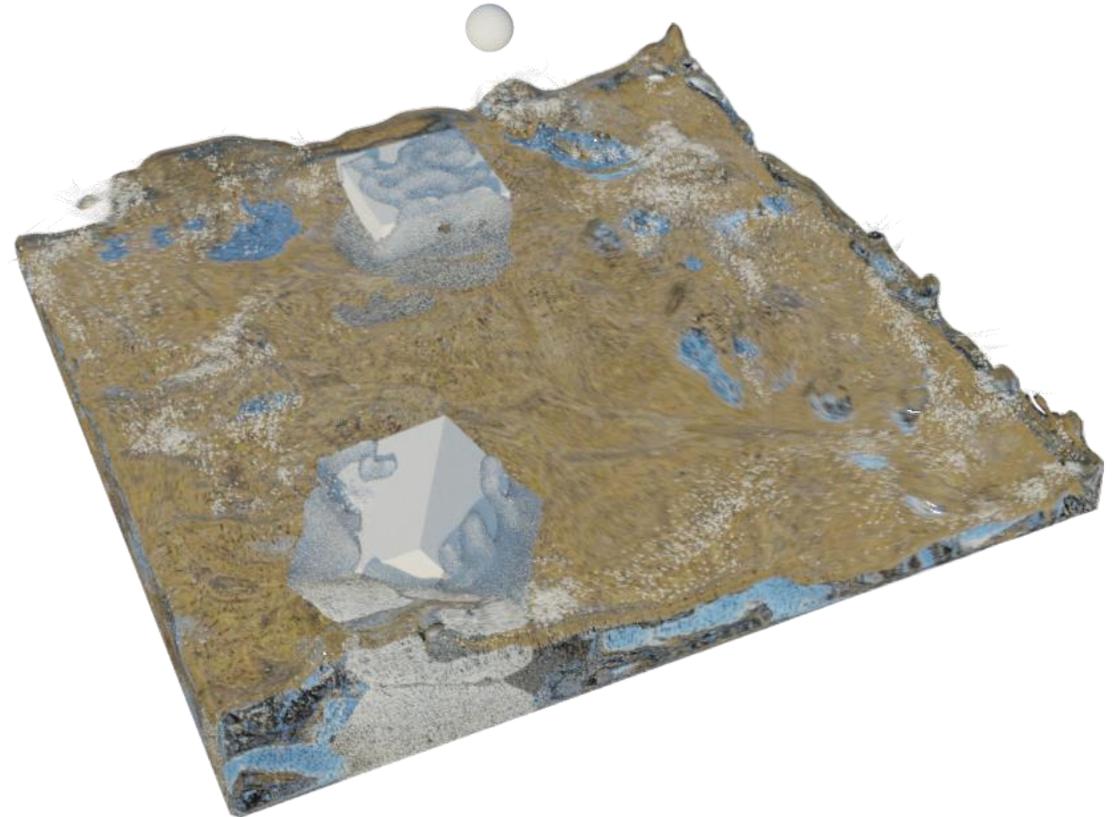


PV272

Cv 11

What do we create today?

Water



How do we create it?

- We are going to try and understand the basic workflow of liquid simulation in Blender
- Watch the finished result in the video in the zip

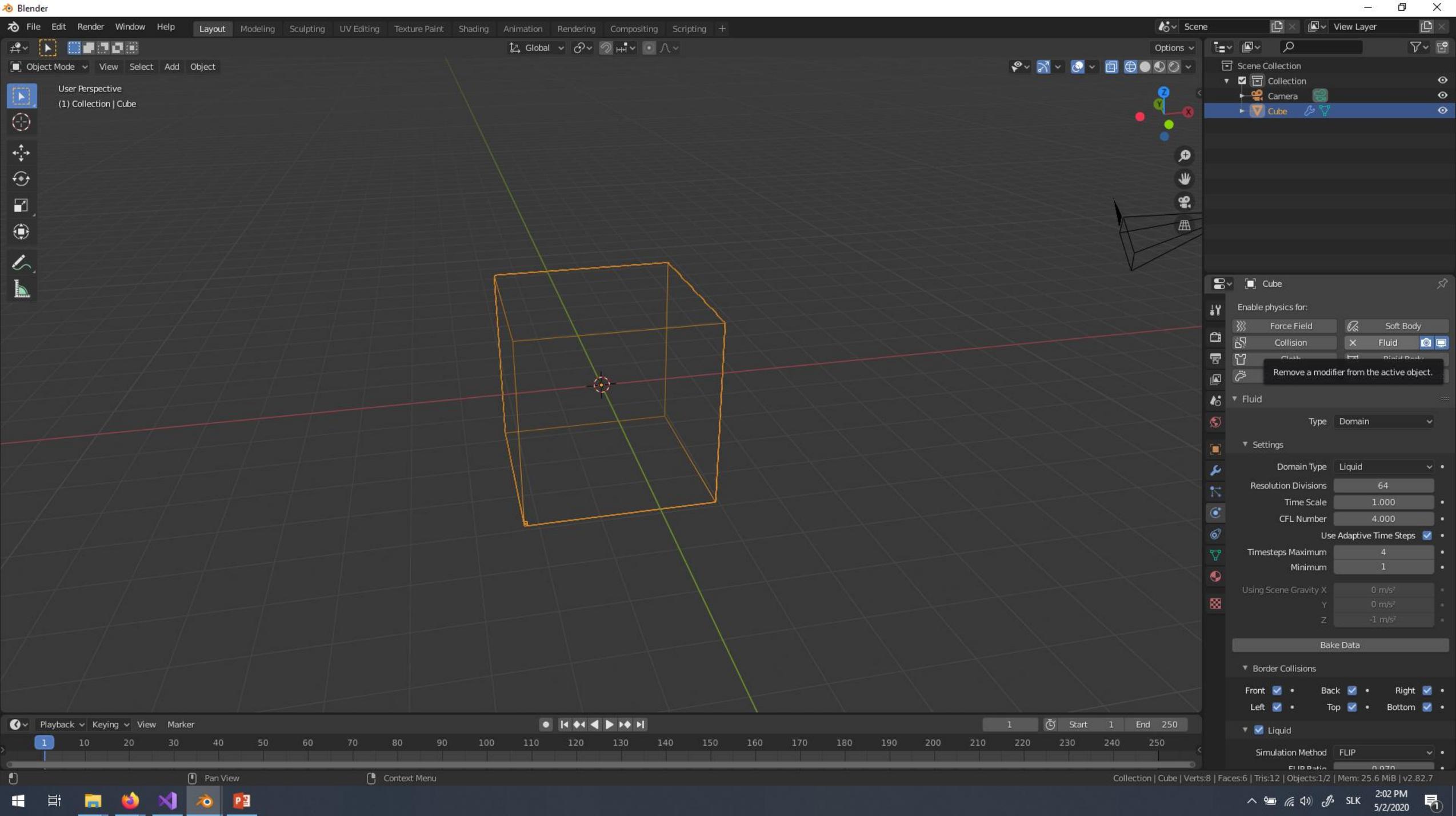
SIMULATED FLUID

Source, Container and Obstacles

- In order to simulate fluid you need to
 - Create a container, where the simulation will take place
 - Create the source of the liquid
 - (Optional) Add various obstacles that will influence the liquid
- Liquid simulation and render is processor-heavy task, so we will do only a very basic setup, you can experiment more with various options on your own

Create the container

- Select the default cube, make it double the size
- Go to the Physics tab
- Activate Fluid
- Select Domain from the drop-down menu
- Set Domain type to Liquid



Object Mode View Select Add Object

User Perspective
(1) Collection | Cube

Options

Scene Collection
Collection
Camera
Cube

Enable physics for:
Force Field Soft Body
Collision Fluid
Remove a modifier from the active object.

Fluid
Type Domain

Settings
Domain Type Liquid
Resolution Divisions 64
Time Scale 1.000
CFL Number 4.000
Use Adaptive Time Steps
Timesteps Maximum 4
Minimum 1
Using Scene Gravity X 0 m/s²
Y 0 m/s²
Z -1 m/s²

Bake Data

Border Collisions
Front Back Right
Left Top Bottom

Liquid
Simulation Method FLIP

Playback Keying View Marker

1 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

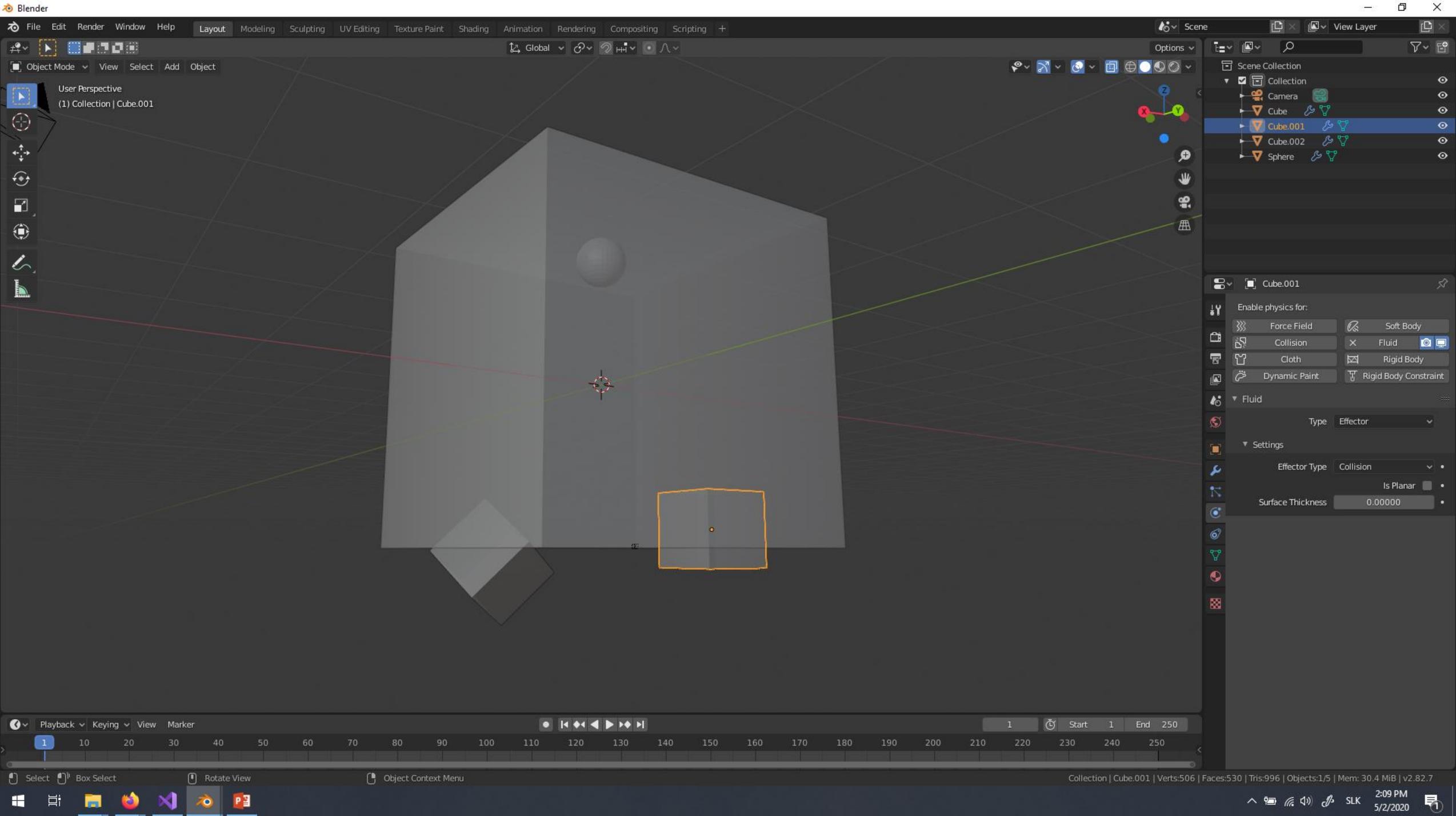
1 Start 1 End 250

Create the source

- Add a UV sphere into the scene
- Make it small and place it inside the box, to the top
- Liquid will start pouring from this object as this is the source and will bounce around in the container
- Once again activate Fluid in the Physics tab
- Select Flow from the drop-down menu
- Flow type to Liquid
- Flow behavior to Inflow
 - This means the object will be used to add liquid into the scene
- We want the inflow to stop early so the container does not fill completely
 - Go to frame 40 and keyframe the “Use Inflow” checkmark
 - Hover mouse over it and press I
 - Go to frame 41, uncheck the “Use Inflow” field and keyframe it

Create the obstacles

- Add a few cubes and place them at the bottom of the container
- Go to the Physics tab, activate Fluid
- Select Effector from the drop-down menu



Scene Collection

- Collection
 - Camera
 - Cube
 - Cube.001
 - Cube.002
 - Sphere

Cube.001

Enable physics for:

- Force Field
- Collision
- Cloth
- Dynamic Paint
- Soft Body
- Fluid
- Rigid Body
- Rigid Body Constraint

Fluid

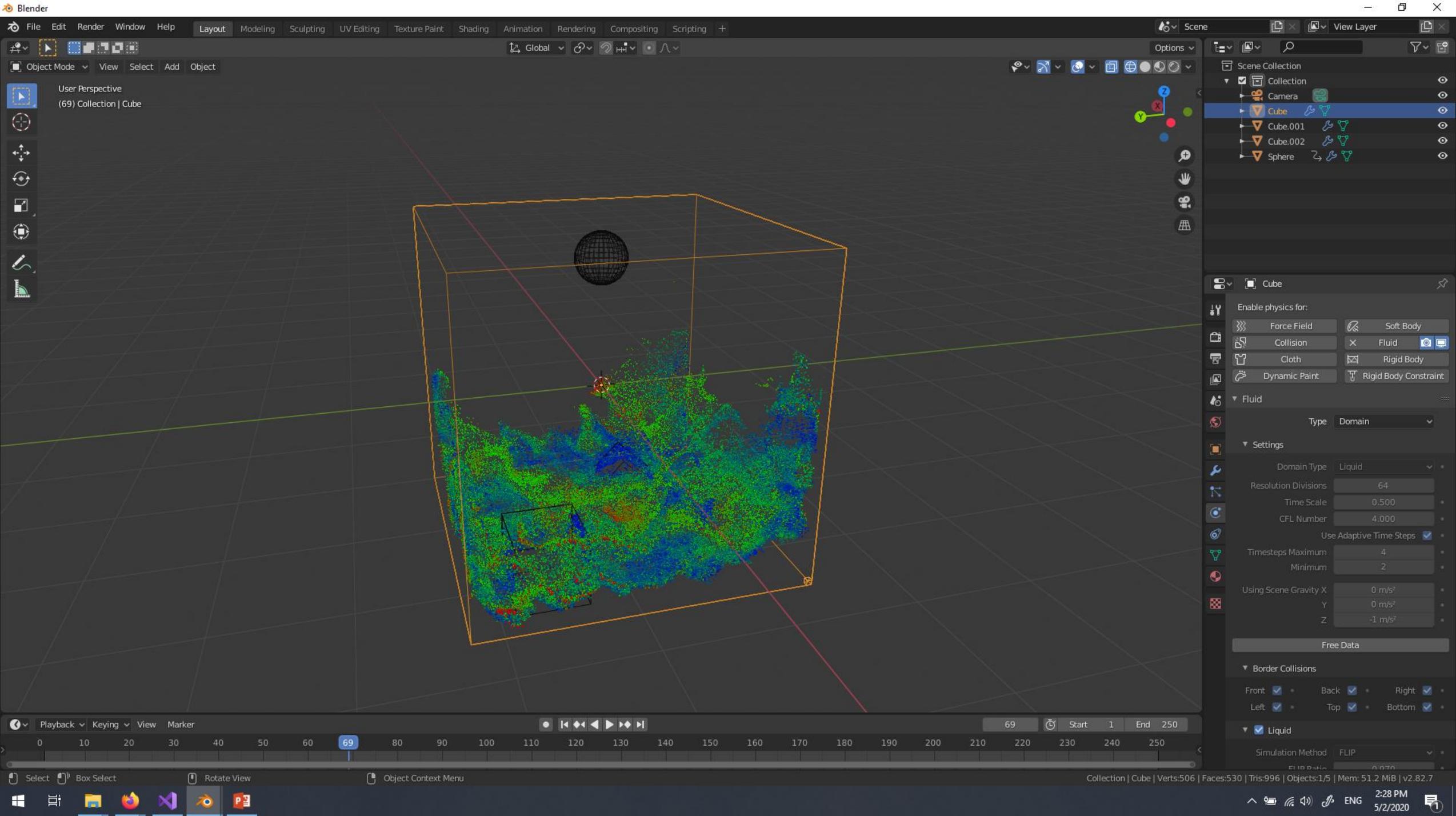
Type: Effector

Settings

- Effector Type: Collision
- Is Planar:
- Surface Thickness: 0.00000

Bake the simulation

- In order to create the simulation we need to bake it
- This process will create particles that represent the flow of the liquid
- When completed and happy we will bake the liquid mesh, which is created from the previously mentioned particles
- The next step is to bake bubbles, foam and spray particles
- Select the domain cube, and set the following settings
 - Set Time Scale to 0.5 to have a slower simulation, otherwise it is quite fast
 - Set Timesteps Minimum to 2, to have more precise simulation
 - Set Frame End to 100
- When all is set, hit Bake data
- If all was done correctly, hit Shift + Space and watch the particles fill the container



Scene Collection

- Collection
- Camera
- Cube
- Cube.001
- Cube.002
- Sphere

Enable physics for:

- Force Field
- Collision
- Cloth
- Dynamic Paint
- Soft Body
- Fluid
- Rigid Body
- Rigid Body Constraint

Fluid

Type: Domain

Settings

- Domain Type: Liquid
- Resolution Divisions: 64
- Time Scale: 0.500
- CFL Number: 4.000
- Use Adaptive Time Steps:
- Timesteps Maximum: 4
- Minimum: 2
- Using Scene Gravity X: 0 m/s²
- Y: 0 m/s²
- Z: -1 m/s²

Free Data

Border Collisions

- Front:
- Back:
- Right:
- Left:
- Top:
- Bottom:

Liquid

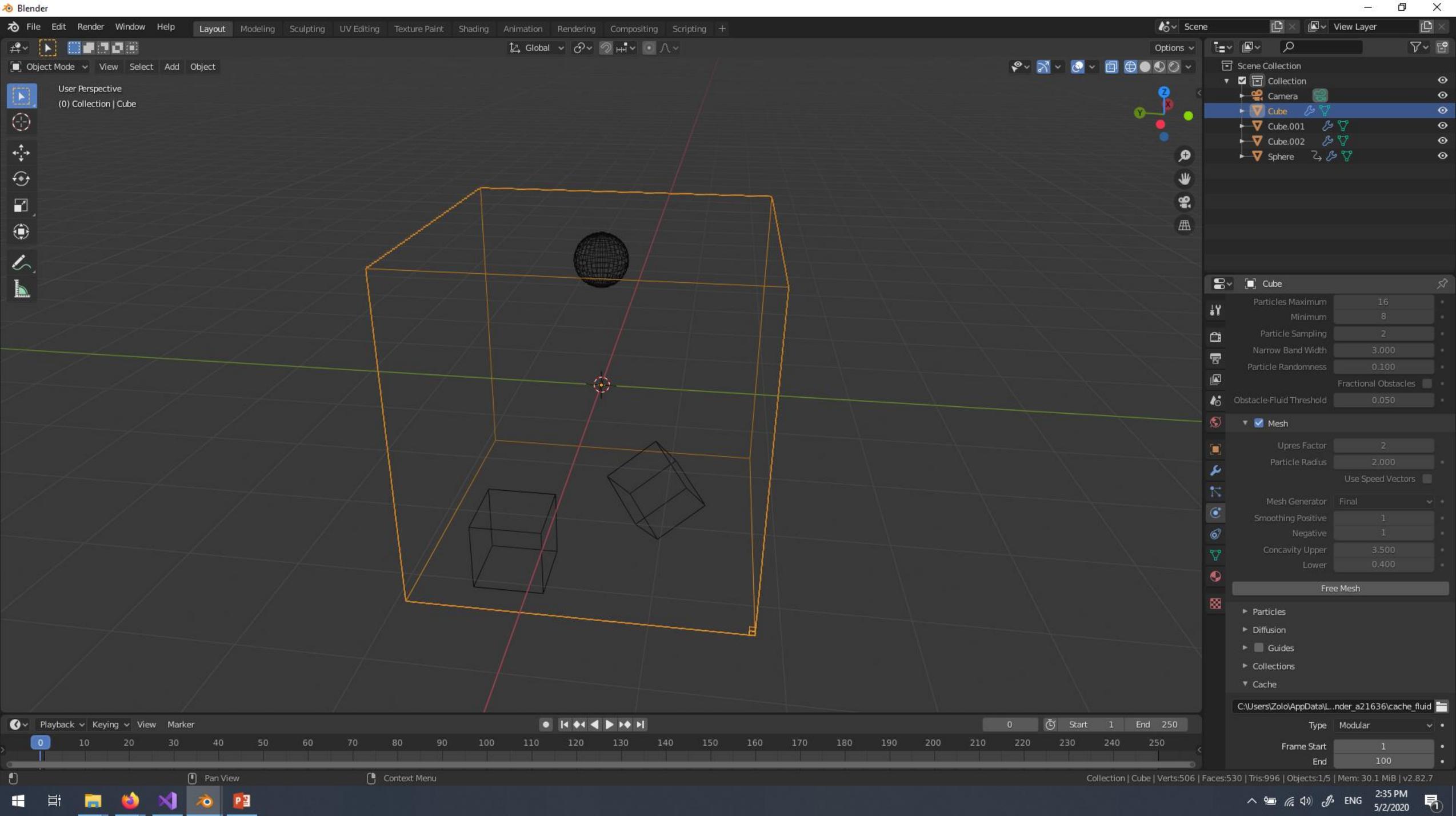
Simulation Method: FLIP

Playback Keying View Marker

69 Start 1 End 250

Create the mesh

- With the container selected, check the Mesh option
- Keep the settings as they are and hit Bake Mesh
- If all was done correctly, hit Shift + Space and watch the mesh representing the liquid fill the container
- Hide the Fluid particles so they do not slow down computer
 - Go to Particles tab and disable Liquid Realtime option



Object Mode View Select Add Object

User Perspective
(0) Collection | Cube

Options

Scene Collection

- Collection
- Camera
- Cube
- Cube.001
- Cube.002
- Sphere

Particles Maximum: 16
Minimum: 8
Particle Sampling: 2
Narrow Band Width: 3,000
Particle Randomness: 0.100
Obstacle-Fluid Threshold: 0.050

Mesh

- Upres Factor: 2
- Particle Radius: 2,000
- Use Speed Vectors:
- Mesh Generator: Final
- Smoothing Positive: 1
- Negative: 1
- Concavity Upper: 3,500
- Lower: 0.400

