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Ore Characterization in Regards to the Pozzolan and Portland Cement Industry

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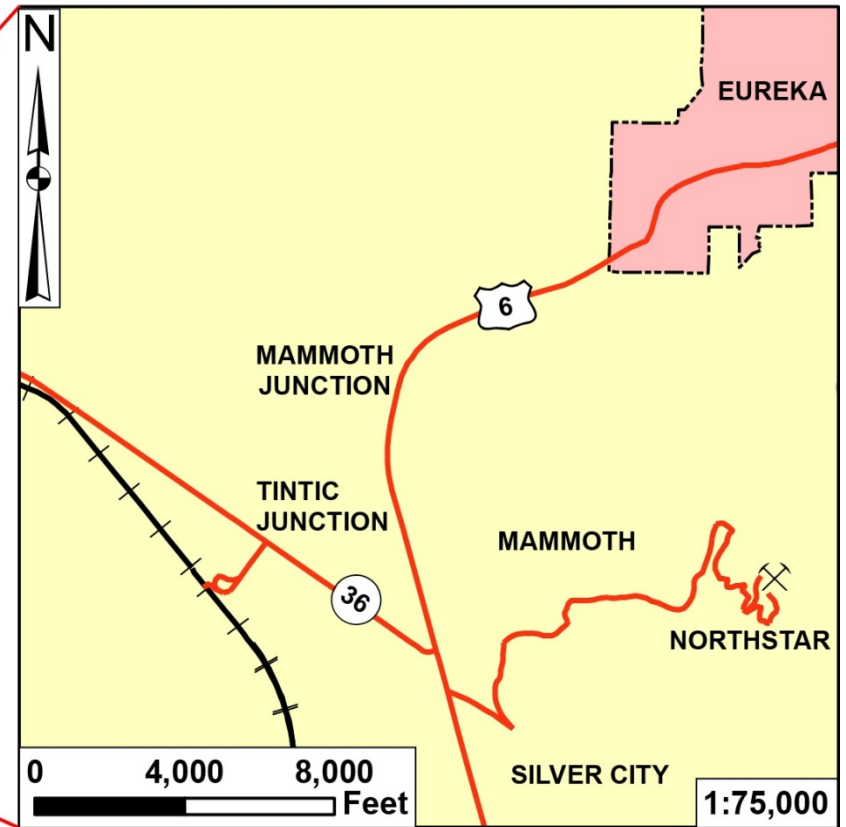
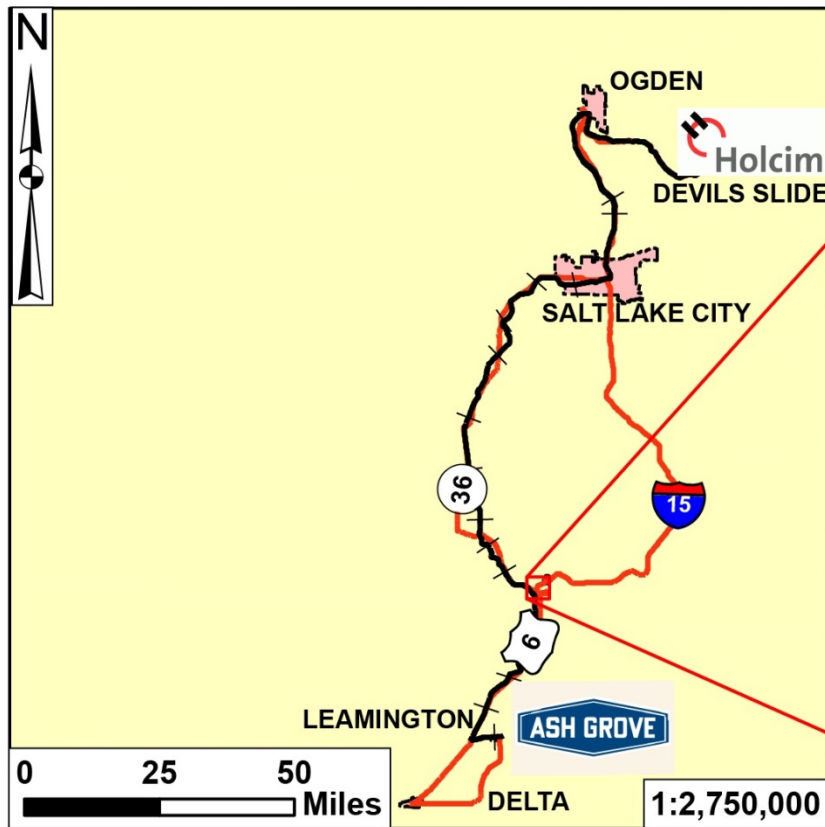
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INTRODUCTION: Operations



