Flexible Geomembrane Institute

Online Webinar - Executive Summary

AI SUMMARY

Geosynthetics Case Studies

Pat Elliott | Brian Fraser | Ron McKenzie

Colorado Lining International / Layfield Geosynthetics / Inland Tarp & Liner

Organized by Timothy D. Stark, PhD

August 13, 2026

Executive Summary

The FGI's seventh webinar of 2026 — the annual case histories event — brought together three veteran installers and fabricators with more than a century of combined geosynthetics experience. Pat Elliott, Director of Installation Services at Colorado Lining International (CLI) and current FGI President, described how an above-ground bladder tank technology borrowed from oil-and-gas fracking operations delivered an emergency potable water storage solution for the Town of Paonia, Colorado. Brian Fraser of Layfield Geosynthetics, FGI Vice President, surveyed the use of flexible geomembrane baffle curtains to improve hydraulic performance in potable and wastewater treatment, illustrated with three project profiles from Ontario and California. Ron McKenzie, Chief Technical Officer at Inland Tarp & Liner and a 20-year FGI member, closed with a practical examination of what factory fabrication does — and does not — change for containment projects in mining and other remote, demanding environments.

Although the three presentations spanned very different applications, a common thread ran through them: moving critical work out of unpredictable field conditions and into controlled fabrication environments — whether a factory-welded bladder erected in six days, a plant-fabricated baffle curtain hoisted into a confined clearwell, or a one-piece tapered tank liner that eliminates a vulnerable field weld — consistently improves speed, quality, and reliability.

Key Takeaway for Engineers & Students

Fabrication adds control; it does not remove responsibility. Factory welding, panel sizing, testing, and documentation completed in a stable environment reduce field seams, field time, and exposure to weather and labor variability — but sound engineering, chemistry-specific material selection, prepared subgrade, and disciplined installation and QA remain non-negotiable. Material selection should follow the application, not habit.

1. Case History: Town of Paonia Temporary Water Storage Solution (Pat Elliott, CLI)

1.1 Background and Challenge

Paonia is a town of roughly 1,500 residents on Colorado's western slope, about an hour and a half from Grand Junction, at just under 5,700 feet in a dry, high-desert climate. The town's water infrastructure relied on two aging tanks — a concrete tank (clearwell) and a steel tank on a hillside roughly 70 feet above it. The failing concrete tank had already been taken offline, leaving the town operating solely on the steel tank, which itself required refurbishment. Talks began in early July, and by September–October the temporary system was in place — an emergency timeline that conventional construction could not have met.

1.2 The Solution: A Rented Above-Ground Bladder Tank

CLI adapted above-ground storage tank technology originally developed for fracking water supply in the oil and gas industry (first deployed by CLI on a bladder project in Australia). The system is a rented steel-wall tank containing a double-lined arrangement: a secondary geomembrane liner deployed over a geotextile cushion, with a potable-water bladder — two circular panels welded together into upper and lower "hemispheres" — inside it. Key design elements included:

- **Stormwater collection** — ballast tubes sink the bladder surface slightly (as on a defined-sump floating cover) so rainwater collects at the center; a dual-valve pump system extracts water both from on top of the bladder and from behind it, on the secondary membrane.
- **Inlet/outlet structure** — a buried stainless steel box with mechanical fastening, butyl and EPDM rubber gaskets, and all-stainless hardware (required for chlorinated drinking water), plus an overflow pipe that signals overfilling and routes treated water to the town's potable system.
- **Remote level monitoring** — a float-mounted pressure transducer installed on the tank floor beneath the bladder lets the town read water volume at any time without site visits.
- **Venting** — a screened foam-float vent releases air trapped under the bladder while excluding rodents, birds, and contaminants.

1.3 Construction and Performance

Once earthwork was complete (a flat pad cut just above the existing steel tank), the crew was on site only about six days: geotextile and secondary membrane deployment, welding of the two bladder hemispheres, erection of the steel walls, pulling the secondary liner up and over the wall to clamp at the perimeter, and installation of stairs and the rainwater pump. The system entered service in September 2025 so the steel tank could be refurbished over the low-demand winter months. It performed so well that the town extended the rental to cover refurbishment of the concrete tank as well — the tank remains in service today, nearly a full year later. When the project ends, the system will be disassembled and removed with virtually no trace; the steel walls and hardware will be reused, and the tank returns to the rental fleet.

