

The background of the entire image is a high-quality rendering of a vast ocean. The water is a deep, vibrant blue, with numerous small, white-capped waves visible across the surface. The horizon line is straight and divides the image roughly in half. Above the horizon, the sky is a lighter blue, filled with soft, white, and light blue clouds that vary in density and shape. The overall lighting suggests a bright, sunny day.

Thank you for Buying

HiG Water System 2.0

An Advanced Water Rendering Solution

For Unity URP

HiG Water System 2.0

HiG Water System 2.0 is an advanced, convenient-to-use and realistic ocean surface rendering solution focused on simulating realistic visuals. It provides real-time, lifelike ocean surface simulations using physics-based oceanographic empirical formulas along with screen-space refraction and reflection based on physical principles.

HiG Water System 2.0 is easy and quick to deploy, featuring an efficient ocean surface toolbox system that allows for rapid parameter adjustments and configuration file saving.

HiG Water System 2.0 is highly versatile, suitable for all scenarios ranging from small rivers to vast oceans. It includes an LOD system that enables the creation of an infinitely expansive ocean surface.

HiG Water System 2.0 includes features like flowmaps, wave scaling, Albedo adjustments, and an interaction system for real-time Kelvin wake simulation. It allows for the creation of flowing rivers, whirlpools, and other dynamic water effects.

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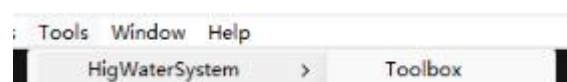
Getting Started

Deployment

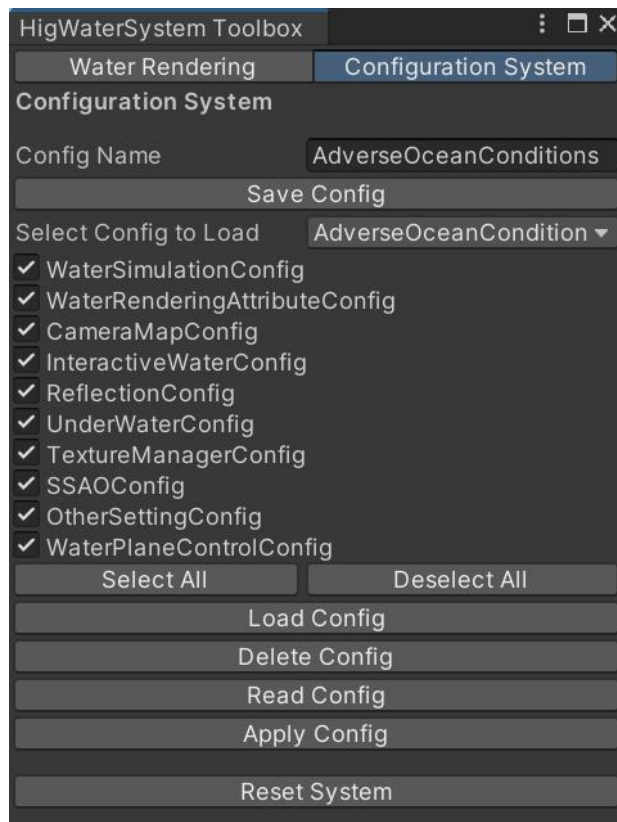
Find the *HigWaterSystem2.0.prefab* file in the *Hig Water System 2.0\Prefab* folder and simply drag it into the scene to complete the deployment. If you want to set the parameters yourself, please unpack the prefab in the scene manually. If you also want to add the default ocean sound effects, you can drag the *OceanAudio.prefab* file from the same directory into the scene as well.

Toolbox

The Toolbox is located under the Tools\HigWaterSystem option in the menu bar. You can find Configuration System and Water Rendering controller here.



Configuration System



The configuration system is located in the Toolbox. In the **Configuration System** page, you can perform configuration file-related operations.

- After entering the **Config Name**, click **Save Config** to save the current settings as a configuration file. Note that if you need to overwrite a configuration file with the same name, double-click **Save Config**.
- When loading a configuration, you first need to select a configuration file. Then, you can choose to load all or part of

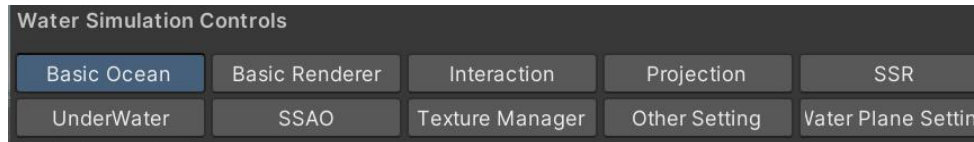
the file's contents from the options menu below. **Select All** to select all parts, click **Deselect All** to cancel all the select.

- **Load Config:** load the entire or partial configuration from the configuration file you selected.
- **Read Config:** will update the configuration file with the current scene's data.
- **Apply Config:** apply the data from **Water Rendering** on the left to the current scene.
- **Delete Config:** delete a selected configuration file.
- If an error occurs in the scene, such as unusual white light, click **Reset System** to restore it.

Water Rendering

The Water Rendering system is also located in the Toolbox, beneath the Configuration System. Most of the water simulation controls and settings are carried out here.

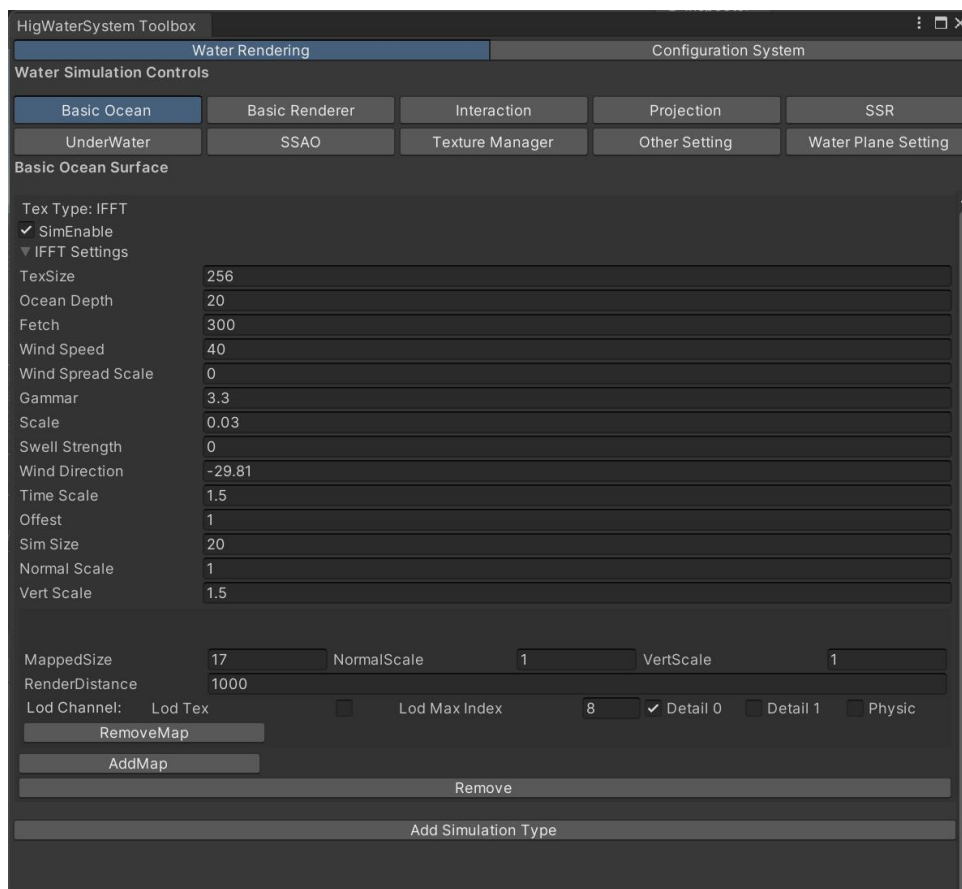
You can find 10 modules under Water Rendering, including **Basic Ocean, Basic Renderer, Interaction, Projection, SSR, UnderWater, SSAO, Texture Manager, Other Settings** and **Water Plane Settings**.



Following the tips below, you can create your ideal water surface out of these 10 modules.