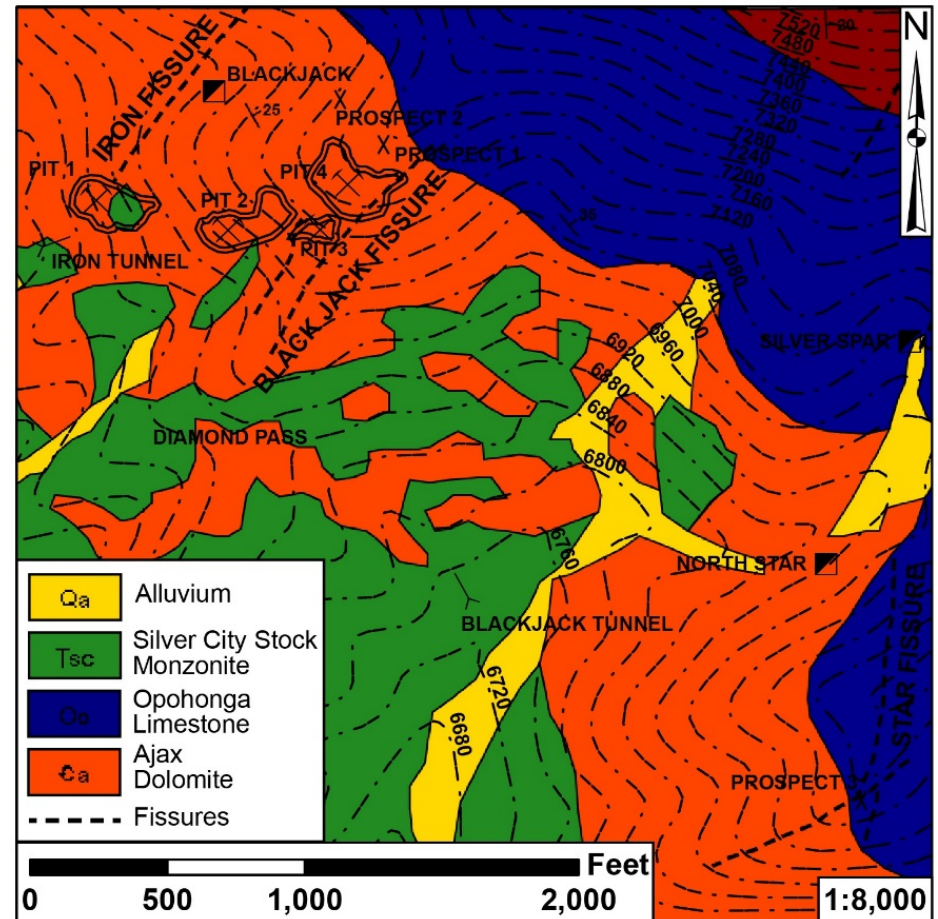
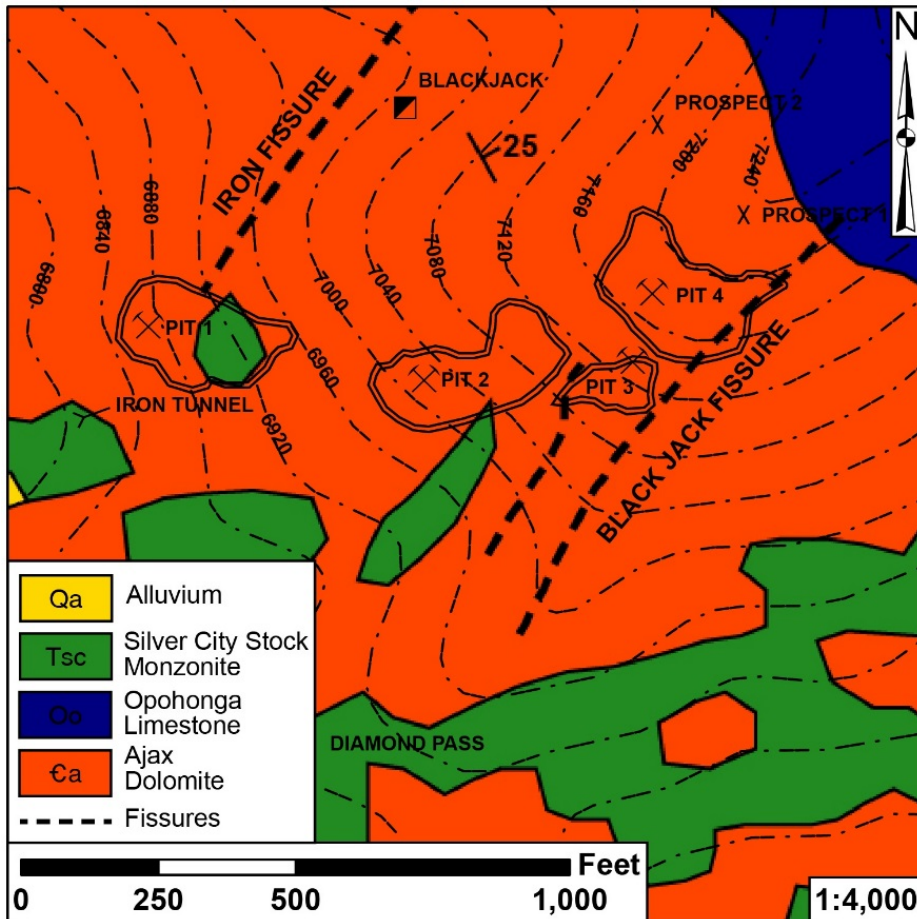
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INTRODUCTION: Transportation



