

WASTE COMBUSTOR ASH STABILIZER IN FULL DEPTH RECLAMATION

Project Team

Olmsted County, Beth Keister, P.E.
Otter Tail County, Chris McConn, P.E.
Stantec, Brad Sullivan, P.E.
Braun Intertec, Amy Grothaus, P.E.
MPCA (Funding Agency)




> LIVE YOUR *best life* HERE.

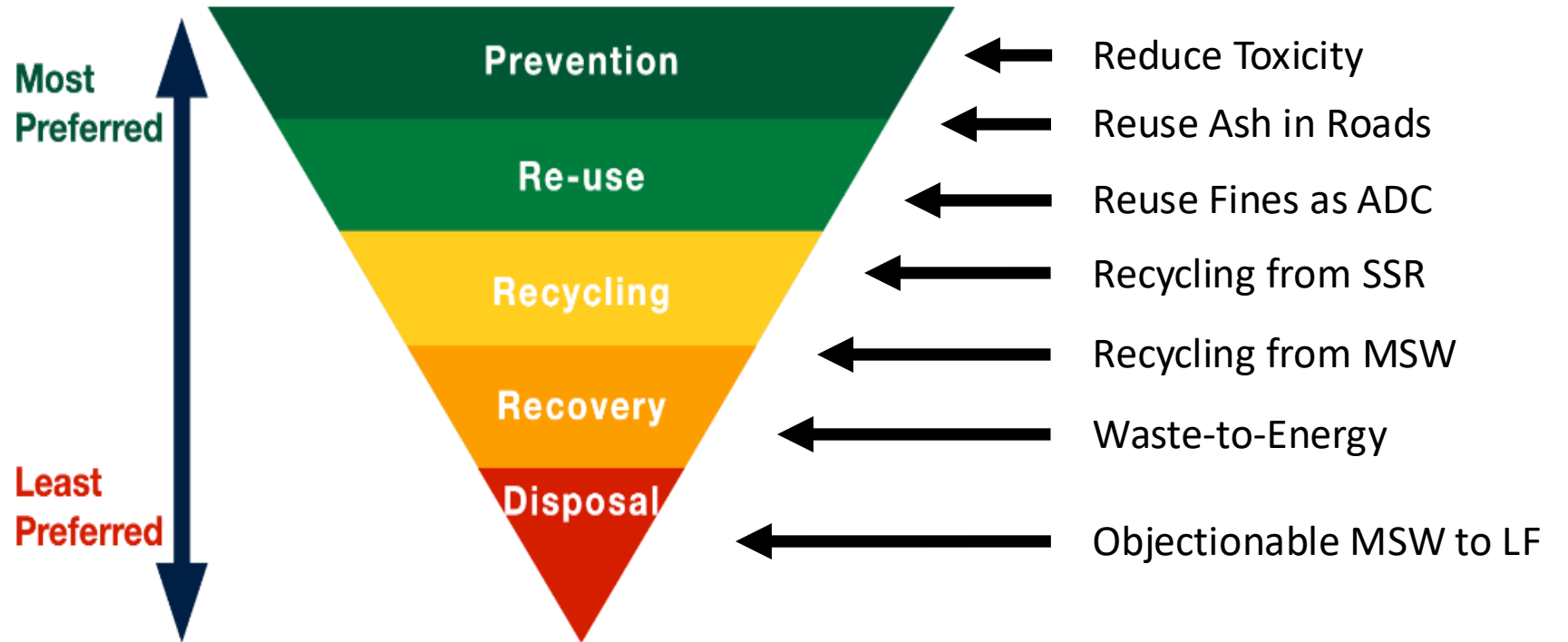


Background:

RESOURCE RECOVERY

- 
1. “Waste to Energy” started in the 1980’s as part of a national initiative to reduce landfilling.
 2. Remains under state and federal policy the preferred management method over landfill.

