High Carbon Fly Ash Phase II Study

Overview

- Sponsor: U.S. DOE
- Research Team: Bloom Consultants, LLC (prime) and University of Wisconsin at Madison
- Partner: Minnesota DOT

Organization

- DOE Project Manager: Mr. Bob Patton
- PI: Dr. Haifang Wen (UW)
- Team: Dr. Tuncer Edil (UW), Mathew Tharaniyil (Bloom), and Swapna Danda (Bloom)
- MnDOT: Maureen Jensen, Ben Worel, Tim Cylne, Roger Olson, Ed Johnson, Bob Edstrom

Phases of Study

- Phase 1: Aug. 2005 – Mar. 2006 (Over!!)
- Phase 2: Aug. 2006 – Dec. 2008

Phase I Study

- Proved the feasibility of using high carbon high calcium fly ash to stabilize the recycled asphalt pavement materials as base course.
- The recycled pavement materials (RPM) consisted of recycled asphalt and existing gravel

Phase I Study

- Used two high carbon fly ashes
- King fly ash from Xcel Energy (Minnesota), 25.8% CaO and 14.3% carbon
- Dewey fly ash from Nelson Dewey Power Plant (Wisconsin), 9.2% CaO and 49.3% carbon

Phase I Study

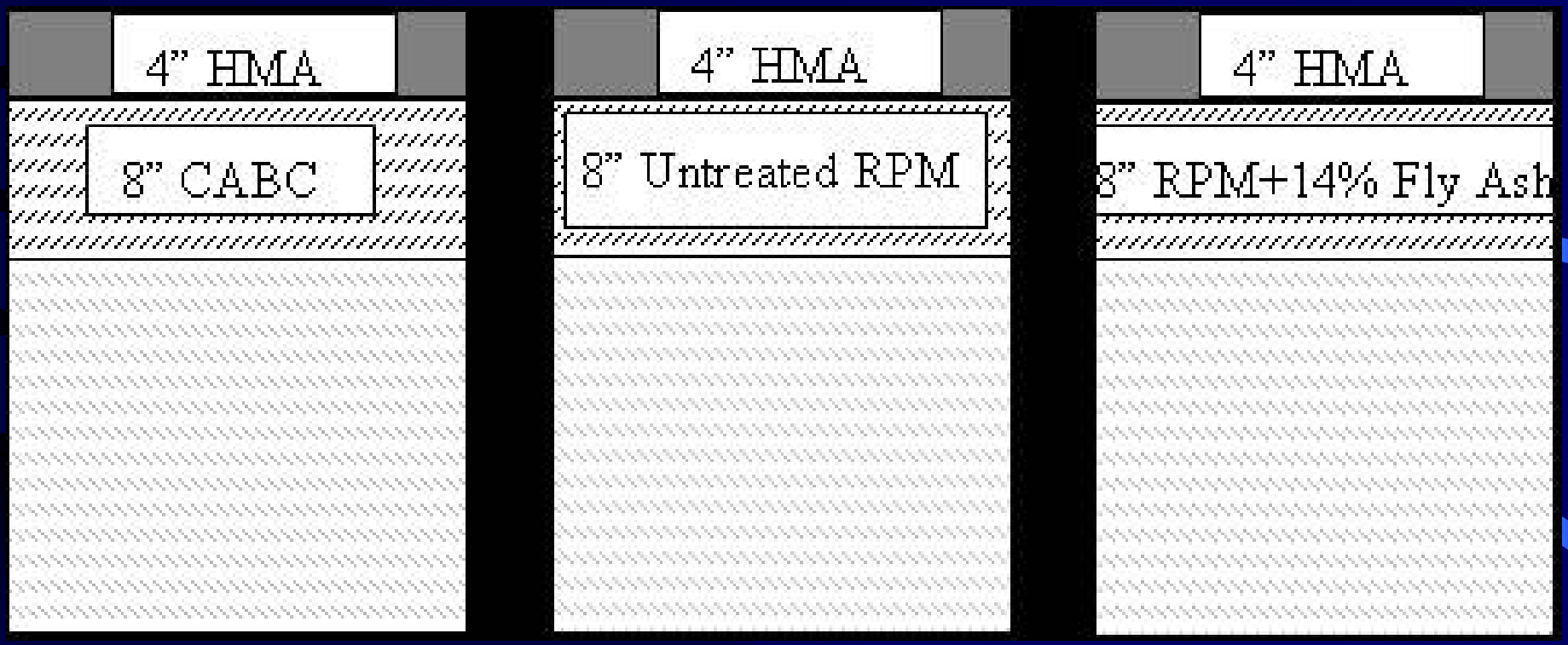
- Untreated RPM: very weak
- RPM – Dewey fly ash: weak
- Crushed aggregate: reference
- RPM – King fly ash: strong