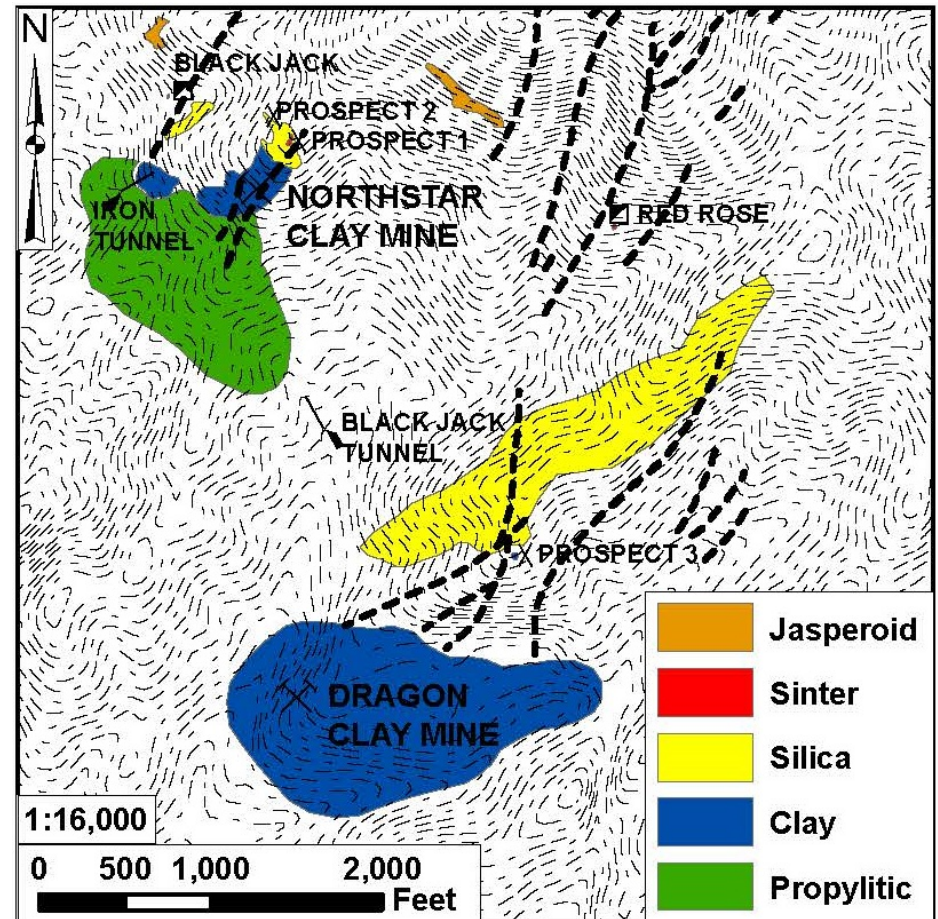
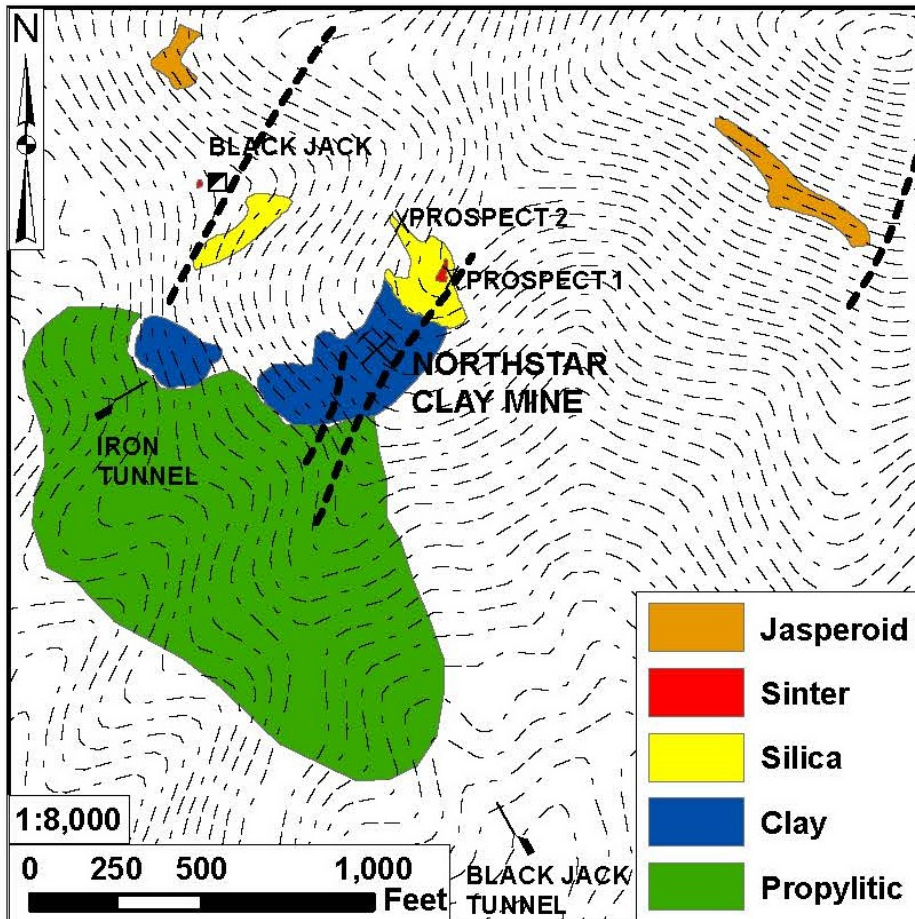
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INTRODUCTION: Geology