WASTE MANAGEMENT HIERARCHY



➤ Background: ASH MANAGEMENT

ASH PRODUCTION (2022)



	Prairie Lakes Municipal Solid Waste Authority	State of Minnesota
Annual Waste Processed	54,000 tons/year	1,105,00 tons/year
Ash Production (2022)	11,000 tons/year	225,092 tons/year

This opportunity for ash recycling is similar to the total increase in recycling observed statewide in the last 8 years.

ASH MANAGEMENT.....



- SEVEN RESOURCE RECOVERY FACILITIES IN MINNESOTA
- MOST ASH IS LANDFILLED.
- IN EUROPE, MOST ASH IS RECYCLED, ESPECIALLY IN ROAD CONSTRUCTION.
- IN UNITED STATES, FLY ASH AND BOTTOM ASH ARE ALWAYS COMINGLED FOR DISPOSAL
- CONTAINS: GLASS, METAL, DIRT, LIME AND ASH

➤ CSBUD & MPCA Approval Process

MSW Ash Reuse in Minnesota



Polk County

- 2000 – 2008: Full-scale pilot testing on Class 5 and HMA
- 2010: CSBUD for amended aggregates
- Annually: Typ 3,500 – 7,500 ton/year on DPW projects

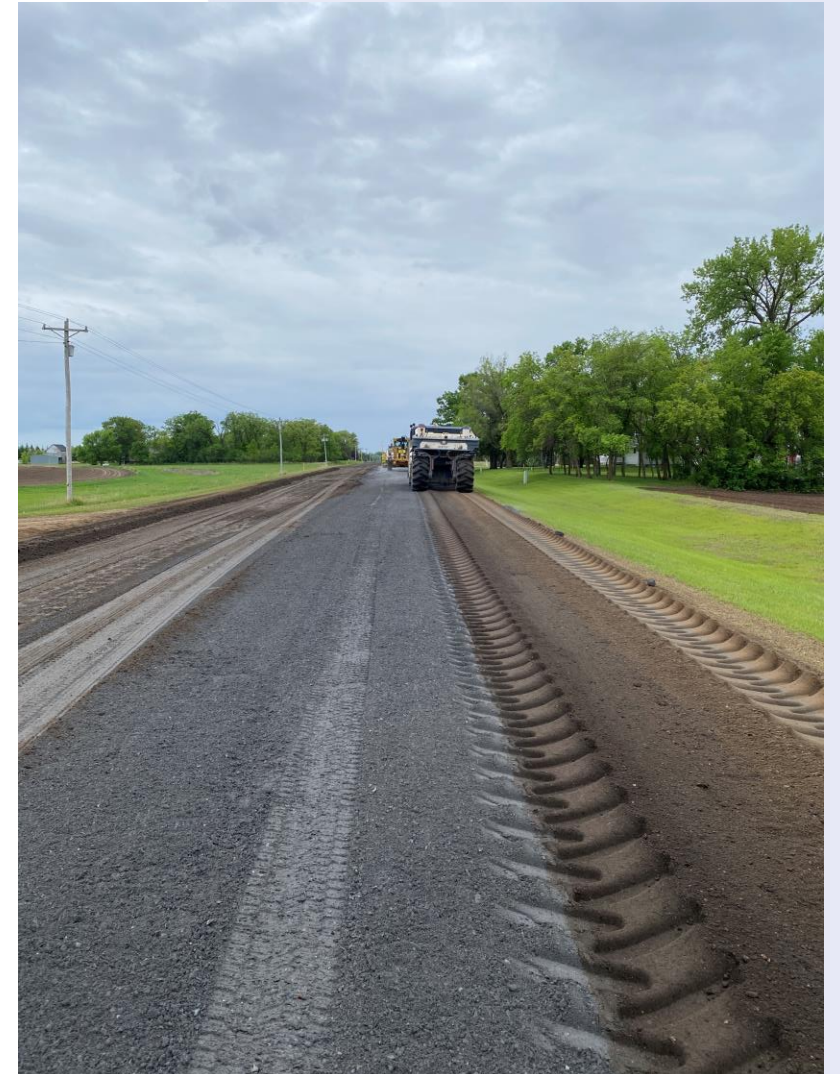
Olmsted County

- 2021: CSBUD* for amended aggregates
- 2022: 435 ton pilot project creating Class 5

