Designing and Constructing Roads with Geogrid

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Houghton County Road Commission

Geogrid in a Pavement System

- Primary function is reinforcement through a.) lateral restraint, b.) improved bearing capacity and c.)tensioned membrane effect.
- Reduce costs by reducing pavement structure thicknesses and increases pavement life

Geogrid Mechanisms

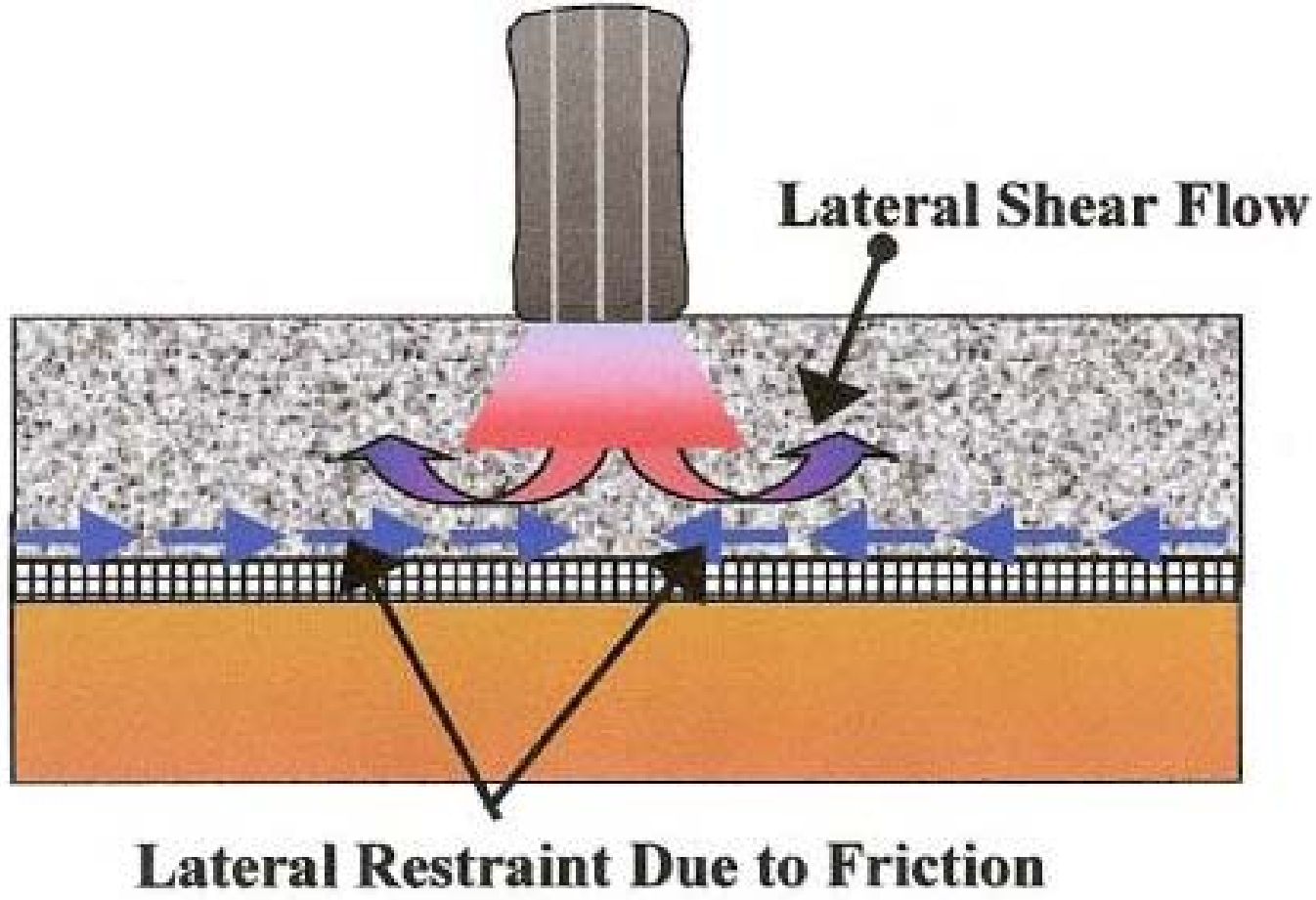


Figure 1. Lateral restraint reinforcement mechanism.
Source: U.S. Army Corps of Engineers ETL 1110-1-189

