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# Motivation for Migration to 22mm Concrete Stone

Road Pavement Forum 12 November 2008

Ray Bonser

Product Technical Manager: AAG

# Contents

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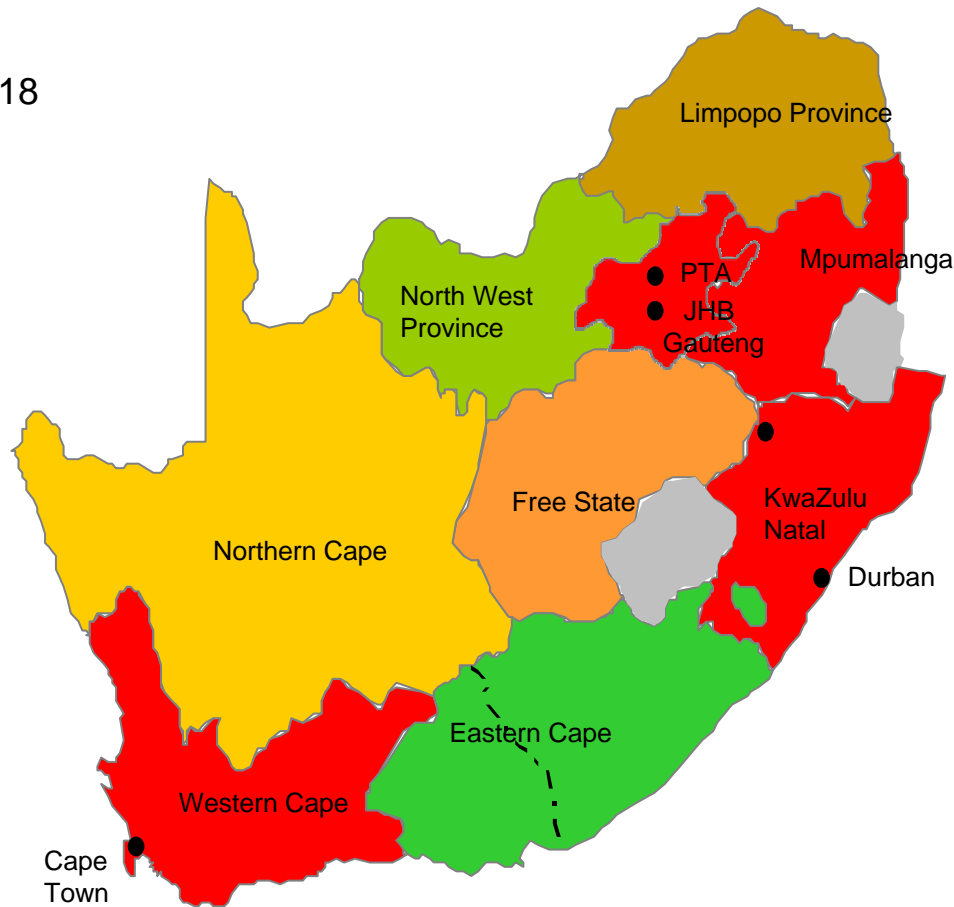
- Aggregate and Readymix Overview
- Quarrying operations
- Product plant mix
- Example of product split (Ferro)
- Product demand from major projects
- Implications in concrete
- Conclusion

# Geographical location: AfriSam Aggregates

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National

Operations: 18



Gauteng\*

Operations: 10  
(7 quarries, 3 dumps)

