Water Caustics Effect
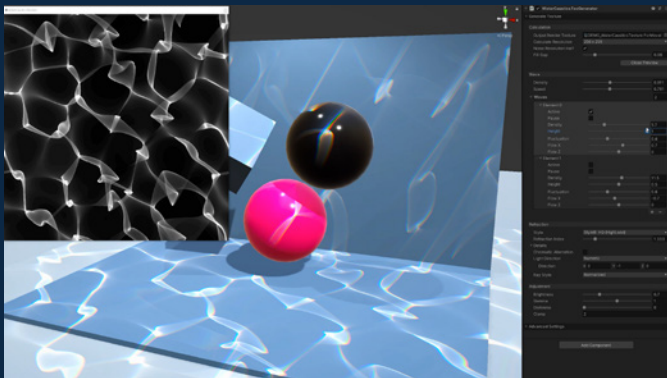
Water Caustics Effect for URP ▶

This asset contains two modules Texture Generator & Effect.

■ **Water Caustics Tex Generator** [URP / HDRP / Standard]

■ **Water Caustics Effect** [URP]

[**2020.3 LTS or higher**] (Tested on Unity 2020.3.13f1, 2021.1.14f1, 2021.2.0b4)

[**PC / MAC / iOS / Android / Switch / Oculus**] (Compute Shader supported devices)

[**DX11,12 / Metal / Vulkan**]   (OpenGL and OpenGL ES have not been tested and are not supported.)

※ All code is included.

※ The specification of URP is still in flux. Therefore, please be aware that it may not work in the future when the URP version is upgraded.

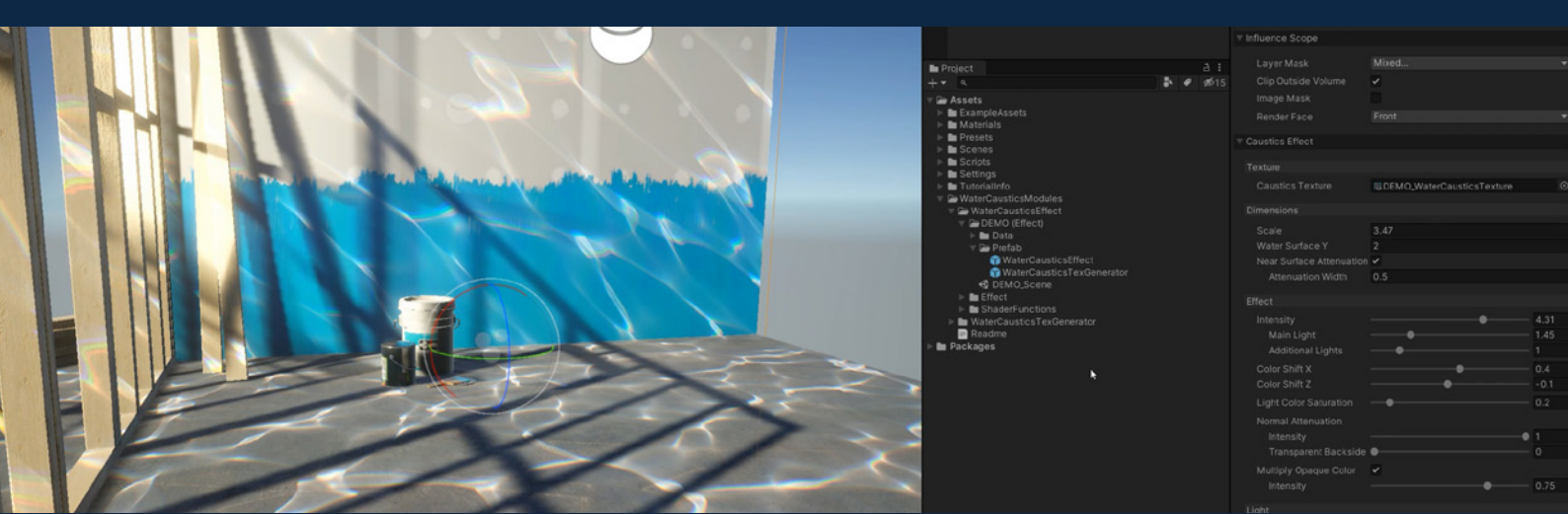※ Please let me know if you encounter any problems. I will try to fix it as soon as possible.

Email: support_asset@hacoapp.com

Twitter: @m_hakozaki

Contents
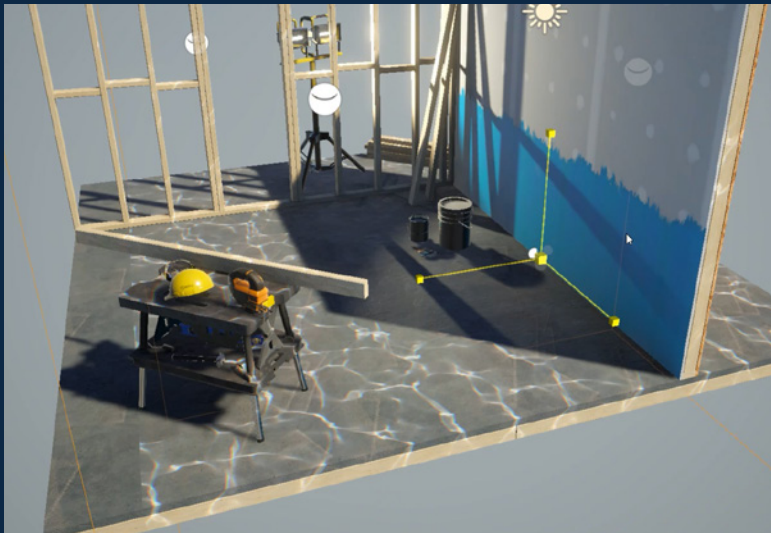
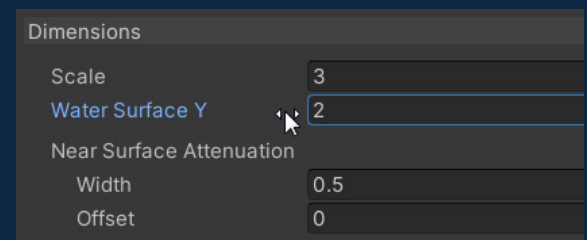# Attach Effect to the Scene ▶

