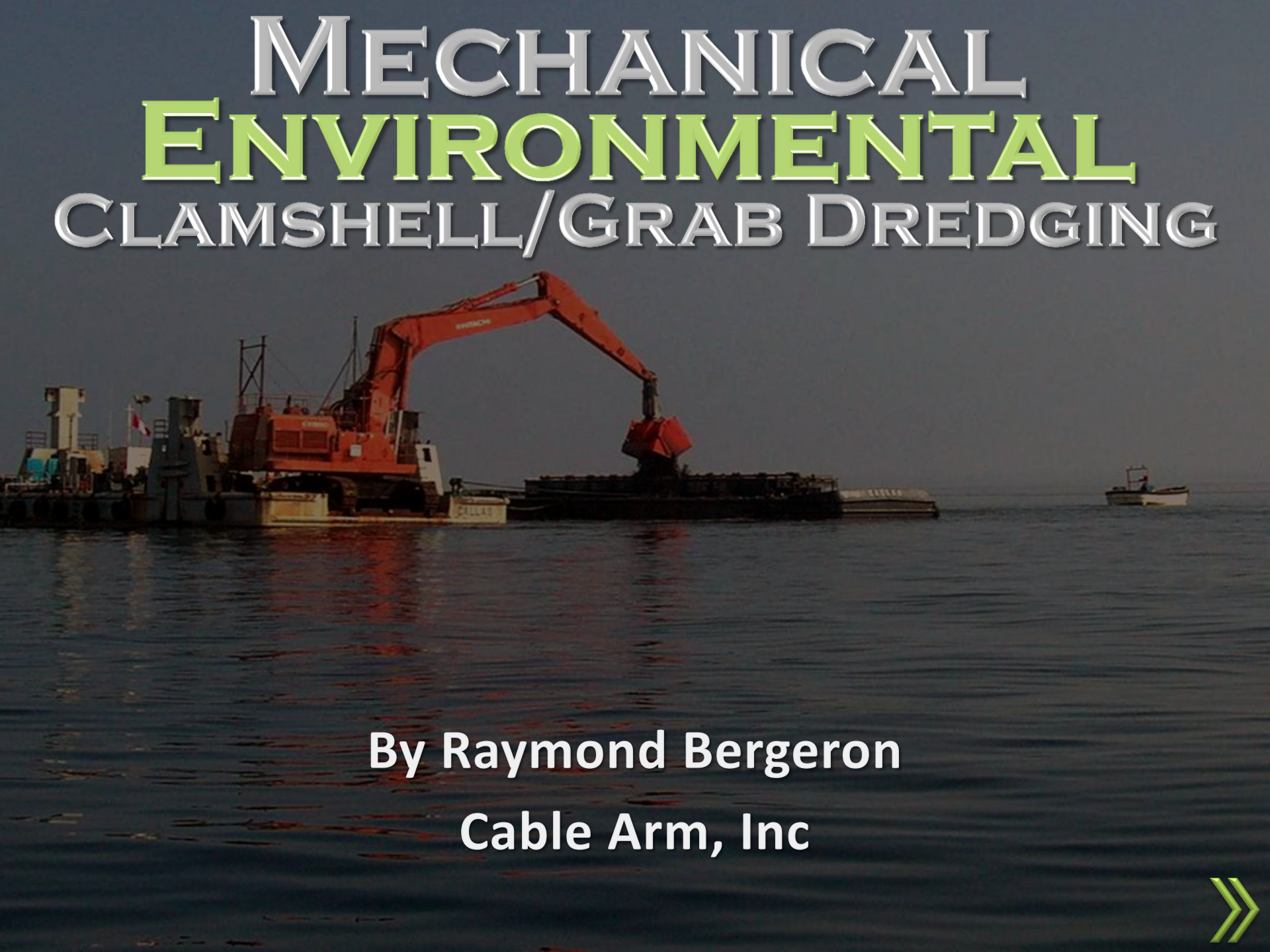
Mechanical Environmental Clamshell/Grab Dredging



By Raymond Bergeron

Cable Arm, Inc

What is Environmental Dredging?

- Dredging aimed to remove, reduce, or limit the spread of contamination by mechanical means, with environmentally friendly procedures and parameters, and with minimal redepositing.
- Reduce sediment content (turbidity) near water intake valves, nuclear power plant intake channels, and any application that requires reduced turbidity.
- Environmental dredging consists of 4 key issues, as defined by the United States Army Corp of Engineers (USACE).
    - Resuspension
    - Release
    - Residual
    - Risk

Resuspension

When dredging, sediments are loosened, stirred, and dispersed into the water column. These sediments then resettle overtop the freshly dredged area and downstream when a current is present.

Release

Pollutants are absorbed into and adsorbed onto pore water and sediment material. Once disturbed and re-suspended, those trapped pollutants can be released.

Residual

Contaminated sediment produced by and/or remaining after dredging.

