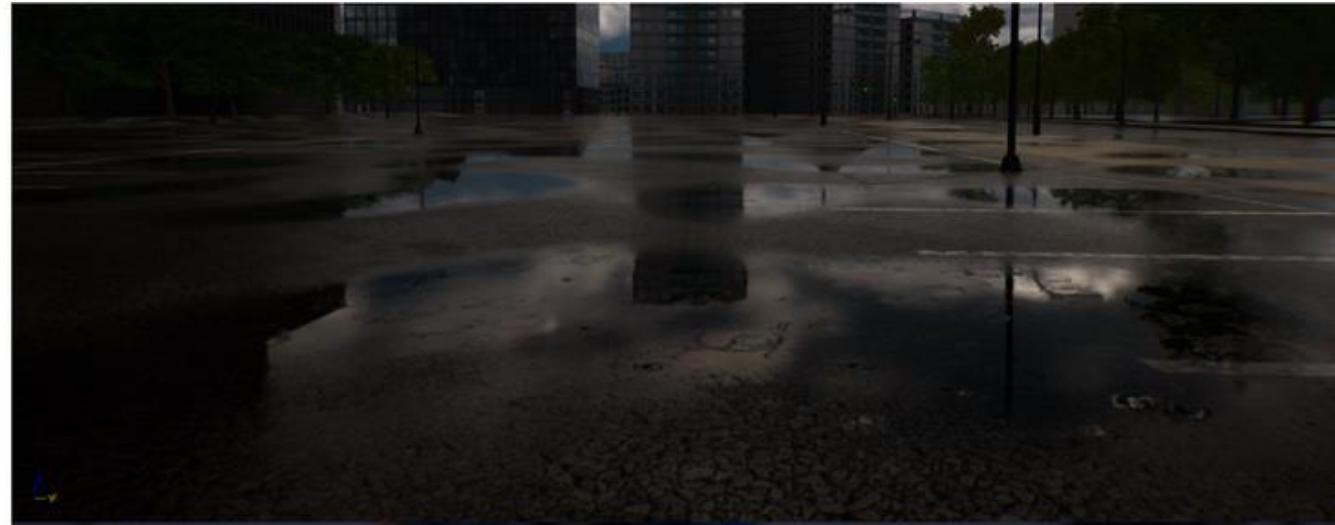
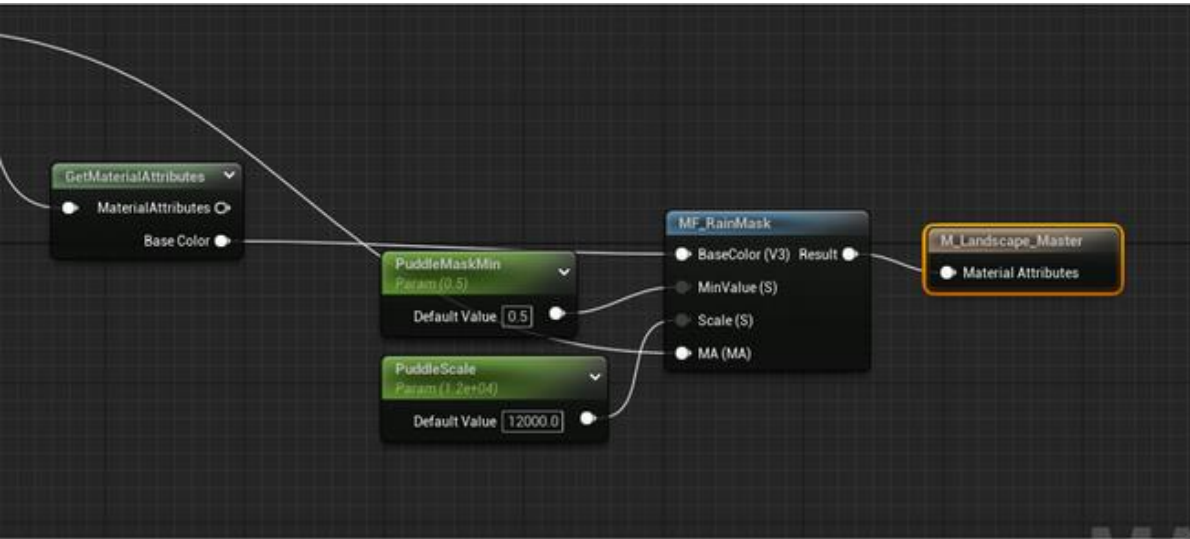
Ripple Mask Texture



Ripple Material Function



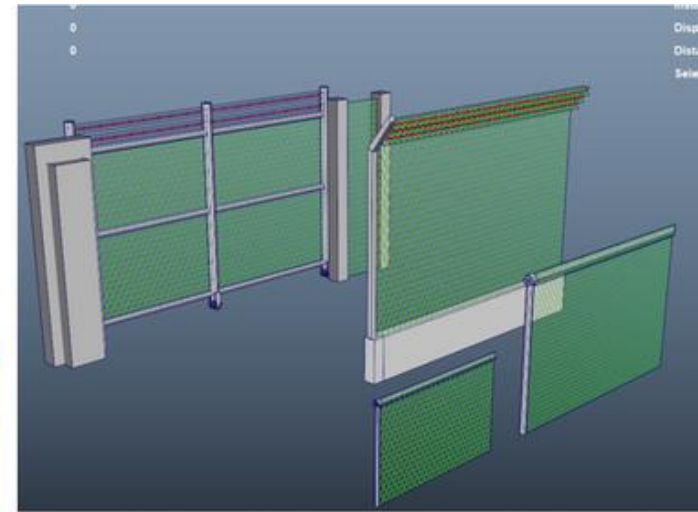
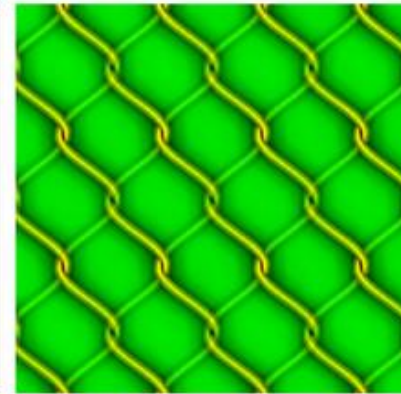
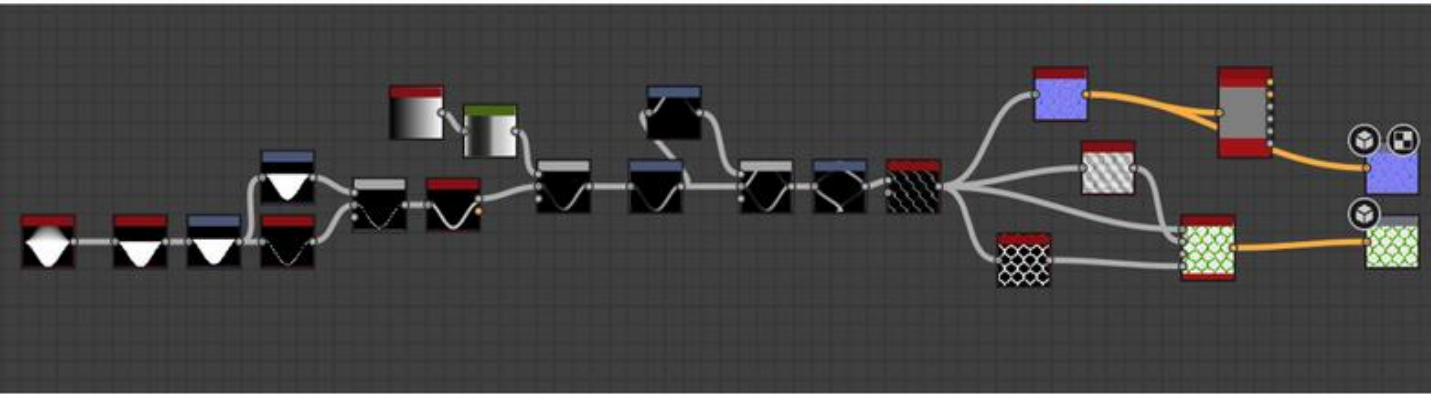
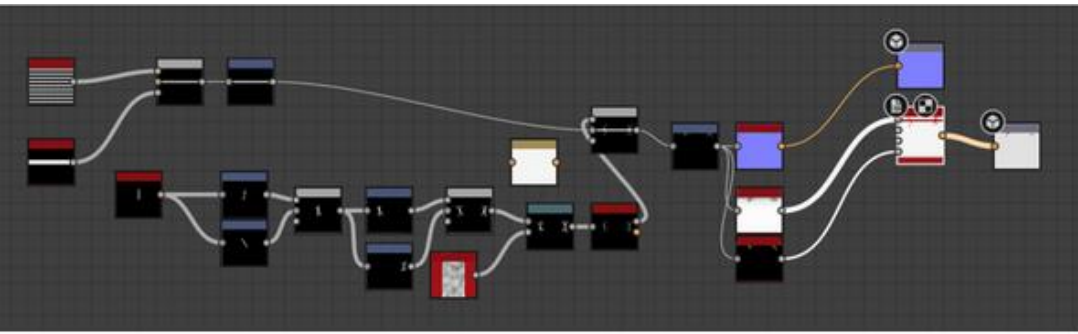
Puddle Material Function



Material function blended with the existing material attributes, in this example, landscape material. Two parameters control the minimum wetness and puddle scale.