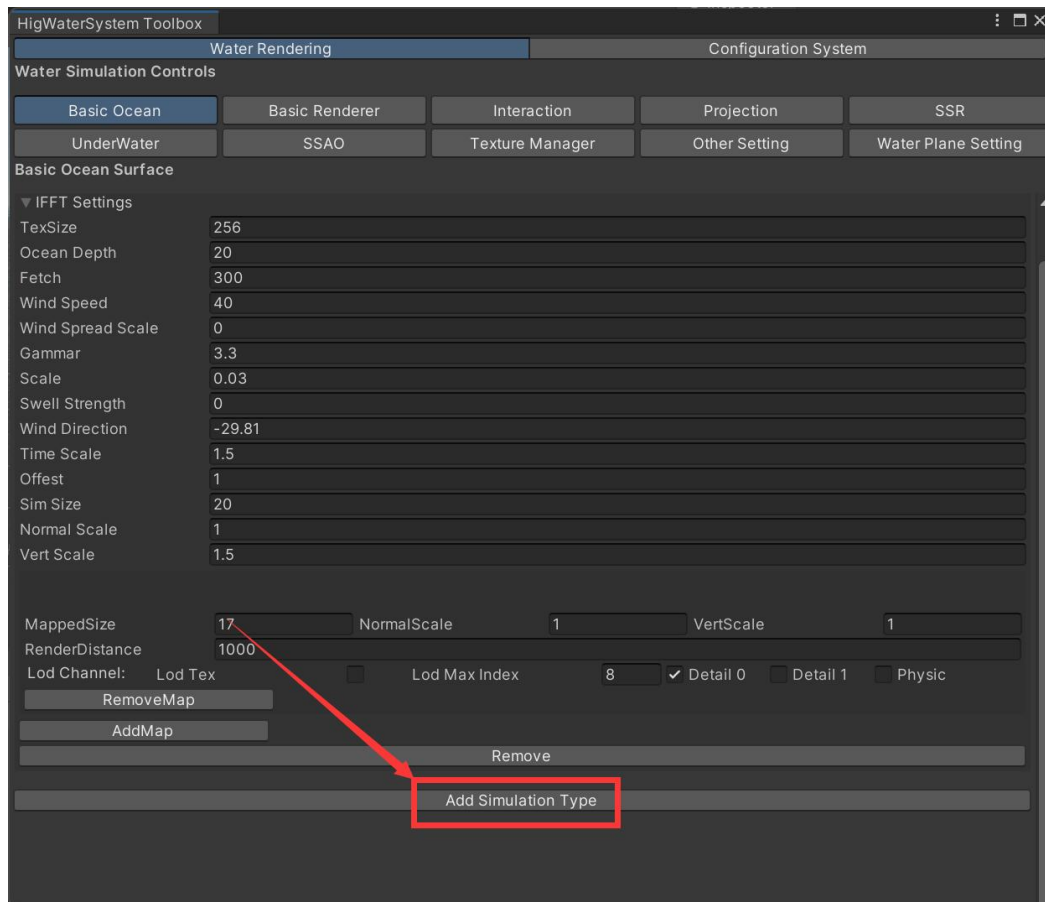
Basic Ocean

You can add multiple wave simulations here to create your desired ocean surface effects. Follow the tips below to set up and configure simulations.



Add Simulation Type

Before setting your ocean simulations, Click the **Add Simulation Type** button at the bottom of the window first. Currently, only **IFFT** is available.



LOD Channel



- **LodTex:** In the **Lod Channel**, click **LodTex** to map the simulation to specific LOD (Level of Detail).

- **LodMaxIndex:** Defines the highest LOD level that the simulation can map to.
- **Detail:** Detail map to high-detail textures that are independent of LOD restrictions. There are 2 detail textures available.
- **Physic:** Enables physics calculations when selected.

Size Parameter Adjustments

MappedSize	17	NormalScale	1	VertScale	1
RenderDistance	1000				

- **NormalScale** and **VertScale:** Multipliers for the normal and vertical channels, respectively.
- **RenderDistance:** The maximum render distance for mapped simulations (does not apply to detailed textures).
- **MappedSize:** Defines the size in world space after mapping.

IFFT Simulation Settings

For the IFFT ocean simulation module, you can adjust following settings based on your need.

Tex Type: IFFT
✓ SimEnable
▼ IFFT Settings

TexSize	256
Ocean Depth	20
Fetch	300
Wind Speed	40
Wind Spread Scale	0
Gammar	3.3
Scale	0.03
Swell Strength	0
Wind Direction	-29.81
Time Scale	1.5
Offset	1
Sim Size	20
Normal Scale	1
Vert Scale	1.5


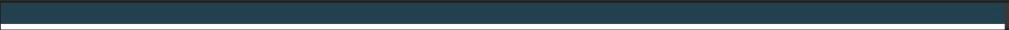
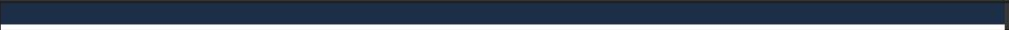
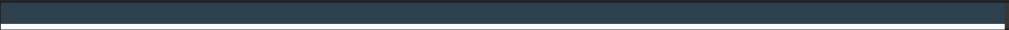
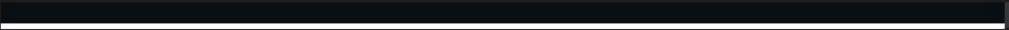
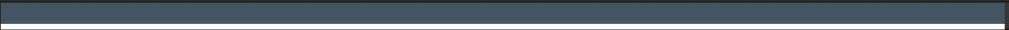
- **TexSize:** Sets the resolution for the simulation.
- **OceanDepth:** Simulates ocean depth (larger values create longer wavelengths).
- **Fetch:** Represents the distance to shore (waves closer to shore are typically calmer).
- **WindSpeed:** Controls the wind speed (higher values increase ocean turbulence).
- **Wind Spread Scale:** Adjusts the balance between stationary wave patterns and directed wave movement.
- **Wind Direction:** Sets the angle of the wind direction.
- **TimeScale:** Adjusts the time scaling factor for the simulation.
- **Offset:** Compresses waves; higher values lead to more wave compression.
- **SimSize:** Defines the area size that this simulation module will cover.

- **NormalScale** and **VertScale**: Control the scaling for normals and vertex transformations, impacting all mapped areas.

Basic Renderer

This module allows you to adjust a variety of fundamental rendering parameters for your ocean simulation. Here's an overview of each parameter and its function. Adjust these settings to fine-tune lighting, scattering, and other effects for a rich visual experience.

Water Rendering Attributes

Water Rendering Attributes	
Render Normal Distance	15000
Render Foam Distance	3000
Shadow Intensity	0.5
Light Color	
Water Color	
Ambient Color	
Reflection Color	
Refraction Color	
Sky Color	
Sky Color HDR	0.4
Ambient Intensity	1
Diffuse Intensity	1
Lambert Factor	0.7
Reflection Blend Ratio	1
Roughness	0.02
Highlight Intensity	30
Highlight HDR Max	4

- **Render Normal Distance**: Sets the maximum distance for normal rendering.

- **Render Foam Distance:** Defines the maximum distance for vertex transformation rendering.
- **Shadow Intensity:** Controls the strength of shadows.
- **Light Color:** Determines the color of light for Lambertian and specular lighting models.
- **Water Color:** Adjusts the water color in the Lambertian lighting model.
- **Ambient Color:** Represents the color for self-emission.
- **Reflection Color:** Sets the global reflection color.
- **Refraction Color:** Specifies the global refraction color.
- **Sky Color:** Influences the sky's color reflected on the ocean surface in mirror-like reflections.
- **Sky Color HDR:** Increases the brightness of mirror reflections from the sky.
- **Ambient Intensity:** Adjusts the intensity of self-emission.
- **Diffuse Intensity:** Affects the intensity of diffuse reflection.
- **Lambert Factor:** Allows for effects like half-Lambert lighting (set to 0.5 for this effect).
- **Reflection Blend Ratio:** Balances between the traditional lighting model and physically-based lighting model.
- **Roughness:** Defines the area over which highlights are calculated.

- **Highlight Intensity:** Controls the strength of highlights.
- **Highlight HDR Max:** Limits the size of bloom effects from highlights.

Point Light Settings

Point Light Settings	
Point Light Roughness	0.3
Point Light Intensity	1
Point Light HDR Max	100

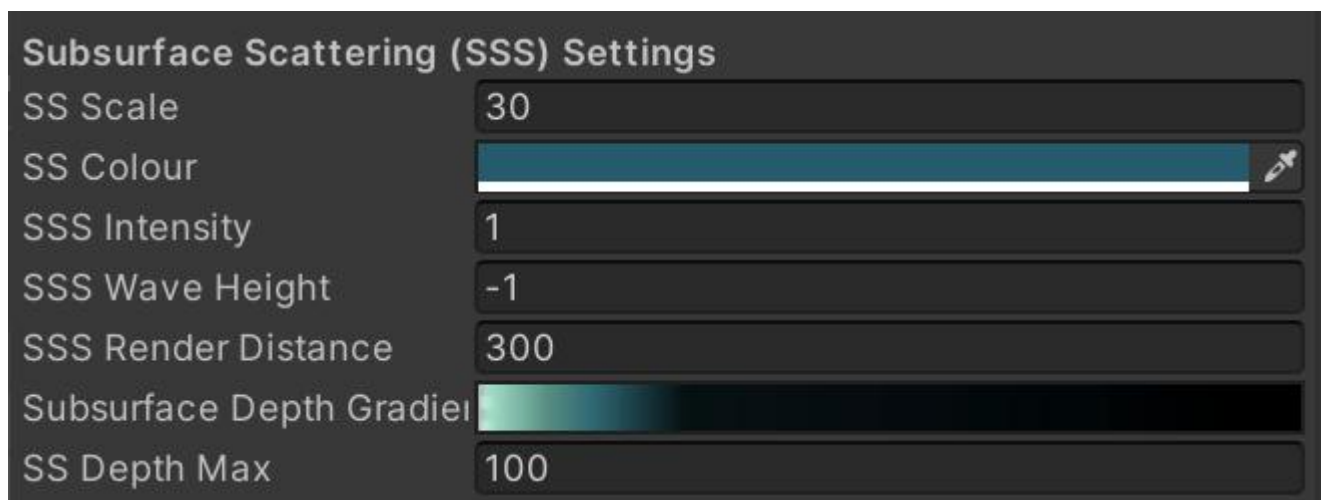
- **Point Light Roughness:** Sets the range of point light reflections on the water surface.
- **Point Light Intensity:** Adjusts the intensity of point light reflections.
- **Point Light HDR Max:** Limits the bloom effect size from point lights.