Geogrid Mechanisms

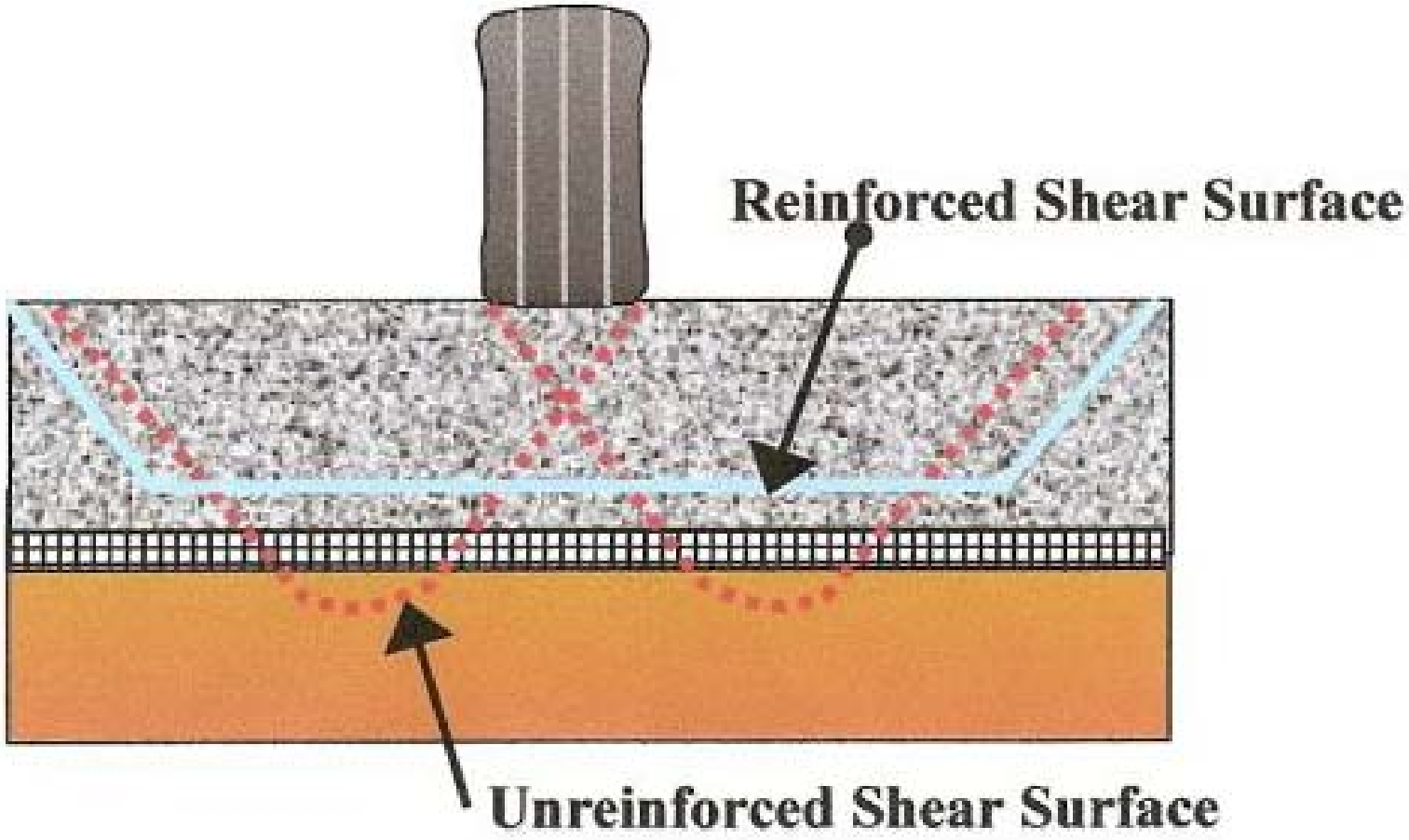


Figure 2. Improved bearing capacity reinforcement mechanism.

