Design and Construction of a ClosureTurf® Final Cover System

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SCS ENGINEERS

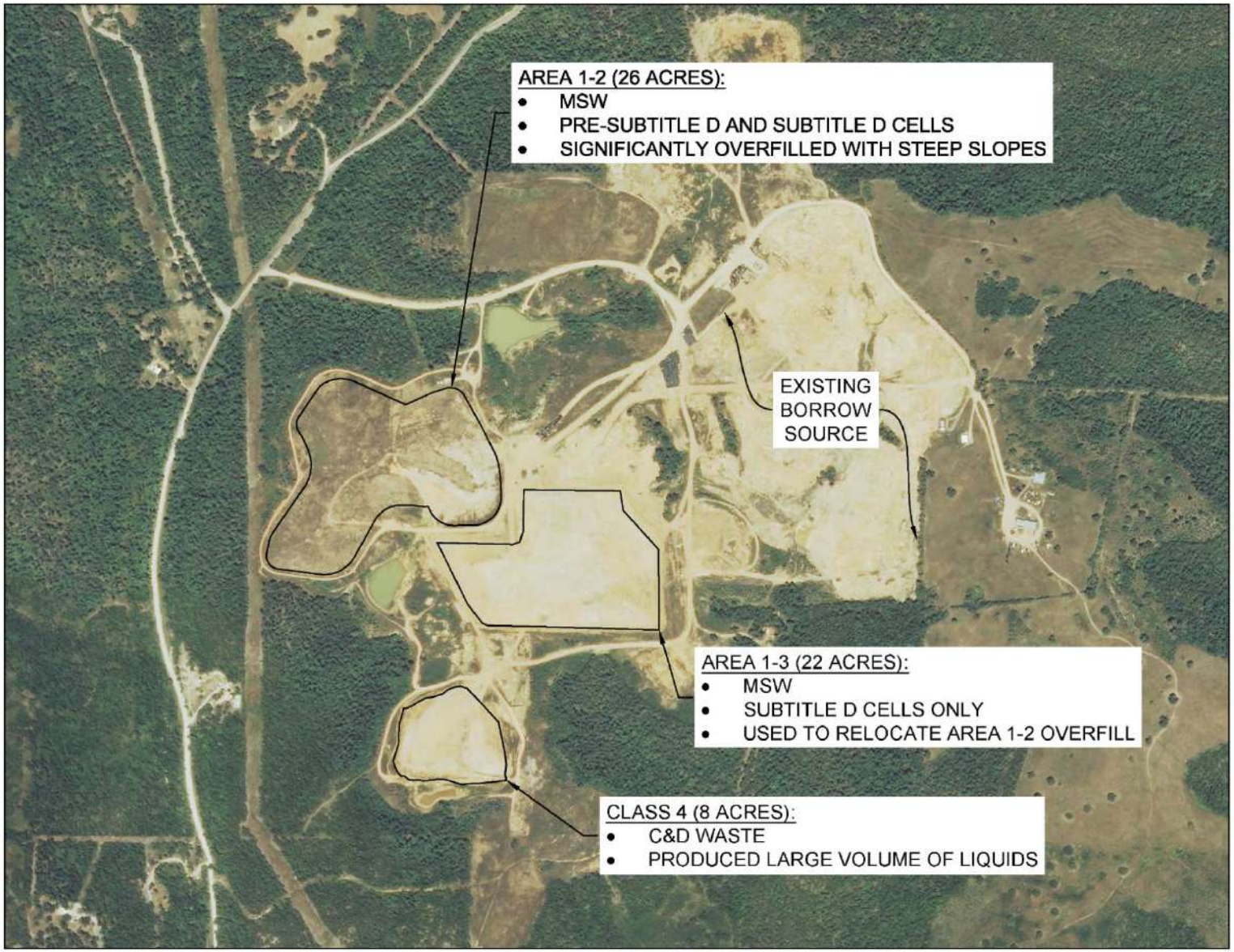
Site/Project Background

- NABORS Landfill operated MSW and C&D landfills from 1987-2012
- Located in north central Arkansas
- NABORS entity went bankrupt…The ADEQ took over closure activities
- ADEQ selected SCS Engineers to provide design and construction management/CQA services