Prairie Lakes Municipal Solid Waste Authority (PLMSWA)

- 2024: CSBUD* for amended aggregates
- 2025: 2,600 tons used in SFDR

*Skipped DRP based on past Polk County DRP success



MPCA's Beneficial Reuse Program



	SBUD – Standing Beneficial Reuse Determination	Case-Specific Beneficial Use Determination (CSBUD)	Demonstration/Research Permit (DRP)
Purpose	16 Standing beneficial uses for well documented materials including wood, paper, glass, latex paint, porcelain, tires, concrete, asphalt, coal ash, foundry sand, uncontaminated lime, shingles	Reuse materials in ways not classified as SBUD	Test new waste management methods or evaluate beneficial uses on a limited scale
Approval Process	Comply with BUD requirements and Rules, no approval needed	<ul style="list-style-type: none"> • CSBUD permit issued by MPCA • May require demonstration research project (DRP) 	DRP permit issued by MPCA
Permit Term	-	No expiration / ongoing use of solid waste in a specific application	Temporary, experimental projects
Conditions	None	<ul style="list-style-type: none"> • Can't store for speculative markets • Fully characterize waste • Effective substitute • Not harm human health or environment • Not used in quantities exceeding accepted standards 	<ul style="list-style-type: none"> • Can't store for speculative markets • May allow temporary noncompliance with state rules (not federal standards) to facilitate research
Reporting Requirements	None	Total quantity used, to where, and how	Report outline proposed in application, experimental design, data, findings

CSBUD Permit Application



- Material characterization
 - Chemical properties
 - Material properties
- Health Risk Assessment
- Complies with Industry Standards
- Routine Sampling & Analysis
- Documentation That Market Exists
- Description of How and Where Material is Use
- Storage of Material Prior to Reuse
- Waste Generated Due to Reuse



CSBUD & CERCLA

SBUD and CSBUDs transition the waste's liability out of CERCLA if testing was performed and approved by regulators.





> OLMSTED COUNTY: ASH MANAGEMENT



> LIVE YOUR *best life* HERE.



With 7 Municipal Solid Waste Incinerators, Minnesota is third after Florida and New York in number of waste-to-energy facilities.





2024 ASH PRODUCTION in Olmsted County



	Olmsted County Waste-to-Energy Facility
Annual Waste Processed (2024)	120,000 tons/year
Ash Production (2024)	28,000 tons/year
Lime Used (2024)	600 tons/year

- Ash generation rates will decline with the operation of the MRF scheduled to begin in 2027.
- Fuel “cleaning” will reduce the volume of accepted MSW by 8 percent.



OLMSTED COUNTY
MINNESOTA

C.R. 154 between T.H. 52 and C.R. 112

MINNESOTA DEPARTMENT OF TRANSPORTATION
THE COUNTY OF OLMSTED
CONSTRUCTION PLAN FOR COLD RECYCLE AND BITUMINOUS OVERLAY

LOCATED ON C.R. 154 BETWEEN T.H. 52 AND C.R. 112 (GEOGRAPHIC DESCRIPTION)

FROM 154.46m W. OF NE. COR. SEC. 32, T108, R14 TO N. COR. SEC. 34, T108, R14 (LEGAL DESCRIPTION)

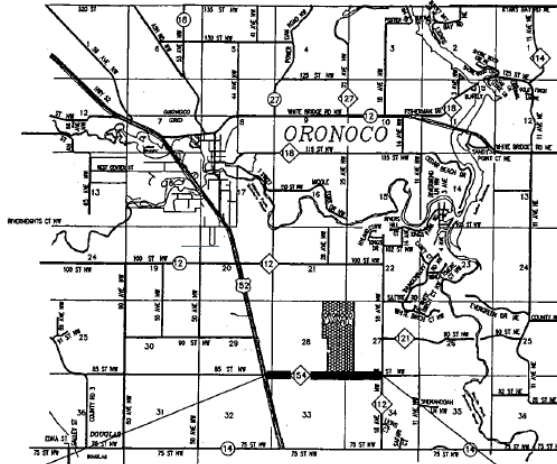
S.A.P. C154-98-01
GROSS LENGTH 2541.00 feet 2.541 Miles
BRIDGE-LENGTH 0.00 feet 0.00 Miles
EXCEPTIONS-LENGTH 0.00 feet 0.00 Miles
NET LENGTH 2541.00 feet 2.541 Miles