1. Drag and drop the two prefabs from the Project window (DEMO(Effect) > Prefab) into the Hierarchy.
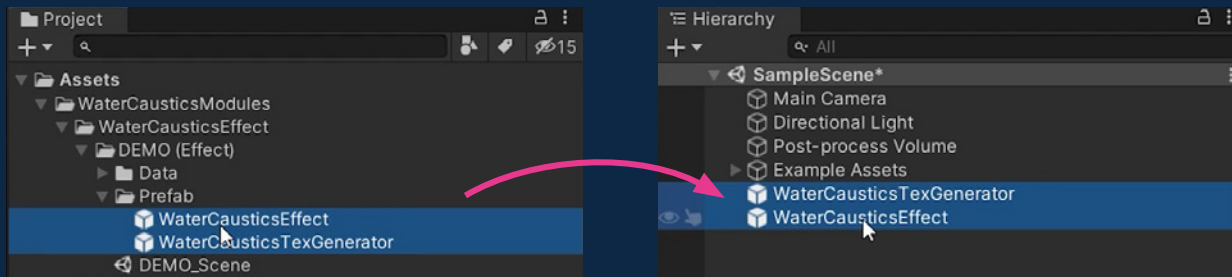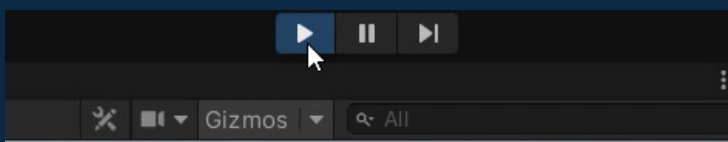

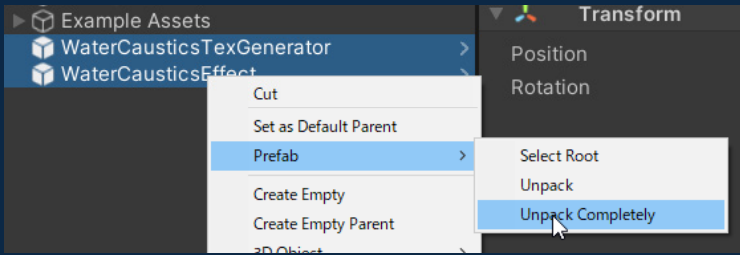2, Select the WaterCausticsEffect and adjust the position and size.

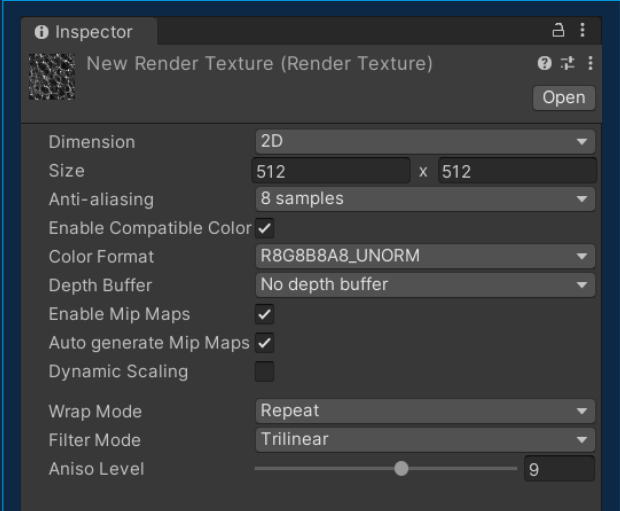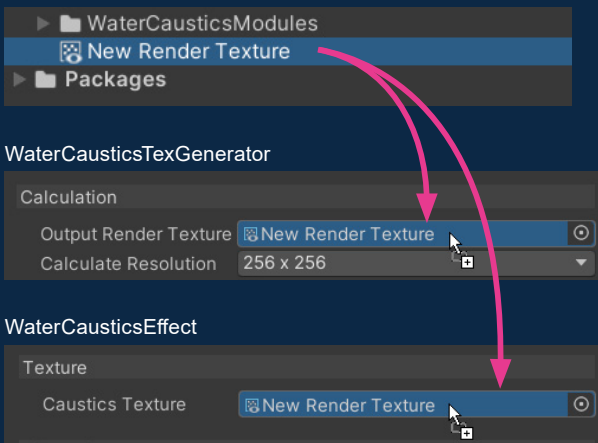If the effect is not visible, adjust Water Surface Y on the Inspector.

3, Enter play mode. The water caustics will animate.
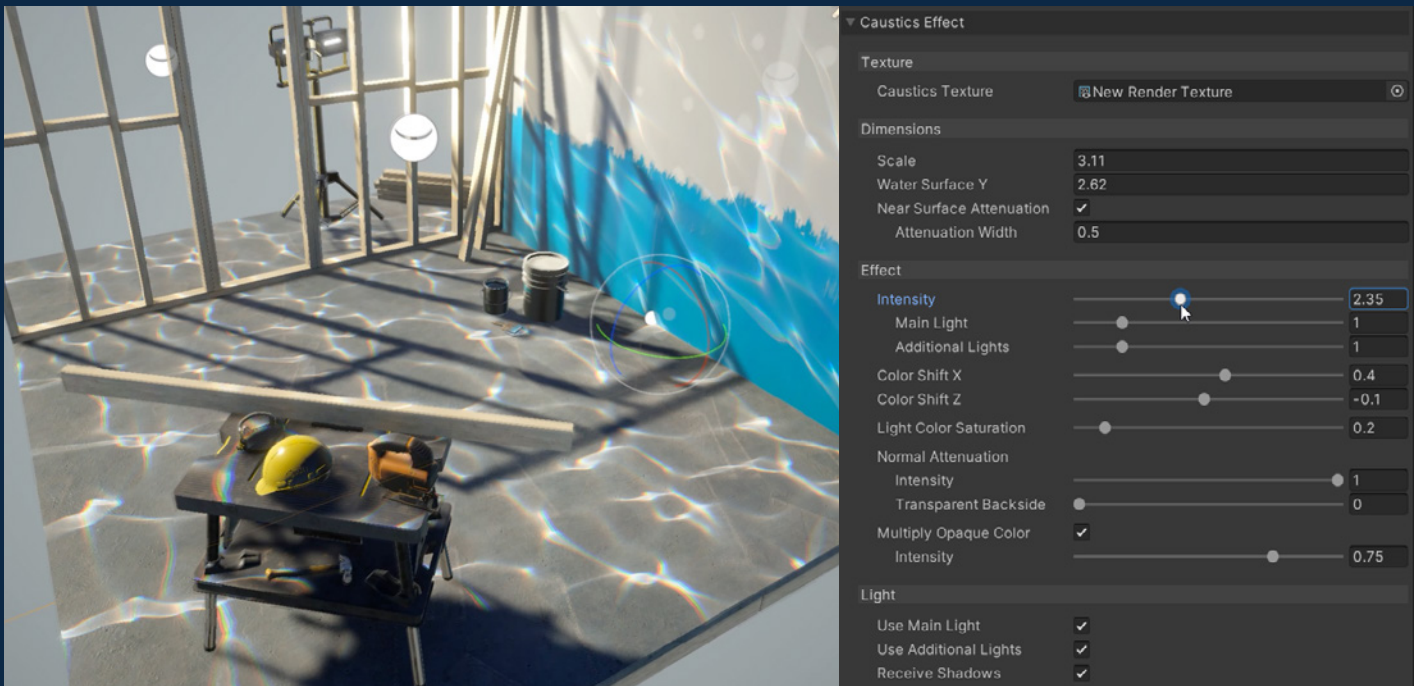

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4, Exit play mode. And unpack the prefabs.

