Dennehotso Bridge

Geosynthetic Reinforced Soil Integrated Bridge System (GRS-IBS)

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FEDERAL LANDS HIGHWAY

Dennehotso Bridge Replacement

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Existing Bridge

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Existing Conditions:

North Approach

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Existing Bridge Superstructure

Site & Subsurface Conditions:

- Alluvium deposit
  - Mapped as Unconsolidated Surficial Deposits of Valley Fill: Mainly Stream-Deposited Silt, Sand, & Gravel, but Includes Some Wind-Blown Sand & Silt Underlain by Navajo Sandstone.
  - Site Materials Encountered—Silty, Very Fine Sand and Fine Gravel. (SM)
  - Scourable & Erodible.
- Navajo Sandstone
  - Very Weak (R1) to Weak (R2) Navajo Sandstone.
  - Erodible.
  - Relatively Few Joints & Fractures.
  - Massive Outcrops Visible.

Existing Conditions:

Existing Conditions:

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Existing Conditions (Hydraulic):

- Floodwater overtopping stream banks flows across approach roads where the approach roads are flush with the floodplain.
- Floodwater flows parallel to the approach roads where there is fill, causing erosion of the road fill and alluvial soil.
- Flooding can be caused by heavy rains, monsoons, or tropical storm remnants.
- Stream transports a moderate amount of woody debris.
- The left stream bank has migrated to the north, resulting in a sharp stream bend immediately upstream of the existing bridge and a skewed flow alignment through the bridge.

Existing Conditions:

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Existing Conditions:

Existing Conditions:

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Challenges & Goals:

- Develop a best-fit alignment that will accommodate a single-span and non-skewed bridge.
- Develop a bridge type that eliminates cast-in-place concrete construction.
- Use available soils in the area for roadway fill construction.
- Provide a project that is reliable, simple to construct, cost effective, that can be constructed without a specialty contractor.
- Satisfy hydraulic concerns.

Replacement Bridge:

- Replacement bridge will be single span about 107' long & 28' wide.
- Seven prestressed 4'-0" wide by 3'3" deep box girders with asphaltic wearing surface.
- Southeast end will be shifted slightly to the northeast to straighten final alignment.
- Temporary culvert put in to provide a temporary detour. Approach road profile will be raised 2 to 5 feet.
- Proposed bridge expected to increase flow conveyance capacity & reduce the amount of debris entangling on the structure.
- The right approach road is predicted to be overtopped for floods equal to and larger that the 100-year event.
- The left approach road is not predicted to be overtopped by the 100-year event.
- The stream channel will be widened to a minimum width of 92 feet.
    - Shortening would increase the frequency of flood water overtopping the stream banks and approach road embankments.

New Bridge Foundations:

- No CIP construction. No piles.
- Reliable, simple to construct, cost effective.
- No specialty contractor needed.
- Local labor can be used, if desired.
- Supports the Nation's progress toward self-determination.