10 TON DESIGN
STA. 0+000 TO STA. 1+575
7 TON DESIGN
STA. 1+575 TO STA. 2+541

GRADED, AGG. BASE, & BIT. UNDER: 1972
C154-72-12

GRADED & AGG. BASE UNDER: 1972
C154-12

AGG. BASE & BIT. UNDER: 1989
C89-01



BEGIN: C154-98-01
STA. 0 + 000

END: C154-98-01
STA. 2 + 541

OLMSTED COUNTY

S.A.P. C154-98-01
C.R. 154

GOVERNING SPECIFICATIONS
THE 1995 EDITION OF THE MINNESOTA DEPARTMENT OF TRANSPORTATION
"STANDARD SPECIFICATIONS FOR CONSTRUCTION" SHALL GOVERN.

INDEX

SHEET NO.	DESCRIPTION
21	TITLE SHEET
22	TYPICAL SECTION
23	TRAFFIC CONTROL

DESIGN DESIGNATION

R _____ EN18 (20) _____
ADT (Current Year) = 181297 Design Speed _____ MPH
ADT (Future Year) = 271917 Based on STOPPING Sight Distance
DHV (Design Hr. Vol.) = _____ Height of eye @ 2 m; height of object @ 150 m
D (Directional Distr.) = _____ Design Speed not achieved at: _____
T (Heavy Commercial) = 50% STA. _____ TO STA. _____ MPH _____
SOL FACTOR = 130% STA. _____ TO STA. _____ MPH _____
TON DESIGN STA. _____ TO STA. _____ MPH _____
SHOULDER WIDTH SEE TYPICAL SECTION
FUNCTIONAL CLASSIFICATION LOCAL



STATE AID PROJ. NO. C154-98-01
LOCATION C.R. 154 SHEET NO. 21 OF 23 SHEETS



ASSESSING THE ASH

Using the SFDR process
Gradations (P200)
Moisture contents
Unconfined Compressive Strength
Effects of the MRF





ASSESSING ASH MANAGEMENT

- Pug mills
- Transport
- Crushing
- Storage
- Curing
- Trommel screens
- Metals removal
- Landfilling