Peak and Foam Settings

Peak and Foam Settings	
Peak Threshold	-4.5
Peak Scale	0.13
Peak Foam Threshold	-1.7
Peak Foam Intensity	1
Foam Intensity	2

- **Peak Threshold:** Sets the height threshold above which a wave is considered a peak.
- **Peak Scale:** Defines the range of wave peaks.
- **Peak Foam Threshold & Peak Foam Intensity:** Control the threshold and intensity for foam at wave peaks.
- **Foam Intensity:** Adjusts the overall intensity of foam effects.

Subsurface Scattering (SSS) Settings



- **SS Scale:** Determines the scale for subsurface scattering.
- **SS Colour:** Sets the color of subsurface scattering.
- **SSS Intensity:** Controls the strength of subsurface scattering.
- **SSS Wave Height:** Defines the wave height at which subsurface scattering occurs.
- **SSS Render Distance:** Limits the rendering distance for subsurface scattering effects.

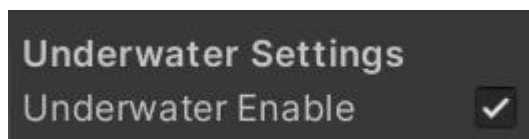
- **Subsurface Depth Gradient:** Adjusts color change based on depth, useful for refractive color calculations to the seafloor.
- **SS Depth Max:** Defines the depth at which the **Subsurface Depth Gradient** reaches its maximum.

Fog Settings



- **Fog Enable:** Toggles fog effects on or off.
- **Fog Distance:** Sets the distance for fog appearance.
- **Fog Power:** Controls the gradient of the fog effect.
- **Fog Color:** Determines the color of the fog.

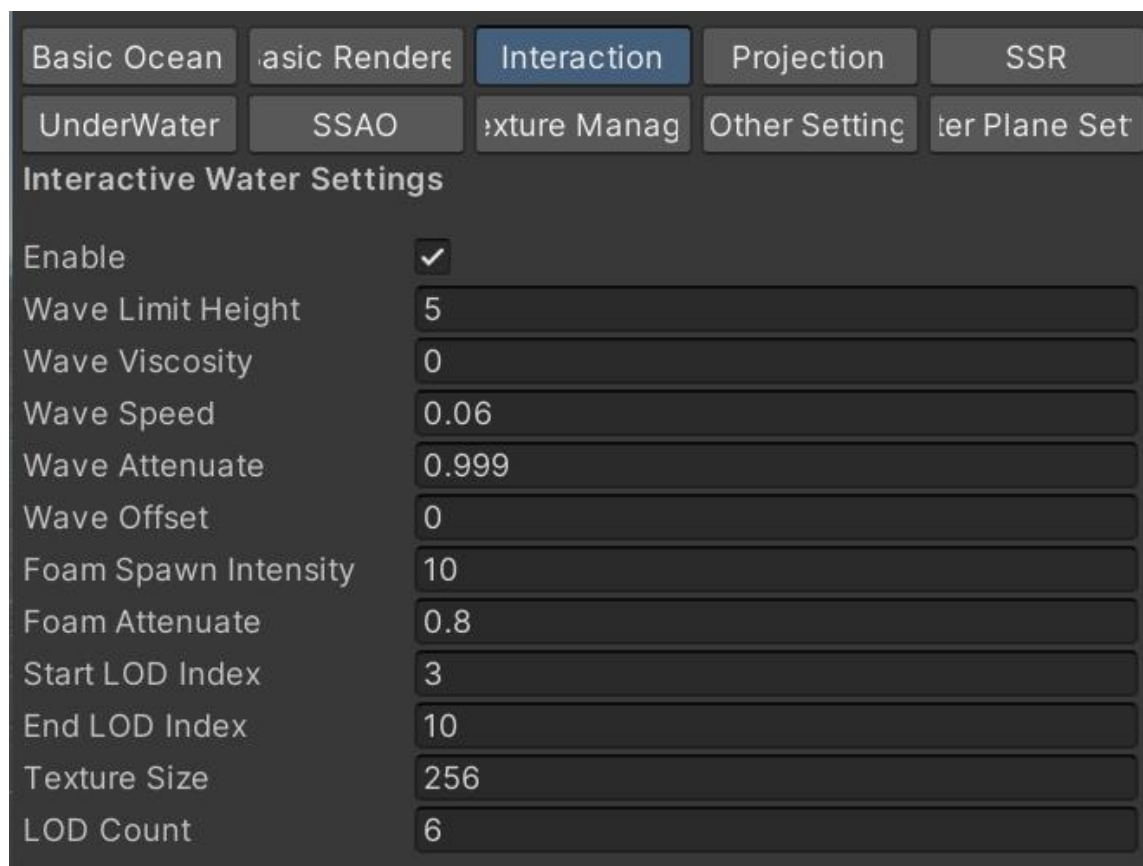
Underwater Settings



- **Underwater Enable:** Manages the activation of global underwater effects.

Interaction

Hig Water System 2.0 enables water surface interactions and wave simulations, you can set them here.



- **Enable:** Toggles water surface interaction on or off.

Wave Properties

- **Wave Limit Height:** Sets the maximum height of waves.
- **Wave Viscosity:** Controls the viscosity of waves, affecting how they dissipate.

- **Wave Speed:** Determines the propagation speed of waves.
- **Wave Attenuate:** Adjusts the energy decay rate of waves with each update.
- **Wave Offset:** Defines the compression effect of waves on the water surface.

Foam Properties

- **Foam Spawn Intensity:** Controls the intensity of foam generated by waves.
- **Foam Attenuate:** Sets the rate at which foam dissipates with each update.

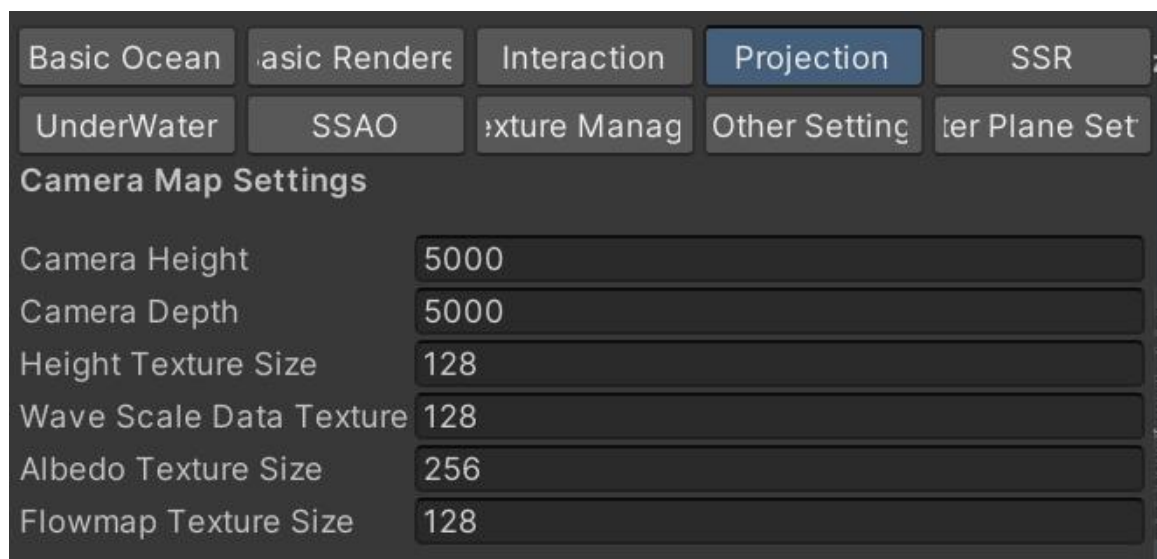
LOD Settings

- **Start LOD Index:** Defines the minimum LOD level for interactive water simulation.
- **End LOD Index:** Sets the maximum LOD level affected by interactive water.
- **Texture Size:** Specifies the resolution for interactive water textures.
- **LOD Count:** Determines the maximum number of LODs that simulate interactive water simultaneously.

