

Sustainable Use of *All* Quarry Materials



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Aggregate Types



- Quarries produce three basic products

Clean/Coarse Aggregate



Fine Aggregate/Screenings



Aggregate Base Course



Uses of Quarry Products



- **Coarse Aggregate**
 - Asphalt pavement
 - Concrete
 - Erosion control
 - Many more
- **Fine Aggregate/Screenings**
 - Asphalt pavement
 - Concrete
 - Fill material
- **Aggregate Base Course (ABC)**
 - Road Base
 - Construction platform

Realities of Crushing Rock



- Any time you break a rock, you make coarse and fine aggregate



Blasting creates fines

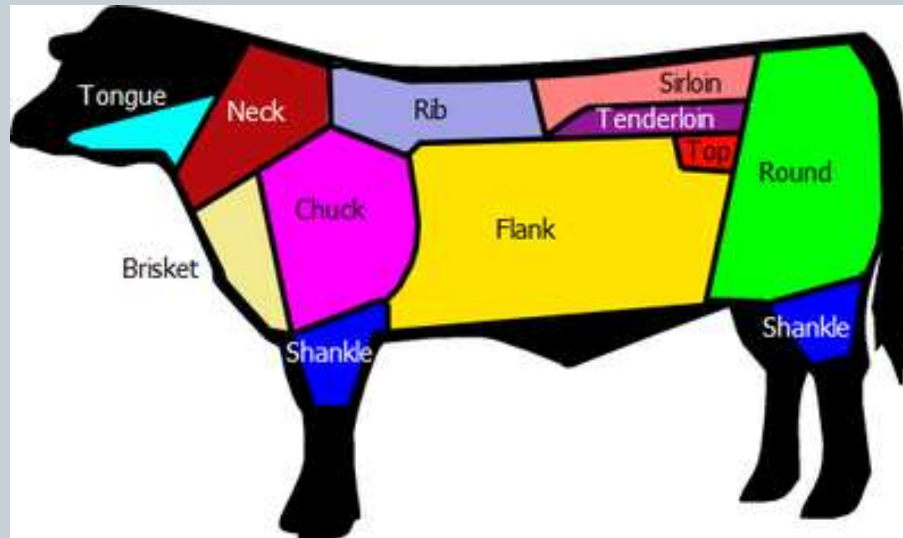


Crushing creates more fines

Product Balance



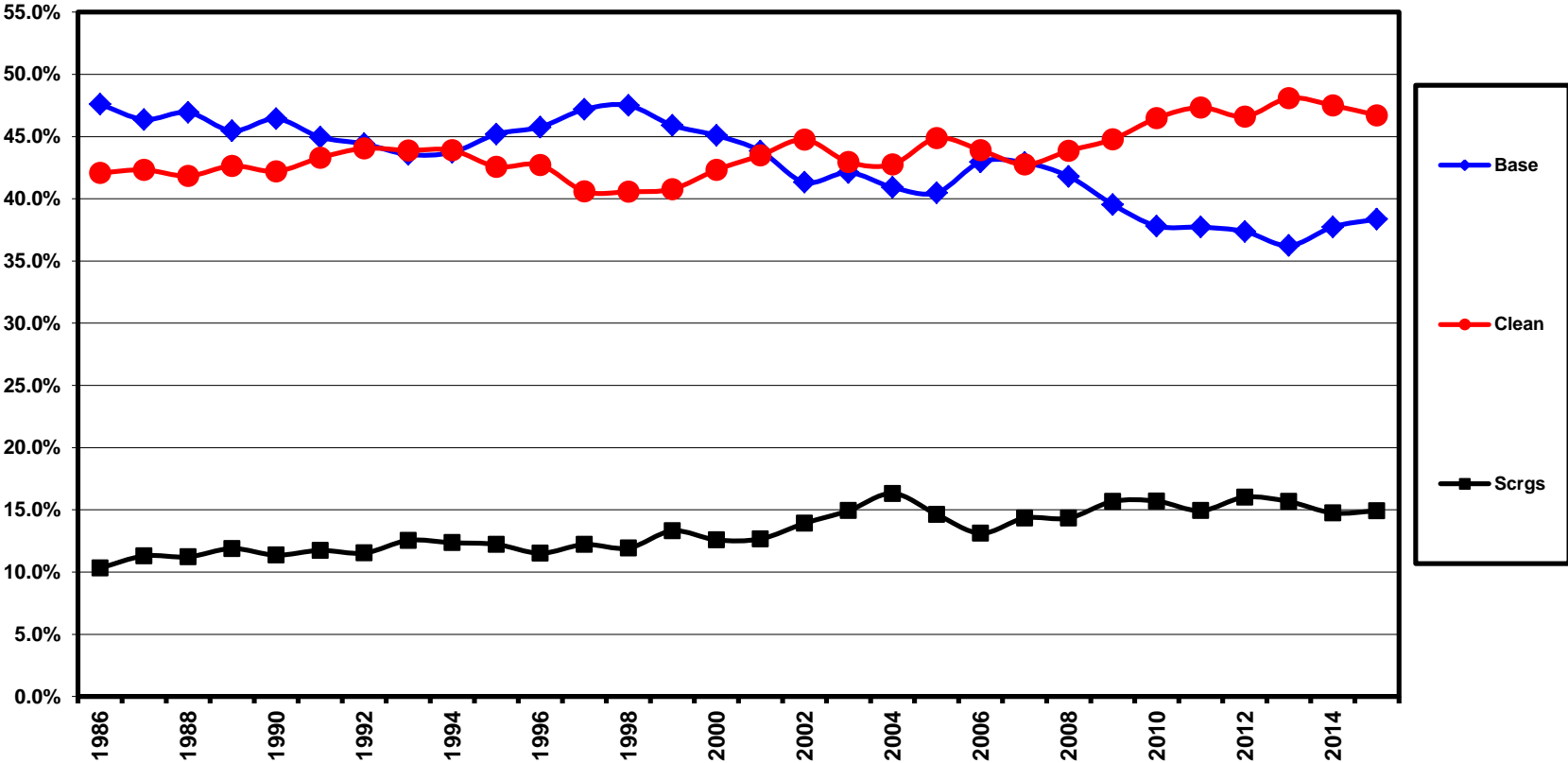
- Balancing the products made versus those sold
- Quarries can't just produce coarse aggregate
 - Make aggregate base and fine aggregate as well