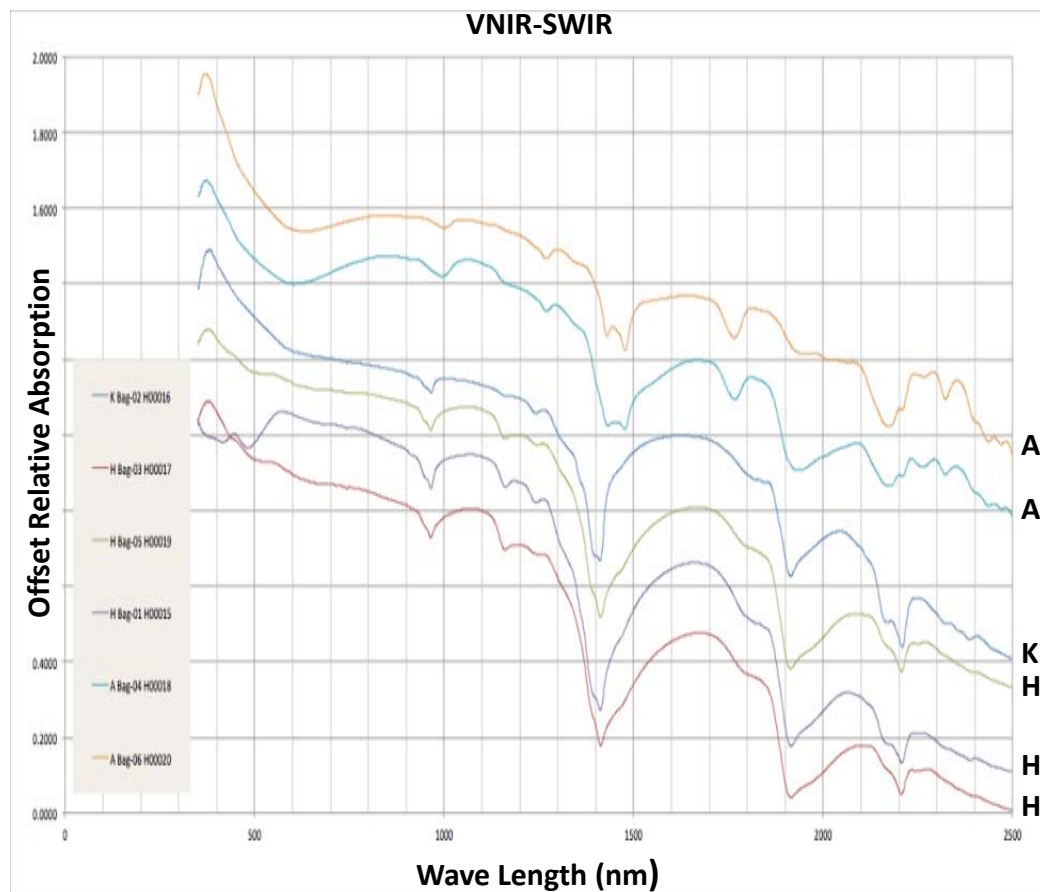
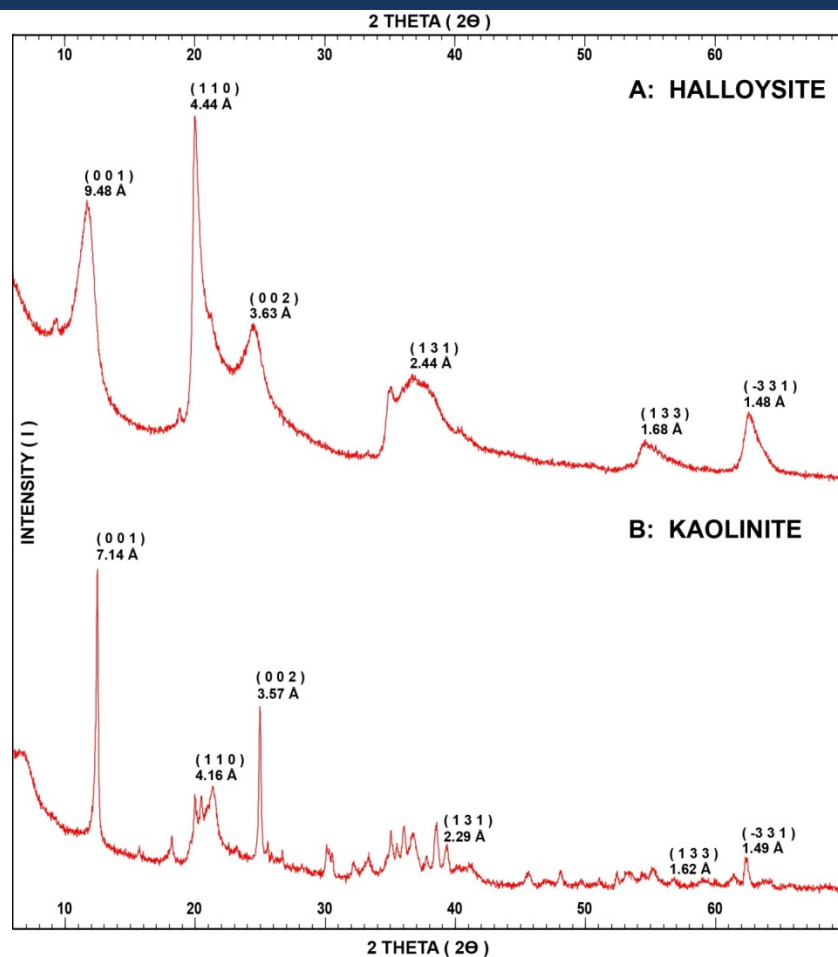
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INTRODUCTION: Alteration