Free Mesh

- Particles
- Diffusion
- Guides
- Collections
- Cache

C:\Users\Zolo\AppData\Local\Blender Foundation\Blender\2.80\cache_fluid

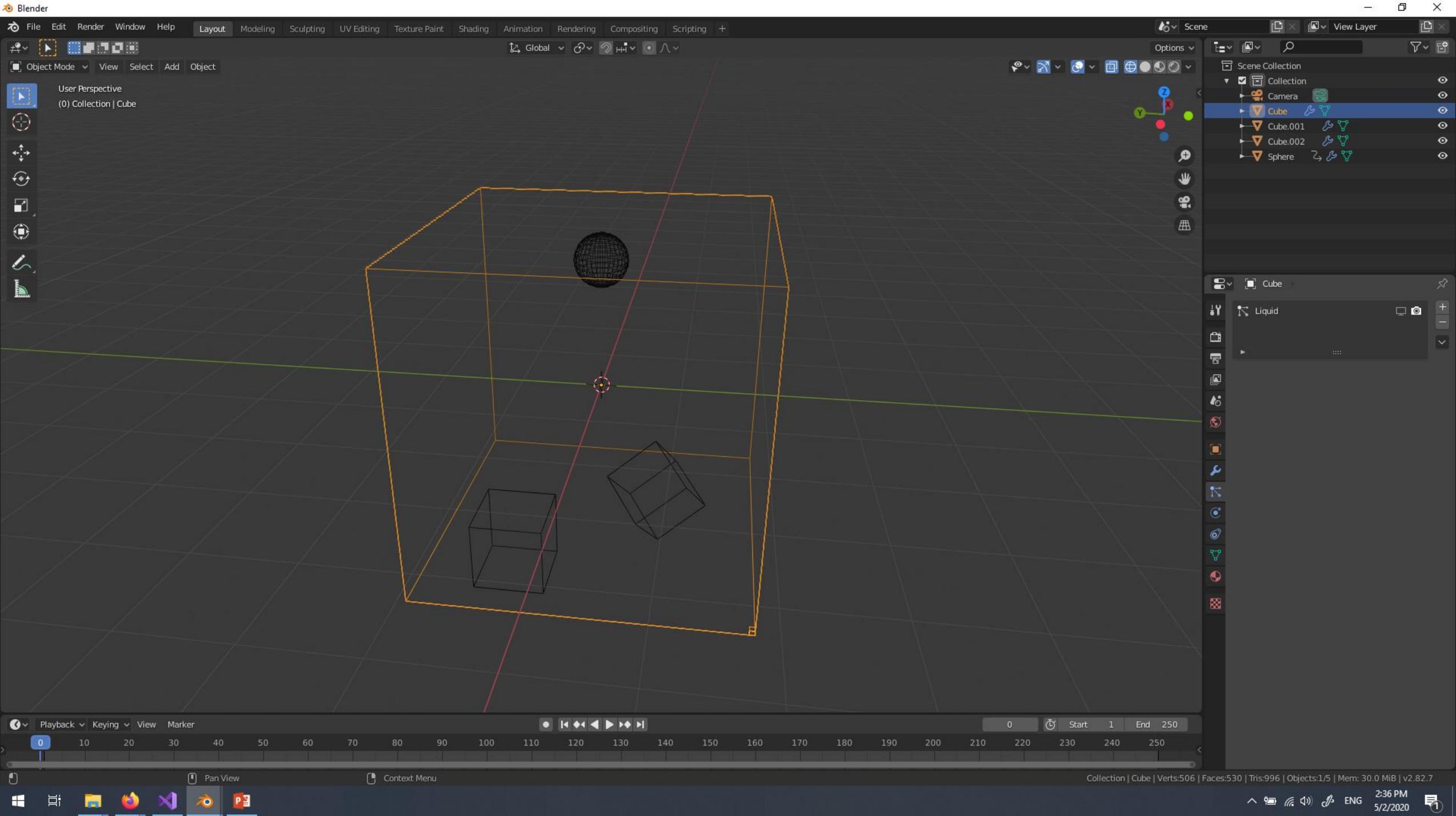
Type: Modular

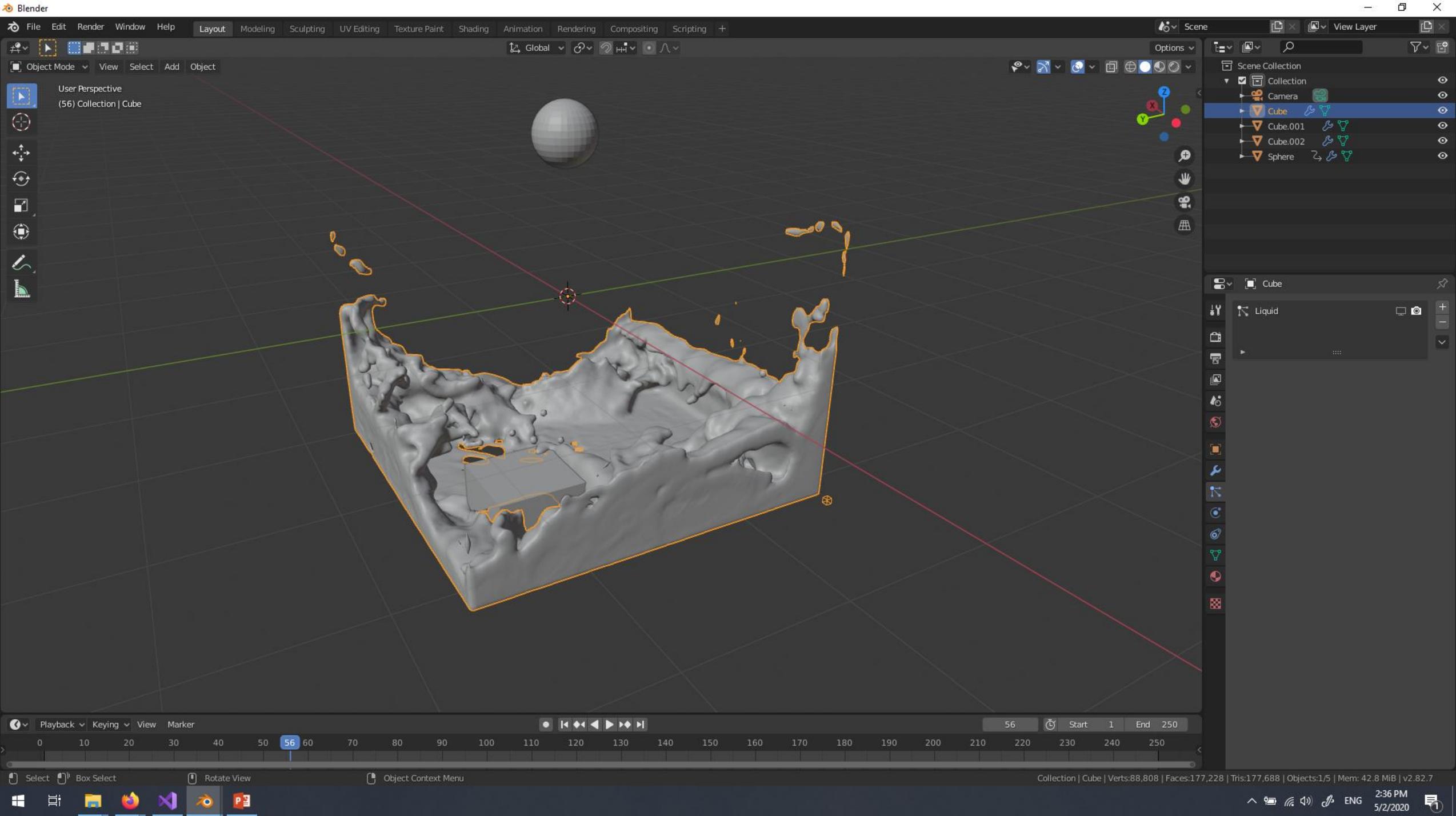
Frame Start: 1
End: 100

Playback Keying View Marker

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

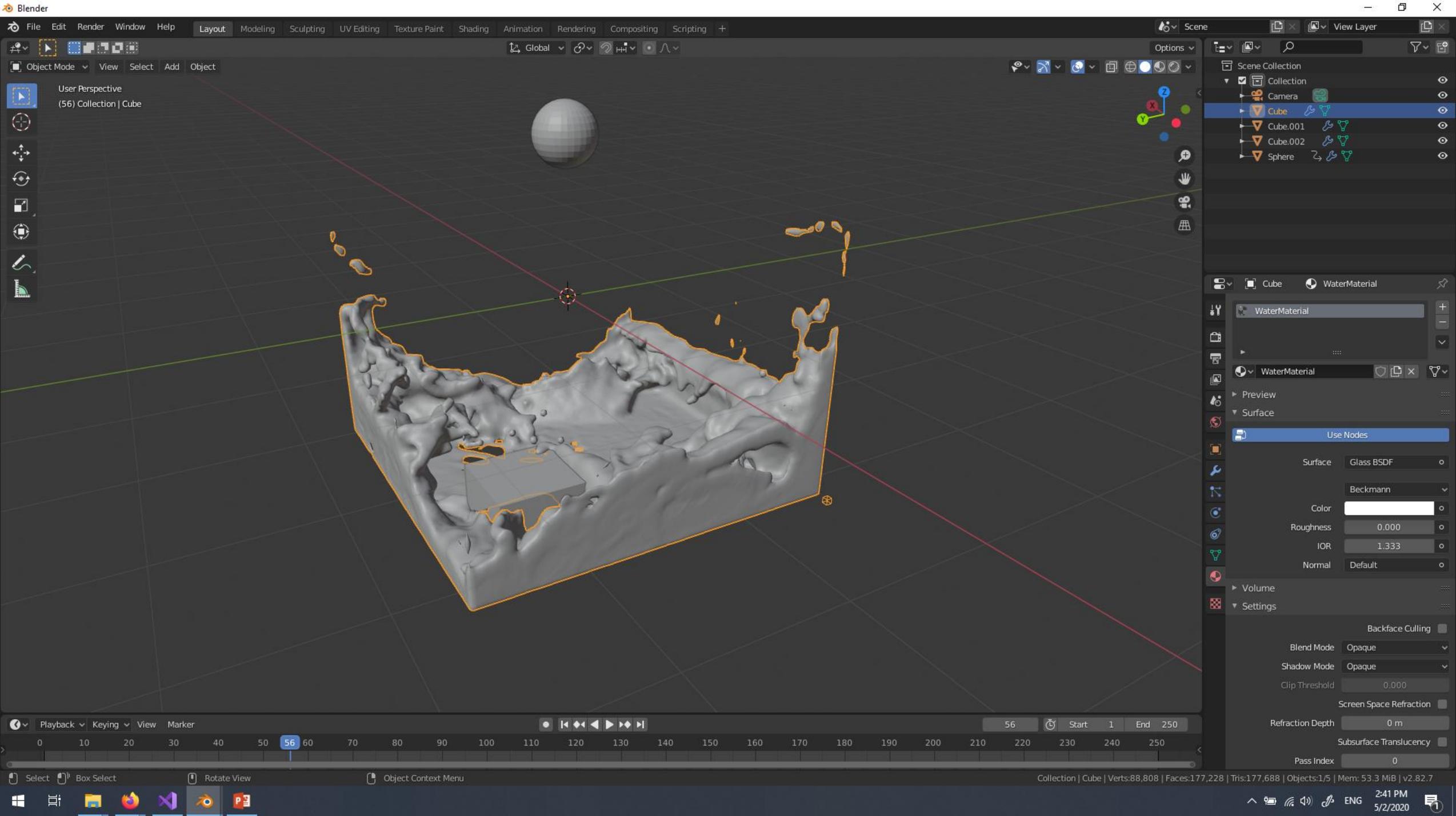
0 Start 1 End 250

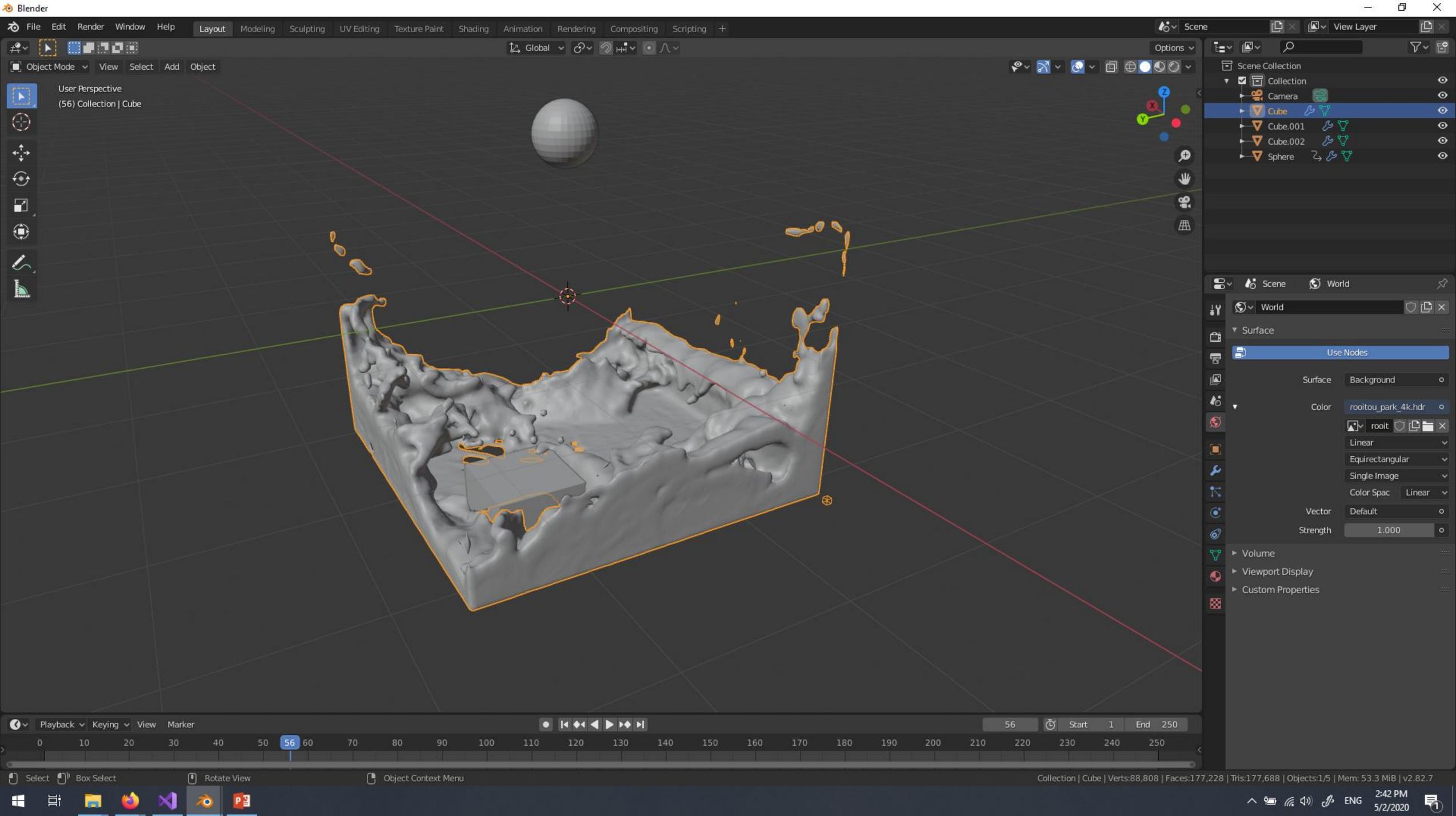




Set the materials

- Shader best representing water is Glass Shader with Index of Refraction set to 1.333 (water refractive index) and roughness of 0
- Add material to the mesh and set the shader accordingly
- Add an Enviromental image to represent the scene lighting
- Make the background transparent
- Set render engine to Cycles
- Turn on Denoising
- Render the image (at frame 55)