Disturbing Trends



Historical Sales Percentages in NC



Example from One Quarry



Production

- Base: 27%
- Coarse Agg: 54%
- Screenings: 18%
- Misc: 1%

Sales

- Base: 23%
- Coarse Agg: 61%
- Screenings: 14%
- Misc : 2%

Quarry Example



- Driving product for this quarry is the coarse agg
- Assume the quarry needs 1,000,000 tons of coarse aggregate to meet sales demand

	Sales (tons)	Production (tons)	Difference (tons)
Coarse	1,000,000	1,000,000	0
Base	377,049	500,000	122,951
Screenings	229,508	333,333	103,825
Misc.	32,787	18,519	-14,268

Added to the stockpiles each year

Results in Excess Inventory







Base & Fines in Virginia



- In Virginia alone, the industry has the following:
 - 6,184,000 tons of aggregate base
 - 910,000 tons of manufactured sand
 - 5,942,000 tons of screenings
- These quantities grow every year as coarse aggregate sales accelerate
- This is not a *sustainable* way to do business
 - Bad for the environment
 - Bad for future aggregate costs

What Causes This Issue?



- **Lack of new road construction**
 - New road construction utilizes aggregate base
- **Recycling also worsens this problem**
 - Recycled Asphalt Pavement (RAP) – less fines sold to asphalt industry
 - Recycled Crushed Concrete – less base sold for pavements
 - RAP as aggregate base – less base sold for pavements
 - In Place Road Recycling – less base sold and less fines for pavement
 - Permeable Pavements – these pavement only use coarse aggregate, no base or fines

The Irony of Recycling!



- As more “green” technologies are used in construction, it causes our industry to be less “green” by creating excess product

The Cost of Unsustainability



- **Excess inventory has a cost associated with it**
 - Crushing and screening products that aren't sold – excess fuel, electricity, time
 - Handling those products – excess fuel and time
 - Stockpiles covering reserves may need to be moved multiple times – excess fuel and time
- **Excess costs for the aggregate industry will end up being a cost for its customers and end users**

What Can Be Done?



- Inform and educate end users
- Quarries can work on reducing fines when crushing
 - But this can't do it all
- Better use of fines and base by end users
- New uses of fines and base by end users

Manufactured Sand



- Quality concrete fine aggregate
- Natural sand deposits are being depleted
- Allowed by ASTM C33



Roller Compacted Concrete

- Good product for aggregate balance
- Tends to use high percentage of man sand
- Recent example
 - 18% #67
 - 28% #78
 - 54% Manufactured Sand



Aggregate Base



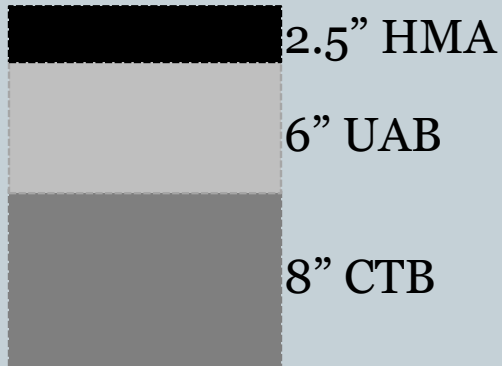
- Used extensively under asphalt pavements
- Aggregate base is a beneficial part of concrete pavement
 - Increased support
 - Less cracking, faulting, and better ride
 - Less maintenance
- Not susceptible to deformation like RAP or leaching chemicals



Inverted Pavement

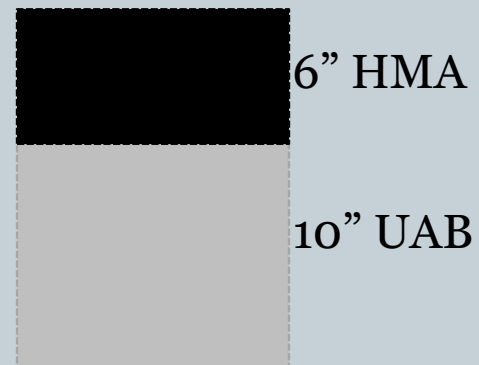


Inverted Pavement



- Uses cement treated base and aggregate base for strong foundation
- Reduces the thickness of asphalt required

Conventional Pavement



Fill Materials



- Fine aggregate and aggregate base make very good fill materials
 - Embankments
 - Shoulder reconstruction
 - Subgrades

What Else?



- May be a variety of other uses
- Making the Transportation Industry aware of the problem may generate some ideas

Thank You



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