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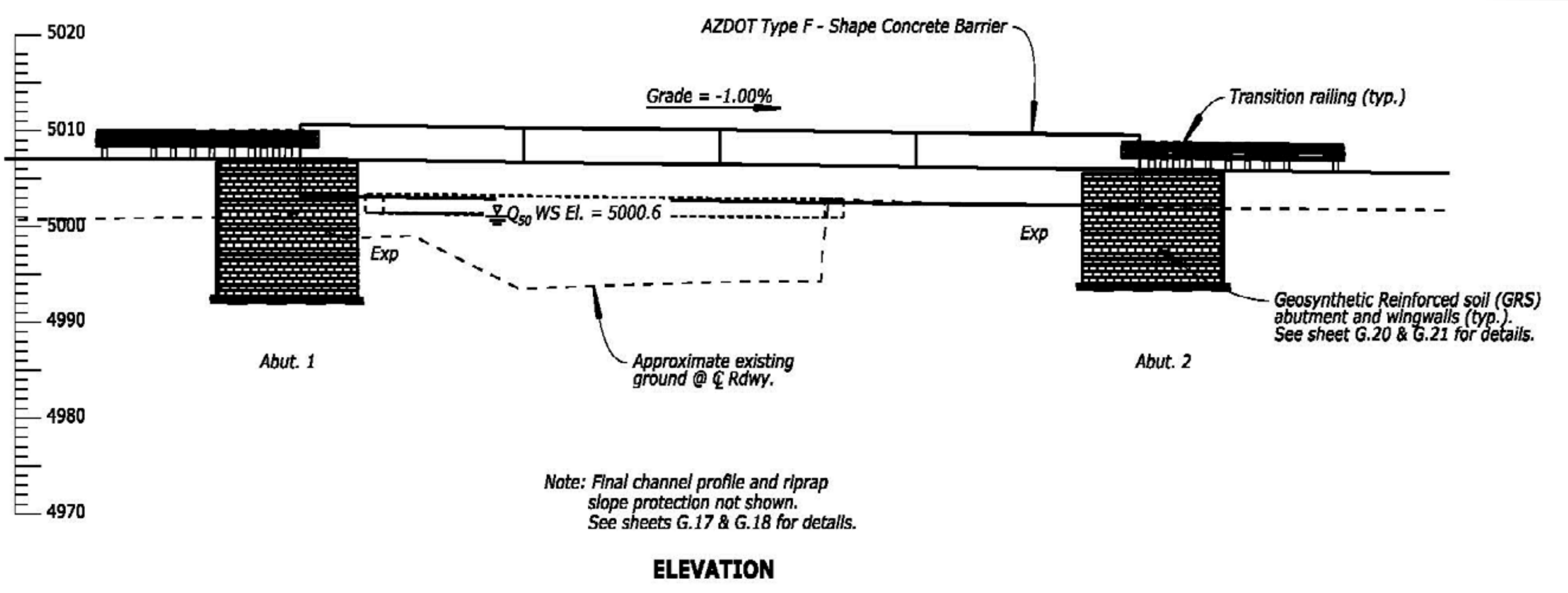
Dennehotso GRS-IBS:



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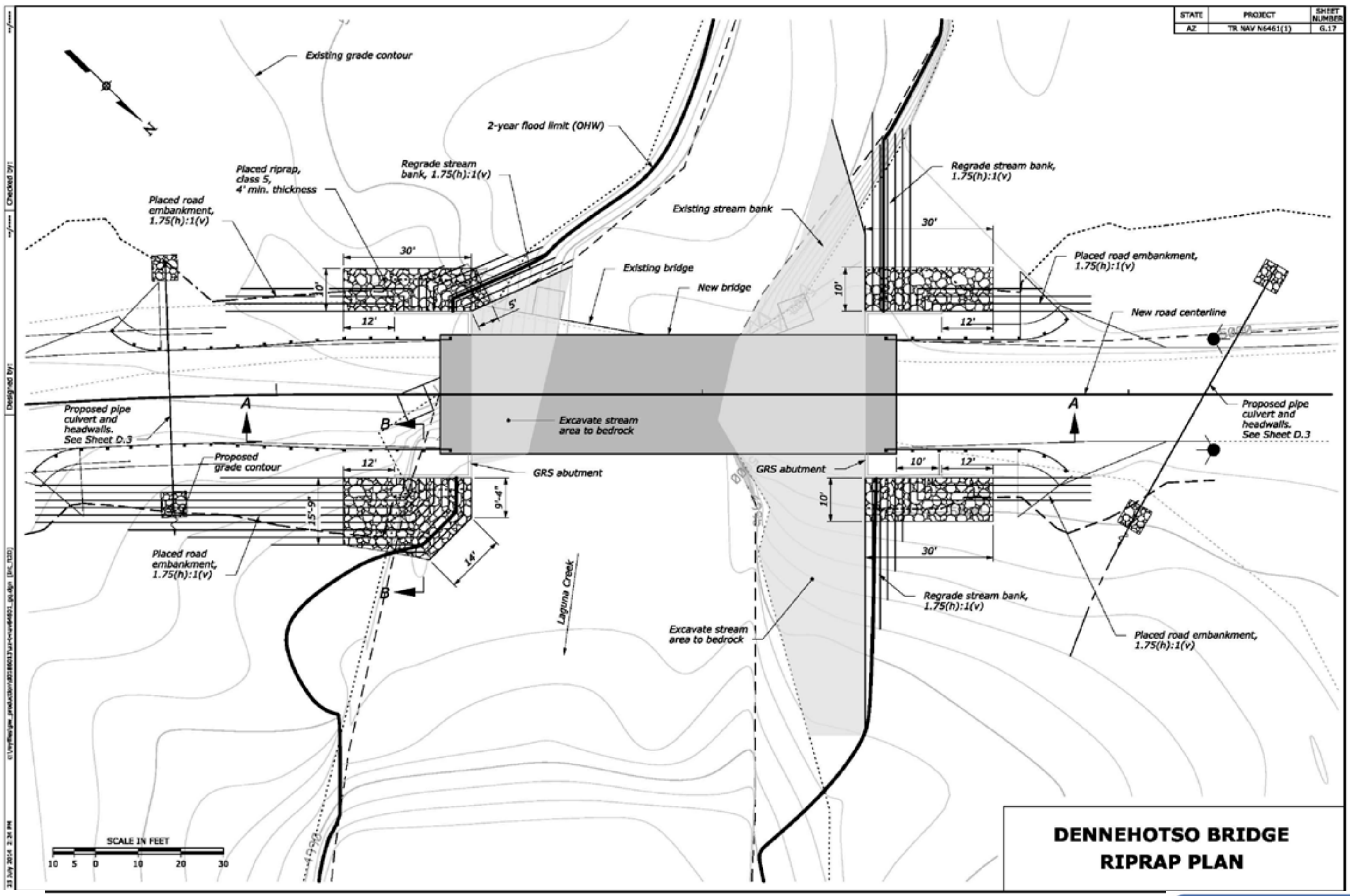