▶ 📦 Example Assets
🔧 WaterCausticsTexGenerator
🔧 WaterCausticsEffect

Cut
Set as Default Parent
Prefab   >   Select Root
                          Unpack
Create Empty   Unpack Completely
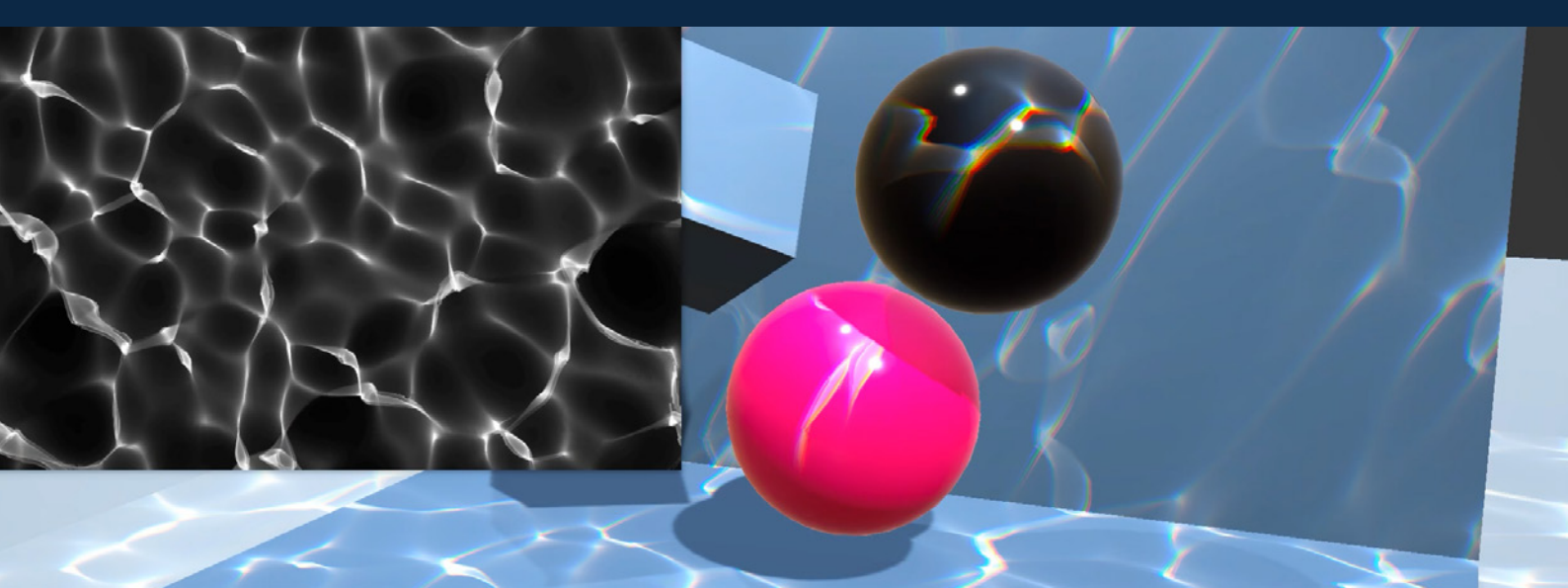Create Empty Parent

▼ 🔧 Transform
Position
Rotation

5, Create a new Render Texture and set. Because the Render Texture in the demo folder may be overwritten in a future update.

▶ 📁 WaterCausticsModules
🖼 New Render Texture
▶ 📁 Packages

WaterCausticsTexGenerator

Calculation

Output Render Texture   🖼New Render Texture   ⊙
Calculate Resolution   256 x 256

WaterCausticsEffect

Texture

Caustics Texture   🖼New Render Texture   ⊙

ℹ Inspector
🖼 New Render Texture (Render Texture)   ❓ ⤢ ⋮
                                              Open

Dimension   2D
Size   512   x 512
Anti-aliasing   8 samples
Enable Compatible Color ✔
Color Format   R8G8B8A8_UNORM
Depth Buffer   No depth buffer
Enable Mip Maps   ✔
Auto generate Mip Maps ✔
Dynamic Scaling   ☐

Wrap Mode   Repeat
Filter Mode   Trilinear
Aniso Level   9

Render Texture Settings Example

6, Adjust the settings to the desired appearance.

▼ Caustics Effect

Texture
Caustics Texture   🖼New Render Texture   ⊙

Dimensions
Scale   3.11
Water Surface Y   2.62
Near Surface Attenuation ✔
    Attenuation Width   0.5

Effect
Intensity   2.35
    Main Light   1
    Additional Lights   1
Color Shift X   0.4
Color Shift Z   -0.1
Light Color Saturation   0.2
Normal Attenuation
    Intensity   1
    Transparent Backside   0
Multiply Opaque Color   ✔
    Intensity   0.75

Light
Use Main Light   ✔
Use Additional Lights   ✔
Receive Shadows   ✔

WaterCausticsTexGenerator Reference ▶

[**URP / HDRP / Standard**]