Object Mode View Select Add Object

User Perspective
(56) Collection | Cube

Options

Scene Collection

- Collection
- Camera
- Cube
- Cube.001
- Cube.002
- Sphere

World

Surface

Use Nodes

Surface Background

Color rootou_park_4k.hdr

root

Linear

Equirectangular

Single Image

Color Spac Linear

Vector Default

Strength 1.000

Volume

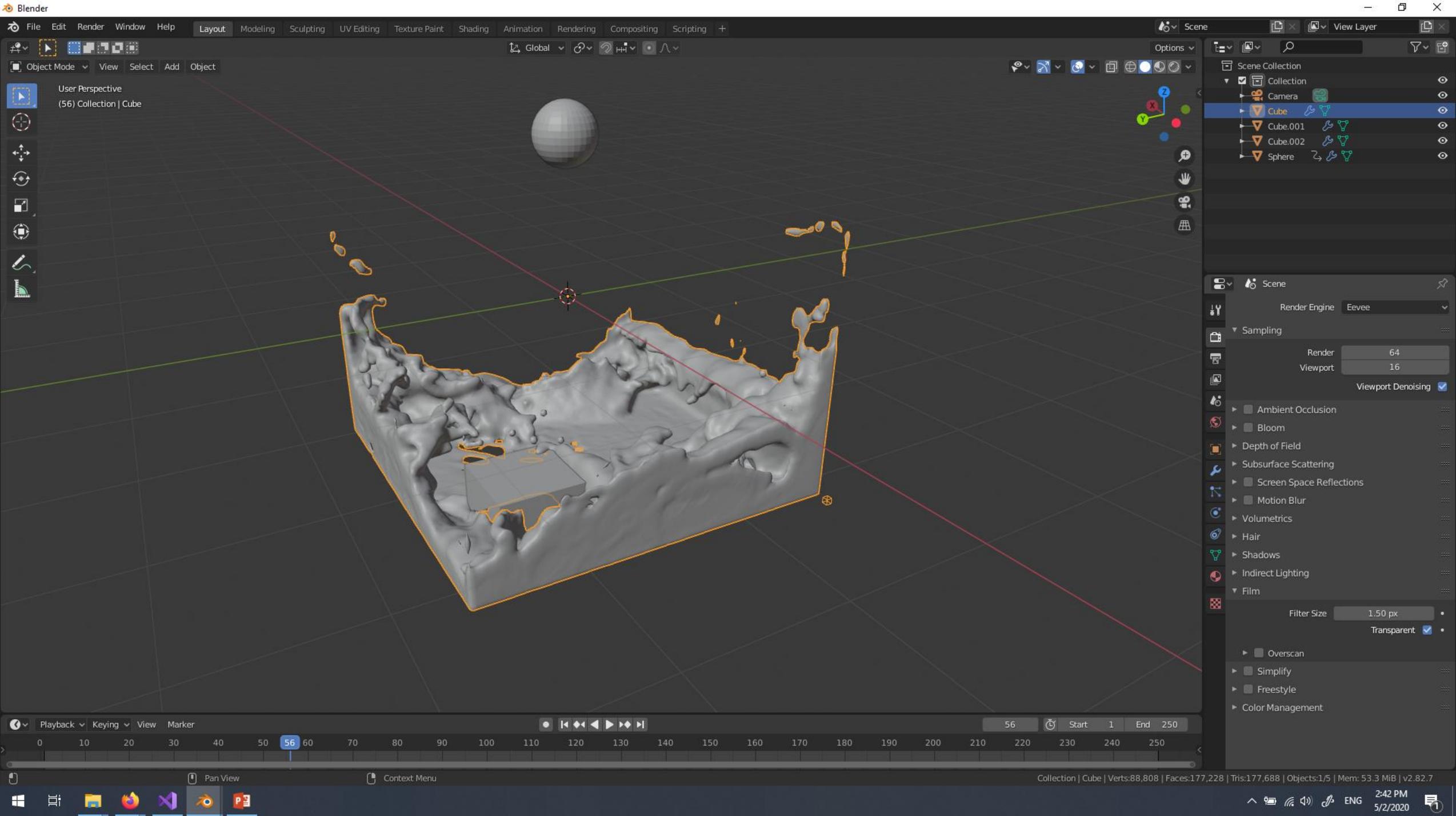
Viewport Display

Custom Properties

Playback Keying View Marker

56 Start 1 End 250

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250



Object Mode View Select Add Object

User Perspective
(56) Collection | Cube

Options

Scene Collection

- Collection
- Camera
- Cube**
- Cube.001
- Cube.002
- Sphere

Scene

Render Engine: Eevee

Sampling

Render	64
Viewport	16

Viewport Denoising

- Ambient Occlusion
- Bloom
- Depth of Field
- Subsurface Scattering
- Screen Space Reflections
- Motion Blur
- Volumetrics
- Hair
- Shadows
- Indirect Lighting

Film

Filter Size: 1.50 px

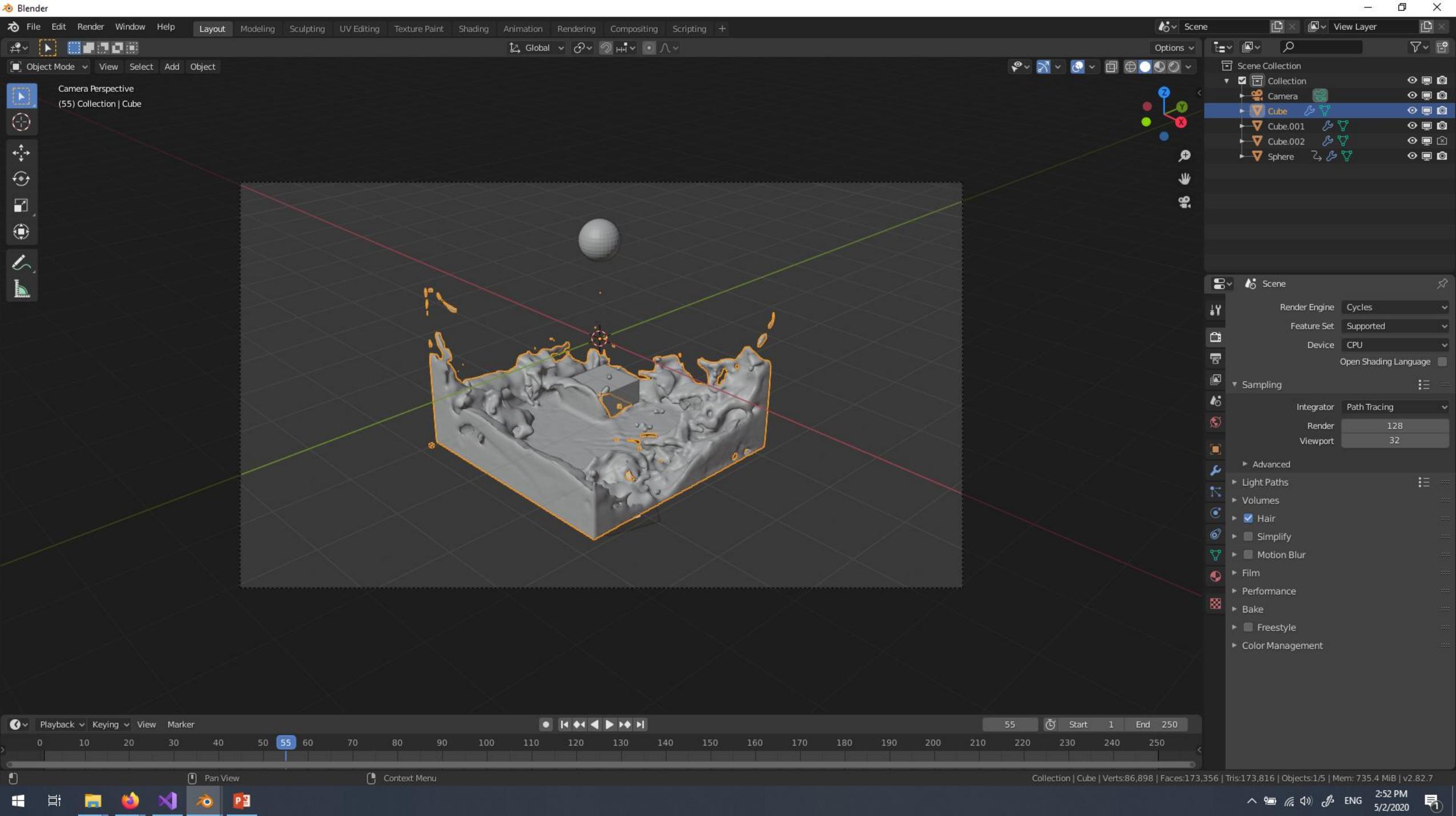
Transparent

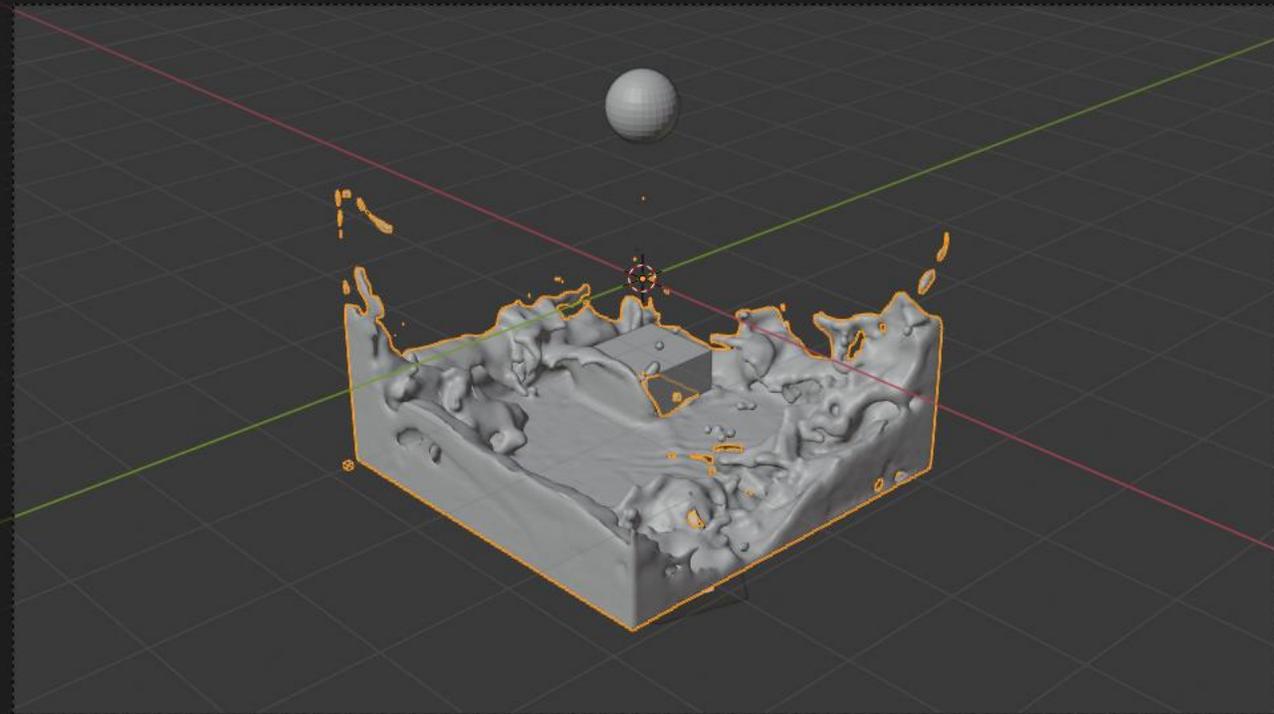
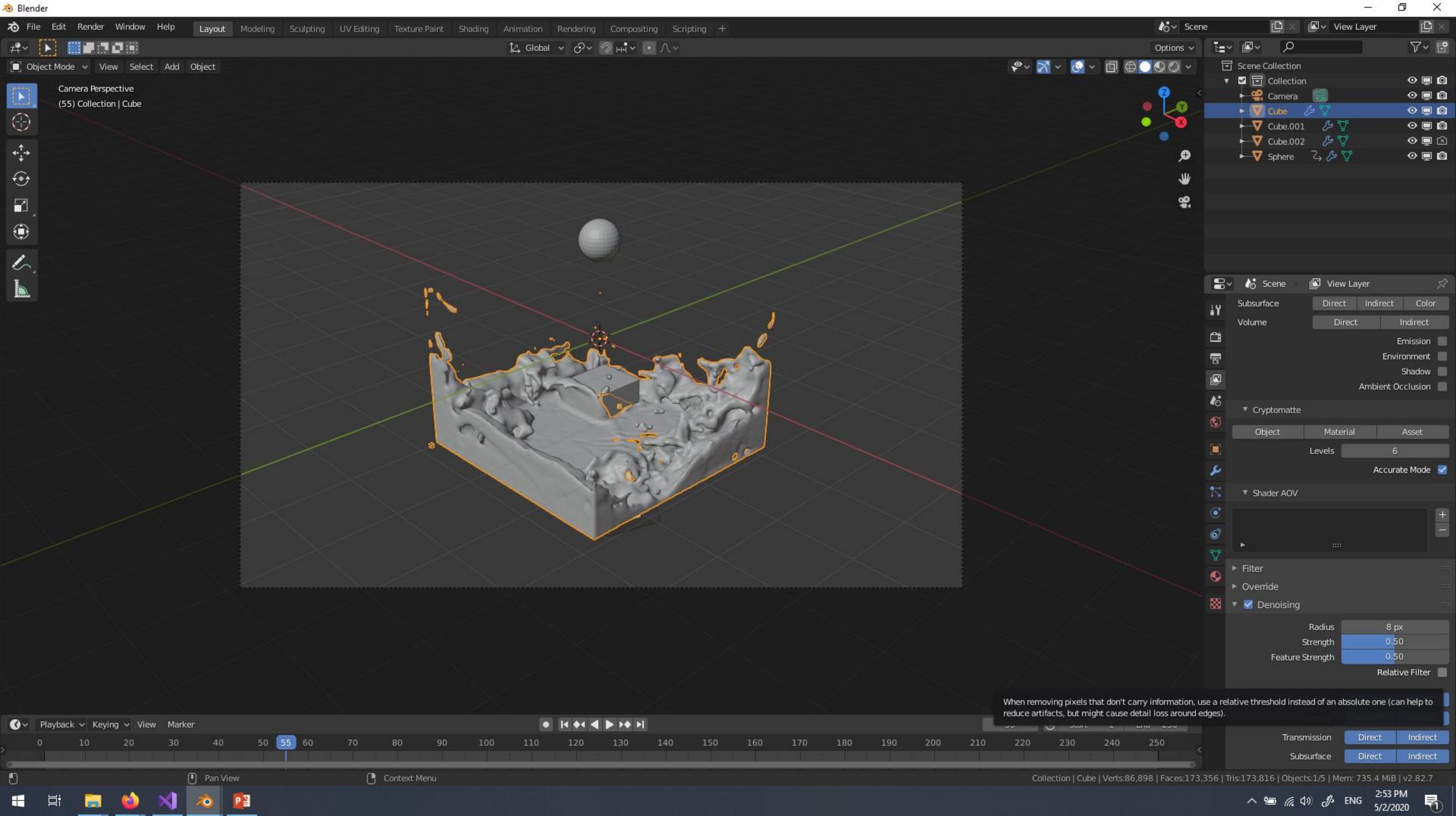
- Overscan
- Simplify
- Freestyle
- Color Management