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Expectations:

- Flood water fill flow along the approach roads for floods larger than the 50-year event.
- Erosion might expose and remove fill soil behind the GRS abutment.
- The approach road embankments will be protected by installing riprap extending from the front face of the GRS to the end of the integrated approach.
- The GRS abutments are designed to resist erosion of the road embankment material.

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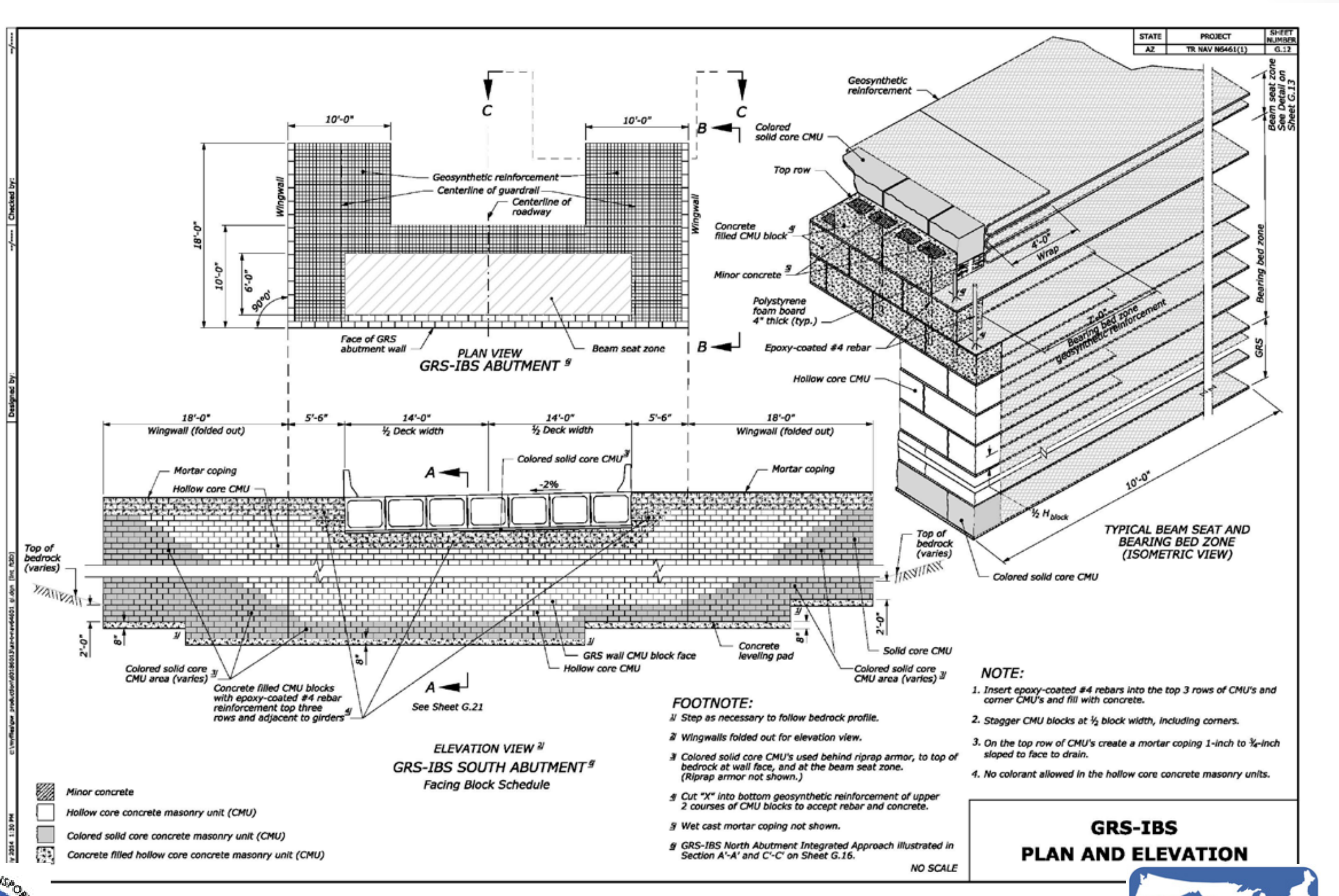