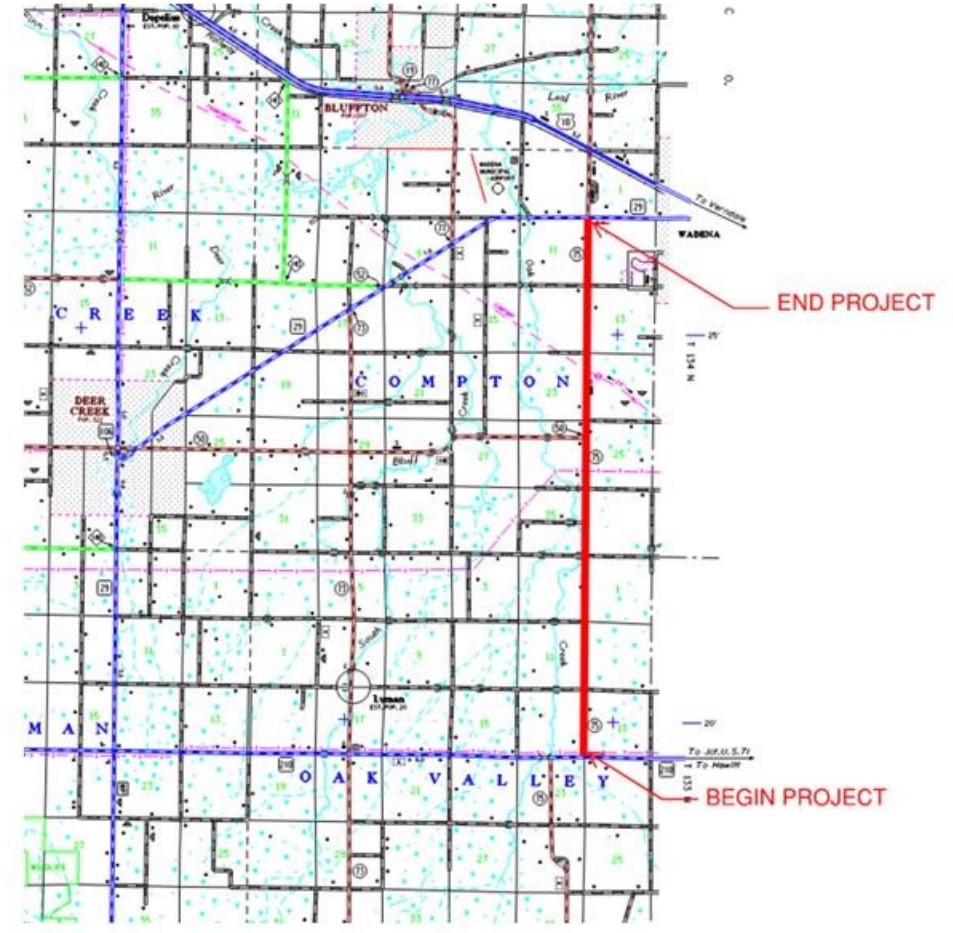


OTTER TAIL CSAH 75 PILOT PROJECT (2025)


Pavement Evaluation in 2023




- 8 miles, located east of Deer Creek
- Reported section consisted of about 3.5 to 4.5" bituminous over 4 to 7" of aggregate base
- Assessing for OL, FDR, CIR or SFDR
- Pavement Evaluation included:
 - Pavement management data review
 - Ground Penetrating Radar (GPR) testing
 - Falling Weight Deflectometer (FWD) testing
 - Soil borings



Pavement Evaluation Results

- 
- Pavement Management Data indicated the bituminous was approx. 30 years of age
 - PQI of 67 from MnDOT
 - Projected 20-yr ESALs of about 350K
 - FWD indicated a 10-ton roadway overall with a subgrade R-value of 25
 - GPR indicated about 4.5 to 5" of bituminous over 5 to 8" of aggregate base
 - Soil borings encountered mostly silty sand and sand fill materials with some areas of buried organics. Native soils were granular.
 - Opportunity to perform FDR or SFDR

Ash Stabilized Mix Design

- 
- Material Sampling
 - Collected 35 6-inch diameter cores and about 300 pounds of aggregate base material
 - PLMSWA provided 300 to 400 pounds of ash to BI lab
 - Laboratory Testing
 - Sieve analysis of the in-place reclaimed materials
 - Density and optimum moisture content of the reclaimed materials (with no ash)
 - Density and optimum moisture content of the stabilized materials with ash
 - Plots of compressive strength versus ash content at the optimum moisture content, 7-day cure
 - Plots of compressive strength versus ash content at the optimum moisture content, 28-day cure
 - Recommended percent of ash

Material Sampling & Design

- Design Details
 - County decided to add ash to northern 4 miles
 - Reclaim depth of 8" (approximately 60% RAP)
 - Remove 2" excess reclaim
 - Stabilize to 6"
 - 4" bituminous overlay (grade change of 2")



Ash Processing

(youtube video 2:37 minutes)

Sieve Analysis & Proctor Results



Sieve Size	Percent Passing Blended Material (60/40)			
1 inch	100			
¾ inch	92	Ash % No ash 10 15 20 25	Maximum Dry Density (lb/ft³) 126.0 130.5 130.5 130.0 127.0	Optimum MC % 8 7 7 8.5 8
½ inch	79			
3/8 inch	70			
No. 4	56			
No. 8	44			
No. 16	33			
No. 30	21			
No. 50	12			
No. 100	6			
No. 200	5			