[**PC / MAC / iOS / Android / Switch / Oculus**]
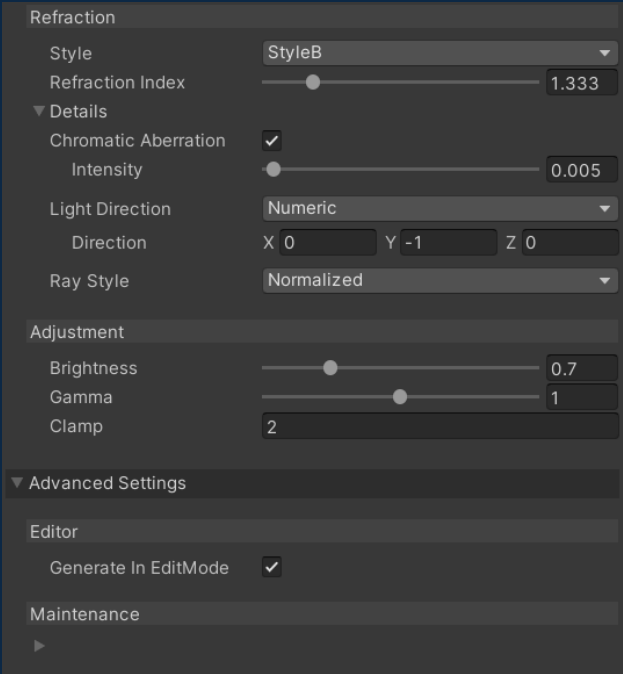
[**DX11,12 / Metal / Vulkan**]

[**Unity 2020.3 LTS or above**]

・Generates rich, realistic water caustics effect animated textures at runtime.

・If using only this generator, any render pipeline (SRP, URP, HDRP, Standerd) can be used.

 (However it is designed to be used in linear color space. If used in gamma color space, raise the value to a power of 1/2.2 at using.)

| Calculation	
Output Render Texture	Output destination render texture.
Calculate Resolution	Resolution used for internal calculations.
Fill Gap	If the edges of the output image are not drawn, increase the value. Make it as small as possible to reduce the load.
Open/Close Preview	Open and close the preview window.

| Wave	
Density	Adjust the overall density.
Speed	Adjust the overall speed.
Waves	Wave settings. Supports up to 4.
Active	Toggles this wave on and off.
Pause	Pause the movement of this wave.
Density	Density of wave.
Height	Height of wave.
Fluctuation	Wave fluctuation amount.
Flow U	Movement amount in the U-axis direction.
Flow V	Movement amount in the V-axis direction.

Refraction

Style	StyleB
Refraction Index	1.333
▼ Details	
Chromatic Aberration	✔
Intensity	0.005
Light Direction	Numeric
Direction	X 0 Y -1 Z 0
Ray Style	Normalized

Adjustment

Brightness	0.7
Gamma	1
Clamp	2

▼ Advanced Settings

Editor

Generate In EditMode	✔

Maintenance

▶

Refraction	
Style	How to calculate light focusing.
Refraction Index	Index of refraction.
Chromatic Aberration	Simulate more realistic chromatic aberrations. Amount of calculation increases. For mobile devices, consider using color shift sampling at the time of drawing instead.
Intensity	Shifts the refractive index in the RGB channels.
Light Direction	Direction of the ray from the Light.
Numeric	Direction of the rays from the Light. It will be normalized.
Transform	Transforms the light to be referenced.
Sun	Use the sun setting in the Light Settings window.
Auto	Use the shader's global variable "_LightDirection".
Ray Style	Either normalize the rays past the surface of the water or extend them to the bottom. If the light ray is oblique, there is a noticeable difference.

Adjustment	
Brightness	Adjust the brightness.
Gamma	Adjusts the contrast.
Clamp	Limit the brightness to this value.

Advanced Settings / Editor	
Generate In EditMode	Whether to generate while in edit mode.
Advanced Settings / Maintenance	
	Do not touch these values if there is no problem.
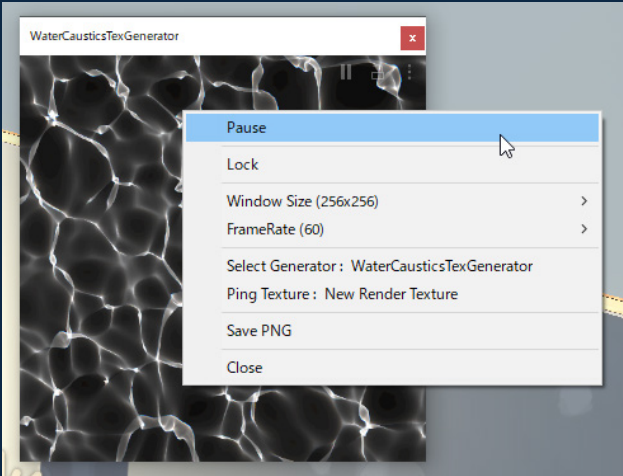
| Preview Window / Context Menu	
Pause	Pause the fluctuation and flow of the waves.
Lock	Lock the generator to be previewed.
Window Size	Specifies the window size.
Frame Rate	Frequency of preview updates.
Select Generator	Select the generator.
Ping Texture	Tells the location of the render texture.
Save PNG	Save the image in PNG format.
Close	Close the window.
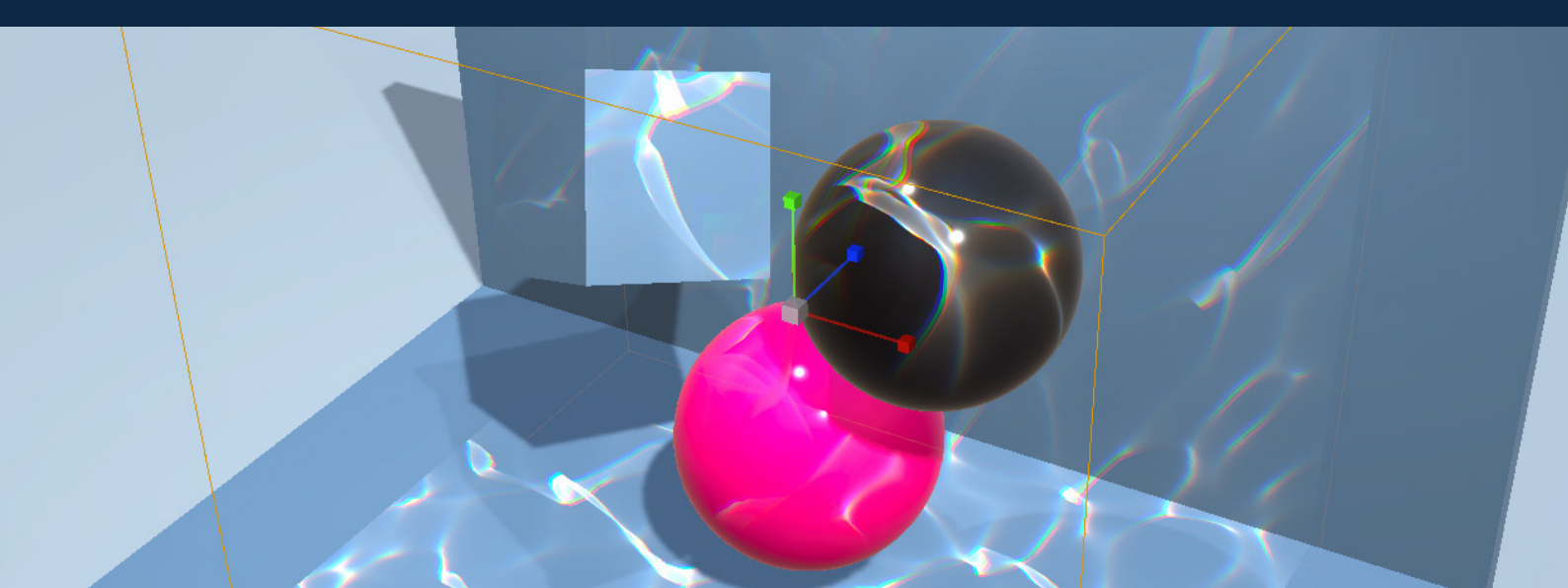
WaterCausticsEffect Reference ▶