Source: U.S. Army Corps of Engineers ETL 1110-1-189

Geogrid Mechanisms

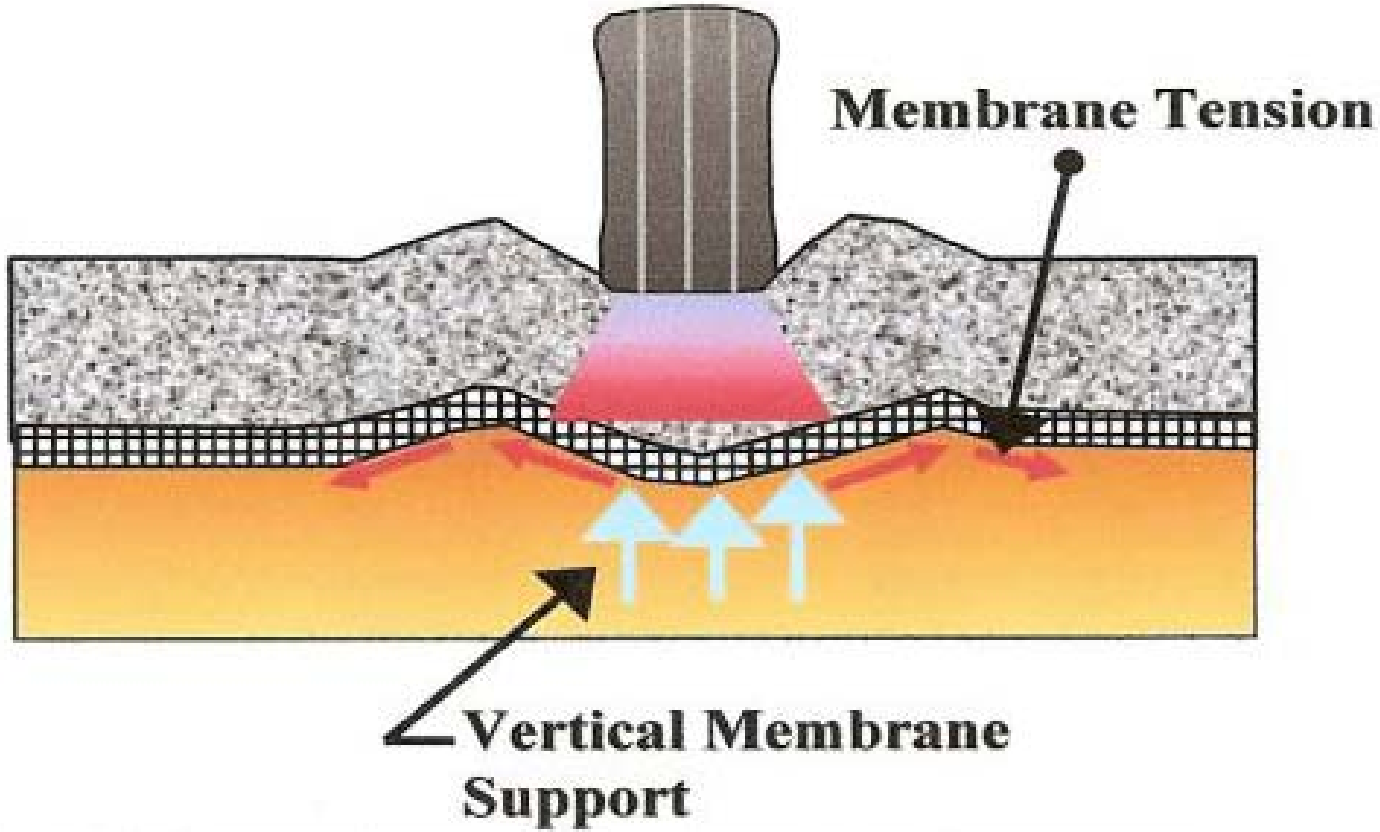


Figure 3. Tensioned membrane effect reinforcement mechanism.

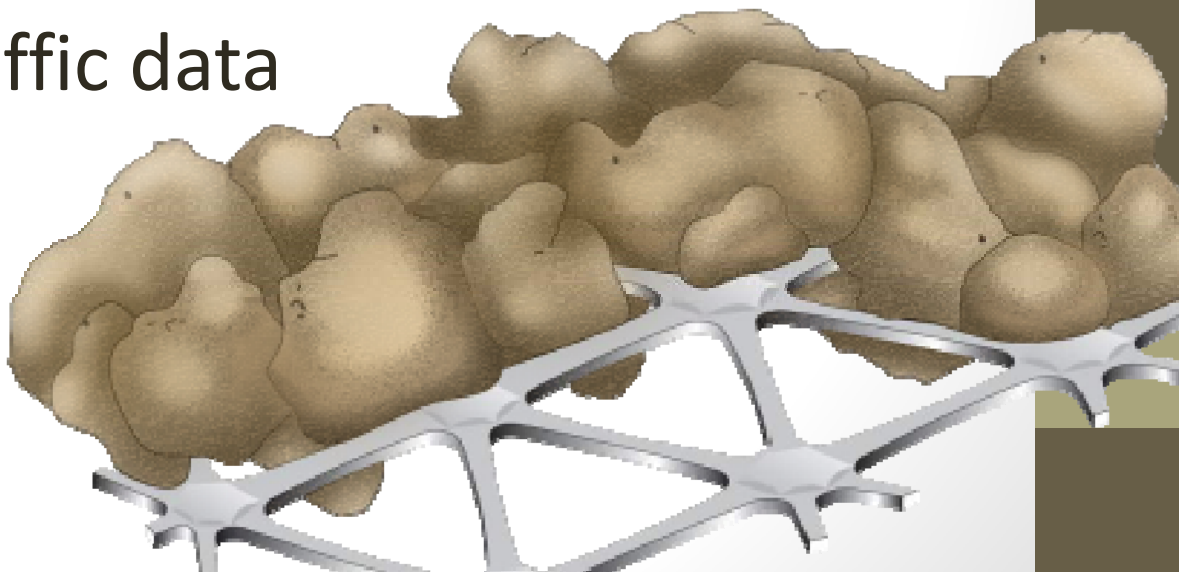
Source: U.S. Army Corps of Engineers ETL 1110-1-189