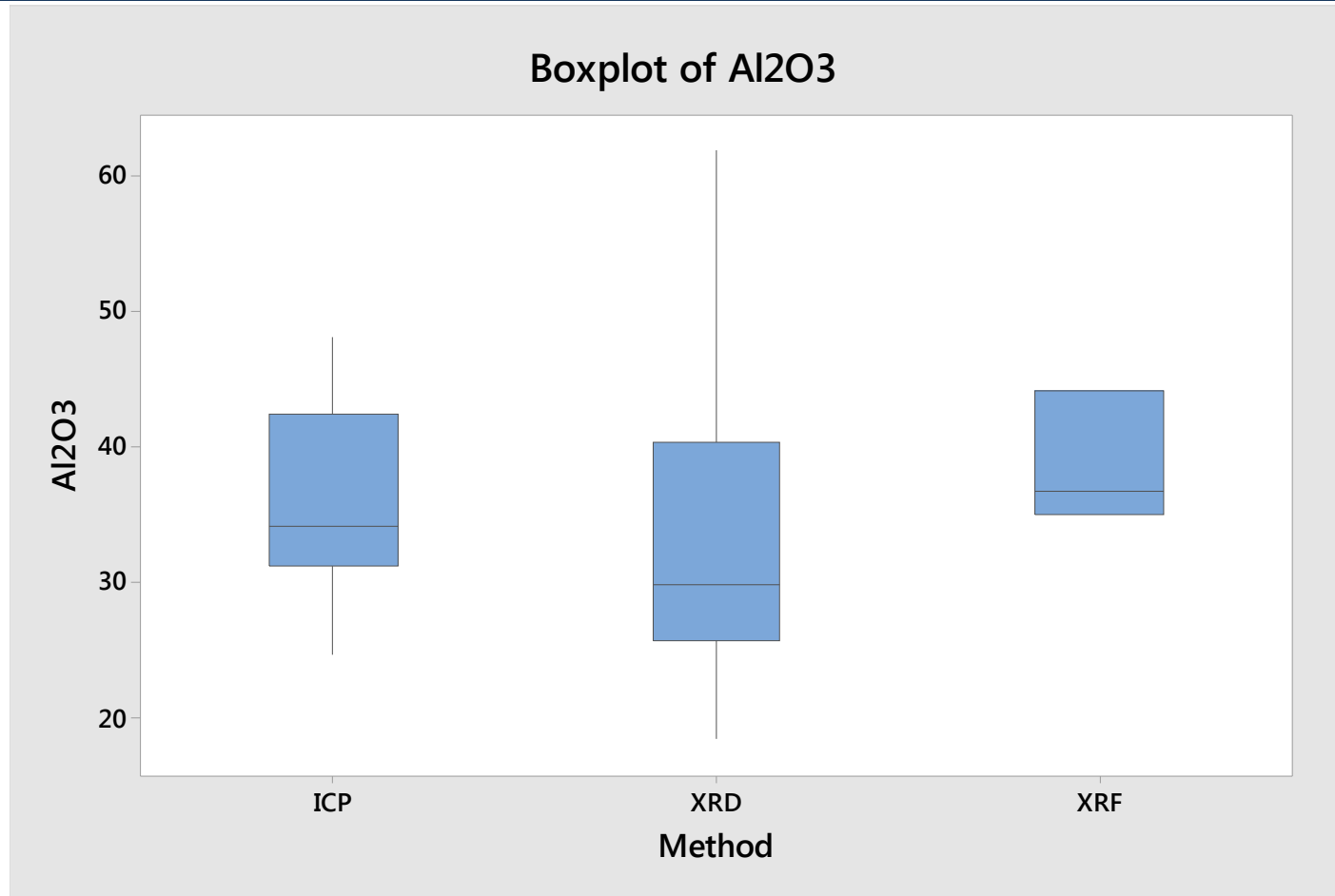
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METHODS/DATA: Introduction



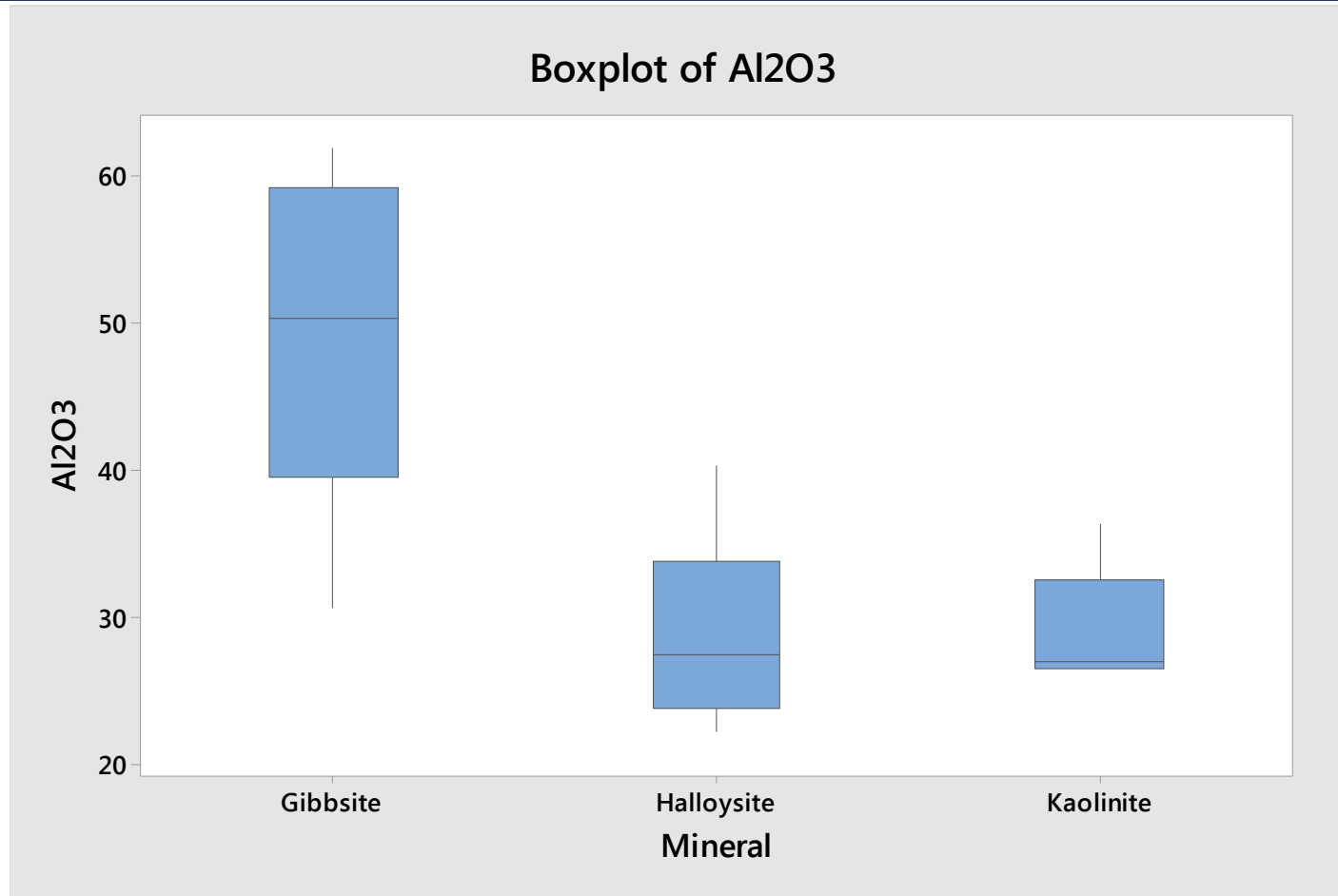
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METHODS/DATA: Comparison



