Geocells – An Innovative Approach to Capping Sediments in High-Energy Sandy Sediment Environments

Battelle: 2019 Sediments Conference

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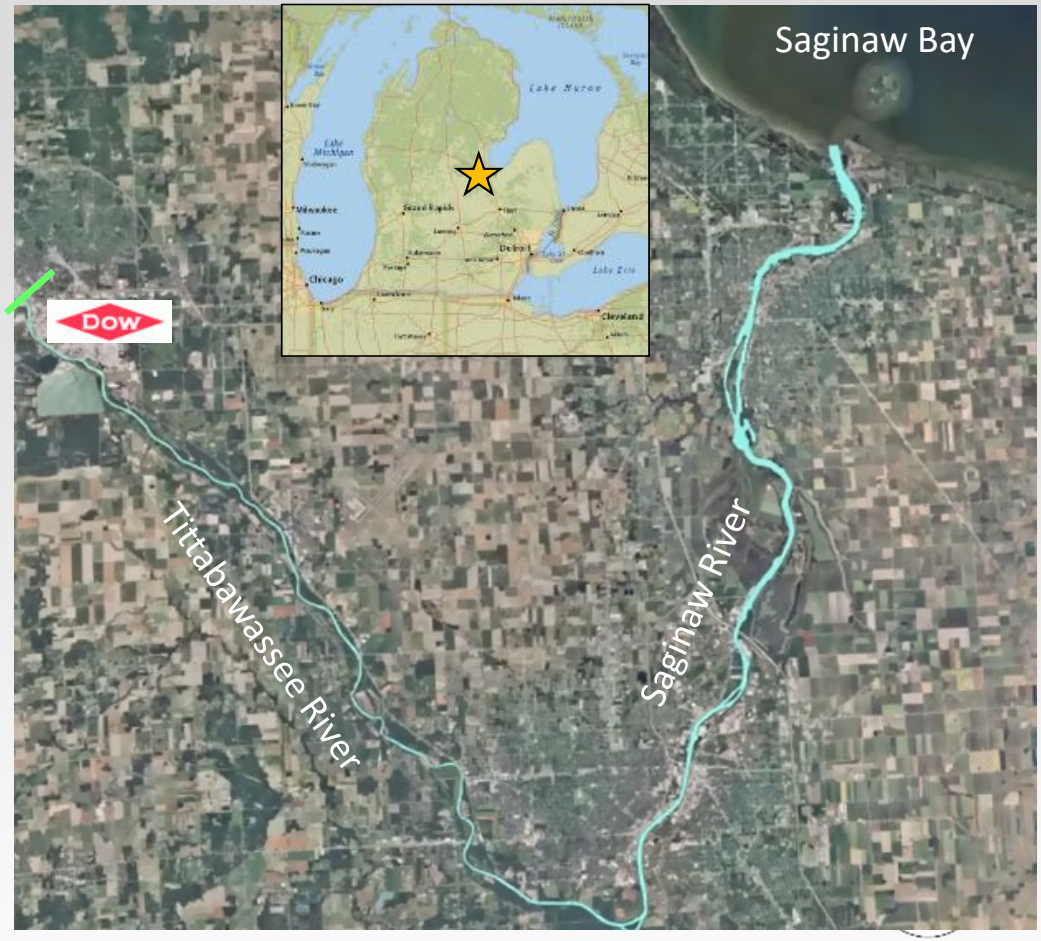
Outline

1. Background
2. Innovative Capping Alternative
3. Cap Design & Installation
4. Performance
5. Lessons Learned

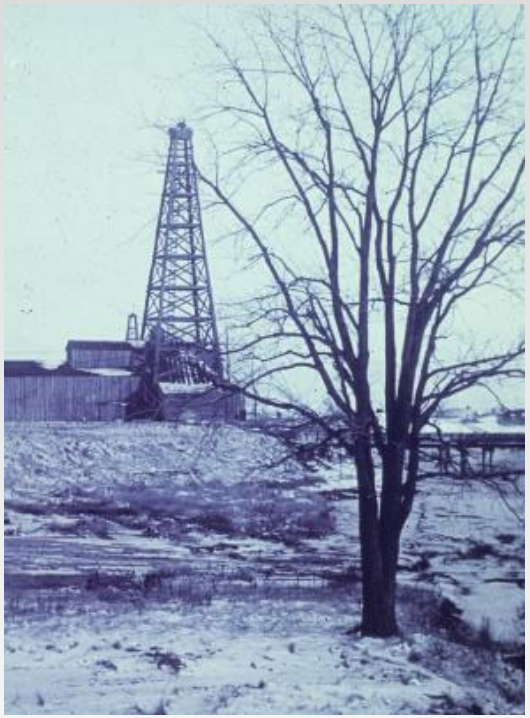
Background: Site Location

- Tittabawassee River
  - From Midland to confluence with Saginaw River (24 miles)
- Saginaw River
  - From confluence to Saginaw Bay (22 miles)
- Saginaw Bay
- Presentation focuses on Tittabawassee River



Background: Past Waste Disposal Practices; Dioxin and Furan Contamination

- Dow operations, starting circa 1900
- Discharges to the River in the early 20th century contained graphitic carbon particles from chloralkali processes
- Unknown at the time, particles contained chlorinated dibenzofurans (furans)
- The graphitic carbon particles mixed with river sediments and moved downstream and eposited in certain areas