KwaZulu Natal

Operations: 6

\* includes Mpumalanga  
PTA : Pretoria  
JHB : Johannesburg

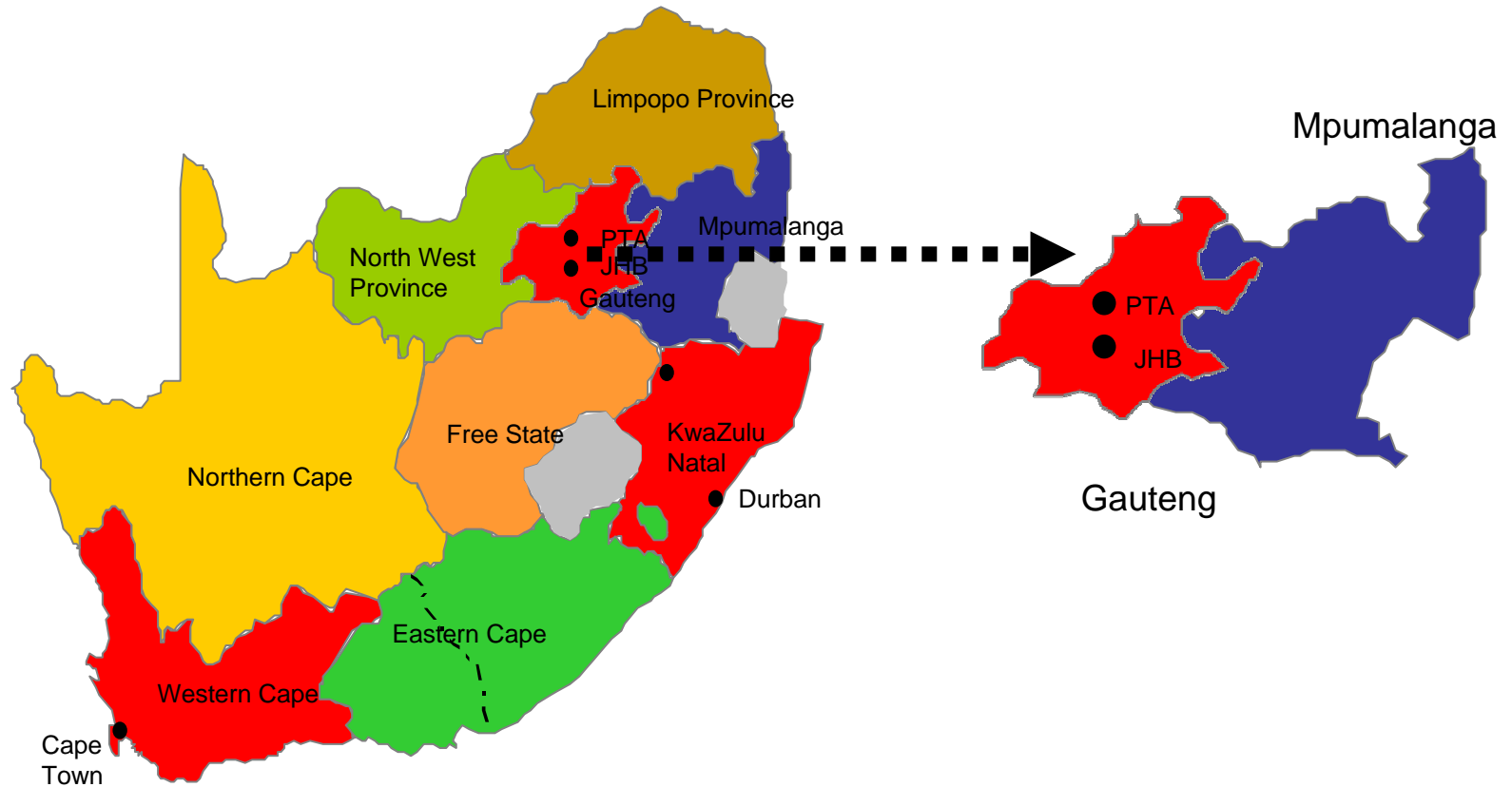
Cape

Operations: 2

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# Geographical location: AfriSam Aggregate Gauteng

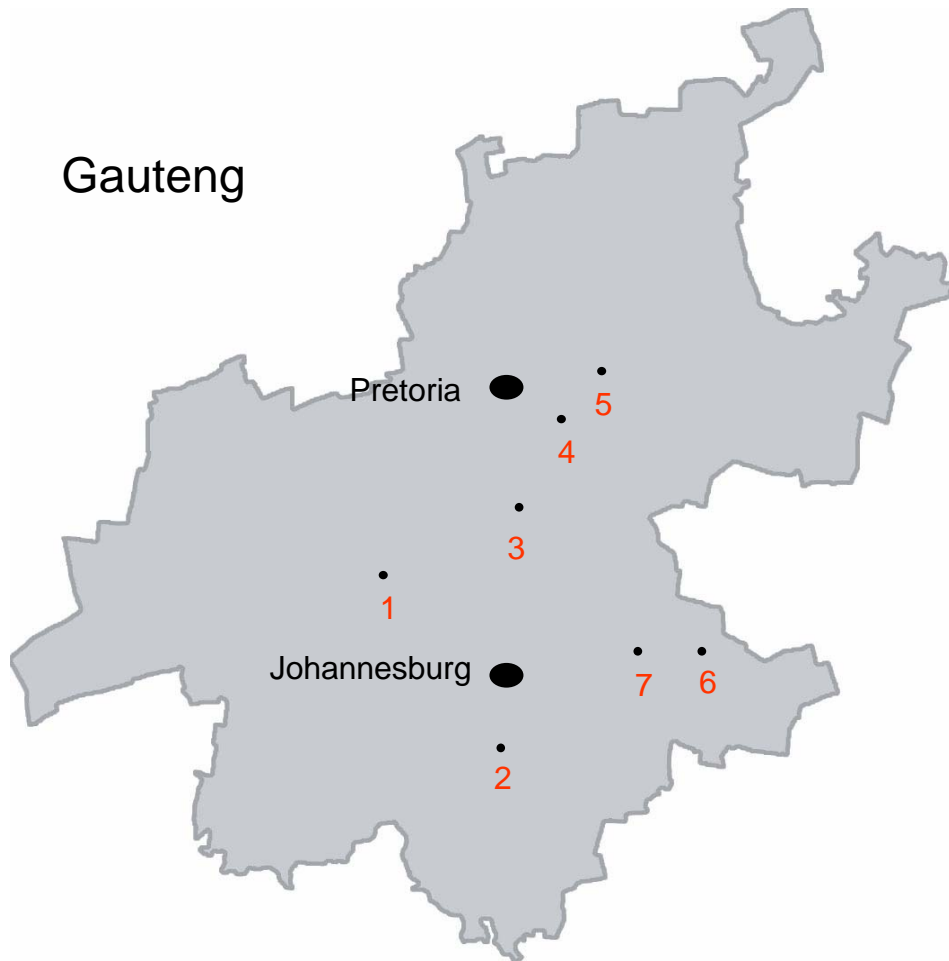
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# Gauteng and Mpumalanga operations