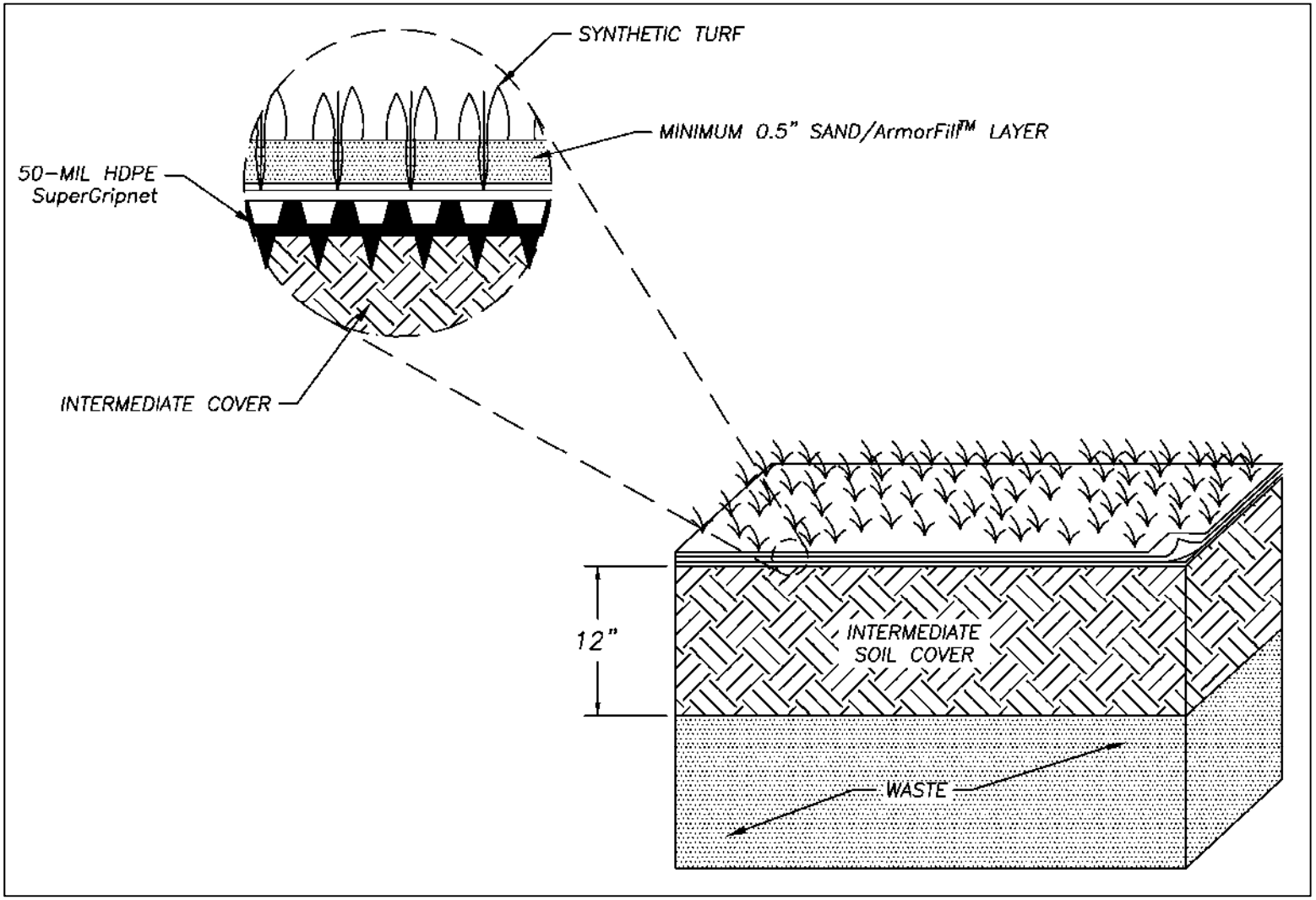
Site/Project Background

- Borrow soil has historically been poor quality and challenging to build low perm layers. Assumed a 50% spoil ratio for screening operations to remove rocks.
- Very difficult to regrow vegetation in borrow areas.
- Approximately 93,000 CY of overfill to relocate.
- The original design/bidding was for the permitted traditional Subtitle D final cover systems (low perm soil, geosynthetics, vegetative layers).
- ADEQ rejected bids and asked SCS to redesign with ClosureTurf® (CT)…within 1 month.
- A typical permit modification application was not submitted to the ADEQ.

Site Layout


AREA 1-2 (26 ACRES):
• MSW
• PRE-SUBTITLE D AND SUBTITLE D CELLS
• SIGNIFICANTLY OVERFILLED WITH STEEP SLOPES
EXISTING BORROW SOURCE
AREA 1-3 (22 ACRES):
• MSW
• SUBTITLE D CELLS ONLY
• USED TO RELOCATE AREA 1-2 OVERFILL
CLASS 4 (8 ACRES):
• C&D WASTE
• PRODUCED LARGE VOLUME OF LIQUIDS