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METHODS/DATA: XRD Comparison



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CHARACTERIZATION: Market

Pozzolan - Class N	
SiO ₂ + Al ₂ O ₃ + Fe ₂ O ₃ , min	70.0
SO ₃ , max	4.0
Na ₂ O + K ₂ O, max	1.5
LOI, max	10.0
Moisture Content, max	3.0

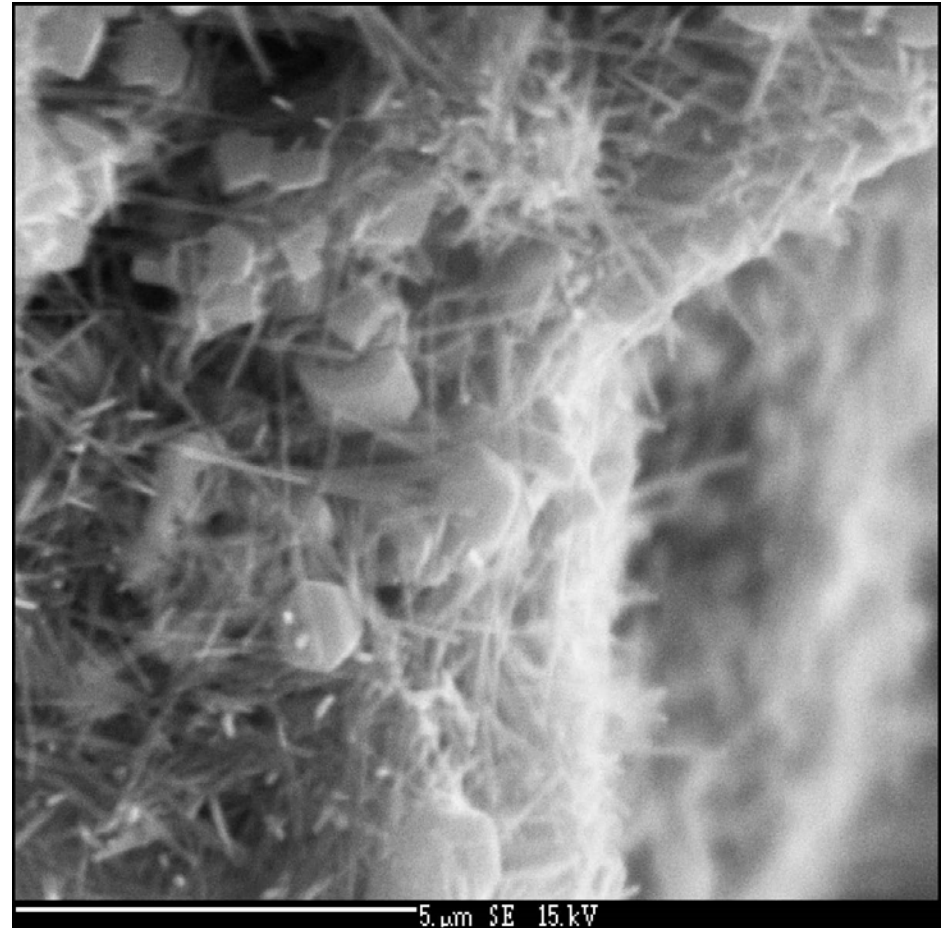


Portland Cement - Type II	
CaO, min	39.2
SiO ₂ , min	20.0
Al ₂ O ₃ , max	6.0
Fe ₂ O ₃ , max	6.0
MgO, max	6.0
SO ₃ , max	3.0
Insoluble, max	0.8
Na ₂ O + 0.658 K ₂ O, max	0.6
3CaO*Al ₂ O ₃ , max	8.0
3CaO*SiO ₂ , max	*
LOI, max	3.0
* Tricalcium Silicate, 58%	