**Material In-action**



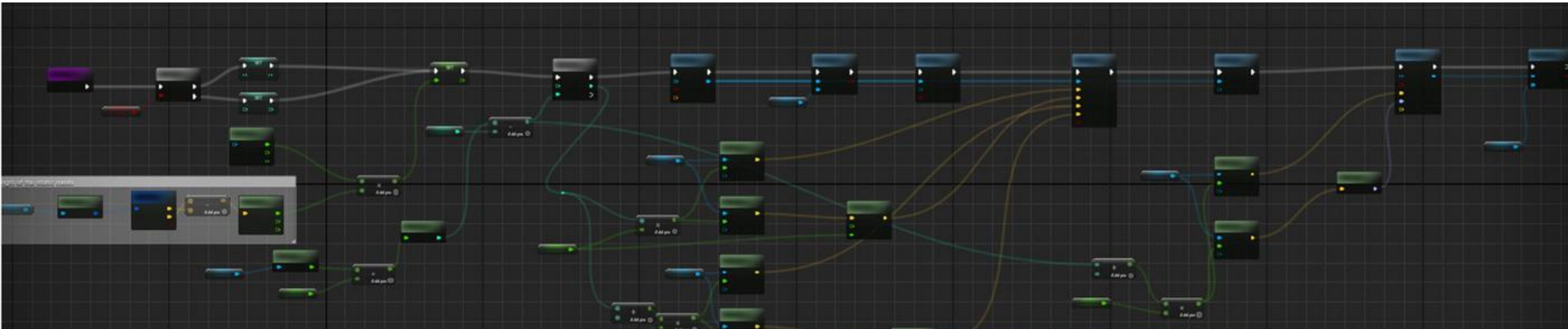


Models

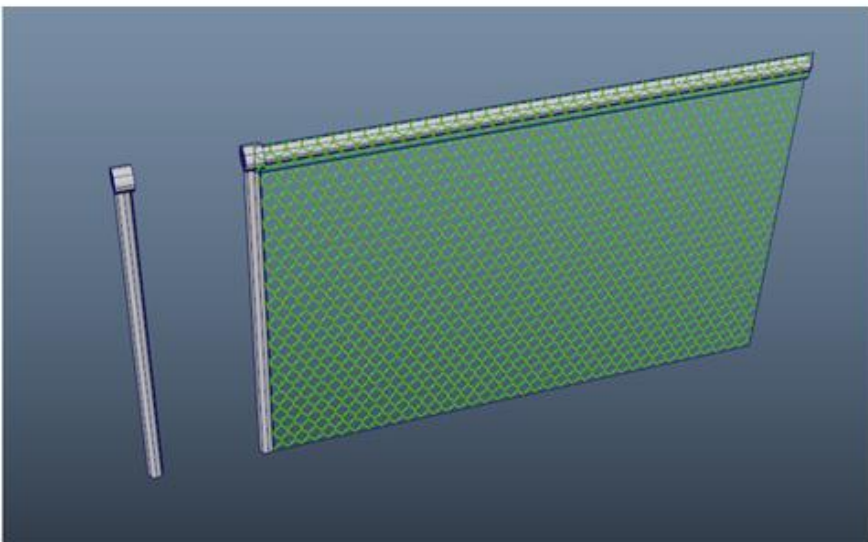
Metal Fence Textures



In-engine Result



**Spline Layout Blueprint**

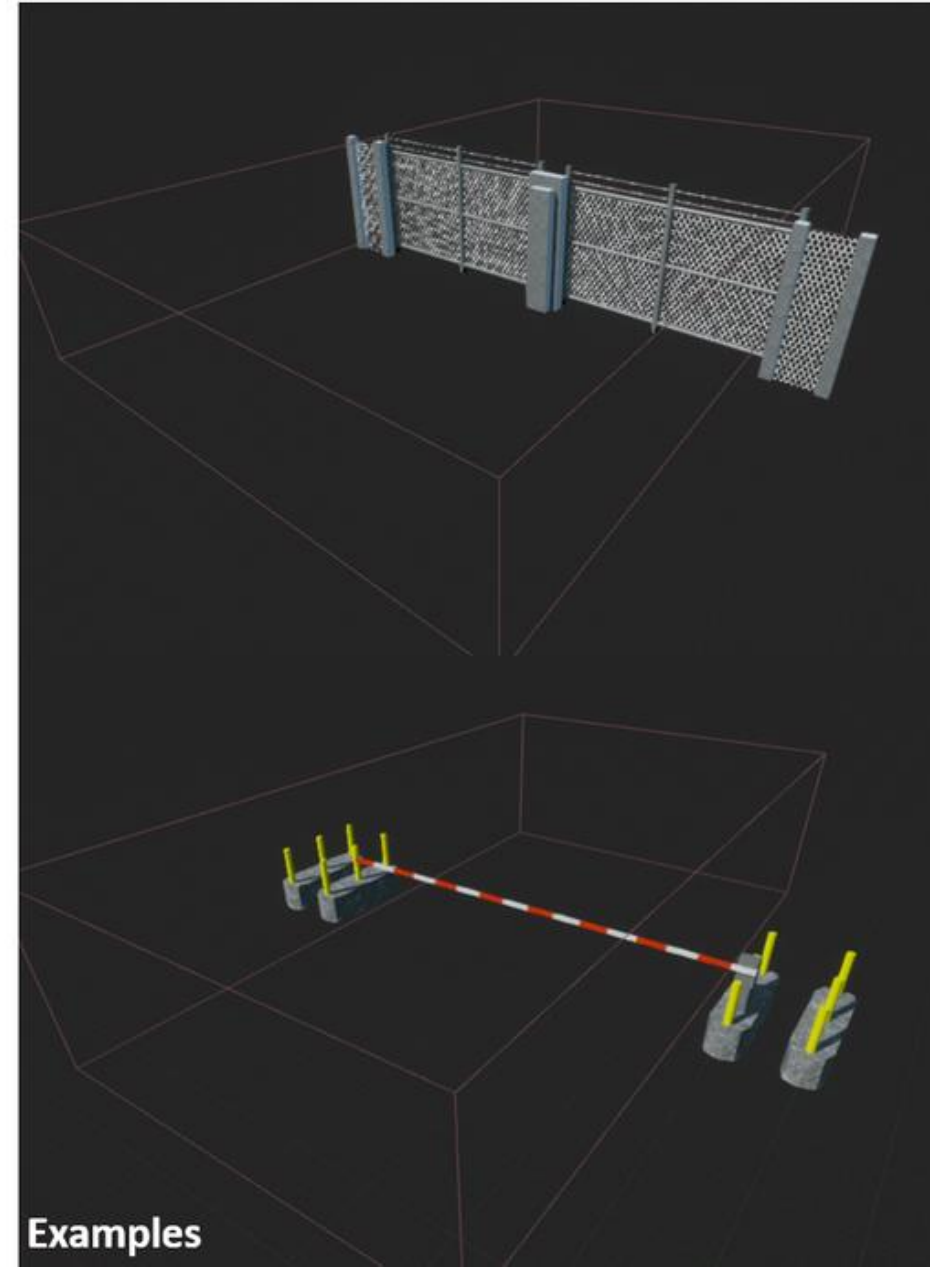
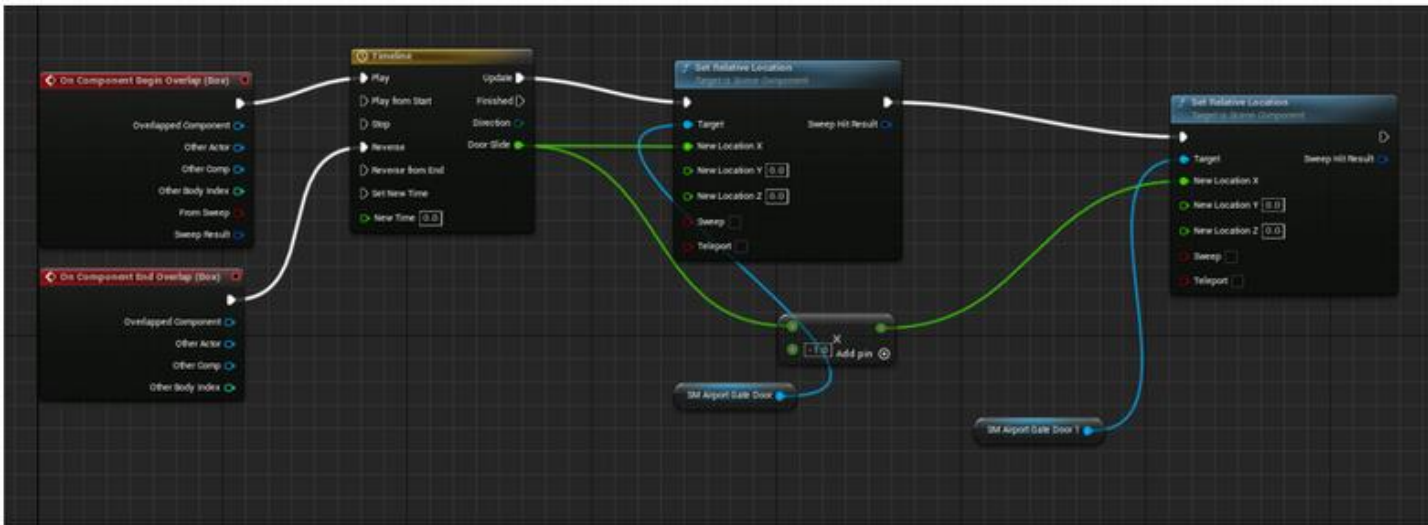