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## Mpumalanga



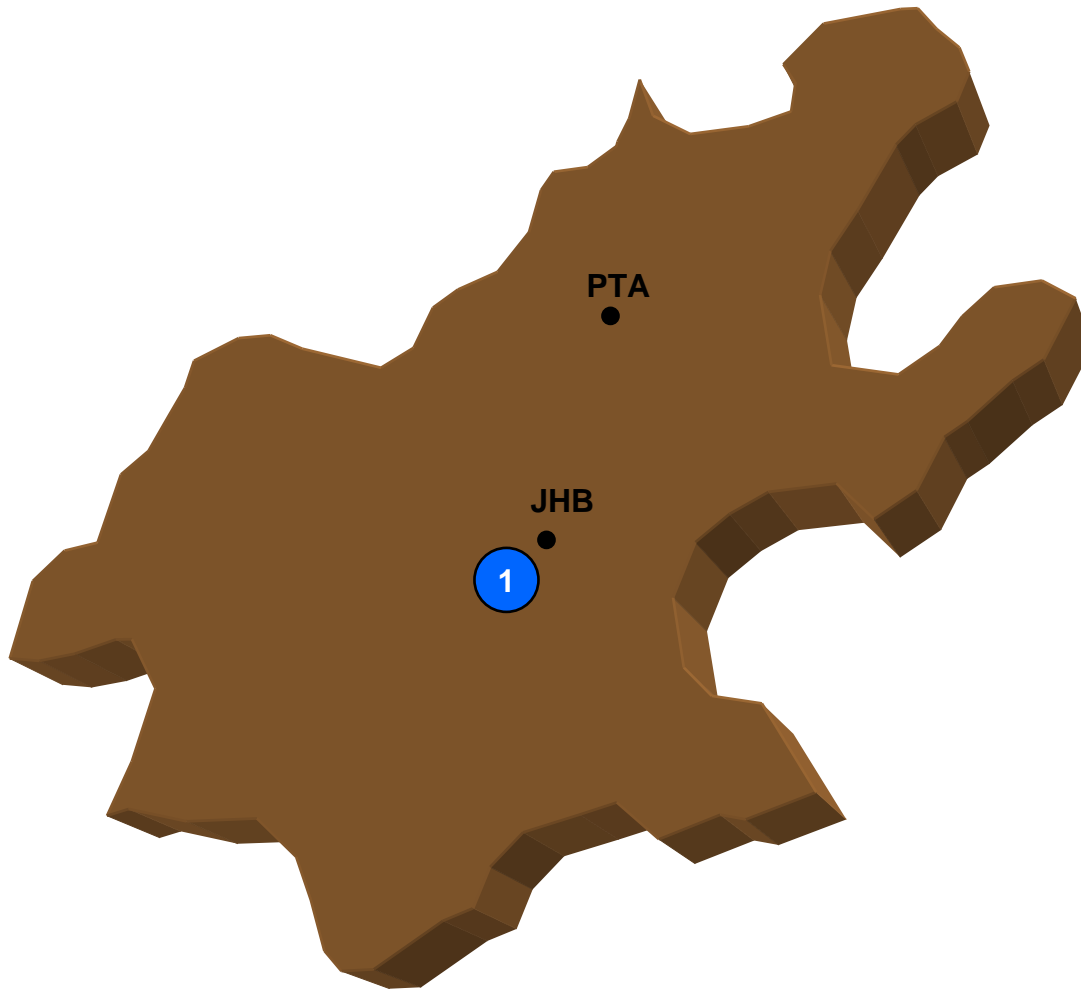
- 1 Roodekrans
- 2 Eikenhof
- 3 Jukskei
- 4 Olifantsfontein
- 5 Ferro
- 6 Vogels\*
- 7 Rooikraal
- 8 Zeekoewater

\* Dump operation, 2 smaller dump operations not shown

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# AAG operations

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- Eikenhof
- Ferro
- Olifantsfontein
- Jukskei
- Roodekrans
- Rooikraal
- Vogels
- Zeekoewater

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# AAG Eikenhof quarry

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## Material properties

### Andesite

- Relative density : 2.92
- ACV : 9
- Unconfined compression : 516-538 Mpa
- 10% FACT : 440-475kN

## Blasting

- Burden : 3m
- Spacing : 3.6m
- Hole dia : 102mm
- Hole depth : 10.5m
- Stemming : 3m
- Powder factor : 325g/ton

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# AAG operations

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- Eikenhof
- **Ferro**
- Olifantsfontein
- Jukskei
- Roodekrans
- Rooikraal
- Vogels
- Zeekoewater