[URP]
[PC / MAC / iOS / Android / Switch / Oculus]
[DX11,12 / Metal / Vulkan]
[Unity 2020.3 LTS or above]

・Apply the caustics effect by simply setting the area and target layer.

・Most opaque materials can get the effect without any modification.

・The vertex deformation shader and the alpha blending shader can get the effect by embedding custom functions into the shader. The Custom functions are supported for Shader Graph, HLSL scripting, and Amplify Shader Editor.

・Supports up to 9 Directional, Spot, and Point Lights. (Complies with URP specifications)

・Screen space shadows, added in URP 11.0 are supported.
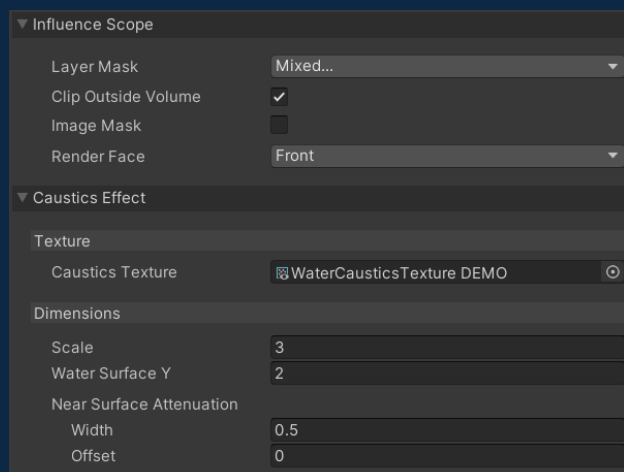
Influence Scope	
Layer Mask	Specify the layers to draw the effect.
Clip Outside Volume	Not draw the outside of the volume.
Image Mask	Texture to use for masking.
Render Face	Which face to draw.

Caustics Effect / Texture	
Caustics Texture	Set the Render Texture specified as the output destination in the Texture Generator.

Dimensions	
Scale	Texture size at the height of the water surface.
Water Surface Y	Height of the water surface. Y-axis. The projected position of the light is calculated with respect to this plane.
Near Surface Attenuation	Attenuation near the surface of the water.
Width	Attenuation width near the water surface.
Offset	Adjustment of height where attenuation starts.

Effect

Effect	
Intensity	Intensity of effect.
Main Light	Adjust the intensity of the main light.
Additional Lights	Adjust the intensity of the additional lights.
Color Shift X	Shifts the RGB channels. X-axis.
Color Shift Z	Shifts the RGB channels. Z-axis.
Light Color Saturation	Color intensity of the light.
Normal Attenuation / Intensy	Attenuation intensity by angle between normal and ray.
Power	Power the attenuation value.
Transparent Backside	The intensity of light transmitted to the back side.
Multiply Opaque Color	Multiply opaque texture color. Opaque Texture is required. Turn it on in the pipeline asset settings or in the camera settings.
Intensity	The intensity of multiplying opaque texture colors.

| Light	
Use Main Light	Whether to calculate the main light.
Use Additional Lights	Whether to calculate the additional lights.
Receive Shadows	Whether to calculate the shadows.

Advanced Settings / Sync	
Sync With Custom Functions	Transmits the settings to the WaterCausticsEmissionSync function embedded in the shader. Turning this On will copy the settings to a global shader variable. If there is more than one of this effect at the same time, only one should be On.

Advanced Settings / Material	
Culling / Cull	Controls which sides of polygons should be culled (not drawn)
Depth /	Depth buffer operations.
ZWrite	Whether to write depth values to the depth buffer.
ZTest	Comparison method with already existing depth values.
Offset Factor	Offset Factor
Offset Units	Offset Units
Stencil /	Stencil operations.
Ref	Stencil Reference Value
ReadMask	Stencil Read Mask
WriteMask	Stencil Write Mask
Comp	Stencil Compare Operation
Pass	Stencil Pass Operation
Fail	Stencil Fail Operation
ZFail	Stencil Z Fail Operation

| Advanced Settings / Maintenance	
	Do not touch these values if there is no problem.
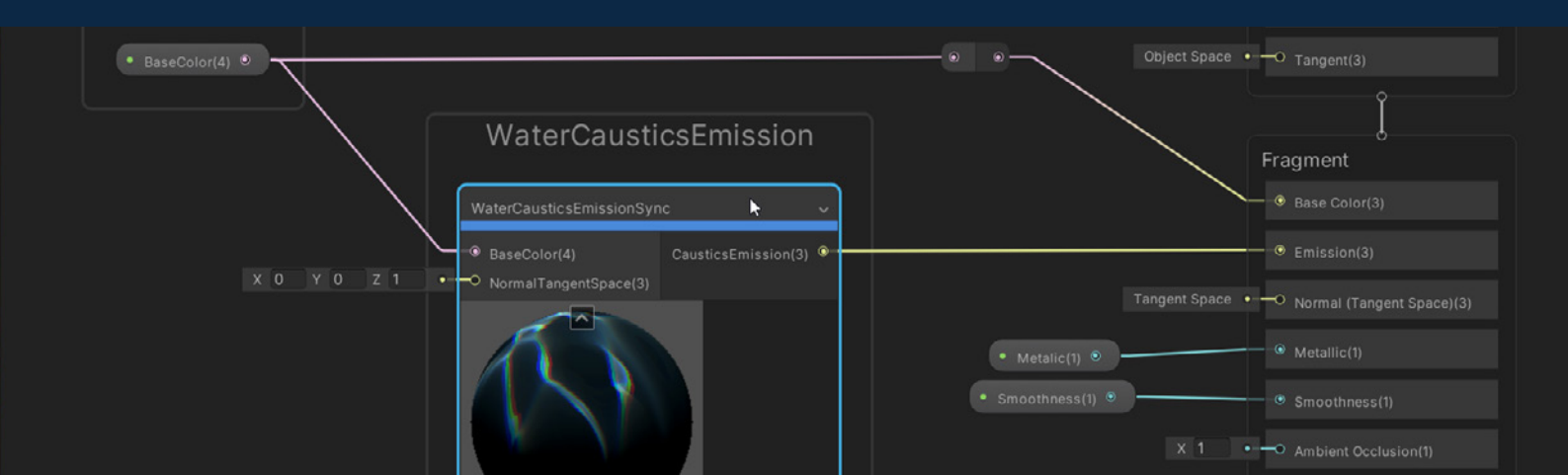
Embed Custom Function to Shader Graph ▶