**Start/End Parts**

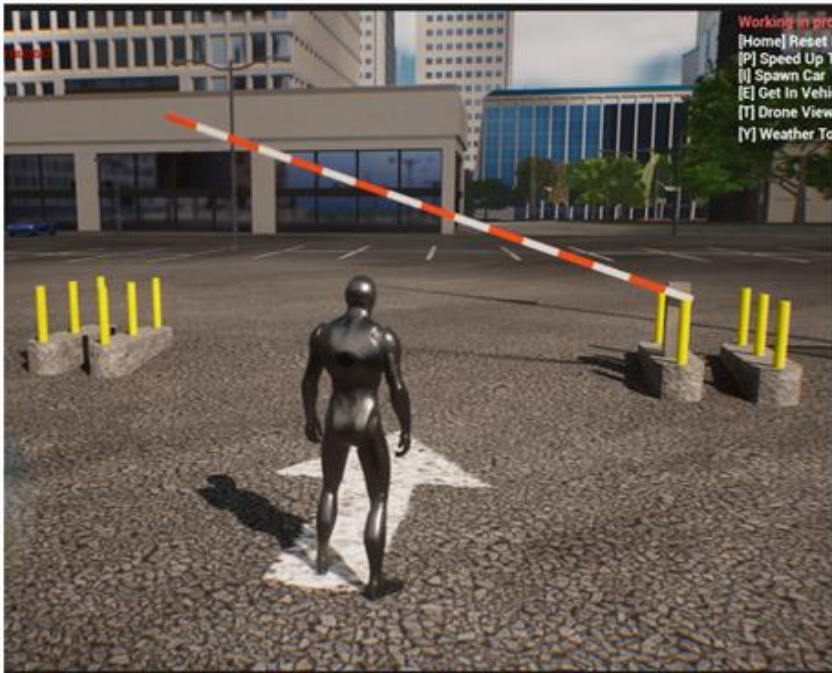


**Placement Example**





Animation using Timeline and Overlap Events



Gate opens when overlaps

Examples

Scene Rendering [STATGROUP\_sceneRendering]  
 Cycle counters (flat)

	CallCount	InclusiveAvg	InclusiveMax	ExclusiveAvg	Ex
RenderViewFamily	1	9.49 ms	12.12 ms	1.39 ms	
InitViews	1	2.50 ms	3.26 ms	0.06 ms	
DeferredShadingSceneRenderer Lighting	1	0.85 ms	1.66 ms	0.67 ms	
InitViewsPossiblyAfterPrepass	1	0.40 ms	0.82 ms	0.01 ms	
GatherRayTracingWorldInstances	1	0.30 ms	0.65 ms	0.20 ms	
Lighting drawing	1	0.18 ms	0.40 ms	0.00 ms	
Dynamic shadow setup	2	0.23 ms	0.46 ms	0.04 ms	
BeginOcclusion Tests	1	0.32 ms	1.04 ms	0.31 ms	
Proj Shadow drawing	2	0.08 ms	0.15 ms	0.03 ms	
Translucency drawing	1	0.07 ms	0.23 ms	0.06 ms	
Base pass drawing	1	0.04 ms	0.09 ms	0.03 ms	
DeferredShadingSceneRenderer RenderLightShaftOcclusion	1	0.04 ms	0.44 ms	0.04 ms	
Bind ray tracing pipeline	2	0.02 ms	0.06 ms	0.02 ms	
DeferredShadingSceneRenderer RenderFinish	1	0.02 ms	0.03 ms	0.01 ms	
DeferredShadingSceneRenderer DBuffer	1	0.02 ms	0.03 ms	0.00 ms	
DeferredShadingSceneRenderer AfterBasePass	1	0.02 ms	0.03 ms	0.00 ms	
DeferredShadingSceneRenderer RenderLightShaftBloom	1	0.02 ms	0.04 ms	0.02 ms	
Depth drawing	1	0.01 ms	0.02 ms	0.01 ms	
DeferredShadingSceneRenderer RenderSkyAtmosphere	1	0.01 ms	0.02 ms	0.01 ms	
DeferredShadingSceneRenderer FXSystem PreRender	1	0.01 ms	0.01 ms	0.01 ms	
RenderVelocities	1	0.01 ms	0.01 ms	0.01 ms	
OcclusionSubmittedFence Dispatch	1	0.01 ms	0.01 ms	0.00 ms	
DeferredShadingSceneRenderer Render Init	1	0.01 ms	0.01 ms	0.01 ms	
DeferredShadingSceneRenderer RenderFog	1	0.01 ms	0.01 ms	0.01 ms	
DeferredShadingSceneRenderer FGlobalDynamicVertexBuffer Commit	2	0.00 ms	0.01 ms	0.00 ms	

4 more stats. Use the stats.MaxPerGroup CVar to increase the limit!

Counters

	Average	Max	Mtg
Present time	5.88 ms	8.39 ms	
Ray tracing active instances	1,193.82	1,237.00	1,184.00
Ray tracing total instances	1,193.82	1,237.00	1,184.00
Mesh draw calls	1,626.97	1,713.00	1,568.00
Lights in scene		119.00	119.00
Lights using light snatts	2.00	2.00	2.00
Ray tracing pending build primitives		0.00	0.00
Ray tracing pending builds		0.00	0.00
Decals in scene		0.00	0.00

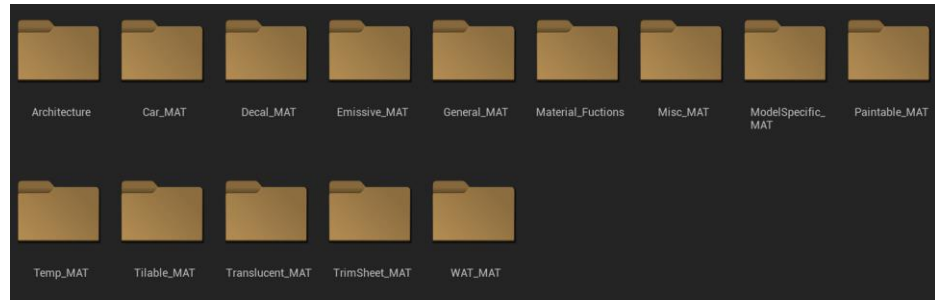
8 km/h

[X] Hide HUD  
 [Home] Reset Level  
 [P] Speed Up Time  
 [I] Spawn Car  
 [M] Get in Vehicle



Various methods were used for optimisation; including world partition streaming, LODs, HLOD, merging actors, texture atlasing, and instancing.