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# AAG Ferro quarry

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## Material properties

### Meta-quartzite

- Relative density : 2.65
- ACV : 20
- 10% FACT : 205 kN

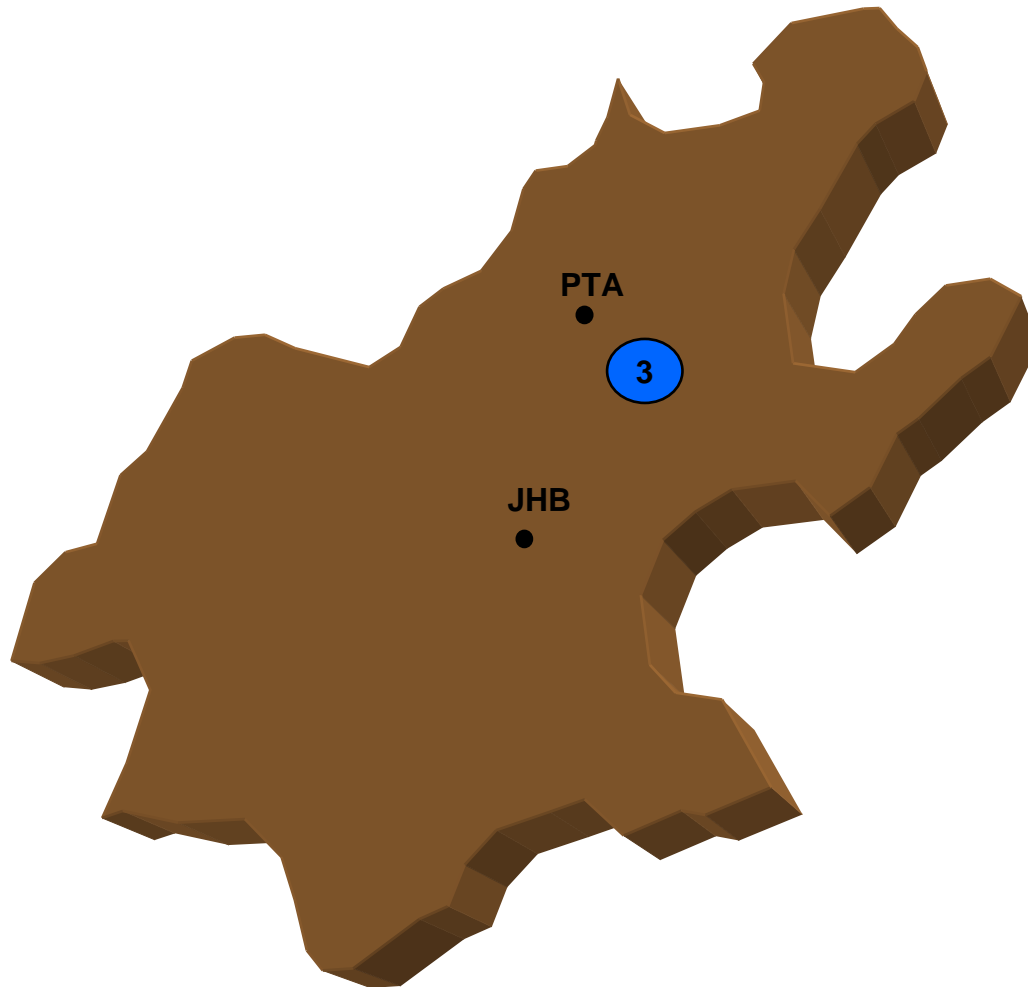
## Blasting

- Burden : 3m
- Spacing : 3m
- Hole dia : 76mm
- Hole depth : 13m
- Stemming : 3m
- Powder factor : 185g/ton

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# AAG operations

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- Eikenhof
- Ferro
- **Olifantsfontein**
- Jukskei
- Roodekrans
- Rooikraal
- Vogels
- Zeekoewater

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# AAG Olifantsfontein quarry

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## Material properties

### Dolomite

- Relative density : 2.86
- ACV : 19
- Unconfined compression : 212-396 MPa
- 10% FACT : 220-240kN