Residual

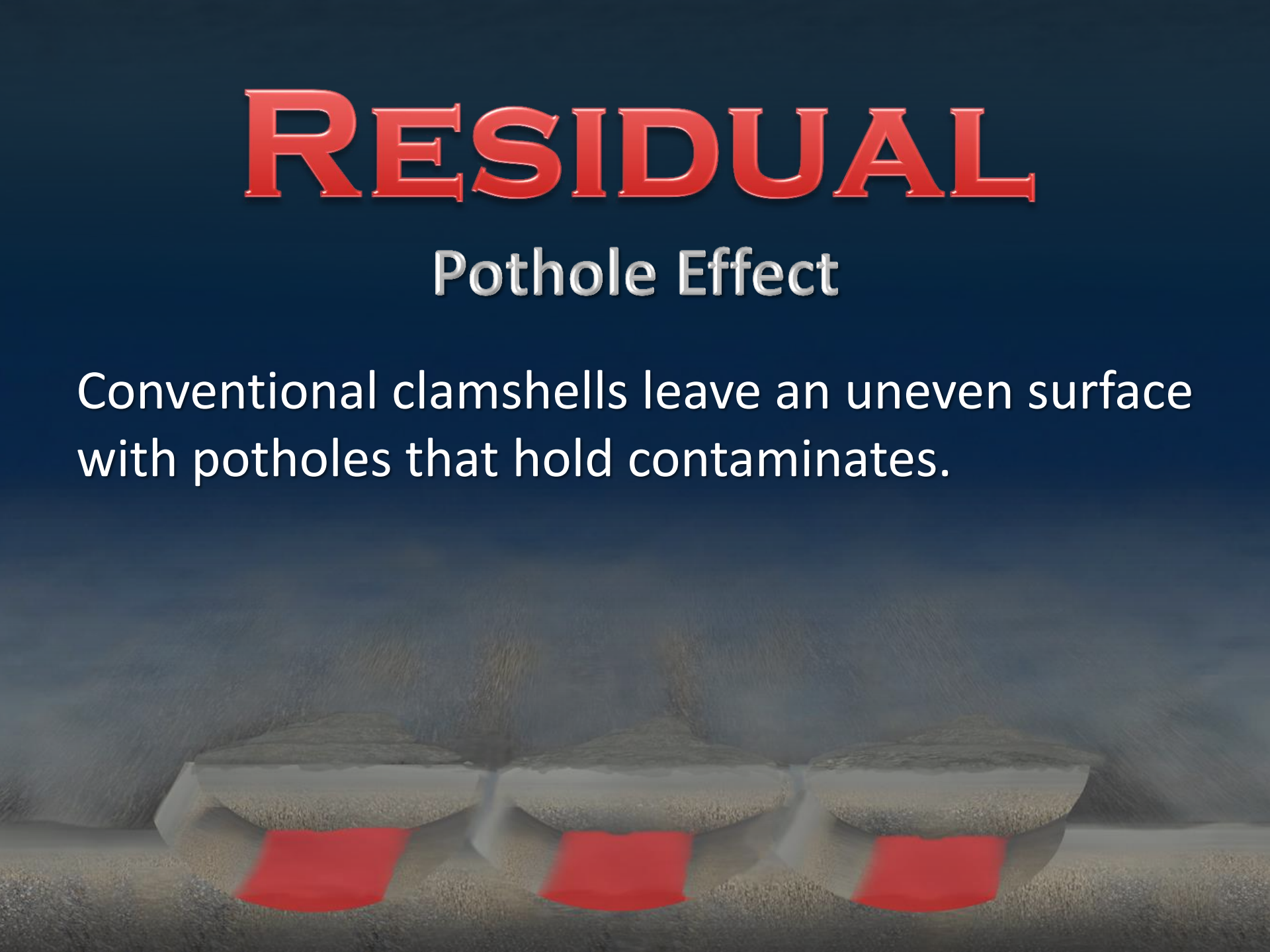
Windrowing

Windrowing is the row of material pushed out of the bucket during closure. Windrowing is the main cause of residual.

Residual

Pothole Effect

Conventional clamshells leave an uneven surface with potholes that hold contaminates.



Residual

Resettlement

Sediment and pollutants re-suspended into the water column will eventually resettle. Resettlement locations vary due to currents.

Residual

Undisturbed

Sediment and pollutants uncovered, but not removed.

RISK

Ecological and human health are the most dangerous risks associated with dredging. Other risks include social and economic.

RISK vs REWARD

Environmental dredging aims to reduce the risks while increasing the rewards.

With proper dredging, contamination spreading into our ecological system (RISK) is reduced while contamination clean up (currently affecting the health of those systems) eliminates future health concerns (REWARD).

Risk

Ecological & Human Health Risks

Direct and indirect risks related to toxicological effects from exposure to contamination at the site.

Risk

Social Risks

Limited or loss of water access for cultural and/or recreational activities during dredging operations.

Risk

Economic Risks

Loss of revenue can occur when nearby utilities must be shutdown due to turbidity exceeding approved levels near water intake valves or channels.

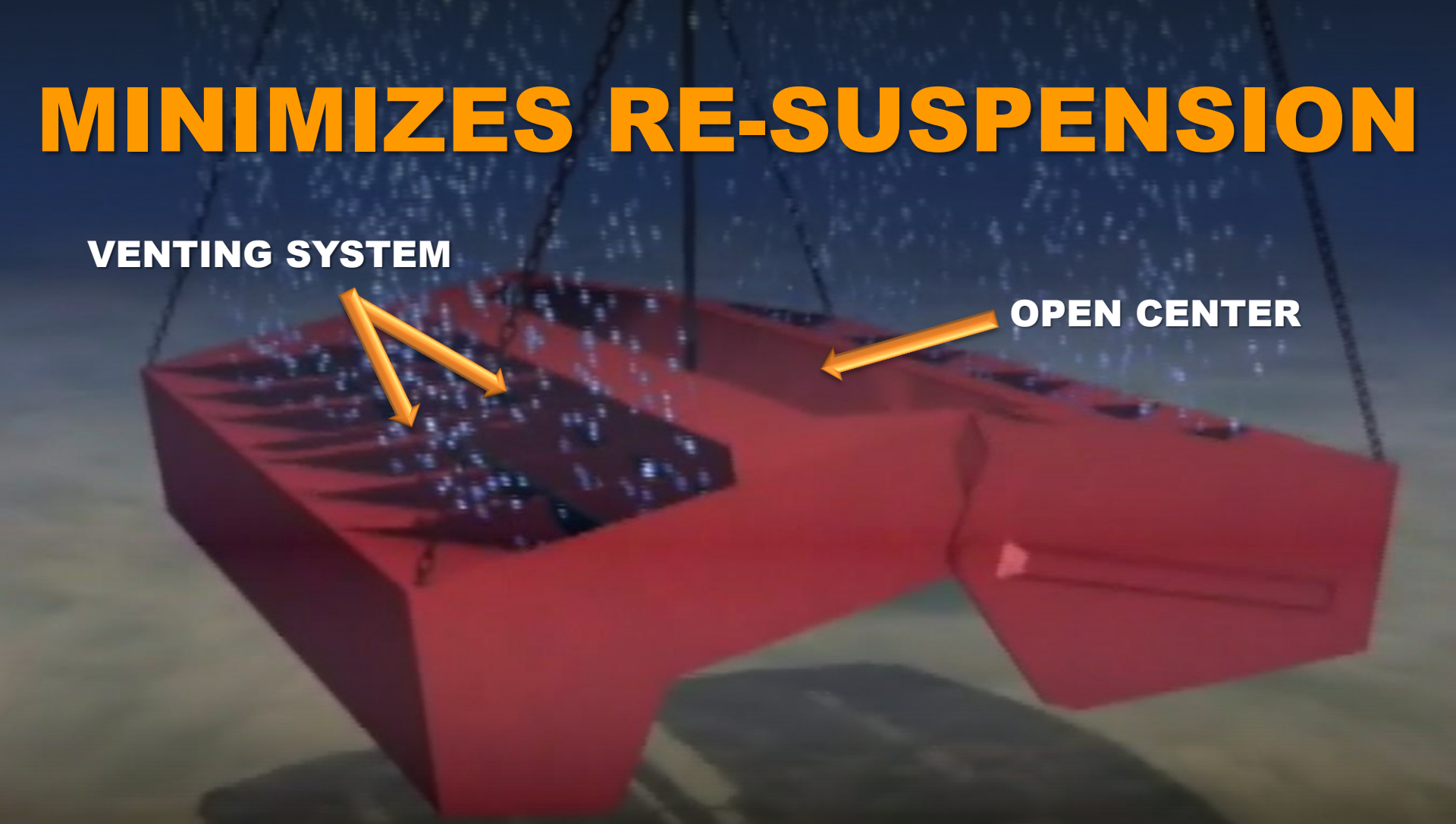
Why does an environmentally designed clamshell/grab matter?