## Material Categories



## Major materials



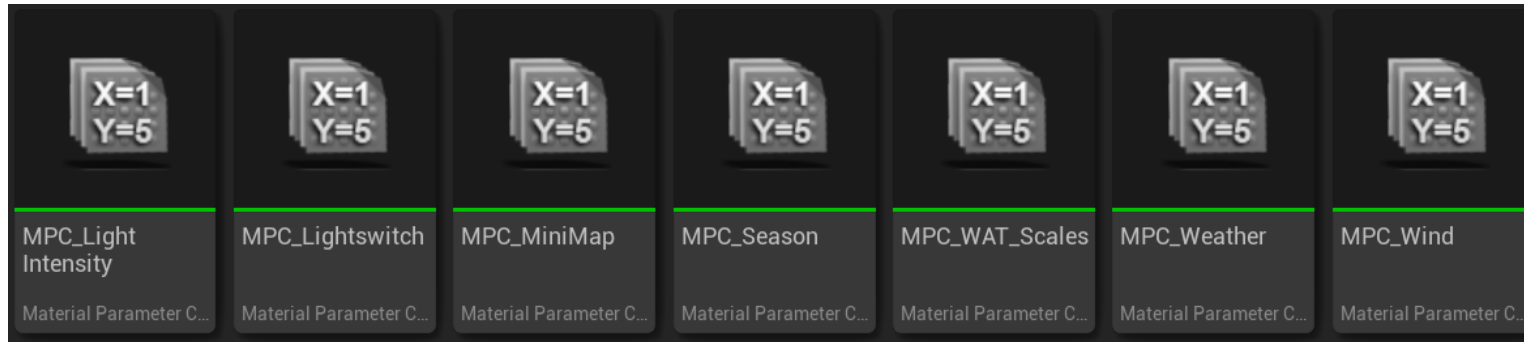
Main blueprints







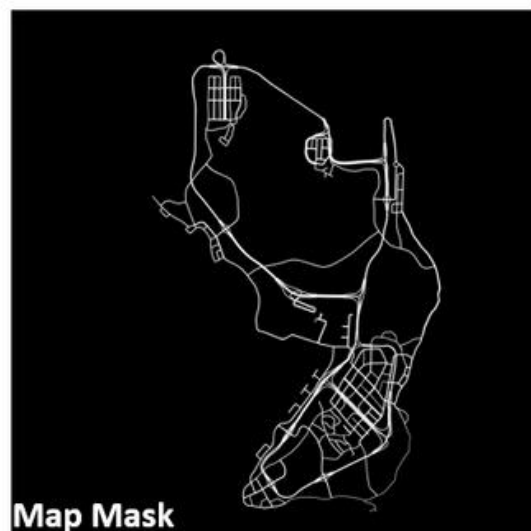
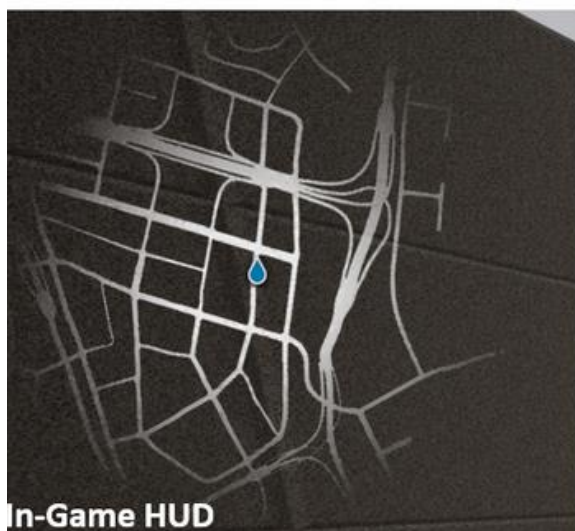
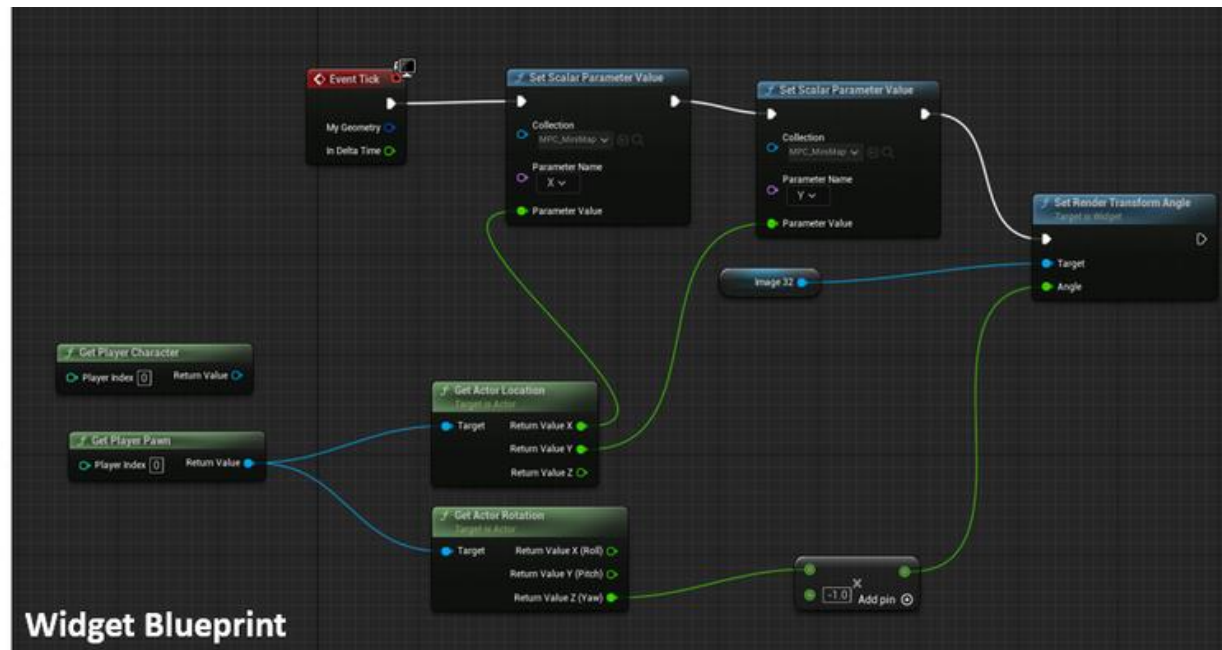
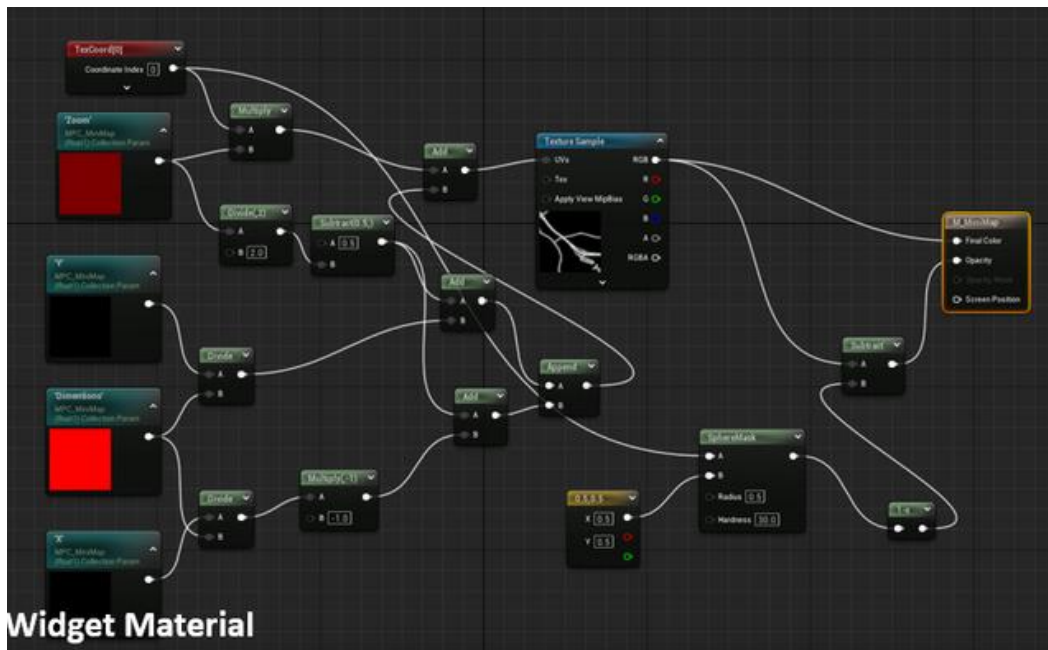
Season/Weather Control



## Key parameter collections

The variable environment factors are controlled by those blueprints by changing these parameters which affects materials, and other attributes in actors in the level.