Innovative Capping Alternative

Innovative Capping Alternative

- A new capping technology was trialed to address the Sediment Management Areas (SMAs)
- A Geoweb® product was used to create a geocell system to stabilize the sediments
- The geocells takes advantage of natural processes to isolate underlying deposits, protecting them from erosion

Innovative Capping Alternative-Natural Deposition Cap

- The Tittabawassee River sediments are predominantly sand and gravel with a active bedload
- The bedload moves down river at a high rate
- Bedload sediments become trapped in the geocells to form a natural cap

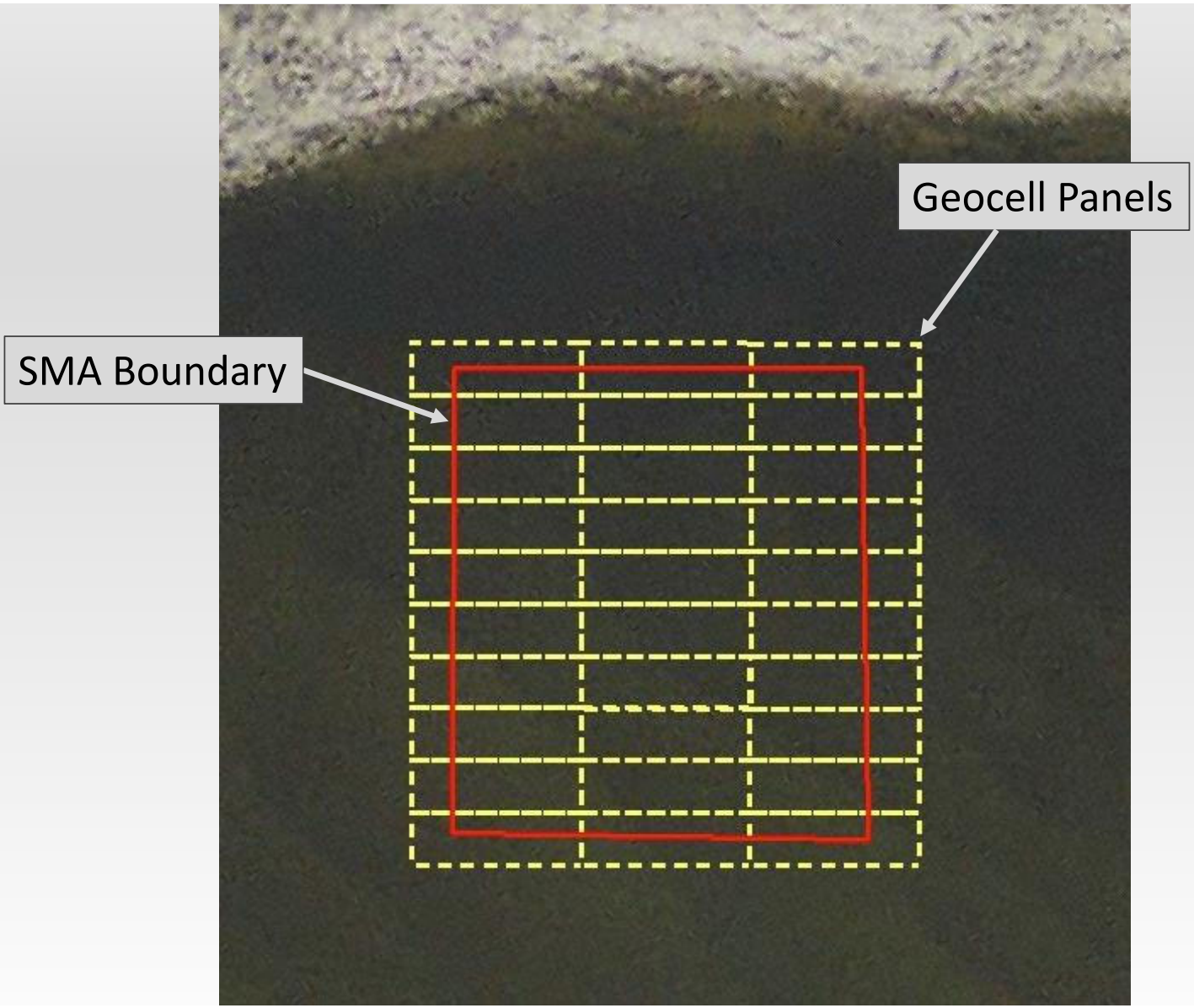
Cap Design & Installation

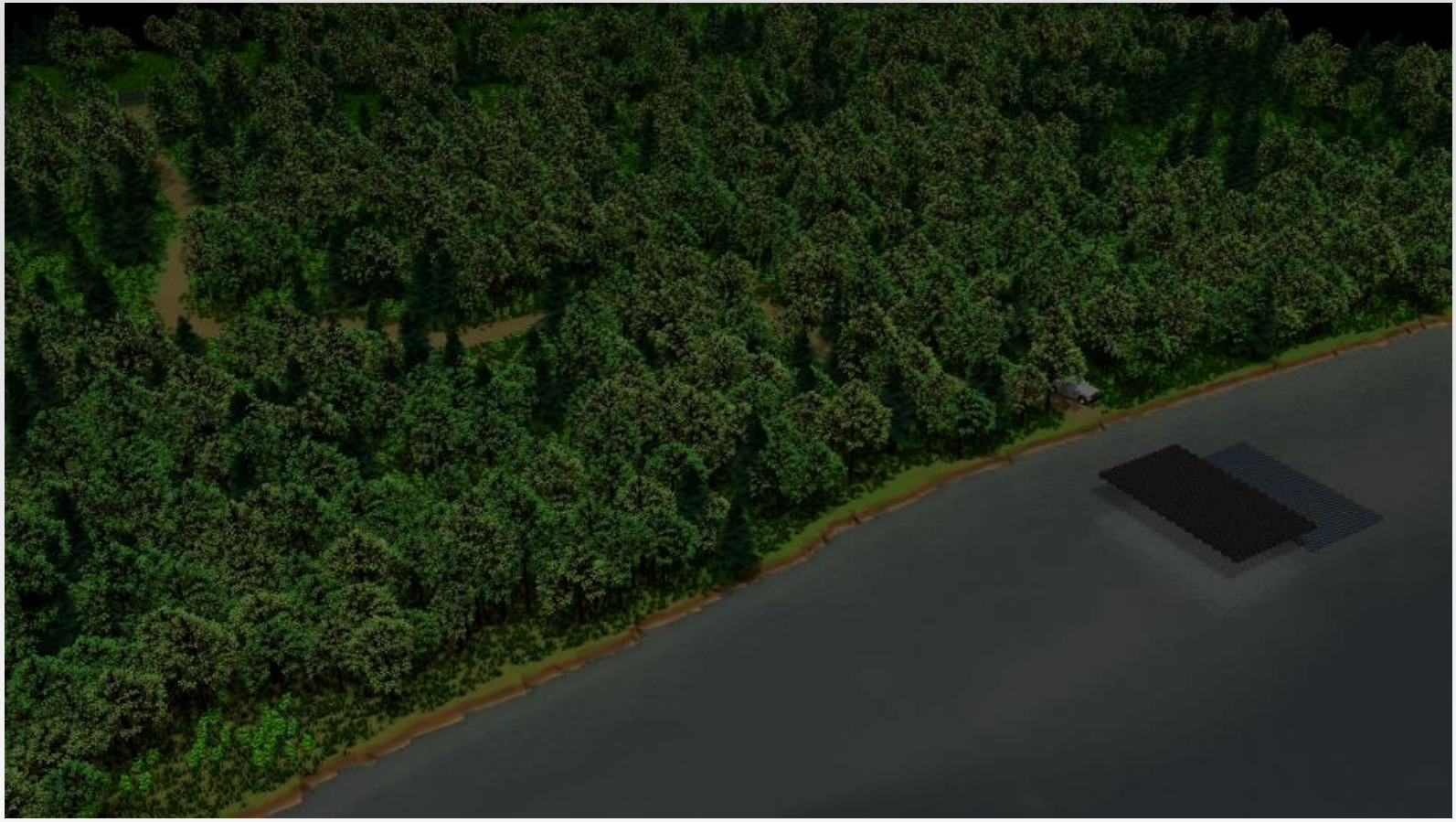
Cap Design & Installation

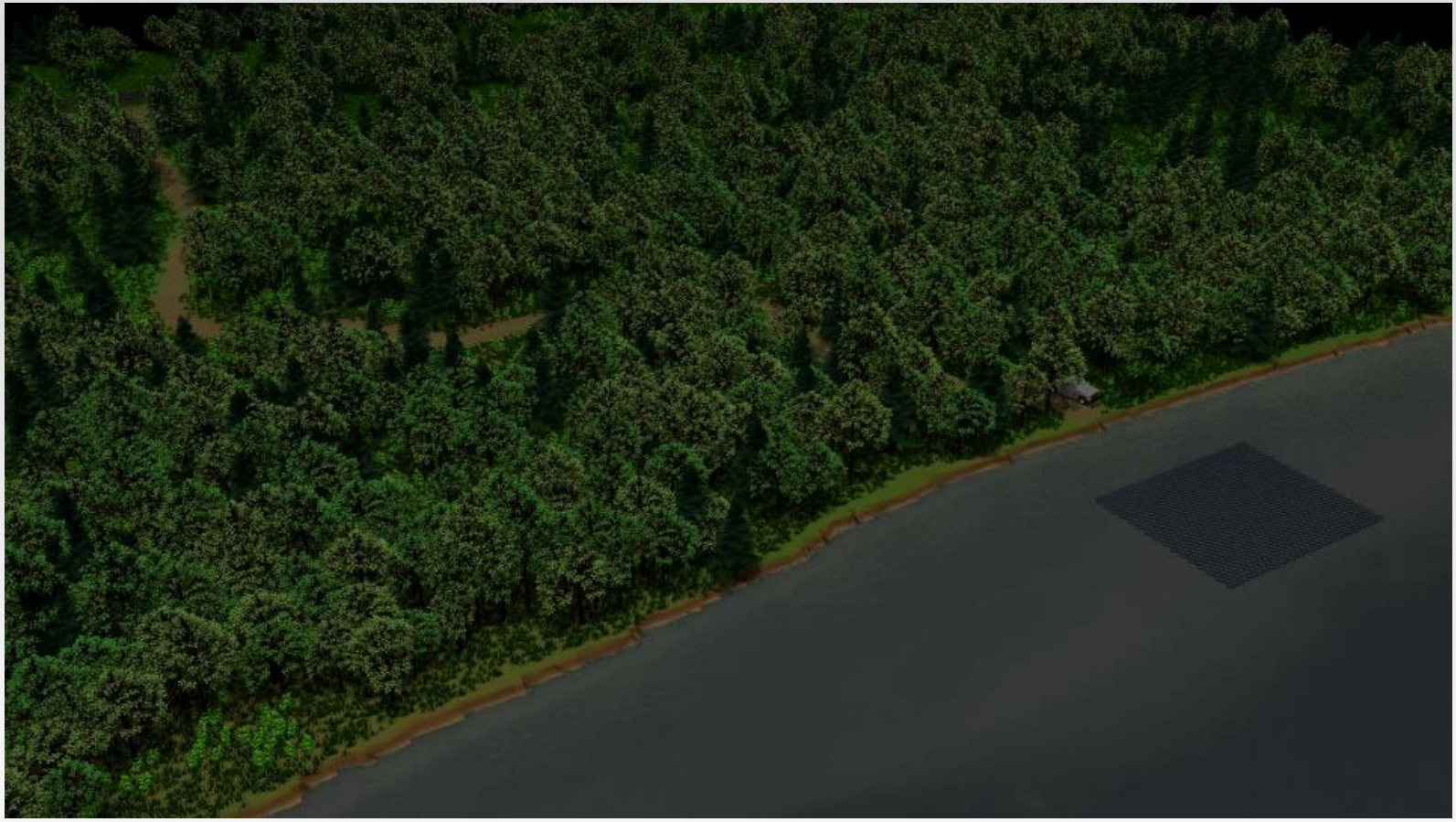
- A 6” deep by 8” open cell Geoweb® product is used
- Multiple geocell panels (8’ x 26’) are attached together to obtain the overall desired size
- The entire system is installed by hand
  - pea-stone filled bags anchor the geocell system
  - Tendons laced through the geocells provide additional anchoring