Playback Keying View Marker

56 Start 1 End 250

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250





Scene Collection

- Collection
 - Camera
 - Cube (selected)
 - Cube.001
 - Cube.002
 - Sphere

Scene View Layer

Subsurface: Direct Indirect Color

Volume: Direct Indirect

Emission:

Environment:

Shadow:

Ambient Occlusion:

Cryptomatte

Object Material Asset

Levels: 6

Accurate Mode:

Shader AOV

Filter

Override

Denoising:

Radius: 8 px

Strength: 0.50

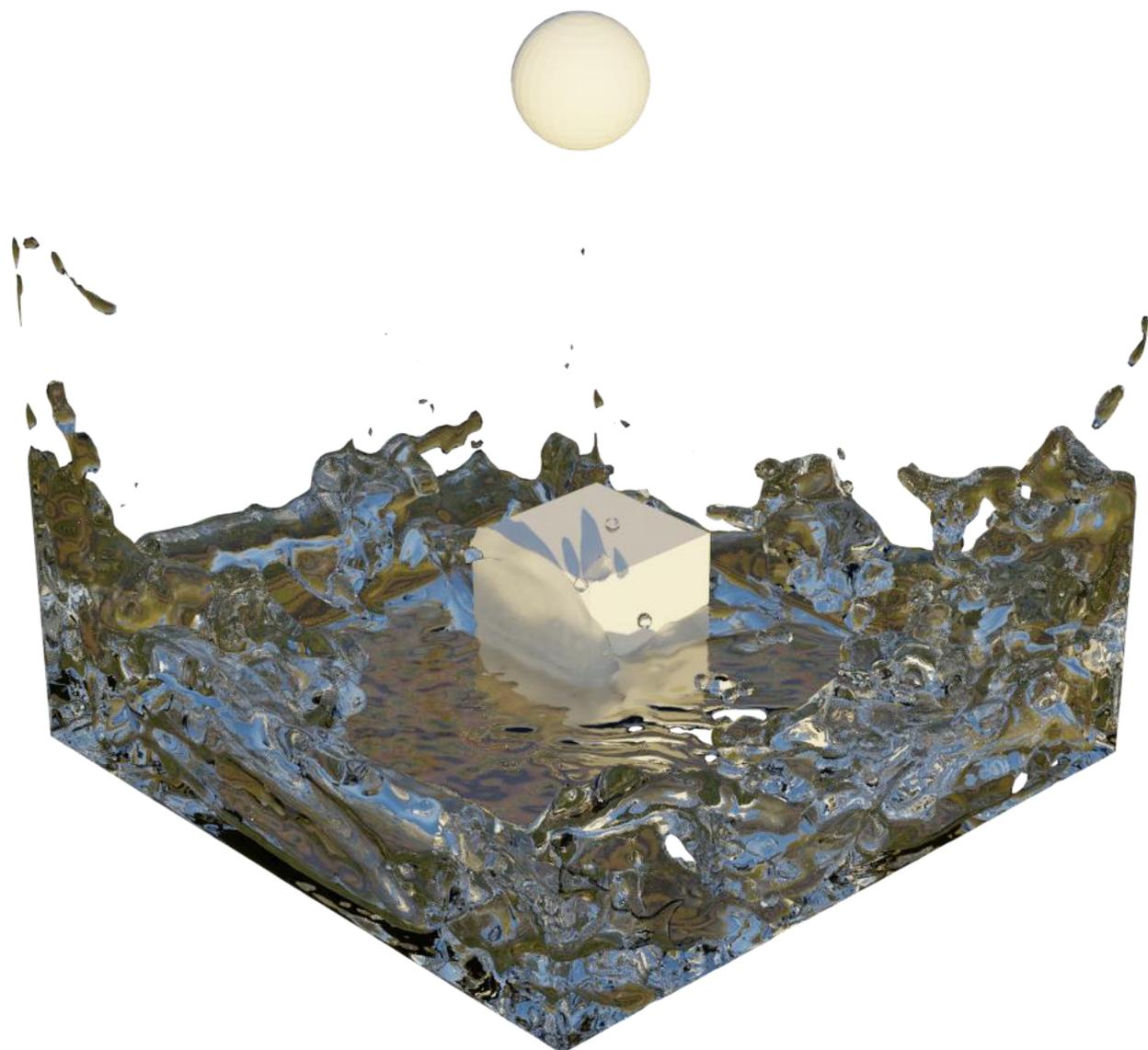
Feature Strength: 0.50

Relative Filter:

Playback Keying View Marker

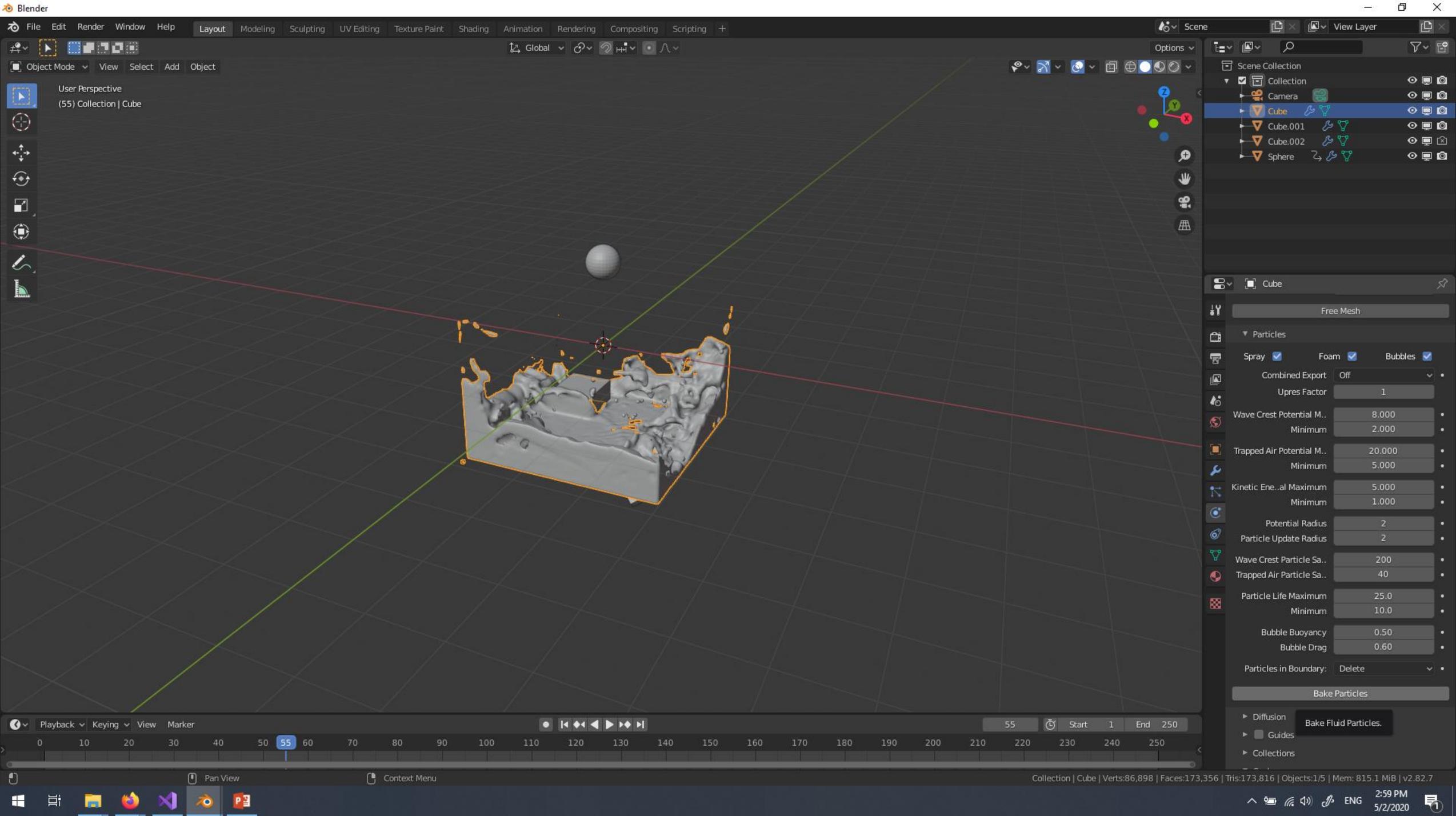
0 10 20 30 40 50 55 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

When removing pixels that don't carry information, use a relative threshold instead of an absolute one (can help to reduce artifacts, but might cause detail loss around edges).



Bake Spray, Foam, Bubbles

- Select the container
- Enable Spray, Foam, Bubbles options
- Keep the setting as they are
- Bake them
- This will create new particle systems
- We will create 2 Icosphere objects representing the Spray and the Foam (one object) and the Bubbles (second object)
- We will set the particles to be rendered as these icospheres



Object Mode View Select Add Object

User Perspective (55) Collection | Cube

Options

Scene Collection

- Collection
- Camera
- Cube
- Cube.001
- Cube.002
- Sphere

Free Mesh

Particles

Spray Foam Bubbles

Combined Export Off

Upres Factor 1

Wave Crest Potential M.. 8.000
Minimum 2.000

Trapped Air Potential M.. 20.000
Minimum 5.000

Kinetic Ene..al Maximum 5.000
Minimum 1.000

Potential Radius 2

Particle Update Radius 2

Wave Crest Particle Sa.. 200

Trapped Air Particle Sa.. 40

Particle Life Maximum 25.0
Minimum 10.0

Bubble Buoyancy 0.50
Bubble Drag 0.60

Particles in Boundary: Delete

Bake Particles

Diffusion Bake Fluid Particles.