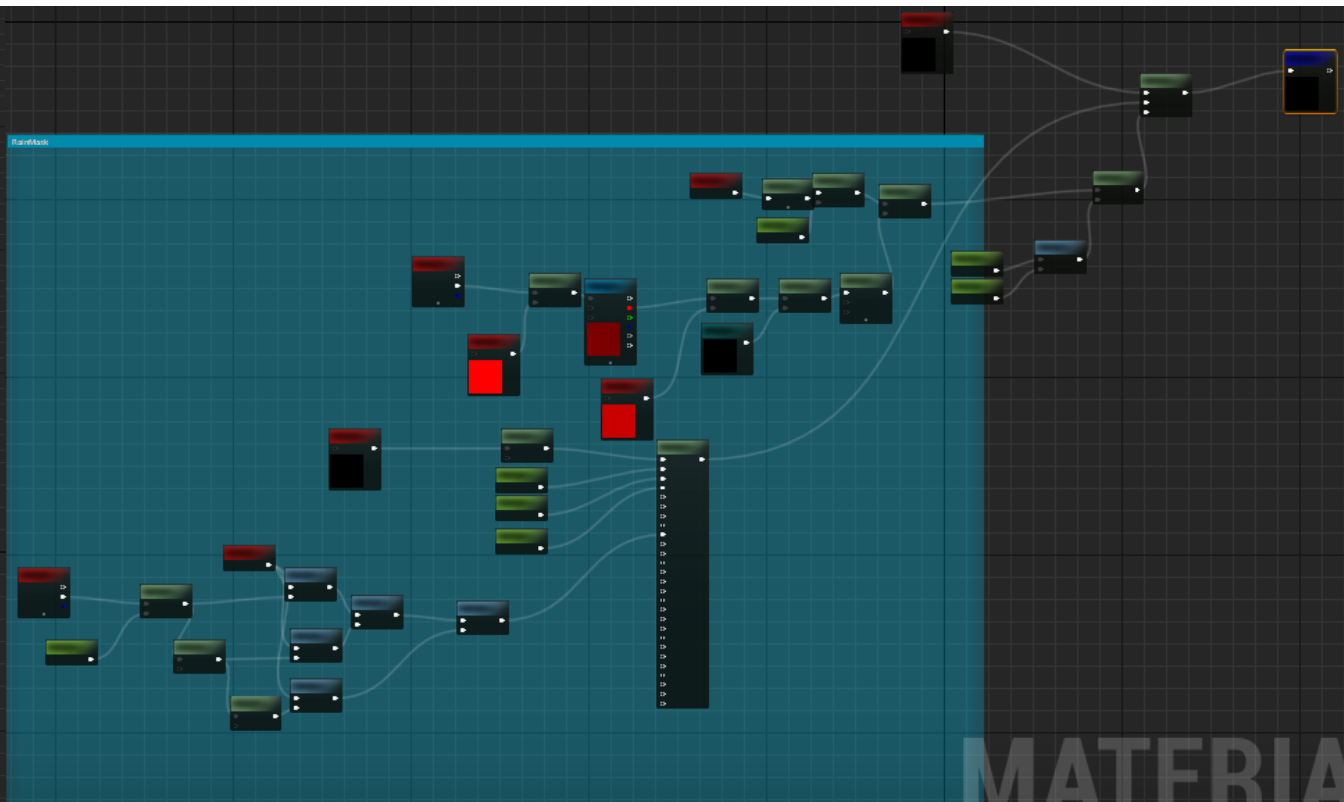
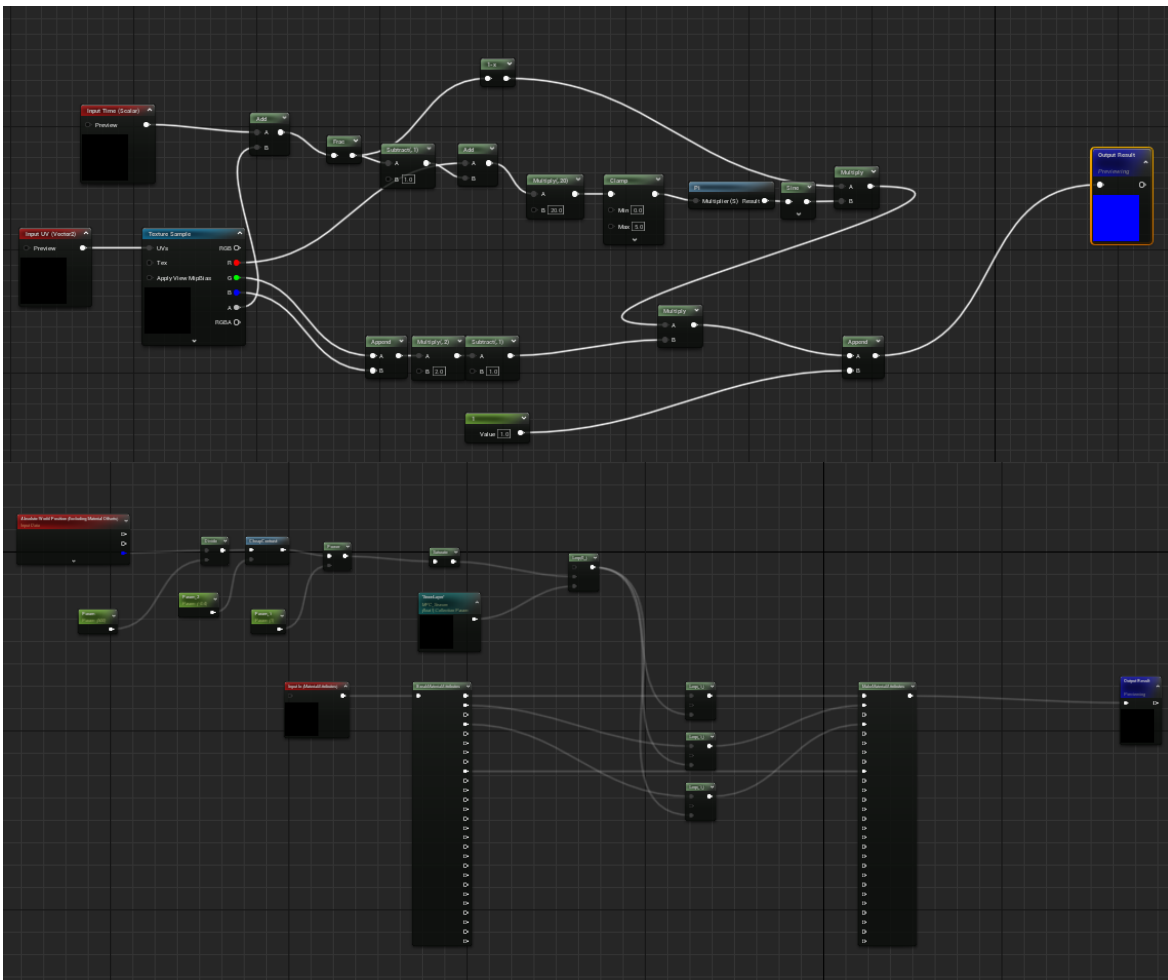
## Mini Map Widget

Something to help navigate when playtesting and constructing the scene.

The road network was rendered from the top with flat colour to use it as a mask.