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CHARACTERIZATION: Gibbsite



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CHARACTERIZATION: Gibbsite

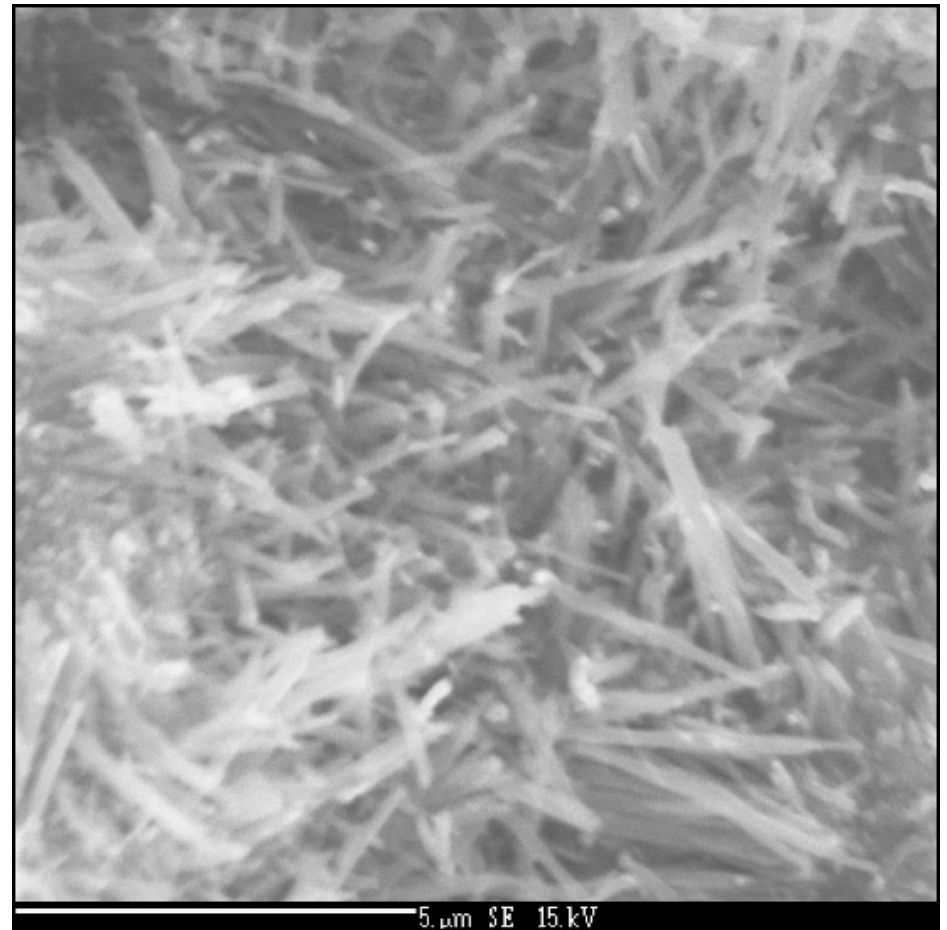
XRD - Gibbsite	
Al_2O_3	48.2
SiO_2	11.8
$\text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	2.6
$\text{Al}_2\text{O}_3 + \text{SiO}_2 + \text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	62.6
CaO	2.4
MgO	1.4
SO_3	0.0
$\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$	0.2
Insoluble	3.3

Gibbsite @16%	
Al_2O_3	5.8
SiO_2	1.4
$\text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	0.3
$\text{Al}_2\text{O}_3 + \text{SiO}_2 + \text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	7.5
CaO	0.3
MgO	0.2
SO_3	0.0
$\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$	0.0
Insoluble	0.4



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CHARACTERIZATION: Halloysite



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CHARACTERIZATION: Halloysite

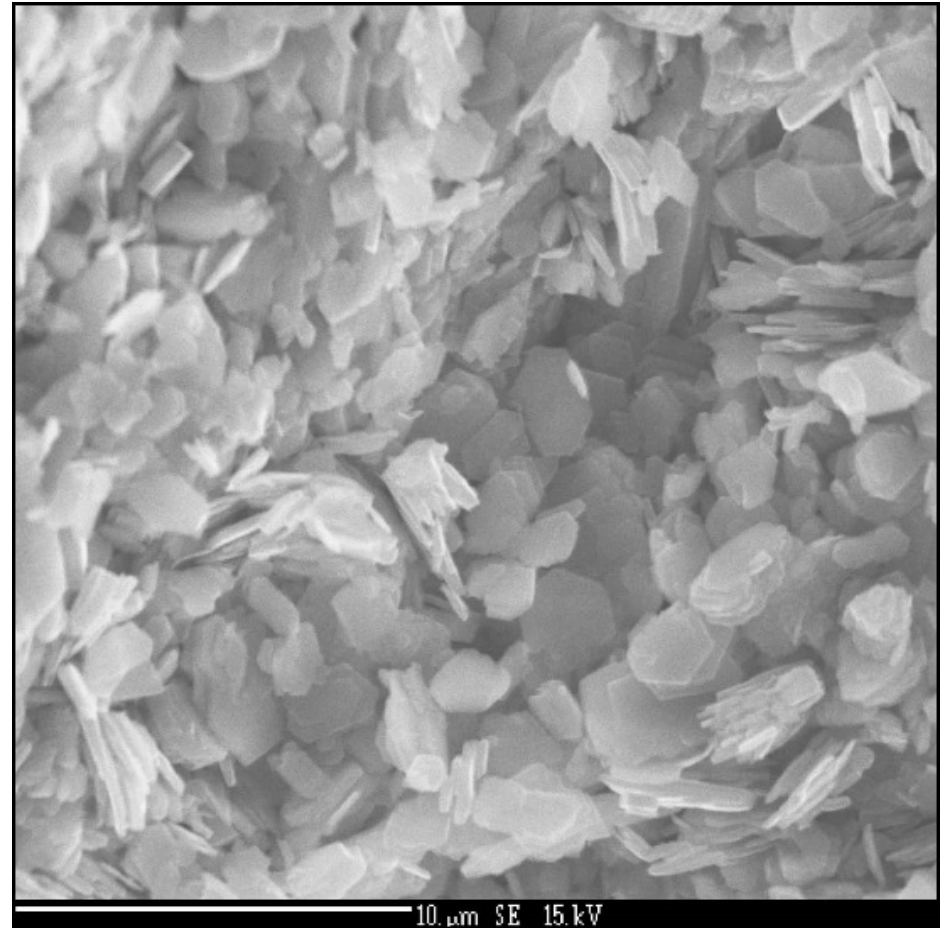
XRD - Halloysite	
Al_2O_3	29.2
SiO_2	35.6
$\text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	7.9
$\text{Al}_2\text{O}_3 + \text{SiO}_2 + \text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	72.6
CaO	0.0
MgO	0.0
SO_3	0.0
$\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$	0.3
Insoluble	5.4