Projection

Hig Water System 2.0 has a strong projection system enabling the creation of rivers, vortices, or even projected images onto specific areas of the water surface.

Camera Map Settings



- **Camera Height:** Sets the height of the projection camera.
- **Camera Depth:** Determines the depth of the projection camera.

There are four types of projections available:

Height: Projects the height of the water surface.

WaveScale: Controls the scaling of water data. The **x** axis adjusts wave simulations, and the **y** axis scales the height projection.

Albedo: Projects the water surface color.

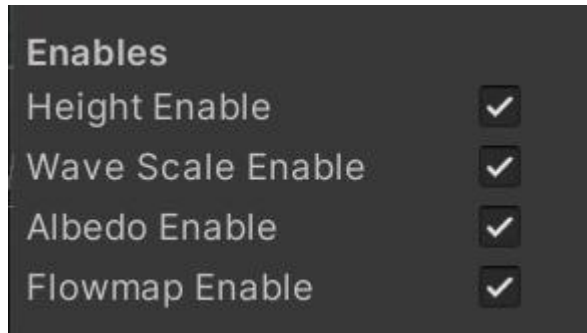
Flowmap: Projects the flow direction of the water surface.

You can set them using:

- **Height Texture Size:** Sets the resolution for the height projection.
- **Wave Scale Data Texture:** Determines the resolution for the WaveScale projection.
- **Albedo Texture Size:** Specifies the resolution for the Albedo projection.
- **Flowmap Texture Size:** Sets the resolution for the Flowmap projection.

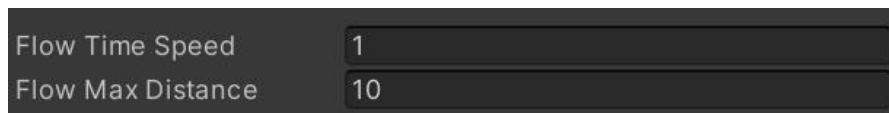
Projection Enable Toggles (Enables)

Each projection type can be enabled or disabled:



- **Height Enable:** Toggles the height projection camera.
- **Wave Scale Enable:** Toggles the WaveScale projection camera.
- **Albedo Enable:** Toggles the Albedo projection camera.
- **Flowmap Enable:** Toggles the Flowmap projection camera.

Flowmap Settings



- **Flow Time Speed:** Controls the flowmap's speed based on time.
- **Flow Max Distance:** Sets the maximum distance-based speed for the flowmap.

LOD limits

You can set the LOD limit of each projection type here.

LOD Limits	
Height LOD Limit	9
Wave Scale LOD Limit	9
Flowmap LOD Limit	6
Albedo LOD Limit	7

- **Height LOD Limit:** Determine the maximum level of LOD layers that Height projection can be mapped to.
- **Wave Scale LOD Limit:** Determine the maximum level of LOD layers that Wave Scale projection can be mapped to.
- **Flowmap LOD Limit:** Determine the maximum level of LOD layers that Flowmap projection can be mapped to.
- **Albedo LOD limit:** Determine the maximum level of LOD layers that Albedo projection can be mapped to.

SSR

The **SSR** feature in Hig Water System 2.0 allows for highly realistic reflections and refractions, essential for achieving lifelike water surfaces.

Reflection Settings

- **Reflection Type** and **Refraction Type:** Adjust the type of reflection and refraction with options:

Reflection Settings	
Reflection Type	SSR
Refraction Type	SSR

Off
Fake
✓ SSR

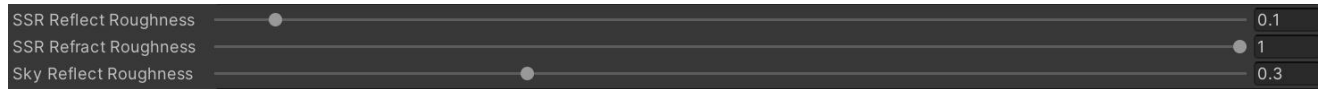
- **None:** No effect.
- **Fake:** Simulated based on normal perturbation.
- **SSR:** Full Screen Space Reflection and Refraction.

SSR Settings

SSR Settings	
SSR Reflection Color	
SSR Refraction Color	
SSR Intensity Reflection	1
SSR Intensity Refraction	20
Distortion Intensity Reflec	1
Distortion Intensity Refrac	1
Refraction Intensity	1
Reflection Intensity	1

- **SSR Reflection Color** and **SSR Refraction Color:** Adjust the color multiplier when light hits an object for reflection and refraction.
- **SSR Intensity Reflection** and **SSR Intensity Refraction:** Set the intensity multipliers for reflections and refractions upon light contact.
- **Distortion Intensity Reflection** and **Distortion Intensity Refraction:** Control distortion intensity in fake reflections and refractions.

- **Refraction Intensity** and **Reflection Intensity**: Adjust the overall strength of global reflection and refraction.



- **SSR Reflect Roughness** and **SSR Refract Roughness**: Control the water surface roughness for reflection and refraction (1 represents true normal direction; 0 treats the water surface as flat).
- **Sky Reflect Roughness**: Adjusts the roughness for the skybox reflection when light does not hit any object.

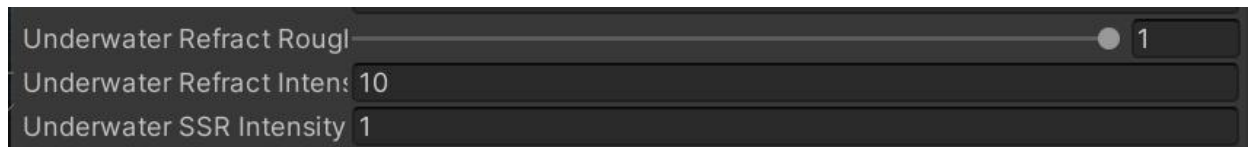


- **Reflect Clip Offset**: Clips objects below a certain distance from the water surface, preventing them from being hit by reflected light.

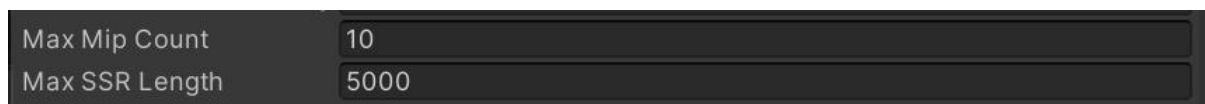
SSR Step Reflection	30
SSR Step Refraction	30
SSR Thickness Reflection	10
SSR Thickness Refraction	20

- **SSR Step Reflection** and **SSR Step Refraction**: Define the maximum step distance for reflections and refractions.

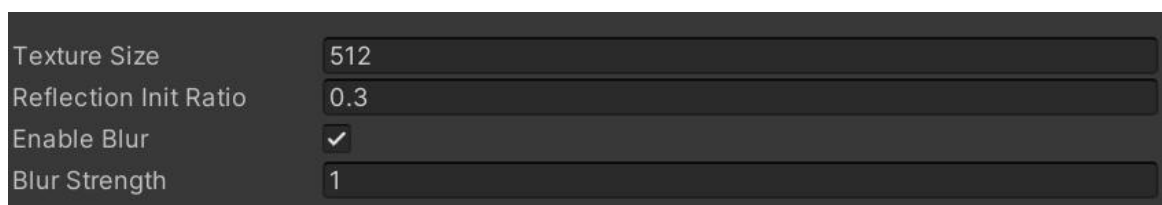
- **SSR Thickness Reflection** and **SSR Thickness Refraction**: Set the perceived thickness of objects, preventing missed objects in multi-step reflections.



- **Underwater Refract Roughness** and **Underwater Refract Intensity**: Adjust roughness and intensity for underwater refraction when receiving light from above.
- **Underwater SSR Intensity**: Controls the refraction intensity specifically for underwater environments.




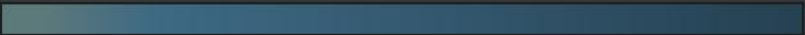

- **Max Mip Count**: Sets the maximum number of MipMaps generated for SSR optimization using the HiZ buffer.
- **Max SSR Length**: Defines the maximum travel distance of SSR rays.



- **Texture Size:** Determines the resolution for refraction and reflection rendering.
- **Reflection Init Ratio:** Controls the balance between reflection and refraction when the camera angle is perpendicular to the surface.
- **Enable Blur:** Enables a blur effect for smoother reflections.
- **Blur Strength:** Sets the intensity of the blur effect.

Underwater

The **Underwater** module allows you to adjust rendering settings for the underwater view, creating a realistic experience beneath the water surface.

Underwater Settings	
Render Type	Render Pipeline Manager
Underwater View Distance	40
Underwater Color	
Underwater Power	0.2
Depth Color Gradient	
Depth Color Distance	10
Depth Color Factor	0.34
Underwater Light Color	
Underwater Light Power	4
Underwater Light Intensity	1.54
Underwater Light Basic	0.54
Seabed Light Basic	0.2
Seabed Light Power	0.8
Absorbivity Of Water	0.002

- **Render Type:** control how underwater effects are rendered.