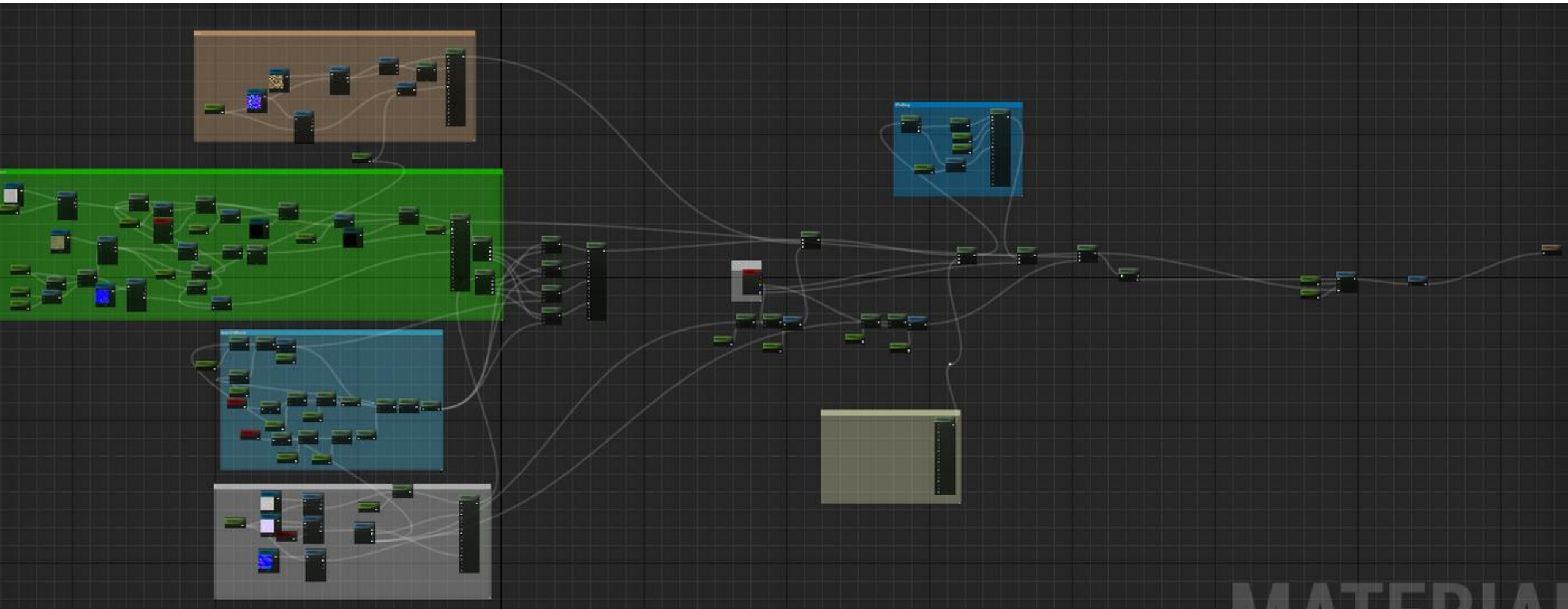
The widget material consists of 4 scalar parameters including zoom, y offset, x offset, and dimensions.

Basically, this widget works by offsetting the texture based on player pawn's location.

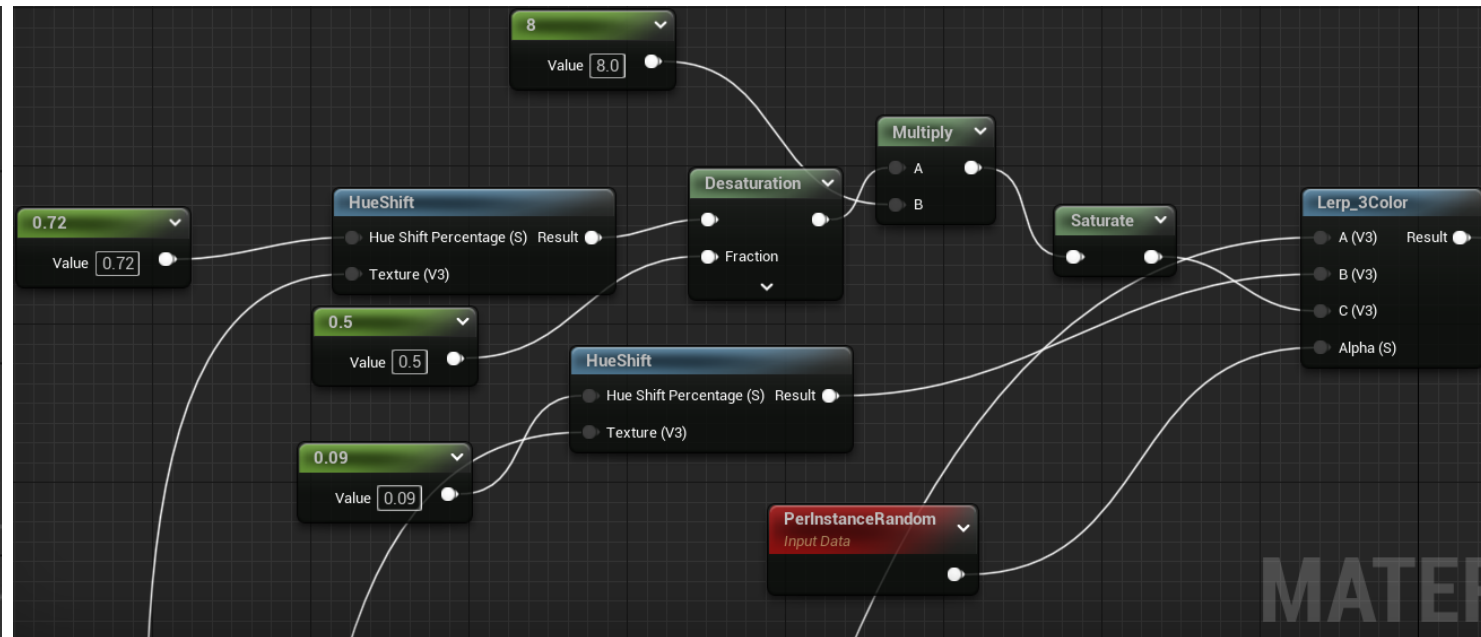
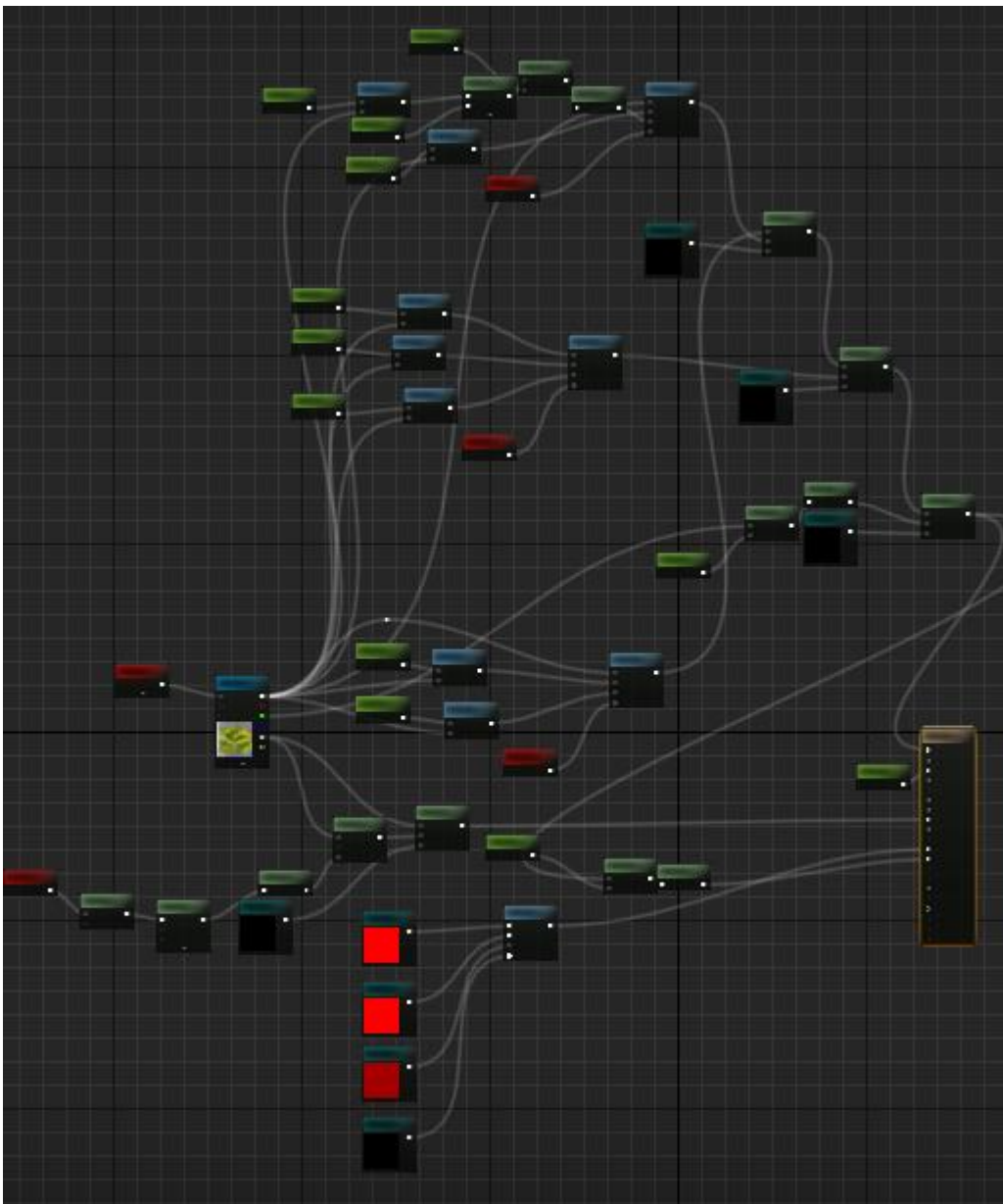