Phase II Study

- Full-scale Test Road: MnROAD
- Well-controlled
- Well-instrumented
- Real life application
- Live truck

Phase II Study

Phase II Study



Phase II Study

- King Power Plant Under Reconstruction
- Will Use Riverside 8 Fly Ash from Xcel Energy
- 14.6% LOI (Carbon)
- 22% CaO
- 14% Application Rate

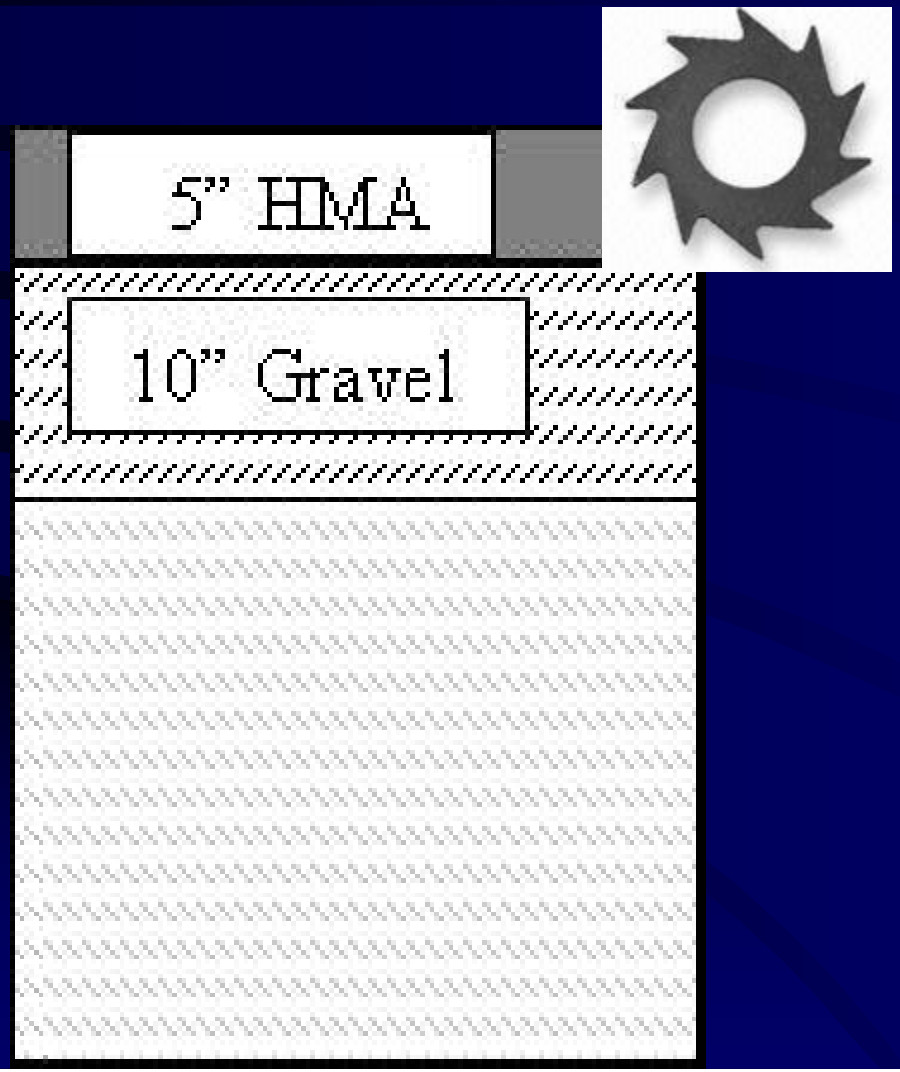
Phase II Study

- MPCA considers Riverside 8 Fly Ash a non-compliant materials
- An agreement was made on June 20, 2007 in which MPCA permitted the use of Riverside 8
- MPCA requested continuous monitoring of leachate till 2017.