Halloysite @20%	
Al_2O_3	5.8
SiO_2	7.1
$\text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	1.6
$\text{Al}_2\text{O}_3 + \text{SiO}_2 + \text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	14.5
CaO	0.0
MgO	0.0
SO_3	0.0
$\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$	0.1
Insoluble	1.1



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CHARACTERIZATION: Kaolinite



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CHARACTERIZATION: Kaolinite

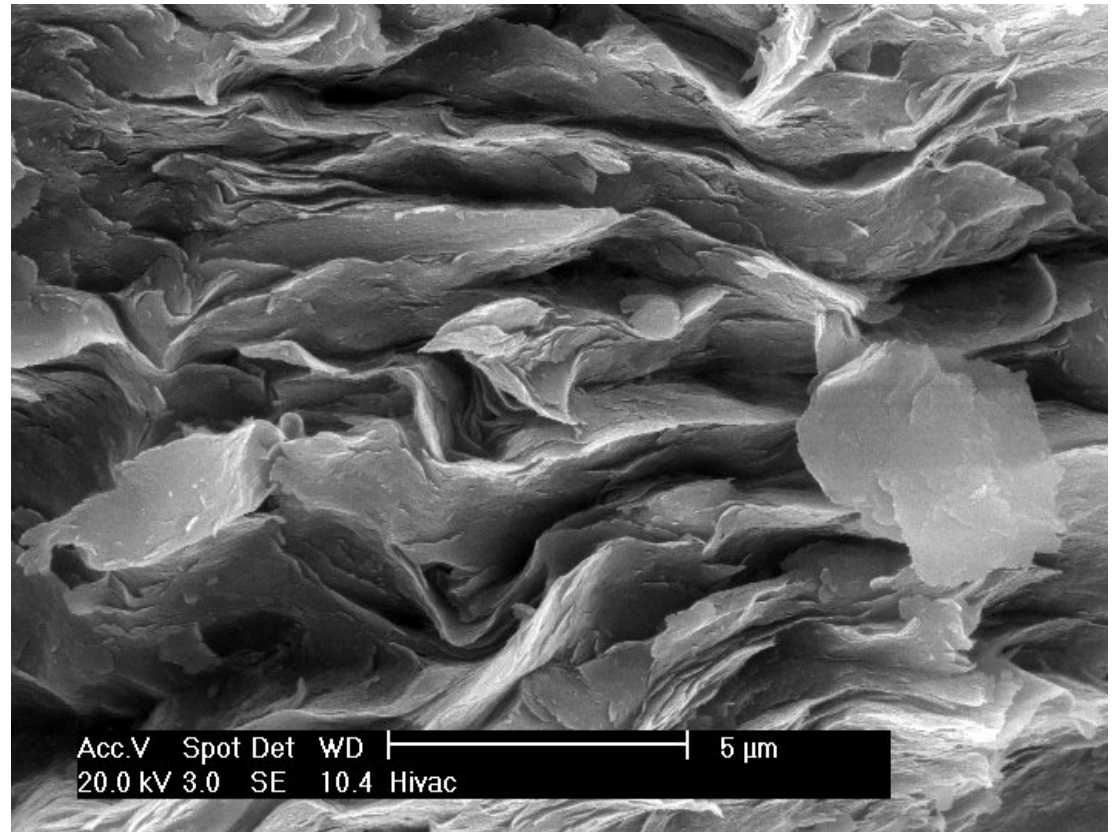
XRD - Kaolinite	
Al_2O_3	29.0
SiO_2	48.9
$\text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	2.3
$\text{Al}_2\text{O}_3 + \text{SiO}_2 + \text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	80.1
CaO	0.1
MgO	1.2
SO_3	2.0
$\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$	1.4
Insoluble	1.1

Kaolinite @20%	
Al_2O_3	5.8
SiO_2	9.8
$\text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	0.5
$\text{Al}_2\text{O}_3 + \text{SiO}_2 + \text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	16.0
CaO	0.0
MgO	0.2
SO_3	0.4
$\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$	0.3
Insoluble	0.2



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CHARACTERIZATION: Shale



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CHARACTERIZATION: Shale

Shale	
Al_2O_3	12.5
SiO_2	55.0
$\text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	4.0
$\text{Al}_2\text{O}_3 + \text{SiO}_2 + \text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	71.5
CaO	4.0
MgO	4.0
SO_3	-
$\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$	3.1
Insoluble	0.5

Shale @30%	
Al_2O_3	3.8
SiO_2	16.5
$\text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	1.2
$\text{Al}_2\text{O}_3 + \text{SiO}_2 + \text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3$	21.5
CaO	1.2
MgO	1.2
SO_3	-
$\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$	0.9
Insoluble	0.2



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QUESTIONS?



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