Material functions associated with weather-specific shaders.





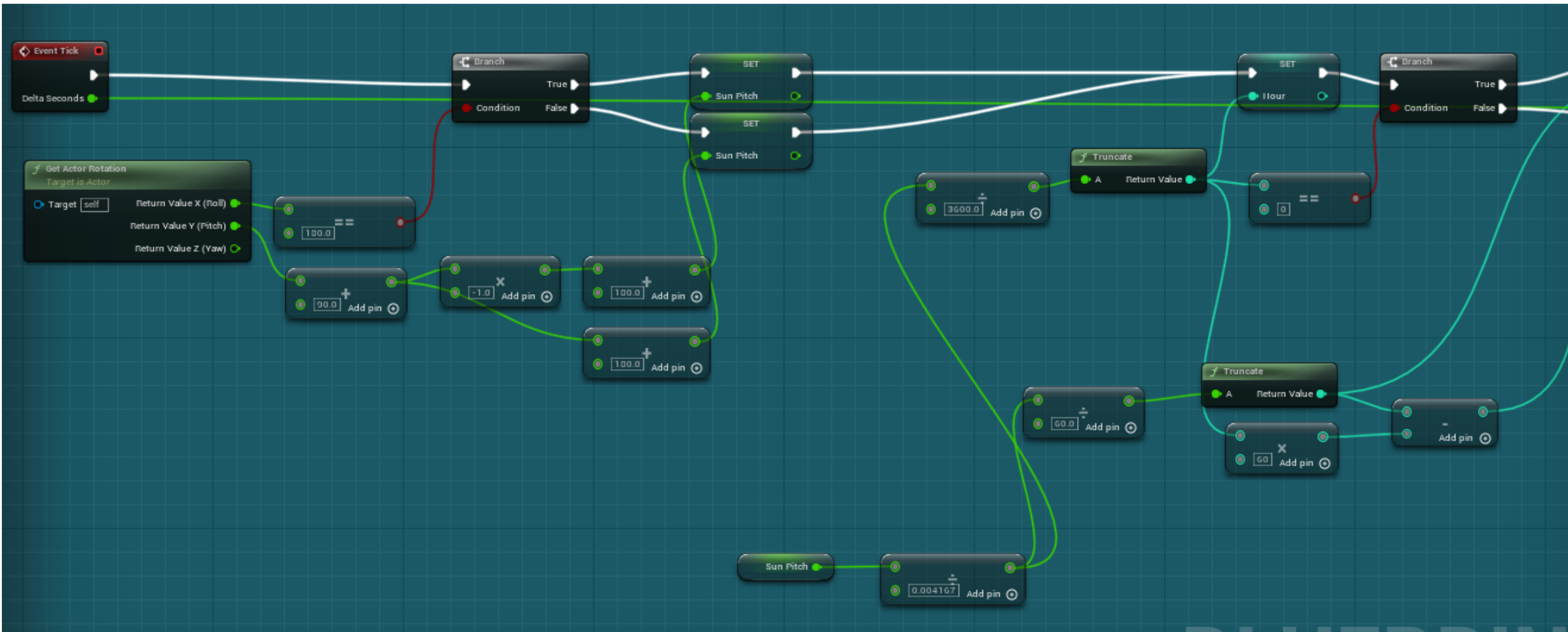
Paintable landscape material



Foliage colour variation and season-specific hue offset

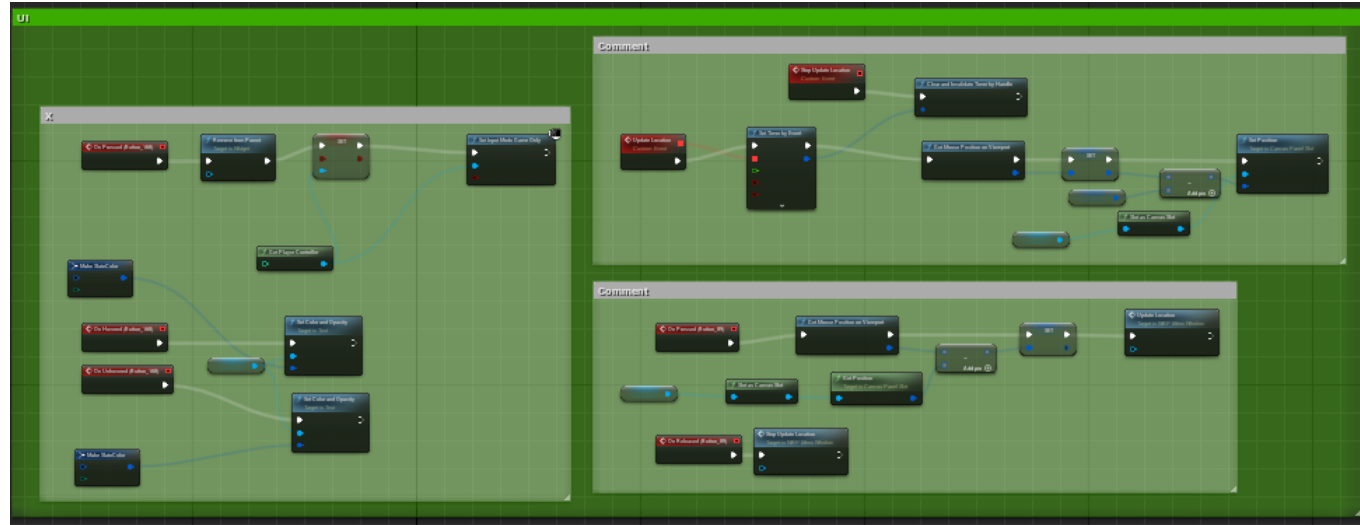
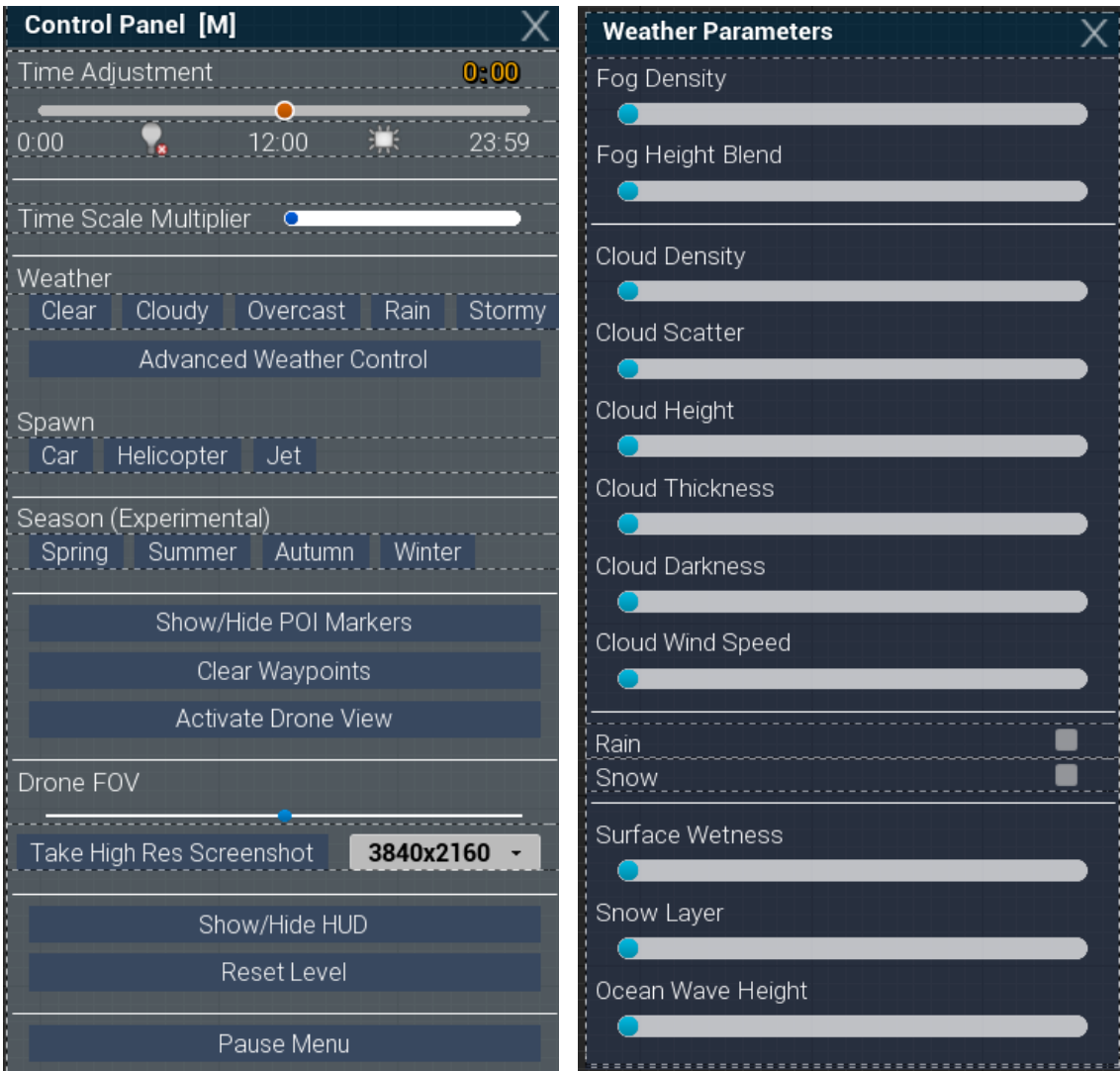