Most opaque materials can get the effect of the WaterCausticsEffect without any modification, but the vertex deformation shader and the alpha blending shader cannot get the effect without modification. In that case, embed a custom function in the shader to get the effect.
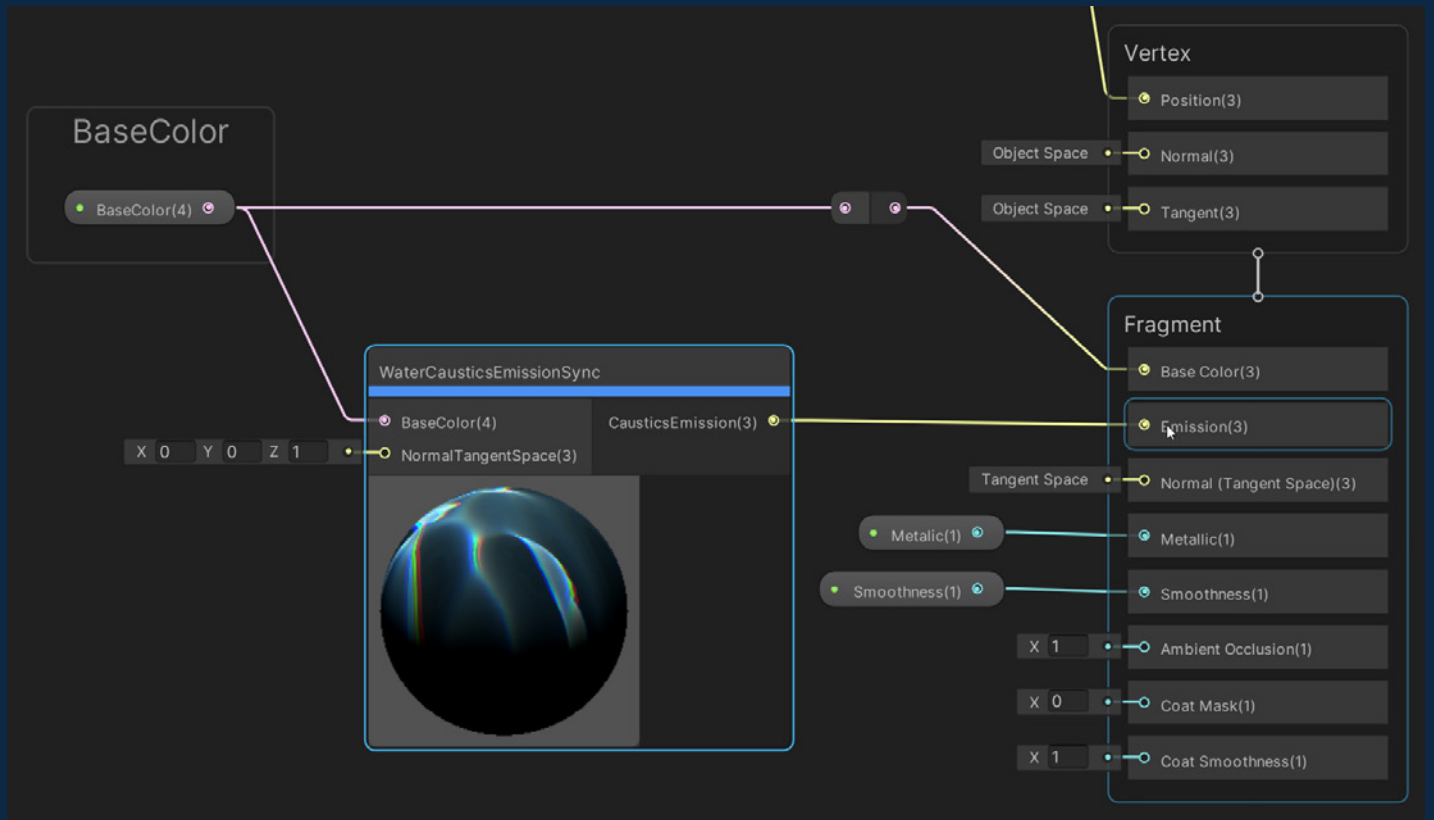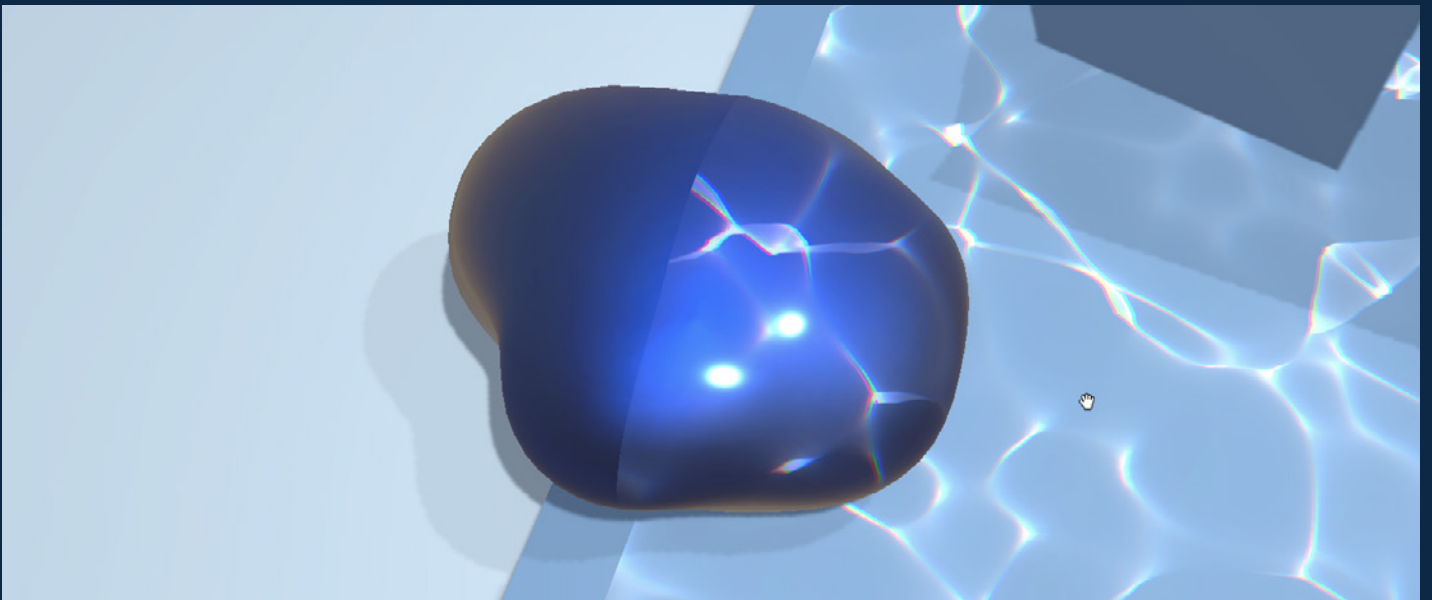
1. Open Shader Graph
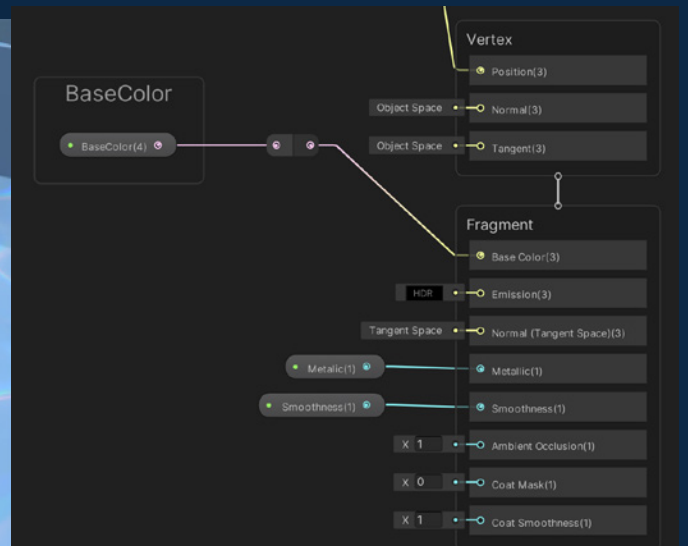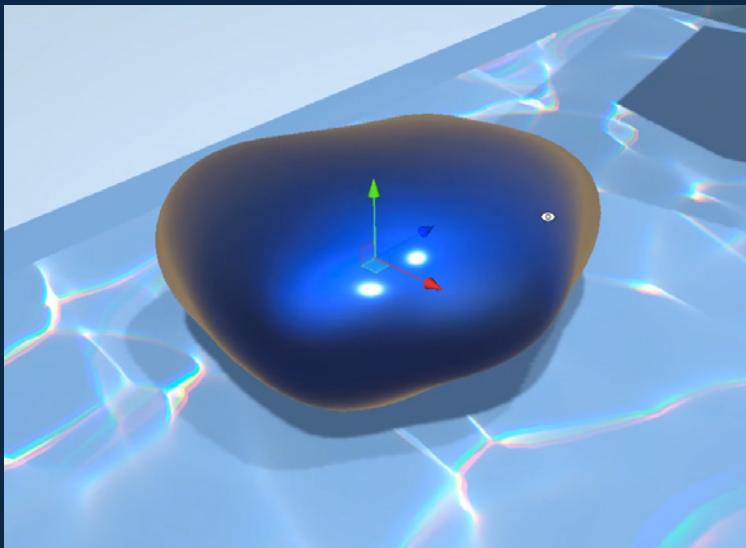
2. In the Create Node, type "water". Create a WaterCausticsEmissionSync.
 (If you want more flexibility adjusting the effect, use WaterCausticsEmission.)