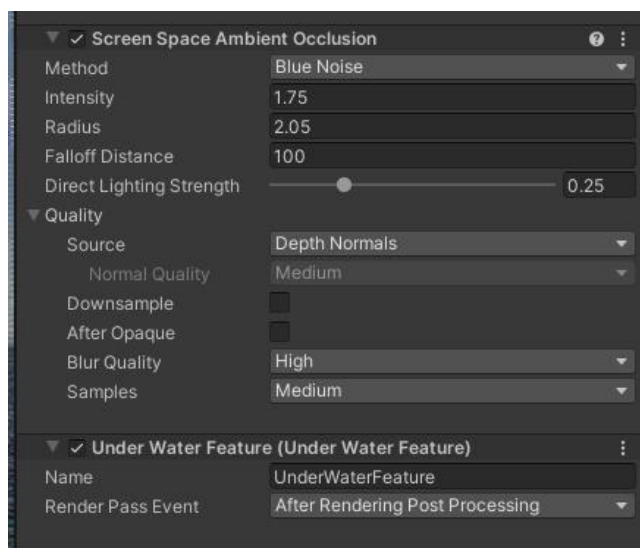
There are two options:

1. Render Pipeline Manager

You can add underwater effects without any other operations under **Render Pipeline Manager** type.

2. Render Feature

If you choose **Render Feature** type, you will need to manually add a **Render Feature** in the **Universal Renderer Data** used by the target camera which you want to add underwater effects to, as the following photo shows.



- **Underwater View Distance:** Sets the maximum visible distance underwater.
- **Underwater Color:** Defines the overall color of the underwater environment.

- **Underwater Power:** Controls the gradient effect of underwater fog.
- **Depth Color Gradient:** Adjusts the color of water at varying depths for a natural depth-based color transition.
- **Depth Color Distance:** Specifies the depth at which the water reaches its deepest color.
- **Depth Color Factor:** Controls the proportion of depth color within the overall underwater color scheme.
- **Underwater Light Color:** Sets the color of sunlight as it penetrates the water.
- **Underwater Light Intensity:** Adjusts the strength of sunlight underwater.
- **Underwater Light Power:** Modifies the gradient of sunlight as it fades underwater.
- **Underwater Light Basic:** Establishes the base color for the underwater lighting.
- **Seabed Light Basic:** Defines the base color of the seabed.
- **Seabed Light Power:** Controls the gradient effect of light on the seabed.
- **Absorbitivity Of Water:** Sets the absorption rate of sunlight as it passes through the water surface.

SSAO

The powerful **SSAO** feature in Hig Water System 2.0 provides realistic ambient occlusion effects on the water surface, enhancing depth and shading.

- **Enable:** Toggles the SSAO feature on or off.



Shadow and Radius Controls

SSAO Shadow Min	0.1
SSAO Radius Min	0
SSAO Radius Max	1
SSAO Distance	1400

- **SSAO Shadow Min:** Sets the minimum intensity for SSAO shadows.
- **SSAO Radius Min** and **SSAO Radius Max:** Define the minimum and maximum sampling radius for SSAO points.
- **SSAO Distance:** Adjusts the distance range for sampling points from the minimum to maximum radius.

SSAO Intensity	3
SSAO Intensity Factor	1

- **SSAO Intensity** and **SSAO Intensity Factor**: Control the overall intensity and gradient of the SSAO effect.

Sampling Distribution

Sigma	3
Normal Disturbance Inten	0.2
Sample Points Count	<input type="range"/> 32

- **Sigma**: Adjusts the density of sampling points; higher values make the sampling points more concentrated, following a normal distribution for more efficient target hits.
- **Normal Disturbance Intensity**: Simulates a convex surface by using the normal direction to adjust SSAO sampling on the water surface.
- **Sample Points Count**: Sets the number of sampling points used for SSAO calculations.

Blur Settings

Enable Blur	<input checked="" type="checkbox"/>
Blur Normal Threshold	0.5
Blur Range Factor	1

- **Enable Blur**: Activates a blur filter for smoothing SSAO effects.

- **Blur Normal Threshold:** Determines the threshold at which normals are filtered out during blur based on their difference.
- **Blur Range Factor:** Defines the range within which blur filtering is applied.

Resolution Control



- **Resolution Scale Factor:** Reduces SSAO resolution by a factor of 2^n to improve performance.

Texture Manager

The **Texture Manager** module handles LOD and detail textures, allowing you to control texture resolutions and mapping settings.

Vertex and Normal Texture Size

You can set the resolution of textures here.

Vertex and Normal Texture Sizes			
Vert Tex Size 0	256	Normal Tex Size 0	512
Vert Tex Size 1	256	Normal Tex Size 1	512
Vert Tex Size 2	256	Normal Tex Size 2	512
Vert Tex Size 3	256	Normal Tex Size 3	512
Vert Tex Size 4	256	Normal Tex Size 4	512
Vert Tex Size 5	256	Normal Tex Size 5	256
Vert Tex Size 6	256	Normal Tex Size 6	256
Vert Tex Size 7	256	Normal Tex Size 7	256
Vert Tex Size 8	256	Normal Tex Size 8	256

- **Vert Tex Size:** Sets the vertex resolution for each LOD level.
- **Normal Tex Size:** Defines the normal map resolution for each LOD level.

Detail Texture Settings

Detail Texture Settings	
Detail Texture 0	
Detail Tex Size	256
Render Distance	3000
Map Size	20
Map Vert Enable	<input checked="" type="checkbox"/>
Detail Texture 1	
Detail Tex Size	256
Render Distance	100000
Map Size	1000
Map Vert Enable	<input checked="" type="checkbox"/>

- **Detail Tex Size:** Determines the resolution of the detail texture.
- **Render Distance:** Specifies the maximum render distance for detail textures.

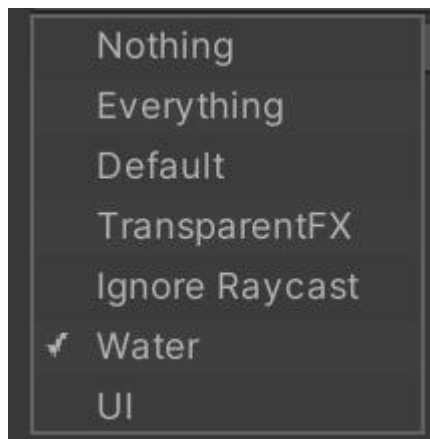
- **Map Size:** Defines the repeat range of the detail texture when mapped onto the ocean surface.
- **Map Vert Enable:** Enables the detail texture to influence vertex positions, adding additional surface detail to the ocean.

Other Setting

The **Other Settings** module provides configuration options for layer channels and rendering priorities, essential for managing the water surface's interaction with other scene elements.



- **Camera Renderer Index:** Specifies the index of the current rendering pipeline for the ocean surface camera, determining which rendering setup is used for the water surface.
- **Water Layer Mask:** Sets the layer mask for the water surface, defining the layer of the water surface. You can choose from the following 7 layers.

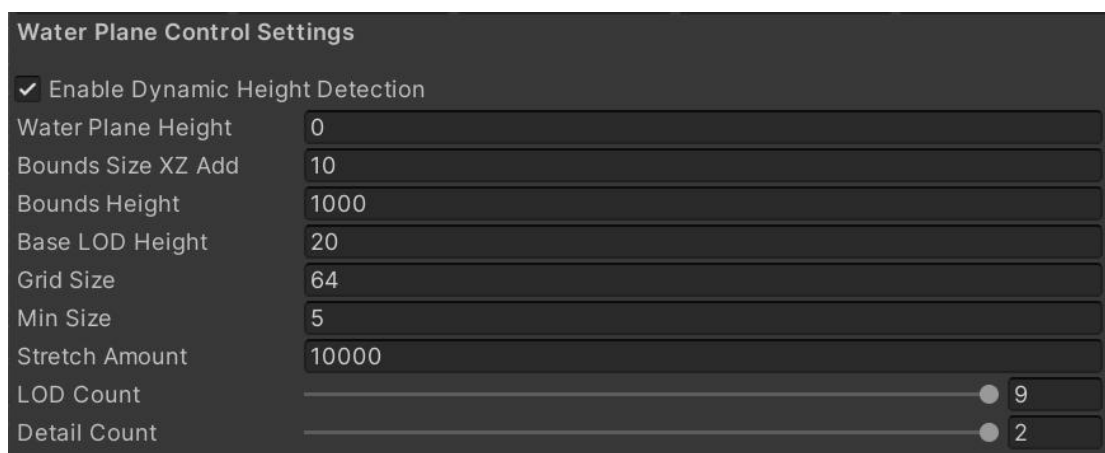


- **Allowed Layers:** Determines the layers for other objects in the scene that interact with the water, used for reflection, refraction, and underwater effects.