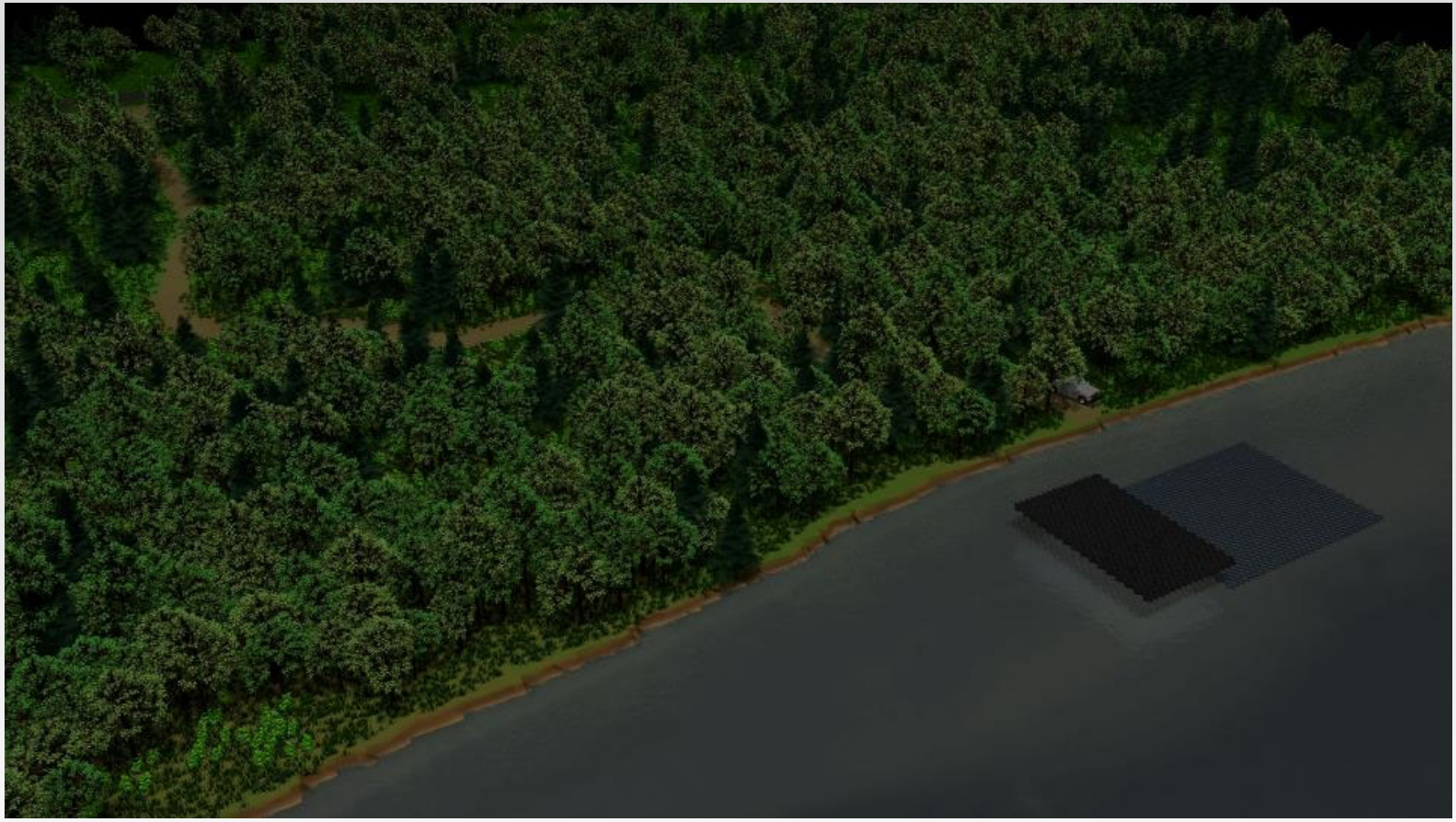
Cap Design & Installation

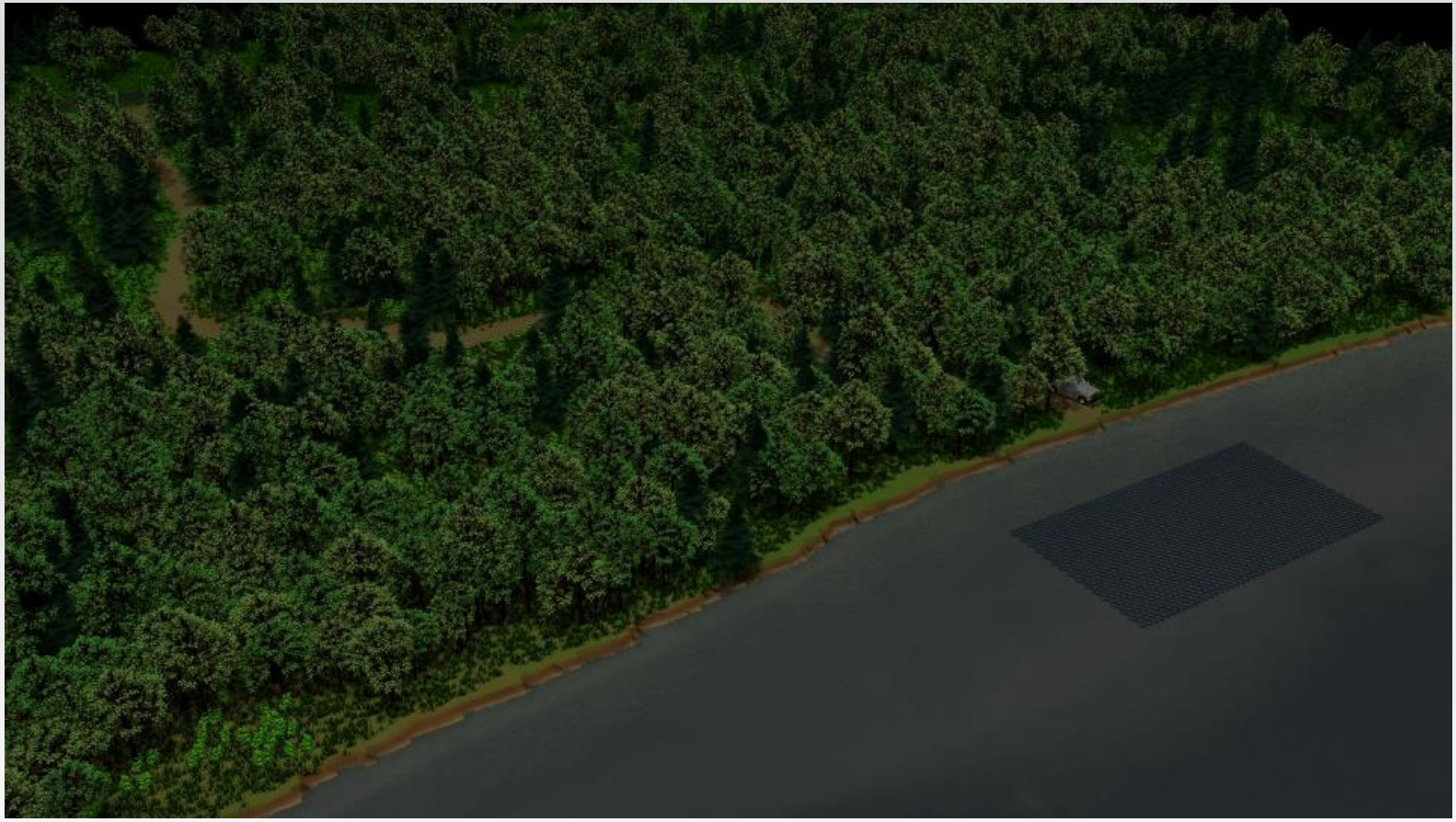
- Around the perimeter of the geocell, rebar is used to anchor the edge of the system
- Natural stone is also place around the perimeter to create a protective transition (2 to 4.0 inch diameter stone)