2. Case History: Baffle Curtains in Potable and Wastewater Treatment (Brian Fraser, Layfield)

2.1 What Baffle Curtains Do

Baffle curtains act as flow barriers that force water to take a longer, serpentine path through ponds, basins, tanks, and reservoirs. By eliminating the short-circuiting that occurs when flow runs directly from inlet to outlet, baffles increase detention and disinfectant contact time, improve hydraulic performance, reduce dead zones, and raise overall treatment efficiency. Applications include settling and mixing ponds, equalization basins, aerated lagoons, chlorine contact tanks, clearwells, and reservoirs.

2.2 Types, Materials, and Fabrication

Two configurations dominate: **mechanically fixed** curtains attached to stainless steel framing on floors, walls, and ceilings, and **floating** curtains buoyed at the top, ballasted at the bottom with heavy chain or sand tubes, tensioned by cable, and installable while a pond or tank remains in service. Curtains are typically made from **reinforced** geomembranes — an internal fabric scrim laminated or coated on both sides — combining strength and tear resistance with the flexibility needed for plant fabrication. Materials include reinforced EIA (ethylene interpolymer alloy), PVC, CSPE (chlorosulfonated polyethylene), reinforced LLDPE, and reinforced polypropylene. Selection criteria include chemical resistance to chlorine, chloramines, and ozone; UV stability for exposed floating applications; and NSF-61 certification for potable water in North America. Curtains are custom fabricated to project dimensions with thermally welded and tested seams, rope-reinforced edges, hemmed-in 3/8-inch stainless chain ballast, 3/8-inch aircraft-grade cable for tensioning, roughly 8-inch closed-cell polyethylene foam flotation, and marine-grade components throughout. Flow-through "windows" can be fabricated in to create zigzag flow patterns.

2.3 Installation Considerations

Below-grade reservoirs and clearwells are classified confined spaces requiring permits, atmospheric monitoring, ventilation, rescue plans, lighting, and fall protection — with access often limited to a small hatch and ladder. Attachment to concrete uses stainless steel batten bars, EPDM or neoprene gaskets, and stainless anchor bolts at roughly 12 inches on center to create a gasketed compression connection.

Sites frequently resemble mobile machine shops, with steel cutting, grinding, and drilling performed in place.

2.4 Project Profiles

Project	Scope	Notable Challenges
Springwater, Ontario — new underground drinking water reservoir	800 lineal ft of mechanically fixed baffles (12 custom curtains, 23 ft / 7 m tall); 2,000+ lineal ft of anchorage into floor, walls, ceiling, and a ceiling bulkhead; 40-mil reinforced EIA	Confined space, ventilation, lighting, fall protection; tight logistics; November cold required ducted heating and air circulation
Skyway WWTP, greater Toronto area — nine equalization tanks	Removal of failed original baffles and installation of 10 new curtains with proper stainless steel batten bars; flow-through windows for zigzag flow	Original contractor's galvanized bars corroded quickly and the curtains tore out — a lesson in material selection for the anchorage, not just the membrane
Bakersfield, Kern County, California — 6.7-million-gallon above-ground steel potable water tank	Removal of aged reinforced polypropylene baffles (heat and chlorine degradation); two new 28 ft × 156 ft fixed baffles in 45-mil reinforced CSPE	Bimetallic (galvanic) corrosion between the steel tank and stainless hardware required non-metallic insulators and coatings on all bolts, washers, bars, and brackets

3. Fabricated Geomembranes and Above-Ground Storage in Mining (Ron McKenzie, Inland Tarp & Liner)

3.1 Where Mining Projects Get Stress-Tested

When containment fails in mining, the fallout is expensive and immediate — and the cause is almost never one big error, but a chain of small decisions: material picked out of habit, subgrade treated as an afterthought, too much critical work pushed to the field. McKenzie identified four conditions that separate a routine civil job from a mining job:

- **Chemistry** — mining fluids are not consistent site to site; they shift with the ore body, extraction method, and operating conditions. Compatibility should be evaluated against the actual permeant, with data — ask "what material is proven in these exact conditions," not "what liner do we usually use."
- **Environment** — strong UV, large temperature swings, uneven ground, and remote access all accelerate wear and complicate installation (confirmed by recent peer-reviewed work on mining geomembrane use). Specs should be written to the site's real conditions, not a generic baseline.
- **Subgrade** — the best liner in the world fails over a bad foundation. On prepared earth rather than a structural floor, subgrade is part of the containment system and must be treated that way.