Water Plane Setting

The **Water Plane Settings** module allows you to configure various parameters for the ocean surface.

Water Plane Control Settings



- **Enable Dynamic Height Detection:** Enables dynamic height detection for the water surface, allowing real-time height updates to optimize calculations.
- **Water Plane Height:** Sets the base height of the water surface.
- **Bounds Size XZ Add:** Adjusts the boundary box size for each water surface patch along the X and Z axes.
- **Bounds Height:** Sets the vertical boundary for each water surface patch.
- **Base LOD Height:** Defines the starting height for LOD scaling. LOD increases by one level with each successive 2^n height increment.
- **Grid Size:** Specifies the vertex resolution of each water patch (each LOD level consists of 4 water patches).
- **Min Size:** Sets the minimum size for the LOD.
- **Stretch Amount:** Determines the extension length of the largest LOD.
- **LOD Count:** Sets the number of LOD levels (supports up to 9 LODs).
- **Detail Count:** Specifies the number of detail textures (supports up to 2).

Water Interaction

Hig Water System 2.0 has a strong interaction system allowing users to create various real-time wave simulations, you can follow the methods below to realize it. The associated functions can be accessed through ***InteractiveWaterManager.Instance***.

Adding a Wave Drawing Request

The request adding function ***AddDrawRequest(IWaterSimDraw waterSimDraw)*** submits a wave generation request to the water interaction manager. Requests are processed at the end of each frame to optimize performance, Requests are processed at the end of each frame. There are two interfaces ***IWaterSimDraw*** and ***waterSimDraw*** in this function.

```
private void Update()
{
    float speed = (transform.position - lastPos).magnitude;
    lastPos = transform.position;
    float deltaHeight = Mathf.Abs(transform.position.y - GetWaterHeight());
    if (deltaHeight < radius)
    {
        InteractiveWaterManager.Instance.AddDrawRequest(new DrawCircleRequest(this, transform.position, (radius - deltaHeight), 1 * Mathf.Clamp(speed, 0, 10), 1));
    }
}
```

Custom Wave Implementation

Implementing the ***IWaterSimDraw*** interface allows the creation of custom wave classes.

```

public interface IWaterSimDraw
{
    public bool CheckInPlane(Vector3 lodPos, float simSize);

    public void Draw(CommandBuffer cmd, InteractiveSim sim);
}

```

CheckInPlane: Detect and exclude simulations outside the LOD area to improve performance.

- ***lodPos***: Coordinates of the simulation LOD.
- ***simSize***: Width and height of the simulation LOD.

Draw: Draws the specific wave simulation.

- ***InteractiveSim***: Provides the necessary RenderTexture for wave rendering, including:

```

public class InteractiveSim
{
    public RenderTexture simWaterTex;
    public RenderTexture simWaterTexLast;
}

```

- ***simWaterTex***: The current frame's wave simulation texture.
- ***simWaterTexLast***: The previous frame's wave simulation texture.

Predefined Wave Classes

The following 2 wave classes can be added under the function ***AddDrawRequest*** for certain wave simulations:

Circular Wave

You can create a circular wave as following:

```
InteractiveWaterManager.Instance.AddDrawRequest(new DrawCircleRequest(this.transform.position, (radius - deltaHeight), 1 * Mathf.Clamp(speed, 0, 10), 1));
```

DrawCircleRequest (Vector3 centerPos, float radius, float height, float createAttenuate)

- ***centerPos***: The center of the wave (world coordinates).
- ***radius***: Radius of the wave.
- ***height***: Amplitude of the wave.
- ***createAttenuate***: Attenuation from the center to the edge (range: 0–1).

Kelvin Ship Wake

You can create a Kelvin ship wake as following:

```
InteractiveWaterManager.Instance.AddDrawRequest(new DrawBoatWakeRequest(this.transform.position, radius, height, dir.normalized, groupWaveWidthPow, groupWaveWidthLimit, groupWaveLengthLimit, groupWaveLengthPow));
```

DrawBoatWakeRequest(Vector3 centerPos, float radius, float height, Vector3 direction, float groupWaveWidthPow, float groupWaveWidthLimit, float groupWaveLengthLimit, float groupWaveLengthPow)

- ***centerPos***: The origin of the wake (world coordinates).
- ***radius***: Radius of the wake.
- ***height***: Amplitude of the waves.
- ***direction***: Direction of wave propagation.

- ***groupWaveWidthPow***: Curvature intensity of wave width.
- ***groupWaveWidthLimit***: Limit for wave width.
- ***groupWaveLengthLimit***: Curvature intensity of wave length.
- ***groupWaveLengthPow***: Limit for wave length.

Ocean Physics

Hig Water System 2.0 provides a range of functions for retrieving detailed information about the water surface for physical effects achieving.

A practical example of implementing water physics functions is contained in the script [*ComplexBuoyancy*](#) which can be found in: [*HigWaterSystem2.0\Example\Feature Scene\Script.*](#)

Associated functions are accessible via ***OceanPhysics.Instance***.

Functions available:

Vector3 GetOceanNormal(Vector3/Vector2 worldPos, float deltaLength = 0.3f)

Purpose: Retrieves the normal vector of the water surface at a

specified position.

- **worldPos**: The position in world space where you want to get the normal of water surface. (supports Vector3 or Vector2).
- **deltaLength**: Distance between sampling points (default: 0.3f).

float GetOceanHeightVariation (Vector3/Vector2 worldPos)

Purpose: Gets the height variation of the water surface at a specific position.

- **worldPos**: The position in world space where you want to get the height variation of the water surface. (supports Vector3 or Vector2).

float GetOceanHeight(Vector3 worldPos)

Purpose: Retrieves the water height at a given world position.

- **worldPos**: The position in world space where you want to get the height of the water surface.

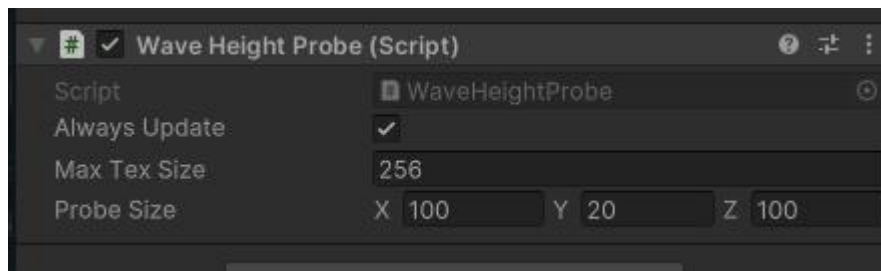
Vector3 GetProbeFlow(Vector3 worldPos)

Purpose: Retrieves the flow direction of the water surface at a specific position.

Requirements: A **Wave Height Probe** is required.

- **worldPos**: The position in world space where you want to get the flow direction of the water surface.

Wave Height Probe



The Ocean Probe allows you to define a region to monitor the water surface state including height, flowmap and scale, which three are set in the cameramap.

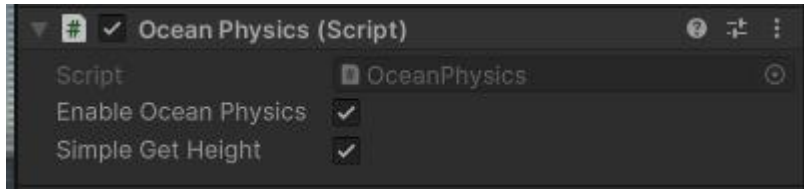
- **AlwaysUpdate**: When enabled, the data will continuously refresh in real-time. When disabled, the data will not refresh automatically. You can use the ***RequestRefresh()*** function correspond to ***WaveHeightProbe*** to manually update the probe's data when AlwaysUpdate is turned off.

```
void Update()
{
    WaveHeightProbe waveHeightProbe = GetComponent<WaveHeightProbe>();
    waveHeightProbe.RequestRefresh();
}
```

- **Max Tex Size**: is the number of pixels on the longest side of Tex used to store probe detection results. For example, if Tex size is 1920*1080, then Max Tex Size is 1920.

- **ProbeSize:** Defines the size of the area being probed.

Ocean Physics Script



To save performance, you can use the *Ocean Physics* script in *HigWaterSystem2.0\OceanphysicManager* under the Hierarchy.

Enable Ocean Physics

You can control whether to enable physical effect refresh using Enable Ocean Physics toggle.

- **Enabled:** Enable physical effect refresh.
- **Disabled:** Disable physical effect refresh.