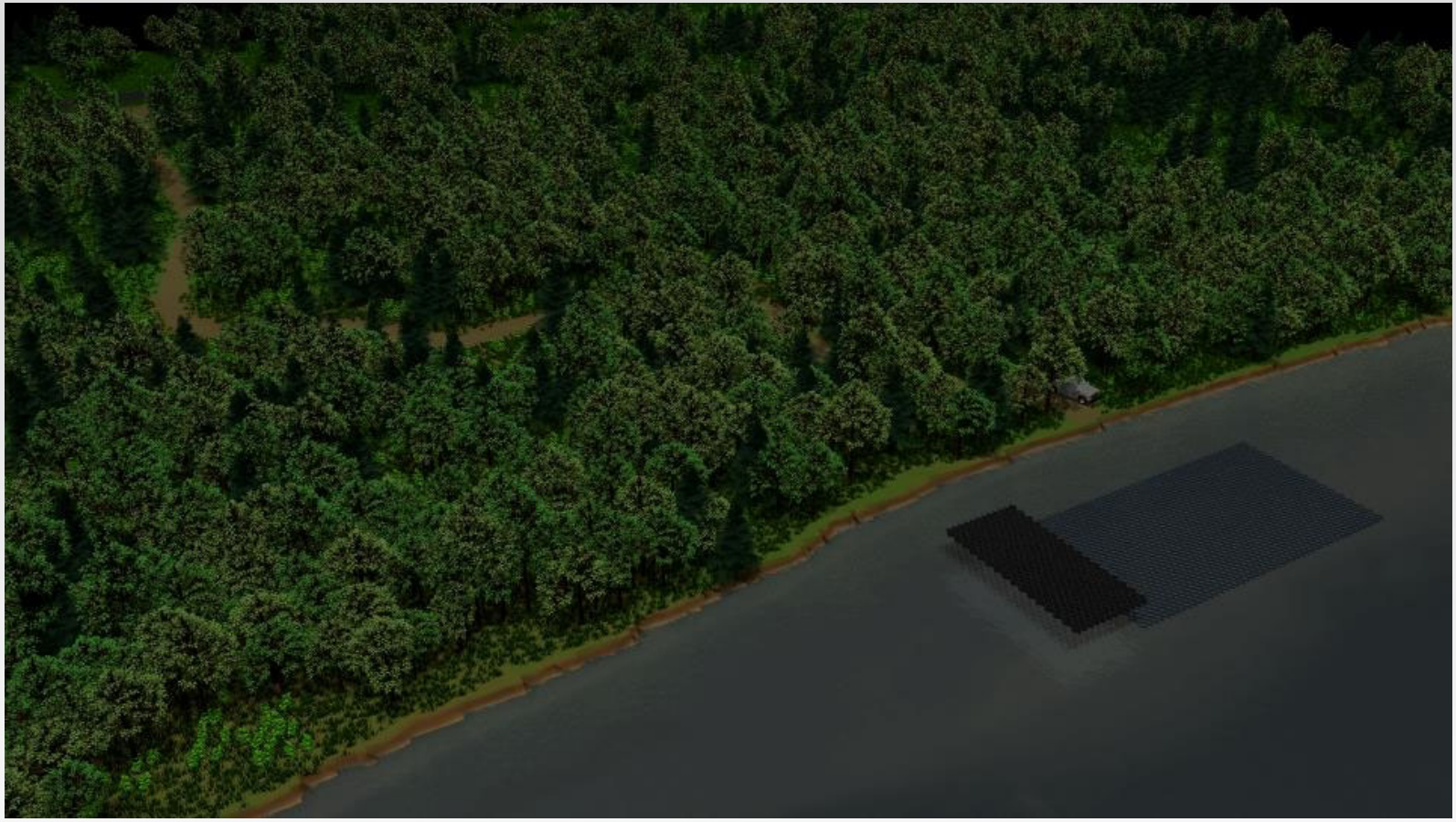

Geocell Panels
SMA Boundary

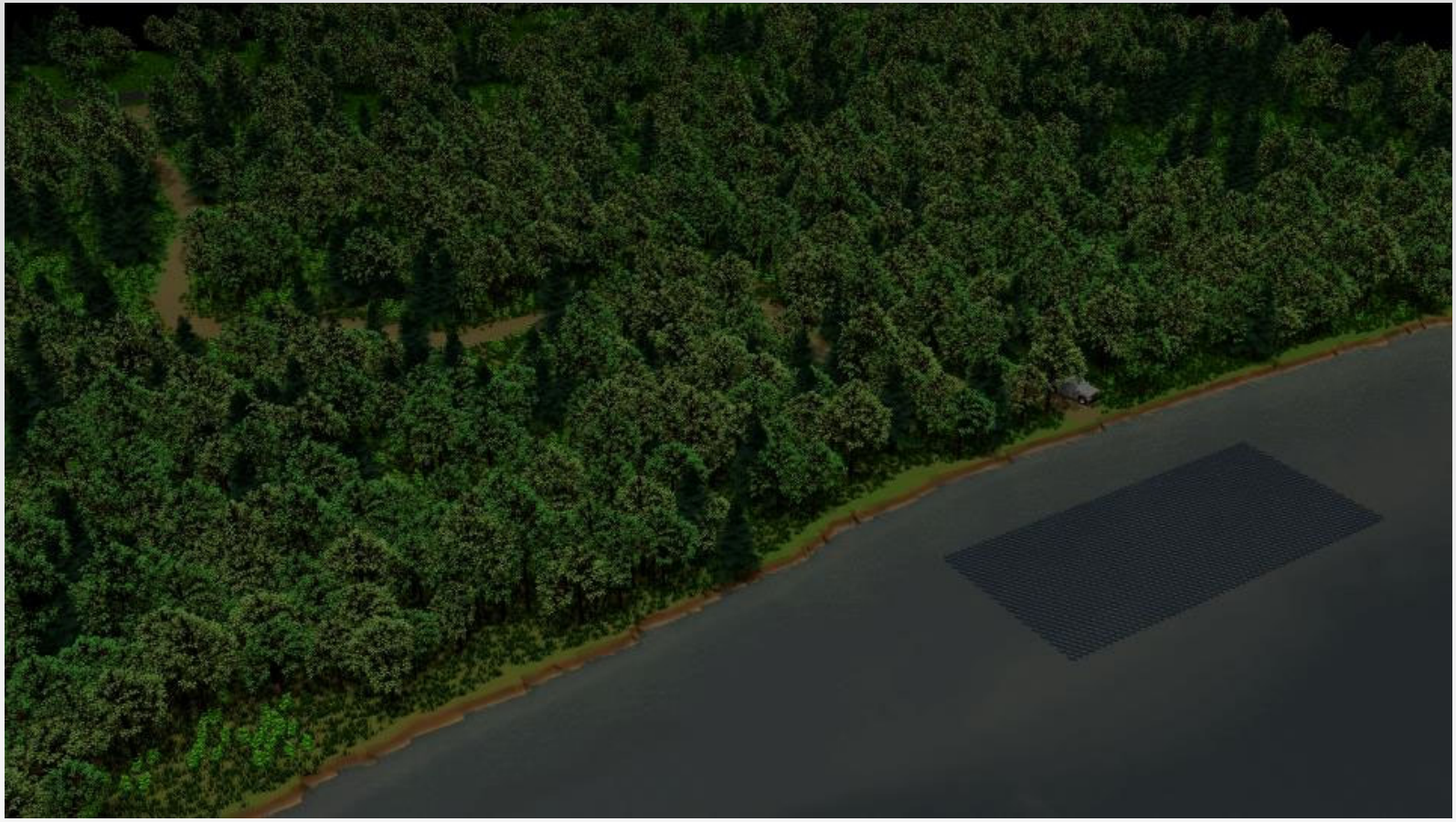


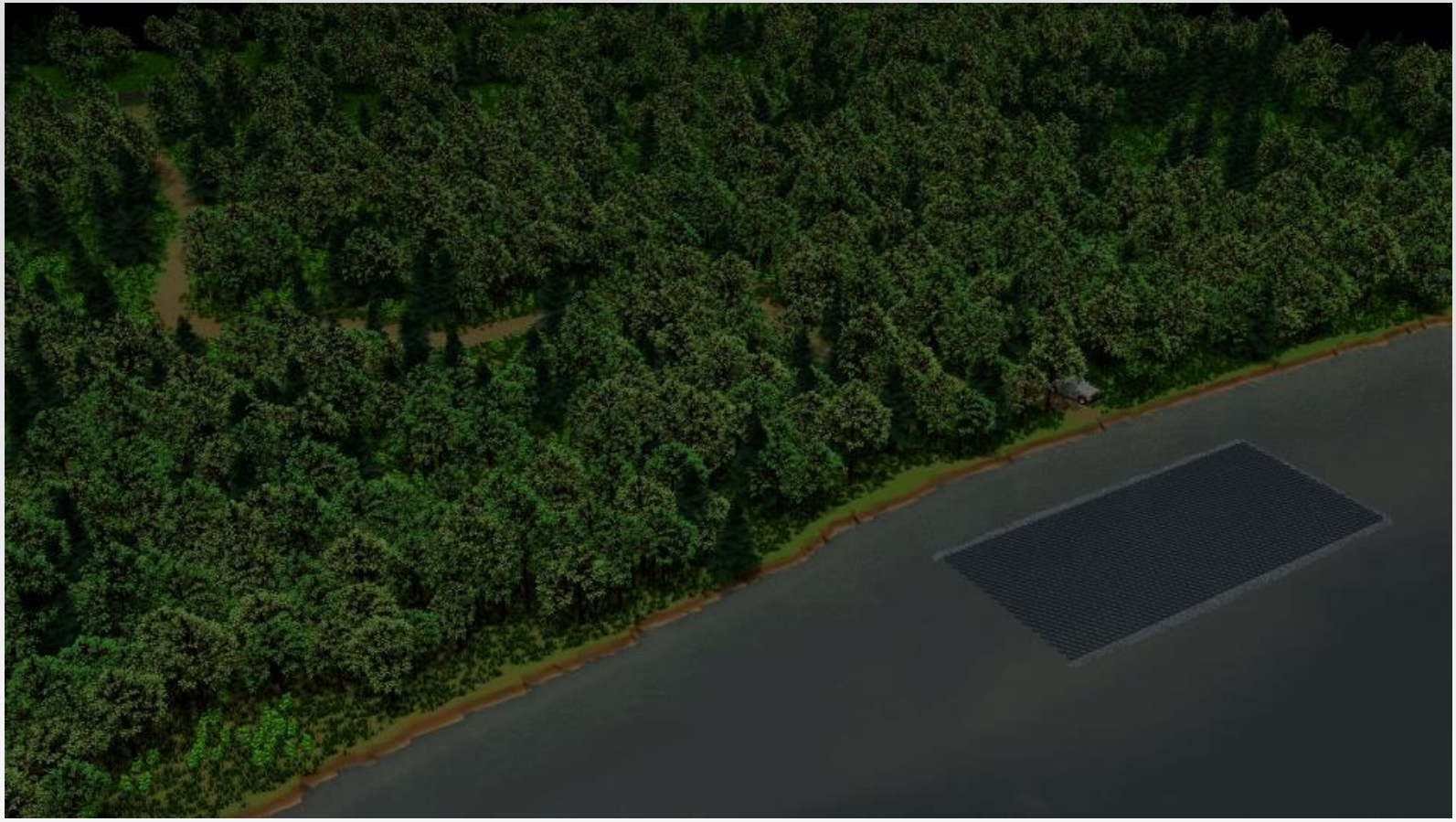


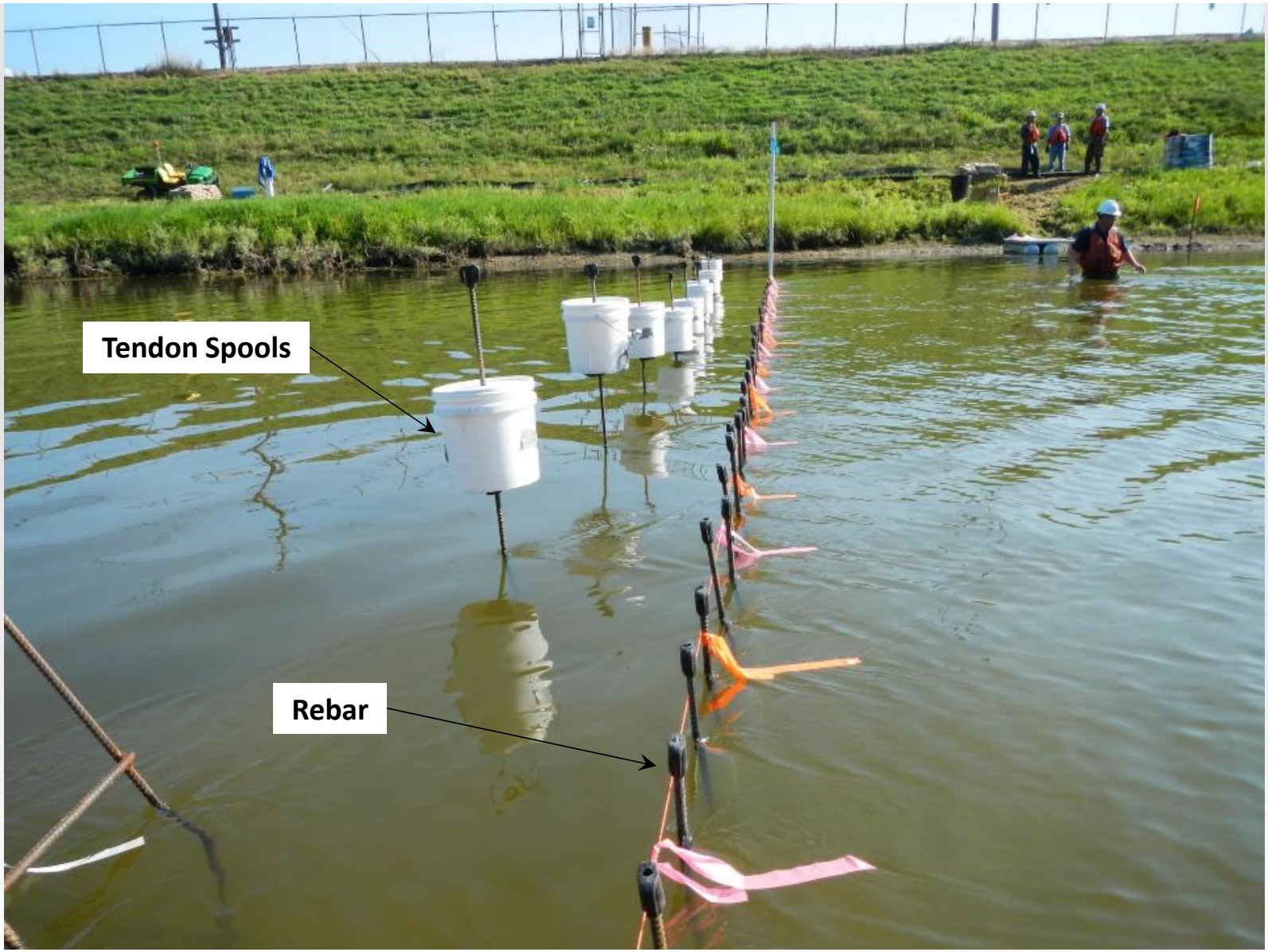








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Rebar


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Performance

Performance

- As of the end of 2018, approximately 130,000 square feet (3 acres) of geocel cap has been installed
  - First geocell cap was piloted in 2010
  - 7 SMAs have used the natural deposition cap remedy
- The geocells fill quickly completing the cap system shortly after installation
- Cap monitoring occurs routinely and after high flow events
  - The caps have proven extremely resilient to high-flow events and erosion
  - Geocell caps remained stable after the 2nd largest flood on record in June 2017

Lessons Learned

Lessons Learned

- To increase stakeholder acceptance a pilot study was conducted on this technology
- Much of the installation is performed by hand
  - Labor intensive
  - Most caps have taken only a few days to install
- Requires a small footprint
  - Staging area and access to the river are minimal
  - Accommodates difficult River access situations

Lessons Learned

- Water depth is a consideration for implementation
- River systems with an active bedload are likely most suitable for this technology
- Geocell caps are cost effective
- The stabilized sediments support aquatic vegetation providing habitat diversity

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