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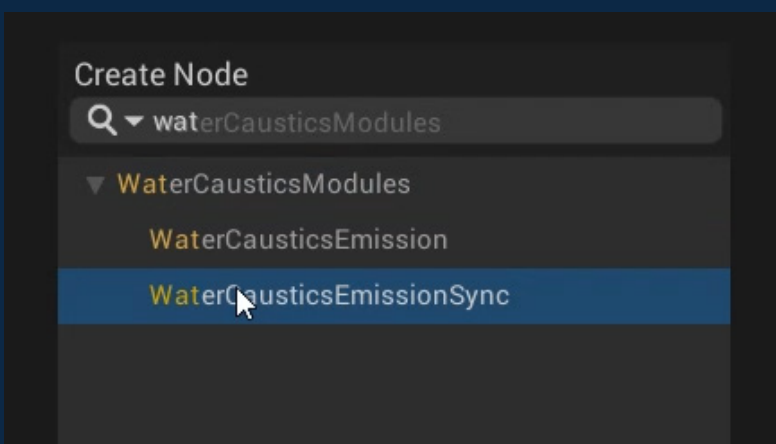
3. Connect the base color to the input and the output to Emission.

4. Save the Shader Graph. Effect will be applied.

Embed Custom Function to Amplify Shader Editor

Amplify Shader Editor is a node-based shader creation tool. (Asset Store Link)

※ If move the WaterCausticsEffect asset folder, there will be an error that the HLSL file cannot be found. In that case, open the shader file and re-save it.