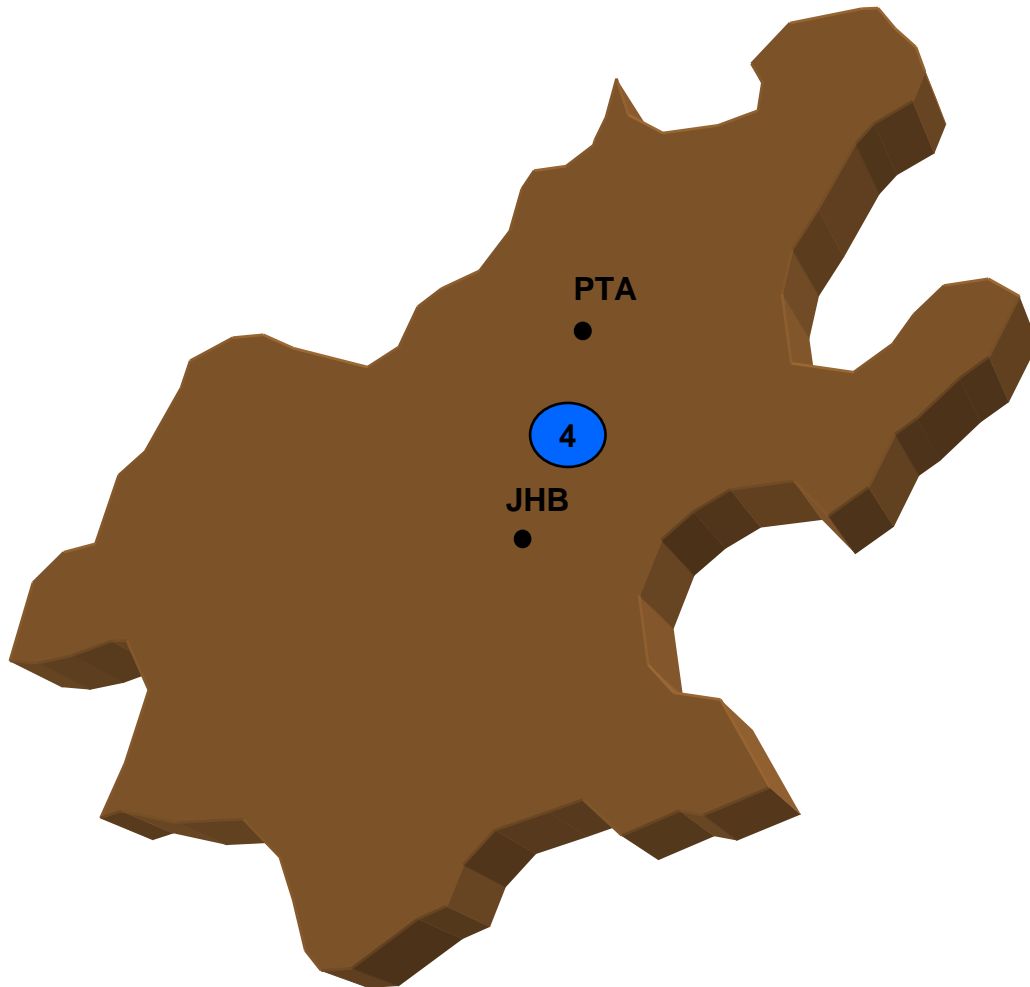
### Blasting

- Burden : 3.8m
- Spacing : 4.2m
- Hole dia : 102mm
- Hole depth : 11m
- Stemming : 1.5m
- Powder factor : 210 g/ton

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# AAG operations

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- Eikenhof
- Ferro
- Olifantsfontein
- **Jukskei**
- Roodekrans
- Rooikraal
- Vogels
- Zeekoewater

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# AAG Jukskei quarry

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## Material properties

### Granite

- Relative density : 2.65
- ACV : 27
- Unconfined compression : 242-275 MPa
- 10% FACT : 120-190kN