MINIMIZES RE-SUSPENSION RELEASE & RESIDUAL

REDUCES TIME

CUTS COSTS

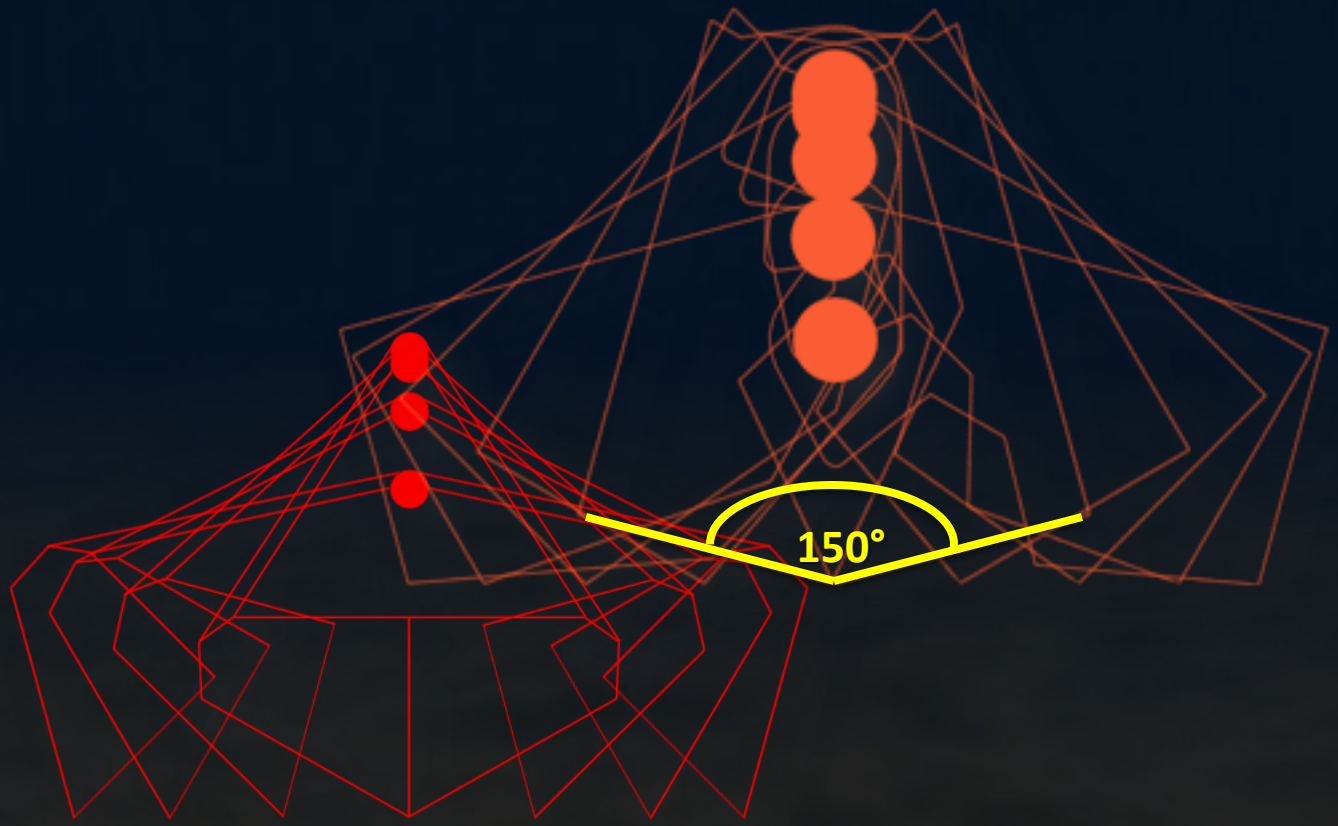
MINIMIZES RE-SUSPENSION



The vents and open center decrease downward pressure during bucket descent and the rubber flaps seal in material during bucket ascension.

MINIMIZES RELEASE

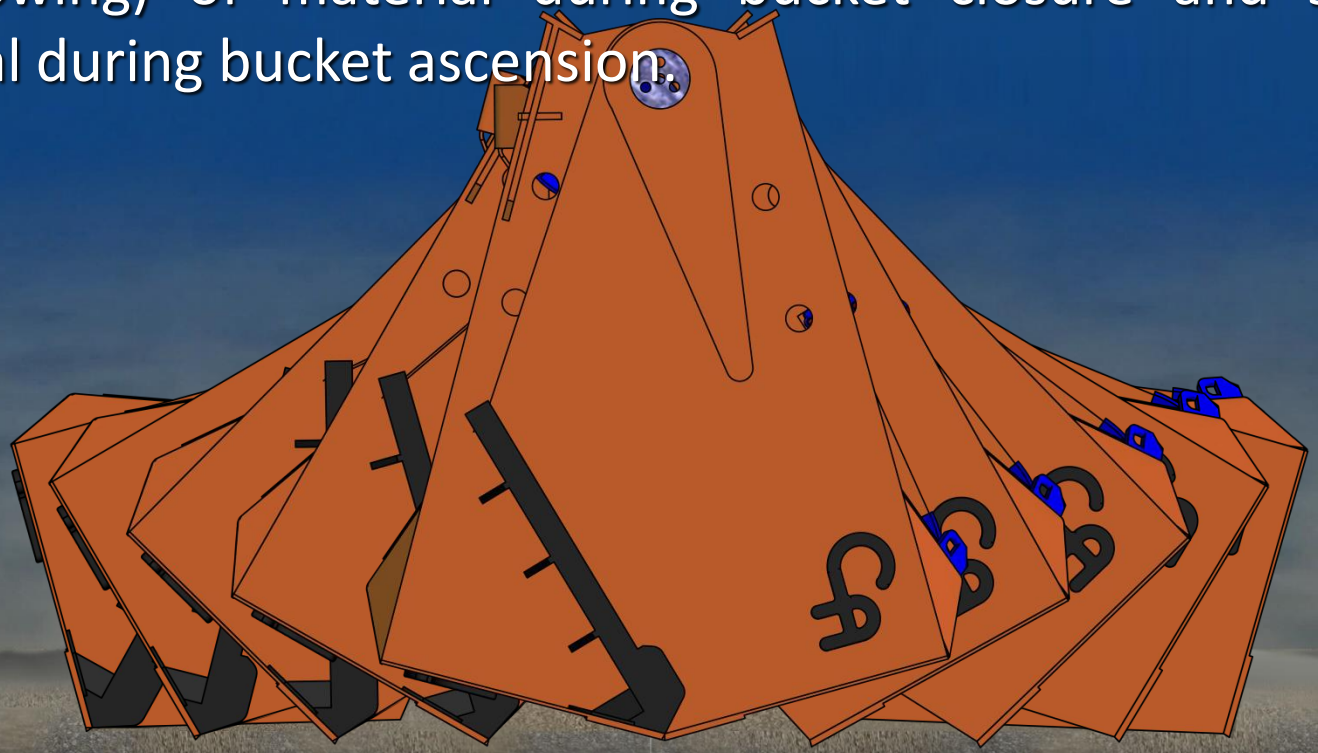
150° CUTTING EDGE



MINIMIZES RESIDUAL

OVERLAPPING SIDE PLATES

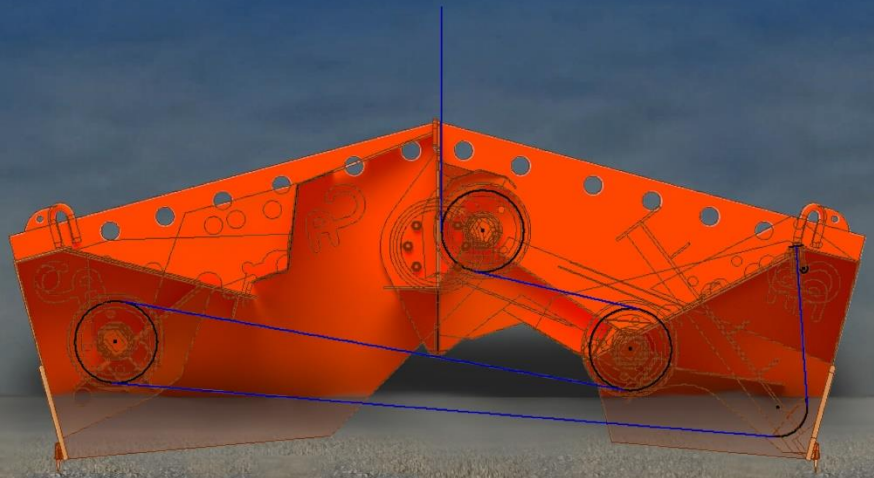
Large overlapping side plates reduce the cross-sectional area when closing. The side plates minimize outward flow (windrowing) of material during bucket closure and seal in material during bucket ascension.