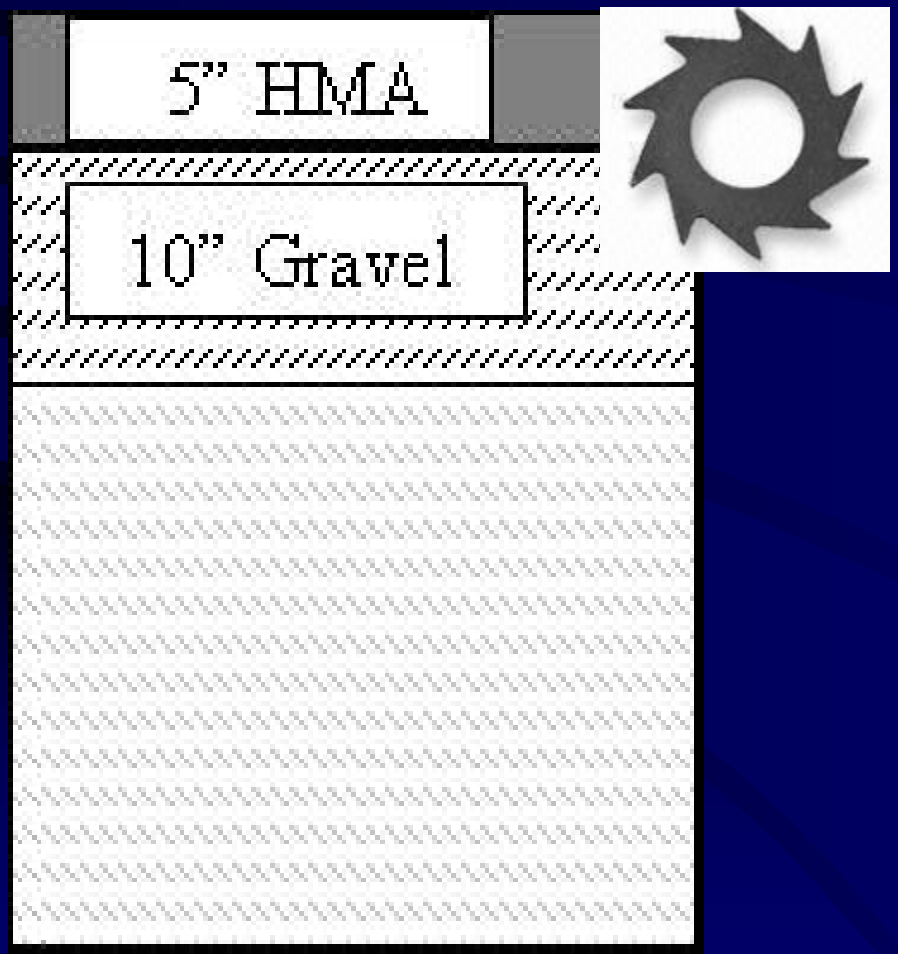
Phase II Construction

- MnDOT let the project on June 8, 2007
- Midwest Asphalt won the bid.
- Construction started on July 23rd, 2007.