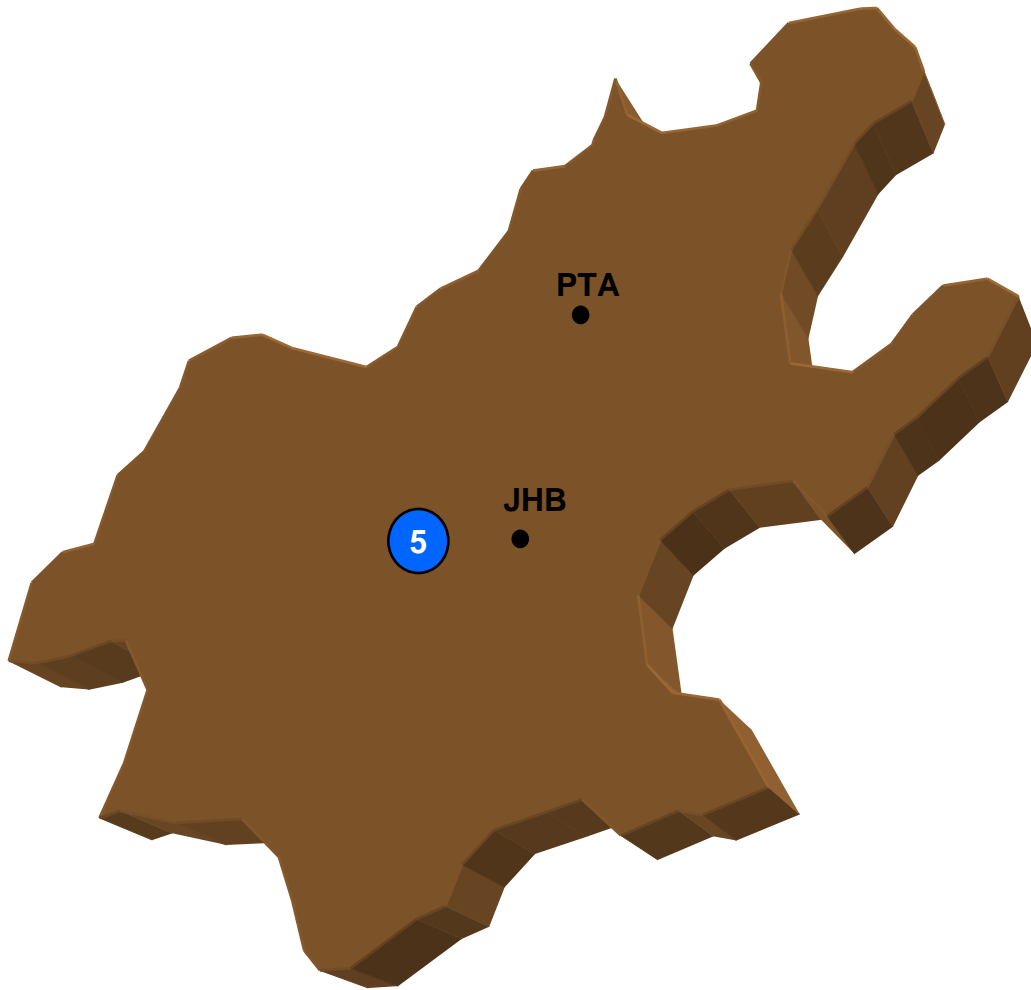
## Blasting

- Burden : 3 m
- Spacing : 3.5 m
- Hole dia : 102 mm
- Hole depth : 14 m
- Stemming : 1.5m
- Powder factor : 330g/ton

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# AAG operations

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- Eikenhof
- Ferro
- Olifantsfontein
- Jukskei
- **Roodekrans**
- Rooikraal
- Vogels
- Zeekoewater

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# Roodekrans quarry

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## Quarry Exploration

- Decomposed Zone : River Sand
- Oxidized Zone : Crushed River Sand
- Fresh Granite : Hard Rock

# AAG operations

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- Eikenhof
- Ferro
- Olifantsfontein
- Jukskei
- Roodekrans
- **Rooikraal**
- Vogels
- Zeekoewater

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# AAG Rooikraal quarry

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## Material properties

- Relative density :2.93
- ACV : 11.8
- 10% FACT : 351.9kN

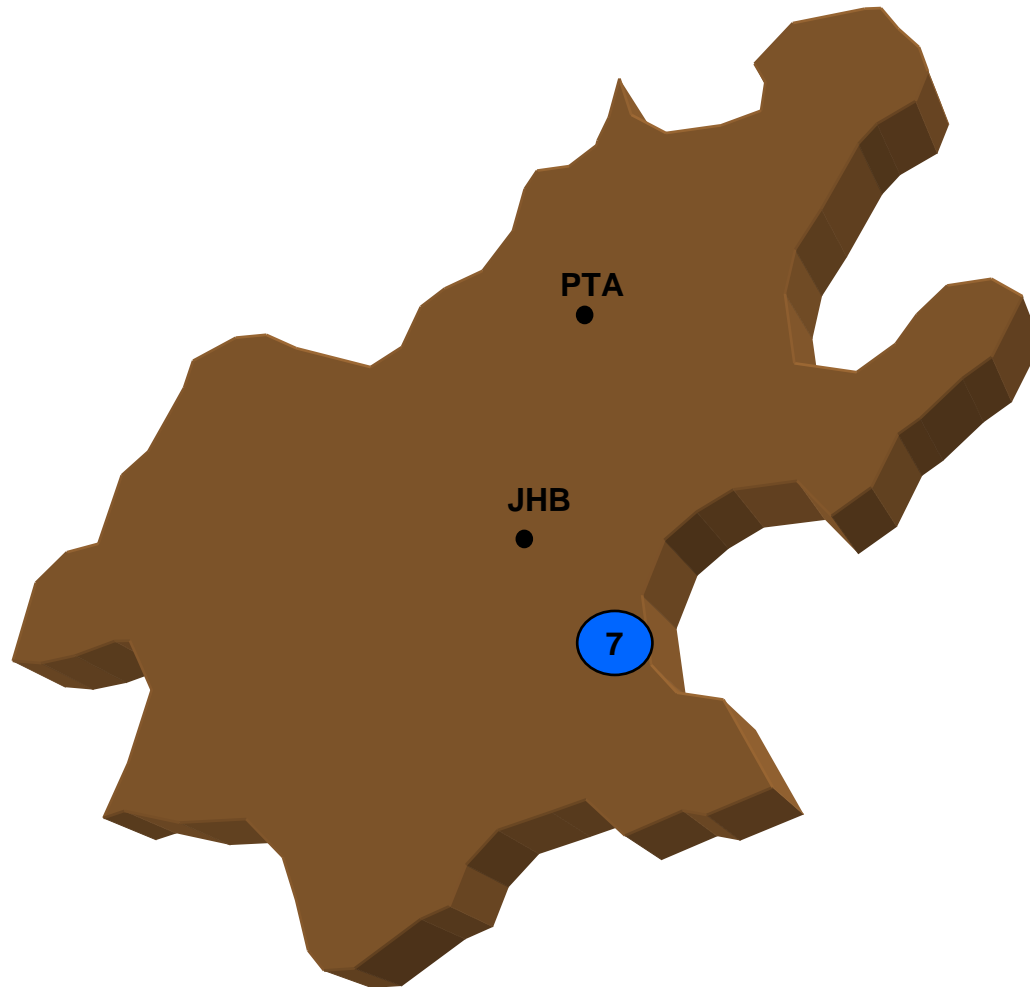
## Blasting

- Burden : 2.8m
- Spacing : 3m
- Hole dia : 102mm
- Hole depth : 10m
- Stemming : 1.5m
- Powder factor : 340g/ton