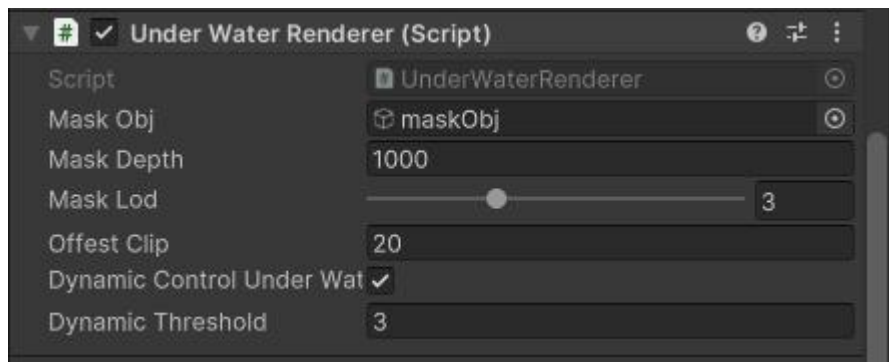
Simple Get Height

To quickly retrieve ocean height while saving performance, you can enable the ***Simple Get Height*** toggle. Use the Simple Get Height toggle based on your performance and accuracy needs.

- **Enabled:** Suitable for scenarios where high precision is not required, improving performance.
- **Disabled:** Obtaining accurate ocean surface height through an iterative approach.

Underwater Effects

To add underwater effects to a scene, attach the UnderWaterRenderer component to the desired camera. This component provides customizable settings for underwater rendering and masking.



Attention: DO NOT make any changes to **Mask Obj**.

- **Mask Depth:** The maximum depth for the underwater mask.
- **Mask Lod:** Determines which LOD level is used as the basis for underwater mask calculations.
- **Offset Clip:** Adds a depth offset to the underwater mask calculations. Increasing this value helps avoid masking issues in areas with significant water surface variations (e.g., a tall water column suddenly rising above the surface).
- **Dynamic Mask Control Under Water Renderer Action:** Enable this toggle to enable dynamic toggling of underwater mask calculations to improve performance. To enable it, you must enable **Enable Dynamic Height Detection** in the

WaterPlaneControl module under **Water Rendering** in **Toolbox**.

- **Dynamic Threshold:** Sets the height threshold (in meters) above the water surface for dynamically disabling underwater masking to improve performance.

Projection

The Projection System in Hig Water System 2.0 enables various types of data to be projected onto the water surface. You can use built-in components for standard effects or create custom projections for more specific needs.

Built-In Projection Components

Add the following components to objects to project data onto the water surface:

- **AlbedoInput :** Projects the color of standard objects onto the water surface.
- **ParticleAlbedoInput:** Projects the color of particle effects onto the water surface.
- **FlowMapInput:** Projects flowmap data onto the water surface,

affecting flow directions.

- **HeightBoxInput:** Modifies the height of the water surface within a specific region.
- **WaveScaleInput:** Adjusts the scaling of water wave data for a specific area.

Default Projection Shaders

Hig Water System 2.0 includes several shaders tailored for common projection tasks:

- **"Unlit/Albedo"**

A basic shader for projecting color data onto the water surface.

- **"Unlit/FlowData"**

A shader that uses the xy values of the maintex texture (mapped from [0, 1] to [-1, 1]) to determine flowmap directions.

- **"Unlit/UpBox"**

Projects the height of an object's vertices (in world space) as color data onto the water surface.

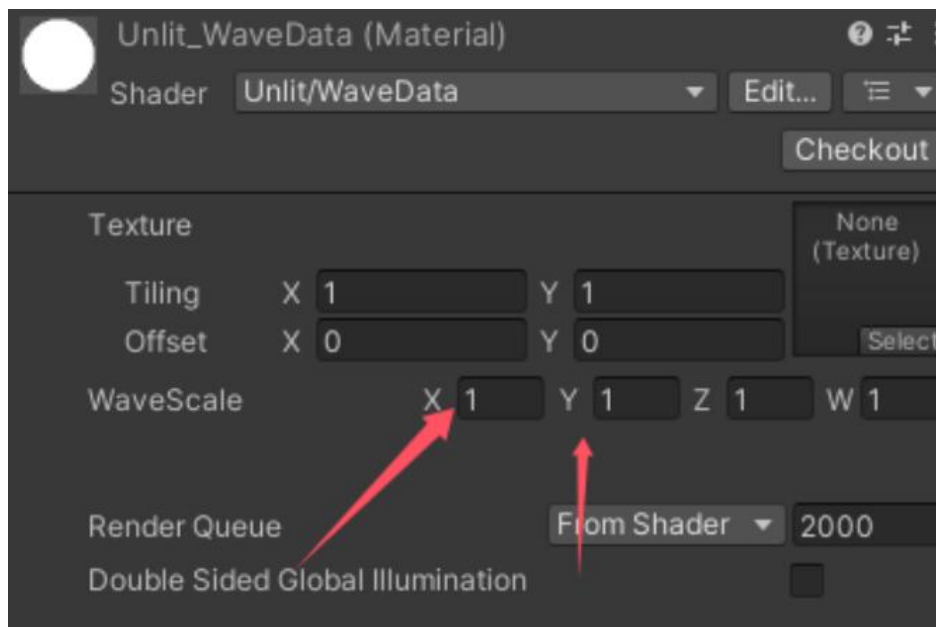
- "Unlit/WaveData"

This shader is used to input data to the **WaveScale** input component. This input component controls the scale of various data of the water surface within a specific area.

In **WaveScale**:

x : The scale of the input component under **Basic Ocean** in **Water Rendering**.

y : The scale of the **HeightData** input component.



Custom Projection Effects

Base classes

To create your own projection effects, extend the following base classes to output specific types of data:

- **HeightDataInput**

Extend to allow this class to output Height data to the water surface.

- **WaveScaleDataInput**

Extend to allow this class to output WaveScale data to the water surface.

In **WaveScale**:

x : The scale of the input component under **Basic Ocean** in **Water Rendering**.

y : The scale of the **HeightData** input component.

- **AlbedoDataInput**

Extend to allow this class to output color data to the water surface.

- **FlowMapDataInput**

Extend to allow this class to output FlowMap data to the water surface.

Custom Renderer and Materials

Overwrite ***GetRenderer()*** and ***GetMats()*** to project custom renderer and materials to the water surface.

- ***GetRenderer()***

Specifies the renderer used for projection.

- ***GetMats()***

Specifies the materials used for projection.

```
public virtual Renderer GetRenderer()
{
    return GetComponent<Renderer>();
}
```

```
public virtual List<Material> GetMats()
{
    List<Material> mats = new List<Material>();
    GetRenderer().GetSharedMaterials(mats);
    return mats;
}
```

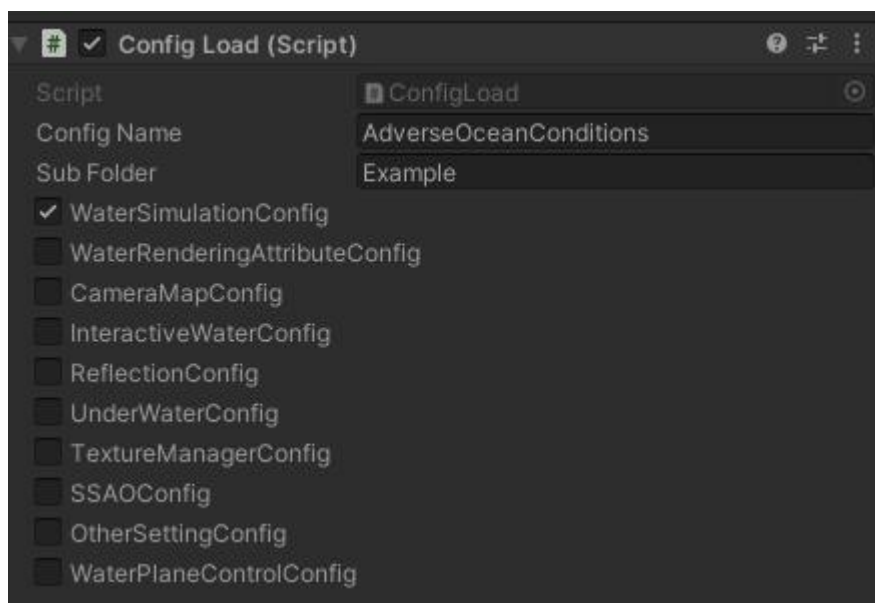
Shader Output Rules for Custom Projections

Follow these rules when creating custom shaders:

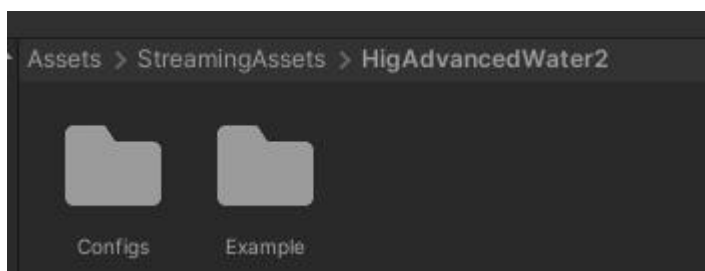
- **HeightData** outputs the desired water height as the w value of a float4.
- **AlbedoData** outputs the desired color as xyz values and transparency as the w value.
- **FlowData** outputs the flow direction (xz) as xy values, with a range of [-1, 1].
- **WaveData** outputs wave scale parameters as xy values:
 - x** : The scale of the input component under Basic Ocean in Water Rendering.
 - y** : The scale of the HeightData input component.

