

AGGREGATES 101/401 EVERYTHING ABOUT AGGREGATES

Douglas E. Needham, P.E.
President Michigan Aggregates Association



MICHIGAN AGGREGATES ASSOCIATION

- Our members who represent stone, sand, gravel, recycled products and slag producers along with the equipment manufacturers and service providers are responsible for the production and delivery of essential raw materials used in our homes, buildings, roads, bridges and public works projects.
- Formed in 1960
- 110 Members
 - 48 Producers
 - 57 Associate
- About 85% of companies that perform aggregate mining in Michigan



WHAT IS AGGREGATE????



AGGREGATES ARE....

- Sand
- Rocks (Gravel)
- Limestone



EVERY AMERICAN BORN WILL NEED...

33,193 lbs. Salt
 1.56 Troy oz. Gold
 539 lbs. Zinc
 452,666 lbs. Coal
 56,016 lbs. Other Minerals & Metals
 11,427 lbs. Clay
 985 lbs. Copper
 72,115 gallons petroleum
 903 lbs. Lead
 5,214 lbs. Bauxite (Aluminum)
 16,651 lbs. Phosphate Rock
 6.96 million cu. Ft. Natural Gas
 26,010 lbs. Iron Ore
 48,483 lbs. Cement
 1.25 million lbs. Stone, Sand & Gravel

Learn more at www.michiganmineralseducation.com
 2015 Minerals Education Coalition - The Society of Mining, Metallurgy & Exploration Foundation



HOW MUCH IS A TON???

100 Watermelons (20 lbs/each)



1 Yugo



232 Gallons of milk (8.6 lbs/each)



4 golf bags filled with rocks



2 toys for tots filled with rocks



HOW FAR DOES A TON GO?

- Construction of one mile of four-lane interstate highway requires 88,000 tons of aggregate
- Average six room house requires 90 tons of aggregate



LOCATION, LOCATION, LOCATION

- Geology
- Material Characteristics
- Access to Market
- Minimize Haul Distance



ROAD VIEW – IN FRONT OF BERM



BEHIND THE BERMS!!!!



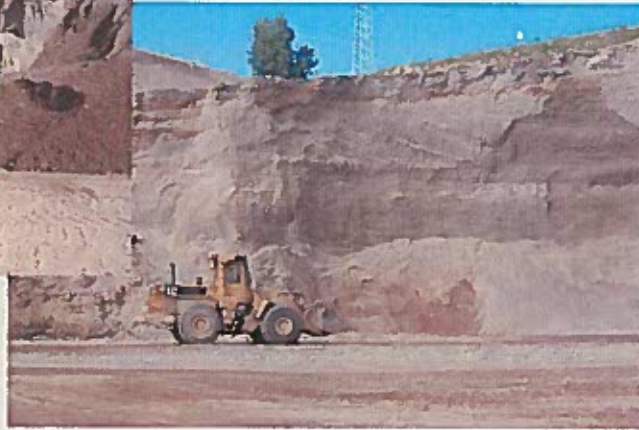
SAND AND GRAVEL EXTRACTION



SAND AND GRAVEL EXTRACTION



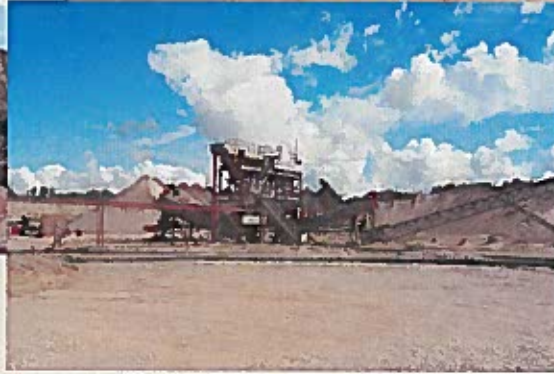
SAND AND GRAVEL EXTRACTION



LIMESTONE EXTRACTION



PROCESSING



NOT THE FLINTSTONE ERA ANYMORE



HIGH TECH AUTOMATION



RECLAMATION

Before



After –
Creation of
100 acres of
wetlands



RECLAMATION

- Lost Dune Golf Club
- 9300 Red Arrow Hwy, Bridgman



RECLAMATION



TRANSPORTING MATERIAL

- \$ of material vs. \$ of transportation
- Fewer railroads and deep water ports
- Shipping – vessel holds 500 trucks
- Railroad – Railroad car holds 100 tons or two trucks of material – Typical train hauls 110 cars or 220 trucks.



TRANSPORTING MATERIALS

- Trucking cost about \$4.50-\$6.00/ton/30 miles
- 50 tons per truck - \$225-\$300 per truck/30 mile



COST OF MATERIAL

- Many variables when determining the cost of aggregate:
- Amount of material in the market
 - Sand is abundant in west Michigan but not in the east side of the state
 - Rocks are not as abundant in the west side of the state as they are in the middle of the state.
- Size of the order
 - 500,000 ton commitment verses 10,000 ton order



COST OF SAND

- Class II Material – (used for fill/embankment)
 - Avg \$6.50/ton (\$4.55 - \$9.00/ton) – Southeast Michigan
 - Avg \$3.00 /ton (\$2.50 - \$3.50/ton) – Central Michigan
 - Avg \$3.00/ton (\$1.85 - \$4.00/ton) – Southwest Michigan
- 2NS – Concrete Sand
 - Requires certain material characteristics and additional processing but in many instances can be produced from material that meets Class II requirements.
 - Cost can double that of Class II depending on availability and order size.



DELIVERY OF MATERIAL

- Distance of delivery
 - Fairly consistent for 30 mile distance (\$4.50-\$5.25/ton/30 miles)
 - Varies based on location of the state
 - There are no two routes that are similar.
 - Factors that impact transportation cost:
 - Traffic
 - Routes (freeway vs backroads)
 - Road construction
 - Anticipated delays
 - *Depending on the surrounding traffic conditions, the cost to transport material 60 miles could double or triple that of a 30 mile delivery distance.*



EXAMPLE OF TOTAL DELIVERED COST

- Scenario 1 - Class II Material – SE Market (30 mile delivery)
 - Cost of Material - \$6.50/ton
 - Cost of Delivery 30 mile - \$4.50/ton
 - Total Cost - \$11.00/ton
- Scenario 2 - Class II Material – SE Market (60 mile delivery)
 - Cost of Material - \$6.50/ton
 - Cost of Delivery 60 mile - \$12.00/ton
 - Total Cost - \$18.50/ton



IMPACT TO CONSTRUCTION COSTS

- Construction of one mile of four-lane interstate highway requires 85,000 tons of aggregate
- Additional cost to project if have to increase haul distance from 30 miles to 60 miles
 - $\$7.50/\text{ton} * 85,000 \text{ tons} = \underline{\$637,500}$



QUESTIONS????