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# AAG operations

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- Eikenhof
- Ferro
- Olifantsfontein
- Jukskei
- Roodekrans
- Rooikraal
- **Vogels**
- Zeekoewater

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# AAG Vogels dump

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## Material properties

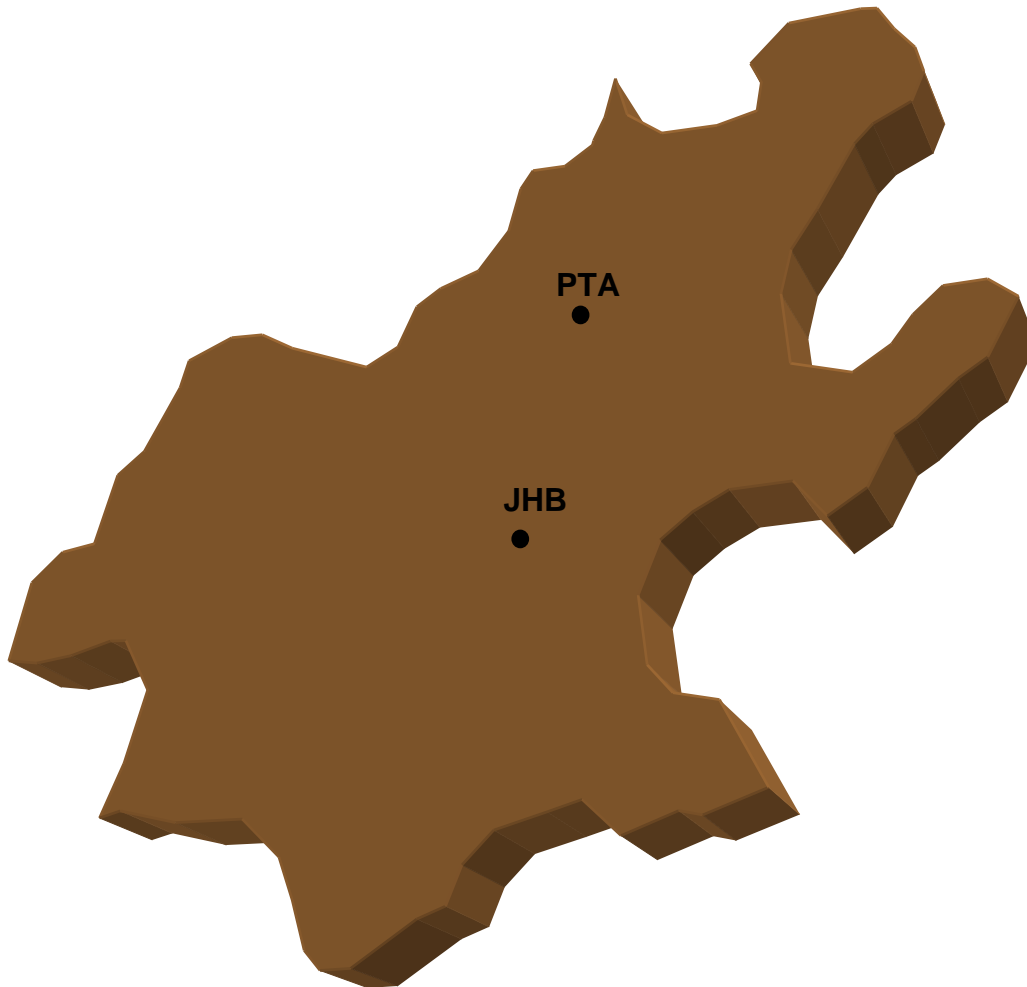
### Reef Quartzite

- Relative density : 2.74
- ACV : 15
- 10% FACT : 245 kN

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# AAG operations

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- Eikenhof
- Ferro
- Olifantsfontein
- Jukskei
- Roodekrans
- Rooikraal
- **7** Vogels
- Zeekoewater

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# AAG Zeekoewater quarry

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## Material properties

### Felsite

- Relative density :2.64
- ACV : 18
- Unconfined compression strength : 377-453 MPa
- 10% FACT : 230-380kN