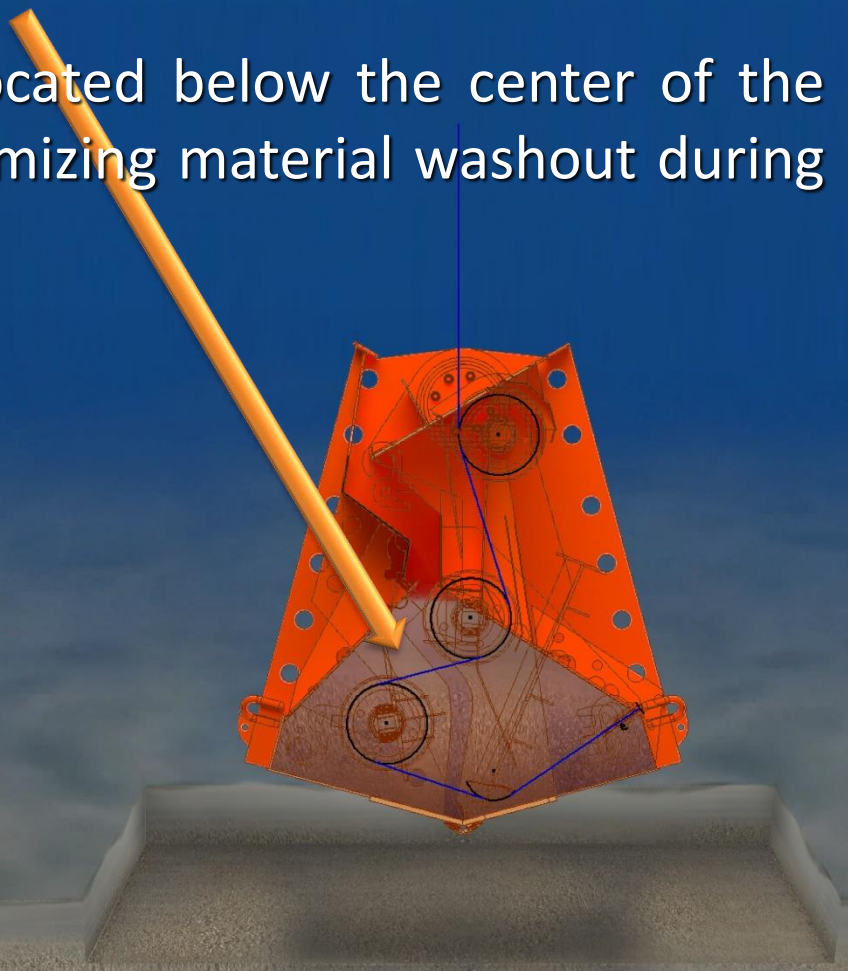


MINIMIZES RESIDUAL

MATERIAL LOCATION

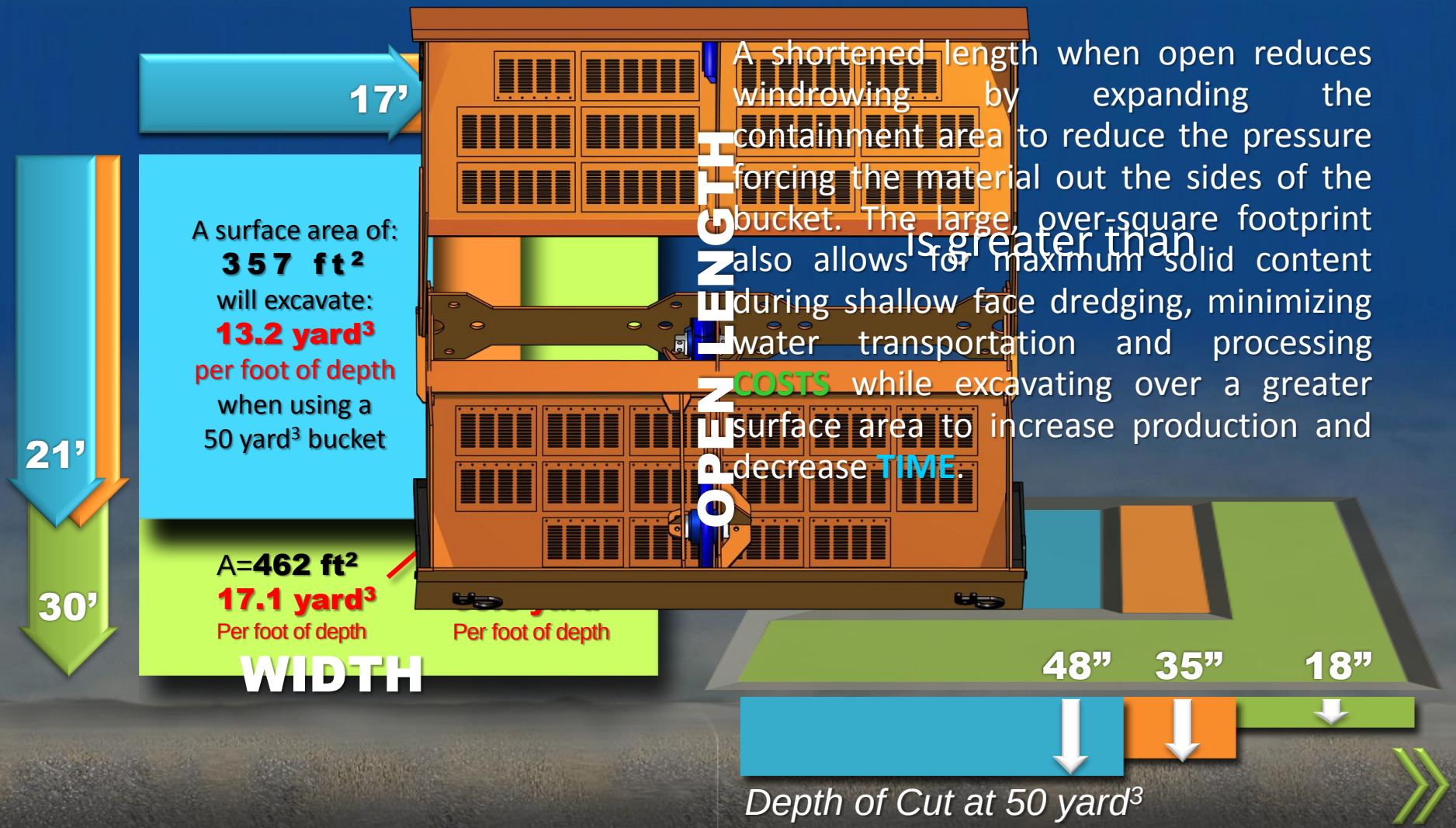
Center of Mass of material is located below the center of the bucket's containment area minimizing material washout during bucket closing and ascension.