- **Remote conditions** — costly labor, short weather windows, and thin QC support mean every field seam is one more thing that must go right at the worst possible time.

3.2 What Fabrication Changes — and What It Doesn't

Fabrication does not change polymer chemistry. It changes *where and how* the work gets done: seam welding, panel sizing, testing, and documentation are completed in a stable factory environment before anything ships, leaving less critical work for the field. It does not replace good subgrade, proper handling, smart installation sequencing, disciplined final inspection, or full testing of the field seams that remain — destructive seam sampling and factory integrity checks stay standard practice. Using the industry calculator on the FGI website, an example one-million-square-foot project showed fabricated panels coming out roughly $58,000 cheaper on installation. The takeaway is the logic, not the dollar figure: fewer field seams means less field time, and less field time means less exposure to weather, labor swings, and delays.

3.3 Material Selection Should Follow the Application, Not Habit

The industry does not lack standards — the challenge is fit. Reinforced polyethylenes, PVC, and EIA are all worth considering depending on geometry, exposure, installation method, and chemistry. The two most common polymers compare as follows:

HDPE	LLDPE
Stiffer; almost always field fabricated; slightly lower stress-crack resistance; difficult in cold weather; excellent broad chemical resistance; well suited to large, flat geometries; 40–120 mil	More flexible and conforming; well suited to factory fabrication; holds up better across temperatures and is easier to work in cold; typically 30–100 mil

3.4 Above-Ground Storage Tanks: Small Design Calls, Big Outcomes

Above-ground storage tanks appear throughout mining — process water, drilling, dust suppression, temporary chemical containment, and potable water. The geomembrane, not the steel wall, is the primary containment, and a round tank on prepared earth with no structural floor is unforgiving. Practical details that rarely reach the spec early enough: use a **tapered, factory-welded one-piece liner** to eliminate the vulnerable radial field weld of a traditional bucket-style liner; place a foot or two of water in the tank before final top clamping to set the load point and ease stress at the wall-to-ground transition; and never leave a lined tank sitting empty for extended periods, where wind movement and thermal cycling work on it before it ever enters service.

Five questions worth asking before specifying: Was containment treated as a real design responsibility or a secondary detail? What documentation shows the polymer was checked against the actual fluid? How many field seams remain, who welds them, and what testing applies? Was the layout engineered ahead of time or decided on the fly? And what is specified for subgrade, anchoring sequence, and QA? How quickly these get answered tells you a great deal about a project.

4. Q&A Highlights

- **Paonia tank dimensions and volume** — 12-ft walls with the overflow set at about 10.5 ft (the operating depth); a 20,000-barrel unit, roughly 840,000 gallons of storage.
- **Freeze protection** — none installed and none needed, despite the elevation: constant inflow/outflow, the large water volume, and the heat-absorbing black bladder prevented any freeze issues through the winter.
- **Service life** — typical design life is about five years; the unreinforced LLDPE used would not be recommended much beyond that with chlorinated water, though stepping up to CSPE could extend it.
- **Why not rented Baker (frac) tanks?** — Sheer volume: equivalent capacity would require many interconnected trailer tanks and far more space. The bladder system operated as a single unit, exactly like the town's permanent tanks.
- **Temporary vs. permanent baffle inspections** — no difference: Fraser recommends an annual inspection and maintenance plan regardless of service duration, since heavy and cyclic flows cause tearing and anchorage loosening.
- **Equipment access** — the Bakersfield tank allowed scissor and man lifts through good access; underground clearwells are reached through a small hatch, with scaffold hand-carried in and assembled inside.
- **Coordinating fabrication with earthwork** — liners are fabricated in advance once sizing is determined; the factory can adjust panels if dimensions change, provided coordination among installer, owner, and factory happens up front, not at the last minute.

5. Announcements

- The recording and slides will be posted on the FGI website; all prior webinars are listed under Resources by year.
- PDH certificates will be sent automatically to all who attended the entire webinar.
- Remaining audience questions — and questions from the Japan, Australia, and South Africa time-zone sessions — will be answered on the follow-up podcast.
- The next FGI webinar is **September 24, 2026**, featuring Dr. Tarek Abichou. Four webinars remain on the 2026 schedule.

Disclaimer: This summary was generated from the webinar transcript and reflects the speakers' presentations and opinions, not necessarily the position of the FGI. Project costs were not disclosed during the webinar; contact the speakers directly for project-specific inquiries.