Runtime Configuration Switching

To dynamically switch ocean configurations at runtime, you can use the **ConfigLoad** component. This allows for seamless configuration changes using predefined presets.



- **Config Name:** The name of the configuration to be loaded.
- **Sub Folder:** The subfolder where the configuration file is stored.



- The list of toggles below determines which types of settings

or data are loaded when switching configurations.

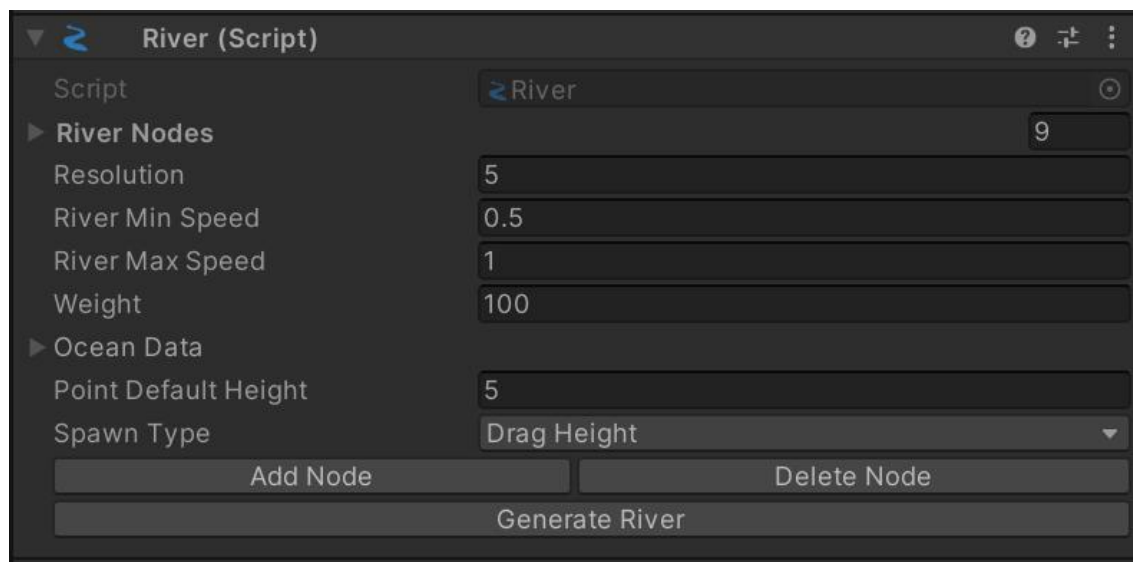
To load a configuration at runtime, call the ***Load()*** function.

River System

Hig Water System 2.0 features a powerful and user-friendly river system, enabling you to quickly create and customize realistic rivers.

Creating a River

In the Hierarchy, create an empty GameObject, then add the **River** component to the GameObject.



River Nodes

- **River Nodes:** The River Nodes panel displays the number of nodes, which automatically updates as nodes are added or

removed. Do not change this data manually.

- **Resolution:** Determines the subdivision count of each river segment. Increasing the resolution avoids issues like visible layering or stepped edges.
- **River Min Speed:** Minimum water flow speed, typically for the flattest areas of the river. Speed range:0-1.
- **River Max Speed:** Maximum water flow speed, usually for the steepest areas of the river. Speed range:0-1.
- **Weight:** Controls the rendering priority for flowmap inputs at overlapping positions. Higher weight takes precedence in rendering.

Ocean Data

- **Point Default Height:** Height offset for nodes in the Default Height generation type.
- **Spawn Type:** Determine the way of confirming node position when generating nodes, including **Default Height** and **Drag Height**.
- **Default Height:** Node height is determined by the clicked position plus a fixed height offset. The offset is set in **Point Default Height**.
- **Drag Height:** Node height is based on terrain height when the mouse is released.

Node Management

Add Node: Click to enter Add Node mode. Enter Add Node mode to add river nodes.

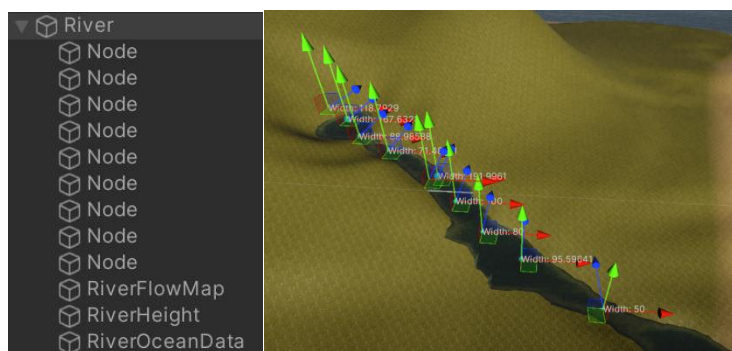
In Add Node mode, when the **Spawn Type** is **Default Height**:

- Click to set the position.
- Slide to determine river width (independent of the slide direction).
- Release to finalize the node creation.

When the **Spawn Type** is **Drag Height**:

- Click to set the XZ position.
- Slide to determine the river width.
- Release to set the node height based on terrain height.

You can adjust the positions and data of the nodes in the Hierarchy. Dragging nodes in the scene allows you to reposition them.



Delete Node: Click to enter Delete Node mode.

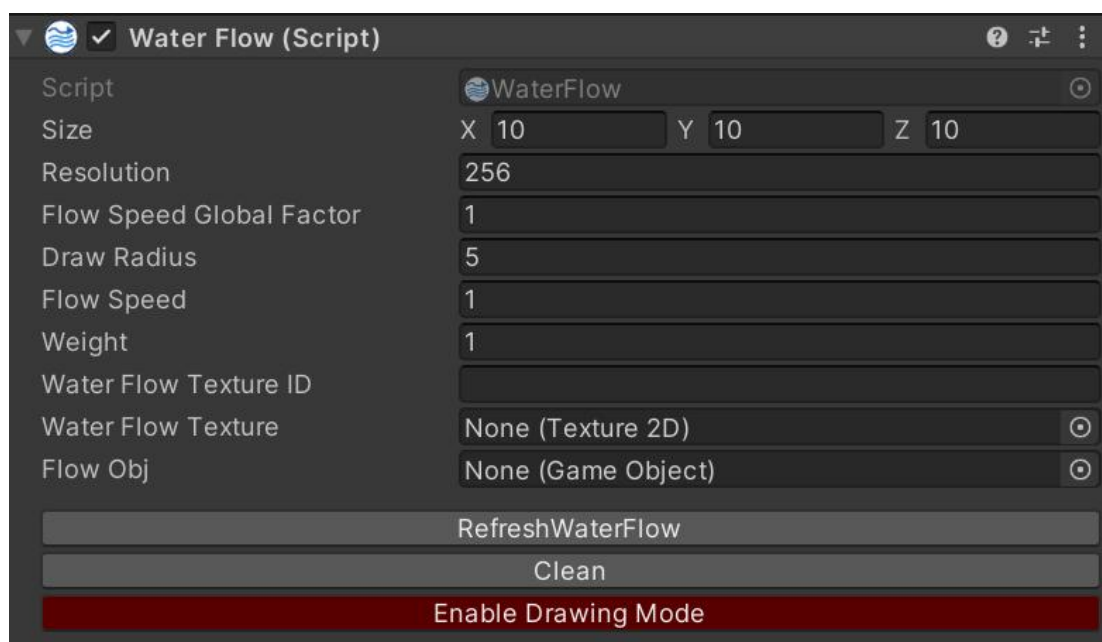
In Delete Node mode, the nodes will turn red. Click a node to delete it.

Generating River

- **Generate River:** Once nodes are added and positioned, click Generate River to create the river.

Water Flow System

The Water Flow System in Hig Water System 2.0 provides a simple and efficient way to create water flow effects. To create a water flow, create an empty GameObject in the Hierarchy, Add the **Water Flow** component to the GameObject.



- **Size:** Sets the size of the flow area. Water flow can only be drawn within this defined area.
- **Resolution:** The resolution of the Water Flow Texture.

- **Flow Speed Global Factor:** Adjusts the overall speed multiplier for the water flow.
- **Draw Radius:** Defines the radius of the brush used to draw flow paths.
- **Flow Speed:** Sets the base speed of the water flow.
- **Weight:** Controls the rendering priority for flowmap inputs at overlapping positions. Higher weight takes precedence in rendering.
- **Water Flow Texture ID, Water Flow Texture, Flow Obj:** No manual changes needed.
- **RefreshWaterFlow:** Refreshes the water flow.
- **Clean:** Clears all flow paths drawn from the water flow canvas.
- **Enable Drawing Mode:** Click to activate drawing mode.

In Drawing Mode:

- Press and hold the mouse button in the Scene view to draw water flow paths within the Size area.
- The direction and path of the mouse movement define the water flow direction and pattern.
- Releasing the mouse completes the drawing.