Why Use Geogrid?

- Subgrade Improvement
  - Reduction of undercutting poor soils
  - Provides a solid construction platform
  - Protection of soft subgrade soils
- Pavement Base Reinforcement
  - Stiffening aggregate base
  - Reduction in pavement thickness
  - Extended pavement life

General Geogrid Design

- Based on strength (CBR) of existing subgrade and traffic data
- Worked with manufacturer and used their design software to determine our proposed pavement structure based on our soils and traffic data



Salo Road Design Considerations

- 2-mile long Rural Major Collector
- ADT 255
- 2% Commercial Traffic
- Soil consisting mainly of sandy organic silts with pockets of “topsoil” and cobble in fill areas.
- Existing 0”-12” of pit run aggregate base under 1.5”-8” of bituminous “road mix”

Salo Road Design Considerations

- Existing 10’ lanes and 3’ aggregate shoulders
- Existing pavement severely alligatored and rutted
- Unrealistic to undercut all bad subgrade areas
- Didn’t want to raise the grade due to existing narrow footprint
- Didn’t want to spend a fortune to fix but didn’t want to be back in <10years


STOP


ROAD
WORK
AHEAD

Design Considerations

- Had prior experience with biaxial geogrid with good results
- Worked with company representative and utilized their design software to determine our project met minimum cover requirements of 6” of 22A over the geogrid.
- Proposed plan was formed