Unconfined Compression Test Results

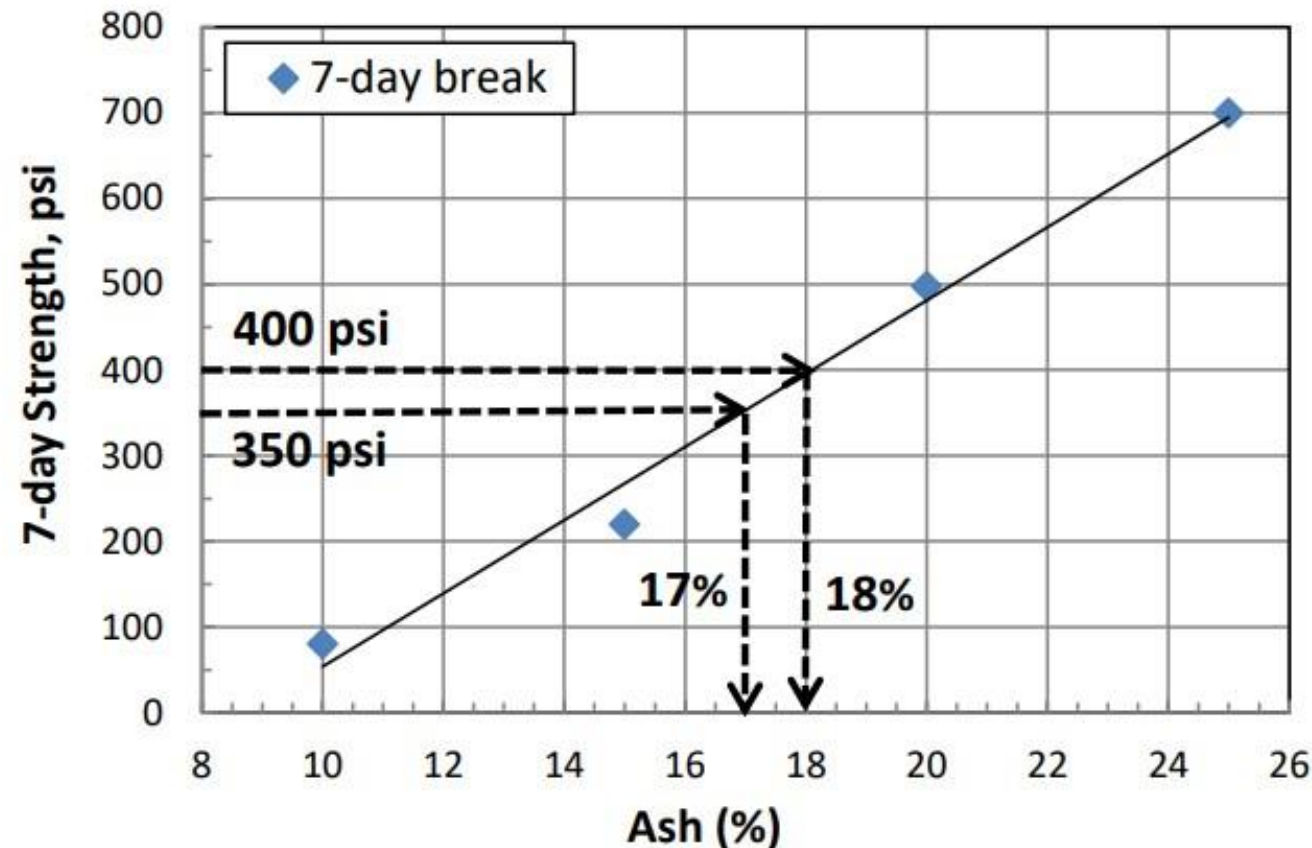


Sample ID	Ash %	Unconfined Strength (psi)	Average Unconfined Strength (psi)
Rep 1	10	85	80
Rep 2		75	
Rep 1	15	225	220
Rep 2		215	
Rep 1	20	510	498
Rep 2		485	
Rep 1	25	755	700
Rep 2		645	