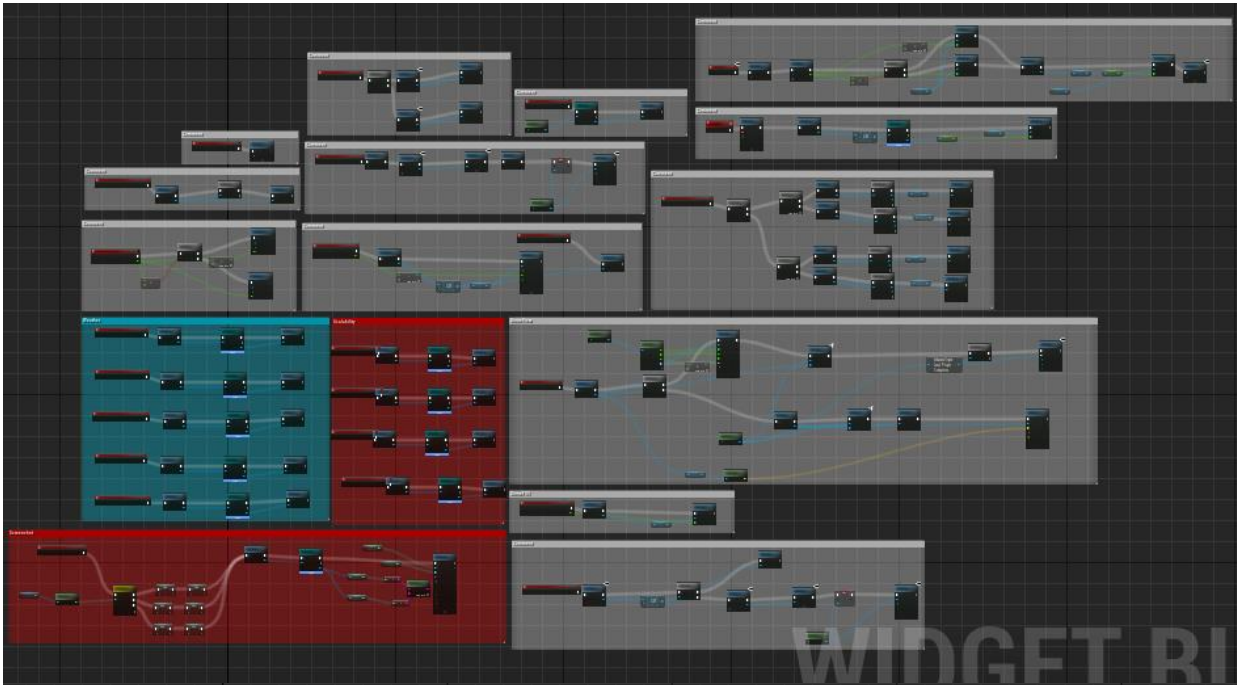
The rotation of the sunlight is converted to 360 degree format 24 hour time is set accordingly.



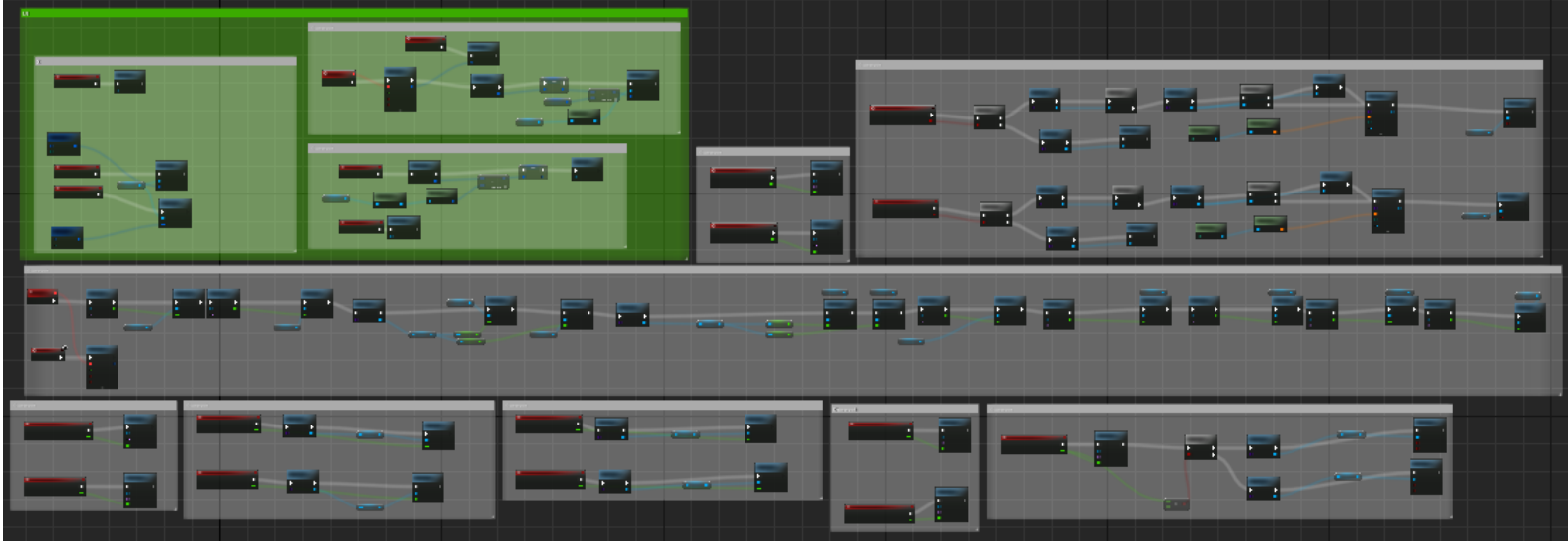


Draggable UI

Interactive Control UI inspired by MSFS 2020



Time controls



Weather parameter controls