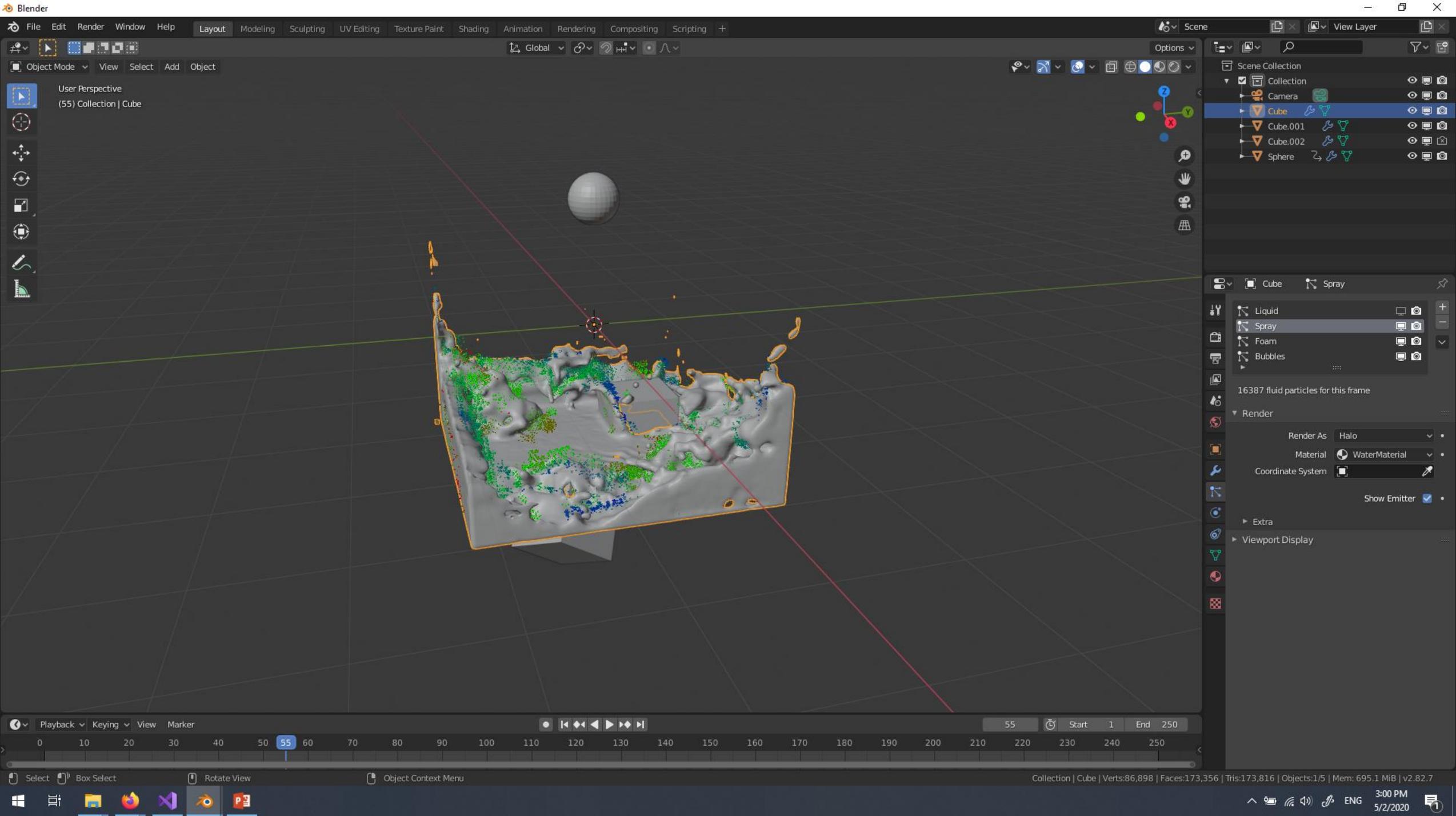
Guides

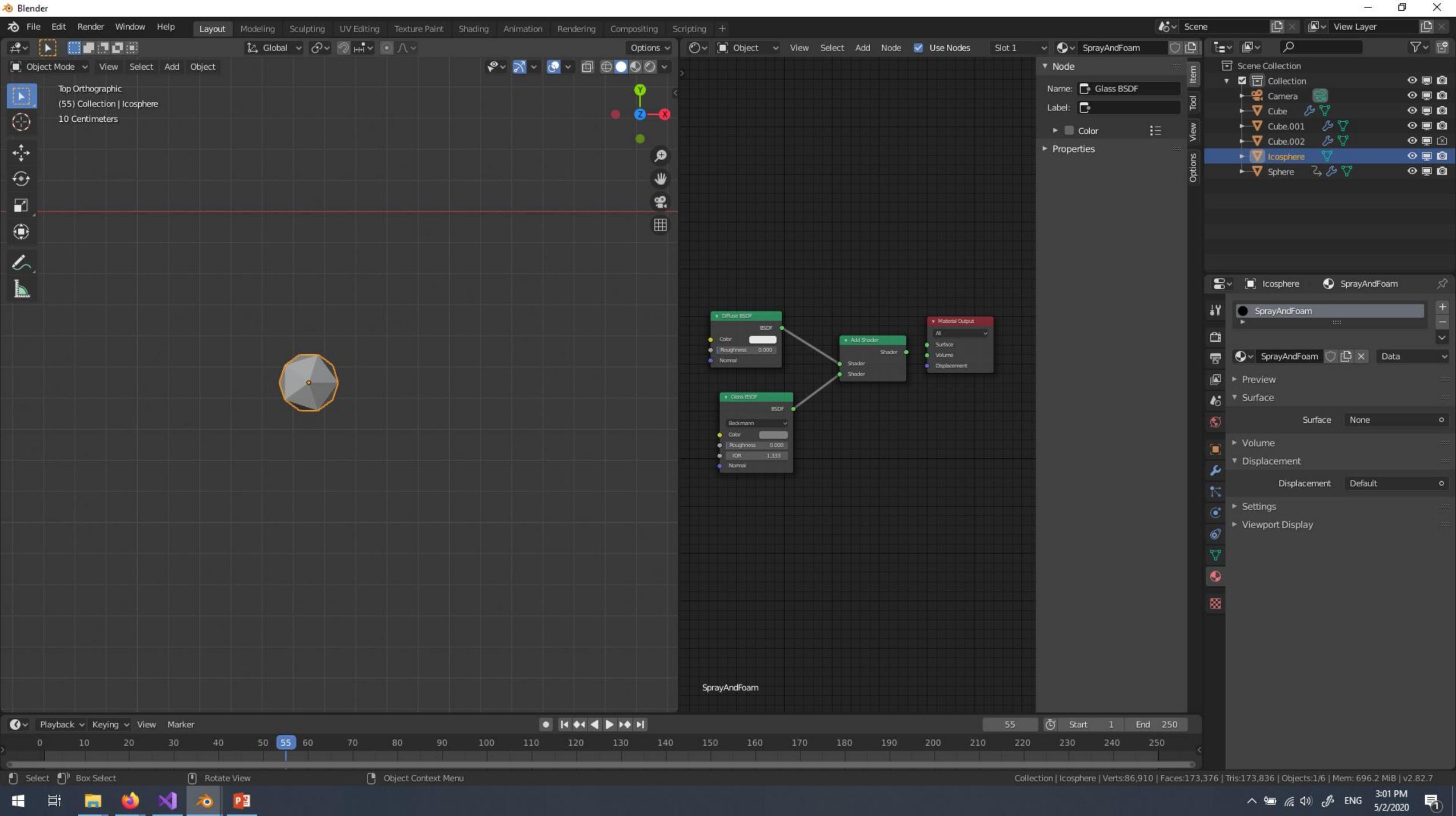
Collections

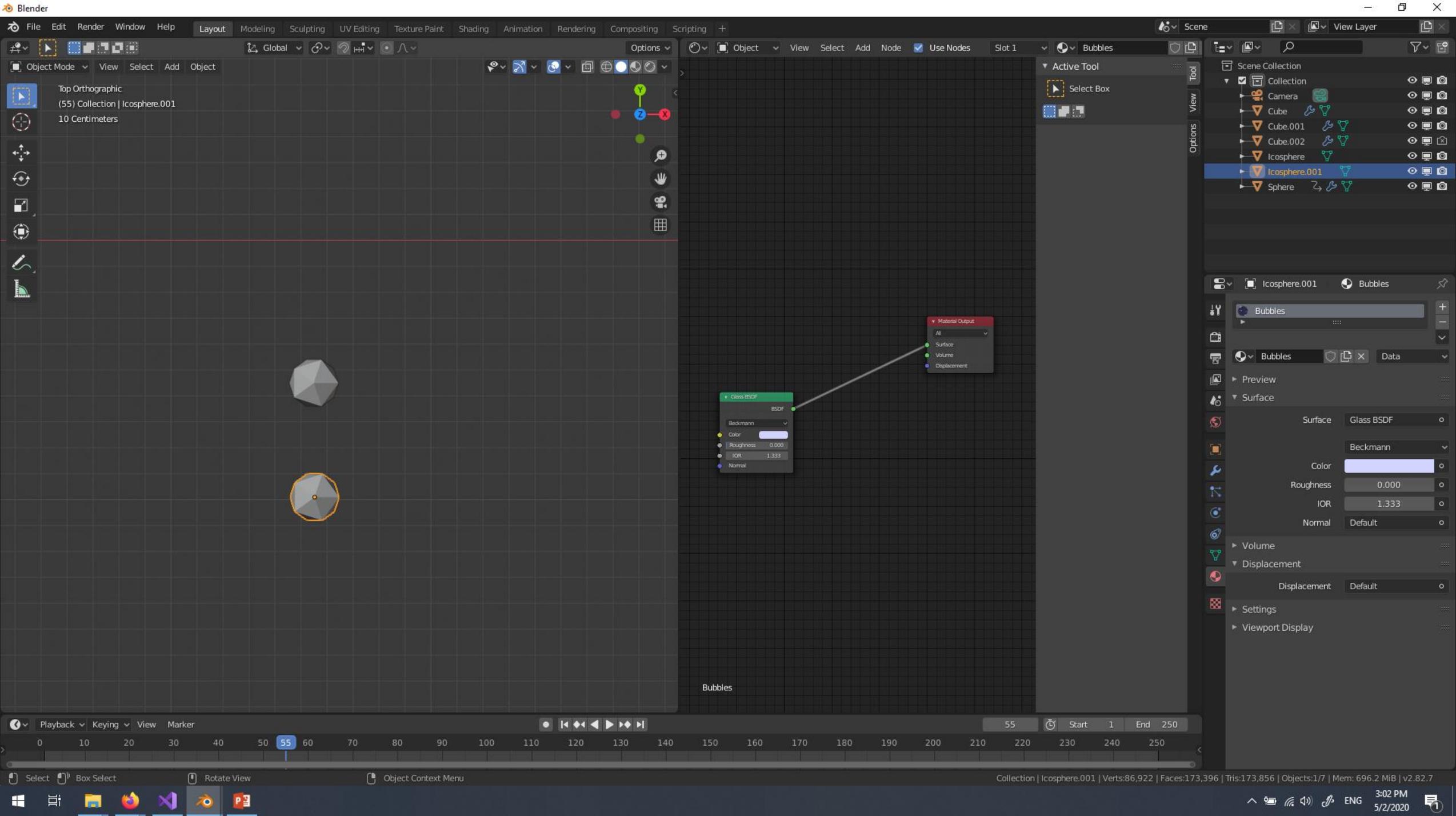
Playback Keying View Marker

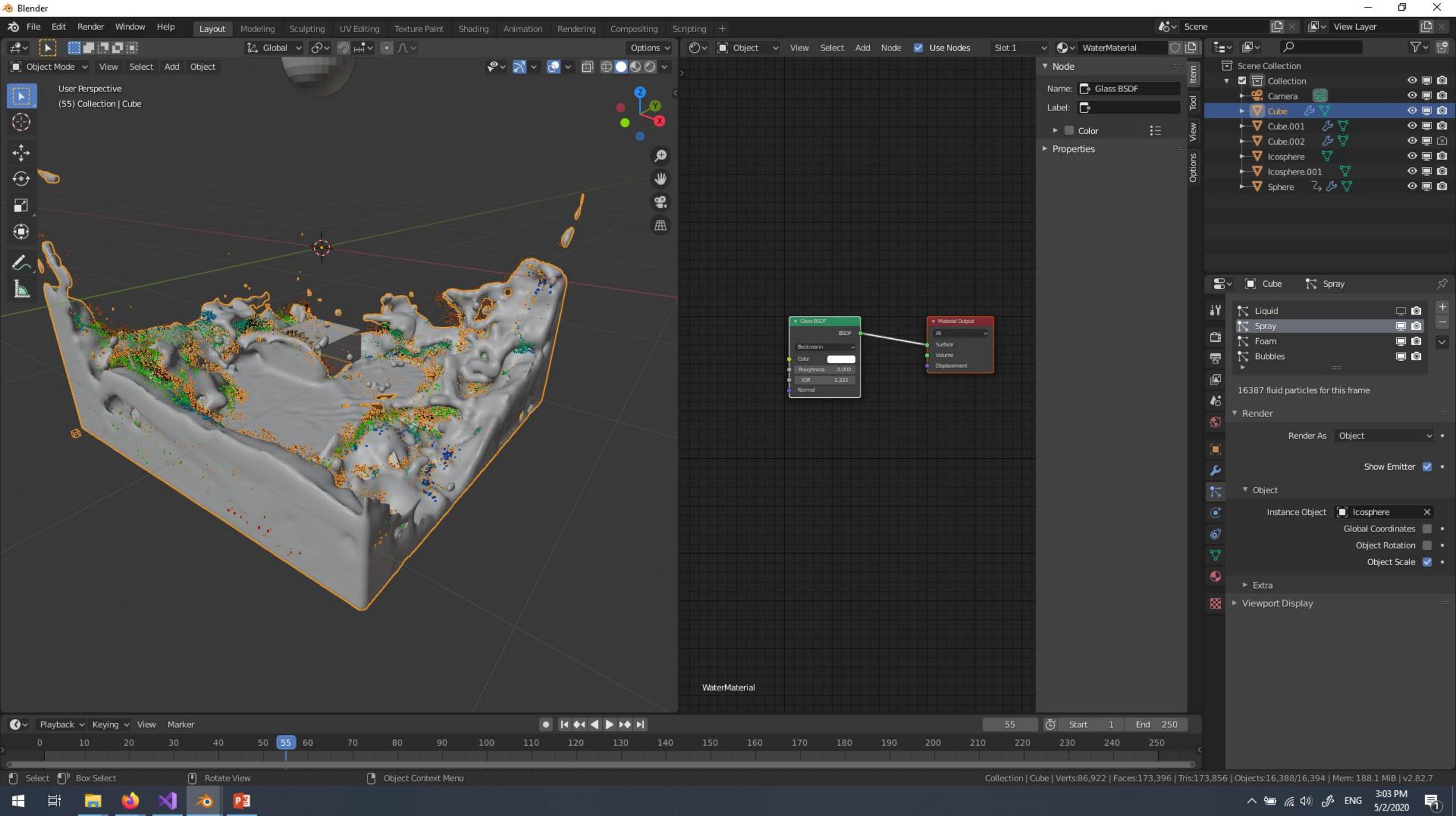
55 Start 1 End 250