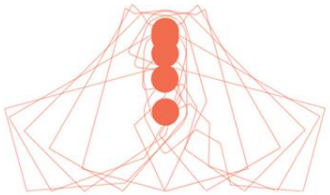


MINIMIZES RESIDUAL

LARGE OVER-SQUARE FOOTPRINT



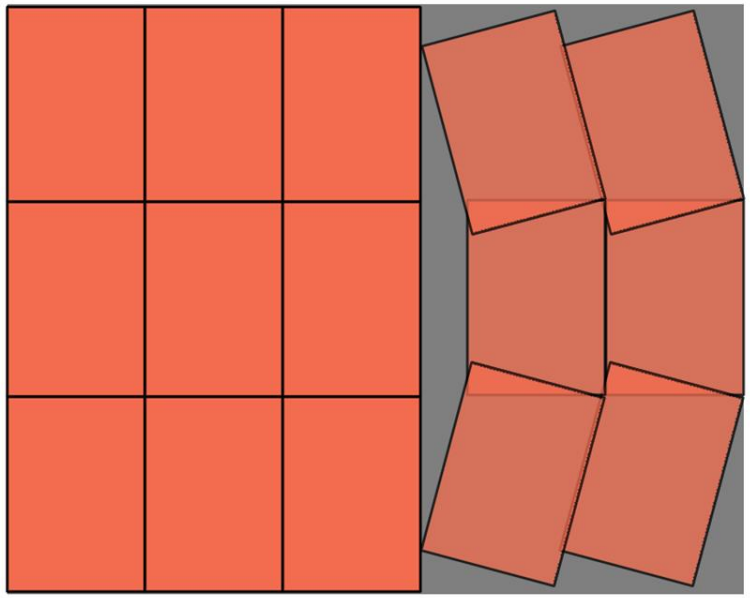
A shortened length when open reduces windrowing by expanding the containment area to reduce the pressure forcing the material out the sides of the bucket. The large, over-square footprint also allows for maximum solid content during shallow face dredging, minimizing water transportation and processing **COSTS** while excavating over a greater surface area to increase production and decrease **TIME**.

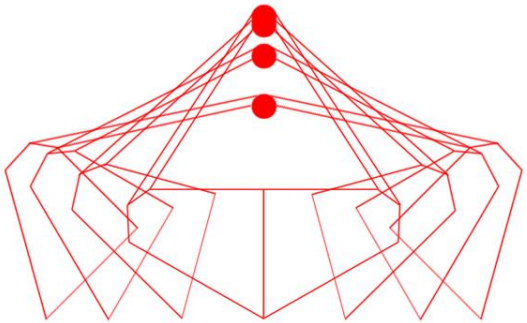


5 yard^3

FOOTPRINT:
8'6" x 12'
102 ft^2 area
1'4" depth

3.8 y^2/ft depth





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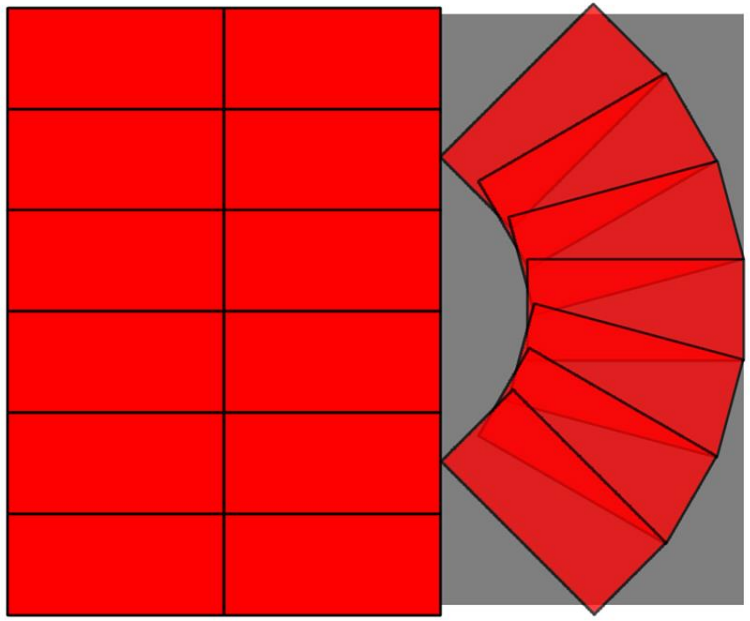


Sloping Profile

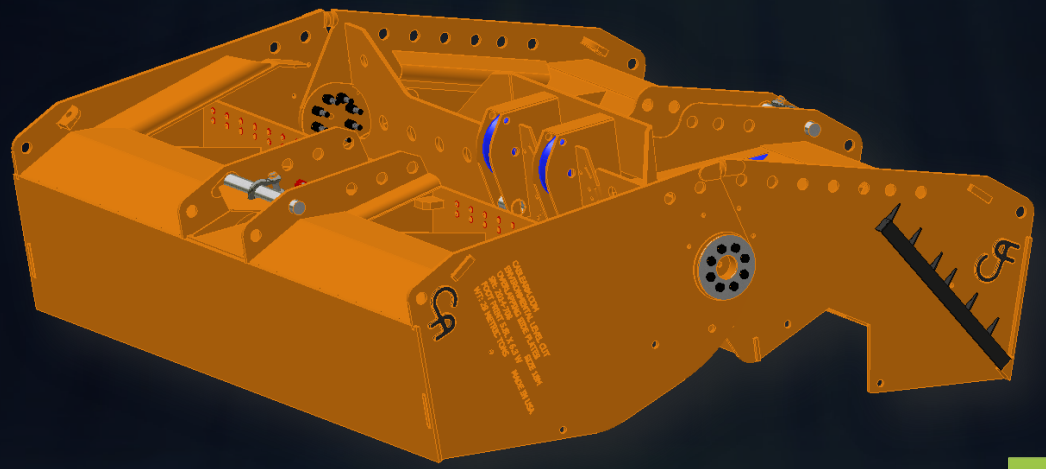
Allows for angled, lateral movement along an inclined bottom. Previously, over dredging in "steps" were required. These steps are then often filled in with capping material.

Lightweight

Eliminates the processing of hard, uncontaminated sediment.

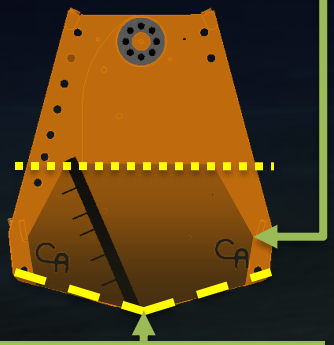
Venting System with Open Center

Decreases downward pressure during bucket descent and seals in material during bucket ascension.



Material Location

Center of Mass of material is located below the center of the bucket's containment area minimizing material washout during bucket closing and ascension.



150° Cutting Edge

Allows the bucket to "scoop" material which lowers the materials center of mass within the containment area.

Level-Cut

Produces a near flat surface opposed to the pothole effect which can create a pool of contamination.

Overlapping Side Plates

Minimize outward flow (windrowing) of material during bucket closure and seals in material during bucket ascension.

Over-Square Footprint

Width greater than opened length minimizes outward flow of material during bucket closure.

(up to 100 m^2)