ClosureTurf® Final Cover System



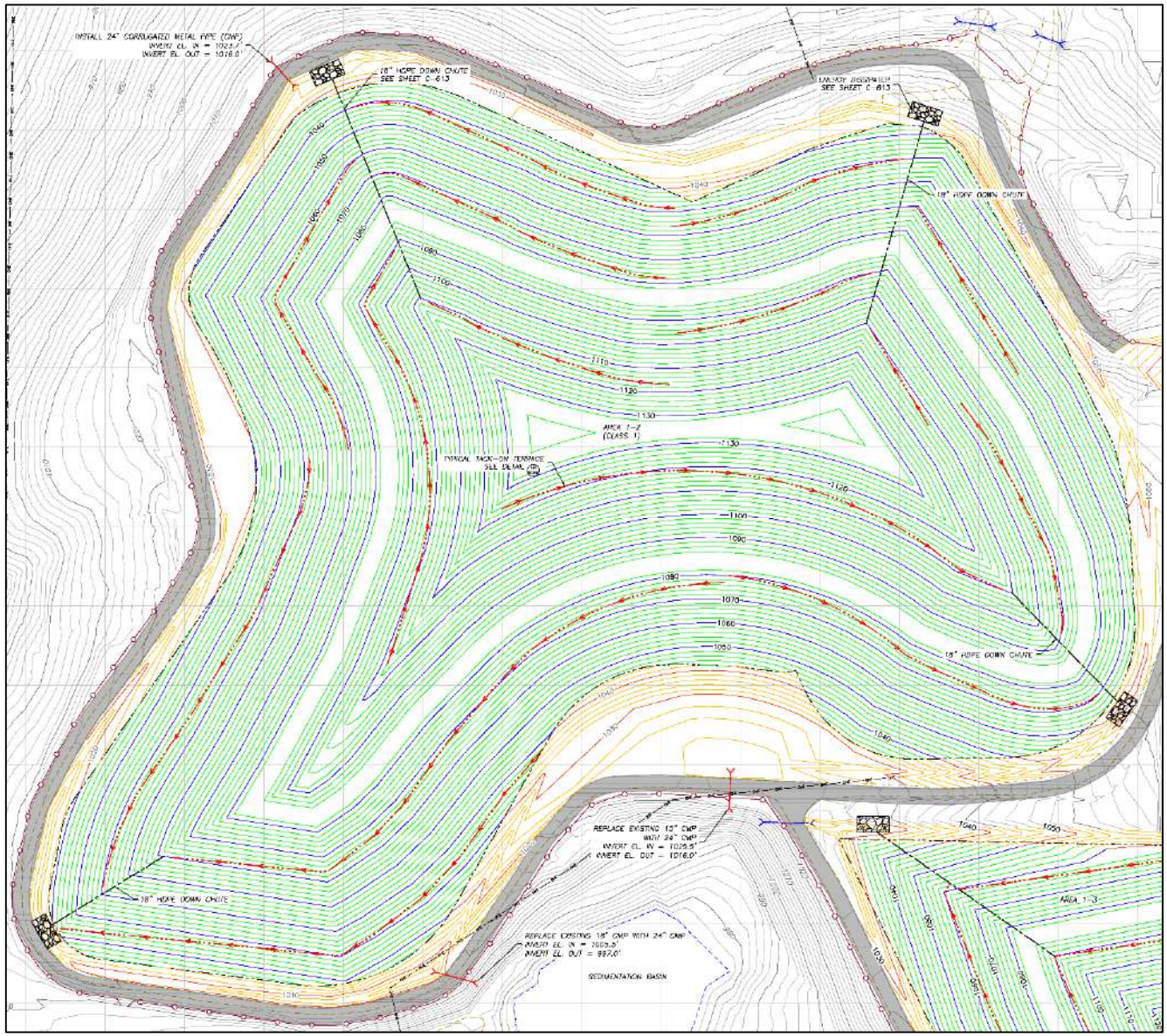
Design Considerations

- Stormwater Runoff – Expect high volume of runoff and velocities.
  - Removed all HDPE pipe down chutes and all but 1 terrace from original design.
  - Lined perimeter stormwater channels with CT.
  - Designed larger energy dissipaters at outlets.
  - Resized stormwater culverts and existing stormwater ponds.
  - Included ArmorFill binder with the sand to prevent sand erosion.

Design Considerations

- <u>Original Design:</u>
  - 16,000 LF tack-on terraces
  - 2,700 LF HDPE pipe down chutes

- <u>CT Design:</u>
  - 1,250 LF tack-on terrace
  - No HDPE pipe down chutes



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Design Considerations

- Active gas collection not required but passive venting needed to be accounted for…CT system has malfunction relief valves for gas accumulation (approximately 1 per acre).
- Passive gas vents were drilled into the waste mass for additional passive gas collection.
- Perimeter roads/grades were redesigned to accommodate anchor trenches and revised ponds.

Construction

- Final covers were installed in phases (Class 4, Area 1-2, Area 1-3).
- HDPE geomembrane CQA procedures were similar to other geomembrane projects (trial welds, destructive/non-destructive testing, etc).
- CQA procedures for turf/sand installation included visual observation, sand thickness measurements, and repair documentation.