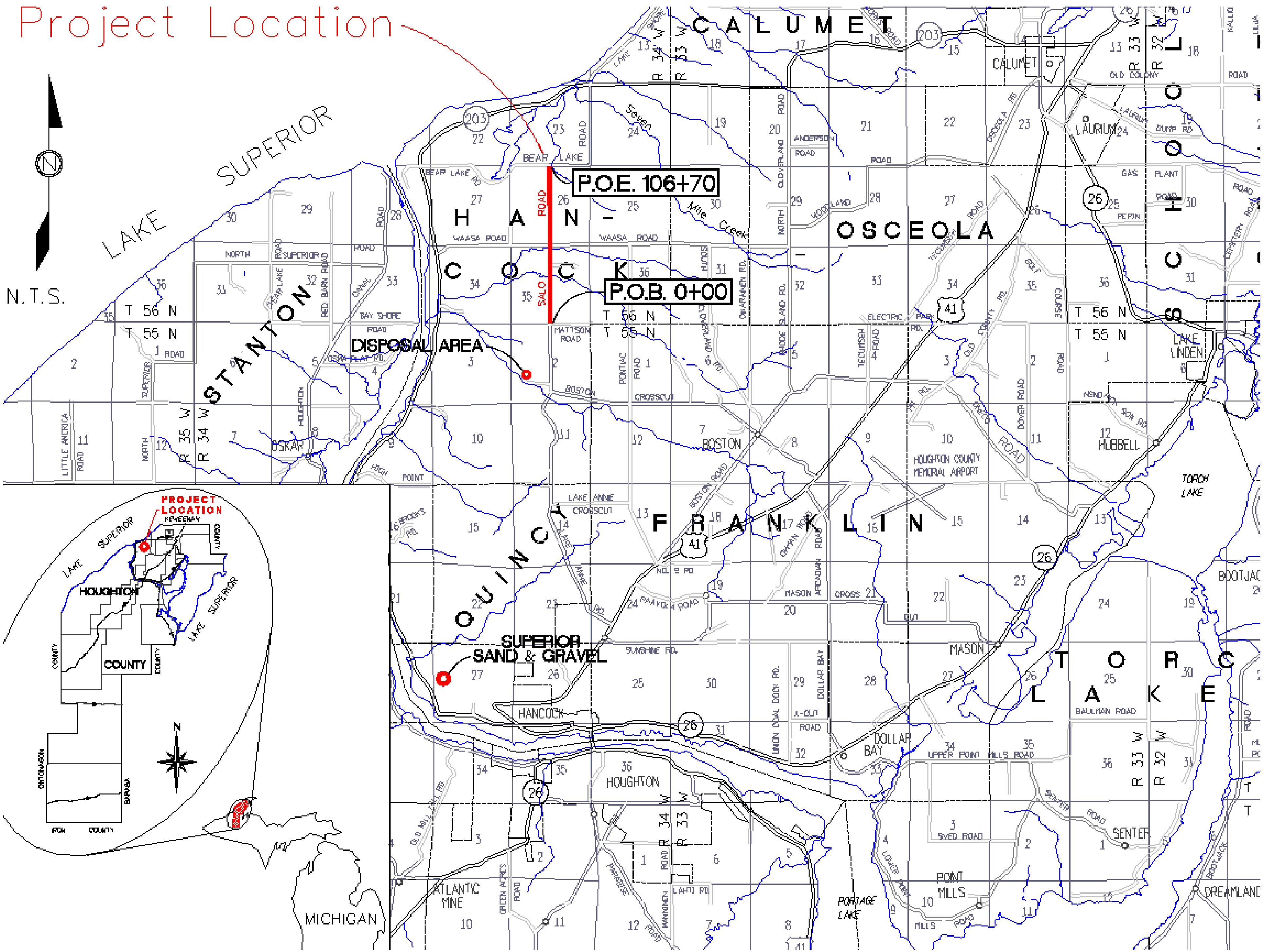
Proposed Project: Phase 1

- Cold mill 8” of existing HMA, agg base and subbase starting at centerline going outward at 2%
- Contractor grade and roll subgrade prior to placing georgrid (include this in SP)


MJO
CONTRACTING
USDOT 1454293


MIO
Peterbilt
MICHIGAN
AC95556


MJO
166



Project Location
N.T.S.
P.O.E. 106+70
P.O.B. 0+00
DISPOSAL AREA
SUPERIOR SAND & GRAVEL
LAKE SUPERIOR
CALUMET
OSCEOLA
HANCOCK
STANTON
QUINCY
FRANKLIN
TORCH LAKE
SALO ROAD
BEAR LAKE ROAD
WAASA ROAD
HOUGHTON
HANCOCK
BOSTON
HUBBELL
LAKE LINDEN
HOUGHTON COUNTY MEMORIAL AIRPORT
DOLLAR BAY
MASON
ATLANTIC MINE
POINT MILLS
PORTAGE LAKE
SENTER
DREAMLAND
TORCH LAKE
T 56 N
T 55 N
R 35 W
R 34 W
R 33 W
R 32 W
PROJECT LOCATION
HOUGHTON
COUNTY
LAKE SUPERIOR
MICHIGAN

Proposed Project: Phase 2

- Place geogrid on subbase
- Rolls were 13.1’ wide x 246’ long
- Contractor would roll them out and overlap at least 1’ on centerline and on the ends (overlap depends on subgrade strength)
- Use zip ties as needed to hold down
- Trial and error to find what worked best
- Found that keeping roll close to gravel seemed to work best

Proposed Project: Phase 3

- Placing 6” of 22A on the geogrid was done by dumping on previously placed aggregate and pushing onto the grid with a dozer
- Dozer operator would start on centerline and push aggregate to the edges being careful to cover the centerline overlap in the correct direction
- Laborer would measure how far each truck load needed to make it based on its weight
- Performed random depth checks to ensure proper aggregate thickness


CALUMET
BEAR LAKE
M-203


CAT
D5M


RED RIVER SERIES
LIVE BOTTOM SYSTEM

Geogrid Information

- Wrote a SP and based acceptance on manufacturer's certification with test results that the product met certain physical properties
- Tensar Triax TX 140 was used on the project
- Unit price was $1.75 per Syd which was about $27,000 per mile for the project

Lessons Learned

- Geogrid won't bridge muck/peat
- Don't run trucks on subgrade if possible
- Make sure dozer is pushing the right way over the centerline overlap
- Make sure the dozer is lifting its blade at the end of the push
- Fold over and crease small waves in the grid and pile aggregate on it to hold it down until it is permanently covered

Lessons Learned

- Set up extra aggregate to touch up areas that are light

Questions?

Email me at john@houghtonroads.org