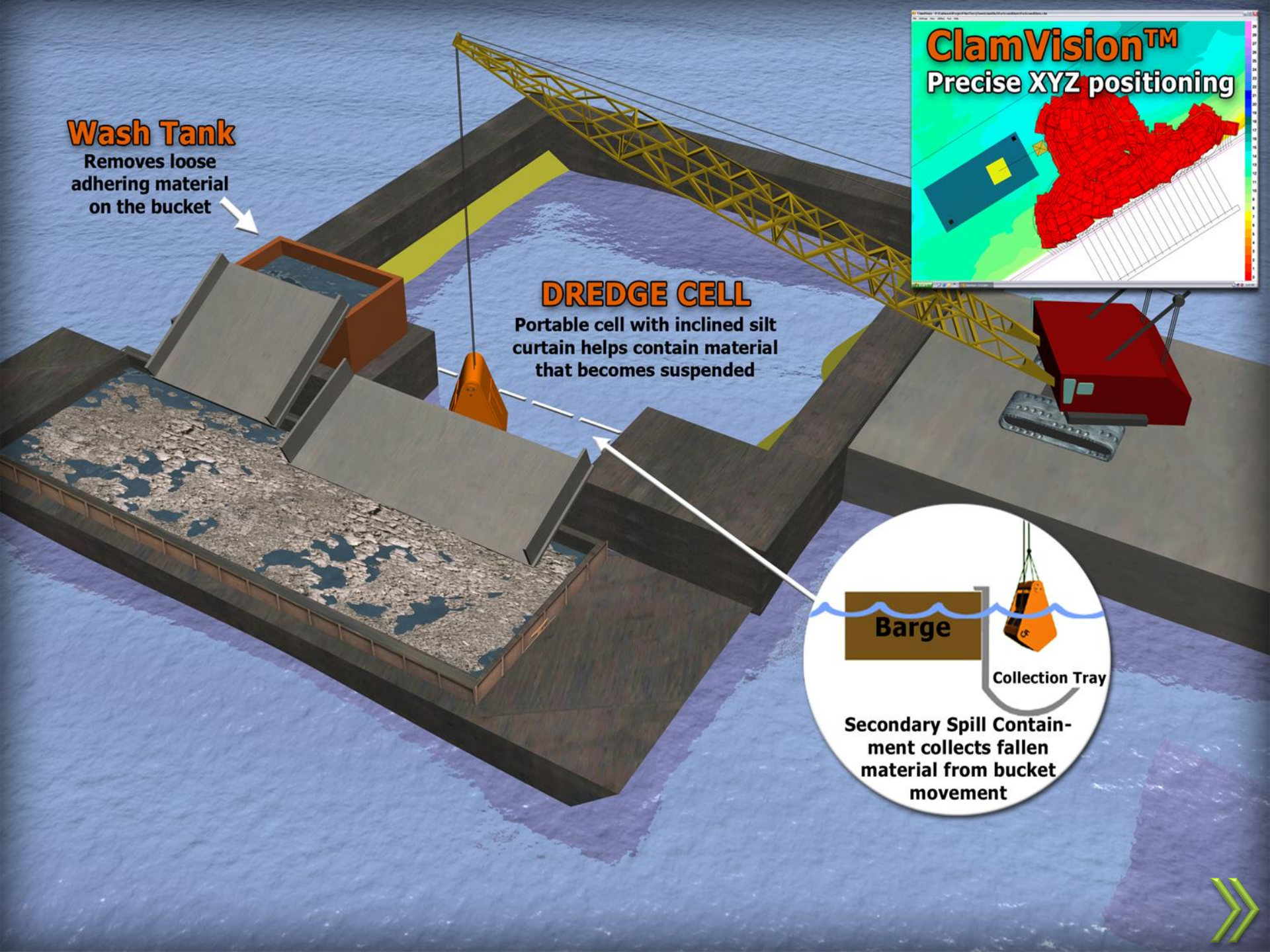
Low Water Content

Squeezes and drains water to minimize transportation/disposal costs.

ClamVision®
PRECISE XYZ DREDGE POSTIONING SOFTWARE

What makes an environmental job successful?

- Successful environmental jobs minimize resuspension, reduce time, and cut costs.
- Meeting cleanup goals, limiting disposal costs, and segregating sediment.
- Includes proven and quality systems, procedures, and equipment.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Precise XYZ positioning
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Secondary Spill Containment collects fallen material from bucket movement