Construction

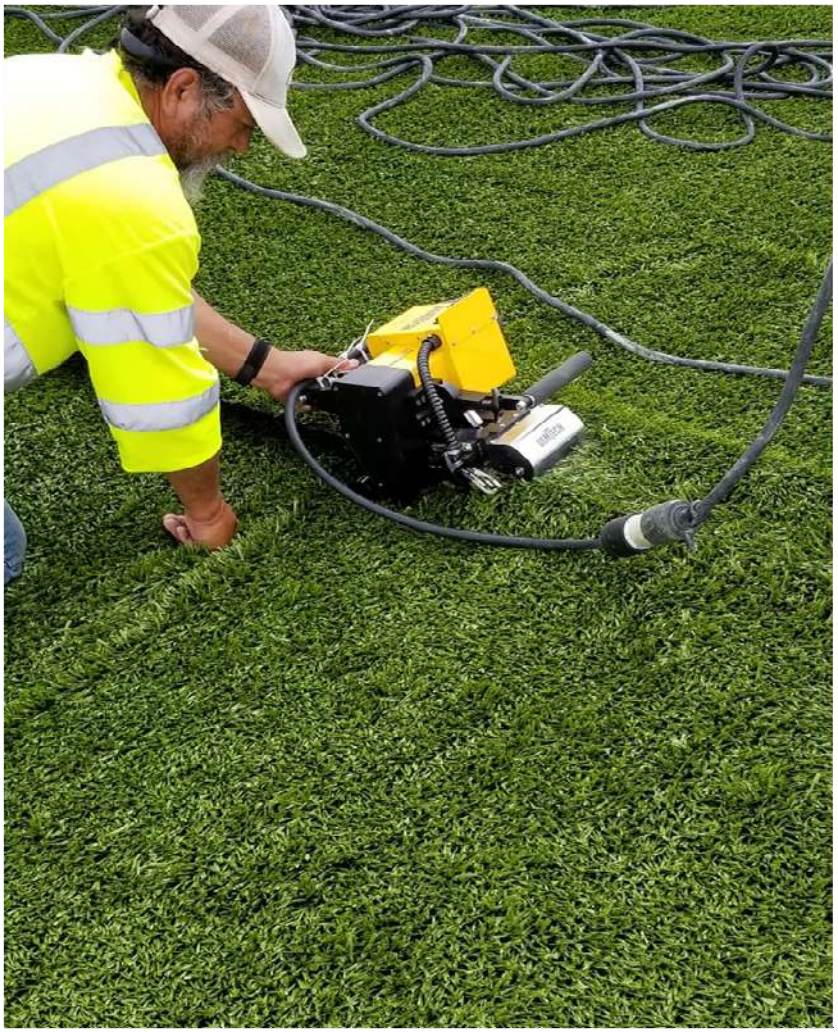
- 50-mil HDPE SuperGripnet is rolled out onto subgrade.
- Panels are joined using fusion/extrusion welding techniques.

Construction

- Turf is then rolled out on top of the liner and turf panels are seamed together utilizing heat.

Construction

- Geosynthetics are secured in an anchor trench.
- Panels of turf are joined by heat.



Construction

- Sand is spread to a thickness of ½ inch thick.
- The sand is then brushed into the turf fibers.

Construction

- ArmorFill is then placed on the sand to provide a durable protective coating and prevent sand from washing away.

Construction

- Malfunction Relief Valve

- Passive gas vent

Challenges - Weather

- Rain: ArmorFill required 24 hours curing period after placement. The sand needed to be dry prior to installation so we really needed a 48-72 hour window.
- Shut down for winter season, VERY wet spring caused delays in installation.

Challenges - Wrinkles

- Large wrinkles developed on Areas 1-2 and 1-3:
  - We think the waste relocation/regrading activities created differential settlement.
  - We were told the site didn't always use compaction equipment when they were open.
  - Wrinkles developed over time and moved towards the perimeter stormwater channel.
  - Wrinkles larger than 1 foot in height were cut out and repaired.
  - Did not appear to impede stormwater flow since they were oriented along the flow line.

Challenges - Wrinkles

Challenges - Wrinkles

- Repairing wrinkles after ArmorFill installation was challenging as it was very hard to cut through.

Challenges - Culverts

- Existing culverts were CMP and was difficult to tie the CT into.
- Poured concrete around the headwalls.
- Secured CT to the concrete using steel battens.

Challenges - Culverts

Post-construction Observations

- Stormwater discharge is very clear!
- Installation of the ClosureTurf® was quick outside of the sand infill which was greatly effected by weather. WatershedGeo has developed a sand spec to eliminate the need for ArmorFill.
- The wrinkles that developed did not effect stormwater drainage…more of an aesthetic issue.
- Sharp angles in the stormwater channels/terrace were difficult to construct…would recommend design with gradual angles.
- Would look into HDPE culverts/headwalls so the CT could be welded to the outlet structures.

Questions?