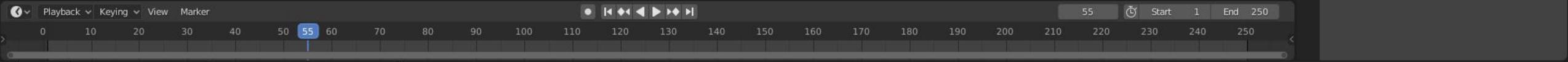
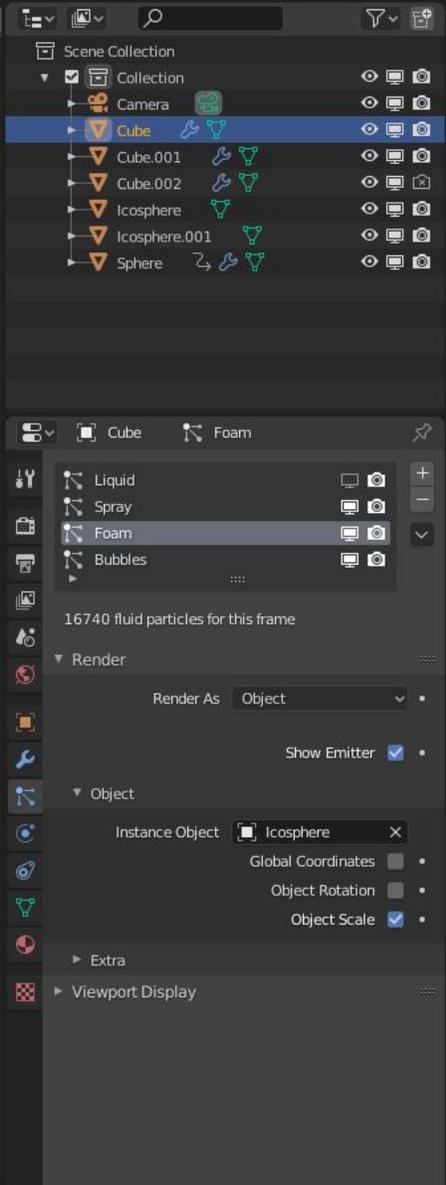
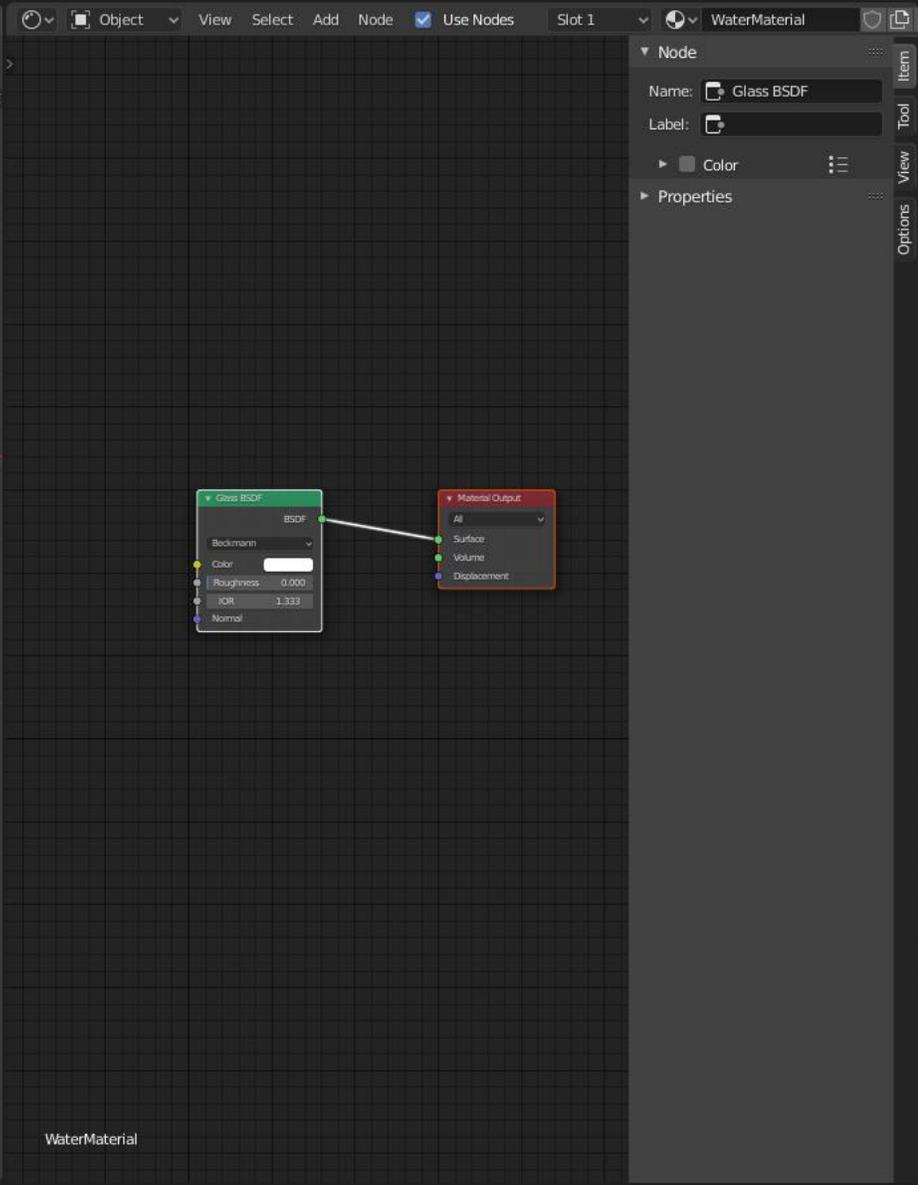
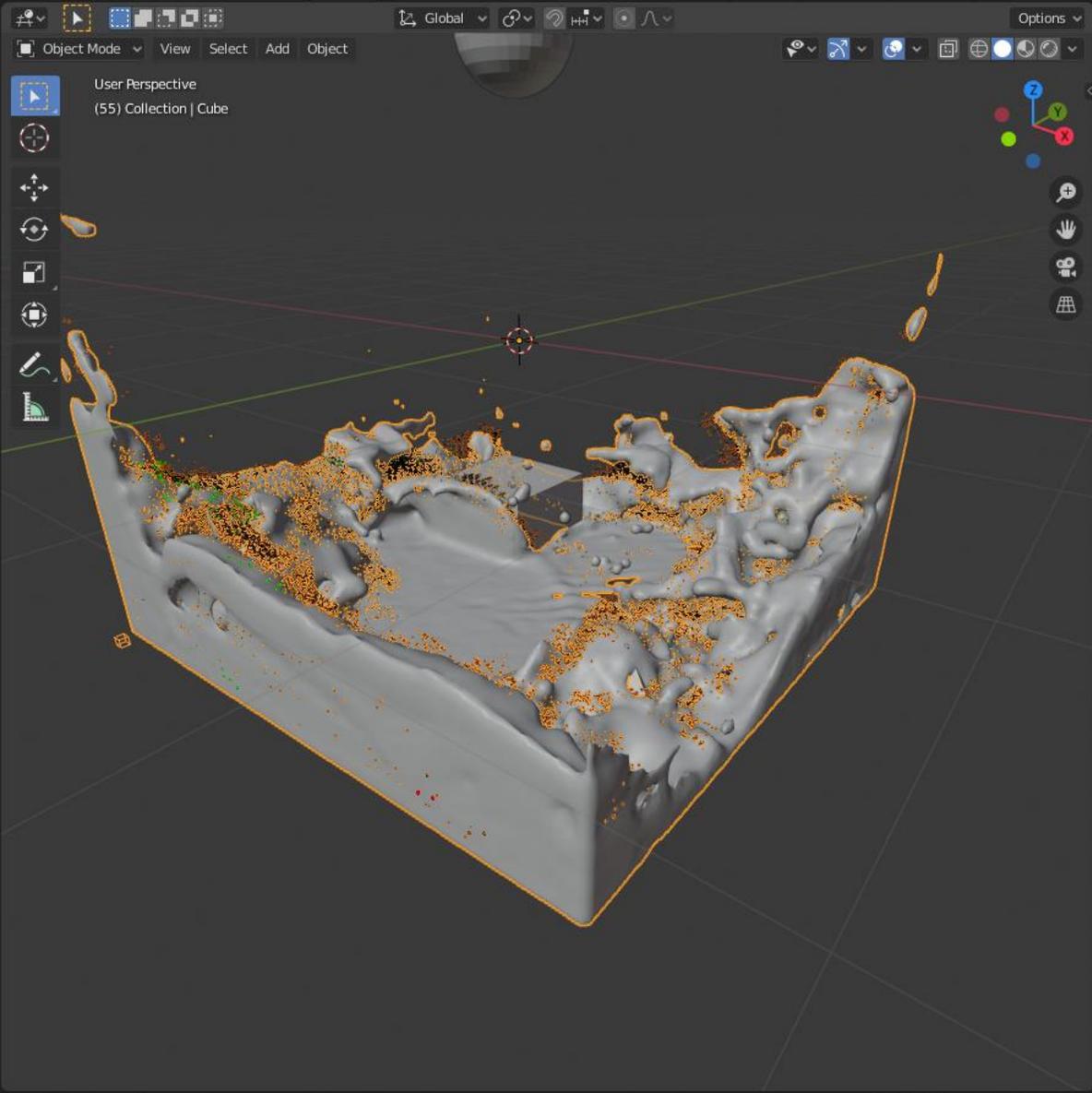
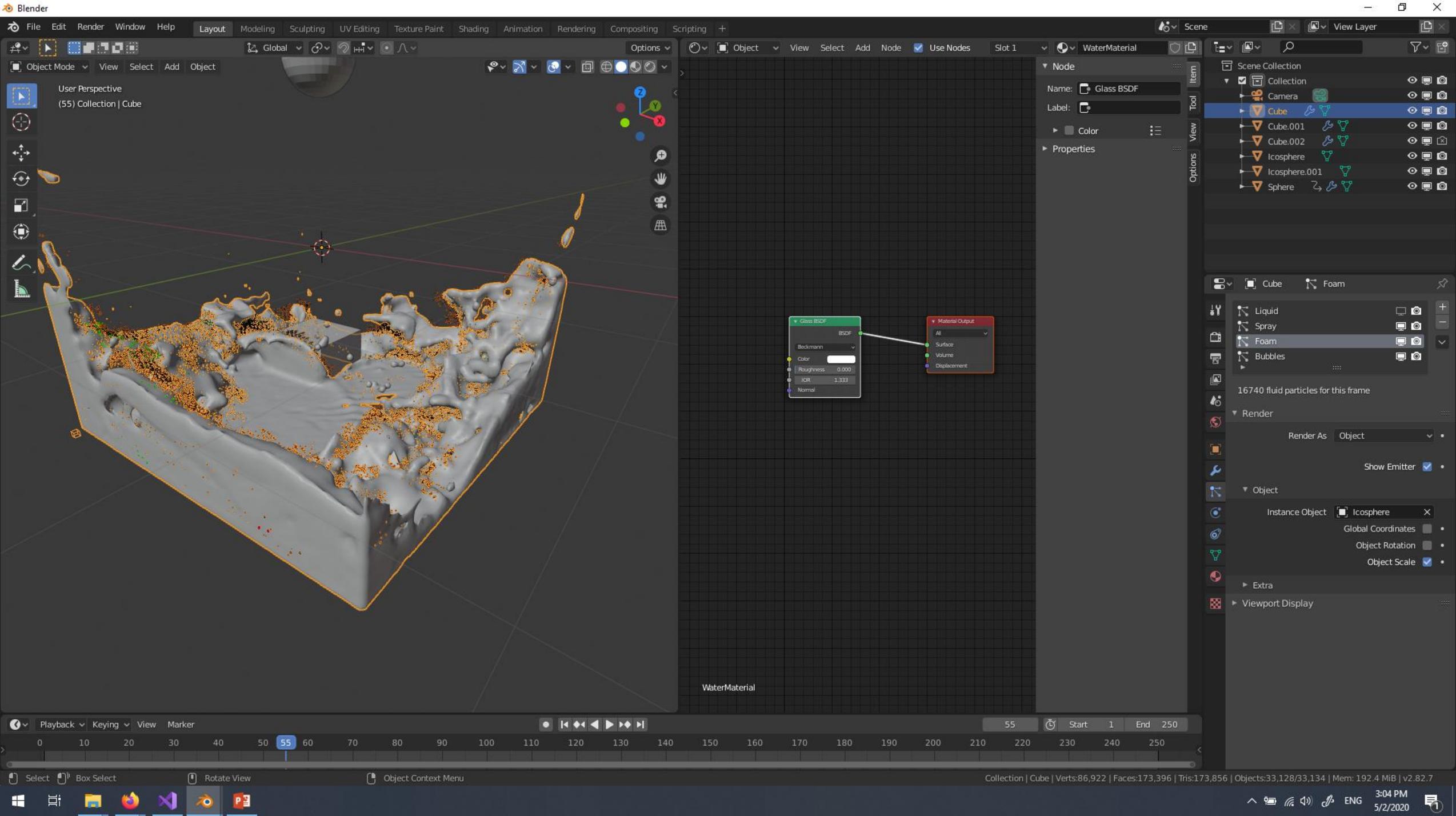
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