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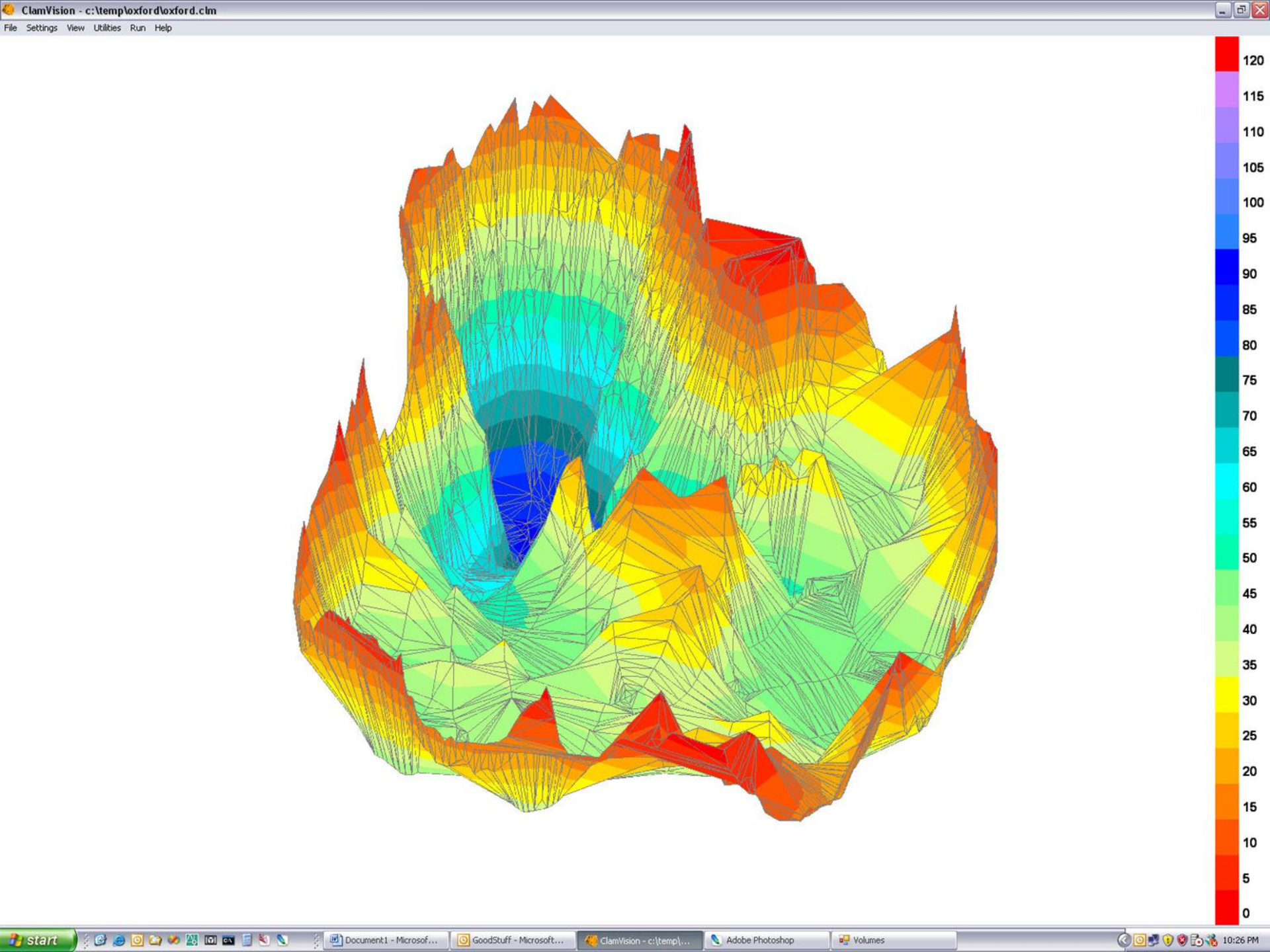
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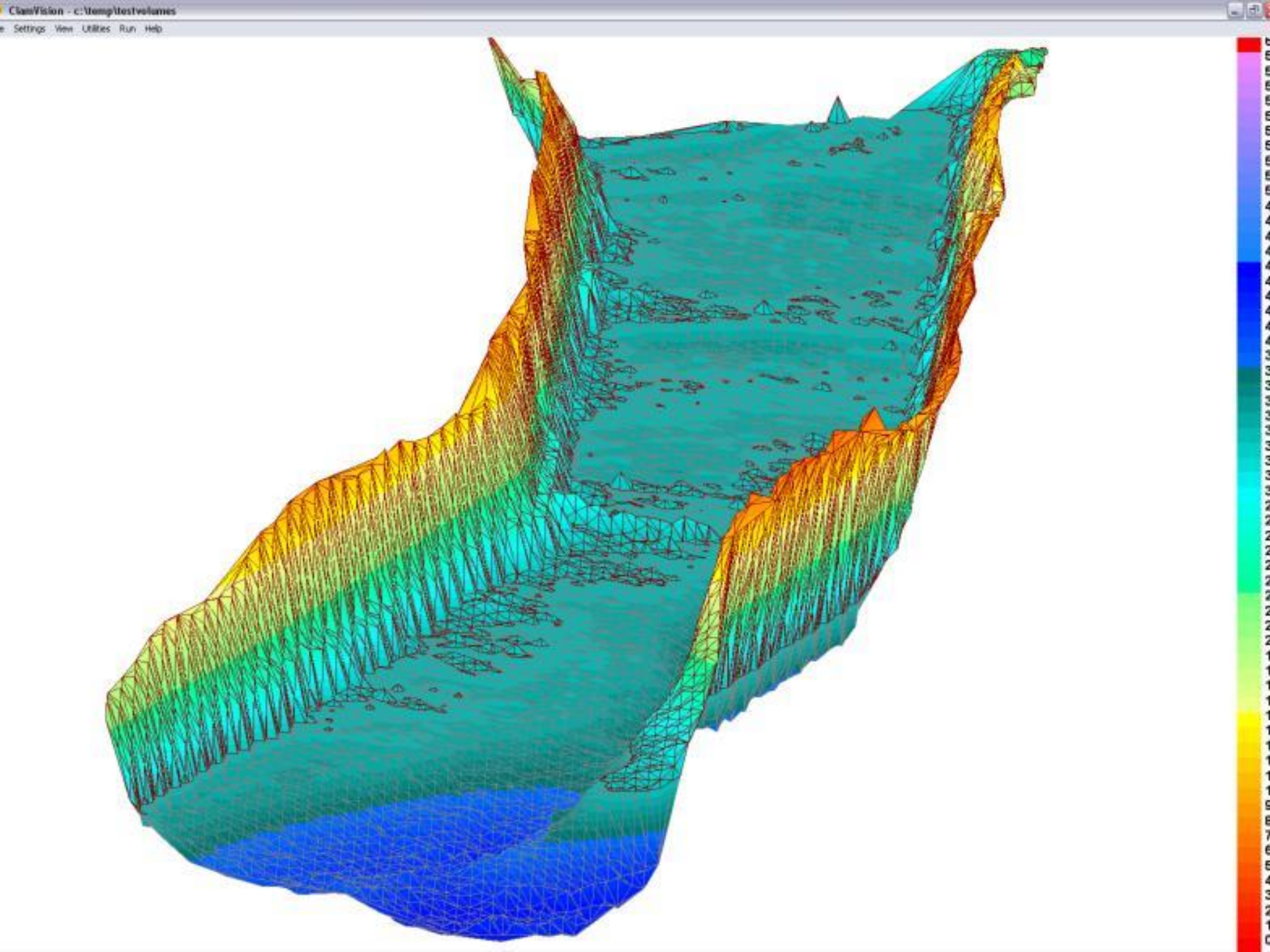
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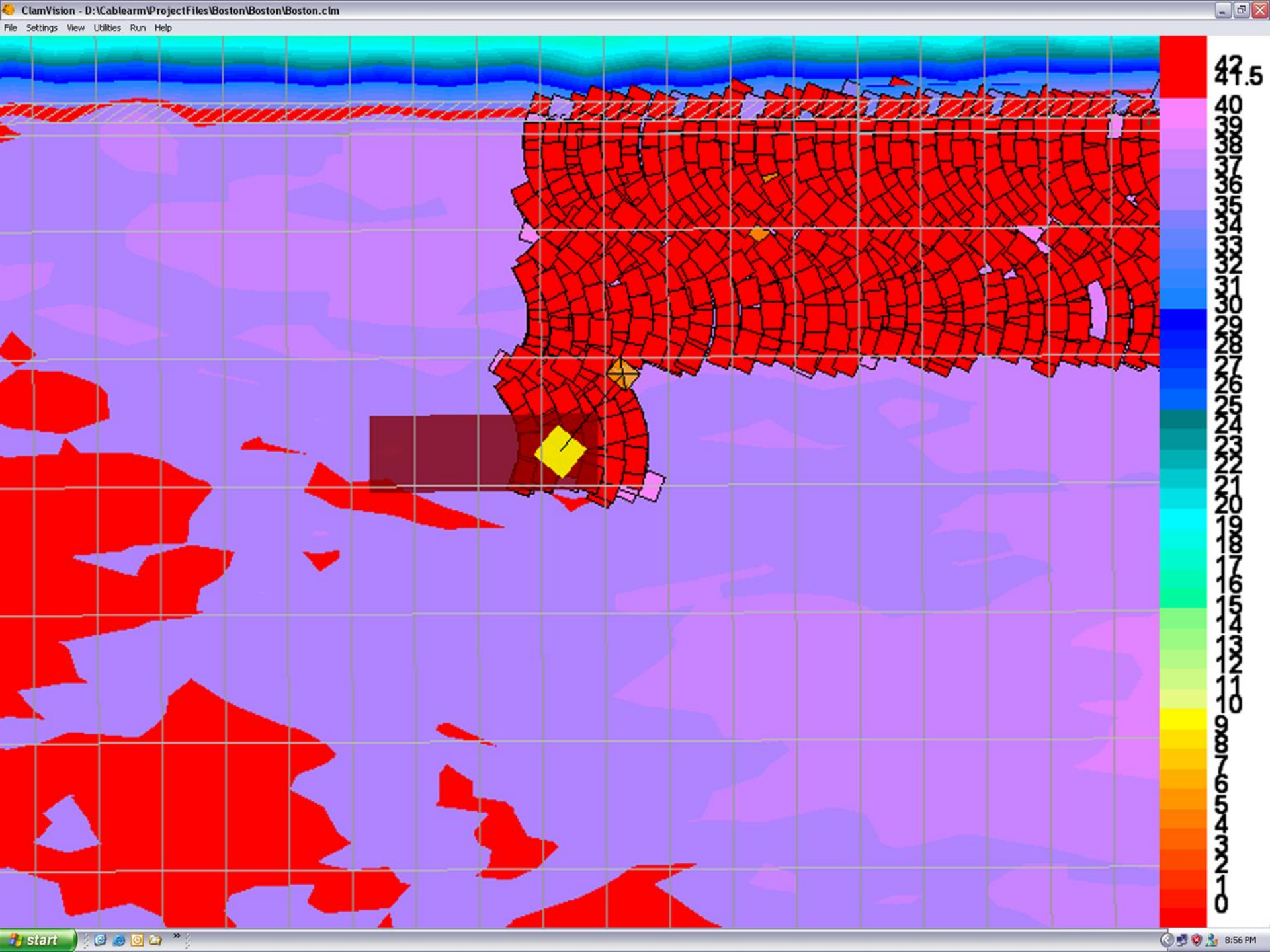
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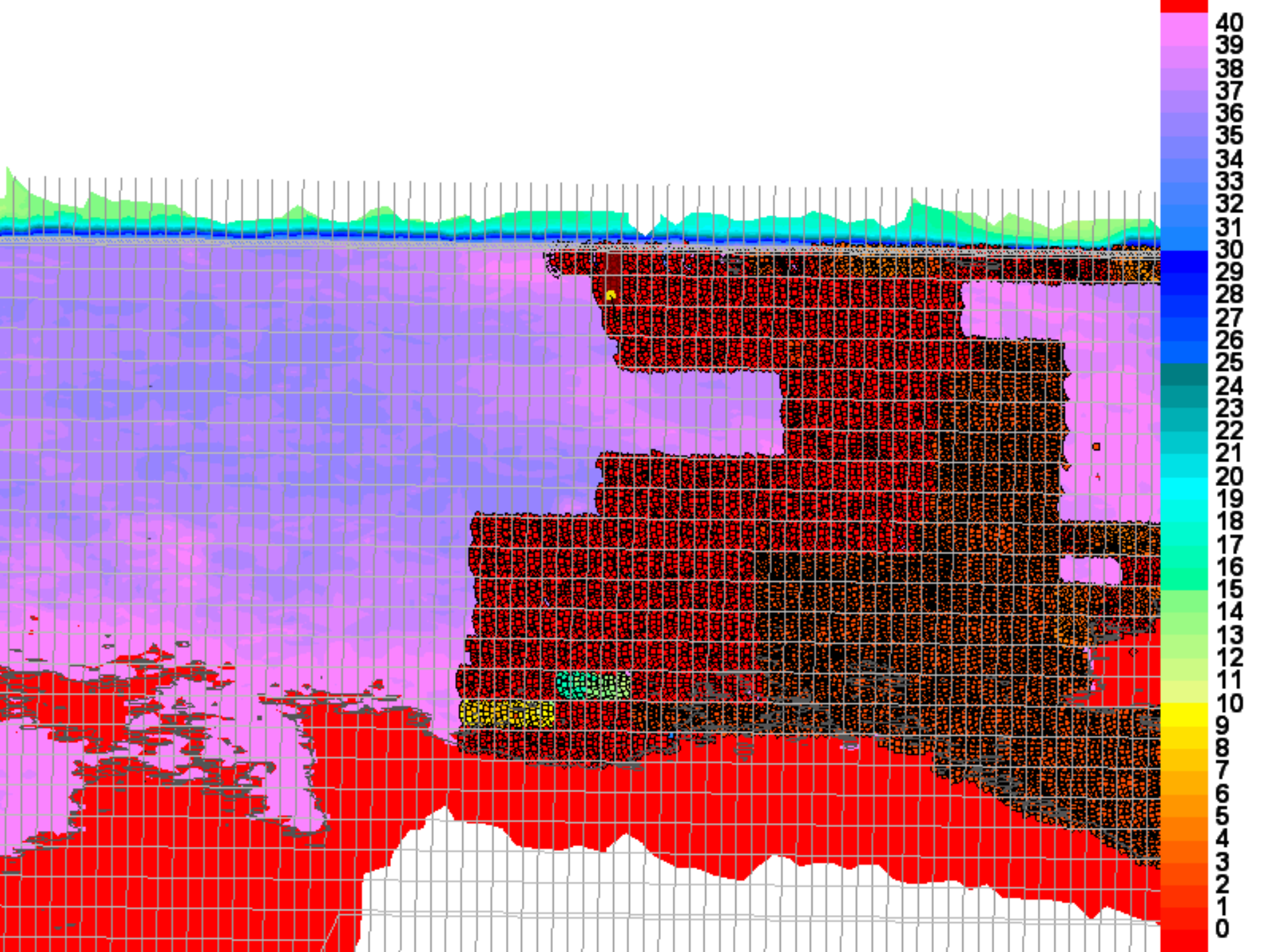
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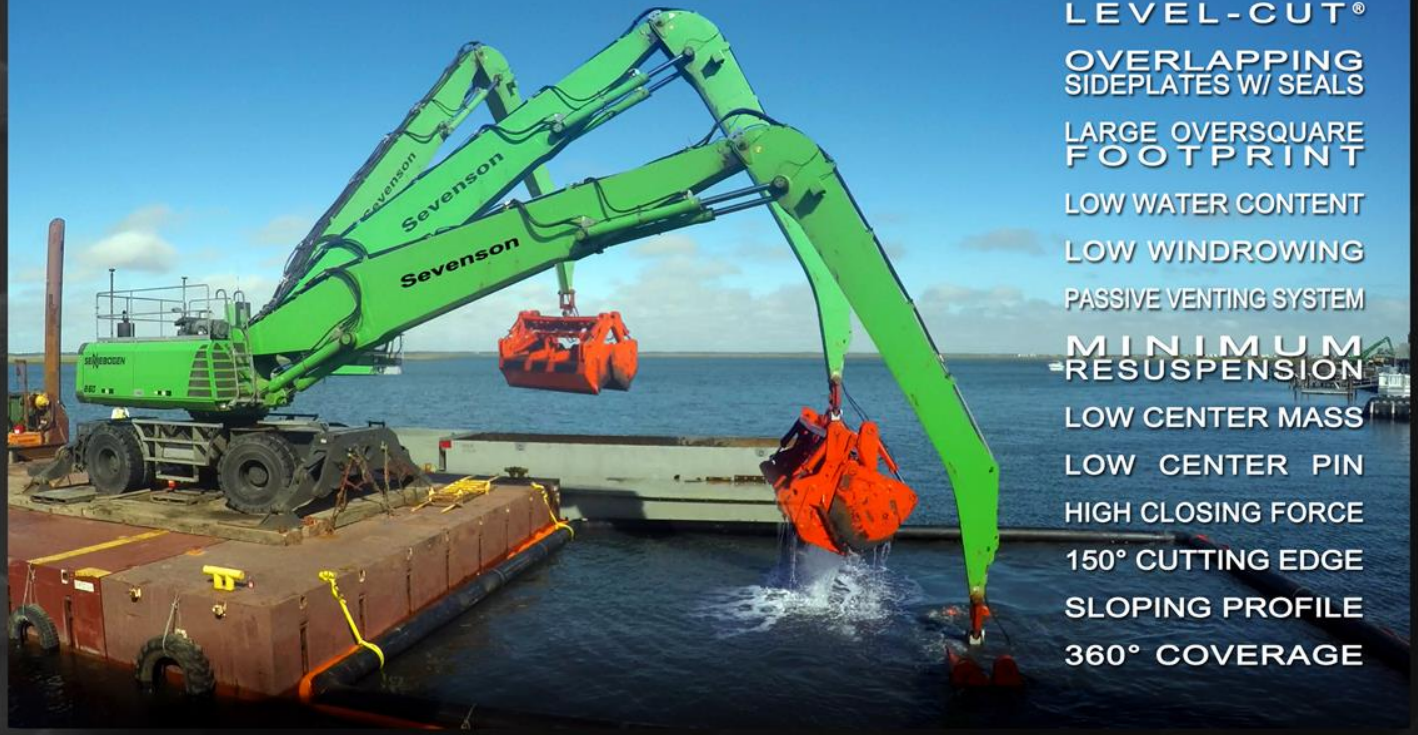
What happens when an environmental job is unsuccessful?

- Unsuccessful environmental jobs are UNACCEPTABLE.
- Not all jobs finished are successful as the cost and time exceeds proposed limits.
- If cleanup goals are not met, additional time and cost will incur by requiring re-dredging of previously dredged areas, dredging of additional areas due to redepositing, and capping.
- When dredging close to water intake valves and channels, nearby utilities may be required to shutdown resulting in a loss of revenue. In this event, penalties and/or fines may be given to the dredger whom will then be required to re-dredge while absorbing all costs.

Cable Arm

*patent & patent pending clamshell



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