Recycle Asphalt



Mix with Gravel



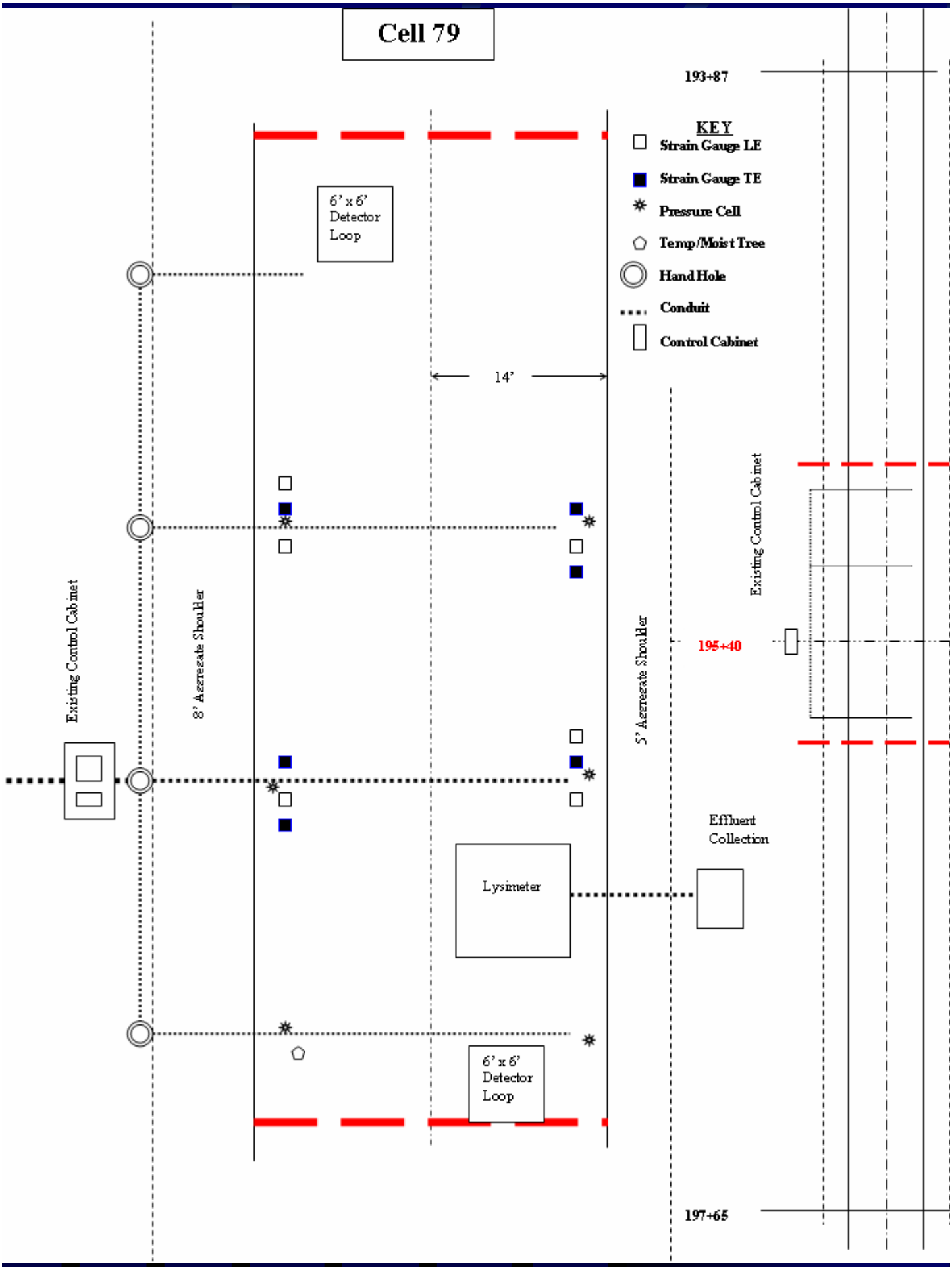
Reclaiming

Reclaimed Materials

Stockpiled Materials

Instrumentation

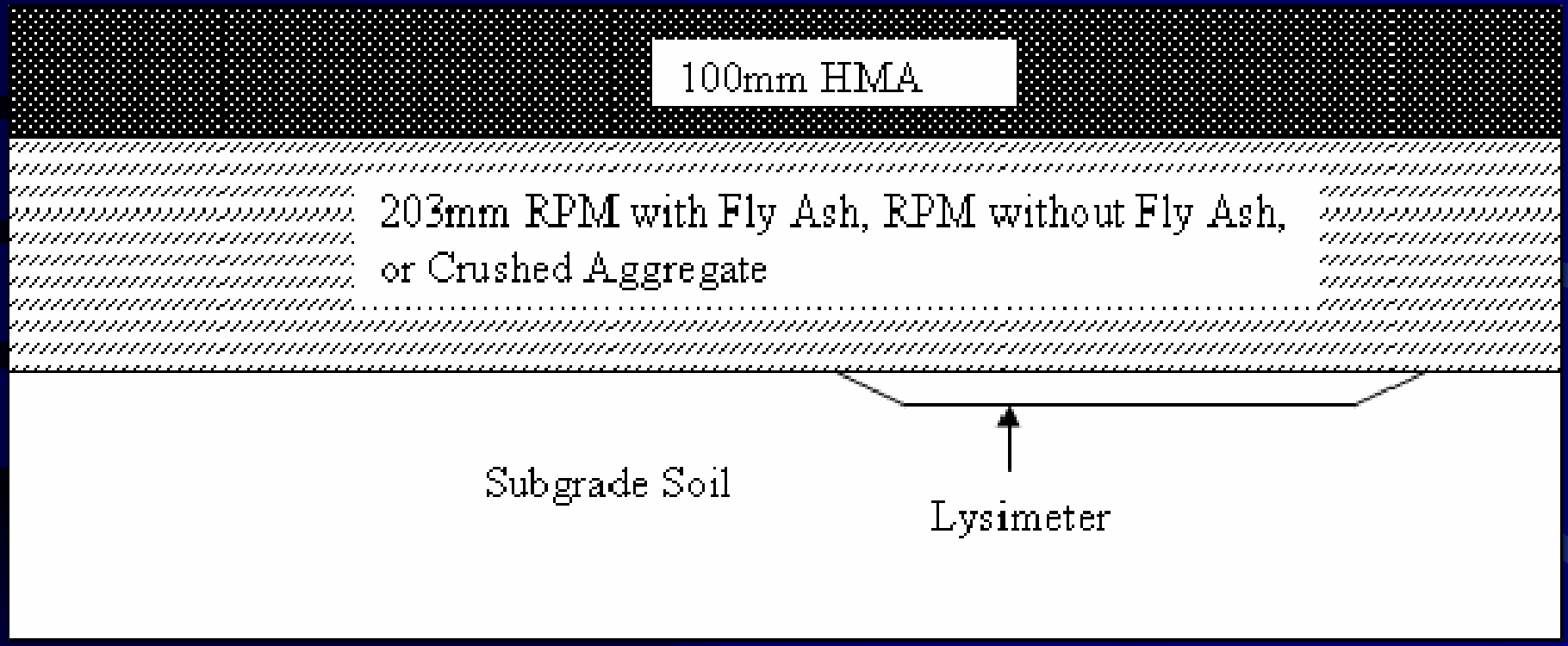
- Pressure Cell, Strain Gauges, Temperature, Moisture
- Lysimeters for leaching


Cell 79
193+87
KEY
Strain Gauge LE
Strain Gauge TE
Pressure Cell
Temp/Moist Tree
Hand Hole
Conduit
Control Cabinet
6' x 6' Detector Loop
14'
Existing Control Cabinet
8' Aggregate Shoulder
5' Aggregate Shoulder
Existing Control Cabinet
195+40
Effluent Collection
Lysimeter
6' x 6' Detector Loop
197+65