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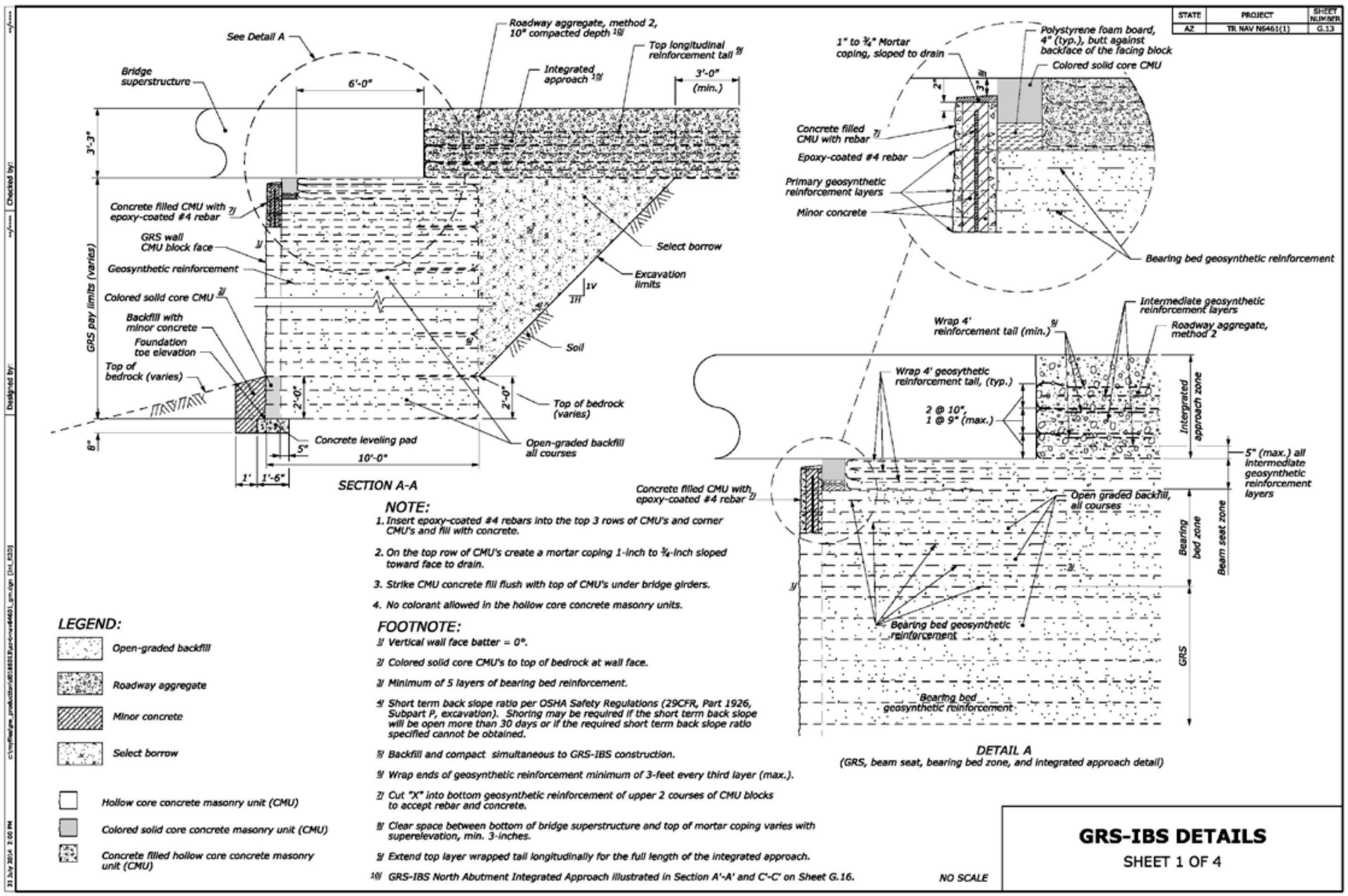