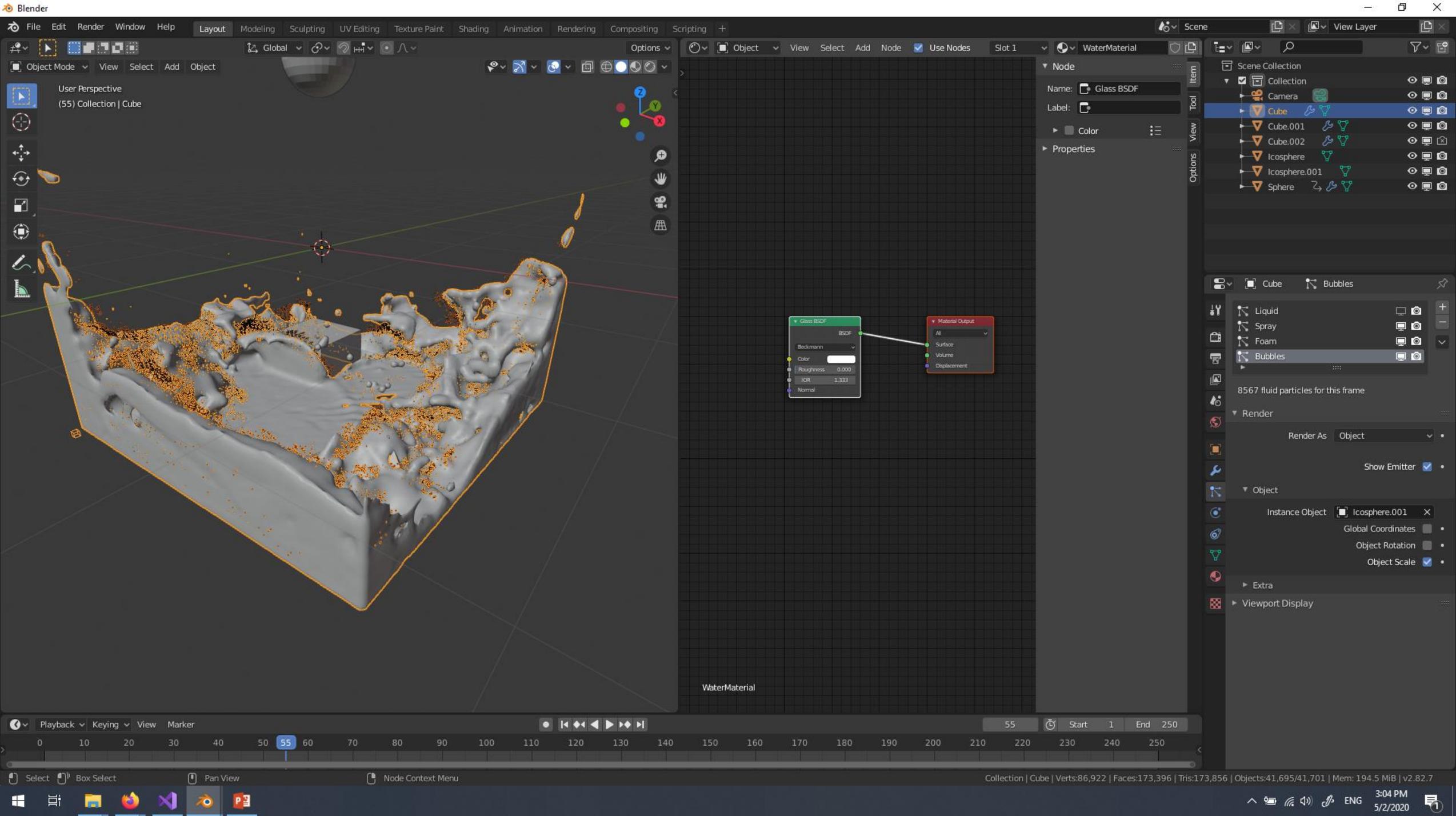












Object Mode View Select Add Object

User Perspective (55) Collection | Cube

Options

Node

Name: Glass BSDF

Label:

Color

Properties

Scene Collection

- Collection
- Camera
- Cube
- Cube.001
- Cube.002
- Icosphere
- Icosphere.001
- Sphere

Cube Bubbles

- Liquid
- Spray
- Foam
- Bubbles

8567 fluid particles for this frame

Render

Render As: Object

Show Emitter:

Object

Instance Object: Icosphere.001

- Global Coordinates:
- Object Rotation:
- Object Scale:

Extra

Viewport Display

WaterMaterial

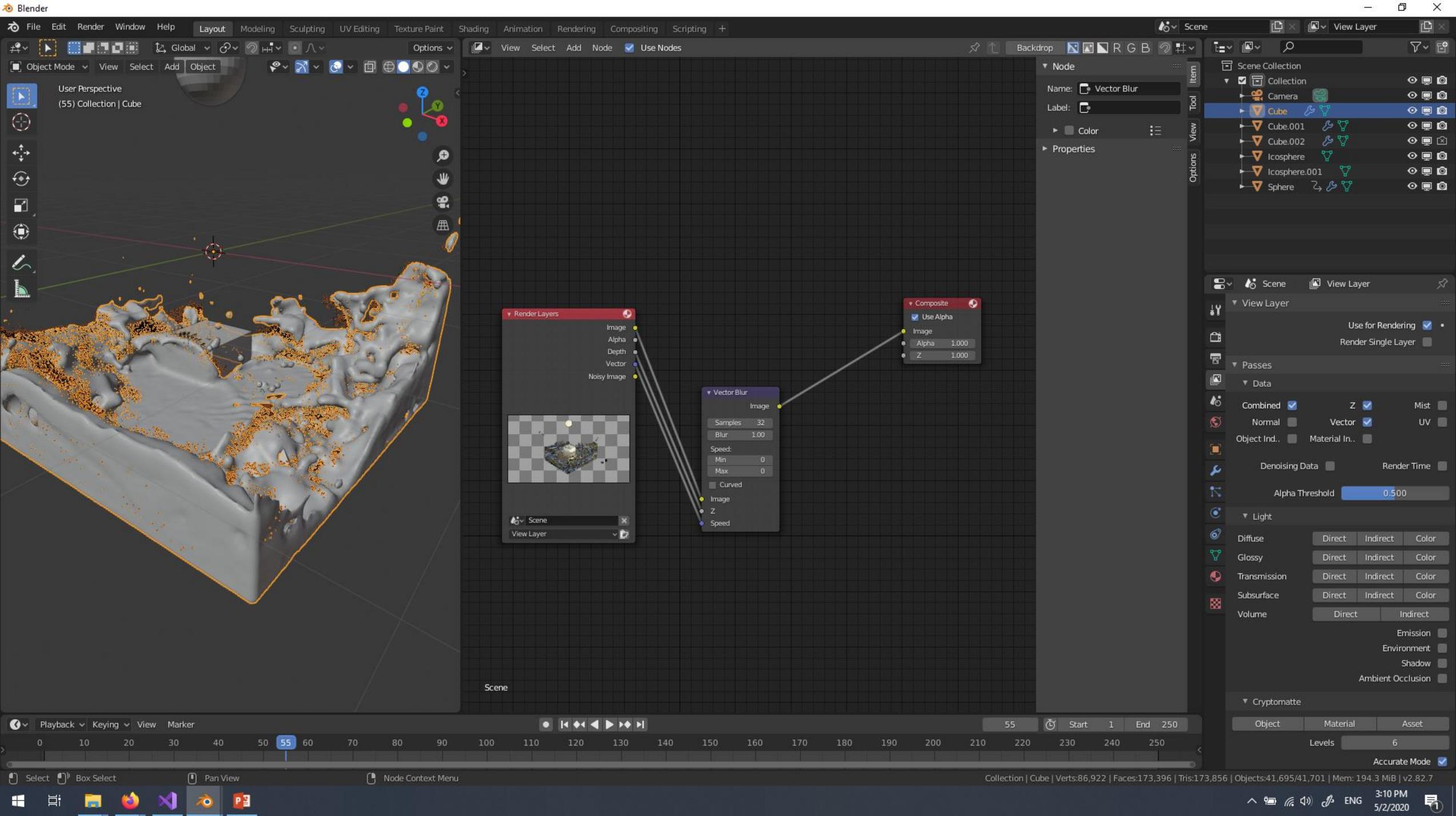
Playback Keying View Marker

55 Start 1 End 250

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

Finish

- This is the most basic workflow you can follow to create liquid simulation
- Now you can play around with various settings to see what effect they have and even create an animation
- Motion blur of the water
 - Adds realism to the scene
 - Go to the container object, Fluid simulator and under Mesh check Use speed vectors
 - In the View Layer Properties check Vector under Passes tab
 - In the compositor set the motion Blur as demonstrated in the next images
- No need to upload any results to IS, as this simulation might be too straining on some weaker computers. I strongly encourage you try it.



Object Mode View Select Add Object

User Perspective
(55) Collection | Cube

Scene

View Select Add Node Use Nodes

Node

Name: Vector Blur
Label:

Color

Properties

Render Layers

- Image
- Alpha
- Depth
- Vector
- Noisy Image

Vector Blur

Image

Samples: 32
Blur: 1.00

Speed:

Min: 0
Max: 0

Curved

Image

Z

Speed

Composite

Use Alpha

Image

Alpha: 1.000
Z: 1.000

Scene Collection

- Collection
- Camera
- Cube
- Cube.001
- Cube.002
- Icosphere
- Icosphere.001
- Sphere

View Layer

Use for Rendering
Render Single Layer

Passes

Data

Combined Z Mist
Normal Vector UV
Object Ind. Material In.

Denoising Data Render Time

Alpha Threshold: 0.500

Light

Diffuse: Direct Indirect Color
Glossy: Direct Indirect Color
Transmission: Direct Indirect Color
Subsurface: Direct Indirect Color
Volume: Direct Indirect
Emission
Environment
Shadow
Ambient Occlusion

Cryptomatte

Object Material Asset

Levels: 6

Accurate Mode

Playback Keying View Marker

0 10 20 30 40 50 55 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

55 Start 1 End 250