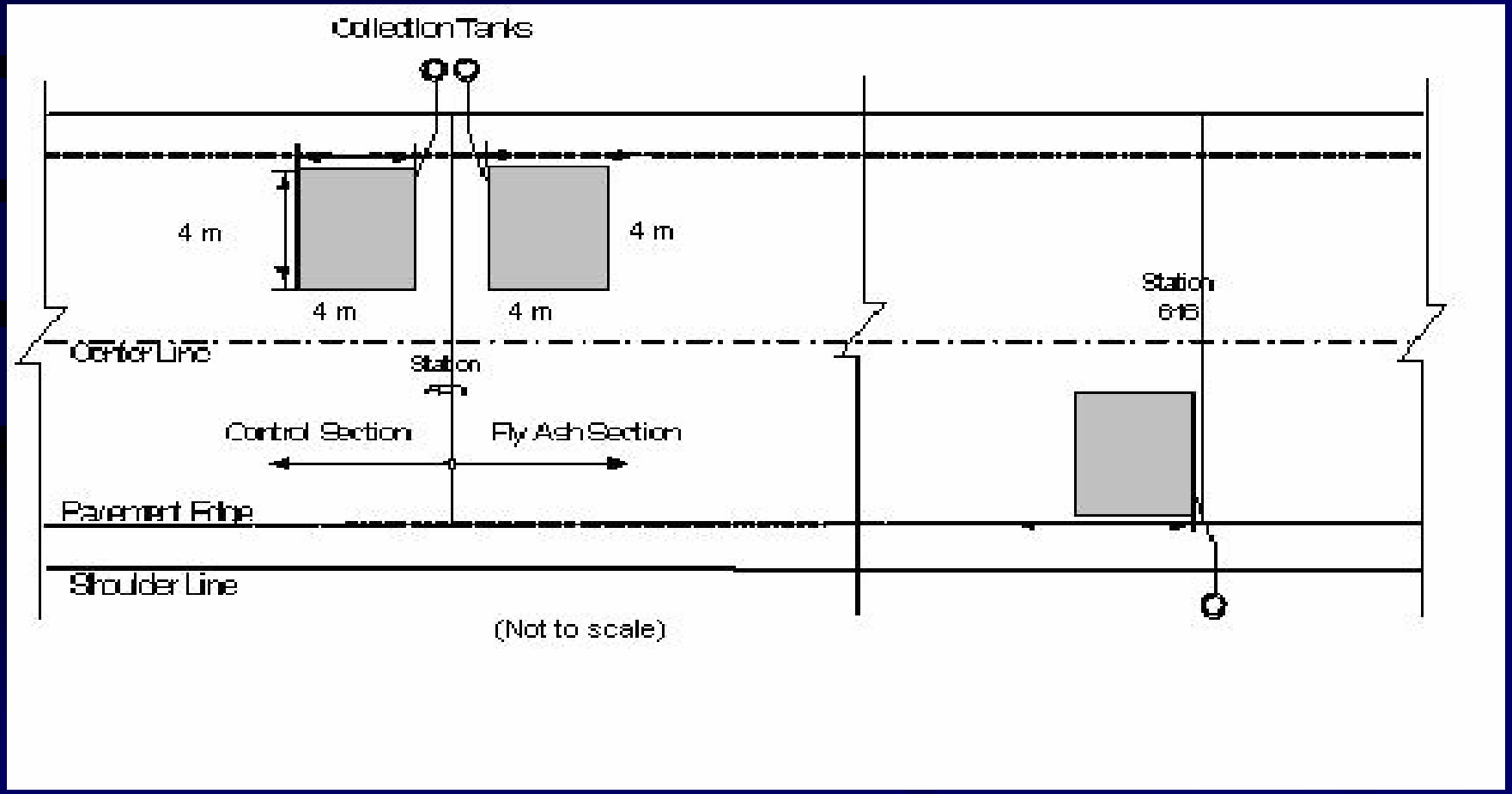
Trenching

Trenching

Lysimeter


100mm HMA
203mm RPM with Fly Ash, RPM without Fly Ash,
or Crushed Aggregate
Subgrade Soil
Lysimeter

Plan View of Lysimeter



Installation of Lysimeter

Pipe to Tank

Collecting Tank

Field Tests

- Bloom: Moisture and Density
- UW: Soil Stiffness Gauge
- MnDOT: Falling Weight Deflectometer (FWD) and Dynamic Cone Penetrometer (DCP)

Lab Tests

- Sampling Soil, Base Materials, and Asphalt
- Mechanical Tests and Environmental Tests