### Blasting

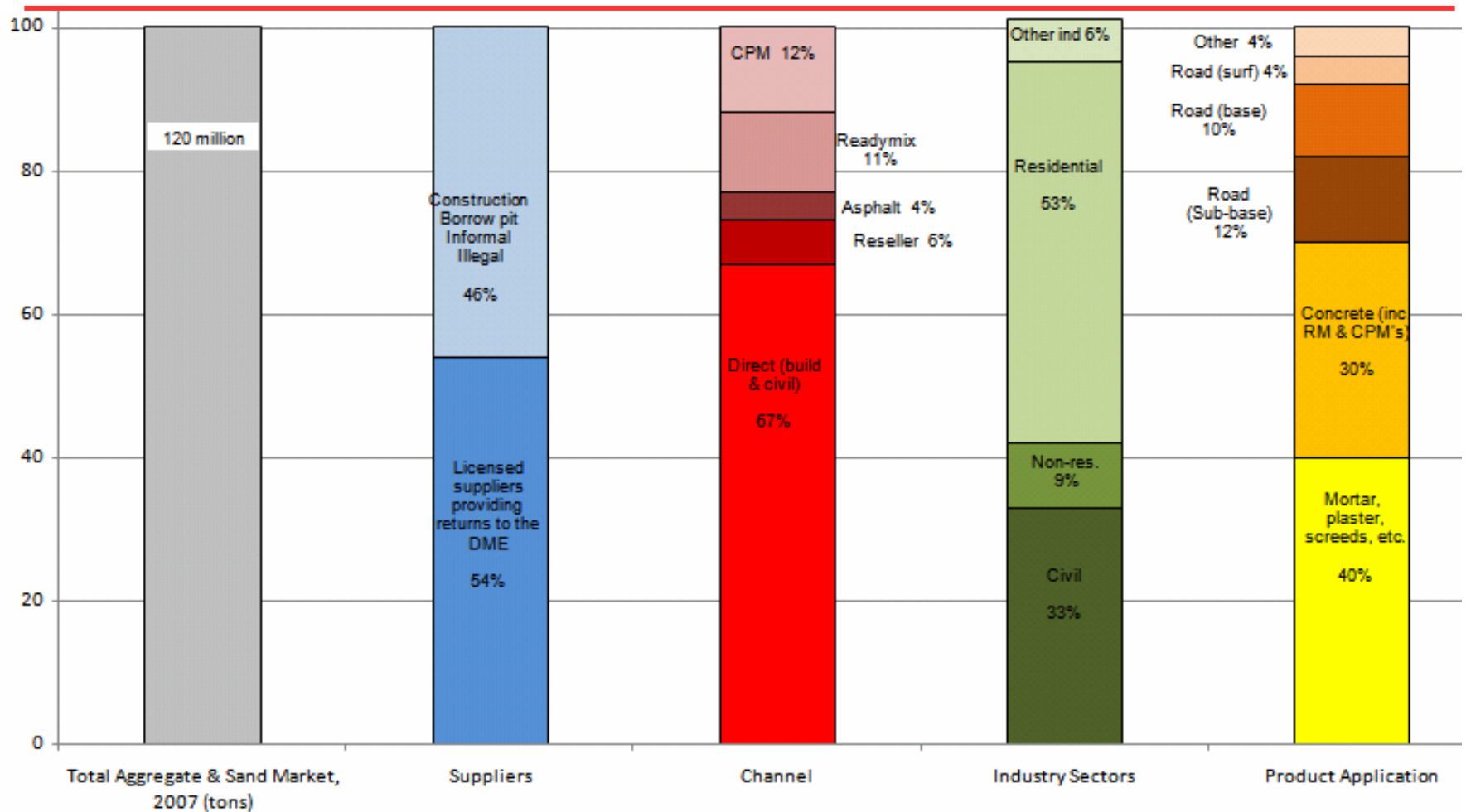
- Burden : 3m
- Spacing : 3.5m
- Hole dia : 102mm
- Powder factor : 220g/ton

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# AAG – Plant/Product Mix

Product	Ferro	Olies	Jukskei	Vogels	Rooikraal	Eikenhof	Roodekrans	Zeekoewater
<b>Concrete Stone</b>								
37,5mm		✓	✓			✓		
22mm	✓	✓	✓	✓	✓	✓	✓	✓
13,2mm	✓	✓	✓	✓	✓	✓	✓	✓
9,5mm	✓		✓	✓	✓	✓		
6,7mm	✓	✓		✓	✓	✓		✓
<b>Road stone</b>								
19mm	✓				✓			
13,2mm	✓				✓			
9,5mm	✓				✓			
6,7mm	✓				✓			
<b>Base Material</b>								
G1	✓		✓	✓	✓		✓	✓
G5	✓		✓				✓	
<b>Sands</b>								
Washed				✓	✓		✓	
Unwashed		✓	✓			✓	✓	✓
Blended sand	✓							

# South African Aggregate Market Map - 2007



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# AAG – Ferro quarry product split

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## TERTIARY/ROADSTONE PLANT

Capacity	345t/hour
Gross OEE	36.3%
Consented hours/month	504

Product	T/hr	% Split
22mm	64.7	18.8
13,2mm	49.1	14.2
Washed sand	8.1	2.3
Unwashed sand	76.0	22.0
19mm Roadstone	52.8	15.3
13,2mm Roadstone	26.4	7.7
9,5mm Roadstone	41.5	12.0
6,7mm Roadstone	26.4	7.7
	345.0	100.0

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# AAG – Major projects

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- GFIP
  - G1 80 000 tons
  - G5 798 000 tons
  - G6/7 600 000 tons
  - Unselected fill 100 000 tons
  - Asphalt 728 000 tons
  
- Gautrain
  - Ballast 438 000 tons

# Implications of larger stone in concrete

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- Benefits:
  - Improved dimensional stability
  - Potentially more durable
  - Reduced cement contents
  - Less shrinkage cracking
- Concerns:
  - Pumpability
  - Congested reinforcing
  - Cover issues

# Conclusion

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- Environmental pressures
- Limited supply of quality aggregates
- Proven successfully in coastal regions/Pioneer 22
- Support and buy in of industry organisations
- Working in conjunction with downstream customers
- SABS:1083 requires revision
- Output increased by about 10%