1. Open the UnityPackage in the location shown in the image below. After importing, the UnityPackage can be deleted.
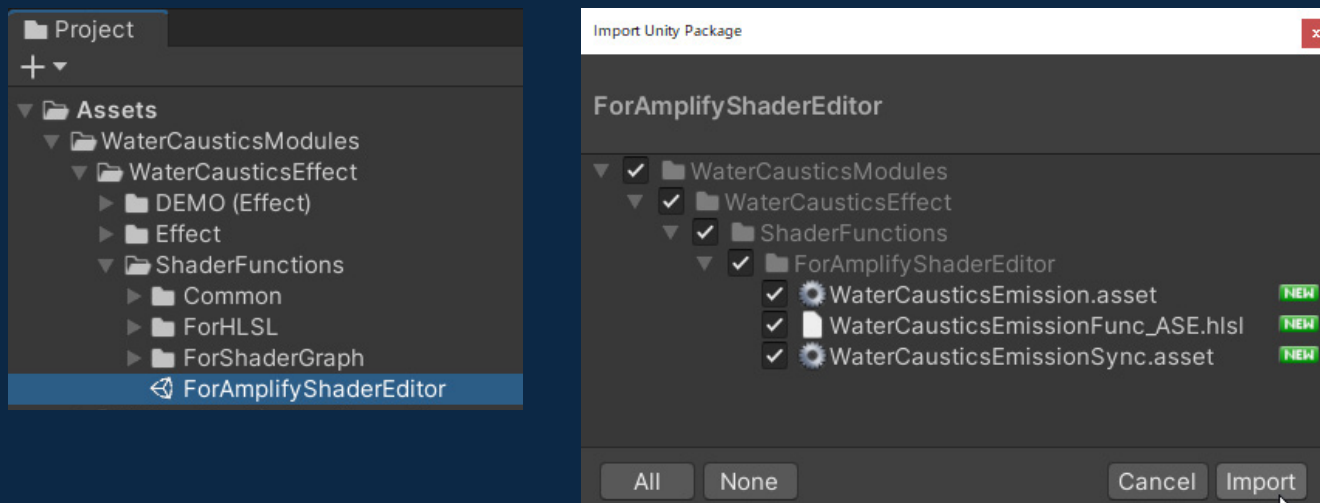
2. After that, the process is the same as for ShaderGraph.
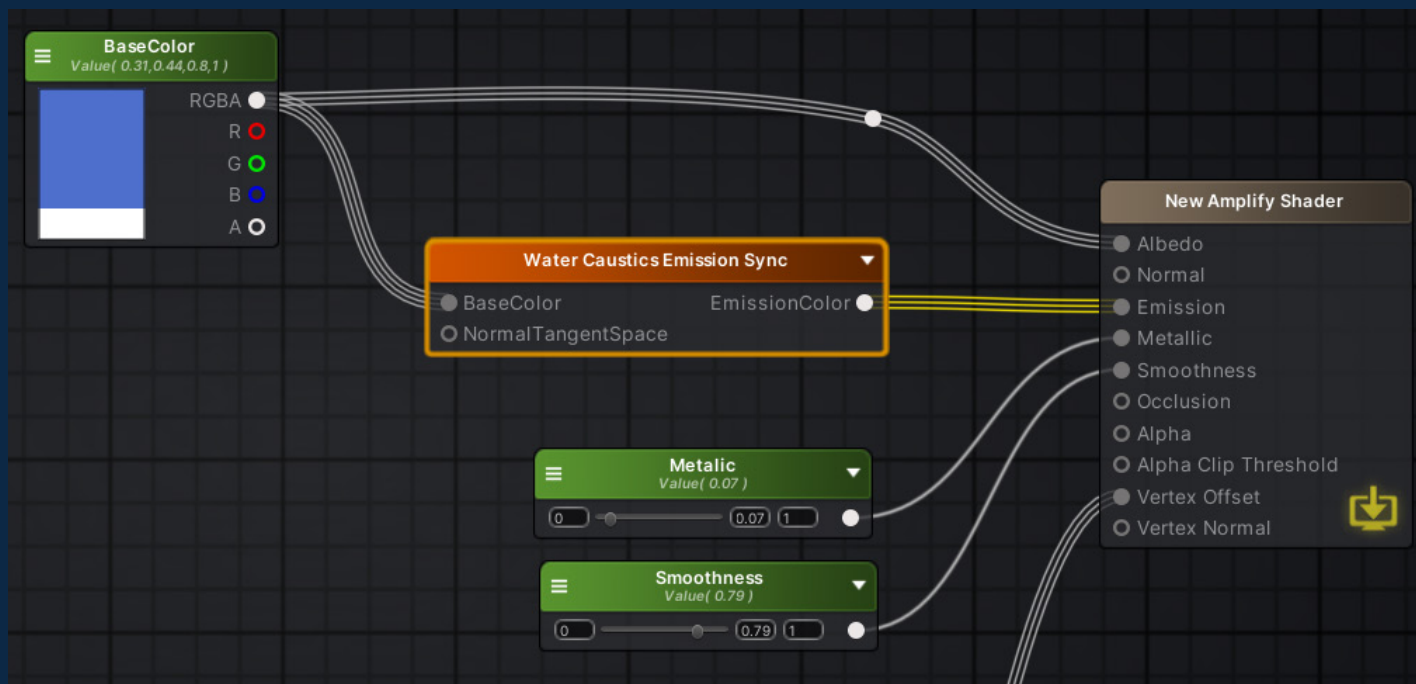
Embed Custom Function to HLSL Scripting

1. Include the custom function HLSL file. The insertion point should be as upper as possible.

#include "Assets/WaterCausticsModules/WaterCausticsEffect/ShaderFunctions/ForHLSL/WaterCausticsEmissionFunc_HLSL.hlsl"

```
HLSLPROGRAM
#include "Assets/WaterCausticsModules/WaterCausticsEffect/ShaderFunctions/ForHLSL/WaterCausticsEmissionFunc_HLSL.hlsl"
```

2-a. Call the function in the fragment shader. The arguments are the world space position, normal, and base color.

half3 WCE_WaterCausticsEmissionSync(float3 WorldPos, half3 NormalWS, half3 BaseColor = half3(1, 1, 1));

```
half3 emission = WCE_WaterCausticsEmissionSync(WorldPos, NormalWS, BaseColor);
```

2-b. If you want more flexibility adjusting the effect, use this function.

half3 WCE_WaterCausticsEmission(float3 WorldPos, half3 NormalWS, Texture2D CausticsTex, SamplerState CausticsTexSS,
float Scale = 3, float WaterSurfaceY = 2, float WaterSurfaceAttenWide = 0.5, float WaterSurfaceAttenOffset = 0,
half IntensityMainLit = 1, half IntensityAddLit = 1, float ColorShiftU = 0.4, float ColorShiftV = -0.1,
half LitSaturation = 0.2, half NormalAttenIntensity = 1, half NormalAttenPower = 2, half TransparentBack = 0);

```
half3 emission = WCE_WaterCausticsEmission(WorldPos, NormalWS, CausticsTex, CausticsTexSS, Scale, WaterSurfaceY,
WaterSurfaceAttenWide, WaterSurfaceAttenOffset, IntensityMainLit, IntensityAddLit, ColorShiftU, ColorShiftV,
LitSaturation, NormalAttenIntensity, NormalAttenPower, TransparentBack);
```