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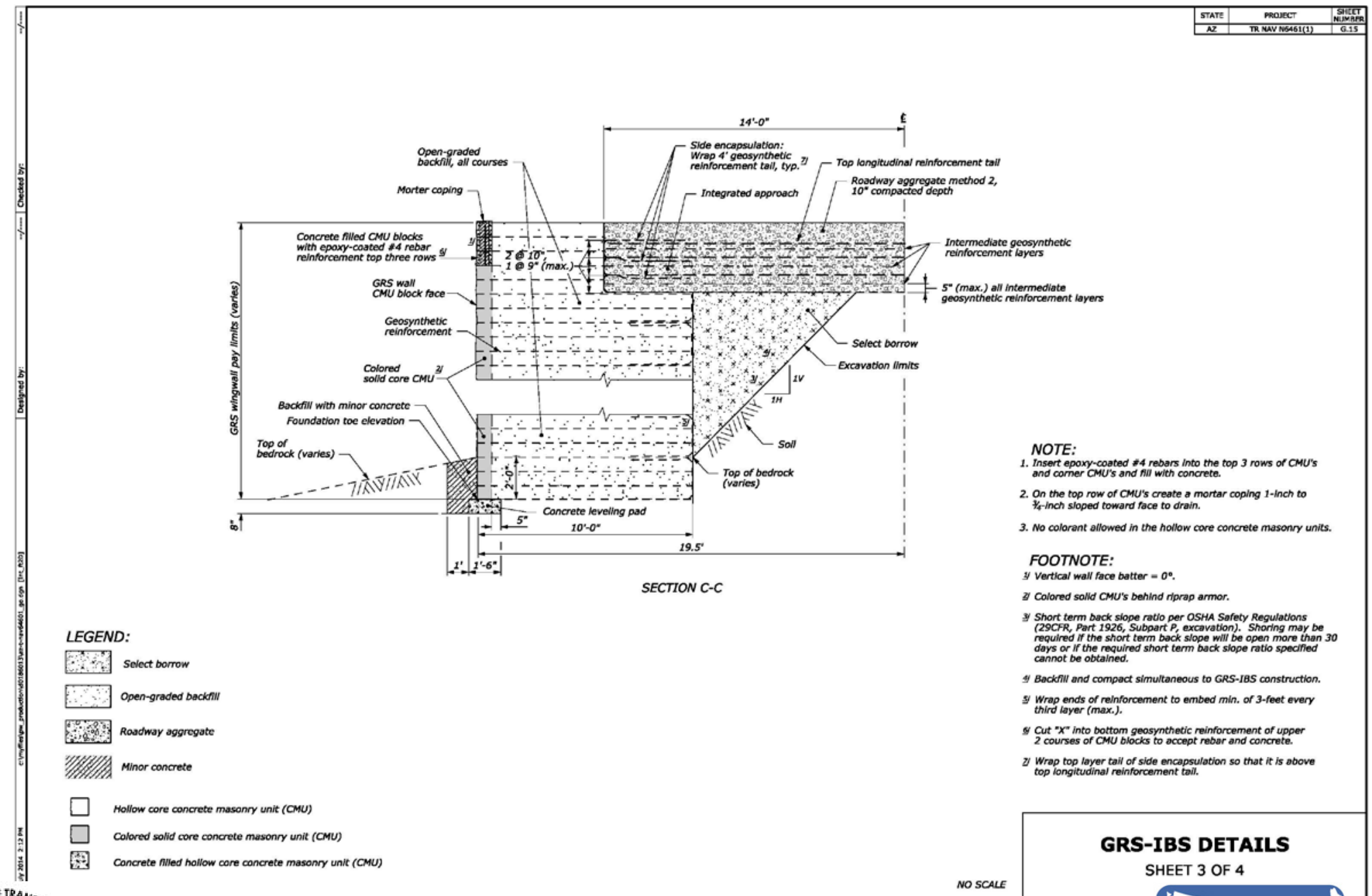