- Ran two tests at each percentage
- 7-day curing
- Ran at optimum MC

Unconfined Compression Test Results

Between 350 and 400 psi is the goal; material is stiff enough to support construction activities, but not too stiff such that cracking will occur

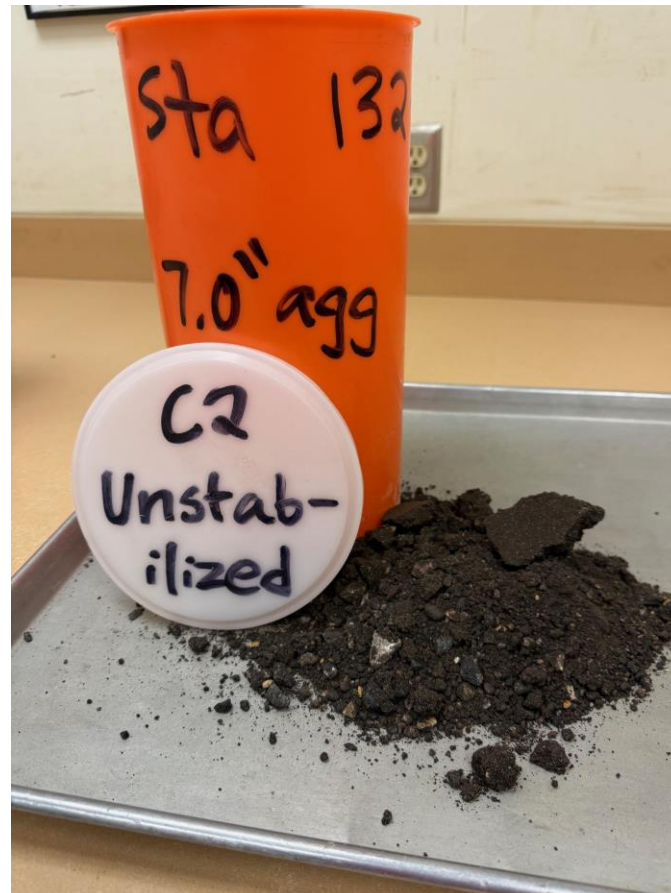


Stabilized Full
Depth
➤ Reclamation
CSAH 75

(youtube video 2:32 minutes)

Recent & Future Evaluation

- Coring performed in October of 2025



Recent & Future Evaluation



- Recommend FWD testing be performed in spring of 2026 (and in subsequent years to ensure roadway is maintaining strength).
- Compare to control section
- Future lab testing? and/or coring?
- Monitoring of pavement condition

CHALLENGES AND FUTURE GOALS



- ARCHITECTS AND ENGINEERS
- INCREASED METAL AND FERROUS RECOVERY
- STANDARDIZING THE PROCESS
- ESTIMATED MARKET FOR PLMSWA:
300 YEARS OF ASH PRODUCTION

QUESTIONS



Contact Information:

Amy Grothaus, P.E. 651-261-7122, Agrothaus@braunintertec.com
Beth Keister, P.E., 612-275-5584, beth.keister@olmsteadcounty.gov
Brad Sullivan, P.E. 763-252-6807, brad.Sullivan@stantec.com
Chris McConn, P.E. 218-998-8904, cmcconn@ottertailcounty.gov

REFERENCES/NOTE



1. Slides 4 and 5: Waste Management Hierarchy slides copied with permission from Polk County (Jon Steiner) from the 2024 RAM/SWANA presentation.
2. Slide 7: Total Resource Recovery tonnage from MPCA SCORE Report. Ash production is an extrapolation of PLMSWA production rate.
3. Slide 34: Based on Otter Tail County's 1,200 miles of roads and the CSAH 75 mix design of 800 tons/mile (17%), there is 100 years of market in Otter Tail County. With other four counties that market exceeds 300 years.