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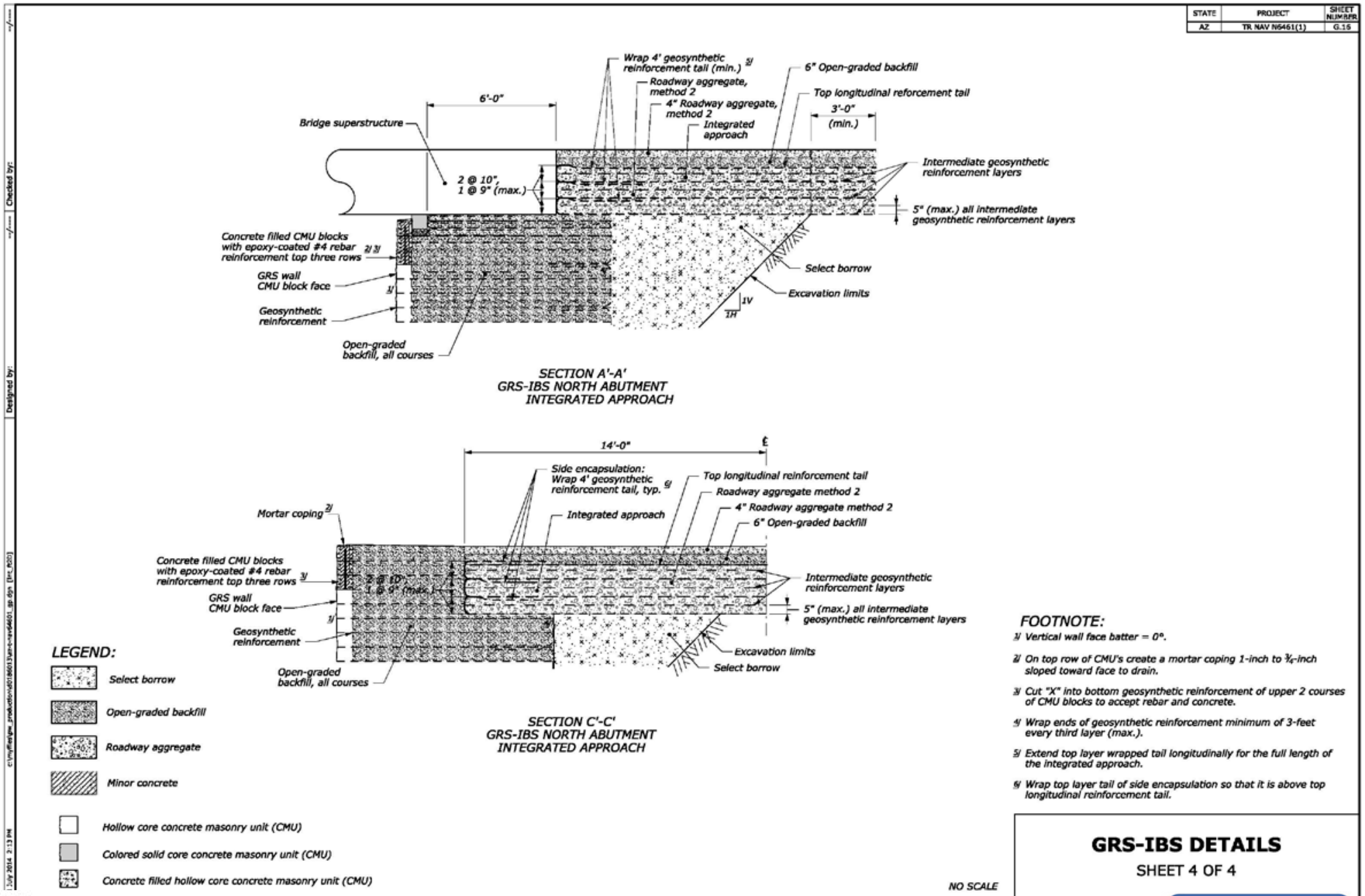

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Every Day Counts - www.fhwa.dot.gov/everydaycounts

FHWA's Geosynthetic Reinforced Soil Integrated Bridge System (GRS IBS) Team

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Questions/Comments: