Technical Report Aries Coal Project

Submitted to:

Ram River Coal Corporation

Project Number: 624-10

Report Date: April 20, 2017

Effective Date: March 31, 2017

Norwest Corporation

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CERTIFICATE OF QUALIFICATIONS

I, Michael Allen P.Eng., do hereby certify that:

1. I am currently employed as Manager, Surface Mining by Norwest Corporation, Suite 1830, 1066 West Hastings Street, Vancouver, British Columbia, Canada V6E 3X2.
2. I graduated with a Bachelor of Applied Science degree from the University of British Columbia in 1999.
3. I am a member of the Association of Professional Engineers and Geoscientists of British Columbia (Member #32696).
4. I have worked as a Mining Engineer for over sixteen years since my graduation from university.
5. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101), and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I am responsible for the preparation of Section 13, Sections 15 through 23 and portions of Section 24 through Section 28 of the report titled "Technical Report Aries Coal Project" dated April 20, 2017, effective date March 31, 2017 (the Technical Report).
7. I conducted a site visit to the property on October 3, 2013.
8. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.
9. I am independent of the issuer applying all of the tests in Section 1.5 of NI 43-101.

Dated:

PROFESSIONAL
PROVINCE
M. G. ALLEN
32696
BRITISH
COLUMBIA
ENGINEER

Michael Allen, P.Eng.
Manager, Surface Mining

CERTIFICATE OF QUALIFICATIONS

I, Ivan Minev, P. Geol., do hereby certify that:

1. I am currently employed as Senior Geologist, Resources by Norwest Corporation Suite 1900, 555 4 Avenue SW, Calgary, Alberta, Canada T2P 3E7

2. I graduated with a Bachelor of Science degree in Geological Engineering from the University of Mining and Geology, Sofia, Bulgaria in 1997.

3. I am a member of Professional Engineers and Geoscientists of Alberta, (Member #90794).

4. I have worked as a Geologist for over sixteen years since my graduation from university. In that time, I have produced computer-based geological and resource models for different coal projects and that work includes the estimations of resources and, where appropriate, reserves.

5. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101), and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

6. I am responsible for the preparation of Sections 1 through 12, Section 14, portions of Section 24 through Section 28 of the report titled "Technical Report Aries Coal Project" dated April 20, 2017, effective date March 31, 2017 (the Technical Report).

7. I conducted a site visit to the property on October 11, 2013.

8. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.

9. I am independent of the issuer applying all of the tests in Section 1.5 of NI 43-101.

Dated April 20, 2017

Ivan Minev, P.Geol.

Senior Geologist

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1 SUMMARY

1.1 Project Highlights

Ram River Coal Corporation (RAM) holds 100% interest in the RAM River Property, an undeveloped metallurgical coal deposit located in west-central Alberta. The RAM River Property comprises of two major coal blocks North Block and South Block, which total 413Mt measure and indicated in-place resource. The 2017 PFS study was based on surface mining the North Block which comprises of 215Mt of measured and indicated resources and is referred to as the Aries Project.

The Aries Project mine plan shows producing a total 121 million tonnes of clean coal from 183 million ROM tonnes (proven and probable combined reserves). The Aries Project can sustain a surface metallurgical coal mine with the capacity to extract and process six million run of mine (ROM) tonnes per year of metallurgical coal over an operating life of 33 years.

The Aries Project is based on similar mining methods and processing techniques used at other coal mines in western Canada. The project will have operating costs comparable to other western Canadian operations of the same scale. The estimated average operating cost over the life of the project is CAD$117/clean tonne. Capital costs have been estimated at CAD$876 million excluding contingency and working capital. The project development plan has allowed for a 3-year design, construction and commissioning period preceded by additional evaluation and permitting activities.

Economic analyses completed for the Aries Project were based on a constant saleable coal price of US$143.55/clean metric tonne and a 0.75 US:CAD exchange rate. The project generates an after-tax cashflow of $4.4 billion over its operating life and has an after-tax NPV of $855 million at an 8% discount with after-tax IRR of 18.8%. The cost estimates and resulting cash flow analysis were prepared in constant 2017 Canadian dollars (CAD$).

1.2 Technical Summary

Ram River Coal Corporation (RAM) holds 100% interest in the mineral rights on the Ram River Property, a metallurgical coal property located in west-central Alberta. Norwest Corporation has completed a prefeasibility level evaluation of the property which focuses on the portion of the property which has sufficient drilling to support reserves definition and is amenable to surface mining. This surface focused development was designated as the Aries Project in the Prefeasibility Study.

The effective date for this report is March 31, 2017, which is the date on which the last geological and PFS information was received for the purposes of developing this Technical Report. The principal sources of data concerning geology, drilling, coal quality testing, and many other technical aspects, were obtained from RAM and publicly available sources.

A summary of the tasks undertaken by Norwest to complete the report are as follows:

- Review area boundaries using descriptions and maps provided by RAM and reference public records available on the provincial Department of Energy website;
- Validate existing and historic lithology assignments by comparing them to geophysical logs provided by RAM and reviewing coal quality data provided by RAM;
- Confirm the geological interpretations made by RAM and their relationship to the raw data by inspecting triangulated surfaces for seam foot walls and faults provided by RAM and constructing a new digital geologic model;
- Confirm the geological complexity in terms of resource reporting classifications by reviewing the geological interpretation;
- Review the drill hole spacing to confirm adequacy for reported resource classes by inspecting the model and drill hole locations;
- Estimation of the coal resources on the property through the preparation of a new 3D computer geologic model;
- Complete the PFS level report including the development of surface mine plans, evaluation of coal processing and handling requirements and economic analyses to support classification of portions of the resource as NI43-101 compliant reserves.

This report has been prepared for RAM by Norwest Corporation. The findings and conclusions are based on information developed by Norwest from data provided by RAM and publicly available sources.

1.3 Location

The Aries Project is located in the eastern Rocky Mountain Foothills of Central Alberta (Drawing 1). The nearest major residential and service centers are located in the Town of Rocky Mountain House (population ~7,200) and the City of Red Deer (population ~100,000) located 45 km and 85 km, respectively, east of the property. The coal leases of the Aries Project occupy portions of Townships 37, 38 and 39 and Ranges 11, 12 and 13, W5.

1.4 Mineral Tenure

The Aries Project Crown coal leases are issued to RAM by the Government of Alberta. Crown coal leases have a 15-year term and are renewable. The crown leases grant exclusive rights to work, win, and recover coal in the described location. The basic requirements of holding a coal lease are payment of annual rent and payment of royalties on the Alberta-owned coal produced from the lease location. The legal descriptions were obtained from public records available on the Alberta Government website. The total coal lease area held by RAM on the Ram River property is 20,107 ha. The company has also applied for additional coal leases that cover a total area of 2,336 ha. Each of these applications is contiguous with acquired coal leases as illustrated in Drawing 2.

1.5 Property Description

In order to provide continuity and accurately reflect the content of previous and historical reports, the overall property is referred to as the Ram River Property comprising both the North and South Block areas and some additional leases held to the south of the Ram River (Scurry Ram property). The PEA completed by Norwest in 2014 considered mining in both the North and South Blocks with a combination of both surface and underground methods. Subsequent to that study, consideration of the property's resource basis and development strategy led to the current mining plan which focuses on surface mining of the North Block (now designated as the Aries Project) and maintaining the South Block as future potential development within the overall Ram River Property (see Drawing 3).

The Ram River Property, as defined in the Technical Report, Ram River Coal, Property, Alberta by Norwest in 2014, is composed of the North and South blocks. The North Block bifurcates from the South Block, with the North Block, measuring approximately 15 km in length and 3.5 km in width and with the South Block measuring, approximately 14 km at its longest point and 2.7 km at its widest point.

1.6 Geology

The Luscar Group is the dominant host rock in the vicinity of the Ram River Property. The orientation of the Luscar Group in the Ram Property is aligned with the regional Northwest – Southeast orientation of the Rocky Mountains. The Alberta Group flanks the western side of the Ram Property. Northwest-southeast thrust faults occur to the west and east of the Ram River Property area. The major regional Burnt Timber thrust fault is located 1 km to 2.5 km northwest of the Ram River Property lease boundary. The thrust has a northwest-trending strike and a southwest-dipping angle of 35° to 40° with vertical displacement of approximately 90 m.

The coal measures of interest on the property are contained in a Jurassic-Cretaceous sequence. This sequence is a well-known source of metallurgical coal for existing operations. The coal seams of interest for the Aries Project are contained in a broad syncline structure approximate 15 km long (trending northwest-southeast) and 3.5 km in width. The economic seams of interest are Seams 2 and 3 with typical seam thicknesses of 2 and 3.5 meters respectively. The property has been the subject of a number of exploration programs completed since 1970.

1.7 Resource Classification

With respect to the in-place coal resource, the term *resource* is used to quantify coal contained in seams occurring within specified limits of thickness and depth from surface. Also, the term *resource* refers to the in-place inventory of coal that has “reasonable prospects for economic extraction”. Coal resources are always reported as in-place tonnage and are not adjusted for mining losses or recovery. Resource classification maps for Seam 3 and Seam 2 are shown on Drawings 4 and 5 respectively.

Table 1.1 summarizes the estimated in-place coal resources within the North Block (Aries Project) and South Block of the Ram property. As these are in-place estimates, no considerations have been given for coal loss, dilution or mining recovery. The following criteria were used for the coal resource estimates shown in Table 1.1.

Suitable for Surface Mining:

- Minimum mineable thickness of 0.5 m; and
- Minimum separable partings thickness of 0.3 m.

Suitable for Underground Mining:

- Minimum mineable thickness of 1.5 m;
- Minimum separable partings of 0.45 m;
- Seam dip less than 16°;
- Minimum cover depth of 50 m; and
- Maximum depth of 600 m.

Table 1.1
In-Place Coal Resource Estimates
(Effective Date: March 31, 2017)

Area	Seam	ASTM** Group	In-Place Coal * (KTONNES)		
			Measured	Indicated	Inferred
SUITABLE FOR SURFACE MINING					
Aries Project (*North Block*)	Seam 3	Med-High Volatile Bituminous	123,452	2,699	0
	Seam 2 and 2R		85,679	3,616	0
Sub-Total for Aries Project Surface Mining by Category			**209,131**	**6,314**	**0**
Aries Project Suitable for Surface Mining Total			**215,445**		
POTENTIAL FUTURE MINING AREAS					
SUITABLE FOR SURFACE MINING					
South Block	Seam 3	Med-High Volatile Bituminous	34,931	14,740	3,257
	Seam 2 and 2R		25,954	12,631	7,227
Sub-total by Category			**60,885**	**27,370**	**10,484**
Combined South Block Suitable for Surface Mining Total			**88,255**		
SUITABLE FOR UNDERGOUND MINING					
North Block	Seam 3	Med-High Volatile Bituminous	1,669	198	0
	Seam 2R		120	1	0
	Seam 2		2,669	13	30
Sub-total by Category			**4,458**	**211**	**30**
Combined North Block Suitable for Underground Mining Total			**4,669**		
South Block	Seam 3	Med-High Volatile Bituminous	26,760	41,033	57,333
	Seam 2R		106	9	2
	Seam 2		11,435	25,951	38,036
Sub-total by Category			**38,301**	**66,992**	**95,370**
Combined South Block Suitable for Underground Mining Total			**105,293**		
Total by Category			**312,774**	**100,888**	**105,884**
Combined Total Resources (Measured and Indicated)			**413,662**		

Note: *Differences in sub-totals are due to rounding.
**American Society for Testing and Materials

1.8 Reserves Classification

The reserves that form the basis of this Technical Report exploit the North Block.

A coal reserve is the economically mineable part of a Measured or Indicated coal resource demonstrated by at least a PFS level of evaluation. Coal reserves are sub-divided into Proven and Probable reserves.

Mine design and financial analysis has been completed for the Aries Project. Norwest has designed pits using geotechnical criteria that are consistent with the proposed designs and site conditions. Mining pits were developed using breakeven costs developed using first principle's and Aries Project capital cost estimates. The portion of the property included in the reserves definition is shown on Drawings 6 (Seam 3) and 7 (Seam 2) as a sub-area within the overall defined resources plan. Table 1.2 is a summary of run of mine surface mineable reserves for the Aries Project as of March 31, 2017.

Table 1.2
Aries Project ROM Coal Reserve Estimates (Surface Mining)
(Effective Date: March 31, 2017)

Area	Seam	ASTM Group	ROM Coal * (KTONNES)	
			Proven	Probable
SUITABLE FOR SURFACE MINING				
Aries project (North Block)	Seam 3	Med-High Volatile Bituminous	105,920	1,696
	Seam 2 and 2R		72,669	2,681
Suitable for Surface Mining Total by Category			**178,589**	**4,378**
Suitable for Surface Mining Total			**182,967**	

*Based on in-situ moisture content basis.
Note: Differences in totals are due to rounding.

Based on the mining criteria defined in the mining section, the plant yield curve was used to estimate clean saleable reserves as a combined product. Table 1.3 is a summary of clean coal product surface mineable reserves for the Aries Project as of March 31, 2017.

Table 1.3
Aries Project Clean Coal Reserve Estimates
(Effective Date: March 31, 2017)

Area	Seam	ASTM Group	Clean Coal * (KTONNES)	
			Proven	Probable
SUITABLE FOR SURFACE MINING				
Aries project North Block	Seam 2,2R and 3	Med-High Volatile Bituminous	118,366	2,902
Suitable for Surface Mining Total			**121,268**	

*Includes allowance for product moisture.

Cautionary Note – *Reserves can be affected by coal product price and other project specific factors/risks as is the case with projects at this stage of evaluation*.

1.9 Product Description

The Aries Project will produce a metallurgical coal product that is a blend of Seams 2, 2R and 3. The Aries clean coal product characteristics are summarized in Table 1.4. Quality characterization and analyses for the blended product indicate the project is positioned to produce a clean coal product which lies between the Australian Tier 2 Coking Coals and the Semi-Hard coals. With its CSR of 50 – 55, RAM's clean coal product is superior in quality to the Australian semi-soft coking coals and compares favourably with Australian semi-hard coking coals. It is expected that a market is available for the Aries product and that it will gain market acceptance.

Table 1.4
Aries Clean Coal Product – Clean Coal Product Specification

Product Quality Specification	Aries Product
Proximate Analysis (dry basis)	
Ash (%)	9.5 ± 0.5
Volatile Matter (%)	30.5 ± 0.5
Sulphur (%)	0.55 ± 0.05
Moisture	8.5 ± 0.5
Free Swelling Index (FSI)	7 to 7.5

1.10 Development

The development of the Aries Project as described in the PFS includes the following major project components:

- Surface mining operation utilizing conventional truck and electric shovel mining methods with capacity for production of 6 Mtpa run of mine (ROM) coal at an average strip ratio of 13.2:1 (bank cubic meters mine rock to 1 tonne ROM coal). The surface mine has been sequenced to limit the creation of external mine rock storage facilities and allow for on-going progressive reclamation.

- Coal processing plant with a nominal capacity of 950 tonnes per hour capable of producing 4 Mtpa clean coal product with a target ash of 9 – 9.5% and a total moisture of 8.5% or less. The coal plant includes coarse, fine and ultrafine coal washing circuits. Average coal recovery yields of approximately 66% over the project's life. The project will produce dewatered coal wastes and does not require a conventional tailings impoundment

- Maintenance, warehouse, office and dry complex to support the operation and personnel required. Employment at full production is expected to be 622 salaried and hourly personnel including off-site management.

- Clean coal handling and rail loadout system to convey clean coal from the site via a 7km overland conveyor system to a rail loadout system with a 36,000 tonne storage capacity in silos and the capability to load over 360 unit trains per year. A rail extension of approximately 28 km is required to tie into the existing rail network. Coal would be transported to one of the existing coal terminals on the west coast of British Columbia.

1.11 Permitting and Community Engagement

The proposed project falls wholly within the province of Alberta and will be subject to an Environmental Assessment ("EA") under both the Provincial and Federal EA legislation. RAM initiated the collection of environmental baseline data in 2013 to support the Provincial and Federal EA processes. RAM has also begun engagement and consultation with Aboriginal and local communities, stakeholders and other interested parties.

The Government of Alberta has provided clarification of the 1976 Coal Policy as it relates to RAM, which indicates that the permitting of surface mining is acceptable for the development of the Aries Project. As is the case elsewhere across Alberta, the permitting of surface mining activities is subject to regulatory review and approvals.

Baseline Environmental studies commenced in 2013 and include, but are not limited to; Air Quality, Aquatic Health, Geochemistry, Fish and Fish Habitat, Hydrology, Hydrogeology, Noise, Soils, Terrestrial health, Wildlife, Vegetation, and Water Quality.

The Aries Project reclamation plan is founded on the principle of progressive reclamation that will begin in the earliest possible phases of the mine development and continue throughout the life of the project. The configuration and phasing of the Aries Project presents significant opportunity for the direct placement of salvaged soil and for early progressive reclamation of the mine rock storage facilities' (MRSF) slopes. The first year where a significant area is available for resloping is Year 3 of the operation. The progressive reclamation plan will allow for reclamation of approximately 75% disturbed area prior to the completion of mining.

1.12 Capital and Operating Costs

The project will have operating costs comparable to other western Canadian operations of the same scale. The cost estimates and resulting cash flow analysis were prepared in constant 2017 Canadian dollars (CAD$). Unless otherwise stated, all dollar amounts are in Canadian currency. The estimated average operating cost over the life of the project is CAD $117/clean tonne which includes approximately $41/clean metric tonne (cmt) for rail transport and port costs. This cost includes contingency allowances commensurate with PFS level evaluation. The operating cost on a US dollar basis is estimated at US $88/tonne (0.75 US:CAD exchange rate).

Capital costs for the project have been estimated and applied to the different periods of the development and operation of the project. The project development plan has allowed for a 3-year design, construction and commissioning period preceded by additional evaluation and permitting activities. The development period starts following the post-feasibility once the project is approved by the ownership team. The feasibility, permitting, and detailed engineering activities have been estimated to take up to four years and cost $61.5 M. A summary overview of the initial capital costs associated with taking the project from construction to full production is shown in Table 1.5.

Table 1.5
Initial Capital Costs

	Direct ($M)	In direct ($M)	Initial ($M)
Pre-Development Cost (Roads, Clearing)	$13	$3	$16
Mine Infrastructure & Facilities	$68	$7	$75
Plant and Coal Handling Facilities	$149	$21	$170
Rail Line Extension and Loop	$97	$33	$130
Rail Load Out	$29	$3	$32
Surface Mine & Support Equipment	$389	$20	$409
Total	**$745**	**$87**	**$832**
Owner's Cost	$19		$19
Reclamation Security	$25		$25
Total w/o contingency	**$745**	**$131**	**$876**
Contingency	$152		
Total with contingency	**$1,028**		

In addition to the initial capital costs, there is also working capital allowance of $74 M. As part of life-of-mine operations, there is a requirement for $223 M in sustaining capital and $738 M of replacement capital.

1.13 Economic Analysis

Economic analyses completed for the project were based on a constant saleable coal price of US$143.55/clean metric tonne and a 0.75 US:CAD exchange rate. The project generates an after-tax cashflow of $4.4 billion over its operating life and has an after-tax NPV of $855 million at an 8% discount with after-tax IRR of 18.8%. A summary of key economic metrics is shown in Table 1.6.

Table 1.6
Economic Results

Item	Results
Capital Cost ($/tonne)	$17.00
Operating Costs ($/tonne)	$117.30
Pre-tax NPV_8 ($M)	$1,498
Pre-tax Internal Rate of Return (%)	22.7%
Payback Period (years)	4.8
After-Tax Cashflow ($B)	$4.38
After-Tax NPV_8 ($M)	$855
After-Tax Internal Rate of Return (%)	18.8%

1.14 Conclusions and Recommendations

The Technical Report completed by Norwest has shown that the Aries Project could be developed as a surface mine. The defined reserve base supports the development of a 6Mtpa operation for a mine life of over 30 years. The additional surface and underground resource estimates are of future potential interest for the development of the Ram Coal mining complex.

In order to move the project forward to support additional evaluation, permitting and engineering design, Norwest has made recommendations to advance the project through to completion of a Feasibility Study (FS) and completion of the Environmental Impact Assessment (EIA). Norwest has prepared a timeline, tasks list and estimated costs to move the project to the next stage of development. The next steps include additional field work to provide additional coal quality samples for product coal testing as well as geotechnical site investigations to support design and permitting of infrastructure. Baseline environmental data collection would also be reactivated and preparations for the feasibility study undertaken.

2 INTRODUCTION

Norwest Corporation was retained by the Ram River Coal Corporation (RAM) to undertake a Preliminary Feasibility study (PFS) with supplemental engineering analyses in support of the development of their Aries metallurgical coal project in west-central Alberta (Drawing 1). The assessment was to include an estimation of coal resources and reserves as well as an evaluation of the technical and economic aspects of surface mining for the North Block portion of the project. This technical report is based on the work from the PFS.

The effective date for this report is March 31, 2017, which is the date on which the last geological and PFS information were received for the purposes of developing this Technical Report. The principal sources of data concerning geology, drilling, coal quality testing, and many other technical aspects, were obtained from RAM and publicly available sources.

Verification of the geology, coal development and levels of assurance of the coal resources were completed through a site visit, data reviews, geological interpretation and geological modeling. Coal resources and reserves have been estimated, classified and reported according to the CIM Standards as is required by NI 43-101.

A summary of the tasks undertaken by Norwest to complete the report are as follows:

- Review area boundaries using descriptions and maps provided by RAM and reference public records available on the provincial Department of Energy website;
- Validate existing and historic lithology assignments by comparing them to geophysical logs provided by RAM and reviewing coal quality data provided by RAM;
- Confirm the geological interpretations made by RAM and their relationship to the raw data by inspecting triangulated surfaces for seam foot walls and faults provided by RAM and constructing a new digital geologic model;
- Confirm the geological complexity in terms of resource reporting classifications by reviewing the geological interpretation;
- Review the drill hole spacing to confirm adequacy for reported resource classes by inspecting the model and drill hole locations;
- Estimation of the coal resources on the property through the preparation of a new 3D computer geologic model;

- Complete the PFS level report including the development of surface mine plans, evaluation of coal processing and handling requirements and economic analyses to support classification of portions of the resource as NI43-101 compliant reserves.

This report has been prepared for RAM by Norwest Corporation. The findings and conclusions are based on information developed by Norwest from data provided by RAM and publicly available sources.

Michael Allen, P. Eng., conducted a site visit to the property on September 20, 2013. Ivan Minev, P. Geo., conducted a site visit to the property on October 11, 2013.

3 RELIANCE ON OTHER EXPERTS

This report is intended to conform to the Canadian system of reserve and resource reporting as required under National Instrument 43-101 (NI 43-101) Standards of Disclosure for Mineral Projects. The reporting nomenclature and formats are consistent with CIM Definition Standards for mineral resources and reserves.

Norwest has relied wholly on information and data provided by RAM and obtained from public sources as the basis for estimating coal resources and reserves within the Ram River Coal Property. Norwest did not conduct field work for resource definition, other than a site visit, and did not independently drill or complete geophysical logs on drill holes, take samples or subject any coal samples. Norwest has relied on numerous assessment reports obtained from RAM and public data available. These reports are tabulated in Section 27.

4 PROPERTY DESCRIPTION AND LOCATION

The Aries Project is located in the eastern Rocky Mountain Foothills of Central Alberta (Drawing 1). The nearest major residential and service centres are the Town of Rocky Mountain House (population ~7,200) and the City of Red Deer (population ~100,000) located 45 km and 85 km, respectively, east of the property. The coal leases of the Aries Project occupy portions of Townships 37, 38 and 39 and Ranges 11, 12 and 13, W5.

The main river systems in the general area are the North Saskatchewan River located approximately 15 km north of the property, and the Clearwater River located approximately 25 km south of the property. The Ram River, North Ram River and their tributaries comprise the primary drainage system within the property limits.

The Aries Project coal leases are issued to RAM by the Government of Alberta. Crown coal leases have a 15-year term and are renewable. The crown leases grant exclusive rights to work, win, and recover coal in the described location. The basic requirements of holding a coal lease are payment of annual rent and payment of royalties on the Alberta-owned coal produced from the lease location. Drawing 2 illustrates the leases that are held by RAM and those coal leases that are under application.

Coal leases are also subject to the following legislation and policies:

- Mines and Minerals Act: Parts 2 and 3 pertain specifically to coal leasing;
- Mines and Mineral Administration Regulation;
- Coal Conservation Act: a coal lessee requires a Mine Permit and Mine License to develop a mine in the location of a lease; and
- Integrated resource plans, policies and local restrictions set by the Government of Alberta under the Mines and Minerals Act, and any other legislation.

Under Alberta law, coal mining companies are responsible for reclaiming land that is disturbed by mining and the operation of related processing facilities. Standards for the reclamation are set by the provincial government. The underlying principle of the Mine Financial Security Program (MFSP) is that the Environmental Protection and Enhancement Act Approval holder is responsible for completing remediation and reclamation activities to the provincial standards and must maintain care-and-custody of the land until a reclamation certificate has been issued. The approval holder must have the financial resources to complete these obligations.

Based on the Government of Alberta's letter to RAM, which provided clarification of the 1976 Coal Policy as it relates to RAM, the permitting of surface mining is acceptable for the development of the Aries Project. As is the case elsewhere across Alberta, the permitting of surface mining activities is subject to regulatory review and approvals. Norwest understands that RAM has been proactive in approaching the regulatory agencies, stakeholders and Aboriginal groups regarding the Aries Project development plans.

The coal lease areas and certain aspects of the local infrastructure are shown on Drawing 3.

Table 4.1 includes the legal descriptions of the leases held by RAM. The legal descriptions were obtained from public records available on the Alberta Government website. The total coal lease area held by RAM on the Ram River coal property is 20,107 ha. The authors are not aware if any of these lease areas have been legally surveyed.

Table 4.1
Legal Description of Coal Leases

Agreement Number	Lease Owner	Issue Date	Expiry Date	TT-RRWM	SS	LSD	Ha
1307030947	Ram River Coal Corp. (100%)	2007-03-18	2022-03-18	36-11W5	4,5,8,9	All	1055.2
1307030948	Ram River Coal Corp. (100%)	2007-03-18	2022-03-18	36-11W5	7,17,18,20	All	1054.8
1307030949	Ram River Coal Corp. (100%)	2007-03-18	2022-03-18	36-11W5	19,30	All	1054.3
				36-12W5	24,25	All	
1307030950	Ram River Coal Corp. (100%)	2007-03-18	2022-03-18	36-12W5	35,36	All	1053.2
				37-12W5	1,2	All	
1307030951	Ram River Coal Corp. (100%)	2007-03-18	2022-03-18	37-12W5	3,10,15	All	791.2
1307030952	Ram River Coal Corp. (100%)	2007-03-18	2022-03-18	37-12W5	11,12,13,14	All	1052.5
1307030953	Ram River Coal Corp. (100%)	2007-03-18	2022-03-18	37-12W5	24,25	All	525.9
1307070574	Ram River Coal Corp. (100%)	2007-07-12	2022-07-12	37-12W5	32,33	All	1051.2
				38-12W5	4,5	All	
1307070575	Ram River Coal Corp. (100%)	2007-07-12	2022-07-12	38-12W5	6,7,8	All	786.5
1307070576	Ram River Coal Corp. (100%)	2007-07-12	2022-07-12	38-13W5	12,13,14	All	789.6
1307100741	Ram River Coal Corp. (100%)	2007-10-07	2022-10-07	38-13W5	25,26,35	All	1052.5
1307100742		2007-10-07	2022-10-07	38-13W5	33,34	All	968.4

Agreement Number	Lease Owner	Issue Date	Expiry Date	TT-RRWM	SS	LSD	Ha
	Ram River Coal Corp. (100%)			39-13W5	2	1-11,14-16	
				39-13W5	3	1-10,12,13	
1307100743	Ram River Coal Corp. (100%)	2007-10-07	2022-10-07	39-13W5	4	All	565.8
				39-13W5	8	1,2,7-11,13-16	
				39-13W5	9	2-7,12	
1307100744	Ram River Coal Corp. (100%)	2007-10-07	2022-10-07	39-13W5	17	2-6,12	350.3
				39-13W5	18	1-3,5-16	
1308020322	Ram River Coal Corp. (100%)	2008-02-01	2023-02-01	39-12W5	6	All	540.9
				39-13W5	1	All	
1308020323	Ram River Coal Corp. (100%)	2008-02-01	2023-02-01	38-13W5	36	All	263.6
1308020324	Ram River Coal Corp. (100%)	2008-02-01	2023-02-01	38-12W5	14,15	All	528.6
1308020325	Ram River Coal Corp. (100%)	2008-02-01	2023-02-01	38-12W5	17-20	All	1050.2
1308020326	Ram River Coal Corp. (100%)	2008-02-01	2023-02-01	38-12W5	21,22,27,28	All	1050.0
1308020327	Ram River Coal Corp. (100%)	2008-02-01	2023-02-01	38-12W5	29-32	All	1055.6
1308030774	Ram River Coal Corp. (100%)	2008-03-13	2023-03-13	38-11W5	5,6	All	1051.9
				38-11W5	7	1-9,12,13,16	
				38-11W5	8	1-8,9-14	
				38-12W5	1	1,7-10,15,16	
1308030775	Ram River Coal Corp. (100%)	2008-03-13	2023-03-13	37-12W5	22,23,26,27	All	1052.0
1308030776	Ram River Coal Corp. (100%)	2008-03-13	2023-03-13	37-12W5	34,35	All	754.7
				38-12W5	3	1-14	
1308030777	Ram River Coal Corp. (100%)	2008-03-13	2023-03-13	38-12W5	9	3-6,11-13	116.0
1308030778	Ram River Coal Corp. (100%)	2008-03-13	2023-03-13	38-12W5	11	9-11,13-16	492.3
				38-12W5	12	1,2,7-16	
				38-12W5	13	1-8,11-13	

Note – Lease areas include township road allowance.

The company has also applied for additional coal leases that cover a total area of 2,336 ha. Each of these applications is contiguous with acquired coal leases as shown on Drawing 2. Alberta

Energy has stated that the 1976 Coal Policy gives the coal lease applicant first notice or opportunity to acquire the lease, in the event that the application was to be converted. In addition, while holding a coal lease application, no other person or company has the ability to apply for the lands. As a result, for the purposes of estimating resources, Norwest deems both coal leases and coal leases under application to be equivalent.

Table 4.2 summarizes the legal descriptions for these applications obtained from public records available on the Alberta Government website.

Table 4.2
Legal Description of Coal Leases Applications

Agreement Number	Lease Owner	TT-RRWM	SS	LSD	Ha
730179001	Ram River Coal Corp. (100%)	35-11W5	28	11-14	448.5
		35-11W5	33,34	All	
		36-11W5	9	3-6,11-14	
		36-11W5	10	3-6	
730180001	Ram River Coal Corp. (100%)	35-11W5	28	11-14	321.4
		35-11W5	33	All	
730183001	Ram River Coal Corp. (100%)	36-12W5	13	1,8-10,15,16	96.7
730184001	Ram River Coal Corp. (100%)	36-12W5	26	1,2,7-10,15,16	128.5
743704001	Ram River Coal Corp. (100%)	38-12W5	9	14,15	286.8
		38-12W5	16	All	
743705001	Ram River Coal Corp. (100%)	38-12W5	10	15,16	32.2
744042001	Ram River Coal Corp. (100%)	38-12W5	10	7-10	112.0
		38-12W5	11	5,6,12	
744044001	Ram River Coal Corp. (100%)	38-13W5	23	1,2,7-16	192.4
744045001	Ram River Coal Corp. (100%)	38-13W5	13	All	254.4
761902001	Ram River Coal Corp. (100%)	38-13W5	22	9-16	319.6
		38-13W5	28	1,2,7-16	
763153001	Ram River Coal Corp. (100%)	38-12W5	23	1-7,11,12	143.8
130159401	Ram River Coal Corp. (100%)	38-13W5	22	7,8	96.7
		38-13W5	23	3,4,5,6	

Note – Lease under application areas include township road allowance.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

This section of the report uses information from the *Coal Resources Report Ram River Property Alberta, Canada* prepared by John T. Boyd Company, February 2013.

5.1 Property Access

The project is in a developed region with a history of agricultural, forestry and oil and gas activity. Drawing 3 shows the location of the Aries Project relative to local communities and infrastructure. Primary access roads to the Aries project are:

- Clearwater County's Northfork road, which is located in the northern portion of the property and follows an west to east alignment. The Northfork road ties into Highway 752 approximately 45 km from the property boundary;
- Sundre Forest Products primary logging road (Sunpine Mainline Road) runs north to south along the eastern boundary of the property and provides access from the east;
- The Sunpine Mainline Road ties into the secondary paved highway designated as Highway #752 approximately 25 km from the southern end of the property. The junction of the Sunpine and #752 highway is about 5 km east of Strachan; and
- A series of secondary logging roads and access trails provide access to the majority of the areas within the Aries property.

The existing railway line (managed by CN Rail) runs through the nearby hamlet of Strachan (approximately 30 km from the site) and extends southwest to the Keyera and Husky gas plants approximately 30 km south of the site. This railway ties into the CN mainline system in Alberta and provides access to coal terminals on the west coast of British Columbia.

5.2 Climate

The project area has a typical Alberta foothills climate characterized by short, temperate summers (June – August) and five winter months with average temperatures below freezing. Annual snowfall averages approximately 2.5m per year. Total precipitation averages 489mm per year. Monthly average temperature and precipitation amounts, which include snow fall amounts, are shown in Table 5.1 below.

Table 5.1
Average Daily Temperatures

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High °C	-4.1	-2.7	3.2	10.5	16	19.4	21.3	20.9	16.1	11.2	1.1	-3.8
Avg. Low °C	-18	-16.4	-9.9	-3.4	1.7	6.2	8	7	1.8	-3.2	-11.8	-17.2
Daily Mean °C	-11.1	-9.6	-3.4	3.6	8.9	12.8	14.7	14	9	4	-5.3	-10.5
Record Low °C	-41	-44.1	-37.1	-27.2	-7.5	-2	0.2	-4.1	-9.6	-3	-38.7	-43.7
Precipitation (mm)	18.4	14.3	17.3	25.1	66.7	88.4	107.1	68.1	20.1	26.5	18.8	18.5

5.3 Infrastructure

There are a number of potential surface water sources for the project from abundant tributaries to the major river systems. It is also expected that sufficient groundwater sources could be located within the property.

A 138kV high-voltage power transmission line exists approximately 6 km east of the property with sufficient capacity to supply the power requirements.

A rail spur line extension from the vicinity of Strachan is proposed as part of the project. This rail extension, incorporated into the design, has a distance of approximately 28 km and runs in a westerly direction (north of Highway #752) to within 7 km of the Aries property. The existing CN rail line links Strachan to the CN main line located near Red Deer which the provides access to coastal coal terminals in British Columbia.

The town of Rocky Mountain House and city of Red Deer, provide all the services (hospitals, schools, retail, industrial supply) required to support an operation the size of the proposed Aries Project. In addition, the city of Edmonton (250 km from Rocky Mountain House) is a major center for supply of mining and construction equipment, and specialized services supporting the oil sands and existing Alberta coal operations.

5.4 Physiography

The Aries property topography ranges from 1,250m to 1,700masl. Rough Creek forms the northern border of the area, while the Ram River bounds the southern portion of the property. The property exists in a transitional region between the Rocky Mountain foothills region to the south and west, and the boreal forest region to the north and east. A mix of deciduous trees and evergreens characterizes the area’s vegetation. Some portions of the property have been extensively logged, while there are occasional wetlands in low-lying areas around the property.

6 HISTORY

The following section is comprised of information from the *Coal Resources Report Ram River Property Alberta, Canada* prepared by John T. Boyd Company (BOYD), February 2013.

6.1 Prior Ownership

The coal resource located within the Ram River property is owned by the Crown and administered by the provincial government of Alberta. CONSOL (via subsidiaries and affiliates) was the previous lessee and formed the current property by combining four separate adjoining coal holdings.

The first tract was acquired from Fraser Exploration in October 1969. Additional properties were acquired from TIFCO Exploration and TVI Mining & Rio Alto Exploration in early 1970. CONSOL obtained the remaining tracts directly from the Province of Alberta in 1970. All of the properties were unexplored prior to acquisition by CONSOL.

Additional coal leases were acquired from Devon Energy. These additional leases are located south of CONSOL's coal leases, and are known as Scurry Ram property (Drawing 2).

6.2 Exploration Drilling Programs

Between 1970 and 2012, 502 exploration drill holes were completed, as shown on Table 6.1.

Table 6.1
Exploration Drilling

Year	Holes Drilled	Depth Drilled (m)
1970	43	6,387
1973	83	6 165
1974	291	27,947
1975	6	269
1980	22	3,620
1981	44	6,531
2012	13	826
Total	502	51,745

The drilling activities are discussed in greater detail in Section 10 of this Technical Report.

6.3 Historical Resource and Reserve Estimates

Note – The use of resources and reserves terminology in this section is with respect to historical estimates. These historical estimates are not NI 43-101 compliant and are included to provided historical context only.

In June 1974, Dave Hughes and Paul Daniels prepared a report for CONSOL, titled "Ram River Project — Preliminary Feasibility". This report included an estimate of surface-mineable reserves (resources) based on the exploration conducted prior to June 1974. Based on information available at that time, the mean thickness of the No. 3 Seam was assigned at 3.8 m and the No. 2 Seam at 3.5 m. The estimate was further based on the following assumptions:

- No. 2 Seam is mined past the outcrop line of No. 3 Seam.
- Preparation plant recovery yield of 76%.
- 10% pit loss.
- 45 degree highwall slope.
- A +10% contingency was added to the overburden volume for stripping ratio calculations.
- Drillhole spacing is sufficient for all tonnes to be classified as indicated.

The results of the 1974 reserve estimate (shown in the alternative based on the maximum overburden depth) are shown on Table 6.2. This estimate did not exclude oxidized coal near the outcrop.

Table 6.2
1974 Surface-Mineable Historical Reserves at 1.55 Float

Maximum Overburden (m)	Overburden Volume (000-m^3)	Raw Coal (000-tonnes)	Clean Coal (000-tonnes)	Raw Ratio	Clean Ratio
61	1,051,899	145,681	100,520	7.22	10.46
58	966,722	137,600	94,944	7.03	10.18
55	881,402	128,162	88,432	6.88	9.97
52	807,061	122,212	84,326	6.60	9.57
49	742,993	116,447	80,349	6.38	9.25
46	680,818	111,060	76,632	6.13	8.88
43	626,742	106,659	73,594	5.88	8.52
40	574,214	99,595	68,721	5.77	8.36

In 1980, reserve estimates were prepared by CONSOL based on that year's drilling program. This reserve estimate was calculated manually using coal isopach maps. The estimate is further based on the following assumptions:

- Preparation plant recovery of 72%.
- 30% underground mining recovery.

- Reserves are based only on exploration in the listed tracts.
- Coal density of 1.36 g/cm^3.

The results of the 1980 reserve estimate are shown on Table 6.3.

Table 6.3
1980 Underground Mineable Historical Reserves (000-saleable tonnes)

Tract No.	No. 3 Seam		No. 2 Seam		Total	
	Indicated	Inferred	Indicated	Inferred	Indicated	Inferred
409-019	-	283	-	153	-	436
409-020	1,823	-	1,039	-	2,862	-
409-021	3,918	1,930	2,755	1,181	6,673	3,110
409-022	7,544	-	5,594	-	13,138	-
409-023	205	-	178	-	383	-
409-024	2,939	-	2,366	-	5,306	-
409-006*	-	128	-	89	-	217
409-027	2,754	-	1,402	-	4,156	-
409-028	55	-	44	-	99	-
Total	19,238	2,341	13,378	1,423	32,616	3,764

* Lands held under a Preferential Rights Lease Application

By 1982, the property had been more extensively explored, and thus the estimated reserves increased. A summary of the 1982 estimate is shown in Table 6.4, and was based on the following assumptions:

- 55% reserve recovery due to a combination of longwall and hydraulic mining.
- Minimum coal thickness of 1.52 m.
- Coal density of 1.40 g/cm^3 for No. 3 Seam and 1.43 g/cm^3 for No. 2 Seam.
- No adjustment was proposed for preparation plant losses (the reserve estimate shown below does not represent saleable product).

Table 6.4
1982 Underground Mineable Historical Reserves (000-tonnes)

	No. 3 Seam		No. 2 Seam		Total	
Tract No.	Measured	Inferred	Measured	Inferred	Measured	Inferred
409-019	-	12,053	-	6,260	-	18,313
409-020	5,187	1,900	3,562	4,298	8,749	6,198
409-021	19,950		11,897	-	31,847	-
409-022	20,976	-	19,652	-	40,628	-
409-023	729	-	462	-	1,191	-
409-024	7,823	-	5,918	-	13,741	-
409-015	-	4,874	-	3,417	-	8,291
409-016	-	10,785	-	7,030	-	17,815
409-017	-	10,220	-	7,760	-	17,980
409-027	5,736	10,282	6,266	4,426	12,002	14,708
409-028	198	1,862	156	1,353	354	3,215
409-005	-	3,715	-	2,767	-	6,482
409-004	-	81	-	-	-	81
409-006*	-	333	-	475	-	808
409-009*	-	1,026	-	582	-	1,608
Total	60,599	57,131	47,913	38,368	108,512	95,499

* Lands held under a Preferential Rights Lease Application

6.4 Production History

There has not been any coal produced on this property as of the effective date of this report.

In addition to the historical information above, the 2013 BOYD report provided new information for coal quality of the Ram River property, based on 2012 drilling results, as well as an updated resource estimate. The new estimates provided by BOYD are based on geologic model created by using Ventyx Minescape computer modeling software. Table 6.5 is the summary of the resource estimate from the BOYD report.

Table 6.5
2013 Mineable Historical Resources (000-tonnes)

Type	ASTM Coal Rank	In-Place Coal Tonnes (millions)				
		Measured	Indicated	Meas.+ Ind.	Inferred	Total
Underground	Med-High Volatile Bituminous	251.8	107.2	359.0	84.8	443.8

The BOYD report also “completed an alternative analysis of the Ram River deposit to quantify in-place coal seam tonnage by strip ratio increment up to a 20:1 strip ratio” and has extensive analysis on the obtained bulk samples of Seam 2 and Seam 3 during 2012 large diameter drilling.

7 GEOLOGICAL SETTING AND MINERALIZATION

Norwest has been involved in the development and review of the geological resource model for the Ram River Property and subsequently, the Aries Project since 2013. The development of the geology model and definition of the resource model has included information from recent drilling and testing programs as well as reference to work carried out prior to Norwest's involvement by RAM and the previous owners. Norwest has had access to and referenced work completed by others on the property and portions of the following section include information from the Coal Resources Report - Ram River Property Alberta, Canada prepared by John T. Boyd Company (BOYD), submitted in February 2013.

The PEA completed by Norwest in 2014 considered mining in both the North and South Blocks with a combination of both surface and underground methods. Subsequent to that study, consideration of the property's resource base and development strategy led to the current mining plan which focuses on surface mining of the North Block (now designated as the Aries project) and maintaining the South Block as future potential development within the overall Ram River Property (see Drawing 3).

Note that in order to provide continuity and accurately reflect the content of previous and historical reports, the overall property is referred to as the Ram River Property comprising both the North and South Block resource areas and some additional leases held to the south of the Ram River (Scurry Ram property).

7.1 Regional Geology

The Jurassic-Cretaceous sequence in the Central Foothills, which contains the coal measures of interest for the Aries Project, includes the following stratigraphic units:

- the Jurassic to Lower Cretaceous Fernie and Nikanassin formations;
- the Lower Cretaceous Luscar Group; and
- the Upper Cretaceous Alberta Group and Brazeau Formation.

The nomenclature of the units is consistent with Map 600, which was released by the Alberta Geological Survey in 2013. Map 600 aligns with the stratigraphic sequence of Langenberg and McMechan (1985). Each of the above-mentioned units are reviewed in the following subsections from the oldest sequence to the youngest. The simplified stratigraphic succession is summarized on Drawing 8. The regional geology of the property is shown on Drawing 9.

7.1.1 Jurassic - Lower Cretaceous Transitional Units (Fernie and Nikanassin Formations)

The Fernie Formation is composed of shale, limestone, siltstone, sandstone, and intermittent chert conglomerate at the base (Prior, 2013). The shale grades from grey to black and is weakly to strongly fissile. The limestone contains phosphatic, cherty, and oolitic varieties. Some of the sandstone is phosphatic. The Fernie Formation is interpreted as a marine sequence.

The Nikanassin Formation overlies the Fernie Formation. The Nikanassin Formation is composed of dark grey mudstone, fine-grained sandstone, and intermittent carbonaceous shale. Minor, thin, impure coal layers occur in the upper part of the sequence (Prior, 2013). The formation is interpreted as marine in the lower portion of the sequence, which grades to a marginal marine to coastal plain sequence in the upper portion of the sequence.

7.1.2 Lower Cretaceous Units – Luscar Group

The Luscar Group contains marginal marine to non-marine units that were derived from the Columbian Orogen during the Early Cretaceous (Dawson, 1989). The Luscar Group in west-central Alberta is approximately 400 m thick and can be divided into four distinct, mappable formations, which are the Cadomin, Gladstone, Moosebar, and Gates (Langenberg and McMechan, 1985). Each formation is reviewed below from oldest to youngest.

7.1.2.1 Cadomin Formation

The base of the Luscar Group is the Cadomin Formation, which has a sharp unconformable lower contact with the Nikanassin Formation (Dawson, 1985). The Cadomin Formation is characterized as an erosion-resistant chert- and quartzite-pebble conglomerate that is interbedded with fine- to coarse-grained quartz sandstone, siltstone and commonly carbonaceous mudstone (Prior, 2013). The Cadomin Formation is interpreted as an alluvial and pediment deposit. The Cadomin Formation varies from 5 m to 15 m in thickness in the region, and forms distinct resistant units in outcrop (Dawson, 1989).

7.1.2.2 Gladstone Formation

The Gladstone Formation conformably overlies the Cadomin Formation. The lower portion of the Gladstone Formation is composed of a fine-grained sandstone, siltstone, and mottled green and maroon shale that contains sideritic concretionary layers. The sandstone beds are resistant in outcrop and are distinctive by the weathered quartz sheen (Dawson, 1989). The depositional environment of the lower sequence is interpreted to be non-marine. The upper part of the sequence contains green-grey, fossiliferous, calcareous, fine-grained sandstone, shale and coquina. The Gladstone Formation is approximately 75 m thick. The depositional environment of this upper sequence is interpreted as marginal marine (Prior, 2013). The top of the Gladstone Formation is gradational with the base of the Moosebar Formation.

7.1.2.3 Moosebar Formation

The Moosebar Formation is generally a dark grey shale that contains sideritic concretions. Platey, siltstone layers occur thought out the unit, with the highest abundance occurring in the upper portion of the sequence (Prior, 2013). The top of the Moosebar Formation is represented by a thin mudstone unit that lies immediately above a 15 m to 20 m thick conglomeratic sequence. Commonly a pebble lag bed is present at the base of the unit. Within the region, the Moosebar Member is less than 65 m thick and represents a marginal marine depositional environment (Dawson, 1989).

7.1.2.4 Gates Formation

The Gates Formation, which lies conformably above the Moosebar Formation, is the uppermost unit in the Luscar Group. The Gates Formation is divided into three members; the Torrens Member, the Grande Cache Member, and the Mountain Park Member. The Torrens Member, the lower-most interval in the sequence, contains fine-grained sandstone with minor intervals of pebble conglomerate. The depositional environment of the Torrens Member is interpreted as marine shoreface to beach.

The Torrens Member is overlain by the Grande Cache Member, which is composed of mudstone, fine-grained orange to brown weathered sandstone, thick coal seams, and orange to dark brown carbonaceous mudstone and siltstone. The rocks contain a high felspathic component, which assists with differentiating the unit during outcrop mapping (Dawson, 1989). The Grande Cache Member in the region is approximately 110 m thick and contains up to six coal zones, of which Zone 1 and Zone 3 are the thickest. The coal zone thicknesses vary considerably throughout the region (Dawson, 1989). The depositional environment of the Grande Cache Member is fluvio-deltaic and coastal plain.

Above the Grande Cache Member is a thick sequence of interbedded, fine-grained sandstone and mudstone, with minor carbonaceous beds of the

Mountain Park Member. Commonly the rocks have a greenish colouration that is attributed to the abundance of feldspar in the unit (Dawson, 1989). Typically, thin coal beds only occur at the top of the unit, with the rest of the interval being barren. The Mountain Park Member is approximately 150 m to 200 m thick. The base of the unit is typically represented by a thick, massive, greenish grey, cliff forming sandstone (Dawson, 1989). The depositional environment of the Mountain Park Member is fluvial (Prior, 2013). The top of the Mountain Park Formation is sharp and unconformable with the overlying Blackstone Formation of the Alberta Group. This contact is commonly distinguished by a pebble conglomerate that varies in thickness from 10 cm to 6 m (Dawson, 1989).

7.1.3 Upper Cretaceous Units (Alberta Group and Brazeau Formation)

7.1.3.1 Alberta Group

The Upper Cretaceous Units are divided into the Alberta Group, which is lower in the sequence, and the Brazeau Formation in the upper part of the sequence. The Alberta Group contains, from the lowest most unit to the upper most unit, the Blackstone Formation, the Cardium Formation, and the Wapiabi Formation. Each formation is reviewed below.

7.1.3.2 Blackstone Formation

The Blackstone Formation is characterized by shale that ranges from silty to calcareous, siltstone intervals that contains bentonite, thin lenticular sideritic beds. The shale is commonly fissile to platy and contains locally prominent bedding. In some areas, the shale has rust-coloured weathering. The uppermost sequence commonly contains sideritic nodules (Prior, 2013). The lower portion of the Blackstone Formation contains a sandstone interval; commonly a pebble layer occurs at the base of the sequence. The Blackstone Formation is up to 530 m thick (Stott, 1963). The Blackstone Formation is typically recessive, with the only complete exposure being observed along the South Ram River (Dawson, 1989). The depositional environment is interpreted as marine.

7.1.3.3 Cardium Formation

The Cardium Formation overlies the Blackstone Formation. The Cardium Formation is composed of thickly bedded to massive quartz sandstone, silty sandstone, siltstone, shale and pebble conglomerate (Prior, 2013). The depositional environment of the Cardium Formation is marine.

7.1.3.4 Wapiabi Formation

The Wapiabi Formation overlies the Cardium Formation and is the uppermost Formation of the Alberta Group. The Wapiabi Formation is composed of shale, mudstone, silty shale, argillaceous siltstone, and siltstone that at times is calcareous, platy, and has rusty-brown weathering. Locally, bentonite layers and areas containing siderite concretions are abundant. Rare, thin chert-pebble layers occur. The lower part of the Wapiabi Formation contains a fine-grained, massive to cross-bedded sandstone that characterizes the Marshybank Member. The upper part of the Wapiabi Formation contains fine-to-coarse-grained sandstone and argillaceous siltstone that characterize the Chungo Member (Prior, 2013). The depositional environment of the Wapiabi Formation is marine to locally nonmarine.

7.1.3.5 Brazeau Formation

Above the Alberta Group is the Brazeau Formation. The Brazeau Formation is composed of sandstone, laminated siltstone, and olive-green mudstone. The lower part of the Brazeau Formation is characterized by chert-and quartzite-bearing, granular to pebble conglomerate intervals. This interval is overlain by greenish-grey to dark grey mudstone, siltstone, and greenish-grey sandstone, thin coal to coaly shale beds. There are numerous thin bentonite layers in the upper part of the sequence (Prior, 2013).

7.2 Ram River Property Geology

The Ram River Property, as defined in an internal 2014 technical report, (Norwest, 2014) is composed of the North and South blocks. The North Block bifurcates from the South Block, with the North Block, measuring approximately 15 km in length and 3.5 km in width and with the South Block measuring, approximately 14 km at its longest point and 2.7 km at its widest point. The local geology of the Ram River Property is addressed in the following subsections in terms of local outcropping units, the associated structure, and the coal seam development and correlation.

The Luscar Group is the dominant host rock in the vicinity of the Ram River Property. The orientation of the Luscar Group in the property is aligned with the regional Northwest – Southeast orientation of the Rocky Mountains. The Alberta Group flanks the western side of the property. Northwest-southeast thrust faults occur to the west and east of the property area. The major regional Burnt Timber thrust fault is located 1 km to 2.5 km northwest of the property lease boundary. The thrust has a northwest-trending strike and a southwest-dipping angle of 35° to 40° with vertical displacement of approximately 90 m.

7.3 Structural Geology

The general structure of the Ram River property consists of northwest-trending anticlines and synclines. The major folding structure is the Ram River anticline. Most of the coal, in close proximity of the anticline axes, was eroded and the area of interest was divided into two blocks (northeast and southwest blocks) with gentle syncline structure (see Drawing 10).

The dipping angle of Seams 2 and 3 is less than 15° in large portions of the blocks (Drawing 11). Higher dipping angles (up to 35°) are observed in the northern part of the South block and the southern part of the North block along Ram River anticline axes.

The Ram River Property is intersected by northwest-southeast trending anticlines and synclines. The distance between the troughs of the folds is approximately 700 m in the central part of the North Block. Commonly, the dips of the stratigraphy vary from 10° and 36° (Erdman, 1945). The Ram River Anticline has had the largest impact on the property, as most of the coal that was near the axes of the Ram River Anticline was removed by erosion. The location of this anticline structure generally aligns with the break between the North and South blocks.

In addition to the observed folding in the Ram River Property, six thrust fault were identified in the North Block, four thrust faults were identified in the South Block and one thrust fault located between the blocks, as shown on Drawing 10. All faults have a northwest-trending strike and southwest dip direction. The vertical displacement varies from 20 m to 70 m. Local coal and interburden thickening was observed in faulted areas.

7.4 Coal Occurrences and Properties

The coal from the Luscar Group occurs on the Ram River Property in four identifiable seams. The primary economically recoverable coal seams within the Ram River Property are Seams 2 and 3. Stratigraphically, Seam 3 is located approximately 235 m above the base of the Luscar Group, and Seam 2 is located 15 m to 20 m below Seam 3 (Drawings 8 and 11). Seam 2 is often shown as two different plies, known as Seam 2 and Seam 2R (“the Rider Seam”). Seam 2R, appears, on average, 0.6 m above Seam 2, with an average thickness of less than 0.5 m. The average thicknesses of Seam 3 and Seam 2 are 3.5 m and 2.0 m, respectively (see Drawings 12 and 13). Seam 4 is located approximately 45m above Seam 3, and Seam 1 occurs approximately 5 m to 10 m below Seam 2. The average thickness of Seams 1 and 4 within the Ram River Property is less than 0.5 m although somewhat thicker occurrences of Seam 1 have been noted occasionally within the North block.

Seam 4 is generally composed of a black, shiny and vitreous coal without shale partings. Contact with underlying strata (e.g., sandstone, silty sandstone, shale and silty shale) tends to be sharp and extremely well defined, but the overlying strata contact is generally gradational. The coal is highly sheared and fractured, and possesses a very soft, friable and powdery texture.

Seam 3 appears relatively continuous throughout the property in its thickness, without any major partings. The coal is normally highly fractured and sheared, with a very soft, friable and powdery texture. The hanging wall contact is usually with a massively bedded sandstone unit exceeding 10 m in thickness. The contact with this sandstone is sharp and well defined. Strata below Seam 3 are generally mudstone, well-indurated shale, siltstone or sandstone with a relatively sharp contact.

The dip of Seams 2 and 3 is less than 15° in large portions of the blocks. Higher coal seam dips (up to 35°) are observed in the northern part of the South block and the southern part of the North block along Ram River anticline axes.

The interburden thickness between Seam 3 and Seam 2 within the North Block vary between 23 and 30 m, averaging 25. Thicker interburden is found along the syncline axes.

Seam 2 and 2R are separated by a parting of black to brown carbonaceous shale. Seam 2R consists generally of black to dark brown coal with numerous thin shale streaks. The coal within Seam 2R tends to be vitreous to dull, highly fractured, very soft and somewhat powdery. The coal within Seam 2 is fractured, extremely soft, friable and powdery. Strata immediately above Seam 2R are generally siltstone, sandstone or silty shale. The contact is much more gradational compared with Seam 3 upper contact. Strata below Seam 2 are generally silty shale, mudstone or silty sandstone. The shale tends to be carbonaceous when Seam 1 is present and the contact is gradational.

The coal within Seam 1, when present, is relatively hard and fractured. The strata above the seam vary from carbonaceous and bentonitic shale to sandstone. The strata immediately underlying Seam 1 generally consist of medium-grained, well-cemented sandstone or silty shale. The coal within Seam 1, when present, is relatively hard and fractured. The strata above the seam vary from carbonaceous and bentonitic shale to sandstone. The strata immediately underlying Seam 1 generally consist of medium-grained, well-cemented sandstone or silty shale.

The highly-fractured nature of the coal seams suggests intense in-seam deformation during folding of the Cretaceous Blairmore Formation strata.

7.5 Mineralization of The Blairmore Formation

For coal deposits, “mineralization” refers to coal development and coal seam stratigraphy.

Drilling has penetrated total of four seams on the property. The seams are named, from base to top, Seam 1, Seam 2, Seam 3 and Seam 4. Seam 1, Seam 3 and Seam 4 occur as single ply seams.

Seam 2 has splits or a "Rider Seam" associated with it (Seam 2R). This rider is typically thinner and usually not as laterally continuous as Seam 2. Occasionally the rider seams achieve thickness more than 1 m.

Seam 3 is the primary seam in the area, as illustrated on Drawing 12. No major partings were observed within the seam intervals. The seam thickness varies, and has an average thickness of 3.5 m. The sediment above Seam 3 varies from 0 m near outcrops to 150-200 m in the northwest block, to more than 500 m in the southeast block. The covering materials are mainly shale, sandstone and silty sandstone.

Seam 2 is thinner than Seam 3, with an average thickness of 2.3 m, as illustrated on Drawing 13. Shale to silty shale occur above Seam 2 between Seam 2 and Seam 2R.

8 DEPOSIT TYPES

The definition of “Deposit Type” for coal properties is different from that applied to other types of geologic deposits. Criteria applied to coal deposits for the purpose of determining coal resources and reserves include both “Geology Type” and “Deposit Type”. For coal deposits this is an important concept because the classification of a coal deposit as a particular type determines the range of limiting criteria that may be applied during the estimation of reserves and resources.

“Geology Type” for coal deposits is a parameter that is specified in Geological Survey of Canada Paper 88-21 (GSC Paper 88-21), which is a reference for coal deposits as specified in NI 43-101. A coal's “Geology Type” defines the amount of geological complexity, usually imposed by the tectonic history of the area, and the classification of a coal deposit by “Geology Type” determines the approach to be used to calculate resource/reserve estimates and the limits to be applied to certain key estimation criteria. The identification of a particular “Geology Type” for a coal property defines the confidence that can be placed in the extrapolation of data values away from a particular point of reference, such as a drill hole.

The classification scheme of GSC Paper 88-21 is similar to many other international coal reserve classification systems, but it has one significant difference. This system is designed to accommodate differences in the degree of tectonic deformation of different coal deposits in Canada. "Geology Type" is divided into the following four classes:

- Low, for deposits of the Plains type with low tectonic disturbance;
- Moderate, for deposits affected to some extent by tectonic deformation;
- Complex, for deposits subjected to relatively high levels of tectonic deformation and
- Severe, for Rocky Mountain-type deposits subjected to extreme levels of tectonic deformation.

The Ram River property is divided into two areas containing coal resources (designated as North Block and South Block) with a similar level of structural complexity. Both blocks have a gentle syncline structure. In both blocks, a thrust fault has been identified. The structure of this area exhibits the features that cause it to be categorized as a Moderate Geology Type in both blocks.

“Deposit Type,” as defined in GSC Paper 88-21, refers to the extraction method most suited to the coal deposit. "Deposit Type" is divided into the following four categories:

- Surface
- Underground
- Non-Conventional
- Sterilized

Ram River property is relatively close to important infrastructure, including major roads, rail and power. These features will be important for the development of the property. Because of the nature of the terrain and the geology within the lease boundaries, the area of Ram River property is amenable for development using both surface and underground mining methods.

9 EXPLORATION

The majority of the exploration that has been conducted in the Ram River property is in the form of drilling and mapping. The drilling techniques used are of different types including diamond coring and conventional air rotary drilling. The drilling activities are discussed in greater detail in Section 10 of this Technical Report.

Based on the information in *Ram River Exploration Report Improvement District No. 10 Volume I of V, May, 1981,* two mapping programs have been conducted in the Ram River property. “A preliminary surface reconnaissance mapping program in 1970” was conducted on the Fraser-Ram River property followed by a drilling program in late 1970 and early 1971. “A detailed surface mapping program of the entire Ram River area was undertaken by Consol during summer, 1974. A geology map, on scale of 1”=2000’, was prepared from this mapping program to serve as the base designing of future drilling programs”.

In 2013, a non-invasive geological surface mapping program was completed prior to the 2013 drilling program. Two teams consisting of two geologists mapped outcrops and sub-crops within the Ram River property boundaries. A total of 429 points were recorded throughout the mapping program. This mapping helped to confirm the surface mapping done in 1974, and provided new geological information based on recent outcrop exposure (from trails/roads).

10 DRILLING

RAM provided the drill hole dataset used to prepare the Ram River Property geologic model. This database includes 608 holes with a total drilling meterage of 63,210 m. Table 10.1 shows the year in which drilling was conducted, the total number of metres drilled, and the number of holes completed. Drawing 14 shows the collar locations for each of the drill holes included in Table 10.1.

Table 10.1
Exploration Drilling

Year	Holes Drilled	Depth Drilled (m)
1970	43	6,387
1973	83	6 165
1974	291	27,947
1975	6	269
1980	22	3,620
1981	44	6,531
2012	13	826
2013	106	11,465
Total	**608**	**63,210**

The following discussion relies on the information presented in *Ram River Exploration Report Improvement District No. 10 Volume I of V, May, 1981* and *Coal Resources Report Ram River Property, February 2013.* The 2013 drilling program is also discussed below.

10.1 Drilling Programs

All 43 drill holes from 1970 drilling program were conventional rotary exploration holes, logged with natural gamma and resistivity tools.

In 1973, a second phase of exploration drilling was conducted and an additional 83 holes were drilled. The majority of these holes were drilled within TVI-Ram River and Fraser-Ram River portions of the Ram River properties. The holes drilled in 1973 were conventional rotary exploration holes and were geophysically logged with natural gamma, resistivity or density tools, or a combination of the three. The drilling program continued into the first months of 1974.

Detailed surface mapping was undertaken in the summer of 1974 and a geology map, on a scale of 1:2000, was prepared. The detailed mapping was followed by another drill hole exploration program. A total of 297 drill holes were drilled in 1974 and early 1975. The majority of these drill holes were rotary exploration holes. Some of the drill holes were rotary drilled with predetermined core intervals to obtain coal samples from Seam 3 and Seam 2. Coal samples were obtained from 42 drill holes.

The 1980 exploration program included 22 drill holes: 2 diamond drill holes, 3 rotary core holes and 17 rotary exploration holes. Core recovery was excellent in adjacent strata, and poor in coal zones.

Following the 1980 drilling program, 44 holes were drilled in 1981, including 14 core holes and one diamond drill hole. As was the case in the previous year, core recovery was excellent in adjacent strata, and poor in coal zones.

In 2012, Ram Coal Corporation completed a large-diameter drilling program. Multiple large-diameter (15 cm) core holes were drilled in two North Block locations to obtain a large enough quantity of each seam for bulk sample for washability and metallurgical testing. On site A1, a pilot rotary drill hole was drilled to determine coal intervals, followed by 3 large diameter core holes targeting Seam 3. On the site A4, a pilot rotary drill hole was drilled followed by 6 large diameter core holes targeting Seam 3 and Seam 2. Two additional core holes (HQ-size) were drilled in 2012. The recovery in the large-diameter holes was excellent, but the recovery in the smaller diameter holes was similar to that in previous years – good through the rock zones but poor through the friable coal zones.

Ram Coal's 2013 exploration program was designed to gather geological, structural, coal quality, geotechnical, geochemical, hydrological and environmental information necessary for a proposed FS. The previous dataset from historical drilling programs was lacking sufficient information in all areas required for a proposed FS or PFS. A total of 11,465 metres in 106 holes on 54 sites were drilled between July 2013 and January 2014. This includes open holes, core holes, overburden holes, standard penetration test (SPT) holes and test pits. Overall, the key objectives of the program were met.

10.2 Drilling Procedures

The 2012 drilling procedures are summarized from the 2013 BOYD report. The 2013 drilling procedure is discussed in Section 10.2.3.

10.2.1 Pre-2012 Drilling Procedures

Pre-2012, diamond core holes were drilled with an HQ-size core bit by a skid-mounted Longyear Super 38 drill rig. The diamond cores were cut by rapid rotation (between 2,000 rpm and 2,500 rpm), feed pressure between 690 kPa and 1,000 kPa, and pump pressure between 690kPa and 860 kPa. Overall core recovery was 99% for non-coal intervals and 40% in coal intervals.

Rotary cores utilized conventional rotary drilling to a depth of 3m to 4.5m above coal seams. At this depth, rotary drill pipe was replaced with a wireline coring pipe and a Christiansen double-core barrel. Core runs in roof and floor were between 1.5m and 3m, and 0.3 to 0.6m in coal. After the coring run was cut, a retrieval device was lowered into the wireline pipe to remove the barrel. The barrel was laid into a pipe rack and was disassembled in order to remove the core. Following removal, the attending geologist would take preliminary notes on lithology, core recovery, and fracturing; the core was then boxed. Recovery of roof and floor cores varied between 60% and 100%; coal seam core recovery was between 20% and 40%. Numerous variations of feed pressure, rotation speed, pump pressure, and drill fluid pressure were attempted to improve core recovery. All were met with minimal success.

The remaining holes were drilled with rotary drilling using reverse-circulation air sampling. Chips samples were bagged, labeled, and sent out for laboratory analysis. Several samples from the 1980 program were contaminated by fine sediments along the drillhole; previous reports attribute this to high hydraulic head at the depth of the coal seams that required high pressure to push samples to the surface and long transport time.

10.2.2 2012 Drilling Procedures

The 2012 drilling was done by a track mounted, self-propelled rig, capable of drilling with compressed air with variable drill hole diameter sizes from HQ and larger. In the interest of expediting the program, it utilized air rotary hammer drilling in non-coal intervals and switched to coring in the coal seam sections. In this way, coal samples of suitable size for the desired analyses could be obtained. The drill cuttings from the rotary drilling were not used for analyses.

Each site consisted of a full-length air rotary hammer drilled pilot hole that was used to establish coal seam and thickness. Cuttings from this pilot hole were collected at 1 ft intervals and the top and bottom depths of the desired seams were determined. Following this determination, the rig was moved to a nearby location on the same drill pad where multiple 150mm diameter core holes could be drilled in order to recover enough material for bulk sample analysis. 240 kg of material was required for the No. 3 Seam and 180 kg for No. 2 Seam.

Bulk sample drilling consisted of first air rotary hammer drilling the 150 mm diameter drill holes down to depth of 1m to 2 m above where the top of the target coal seam was encountered in the pilot hole. At this point, drill rods were pulled, the air rotary hammer bits are replaced with a 150 mm diameter coring bit, and a double walled core barrel with a split inner barrel. Remaining roof rock was then cored along with the entire coal seam. Coring was stopped once an approximate depth of 0.5m to 1 m below the coal seam was reached. All of the large diameter core holes achieved good to excellent recovery percentages. See Table 10.2 for exact recovery percentages of all samples taken in the coal seams of interest.

Recovered coal samples were geologically described, measured, photographed, and packed in plastic lined wooden boxes. The core boxes were then sealed and stored in heated garage. Once the minimum required sample weight was achieved for each seam, the samples were taken to Loring Laboratories, in Calgary Alberta, Canada, for analysis.

Due to the low core recovery in the coal intervals from 1980 and 1981 drilling programs and reported contamination in 1980 drill cuttings, only coal quality samples from 12 drill holes were determined as “reliable” drill holes by RAM’s contracted geologists to be used in geological model. Criteria used to determine drill holes with reliable coal quality data includes: core recovery more than 85%, available lithology and geophysical logs, and clear record of the drill hole interval where the sample was taken.

Table 10.2
Coal Quality Sample Recovery Percentages

Sample ID	From	To	Seam	Percent Recovery
A1B1	55.48	59.21	3	97
A1B2	55.46	59.88	3	78
A1B3	55.82	59.86	3	93
A4B1	19.71	24.04	3	91
A4B1	45.75	47.79	2	100
A4B2	45.75	47.47	2	100
A4B2	19.5	23.72	3	98
A4B3	20.38	24.4	3	98
A4B4	46.11	47.6	2	100
A4B5	46.4	48.08	2	90
A4B6	45.3	47.37	2	100

10.2.3 2013 Drilling Procedures

Multiple drilling methods were used throughout the 2013 program. These included rotary, rotary with coring of select coal seams, and roof and floor strata, as well as continuous coring of selected holes from the collar to the total depth of the hole. All sites had at least one rotary open hole, with a maximum of two drill holes per site (i.e. one open rotary and one rotary with partial coring or a continuous coring hole), except for the bulk sample locations.

11 SAMPLE PREPARATION, ANALYSES AND SECURITY

The following is a summary of the "Sample Preparation, Analyses and Security" sections of *Coal Resources Report Ram River Property, February 2013*.

All explorations and coal quality testing for the Ram River property were conducted by CONSOL from 1970 to 1981. It is our understanding that work conducted in that period by CONSOL was performed both by company employees and third-party vendors. The authors of this report did not participate in any of the exploration activities and cannot comment on the security measures employed in conducting such work.

2012 exploration program was supervised by BOYD. All coal seam core handling, descriptions, storage and delivery to Loring Laboratories, in Calgary Alberta, under BOYD's supervision. "All analytical work was to be done in accordance with American Society for Testing and Materials (ASTM) or International Organization for Standardization (ISO) standards".

2013-14 exploration program was supervised by RAM's consultants. All coal seam core handling, descriptions, storage and delivery to Loring Laboratories, in Calgary Alberta, under RAM Coal's or its contractor's supervision. "All analytical work was to be done in accordance with American Society for Testing and Materials (ASTM) or International Organization for Standardization (ISO) standards".

12 DATA VERIFICATION AND RESOURCE MODEL DEVELOPMENT

RAM provided Norwest with the electronic drill hole data. The dataset included tables with: collar locations, drill hole intervals with lithology description, drill hole intervals with seam name assignments, downhole survey, overburden thickness and core hole coal quality results.

12.1 Lithology Review

In an effort to refine the drill hole coal interpretation and coal correlation, RAM's internal geological consultants adjusted some of the seam picks of the roof and the floor of the coal plies. These adjustments have been made only in the dataset storing the seam interval. The lithology description table was not updated. Due to the created discrepancy between the lithology descriptions and seam intervals, lithology description data was omitted and seam interval assignments were used in the model.

Table 12.1 summarizes the drill hole dataset used to develop the models.

Table 12.1
Drill Hole Dataset

	Collar	Survey	Seam Picks	Overburden	Coal Quality
Total Drill Holes	608	608	451	385	23

About 15% of geophysical logs (e-logs) were reviewed to ensure accuracy. As discussed with RAM, the main targets were Seam 3, Seam 2 and Seam 2R. During the review of the geophysical logs, a limited number of drill holes in Seam 2R did not identify due to an unclear e-log response and/or poor coal quality. These intervals were re-evaluated by a geology consulting group hired by RAM and added to the database.

12.2 Coal Quality Data Review

The coal quality data, used to develop the geological model, was taken from 23 drill holes. The location of the drill holes with coal quality data are shown on Drawing 14.

Seventeen drill holes characterized moisture, ash, volatile matter (VM), fixed carbon (FC), sulfur and free-swelling index (FSI) of Seam 3. Nine of these drill holes also provide information on the calorific values (CV) and density (SG) of Seam 3.

Sixteen drill holes characterized moisture, ash, volatile matter (VM), fixed carbon (FC), sulfur and free-swelling index (FSI) of Seam 2. Ten of these drill holes also provide information on the calorific values (CV) and density of Seam 2. In addition, 2 samples were examined from Seam 2R.

Based on the available information, a relationship between ash and SG was established, as well as a relationship between ash and CV. For the samples without SG and CV information the SG and CV value were estimated using formulas:

$SG = 0.0118 * ASH_{AD} + 1.2119$

$CV = -88.822 * ASH_{AD} + 8337.4$

where ASH_{AD} is Air Dried Basis Ash.

Most of the 23 drill holes with coal quality data provide interburden and partings information used in the geological model.

12.3 Resource Model Preparation

The resource model was developed using MineSight®, Mintec's geological modeling and mine planning software. MineSight® is widely used throughout the mining industry for digital resource model development. Mintec's suite of interpretive and modeling tools is well-suited to meet the modeling requirements of RAM's Aries Project.

Norwest determined that a Gridded Seam Model (GSM) approach would be the most appropriate method to characterize this deposit for underground mining and a three-dimensional block model (3DBM) approach would be more appropriate for surface mining evaluation. Therefore, the Aries Project has been evaluated using a 3DBM.

The 3DBM consists of laterally and vertically contiguous cells (commonly called blocks) that occupy the 3-D extents of the project area. The selected block size was determined based on the density of the drill hole dataset, as well as the requirements for the mining selectivity of a particular deposit. The block size for this assessment was 25 m x 25 m x 10 m (x, y, z). Each block has a fixed position of easting, northing and elevation within the 3D model and contains a list of variables or numeric identifiers such as the seam code, ore percent, coal thickness, coal quality values, specific gravity, as well as other pertinent information. These attributes are used to characterize the deposit in a manner that supports all surface mining-related initiatives.

Table 12.2 shows the extents and rotation of the 3DBM.

Table 12.2
3DBM Limits

Direction	Minimum (m)	Maximum (m)	Dimension (m)	# of Blocks
East	579,860	599,892	25	460
North	5,783,300	5,802,715	25	660
Elevation	800	2,200	10	140
Rotation origin	East: 592,500	North: 5,783,300	Elevation: 0	Rotation: 310°

12.3.1 Topography and Base of Till Horizons

RAM provided Norwest with the topography surface file from the light detection and ranging (LiDAR) topographic flyover survey. The triangulated surface was converted into a gridded surface file in MineSight®.

Drill hole collar locations were compared against the topographic surface. 94% of the drill hole collar elevations were within +/-3 m of the LiDAR topography. All remaining locations were within +/-6 m. Considering the topographic relief of the project area, the cut and fill earthworks required to construct the drill pads could generate differences within this range. Furthermore, there didn't appear to be any material bias in the differences. Based on the results from this comparison, Norwest decided to use the drill hole collar locations as provided.

A till isopach was developed throughout the project area using vertical till thickness intervals identified within each of the drill holes. This isopach was used to define the contact between the bedrock and overburden (till). The isopach thickness was subtracted from the topographic horizon to create a base-of-till surface (or bedrock contact).

12.3.2 Geologic Interpretation

Structural interpretation of the deposit was developed by RAM's geological consultants. Norwest was provided with thirty-one triangulated surfaces: ten represented the footwall (FW) of Seam 2 within ten unique fault blocks, ten represented the FW of Seam 3 and eleven represented thrust faults dividing each respective fault block.

Drill hole seam interpretation and seam correlation provided were verified on a drill hole by drill hole level to ensure interpretive consistency.

Surfaces were reviewed against drill hole seam intersections and geological settings in the area and were deemed to be reasonable and the interpretation acceptable for resource and reserves definition.

12.4 Resource Model Preparation

The seams of economic interest for the Aries Project area are Seam 3 and Seam 2 as illustrated in Drawings 4 and 5. Because of the proximity of Seam 2R to Seam 2, Seam 2R was also included in the modeling effort.

During the seam interpretation stage, the top and the bottom depths of each seam zone were identified in the drill holes. All lithology intervals, defined as either rock or coal, contained within these zones were assigned to a specific seam group. A unique code was used for each of the modeled seams. Table 12.3 shows the seam name and seam code used in the model.

Table 12.3
Seam Name and Seam Code in 3DBM

Seam name	Seam code	Seam Group Code
3	35	30
2R	27	20
2	25	20

Data assigned to each model block includes: percentage of the block occupied by the seam group, percentage of the mineable portion of the gross Seam Group within the block, true thickness of the group, coal percentage, parting percentage, oxidation zone percentage, coal quality values, number of contacts between individual plies and partings/rocks, Run-of-Mine (ROM) coal quality values and ROM specific gravity. Each of these block variables are described below.

12.4.1 Seam True Thickness

Although each of the coal and rock intervals have a down hole drilling length, it was necessary to convert these lengths into true thicknesses. True thickness refers to the thickness using a measurement orientation orthogonal to the bedding plane of the seam. Differentiating mineable coal from separable waste intervals for the block model is based on a true thickness measurement approach.

A total of 660 vertical cross sections were generated orthogonal to the geological structure (which has an azimuth of 310°), 25 m apart, through the centroid of each model grid. Provided seam footwall (FW) surfaces were sliced to create polylines on each cross section representing the seam footwall. Using the downhole survey for each drill hole, combined with the constructed footwall polylines, an algorithm was used to convert downhole lengths into true thicknesses for each seam and parting interval intersection.

The drill hole Seam Grouping's true thickness values and seam footwall polylines were used to interpolate the top of the Seam Group and create closed seam polygons on each section. All the polygons were then clipped against faults and base of the overburden horizon.

To avoid interpolating very thin or very thick true thicknesses due to structural disturbance, manual changes on a case-by-case basis were made, and some drill hole intervals were excluded from true thickness interpolation; these were discussed with RAM and are shown in Table 12.4.

Table 12.4
Intervals Omitted in True Thickness Interpolation

Drill Hole	From	To	Seam	Reason
13-RR-008	53.7	57.8	2	Unusual thickening of seam, possibly due to faulting
13-RR-018	3.3	8.3	3	Unusual thickening of seam, possibly due to faulting
13-RR-034	109	117.7	3	Unusual thickening of seam, possibly due to faulting
13-RR-037	9.5	15.7	3	Unusual thickening of seam, possibly due to faulting
70-I-01	24.41	25.02	2	Unusual thickening of seam, possibly due to faulting
70-I-01	25.3	27.01	2	Unusual thickening of seam, possibly due to faulting
70-I-02	13.11	16.15	2	Unusual thickening of seam, possibly due to faulting
70-II-11	159.17	169.71	2	Seam repetition due to faulting
70-III-07	133.87	135.45	3	Seam repetition due to faulting
70-III-08	161.97	163.43	3	Questionable correlation of seam
70-III-11	257.56	259.78	2	Seam repetition due to faulting
70-III-17	135.35	137.46	2	Unreliable seam thickness.
70-III-22	128.53	135.91	3	Unusual thickening of seam, possibly due to faulting
73-RR-101	22.71	23.01	3	Questionable correlation of seam.
73-RR-111	7.32	8.23	3	Seam is in contact with overburden
74-C-32	93.88	94.4	1	Unusual thickening of seam, possibly due to faulting
74-C-63	86.11	86.62	1	Unusual thickening of seam, possibly due to faulting
74-RR-121	159.59	160.66	2	Unreliable seam thickness
74-RR-137	107.59	110.95	3	Unreliable seam thickness. Second drill hole on same pad had more reliable thickness data, was used instead
74-RR-142	70.32	80.47	3	Unusual thickening of seam, possibly due to faulting
74-RR-155	57.7	62.97	2	Unusual thickening of seam, possibly due to faulting
74-RR-159	48.71	50.47	2	Unusual thickening of seam, possibly due to faulting
74-RR-170	9.14	9.45	2	Seam is in contact with overburden

Drill Hole	From	To	Seam	Reason
74-RR-205	94.18	97.6	2	Reported thickness possible composite of plies
74-RR-211	1.22	2.8	3	Seam is in contact with overburden
74-RR-213	4.75	5.85	3	Seam is in contact with overburden
74-RR-214	2.74	5.03	3	Seam is in contact with overburden
74-RR-222	2.83	4.18	3	Seam is in contact with overburden
74-RR-242	17.74	18.23	2	Unusual seam thickness, possibly due to folding/faulting
74-RR-246	4.57	6.71	2	Reported thickness possible composite of plies
74-RR-247	7.01	10.97	2	Reported thickness possible composite of plies
74-RR-249	6.4	9.45	2	Reported thickness possible composite of plies
74-RR-252	13.11	17.68	2	Reported thickness possible composite of plies
74-RR-258	15.82	21.64	3	Unreliable seam thickness
74-RR-263	4.05	7.44	3	Unreliable seam thickness
74-RR-283	2.99	5.82	3	Seam is in contact with overburden
75-BD-06	3.81	12.95	3	Possible structural thickening
80-RR-08	167.94	170.6	3	Atypical log response, possible shearing
81-RR-13C	210.92	213.57	2R	Unreliable seam thickness. Second drill hole on same pad had more reliable thickness data, was used instead
81-RR-18	26.88	35.84	3	Unusual thickening of seam, possibly due to faulting
81-RR-39C	174.59	188.18	2R	Unusual thickening of seam, possibly due to faulting
81-RR-43C	145.57	146	2/2R	Unreliable seam thickness
81-RR-DDH4	197.85	204.37	2R	Unusual thickening of seam, possibly due to faulting

12.4.2 Seam Group and Seam Group Percentage

The coal polygons were used to populate the model blocks with Seam Group codes, and the volume percentage of the seam polygons contained within a particular block. Each polygon is located at the centroid of the model column, and has projected influence of 12.5 m on both sides of the polygon. For example, if a given polygon only intersected 30% of a model block (by area footprint projection), then the volume percentage assigned to the block would be 30%. If more than one polygon intersected a model block, then additional seam identifiers and volume percentage attributes were populated using top-down stratigraphic priority order.

12.4.3 Coal-Waste Discrimination

Using a minimum coal true thickness of 0.5 m and a minimum separable parting true thickness of 0.3 m on the individual plies, a discrimination routine identified all mineable coal intervals, non-separable parting intervals, and waste zone.

The proportion of mineable coal for each Seam Group composite is the thickness of the individual coal plies and non-separable parting intervals that meet the prescribed criteria within a given seam group interval, divided by the total thickness of the grouping. Therefore, if a given seam group interval has a true thickness of 3 m and had only 2.1 m of mineable coal (the thickness sum of the individual mineable coal plies and non-separable partings), the mineable coal ratio would be 0.7 or 70%.

Mineable coal percentages calculated within the Seam Group composites were interpolated into the model blocks using an inverse distance interpolation method.

After the percent representing the volume of the seam group, occupying the given block, and the mining percent are populated, the coal percent is calculated as the product of the group percent and mineable percent. In other words, if the seam group occupies 80% of the block, and only 75% of that is mineable, then the mineable coal presented in the block will be 60%. A similar calculation is completed to determine the parting percent contained within the block. In the example above, the parting percent would be 20%.

12.4.4 Coal Quality and Specific Gravity

Coal quality data for this study was composited and populated into the model.

For each composited seam group, the coal quality value was calculated using a length-weighted and density-weighted average of the values for each of the individual coal plies and non-separable parting intervals that met the prescribed criteria for mineable within a given interval.

As an example, the formula used to calculate the ash in the composites is:

$$Composited\ Ash = \frac{\sum_{i=1}^{n} Ash_i * SG_i * Interval\ Lenght_i}{\sum_{i=1}^{n} SG_i * Interval\ Lenght_i}$$

Any quality data, contained within the composite zone and identified as non-mineable, would not be used in the composited average.

The coal quality values for each composited seam group were interpolated into the model blocks using an inverse distance algorithm.

12.4.5 Contact Count

Each mineable coal/waste contact within a drill hole Seam Grouping was tabulated and assigned a respective composite interval. A coal grouping that contained two unique mineable coal plies would be assigned a contact count of four, and a group that contained only one mineable coal ply would be assigned a contact count of two. These contact counts were used to determine coal loss and mining dilution in "run of mine" calculations.

Contact counts were interpolated into the model blocks using an inverse distance interpolation method. Due to the averaging, or smoothing, algorithm used, the resulting values populated into the model blocks were not in even increments of two. This means that the absolute value contained within any given model block is not necessarily accurate, but, statistically, the distribution of the contact counts throughout a region of model blocks is representative of the drill hole inputs. The benefits of using an inverse distance interpolation for this particular attribute include: a smooth gradation of dilution fluctuations through the model, and a consistent interpolation method used to populate other block attributes.

12.4.6 Run-of-Mine Values

Coal quality values represent in-place or in-situ estimates of the various quality parameters. Run-of-mine (ROM) results are estimated in order to reflect the mining product transported to the processing facility. As a result, ROM estimates include the effects of dilution and coal loss that are inherent in surface mining operations. Dilution is included in the following manner: a constant dilution thickness of 7.5 cm is multiplied by the mining contact count assigned to each model block. Total dilution thickness is added to the block true thickness attribute, with an equivalent thickness (7.5 cm per contact) of coal being removed (coal loss). A portion of the coal thickness has now been replaced with rock thickness.

As an example, the formula used to calculate ROM ash (RMSH) in each model block is as follows:

$$ROM\ Ash = \frac{(SG_{Coal} * Ash_{Coal} * (\mathrm{TT} - \mathrm{CC} * 0.075)) + (SG_{dilution} * Ash_{Dilution} * \mathrm{CC} * 0.075)}{(SG_{Coal} * (\mathrm{TT} - \mathrm{CC} * 0.075)) + (SG_{Dilution} * \mathrm{CC} * 0.075)}$$

where:

ROM_{Ash} is Run-of-Mine Ash

Ash_{Coal} is the Ash of the coal

$Ash_{Dilution}$ is the Ash of the dilution material

SG_{Coal} is the Specific Gravity of the coal

$SG_{Dilution}$ is the Specific Gravity of the dilution material

TT is the true thickness of all mineable plies in the seam group

CC is the contacts count

Due to the gradual roof contact of Seam 3 in some drill holes, 76 drill holes with geophysical logs have been reviewed to identify the high dilution area for Seam 3.

The northern half of the proposed pit area had dilution thicknesses of 0.15 m per contact applied for Seam 3. The southern portion of the pit has thicker contact dilution of 0.3m, due to gradational seam footwall contacts. Coal loss thickness remains unchanged at 0.075 m per contact.

As an example, the formula used to calculate ROM ash (RMSH) in each model block within the high dilution area for Seam 3 is as follows:

$$ROM\ Ash = \frac{(SG_{Coal} * Ash_{Coal} * (\mathrm{TT} - \mathrm{CC} * 0.075)) + (SG_{dilution} * Ash_{Dilution} * \mathrm{CC} * 0.15)}{(SG_{Coal} * (\mathrm{TT} - \mathrm{CC} * 0.075)) + \ (SG_{Dilution} * \mathrm{CC} * 0.15)}$$

where:

ROM Ash is Run-of-Mine Ash
Ash Coal is the Ash of the coal
Ash Dilution is the Ash of the dilution material
SG Coal is the Specific Gravity of the coal
SG Dilution is the Specific Gravity of the dilution material
TT is the true thickness of all mineable plies in the seam group
CC is the contacts count

Run-of-Mine coal percent was adjusted to reflect increased ROM volume.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Sampling and Testing

An exploration program was conducted by RAM in 2013 on the Ram River property. This program included a select number of large diameter (150 mm) cores (LDC) for the purpose of obtaining representative washability and carbonization data. Seams 2 (1 sample) and 3 (2 samples) were drilled and laboratory testing data was collected.

13.2 Seam Characterization

Based on the washability results from the 2012 to 2014 exploration and testing program, Norwest input the washability data into the Limn® process simulation platform. Using a selected process design flowsheet that typifies current industry designs for the recovery of high value coking coals, a plausible simulated product for each seam was developed.

The mined coal from Aries or the property will likely fall into two main logical groups: marginally high medium volatile (mid-vol) and high volatile (high-vol) bituminous coals.

Both seams will be marketed as Tier 2 hard coking coal (HCC). Seam 3 has a fluidity of 385 ddpm and could be marketed independently from Seam 2 which has a fluidity of 66 ddpm. Proper blending of Seam 2 and Seam 3 products (or ROM) will allow marketing a single product with characteristics that can be fully defined depending on the mining strategy.

Historical results and considerations (1970-1990) are in line with most recent results (2012-2013) in terms of coal quality, requirements for coal washing and expected results.

13.3 Projected Coal Characterization & Washabilities

RAM engaged in comprehensive exploration and testing programs during 2012 and 2013. As part of those programs, several large diameter (LD) cores (150 mm) were extracted from the key seams in the planned Aries North Block mining areas. The purposes of the LD cores were to enable improved core recovery and to provide sufficient coal mass to perform bulk washability tests. The LD cores were also of sufficient mass to provide bulk samples for coke pilot oven testing as well as performing a pilot washing test. Two separate Norwest documents, *Ram River Prefeasibility Coal Preparation Evaluation* (Norwest, 9-9-2014) and *Ram Coal Bulk Samples Test Work Report* (Norwest, 10-14-2014) detail the characterization of the Aries property coals and the pilot wash testing performed in Australia.

RAM and Norwest jointly developed a bulk washability testing program for the LD cores for the purpose of designing a coal process plant. The program included core treatment procedures accepted internationally, especially for use in coking coal assessment. This included a series of low-energy liberation procedures, including dry and wet tumbling tests. The latter two tests tend to replicate the effects of screening and pumping operations in a preparation plant allowing a more accurate modeling and simulation for the determination of an optimal process. This is especially important given the typically friable nature of western Canadian metallurgical coals.

13.3.1 Large Mass Bulk Washability Laboratory Testing Program

Bulk samples of sufficiently large mass to develop PFS level process plant designs were obtained from LD cores. The washability study testing procedures for the large mass LD cores were prepared and tested in the following manner.

13.3.1.1 Attrition Treatment

The cores were broken by means of drop-shatter testing. Individual lots of 25kg batches were repeatedly dropped 12 times from a height of 2m. After the drops, the raw coal was screened a 100mm with the oversize hand knapped to pass 100mm. This was followed with an initial screen analysis at following sieve fractions; 75mm, 50mm, 31.5mm, 25mm, 19mm, 12.5mm, 9.5mm, 6.3mm and 2mm.

The shattered coal was then dry tumbled for 5 minutes in 50kg batches followed by wet tumbling with steel cubes for another 5 minutes.

The bulk sample was then wet screened into 16 size fractions at 75mm, 50mm, 31.5mm, 25mm, 19mm, 12.5mm, 9.5mm, 6.3mm, 2mm, 1mm, 0.5mm, 0.25mm, 0.15mm, 0.075mm and 0.038mm.

A bulk analysis of the entire raw sample was conducted prior to screening, float-sink and froth flotation testing for reference. The analyses included moisture, ash, volatile matter, fixed carbon, sulphur, heat content and FSI, as well as equilibrium moisture and light transmittance values.

13.3.1.2 Float-Sink Testing

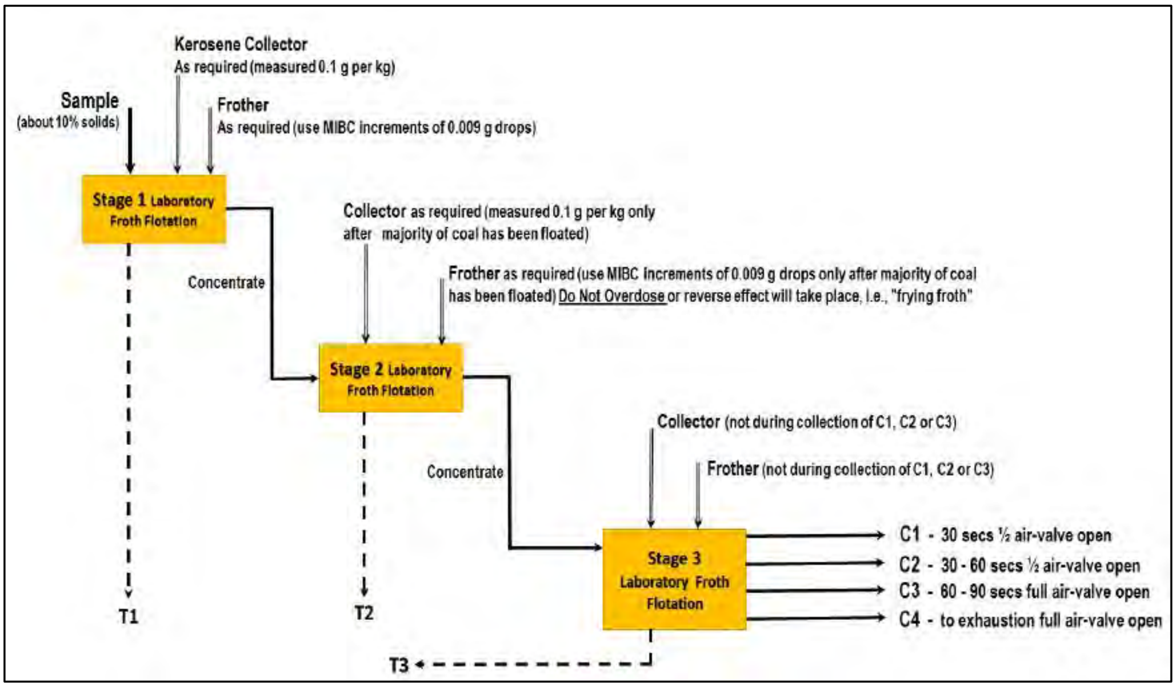
The attrited sample screen fractions were recombined into 5 size groups for float-sink testing. The size fractions were 50mm x 19mm, 19mm x 9.5mm, 9.5mm x 2mm, 2mm x 0.5mm and 0.5mm x 0.25mm. The original 100mm x 50mm fraction was relatively small and was hand knapped to pass 50mm and distributed among the other fractions. These fractions were individually subjected to float-sink tests at the following 15 density fractions: 1.27, 1.30, 1.35, 1.40, 1.45, 1.50, 1.55, 1.60, 1.65, 1.70, 1.75, 1.80, 2.00, 2.20 and 2.20 sink.

Ash, volatile matter, sulphur and FSI analytical test were performed on each density fraction.

13.3.1.3 Froth Flotation Testing

Froth Flotation testing was performed on the minus 0.25mm ultrafine fraction of Seam 2 and 3 bulk samples. A release analysis procedure was used as depicted in Figure 13.1.

Figure 13.1
Ram Coal Froth Flotation Release Analysis Procedure

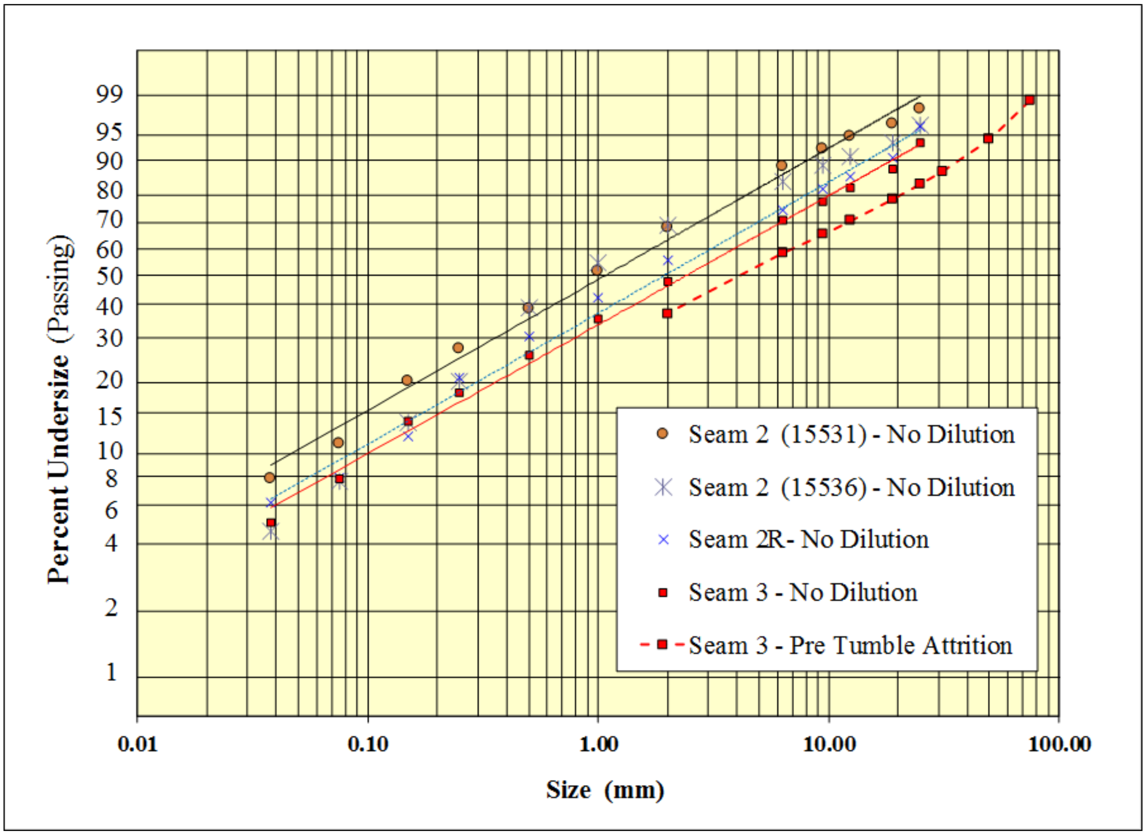


13.3.2 Size Distributions

The composite size distributions of Seams 2 and 3 as well as Seam 2 Rider core samples, after the dry and wet tumbling attrition procedures, were fine. A Rosin-Rammler plot of the key bulk seam samples is shown in Figure 13.2. These size distributions appear to be typical of the Canadian Rocky Mountain coal region and are deemed to be related to tectonic induced friability.

The size distributions derived from the current testing has been used as a design basis for raw coal feedstock to develop the preparation plant process.

Figure 13.2
Ram Coal Rosin-Rammler Particle Size Distributions
– Attrited Bulk Seam Samples



13.3.3 Individual Coal Seam Washability Characterizations

The densimetric washability character of the Aries coal seams are graphically shown in Figures 13.3 through 13.5 below. Each seam float-sink data for each size fraction has been proportionately combined by particle size distribution and plotted as a single line. The shape of the line curve for each seam visually characterizes relative yield and level of wash difficulty.

The cumulative ash and theoretical yield values are plotted to visually depict the washability characterizations of the individual coal seam. Note that the yields shown are only theoretical and should not be confused with simulated plant yields, which are always somewhat lower due to real-life process inefficiencies.

Figure 13.3

Ram Coal Seam 3 Ash-Theoretical Yield Characteristics (50mm x 0.25mm)

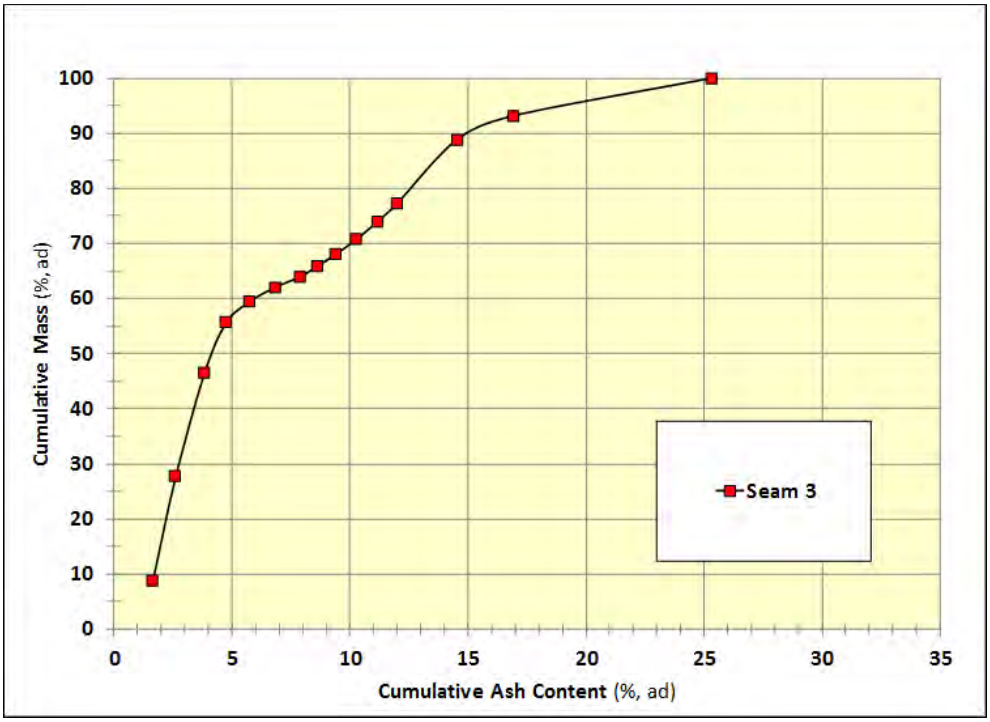


Figure 13.4

Ram Coal Seam 2 Ash-Theoretical Yield Characteristics (50mm x 0.25mm)

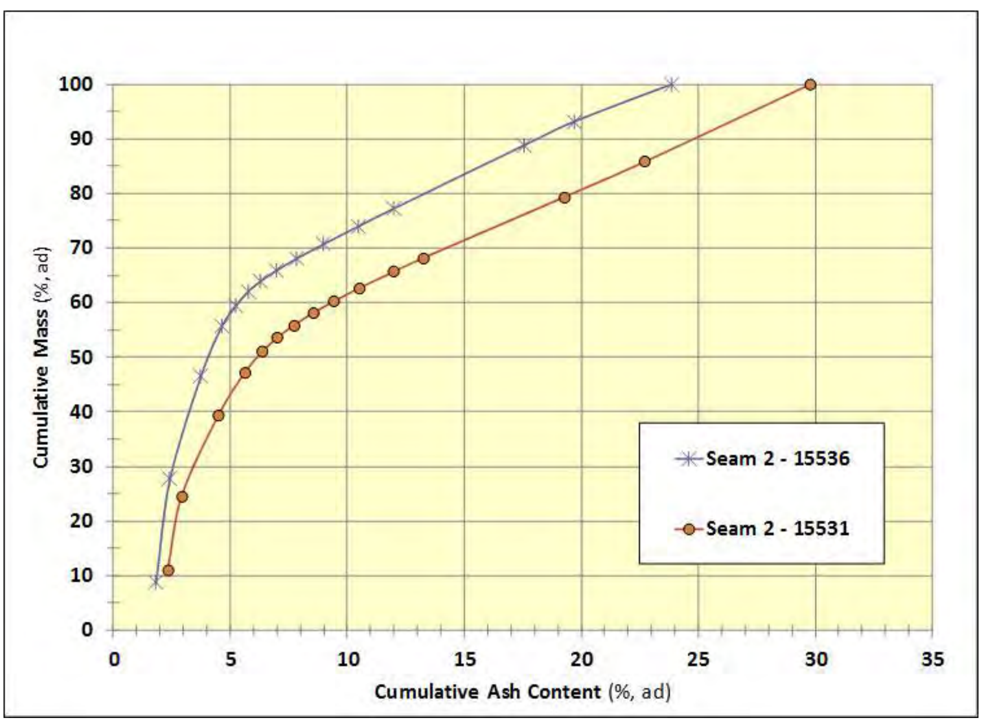


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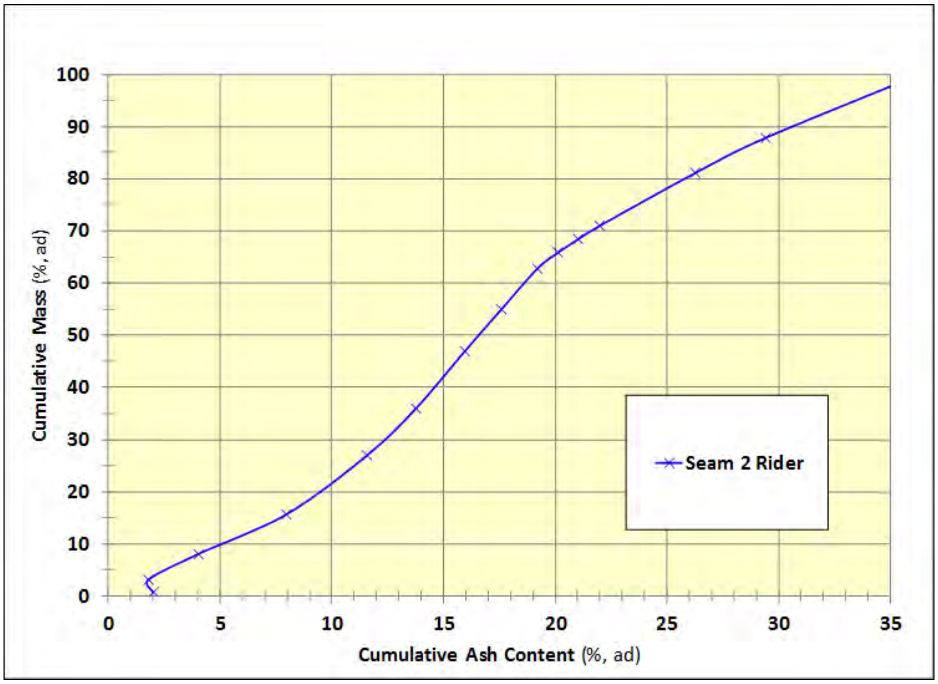
Figure 13.5

Ram Coal Seam 2 Rider Ash-Theoretical Yield Characteristics (50mm x 0.25mm)



13.4 Coal Product Specifications

The process design and plant equipment specifications were developed to meet the criteria listed in Table 13.1.

Table 13.1

Product and Preparation Plant Operating Criteria

Ash	9.5% adb
Moisture (maximum)	<8.5% FOB Mine
ROM Coal Production (Mt/y)	6,000,000
Annual "Coal-On" Hours	6,500

The target moisture and ash values are based on discussions held with RAM's project team to narrow the design basis. This moisture target, although slightly higher than other regional coking coals, still likely requires a fluidized bed thermal dryer. Notwithstanding, an emphasis is still placed on maximizing mechanical dewatering in order to reduce the capital size/cost of a thermal dryer as well as minimize fuel and electric power costs.

Given the above washability characteristics and operating criteria, Norwest has designed a flexible wash plant to tolerate variations in ROM feed quality, quantity and product targets, relying upon proven technologies.

13.4.1 Process Design Considerations

Although the coal seams can be ranked as high volatile, the Hardgrove Grindability Indices (HGI) indicate a friable coal in the 80 to 95 range. These HGI values indicate the friable coals will be very fine. This is typical of western Canadian mountain coals. The bulk samples, after testing attrition treatment, show a high percentage of fine-size material with a range of 25% to 35% passing 0.5mm as illustrated in Figure 13.2. A friable coal such as the seams within the Aries property requires care in materials handling including care in design of moist materials handling. This must also include specific moisture-removal systems since moisture content is a direct function of the amount of fines present. As the proportion of fines in the processed coal increases, correspondingly the surface area increases, and therefore the surface area available for moisture adhesion. The presence of increased fines in general requires the close attention to the design of those circuits to ensure optimal recovery as well as being sufficiently large without derating the feed rate during upset conditions. Norwest has addressed these fines-related processing issues within the plant design.

The variability in ROM ash due to the inherent differences in the seams and mining area has also been taken into consideration. The various processes have been physically sized accommodate large variability in yield to avoid bottlenecks and de-rates of plant throughput.

13.4.2 Process Simulation

Norwest developed a coking coal washing process with the Limn® Flowsheet Process Simulator. Using relevant available washability data, multiple simulations were run to optimize the design of the coal preparation plant and processes. Norwest selected a three-circuit process “best practices” concept appropriate for types of coal found at the Aries property as starting point. This was followed with Limn® simulations to optimize the design. The developed process concept utilizes a large diameter heavy media cyclone for treating the coarse coal (50mm x 1.4mm), Reflux™ classifier concentrators for the fine coal (1.4mm x 0.25mm) and froth flotation (primary/cleaner arrangement) for recovery of the ultrafines (0.25mm x 0).

In the development of Aries Project’s preparation plant, Limn® simulation allowed each unit process to be modeled both individually and simultaneously with the other processes in the plant. The simulation model, using the 2014 bulk washability data, simultaneously computing the 15 relative density (specific gravity) fractions for each of the 14 particle size fractions. The simulation performed highly iterative calculations tracking all of the 210 discrete particles (size x SG), each with individually assigned ash and FSI values from feed input through to the plant outputs. The individual processes were discretely modeled including screening and classifying cyclone performances as well the heavy media cyclone (HMC), Reflux™ classifier concentrators and froth flotation.

Heavy Media Cyclone Modeling

Process modeling of the HMC circuit was multi-factor with the inclusion of influences for cyclone geometry, the medium - coal ratio, etc. These factors combine to generate multiple, particle size-based Tromp partition values allowing the projection of accurate, realistic product yields and quality.

Reflux™ Classifier Concentrator Modeling

Projected performance of the FLSmidth/Ludowici Reflux™ classifier concentrators were also modeled in a similar manner using Ludowici's modeling routines embedded in Limn®.

Classifying Cyclone Modeling

Classifying cyclone performance was developed using the Whiten cyclone efficiency empirical model. Based on the recommended application of Krebs gMAX® cyclones, the cut sharpness alpha value was increased (better) to 4.0 with further model adjustments to match Krebs performance projections. Classifying cyclones are normally used to perform a size-classification, but particle sizes of differing relative densities (SG) behave differentially to their size classification. The process simulation fully captures the effects of this behavior on both mass and ash quality.

Froth Flotation Modeling

Norwest used the pseudo-gravity flotation model for Limn®, developed by C. Clarkson & Associates Pty Ltd along with data collected previously by Norwest during small scale pilot froth flotation testing.

Other Process Component Modeling

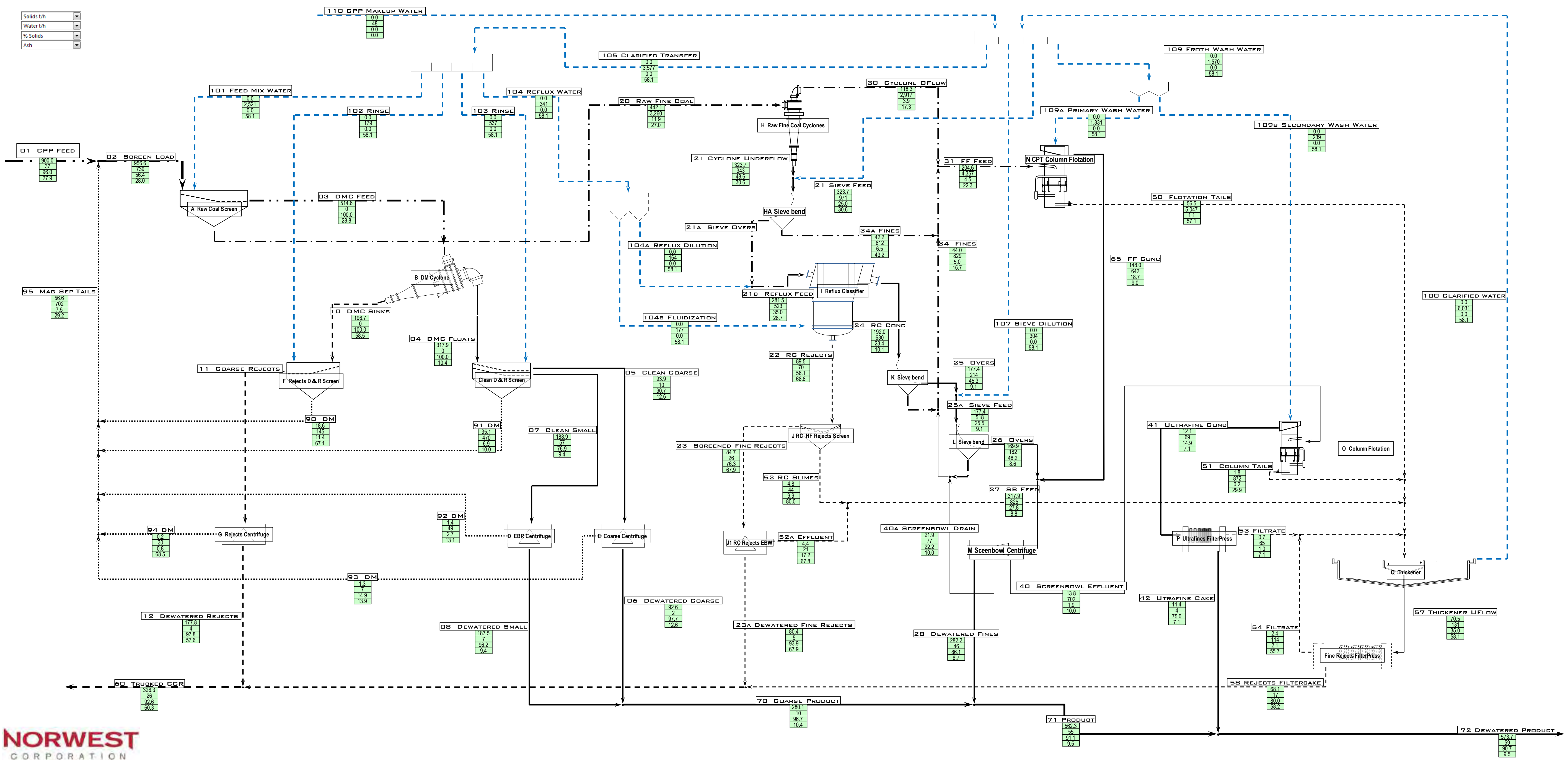
Other processes involving size classification, most notably vibrating screens and static sieves were modeled in a similar manner retaining certain modeling criteria specific to that particular process.

The flowsheet simulation program processed all the data in a highly iterative manner tracking all misplaced material, i.e., real life process imperfections.

Individual data tables for each process were shared with potential vendors to assure proper equipment selection.

Simulation results of a balanced flowsheet for blended Seams 2 and 3 are shown in Figure 13.6 Process Flow Diagram.

Figure 13.6 Limn® Flowsheet Simulation – Ram Coal Blended Seams 2 and 3



13.5 Projected Product Quality

The simulated product coal quality and tonnage of each CPP circuit are summarized in Table 13.2. These results are representative of a blend of Seams 2 and 3 with a raw ash content of 28% (ad).

Table 13.2
Projected Product Qualities – Ram Coal Blend Seams 2 and 3

Process Output Circuit	TPH (ad)	Surface Moisture	Total Moisture	TPH (ar)	Ash (ar)	Ash (ad)	FSI	Sulphur	Process Cut point SG
Coarse Coal (50mm x 13mm)	93	23	4.0	95	12.1	12.6	4 ½	0.49	1.62
Small Coal (13mm x 1.4mm)	187	3.8	5.5	195	8.8	9.3	5	0.51	
Fine Coal (1.4mm x 0.04mm)	282	14.0	15.5	328	7.3	8.7	5 ½	0.53	170
Filtered Ultrafines (0.04mm x 0)	12	25.0	26.3	16	5.7	7.7	6	0.56	
Coking Product	574	9.4	11.0	634	8.5	9.5	5 ½	0.51	
Product Yield	64% adb		66% ar						
Inherent Moisture	1.75%		Dried to 8% TM						
Feed Ash	28%								

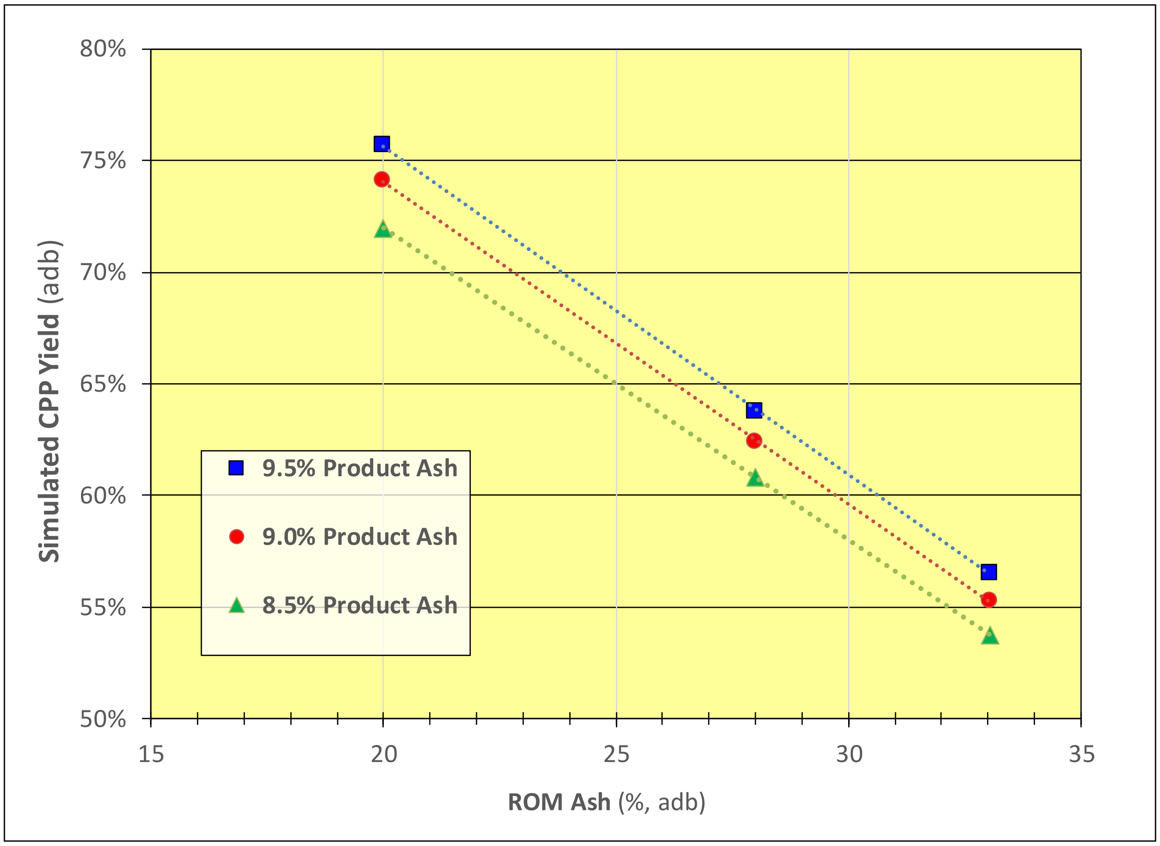
The tonnages reflected in this table is based on a design plant feed rate of 950 t/h (arb) and ROM ash content of about 28% (ad) This ROM ash content is indicative of only the location of the respective bulk sample LD cores. The FSI shown in Table 13.2 is indicative and was developed mathematically. The expected actual product FSI value is likely to be in the range of 7 to 7.5.

Actual mining conditions will vary the raw feed ash to the CPP, and therefore variations in product yield will also occur. Normal shifts in ROM ash content will not likely impact the product quality since washing processes are automatically controlled. The HMC, Reflux and flotation circuits are sufficiently oversized as not to be impeded by a large influx of dilution rock. Likewise, shifts in particle size distributions may occur but sufficient circuit sizing mitigates this type of situation, too.

The mine plan data was used to create a dynamic yield modeling for the reserves relative to changes in ROM coal quality. Figure 13.7 depicts the influence of ROM ash on plant yield.

Figure 13.7

Simulated Plant Product Yields as Function of ROM Ash



Figures 13.8 through 13.10 show the results of stepping sequentially, the lowest to highest plausible cut-points for the HMC circuit. These graphs the potential range of product ash and yields based on a single ROM ash. This is useful in determining most efficient cut point for a required yield and product ash.

Figure 13.8

Simulated Product Ash and Yields as Function of HMC Cut-point:

Seam 3 at 25.5% ROM Ash

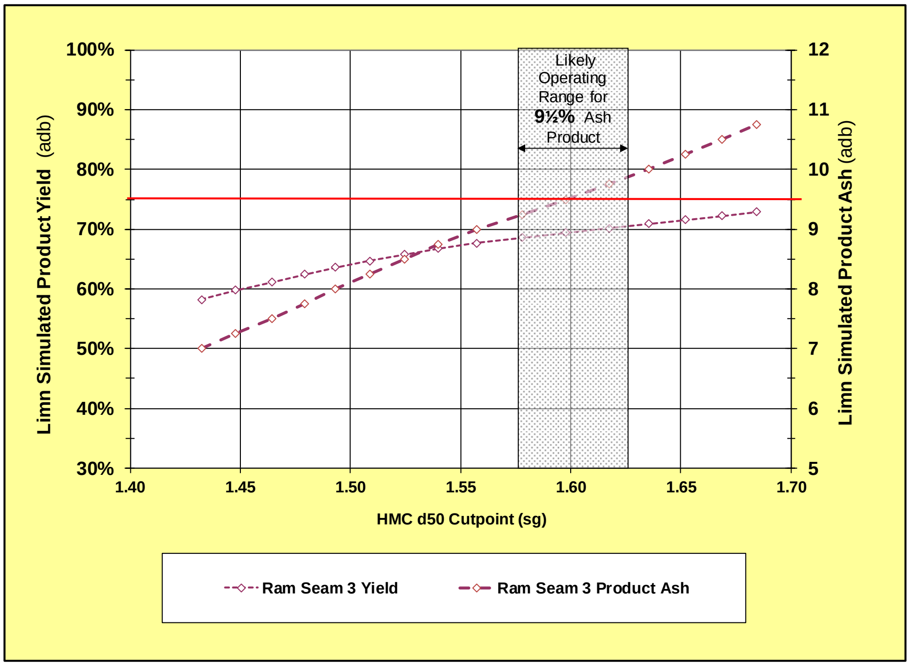


Figure 13.9

Simulated Product Ash and Yields as Function of HMC Cut-point:

Seam 2 at 31.5% ROM Ash

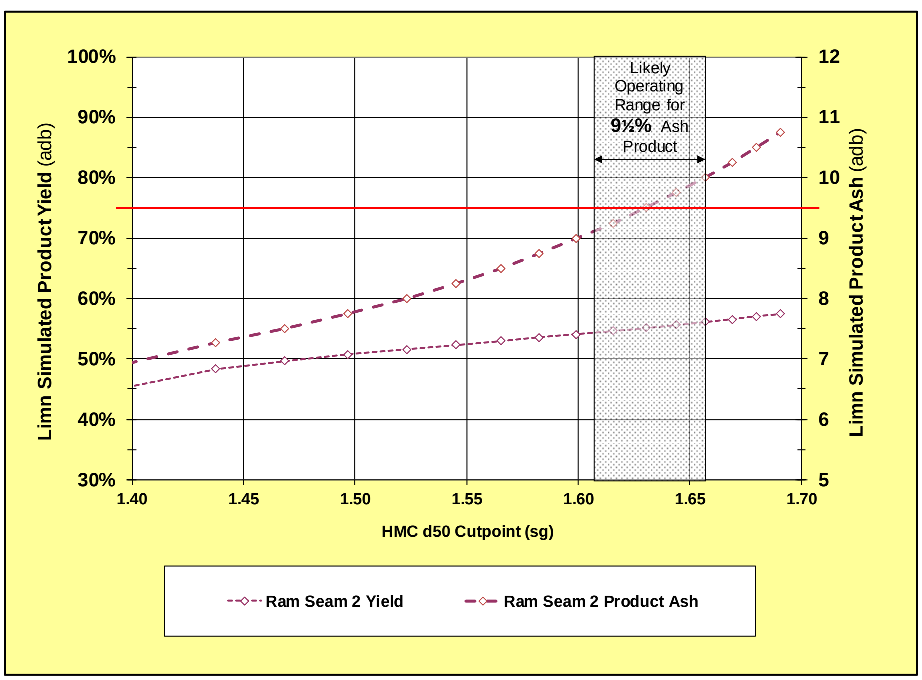
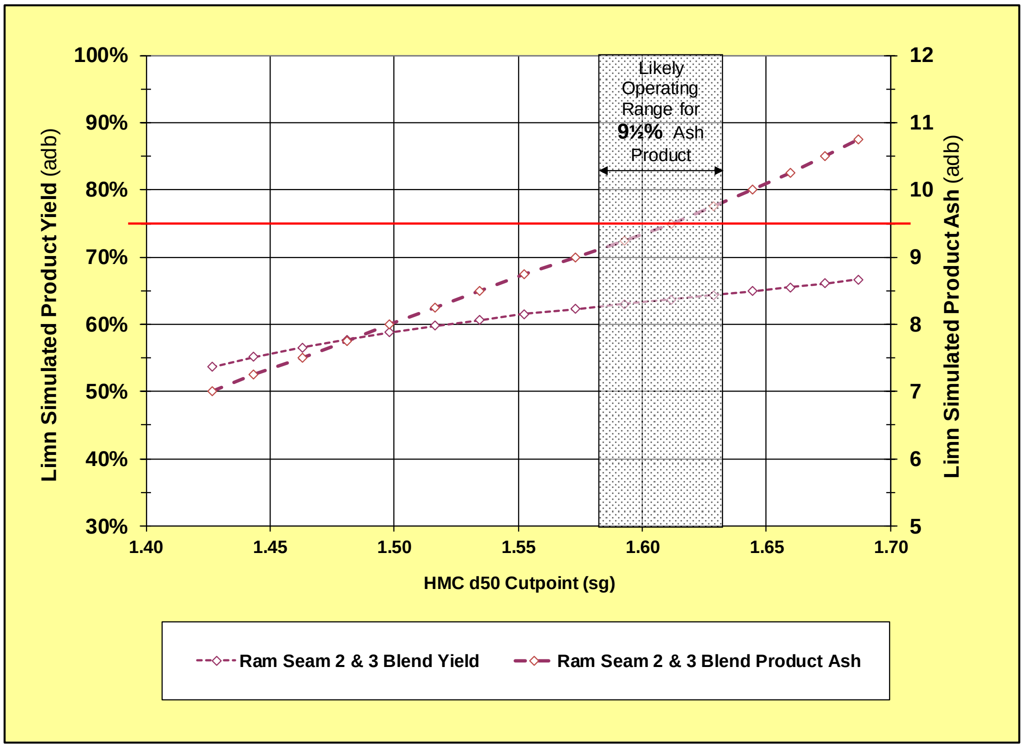


Figure 13.10
Simulated Product Ash and Yields as Function of HMC
Cut-point: Blended Seams 2 & 3 at 28% ROM Ash



14 MINERAL RESOURCE ESTIMATES

14.1 Approach

In accordance with NI 43-101, Norwest referenced Definition Standards on Mineral Resources and Reserves (CIM, 2010) in the production of this report. Norwest also referred to the Geological Survey of Canada Paper (GSC) 88-21 A Standardized Coal Resource/Reserve Reporting System for Canada during the classification, estimation and reporting of coal resources.

GSC 88-21 was written in 1987 and is now obsolete with respect to certain numerical parameters; Norwest used this document only as a guideline for resource estimation.

Norwest used the following approach to estimate the resources and reserves:

- Drill hole data was verified by reviewing the available geophysical logs for a selection of exploration holes within the project area.
- The level of geological complexity was established by reviewing the geological interpretation.
- Key coal-bearing zones were modeled to provide the required volume estimates; additional attributes were also populated into the model to identify separable in-seam waste and estimate run-of-mine performance.
- Volumes were converted to tonnage by applying density values representative of each coal seam mined.
- Using the geological model, geological and mining criteria were used for resource estimation initiatives.
- Spatial distribution coal data were used to classify resources.

14.2 Basis for Resource Determination

National Instrument 43-101 specifies that the definitions of the CIM Guidelines be used for the identification of resources. The CIM Resource and Reserve Definition Committee produced the following statement:

"Mineral Resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories. An Inferred Mineral Resource has a lower level of confidence than that applied to an Indicated Mineral Resource. An Indicated Mineral Resource has a higher level of confidence than an Inferred Mineral Resource but has a lower level of confidence than a Measured Mineral Resource."

The CIM Definition of Resources is as follows:

"A Mineral Resource is a concentration or occurrence of material of economic interest in or on the Earth's crust in such form, quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling."

"Material of economic interest refers to diamonds, natural inorganic material, or natural fossilized organic material including base and precious metals, coal, and industrial minerals."

The committee went on to state the following:

"The term Mineral Resource covers mineralization and natural material of intrinsic economic interest which has been identified and estimated through exploration and sampling and within which Mineral Reserves may subsequently be defined by the consideration and application of technical, economic, legal, environmental, socio-economic and governmental factors. The phrase 'reasonable prospects for eventual economic extraction' implies a judgment by the Qualified Person in respect of the technical and economic factors likely to influence the prospect of economic extraction. Interpretation of the word 'eventual' in this context may vary depending on the commodity or mineral involved. For example, for some coal, iron, potash deposits and other bulk minerals or commodities, it may be reasonable to envisage 'eventual economic extraction' as covering time periods in excess of 50 years. However, for many gold deposits, application of the concept would normally be restricted to perhaps 10 to 15 years, and frequently to much shorter periods of time."

These definitions and statements clearly show that coal material can only be considered a resource if there is a clear identification of the economic potential of the deposit. For coal deposits, this means that the nature of the database, technology for mining and mine planning, some degree of practical recovery constraints and the economic potential in current markets have to be considered in order to identify a coal resource, and while the strict conditions for the definition of a reserve may not be needed to identify a resource, consideration should still be given to the same key issues.

The resource areas include a provision at the coal outcrop to allow for oxidation and weathering of the coal at the surface. The oxidation limit was determined to be 10 m vertically from base of till horizon.

14.3 Classification

The stratigraphic sequence is contained within northwest-trending anticline and synclines. The erosion of the Ram River property anticline divides the property into two blocks: North block and South block (see drawing 10). Each block features a gentle syncline structure with one trust fault presented in each block.

Structurally, this deposit is considered to be a Moderate Geology Type based on the definitions outlined in GSC Paper 88-21.

The different resource classifications outlined in the GSC Paper 88-21 are based on the spacing of valid data points which, in this case, are coal drill hole intersections; for example, as the proximity of the coal to the drill hole intersection decreases, the confidence in the presence of the coal increases.

The classification templates are based on the three-dimensional distance to the nearest drill hole that penetrates a given seam. This modeling approach ensures that the populated distances are specifically related to coal intersections for each unique seam. Therefore, the classification of a particular seam is independent of other seams contained within the model. The radial distance for a Measured resource classification is 450 m from a data point. The radial distance for an Indicated resource classification is between 450 m and 900 m. The radial distance for an Inferred resource classification is greater than 900 m.

14.4 In-Place Coal Resource Estimation

With respect to the in-place coal resource, the term *resource* is used to quantify coal contained in seams occurring within specified limits of thickness and depth from surface. Also, the term *resource* refers to the in-place inventory of coal that has “reasonable prospects for economic extraction”. Coal resources are always reported as in-place tonnage and are not adjusted for mining losses or recovery.

Resource classification maps for Seam 3 and Seam 2 are shown on Drawings 4 and 5 respectively.

Table 14.1 summarizes the estimated in-place coal resources within the North Block (Aries Project) and South Block of the Ram property. As these are in-place estimates, no considerations have been given for coal loss, dilution or mining recovery. However, a minimum mineable seam thickness of 0.5 m for surface mineable resources and a minimum mineable seam thickness of 1.5 m for underground mineable resources are considered.

The following criteria were used for the coal resource estimates shown in Table 14.1:

Suitable for Surface Mining:

- Minimum mineable thickness of 0.5 m; and
- Minimum separable partings thickness of 0.3 m.

Suitable for Underground Mining:

- Minimum mineable thickness of 1.5 m;
- Minimum separable partings of 0.45 m;
- Seam dip less than 16°;
- Minimum cover depth of 50 m; and
- Maximum depth of 600 m.

Table 14.1
In-Place Coal Resource Estimates
(Effective Date: March 31, 2017)

Area	Seam	ASTM Group	In-Place Coal * (KTONNES)		
			Measured	Indicated	Inferred
SUITABLE FOR SURFACE MINING					
Aries Project (*North Block*)	Seam 3	Med-High Volatile Bituminous	123,452	2,699	0
	Seam 2 and 2R		85,679	3,616	0
Sub-Total for Aries Project Surface Mining by Category			**209,131**	**6,314**	**0**
Aries Project Suitable for Surface Mining Total			**215,445**		
POTENTIAL FUTURE MINING AREAS					
SUITABLE FOR SURFACE MINING					
South Block	Seam 3	Med-High Volatile Bituminous	34,931	14,740	3,257
	Seam 2 and 2R		25,954	12,631	7,227
Sub-total by Category			**60,885**	**27,370**	**10,484**
Combined South Block Suitable for Surface Mining Total			**88,255**		
SUITABLE FOR UNDERGOUND MINING					
North Block	Seam 3	Med-High Volatile Bituminous	1,669	198	0
	Seam 2R		120	1	0
	Seam 2		2,669	13	30
Sub-total by Category			**4,458**	**211**	**30**
Combined North Block Suitable for Underground Mining Total			**4,669**		
South Block	Seam 3	Med-High Volatile Bituminous	26,760	41,033	57,333
	Seam 2R		106	9	2
	Seam 2		11,435	25,951	38,036
Sub-total by Category			**38,301**	**66,992**	**95,370**
Combined South Block Suitable for Underground Mining Total			**105,293**		
Total by Category			**312,774**	**100,888**	**105,884**
Combined Total Resources (Measured and Indicated)			**413,662**		

Note: Differences in sub-totals are due to rounding.

While Table 14.1 provides an estimate of the resources for the RAM Property (comprising both the Aries Project (North block) and South block), this evaluation is focused on the surface mineable resource in the Aries Project (North block) area only. The South Block and Aries underground resources are expected to be part of future evaluations.

The Measured and Indicated Mineral Resources estimates shown in Table 14.1 are inclusive of those Mineral Resources modified to produce the Mineral Reserves estimates shown in Table 15.2.

15 MINERAL RESERVE ESTIMATES

A coal reserve is the economically mineable part of a Measured or Indicated coal resource demonstrated by at least a PFS level of evaluation. This study must include up-to-date information on mining, processing, economics and other relevant factors that demonstrate, at the time of reporting, economic extraction can be justified. Coal reserves are sub-divided into Probable and Proven reserves. Proven reserves have a higher degree of confidence than Probable reserves. A probable coal reserve is the economically mineable part of an Indicated resource, and in some cases, the economically mineable part of a Measured resource. A proven coal reserve may be economically mineable part, or portion thereof, of a Measured resource, depending on the technical circumstances of the project.

The reserves classification criteria applied is consistent with those used to categorize resources. There is, however, one exception: because reserves are based on recoverable coal estimates, this requires an increased level of certainty to characterize key coal quality attributes specific to the Aries Project area.

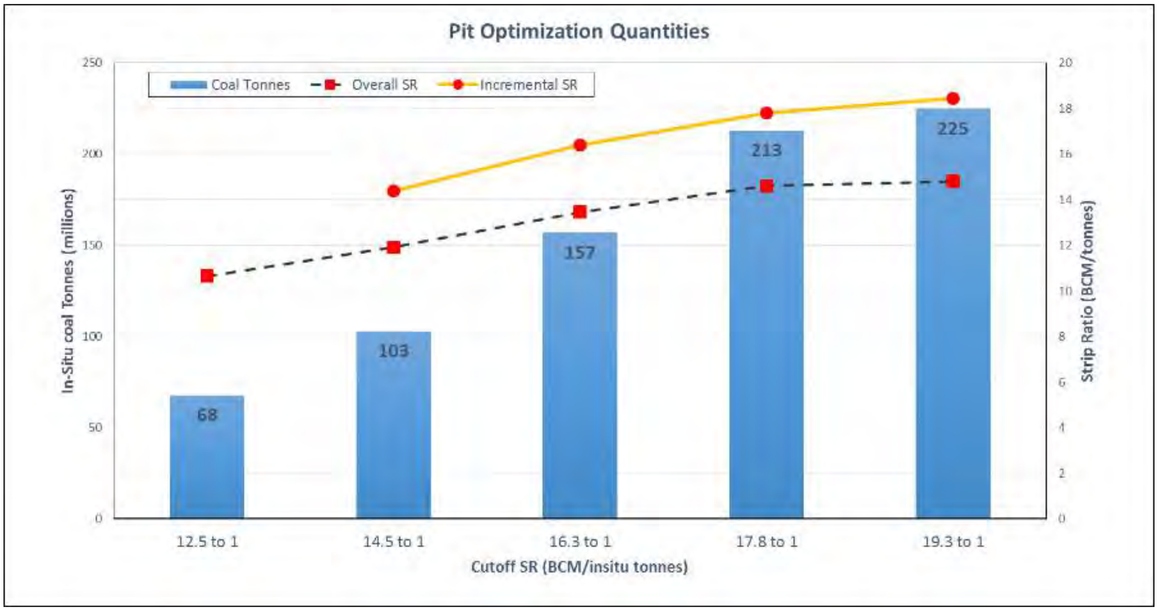
15.1 Pit Optimization

A series of pit shells were developed for the Aries Project using approximately a 10% risk contingency to the expected long-term coal price achievable for the product produced. (The discounted coal price used takes into account the expected long term sales price and the quality discount applying an exchange rate of $0.75 USD: $1 CAD). The discounted coal price in Canadian Dollars will support an incremental strip ratio of 18 BCM : 1 ROM tonne.

The results from pit optimization are illustrated in the chart in Figure 15.1, which shows the estimated in-situ coal tonnages based on a range of cut-off strip ratios (COSR) as well as the incremental and cumulative overall strip ratio values at each COSR increment. Limited additional mineable tonnage above the 18:1 incremental exists, therefore Norwest recommended an upper COSR limit in the range of 17 – 18:1 based on the preliminary economic assessment. The 18:1 COSR limit results in an total coal tonnage in the range of 210M ROM tonnes at an overall ratio of approximately 15:1.

Figure 15.1

Pit Shell Optimization Quantities



15.2 Reserve Calculation

Mine design and financial analysis has been completed for the Aries Property. Norwest has designed pits using geotechnical criteria that are consistent with the proposed pit designs and site conditions. Mining pits were developed using breakeven costs developed using first principle's and Aries Project capital cost estimates. Table 15.1 details the mine coal recovery design basis for determining the reserve estimate.

Table 15.1

Aries Project Basis for Reserve Estimate

Parameter	Truck/Shovel Mining
Rock Dilution	0.15 m
Coal Loss	0.15 m
Minimum Mineable Seam Thickness	0.5 m
Coal Recovery Factor	97.5%

Note – Dilution for Seam 3 is increased to 0.3m in the area shown Figure 12.1.

Coal quality values represent in-place or in-situ estimates of the various quality parameters. Run-of-mine (ROM) results are estimated in order to reflect the mining product transported to the processing facility. As a result, ROM estimates include the effects of dilution and coal loss that are inherent in surface mining operations. Dilution is included in the following manner: a dilution thickness is multiplied by the mining contact count assigned to each model block. Total dilution thickness is added to the block true thickness attribute, with an equivalent thickness (7.5 cm per contact) of coal being removed (coal loss). A portion of the coal thickness has now been replaced with rock thickness.

As an example, the formula used to calculate ROM ash (RMSH) in each model block is as follows:

$$ROM\ Ash = \frac{(SG_{Coal} * Ash_{Coal} * (\mathrm{TT} - \mathrm{CC} * 0.075)) + (SG_{dilution} * Ash_{Dilution} * \mathrm{CC} * 0.075)}{(SG_{Coal} * (\mathrm{TT} - \mathrm{CC} * 0.075)) + \ (SG_{Dilution} * \mathrm{CC} * 0.075)}$$

where:

- ROM $_{\text{Ash}}$ is Run-of-Mine Ash
- Ash $_{\text{Coal}}$ is the Ash of the coal
- Ash $_{\text{Dilution}}$ is the Ash of the dilution material
- SG $_{\text{Coal}}$ is the Specific Gravity of the coal
- SG $_{\text{Dilution}}$ is the Specific Gravity of the dilution material
- TT is the true thickness of all mineable plies in the seam group
- CC is the contacts count

15.3 Reserves

The portion of the property included in the reserves definition is shown in Drawings 6 (Seam 3) and 7 (Seam 2) as a sub-area within the overall defined resources plan. The area of defined reserves has a footprint of approximately 2,200 Ha. The run of mine surface mineable reserves for the Aries Project are estimated to be 182,967 Ktonnes, which includes dilution and coal recovery factors detailed in Table 15.1. Table 15.2 is a summary of run of mine surface mineable reserves for the Aries Project as at March 31, 2017.

Table 15.2
Aries Project ROM Coal Reserve Estimates (Surface Mining)
(Effective Date: March 31, 2017)

Area	Seam	ASTM Group	ROM Coal * (KTONNES)	
			Proven	Probable
SUITABLE FOR SURFACE MINING				
Aries Project North Block	Seam 3	Med-High Volatile Bituminous	105,920	1,696
	Seam 2 and 2R		72,669	2,681
Suitable for Surface Mining Total by Category			**178,589**	**4,378**
Suitable for Surface Mining Total			**182,967**	

*Based on in-situ moisture content basis.

Based on the mining criteria defined in the mining section (Section 13), the plant yield curve was used to estimate clean saleable reserves on a as a combined product.

The Aries Project will produce a metallurgical coal product that is a blend of Seams 2, 2R and 3. Quality characterization and analyses for the blended product indicate the project is positioned to produce a clean coal product which lies between the Australian Tier 2 Coking Coals and the Semi-Hard coals. The clean coal product specifications of the Aries clean coal product are detailed in Table 15.3.

Table 15.3
Aries Clean Coal Product – Clean Coal Product Specification

Product Quality Specification	Aries Product
Proximate Analysis (dry basis)	
Ash (%)	9.5 ± 0.5
Volatile Matter (%)	30.5 ± 0.5
Sulphur (%)	0.55 ± 0.05
Moisture	8.5 ± 0.5
Free Swelling Index (FSI)	7 to 7.5

The clean saleable surface reserves for the Aries Project area estimated to be 121,268 Ktonnes. Table 15.4 is a summary of clean coal product surface mineable reserves for the Aries Project as at March 31, 2017.

Table 15.4
Aries Project Clean Coal Reserve Estimates
(Effective Date: March 31, 2017)

Area	Seam	ASTM Group	Clean Coal * (KTONNES)	
			Proven	Probable
SUITABLE FOR SURFACE MINING				
Aries Project North Block	Seam 2, 2R and 3	Med-High Volatile Bituminous	118,366	2,902
Suitable for Surface Mining Total			**121,268**	

*Includes allowance for product moisture.

Cautionary Note – *Reserves can be affected by coal product price and other project specific factors/risks as is the case with projects at this stage of evaluation*.

16 MINING METHODS

The mine plan for the PFS level evaluation exploits only the surface mineable portion of the North Block area of the property. As discussed in the geology section, additional geology and geotechnical field programs will increase the confidence in the South Block resources which will potentially result in additional reserves being defined and an extended mine life or increased production rate. Based on the 2014 PEA evaluation, the great majority of the coal resource in the South Block area is deeper than in North Block and as a result is likely more amenable to underground mining.

16.1 Surface Mine Design Parameters

The production schedule for the Aries Project is based on 24 hour, year-round operation: operating days are 349 days. The following mining parameters have been based on the previous level of studies and reports and site operating data. These factors are consistent with other operations in the western Canadian coalfields. These factors take into account mining conditions, coal seam dip/structure, and equipment selection.

- Waste Swell Factor: 30%
- Waste In-situ Density: 2.65 tonnes / m^3
- Coal Loss: 15cm by seam
- Dilution: 15cm by Seam
- Dilution ash content: 89% (dry basis)
- Dilution density: 2.2 tonnes / m^3 (dry basis)
- Coal Recovery: 97.5%
- Pit Wall Slopes 45°
- Bench height 15m
- Overall MRSF Slope 2:1 exterior slope

The majority of mine haul roads will be designed on side-slopes; this design width allows for a single berm on the down-slope side only, and a drainage ditch on the up-slope side. Mine haul roads (i.e. in-pit roads) without an up-slope cut will require additional width for a second berm. Mine haul roads were designed using the following criteria which meet Alberta mine regulatory requirements.

16.2 Mine Equipment

The mining equipment proposed to support the mine plan is conventional truck and shovel/hydraulic excavator equipment of a capacity similar to that currently used in western Canadian coal operations and in the Alberta oil sands operations around Fort McMurray. This equipment selection will provide a pool of experienced operators and tradespersons to draw from in addition to the supplier support needed to operate and maintain the equipment as well as major parts/supply depots in Edmonton. Table 16.1 lists the proposed major surface mine mobile equipment fleet to support the PFS mine plan at full initial production.

Table 16.1
Proposed Major Mobile Equipment List

Description of the Equipment	Equipment	Number of Units
Electric drill	Sandvik D90KS (321mm)	5
Electric Rope Shovel	P&H4100XPC (56m^3)	4
Diesel Hydraulic Shovel	Komatsu PC8000 (42m^3)	1
Mine rock haul truck	Komatsu 930E Haul Trucks	35
Coal front-end loader (FEL)	Komatsu WA1200	1
Coal haul truck	CAT 785 Coal Haul Trucks	5
Small Excavator (coal)	CAT 390 Excavator	4
Dozer (pit and reclamation)	CAT D10 Dozer	11
Dust control water truck	CAT 777 Water Truck	2
Road maintenance grader	CAT 16 Grader	4

Note – where specific manufacturer's or suppliers are listed, it is only intended to denote size or capacity of the equipment and not limit future selection.

16.2.1 Mine Rock Loading

Norwest judged that the optimal mix of equipment would be the use of electric rope shovels (56m^3 bucket capacity) and diesel hydraulic shovels (<40m^3 bucket capacity). The primary rope shovel mining units (P&H4100's) would be best matched with the Komatsu 930E rear dump haul truck (292 tonne capacity).

16.2.2 Coal Cleaning and Mining

This equipment configuration provides the capacity and mobility required for coal mining on the Aries property. Efficient excavation of the coal seams without delaying mining of rock is a key component of meeting the production sequence for the project. Primary coal loading with front end loader units and smaller excavators for coal cleaning have been used. These coal loading units would be best matched with Komatsu HD-1500 (144 tonne) rear dump haul trucks. The coal haul trucks will be fitted with expanded coal boxes to increase their volumetric capacity.

16.2.3 Support Equipment

Support equipment for the project would be required for the following tasks:

- Clean-up and support for in-pit mine rock and coal loading.
- Movement of mine rock on the MRSF and re-sloping of MRSFs.
- Maintenance of haulroads.
- Maintenance of the clean coal haulroads
- Maintenance and fueling of mining equipment.
- Soil salvage and removal prior to production mining.
- Support for drilling and blasting operations.

The exact size and configuration of the support fleet would be finalized at the detailed engineering stage.

16.3 Mine Development and Phasing

Based on the discussions with RAM in preliminary meetings, the following goals were put forward with regards to the PFS mine plan:

- Target of 6mtpa ROM coal with a minimum 30-year mine life – A production target in the range of 6mtpa ROM coal with a minimum mine life of 30 years was determined to be the preferred production level for the property.
- Phased increase in strip ratio – The initial phases of the mine will target the lower strip ratio portions of the resource adjacent to the processing plant to the extent feasible.
- Mining will progress into higher strip ratio mine phases over the life of the project with the highest strip ratio areas being delayed to the end of the mine schedule.
- Maximize in-pit mine rock disposal – The sequencing of mining to maximize the in-pit disposal of mine rock is a desired goal of the mine planning process. In-pit disposal will provide benefits in terms reduced disturbance footprint and shorter haul distances.
- A ramp-up period is required in the mine's initial life in order to provide sufficient time to develop the work force, deliver and assemble the required mine equipment fleet and develop sufficient in-pit mining areas. Based on discussions between Norwest and RAM, it was agreed that a three-year ramp-up period would be sufficient for the project.

16.3.1 Material Schedule

The volumes of overburden, waste rock, and recoverable coal resources (including in-seam partings) were determined from the mining model. The recoverable coal tonnage is the amount of coal that is expected to be extracted from the mineable in-place resource during the mining process. The calculation of these tonnages takes into account various mining parameters, such as:

- Coal losses that might occur during mining.
- Introduction of in-seam and out-of-seam dilution.
- Thickness limits for mining.
- Rehandle of mine rock (2.5%)

The pit shells economic criteria and other design constraints were selected to create detailed pit designs. The overall coal and mine rock volumes were calculated for the various mine phases within the designed pit. Coal and mine rock volumes were calculated from the mine block model generated from the geological model using MineSight software. As noted in Section 15, the specific gravity for the various coal seams was provided by Norwest geology team. Table 16.2 summarizes the mined material quantities for the detailed 6.0 Mt/year Aries PFS plan. Mine rock and overburden were combined for the pit phase quantities for reporting purposes and are detailed in Table 16.2.

16.3.2 Pit Phasing

Phasing was determined primarily by mine plan objectives to minimize the initial strip ratio, optimize mining productivity and maximize backfill of mine rock in-pit. The key driver was the requirement to place mine rock in-pit to minimize the external MRSF footprint and shorten waste hauls. The high level the pit phasing required for achieving maximized backfill are illustrated in Drawings 15 to 21.

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Table 16.2

Surface Mine Production Summary

	Year	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mine Rock	MBCM			9.4	31.5	53.8	59.2	81.7	80.7	81.1	80.7	81.8	79	79.9	78.1	82.7	82.1	81.5	73.9	79.2
ROM Coal	Mt			0.4	3.7	5.1	5.8	5.9	6.1	6.4	6.2	6.0	6.3	6.1	6.4	5.7	6.2	6.4	6.0	6.0
Clean Coal	Mt			0.3	2.4	3.3	3.9	3.8	3.9	4.1	3.9	3.8	4.0	4.0	4.4	4.0	4.3	4.5	4.2	4.1
Clean Coal Strip Ratio	BCM/t			31.3	13.1	16.3	15.2	21.5	20.7	19.8	20.7	21.5	19.8	20.0	17.8	20.7	19.1	18.1	17.6	19.3

	Year	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Mine Rock	MBCM	79.2	79.2	79.2	79.2	81.7	81.7	81.7	81.7	81.7	80.4	80.4	80.4	80.4	80.4	45	45	45		
ROM Coal	Mt	6.0	6.0	6.0	6.0	5.8	5.8	5.8	5.8	5.8	4.3	4.3	4.3	4.3	4.3	4.4	4.4	4.4		
Clean Coal	Mt	4.1	4.1	4.1	4.1	3.8	3.8	3.8	3.8	3.8	2.8	2.8	2.8	2.8	2.8	3.0	3.0	3.0		
Clean Coal Strip Ratio	BCM/t	19.3	19.3	19.3	19.3	21.5	21.5	21.5	21.5	21.5	28.7	28.7	28.7	28.7	28.7	15.0	15.0	15.0		

17 COAL PROCESSING AND HANDLING METHODS

Norwest developed a PFS level design of an industry standard coal preparation process with a feed capacity sized to produce approximately 4 Mt/y coking product coal from a 6 Mt/y ROM feed. The target product ash ranges between 9.0% and 9.5%, on an air-dried basis (“adb”). A key objective has been assigned to achieve product total moisture of 8.5% or less with an emphasis on mechanical dewatering methods to minimize thermal drying requirements.

While reviewing process alternatives, Norwest sought to develop a coal processing operation with the following attributes:

- High utilization to minimize the required rated plant feed capacity and reduce idle capacity.
- High capacity process machinery units.
- Minimize covered internal footprint without compromising maintainability.

With annual throughput of the Aries coal handling and processing plant (CHPP) targeted to be 6.0Mt/y ROM, a 7,000 hr/y operating schedule followed with a mechanical availability of 92.5% (6,500 coal-on hours) or better, is required to limit the coal preparation plant module (CPP) from exceeding 950 t/h (as-received basis).

The CHPP is intended to be robust in construction and flexible in function to accept a wide variety of feed characteristics. The CHPP design takes into account the requirements of harsh winter conditions without interruption to operations.

17.1 Coal Characterization & Washabilities

RAM engaged in comprehensive exploration and testing programs during 2013 and 2014. As part of those programs, several large diameter (LD) cores (150mm) were extracted from the key seams in the planned Aries Project mining areas. The LD cores were of sufficient mass to provide bulk samples for coke pilot oven testing as well as performing a pilot washing test.

17.2 Process Development Discussion

In the coal characterization discussion above, washability data is presented for each coal seam. For the purposes of designing a coal washing process, the relevant seam data from each mining pit were proportionately combined to represent a probable composite of the feedstock, i.e., the Aries Project blend. These proportions, along with the projected raw ash content of the seams are found in Table 17.1.

Table 17.1
Calculated Seam Proportions & ROM Ash Contents for CHPP Feed

Seam Name	Proportion	ROM Ash
2 and 2R	41%	31%
3	59%	25%
	100%	28%

The target moisture and ash values are based on discussions held with RAM's project team to narrow the design basis. This moisture target, although slightly higher than other regional coking coals, still likely requires a fluidized bed thermal dryer. Notwithstanding, an emphasis is still placed on maximizing mechanical dewatering in order to reduce the capital size/cost of a thermal dryer as well as minimize fuel and electric power costs.

17.3 Process Design Considerations

Although the coal seams can be ranked as high volatile, the Hardgrove Grindability Indices (HGI) indicate a friable coal in the 80 to 95 range. These HGI values indicate the friable coals will be very fine. This is typical of western Canadian mountain coals. A friable coal such as the seams within the Aries property requires care in materials handling including care in design of moist materials handling. This must also include specific moisture-removal systems since moisture content is a direct function of the amount of fines present.

The variability in ROM ash due to the inherent differences in the seams and mining area has also been taken into consideration. The various processes have been physically sized accommodate large variability in yield to avoid bottlenecks and de-rates of plant throughput.

17.4 Projected Product Quality

The simulated product coal quality and tonnage of each CPP circuit are summarized in Table 17.2. These results are representative of a blend of Seams 2 and 3 with a raw ash content of 28% (ad).

Table 17.2
Projected Product Qualities – Ram Coal Blend Seams 2 and 3

Process Output Circuit	TPH (ad)	Surface Moisture	Total Moisture	TPH (ar)	Ash (ar)	Ash (ad)	FSI	Sulphur	Process Cut point SG
Coarse Coal (50mm x 13mm)	93	23	4.0	95	12.1	12.6	4 ½	0.49	1.62
Small Coal (13mm x 1.4mm)	187	3.8	5.5	195	8.8	9.3	5	0.51	
Fine Coal (1.4mm x 0.04mm)	282	14.0	15.5	328	7.3	8.7	5 ½	0.53	170
Filtered Ultrafines (0.04mm x 0)	12	25.0	26.3	16	5.7	7.7	6	0.56	
Coking Product	574	9.4	11.0	634	8.5	9.5	5 ½	0.51	
Product Yield	64% adb		66% ar						
Inherent Moisture	1.75%		Dried to 8% TM						
Feed Ash	28%								

The tonnages reflected in this table is based on a design plant feed rate of 950 t/h as-received (900tph adb) and ROM ash content of about 28% (adb) This ROM ash content is indicative of only the location of the respective bulk sample LD cores. The FSI shown is indicative and was developed mathematically. The expected actual product FSI value is likely to be in the range of 7 to 7.5.

17.5 Operational Description of Preparation Plant Process Flow

Refer to Drawings 22 and 23, the materials handling and process flowsheets, for the process section. The process flow sheet was developed from the plant design criteria previously discussed. The process operation generally follows the order in which the coal flows through the plant, from raw coal entering the plant through to dewatering.

17.5.1 Product Coal Handling

The product coal is conveyed away from the thermal dry to a surge silo. The surge silo is intended to evenly meter coal onto an overland conveyor. The overland conveyor delivers product coal to a series of coal storage silos located at the train loadout facilities.

17.5.2 CHPP Area Coal Handling

The dried coal exiting the thermal dryer is conveyed directly to the top of a 12,000 tonne capacity surge silo. The conveyor is about 465 meters in length, most of which is an enclosed tubular gallery. The rise to the top of the silo is about 75 meters.

17.5.3 Overland Conveyor

The proposed overland conveyor option requires approximately 7km of conveyor to be constructed including a crossing over the Ram River. An aerial long distance conveyor system has been selected to connect the CHPP to the rail loadout in order to limit disturbance while providing the required capacity.

17.5.4 Train Loading

The rail loadout facility (RLO) consists of a series of storage silos and a batch weigh rapid railcar loading system.

- *Storage Silos*
  The product coal is delivered to a series of three 12,000 tonne capacity silos.

- *Train Loading*
  The train loading structure will be a precision batch-weigh system for rapid, repeated accurate railcar loading.

17.5.5 Reject Handling

The reject streams from the Heavy Medium Cyclone Circuit and Reflux Concentrator circuit are collected on the Rejects Collection Conveyor and belted to an external truck loadout. Rejects will be transported by mine coal trucks to the designated disposal site.

The ultrafine flotation circuits will generate a dilute reject slurry that requires thickening and filtration to produce a filter cake product. The filter cake is transferred to the main rejects conveyor for transport to the truck bin. The filter cake and coarser rejects are combined for disposal.

17.6 Plant Location

The CHPP is located on the eastern side of the property near the existing Sunpine forestry road (Drawing 3). A number of locations were considered during the study, but the selected location was preferred due to the following factors:

- Accessibility and suitability for construction.
- Central location.
- Environmental/visual considerations.

The CHPP process equipment structure is designed as a low-profile, open-bay configuration within a large shed enclosure.

The CHPP operation will be centrally controlled with PLC type controllers. These systems allow the plant operator to smoothly and efficiently start-up/shutdown the plant as well as automatically control the various subsystems. This will minimize workforce requirements and allow the operator to actively patrol the plant.

The plant will feature a detached two-story structure constructed alongside the main CHPP structure. It will house a warehouse for CHPP stores on the ground floor. The building will also serve as the operations center for the CHPP with offices. The lower floor will feature the dry and laboratory.

18 PROJECT INFRASTRUCTURE AND PERSONNEL REQUIREMENTS

The Ram River property is located near existing infrastructure including:

- Paved public highway tying into a maintained year-round gravel road access (Sunpine Mainline Road)
- Railway extending to the existing line near Strachan approximately 28.3km from the site
- Transmission line approximately 6km east of site

The expansion or development of the existing infrastructure in order to support a coal mine is discussed by specific area in the sections below. Drawings 3 and 24 show the location of the various infrastructure components.

18.1 Road Development

The current study assumes the primary access road to the site will be the Sunpine Mainline Road, which is accessed off Highway 752 that runs in a southwesterly direction from Rocky Mountain House (see Drawing 3). However, access from the existing road system to the north is also a viable option. The Sunpine Mainline Road is currently an improved all-season gravel road, which was built to support logging operations in the area. During a site visit in September of 2013 it was observed that the road was well maintained. Generally, the driving surface width of the road was observed to be 7.5 meters. Two bridges, one of which spans the Ram River, were observed to be in good condition. The width of the bridges is about 4.8 meters and considered to be single lane bridges. The road is currently a radio-controlled road observed by the logging and drilling operations in the area. The road is also an access road for recreational use.

The current development plan allows for minor improvements to the Sunpine Mainline Road to accommodate the increased daily traffic associated with mine operations. A transportation study and discussions with other road users should be undertaken as part of future evaluation work.

18.2 Site Development

During the mine construction period, site development is required for the CHPP site, central access road, and RLO site. Development activities include all access roads, water management and environmental controls, conveyor and utility corridors to provide operational and supply support needed for mining. Proposed footprints for the various facilities have been laid out on the infrastructure drawings but grading plans were not developed at the PFS level of study given that specific configurations of structures may vary during FS level review. The foundation investigation completed in the area of the CHPP site are sufficient to support PFS level planning but geotechnical studies and drainage plans will be required for detailed design phases. The current development plan assumes that soil materials will be stripped and stored for later placement during mine reclamation. PFS-level costs for these site preparation activities have been incorporated into Section 21 this study.

18.3 Water Management Structures

In areas of surface disturbance, water management structures (ditches, culvert crossing, and sedimentation ponds) will be required to manage mine affected surface run-off. Surface water management for the project will require initial construction of three external sedimentation ponds as well as a series of perimeter diversion channels around the perimeter of the property to direct sediment laden contact water into the sedimentation ponds. The general layout of the surface water management system is shown in plan in Drawing 25. As mining progresses, two additional external sedimentation ponds will be required.

18.4 Maintenance, Warehouse, Administration and Mine Dry Buildings

The maintenance shop building and its integrated warehouse and mine operations centre will be constructed with a poured concrete slab foundation, interior partitions, and pre-engineered metal clad building shell. Given the scale of the foundation slabs, it is recommended that foundations be laid during temperate months in order to avoid costs associated with concrete placement during freezing conditions.

The shop area will have twelve heavy equipment repair bays (based on the projected mobile fleet size, mechanical availabilities and composition), two wash bays and one welding bay included in the shop. The number of shop bays reflects typical practice related to number of pieces of mobile equipment.

The maintenance shop, warehouse and office building will be constructed with a poured slab foundation, interior partitions, and pre-engineered metal clad building shell and is site erected. There are eight heavy equipment repair bays, two wash bay and one welding bay included in the shop.

A separate administrative building will be incorporated into the site plan near the Maintenance/Warehouse Complex. The office building is a single-story building with approximately 1,190 square metres of floor space intended to house the main administration and non-operations support staff including environmental, health and safety, IT, accounting, purchasing and human resources. The office area is expected to provide offices and cubicle space for approximately 20 employees. Included within the office area is a conference room, kitchen and washroom facilities for male and female employees. An allowance has been allocated in the capital cost for equipping the office.

The office building is constructed of slab-on-grade foundation with metal frame and metal gauge siding. The Mine Dry and First Aid and Ambulance buildings are adjacent to the Administration Building.

CHPP operations and technical staff will be supplied office accommodations and facilities elsewhere in the CHPP operations building. The building will also serve as the operations center for the CHPP with offices, document storage and the control room on the upper floor. These will have direct access to an elevated floor in the CHPP. The lower floor will feature the dry and laboratory.

The main Mine Dry building is a single-story building intended to provide change rooms for the hourly labour and salaried technical/management staff. The outside dimensions are approximately 56 metres (long) and 38 metres (wide) with a floor area of 2100m^2. The building is constructed of slab-on-grade foundation with metal frame and metal gauge siding and a standing seam roof with pitch. Separate male and female areas are provided. The interior of each bathhouse area is subdivided to provide “clean” and “dirty” areas for the salaried and hourly employees.

18.5 Electrical Requirements and Powerline Extension

The electrical distribution system for the surface facilities, underground and surface mining complex has been determined to have a total installed power demand of 40MW. Peak load demands were estimated based on measured load demands at other operating mines of a similar nature relative to the total install power demand. Peak demand for these mines is 60% of the total installed power. Average demand is typically 40% to 50% of the peak-installed power. The average power demand is 45% of the total installed load. Table 18.1 summarizes the total installed power requirements, peak power demand and average power demand.

Table 18.1
Power Requirements

	Power Requirement (MW)	RLO Power Requirements (MW)
Total Installed Power	40	1.4
Peak Power Demand	24	0.8
Average Power	18	0.6

A 138 kV high-voltage power transmission line exists approximately 6 km east of the property with sufficient capacity to supply the power requirements. There will be a new transformer and 69KV transmission line to provide the power supply for site. The main 69KV transmission line will terminate at a central main substation near the CPP. The various mining operations will be provided electrical service with transmission lines from the main substation and satellite substations.

The RLO will be supplied power from the main substation with an approximately 7 km transmission line running along the proposed conveyor right of way and following the dedicated RLO access road that will be required for access from the minesite.

18.6 Natural Gas Supply

Natural gas provides considerable operational cost savings over electricity when drying coal, and heating larger buildings and quantities of water. The main natural gas requirement for the Aries Project is the CHPP site which is located 28 km from an existing gas plant and a network of natural gas pipelines.

18.7 Rail Infrastructure

Development of the property as an operating mine is expected to require the extension of the railway to a dedicated rail loadout and rail loop or siding. Currently, Norwest expects the rail loop to be located on the southeastern side of the property with the rail line being extended from the existing line near Strachan. Depending on the location of the rail loop, approximately 28.3km of new rail is proposed as illustrated in Drawing 3. This rail loop connects to a CN spur line that is limited to 268,000lbs gross weight railcars. There is the opportunity to switch rail providers in Red Deer as both CP and CN have mainlines servicing the Red Deer area.

18.8 Ports

Product coal from the Aries Project will be loaded at the RLO into unit trains supplied and operated by either CN Rail for transporting the coal to one of the coal terminals on the BC coast, where it will be loaded onto standard ocean-going bulk carriers for delivery to steelmakers and customers worldwide. There is option to move product through one of the two Vancouver, BC ports or through Prince Rupert, BC.

18.9 Project Personnel Requirements

Norwest has estimated the number of personnel required for the PFS level work completed to date. Table 18.2 below provides estimates of the Ram River hourly and management personnel required for the project. The numbers shown below are the average staffing requirements.

Table 18.2
Summary Average Personnel Requirements

	Numbers
Plant Management	13
Plant Hourly	62
Surface Mine Operations	301
Surface Mine Operations Management	17
Surface Mine Maintenance	170
Surface Mine Maintenance Management	14
Site Management	32
Site Total	**609**
Offsite Management	12
Project Total	**621**
Direct Contractors	20

In addition to personnel required during operations, it is expected that a peak workforce of approximately 800 personnel will be required during the mine construction and start-up period.

19 MARKETS AND CONTRACTS

Norwest has reviewed the coal quality data developed during the various testing programs in order to provide comparison for the proposed Aries clean coal product with other metallurgical coals known to the coking making market.

The international metallurgical coal market study included model coal products from several countries with Australia being the dominant player in the seaborne coking coal market. The highest tier of metallurgical coal product is designated as a hard coking coal (HCC) with specific coking and chemical characteristics. The number of coals with a HCC designation on the market is relatively limited and these coals receive a premium price. Numerous coal products and coal blends are sold on the market that are rated below the HCC products in a rating classification moving from HCC to Tier 2 coking coals, semi-hard coking coals, semi-soft coking coals and pulverized coal injection (PCI) coal products. There is some overlap between product classifications in the market as each buyer has specific criteria and characteristics they find suitable for their coke ovens. In addition to coal quality parameters, the marketability of a given coal product can also be affected by security of supply, diversity of suppliers and other market driven factors.

The Aries Project is positioned to produce a clean coal product which lies between the Australian Tier 2 Coking Coals and the Semi-Hard coals. Its coking characteristics will support its use in coke blends where Asian steelmakers increasingly seek to reduce usage on the highest quality and most expensive hard coking coals. With its CSR of 50 – 55, RAM's clean coal product is superior in quality to the Australian semi-soft coking coals and compares favourably with Australian semi-hard coking coals that are used for this purpose. It also enjoys the advantage of providing diversification of supply to Asian buyers who rely heavily on Australian supply in this quality category. For these reasons, it is expected that a market is available for the Aries product and that it will gain market acceptance. The projected long-life of the project is also attractive to buyers seeking long-term security of supply.

Norwest prepared a series of drawings to compare the Aries coking coal quality parameters to other coking coal products, Drawings 26 through 28. The drawings illustrate the range of various coking properties and coking coal products on the market. The Aries coal is within the range of other clean coals that are blended to manufacture coke as illustrated in the following drawings:

- Shapiro-Gray Composition Balance Index Comparative Coke Strength (Drawing 26).
- Thermal Rheology as Function of Rank Ruhr Dilation (Drawing 27).
- Relation of Fluidity and Mean Maximum Reflectance MOF Diagram (NKK) (Drawing 28).

The brands selected for comparison with Aries clean coal are similar in terms of rank and volatile matter (VM). Rheological characteristics are very good, with fluidity as high as 5,000 ddpm. The Aries clean coal product would be expected to be competitive with these coals with respect to reflectance, ash content, ash chemistry, sulphur and phosphorus.

The clean coal data available supports the opinion that Aries coal is superior to the semi-hard coking coals, and should be benchmarked against the Tier 2 coking coals, in particular the Tahmoor and Kestrel brands. Since steelmakers prefer a CSR of at least 58 in a hard coking coal, it is expected that Aries product will be discounted at or just below the lower range for the Tier 2 coals during pricing negotiations.

Price Outlook for Aries Coking Coal

Price benchmarking for Aries coking coal is developed firstly from the pricing of Tier 2 and Semi-Hard coking coals in relation to the long-term Benchmark HCC price, and secondly from an assessment of the quality differential between Aries coal and the Tier 2 and Semi-Hard coals. Since steelmakers prefer a CSR of at least 58 in a hard coking coal, it is expected that Aries product may be discounted off the Tier 2 coals during pricing negotiations.

Table 19.1 arrives at a range of prices for Aries coking coal based on different assumptions related to market pricing.

Table 19.1
Forecast Price Outlook for Aries Coking Coal

(US$ per Tonne in Nominal $)	Price as % of HCC	Current Market[1]	Medium Term Price 2018 - 2020	Long Term Price 2021 on
Prime Hard Coking Coal	100%	154	140 - 170	140 - 170
Tier 2 Coking Coal	88 - 90%	136 – 139	136 – 153	136 – 153
Semi-Hard Coking Coal	83 - 85%	128 - 131	116 - 145	116 - 145
Pricing for Aries Coking Coal (87% of HCC)		134	122 - 148	122 - 148

[1] March 31, 2017 Spot Market Price

Overall, the Aries coal product quality shows it to be comparable to a number of widely sold coking coals. It is reasonable to expect that it will find its place in the market as one of the many coals used in blends for coke production. A key component of the Aries Project will be to establish a presence for the coal product in the international market by undertaking additional sampling and testing and developing relationships with potential buyers.

20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

In early 2013, RAM initiated the collection of environmental baseline data which is required for the provincial and federal Environmental Assessment ("EA") processes. The baseline data collected will be used to support both the assessment and regulatory processes, and will establish the environmental baseline conditions for future monitoring.

RAM's mission is to develop the Aries Project into a modern, state-of-the-art mining operation utilizing industry best practices in the areas of Health, Safety and Environmental while providing sustainable benefits to local communities. Planning and operations will prioritize direct and constant communication and consultation with local communities, as they are important partners in the development of the project.

20.1 Jurisdiction and Applicable Regulations

The proposed project falls wholly within the province of Alberta and will be subject to an Environmental Assessment ("EA") under both the Provincial and Federal EA legislation. There are minor differences between the two jurisdictions; however, the scientific basis of both processes is complementary.

20.2 Reclamation

The Aries Project reclamation plan is founded on the principle of progressive reclamation that will begin in the earliest possible phases of the mine development and continue throughout the life of the project. The configuration and phasing of the Aries Project presents significant opportunity for the direct placement of salvaged soil and for early progressive reclamation of the stockpile MRSF slopes. The first year where a significant area is available for resloping is Year 3 of the operation. The progressive reclamation plan will allow for reclamation of approximately 75% disturbed area prior to the completion of mining. The final reclaimed footprint is shown in Drawing 25.

20.3 Environmental Studies

Local and regional impacts will be assessed for all relevant activities. Baseline Environmental studies commenced in 2013 and included, but not limited to; Air Quality, Aquatic Health, Geochemistry, Fish and Fish Habitat, Hydrology, Hydrogeology, Noise, Soils, Terrestrial health, Wildlife, Vegetation, and Water Quality. Additional baseline data is required for some disciplines and further engagement with local regulators is required to ensure a complete and comprehensive data set is collected before assessments of the baseline data can be completed, Following the completion of all required baseline data, the assessment and modeling of the data will be required to complete an Environmental Impact Assessment.

20.4 Water Quality and Selenium Management

Water quality and selenium management are issues which are affecting coal mining activities and mine development in western Canada. Norwest understands that RAM has been proactive in the evaluation of potential water quality effects related to the Aries Project and is examining selenium management options for the project. These efforts should be continued in order to mitigate potential delays in permitting or cost implications for the project.

20.5 Aboriginal and Community Engagement

Throughout the development, operational, and reclamation stages of the proposed Aries Project, there is the expectation that each stage be completed within a sustainable and responsible framework.

Engagement and consultation began in 2013 during RAM's initial exploration drill program. With the completion of the revised project design within a prefeasibility framework, this will provide an opportunity for RAM to engage in meaningful conversations with Aboriginal and local communities, stakeholders, and other interested parties. RAM is committed to incorporating the views expressed by the parties, which includes local and traditional knowledge, into the next stages of the project design and the decision-making process.

21 CAPITAL, AND OPERATING COSTS

Cost estimates were prepared for mine, processing and coal handling operations, development work, and the reclamation activities that are associated with the mining of the Aries Project. Cost estimates contained within this report are sufficient to support a level of accuracy of ±25% which correlates with a PFS level evaluation.

Operating unit costs are expressed as dollars per BCM and/or dollars per clean product tonne unless specified otherwise. The cost estimates and resulting cash flow analysis were prepared in constant 2017 Canadian dollars (CAD$).

21.1 Capital Costs

The mine capital schedule has been developed on the basis of RAM developing and operating the Aries Project as an owner-operator.

21.1.1 Pre-construction permitting, engineering and design.

Cost estimates for the pre-construction development stage of the Aries Project are based on a schedule developed by Norwest with input from RAM's project team. The costs assume the project is advanced from completion of the PFS report through FS evaluation and detailed engineering with a parallel track for environmental assessment, permitting and approval of mine licenses.

The assumed timeline for these activities allows for their completion in approximately 3.5 to 4 years assuming no unexpected delays are encountered during the evaluation, permitting and detail design process.

21.1.2 Mine Development and Infrastructure Capital Cost Estimates

Mine development and infrastructure capital expenditures are incurred as part of the initial Aries Project site development and access improvement. Major capital items related to the mine development and infrastructure are related to the following:

- Site preparation (access improvements, clearing, grading).
- Construction of the maintenance/warehouse complex and office/dry facility.
- Substations, powerline to site and site power distribution facilities.
- Water management structures (ditches, dams, culverts, erosion controls).
- Development of pit access and pre-stripping.
- Improvement of existing logging roads (if/as required).
- Owner's Costs / Construction management.

Major capital costs for the surface mine development and infrastructure are summarized in Table 21.1.

21.1.3 Construction Management

Construction management will require the hiring of a RAM project team to manage the project as well as third-party environmental and engineering consultants. As the project advances through feasibility and into the detailed design phase, it is expected that RAM would partner with an engineering, procurement and construction (EPC) company with experience in mine development to take the project through detailed design and into the construction phase. Project management costs are included in the capital estimates.

21.1.4 Mine Equipment Capital

This economic analysis is based on purchasing the surface mining equipment (shovels, trucks, dozers, etc.). The infrastructure to support the surface mine will be located at the plant facilities location and has been included in the facilities capital.

21.1.5 Rail Extension Capital Cost Estimate

A critical decision made through the development of the PFS on the Aries Project was the extension of a 28.3km rail line, which brought the rail closest to the Aries Project site.

21.1.6 Process Plant and Coal Handling Capital Estimate

The projected capital costs for the Aries coal washing and clean coal handling systems include the following major components:

- Raw coal truck dump, breaker and surge bin with associated conveying system.
- Coal wash plant, which includes processing equipment.
- Process plant building shell with overhead crane.
- Rejects bin for truck loading and enclosed conveyor.
- Thermal dryer with enclosed feed conveyor.
- Clean coal surge silo with feed conveyor.
- Elevated RopeCon overland conveyor.
- Clean coal product storage silos.
- Rail loop and train loading system including Point of Sale (POS) scales, sampling and car sprayer system.

Cost estimates include construction costs for the various components. These costs were estimated based on material takeoffs applied to local construction and fabrication unit costs. All major equipment costs were current vendor supplied budgetary quotations specific to this study.

21.1.7 Initial Capital Cost Total

Table 21.1 summarizes the initial capital costs for the Aries Project. All capital costs have contingency estimates applied. The capital contingency is based on the level of detail and the uncertainty of the costs estimated.

Working capital has been included on a separate line as these funds are recovered into the cash flows at the end of the operation.

Table 21.1
Initial Capital Costs

	Direct ($M)	Indirect ($M)	Initial ($M)
Pre-Development Cost (Roads, Clearing)	$13	$3	$16
Mine Infrastructure & Facilities	$68	$7	$75
Plant and Coal Handling Facilities	$149	$21	$170
Rail Line Extension and Loop	$97	$33	$130
Rail Load Out	$29	$3	$32
Surface Mine & Support Equipment*	$389	$20	$409
Total	**$745**	**$87**	**$832**
Owner's Cost	$19		$19
Reclamation Security	$25		$25
Total w/o contingency	**$745**	**$131**	**$876**
Contingency	$152		
Total with contingency	**$1,028**		

*Mine Capital through mine ramp up period.

In addition to the initial capital costs, there is also working capital allowance of $74 M and a contingency allowance which equals 18% of the initial capital costs. As part of on-going operations, there is a requirement for $223 M sustaining capital and $738 M of replacement capital.

21.2 Operating Costs

Operating costs have been developed from first principles for the mine, plant, transportation costs, and general administration costs. Operating unit costs are summarized in Table 21.2.

21.2.1 Mine Equipment Operating Costs

Costs were developed using the life cycle method which recognizes that the timing and costs of component overhauls are periodic and, therefore, predictable. Operating cost estimates on a $/SMU basis were developed for each equipment fleet planned for the project.

21.2.2 Coal Process Plant and Coal Handling Operating Costs

The projected operating costs for the Aries Project coal washing and coal handling systems were based on a 950 Tonne per hour (TPH) plant. The Coal process plant (CPP) yield will be variable depending on mined-seam proportions as well as dilution rock thus varying the product cost. Therefore, the CHPP operating costs are stated on an ROM basis.

21.2.3 Transportation and Port Costs

Transportation and port costs were based upon initial discussions for rates for transport of coal from site to the Ridley Terminal located in Prince Rupert. The rail estimates provided loading the aluminum railcars wagon sets at site, 2017 fuel surcharges, tariffs and transporting the coal 1700km. Rates were based on discussions with existing users and rail and port operators in western Canada. Port costs covering sales and survey were based on estimates reviewed by Norwest.

Table 21.2
Operating Unit Costs

Cost Center	($ / cmt 8%)
Surface Mining - Direct Coal, Waste Coal & O/B	$60.31
General and Administration	$7.60
Processing Costs	$6.67
Rail and Port Cost	$41.46
Offsite Administration	$1.26
Average Operating Cost	**$117.30**

22 ECONOMIC ANALYSIS

This section evaluates the project economics at a level of detail commensurate with a PFS level study.

22.1 Economic Assumptions

22.1.1 Currency Assumptions

Metallurgical coal revenue is converted from US dollars in to Canadian dollars at a long-term exchange rate of CAD$1.00:US$0.75US based on the recent performance of the Canadian dollar and reviewed published information. The Bank of Canada average exchange rate was US$0.755 over the last 12 months, and US$0.756 over the last 6 months.

The economic analysis is calculated using constant 2017 Canadian dollar revenues and costs.

22.1.2 Metallurgical Coal Price

RAM retained the services of an independent coal marketing consultant to provide an opinion on coal pricing. The consultant provided a range in long-term estimates of the selling price per clean tonne for HCC from $140USD/tonne to $170USD/tonne. The HCC price used to develop the Aries coking coal price is $165USD/tonne as a base case. The Aries coking coal is assumed to receive 87% of the average expected price of HCC, which equates to a long-term price of $143.55USD/tonne for the Aries' clean coal product. The coking coal price reflects the coal quality considerations and looks to comparable products on the market as discussed in Section 19. The economic analysis is based on the coal price assumption.

22.1.3 Salvage Value

The evaluation assumes there is no net salvage value for the equipment at the end of the equipment's useful life. In reality, some salvage value may be realized so as to offset post-mining dismantling and reclamation costs.

22.1.4 Reclamation Bond

The reclamation costs are assumed to be expensed in the year that the reclamation activities occur. A reclamation bond would reflect these discounted expenses. For the purposes of this project, the discount rate used to calculate the reclamation bond would be the same as the project discount rate.

22.2 Royalties and Taxes

The Aries Project is subject to both Provincial and Federal Corporate Income taxes, a private royalty payment and an Alberta Coal Royalty. This section details the provisions made for the respective taxes and royalties.

22.2.1 Private Coal Royalty

There are two privately held royalties on the Aries Project leases. One is held by Fraser Exploration Ltd. and the other is held by Imperial Metals. Portions of the North Block area are subject $0.12/ clean tonne royalty held by Imperial Metals. Norwest hasn't been able to independently verify the royalty agreement and has applied the royalties to all the North Block coal leases to be conservative.

22.2.2 Alberta Coal Royalty

Aries Project is located on Crown land and is therefore subject to the Alberta Mineral Tax. The Tax provides for the Crown's financial share of mineral production in two ways:

The primary form is to receive 13% of the producer's profit that is in excess of a normal return on investment over the life of the mine. This is the Net Revenue Tax. To minimize any disincentive to investment, the province does not receive this share of the tax until the investment in the mine and a reasonable return has been recovered.

The second share from mineral production is to receive 1% of operating cash flow from production each year. This is referred to as the Net Current Proceeds Tax. It is intended to provide compensation to the province for depletion of the resource when production yields less than a reasonable profit for the producer. So, that only one or the other share is paid, Net Current Proceed Tax can be deducted from Net Revenue Tax.

22.2.3 Corporate Income Taxes

Federal and Provincial income taxes have been calculated on a project basis. Tax losses in the early years are carried forward to be deducted against future income. Tax credits available at the end of mine life are not included in the cash flow. Similarly, tax credits that may be available from expenditures prior to commercial production are not included in the cash flow. RAM may want to determine the effect of possible tax losses or incentives that might be applied to the Aries Project on a corporate basis both at the start of and at the end of the project.

As this is an Alberta based project, the corporate income tax rate for Alberta has been applied in addition to the Federal corporate tax rate. The 2016 tax rates have been used for the purposes of calculating the income tax bill for the Aries Project and the rates are detailed in Table 22.1.

Table 22.1
2016 Corporate Income Tax Rates

	Tax Rate (%)
Alberta Income Tax Rate	12%
Federal Income Tax Rate	15%
Total Tax Rate	27%

All other capital expenditures are assumed to be Class 41 assets. Class 41A assets are those capital costs up to the start of substantial production. Thereafter, capital additions are included as Class 41B assets. Class 41A can be written off up to 100% or to a maximum of taxable income in order to reduce taxable income to zero. Class 41B can be written off at a rate of 25% on the declining balance.

22.3 Results

The results of the economic analysis in terms of capital cost ($/tonne), operating cost ($/tonne), pre-tax net present value at 8% (NPV8), internal rate of return (IRR%), payback period, after tax cashflow are shown in Table 22.2 for the base case assumptions listed above and the capital and operating costs developed in Section 21 for the base case assumptions.

Table 22.2
Economic Results

	Results
Capital Cost ($/tonne)	$17.00
Operating Costs ($/tonne)	$117.30
Pre-tax NPV_8 ($M)	$1,498
Pre-tax Internal Rate of Return (%)	22.7%
Payback Period (years)	4.8
After-Tax Cashflow ($B)	$4.38
After-Tax NPV_8 ($M)	$855
After-Tax Internal Rate of Return (%)	18.8%

Table 22.3 summarizes production and annual cashflow over the life of the project.

Table 22.3

Annual Cashflows

	Year	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mine Rock	MBCM			9.4	31.5	53.8	59.2	81.7	80.7	81.1	80.7	81.8	79	79.9	78.1	82.7	82.1	81.5	73.9	79.2
ROM Coal	Mt			0.4	3.7	5.1	5.8	5.9	6.1	6.4	6.2	6.0	6.3	6.1	6.4	5.7	6.2	6.4	6.0	6.0
Clean Coal	Mt			0.3	2.4	3.3	3.9	3.8	3.9	4.1	3.9	3.8	4.0	4.0	4.4	4.0	4.3	4.5	4.2	4.1
Revenue	($ M)	$ -	$ -	$ 52	$ 453	$ 623	$ 746	$ 718	$ 738	$ 791	$ 745	$ 727	$ 775	$ 764	$ 851	$ 761	$ 829	$ 856	$ 809	$ 789
Operating Costs	($ M)	$ -	$ 4	$ 68	$ 250	$ 350	$ 388	$ 423	$ 432	$ 464	$ 454	$ 430	$ 444	$ 449	$ 475	$ 463	$ 479	$ 484	$ 454	$ 478
Capital Spend Annual	($ M)	$ 80	$ 275	$ 366	$ 255	$ 134	$ 25	$ 104	$ 12	$ 53	$ 2	$ 8	$ 8	$ 14	$ 31	$ 36	$ 4	$ 82	$ 71	$ 129
Alberta Royalty Tax	($ M)	$ -	$ -	$ 0	$ 4	$ 5	$ 6	$ 6	$ 6	$ 6	$ 39	$ 40	$ 44	$ 41	$ 48	$ 36	$ 47	$ 40	$ 39	$ 26
Federal and Provincial Corporate Tax	($ M)	$ -	$ -	$ -	$ -	$ -	$ -	$ 40	$ 64	$ 72	$ 55	$ 59	$ 69	$ 67	$ 82	$ 63	$ 75	$ 82	$ 74	$ 62
Cash Flow	**($ M)**	**$ (80)**	**$ (279)**	**$ (383)**	**$ (56)**	**$ 134**	**$ 328**	**$ 145**	**$ 224**	**$ 196**	**$ 194**	**$ 190**	**$ 209**	**$ 193**	**$ 216**	**$ 162**	**$ 224**	**$ 168**	**$ 170**	**$ 94**
Cumulative Cash Flow	**($ M)**	**$ (80)**	**$ (359)**	**$ (742)**	**$ (798)**	**$ (664)**	**$ (336)**	**$ (191)**	**$ 33**	**$ 228**	**$ 423**	**$ 612**	**$ 821**	**$ 1,014**	**$ 1,230**	**$ 1,392**	**$ 1,616**	**$ 1,783**	**$ 1,954**	**$ 2,048**

	Year	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Mine Rock	MBCM	79.2	79.2	79.2	79.2	81.7	81.7	81.7	81.7	81.7	80.4	80.4	80.4	80.4	80.4	45	45	45		
ROM Coal	Mt	6.0	6.0	6.0	6.0	5.8	5.8	5.8	5.8	5.8	4.3	4.3	4.3	4.3	4.3	4.4	4.4	4.4		
Clean Coal	Mt	4.1	4.1	4.1	4.1	3.8	3.8	3.8	3.8	3.8	2.8	2.8	2.8	2.8	2.8	3.0	3.0	3.0		
Revenue	($ M)	$ 789	$ 789	$ 789	$ 789	$ 734	$ 734	$ 734	$ 734	$ 734	$ 530	$ 530	$ 530	$ 530	$ 530	$ 570	$ 570	$ 570		
Operating Costs	($ M)	$ 476	$ 477	$ 477	$ 477	$ 461	$ 461	$ 460	$ 460	$ 460	$ 415	$ 415	$ 411	$ 411	$ 411	$ 310	$ 310	$ 311	$ 16	$ 16
Capital Spend Annual	($ M)	$ 19	$ 55	$ 8	$ 69	$ 13	$ 74	$ 23	$ 18	$ 63	$ 36	$ 13	$ 63	$ 10	$ 6	$ 1	$ 0	$ -		
Alberta Royalty Tax	($ M)	$ 40	$ 36	$ 42	$ 34	$ 36	$ 28	$ 34	$ 35	$ 29	$ 10	$ 14	$ 8	$ 14	$ 15	$ 36	$ 36	$ 36	$ -	$ -
Federal and Provincial Corporate Tax	($ M)	$ 57	$ 60	$ 60	$ 63	$ 52	$ 54	$ 52	$ 54	$ 55	$ 17	$ 17	$ 20	$ 18	$ 20	$ 54	$ 56	$ 57	$ (7)	$ -
Cash Flow	**($ M)**	**$ 196**	**$ 162**	**$ 203**	**$ 147**	**$ 173**	**$ 117**	**$ 164**	**$ 167**	**$ 127**	**$ 51**	**$ 71**	**$ 28**	**$ 76**	**$ 78**	**$ 169**	**$ 168**	**$ 167**	**$ (9)**	**$ 82**
Cumulative Cash Flow	**($ M)**	**$ 2,244**	**$ 2,406**	**$ 2,609**	**$ 2,755**	**$ 2,928**	**$ 3,045**	**$ 3,209**	**$ 3,376**	**$ 3,503**	**$ 3,553**	**$ 3,624**	**$ 3,652**	**$ 3,728**	**$ 3,806**	**$ 3,975**	**$ 4,143**	**$ 4,310**	**$ 4,301**	**$ 4,383**

Pre-tax IRR (%)	22.7%
Pre-tax NPV ($M)	$1,498
After-tax IRR (%)	18.8%
After-tax NPV ($M)	$ 855

22.4 Sensitivity Analysis

Sensitivity analyses were carried out to determine the impact that changes to key parameters would have on the economic performance of the Project. Sensitivity to the following parameters and assumptions was examined:

Base case, all parameters set at base case levels (100%).

- Selling prices, ± 10% and ± 20%.
- Exchange rate, ± 10% and ± 20%.
- Rail and port cost, +-10% and ± 20%.
- Operating cost, ± 10% and ± 20%.
- Capital cost, ± 10% and ± 20%.

The results of the sensitivity analyses are shown in Table 22.4

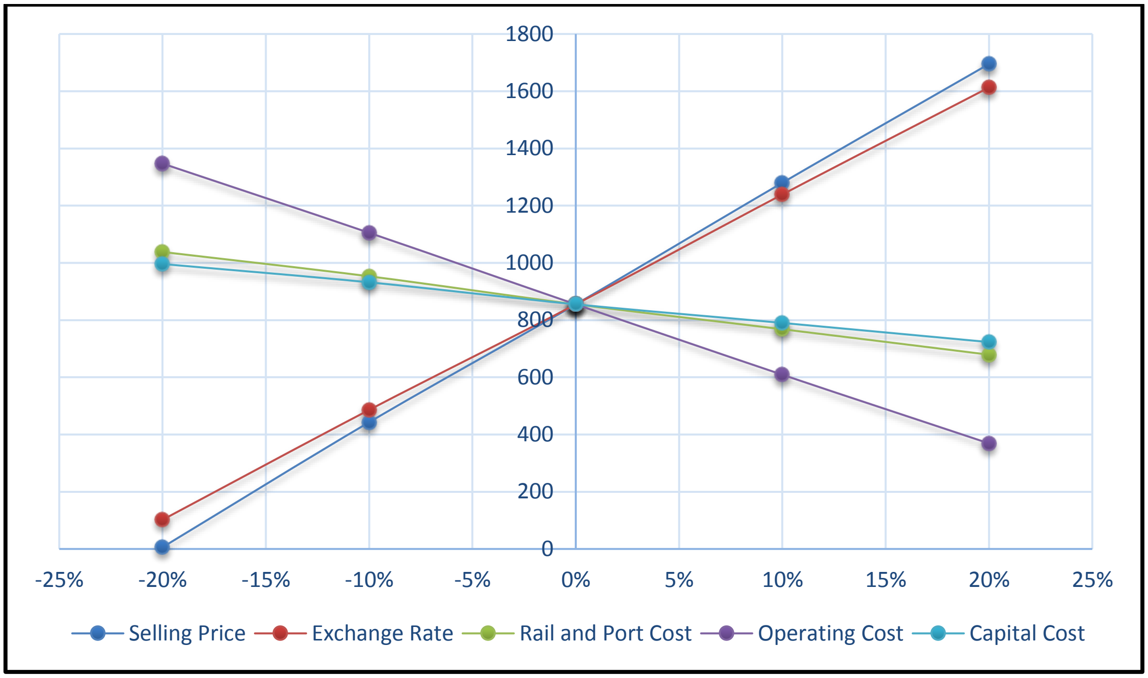
Table 22.4
Economic Results Results NPV8 ($M)

NPV8 ($M)					
	Sensitivity Range	Pre-Tax		After Tax	
		+	-	+	-
Base Case	-	$1,498		$855	
Selling Price	+/-10%	$2,156	$840	$1,280	$443
	+/-20%	$2,813	$182	$1,695	$6
Exchange Rate	+/-10%	$2,094	$902	$1,239	$486
	+/-20%	$2,689	$306	$1,613	$102
Rail and Port Cost	+/-10%	$1,353	$1,642	$768	$953
	+/-20%	$1,209	$1,787	$679	$1,038
Operating Cost	+/-10%	$1,106	$1,889	$609	$1,105
	+/-20%	$715	$2,280	$369	$1,347
Capital Cost	+/-10%	$1,399	$1,596	$790	$932
	+/-20%	$1,300	$1,695	$723	$996

The sensitivity analyses show the project economics are most sensitive to coal price, and exchange rates. Coal price and exchange rates are factors beyond RAM's control and must be considered as part of the inherent project risk. This is depicted in Figure 22.1.

Figure 22.1

Sensitivity Analysis Graph.



23 ADJACENT PROPERTIES

Ram River Coal Corp. coal leases combined historically two coal properties - Ram River property and Scurry Ram property. The northern part of the coal leases represents the Ram River property and Scurry Ram property is located immediately south of it.

The closest coal mine is Nordegg Mine, closed in 1955. Nordegg mine is located 26 km north from the Ram River property.

24 OTHER RELEVANT DATA AND INFORMATION

This section discusses issues that may affect the development schedule of the project and provide background to some points raised previously in the report.

24.1 Alberta Coal Policy

In June of 1976 the Alberta government put in place a Coal Policy that classified lands in province as being suitable for various types of coal mining. The RAM property is within lands subject to the restrictions of Category 2. The Policy, as originally written, laid out that while it is possible to conduct coal exploration in Category 2 land, there is strict control by Albertan authorities. Mine development is limited to underground mining only, and even then requires approval that the surface effects of mining is will be environmentally acceptable.

RAM has received documentation from the provincial government which provided clarification of the 1976 Coal Policy as it relates to RAM's properties (Alberta Government communication, July 2016), that the permitting of surface mining is acceptable for the development of the Aries Project. As is the case elsewhere across Alberta, the permitting of surface mining activities is subject to regulatory review and approvals.

24.2 Alberta Land Use and Resource Development Framework

A summary of the potentially applicable permitting, development and land-use policies, which may or may not be considered by provincial regulators in its review of the Aries Project, is summarized below.

- 1976 A Coal Development Policy for Alberta;
- 1983 Directive 61 – How to Apply for Government Approvals of Coal Projects in Alberta;
- 1984 Eastern Slopes Policy;
- 1986 Nordegg – Red Deer River Sub-Regional Integrated Resource Plan; and
- 1986 Rocky – North Saskatchewan Sub-Regional Integrated Resource Plan.

The Nordegg and Rocky Sub-Regional Integrated Resources Plans ("IRPs") from 1986 overlay the project area. These IRP's are planning documents prepared by the government and the public for improved management of Alberta's land and resources. Each plan presents the Alberta Government's resource management policy for the public lands and resources within the area. They are intended to be a guide to resource managers, industry, and the public whom have responsibilities or interests in the area. Language contained within each of the IRPs are favorable towards sustainable coal development, and they both make specific reference to the development of RAM coal deposits within each IRP's Management Objectives.

Alberta Land-use Framework

The provincial government adopted a provincial Land-use Framework (LUF) in 2008 which purpose was to provide a land-use system that manages public and private lands and natural resources in a responsible manner. The LUF was incorporated as a new approach to managing provincial lands and natural resources to achieve, long-term economic, environmental and social goals. The government recognized that the social, economic and environmental goals are highly integrated, and that decision making and trade-offs for Alberta's land and resources would have to be considered. To date, two regional plans have been completed and approved, the Lower Athabasca and the South Saskatchewan.

The Aries Project is within the North Saskatchewan Regional Planning (NRSP) area which was initiated in 2014. Phase one of a three phase process has been completed and it is anticipated that phase two will begin later in 2017. RAM team members have been actively engaged in the public and specific consultation for the NSRP. The process involves extensive public, municipal, industry and other interested groups engagement at a variety of levels. The RAM coal deposits were identified in the NRSP Profile document which demonstrates the provincial government recognize the economic opportunities that exists with the Project.

24.3 Water Quality and Selenium Management

Water quality and selenium management are issues which are affecting coal mining activities and mine development in western Canada in both Alberta and British Columbia. Norwest understands that RAM has been proactive in the evaluation of potential water quality effects related to the Aries Project and is examining selenium management options for the project. These efforts should be continued in order to mitigate potential delays in permitting or cost implications for the project.

25 INTERPRETATION AND CONCLUSIONS

The effective date for this Technical Report is March 31, 2017, which is the date on which the last geological data was received for the purposes of developing this report. The principal sources of data concerning geology, drilling, coal quality testing, and many other technical aspects, were obtained from RAM and publicly available sources.

The geology type for the Property was classified as Moderate, based on Geological Survey of Canada Paper 88-21 criteria. The Deposit Type can be classified as amenable to both Surface and Underground mining methods. Verification of the historic records of the geology was achieved by data reviews and geological model construction.

This Technical Report shows that the Aries Project could be developed as a surface mine. This conclusion is based on the observations that have been reached with respect to the following components of the project:

- Resource quantity within the coal leases:

  The density of drilling allowed 312.7 Mt of coal resource to be classified as “Measured” and 100.9 Mt as “Indicated”. A further 105.9 Mt is classified as “Inferred”. These resource estimates apply to both blocks of the property combined and are based on a minimum coal thickness cut-off of 1.5 m for underground mining and 0.5 m for surface mineable resources. The combined surface mineable resource for the Aries Project only is 215.4 M tonnes.

- Infrastructure:

  The Aries Project is located in an established coal mining region with existing gravel roads to the property, power, rail, and available port infrastructure.

- Local Mining Suppliers and Support Industries:

  Red Deer and Rocky Mountain House, Alberta, and the surrounding area support a number of industries including: logging, oil and gas exploration and development, mining contractors, and mining-related service industries. Mining-related service industries operate in the area, such as power line construction contractors, drilling support workers, mining equipment tire suppliers, and other speciality contractors. Major mine equipment suppliers are present in Alberta supporting the existing coal and oil sands operations.

- Mine Development:

  The PFS evaluation completed by Norwest shows the potential for the Aries Project to support a surface mine with its associated coal processing and handling facilities, along with related infrastructure. The planning completed to date shows the property could support a ROM production in the range of 5-6Mt per year for a period of 30 years with the associated clean coal production rate ranging from 4.0 Mt to 4.3 Mt per year.

26 RECOMMENDATIONS

The PFS completed by Norwest for the Aries Project shows the project to be economic under the cost and coal price conditions described in this report. A surface mineable resource and reserve base has been defined in accordance with the requirements of NI4 3-101 Standards of Disclosure for Mineral Projects. The defined reserve base supports the development of a 6 Mtpa operation for a mine life of over 30 years. Additional surface and underground resources, defined previously, are of future potential interest for the development of the Ram River mining complex.

In order to move the project forward to support additional evaluation, permitting and engineering design, Norwest has made recommendation to advance the project through to completion of a FS and completion of the EIA process.

High level timelines and budget estimates have been prepared for both these cases and are discussed in the following sections.

26.1 Development through Feasibility Study and Regulatory Approvals

This path forward may be selected by RAM in order to increase the level of certainty in the project definition and de-risk the project both in terms of the technical aspects of the project as well as aspects related to environmental permitting. The timeline shown on Figure 26.1 is based on a nominal start at the beginning of a calendar year. In reality, portions of the development schedule related to on-site work (site investigation, coal sampling) have some seasonal constraints which would need to be factored into a more detailed schedule.

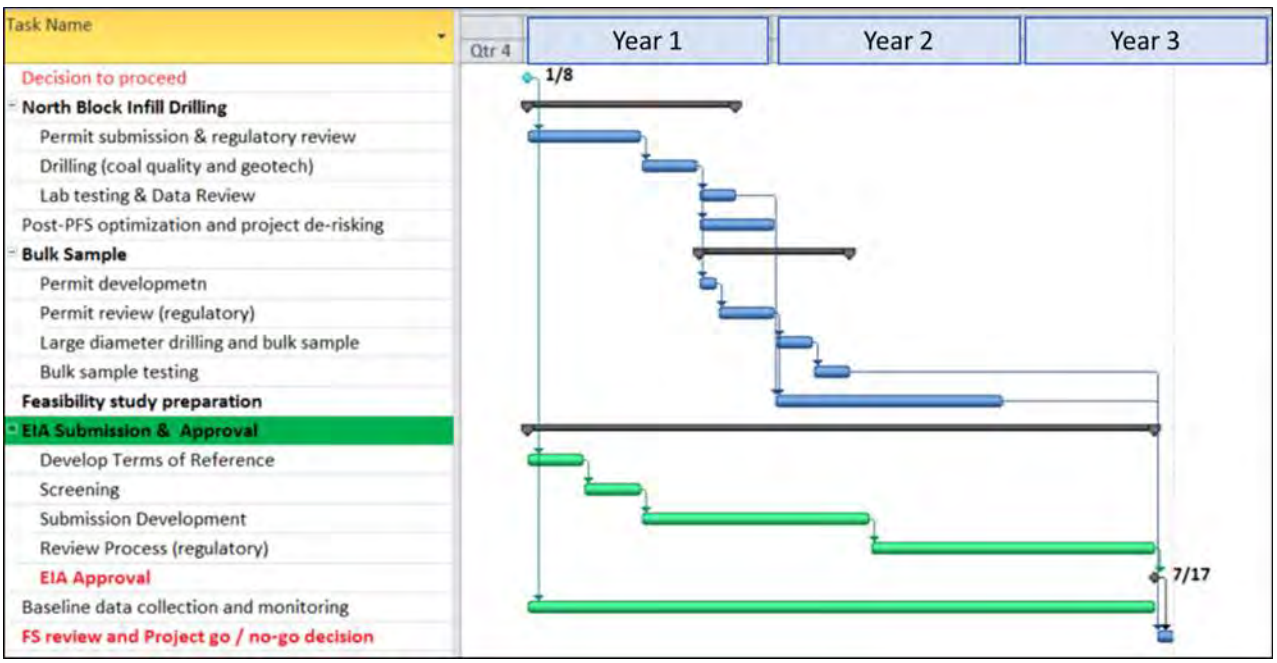
The first stage in the schedule is the planning and permitting for a drill program to collect large diameter core coal samples and geotechnical information in the Phase 1 mining area. Geotechnical drilling would also be completed along the proposed overland conveyor and railway alignment. This data would support more detailed mine and infrastructure design and preparation of updated capital cost estimates for coal handling infrastructure. The coal samples would be used for further coal quality testing in order to refine the existing database as well as define the depth of oxidation at the coal seam outcrops.

The EIA process would be initiated at the same time as the field work in order to meet the EIA timeline as it is currently understood by RAM. Additional Baseline data collection would be initiated to complete the required dataset to enter the regulatory process and carried out on an ongoing basis through permitting.

Following completion of the infill drilling program and completion of the supplement coal handling system design, a second more comprehensive bulk sampling and coal washability/quality program would be carried out during Year 2. This program is intended to provide large samples (500 kg to 1,000 kg) suitable for shipping and testing by potential end-users as well as for RAM's internal testing. This testing would be used to support the marketing and price-setting for the Aries metallurgical coal blend.

While the bulk sample work is underway, the FS could be initiated. The FS has been forecast to require approximately 12-16 months to complete. Based on the current timeline the FS would be completed mid-way through Year 3 with completion and approval of the EIA expected at the end of Year 3.

Figure 26.1
Timeline for development through FS and EA



Cost estimates for the various components of this development plan are summarized in Table 26.1. The total cost for moving the project through the FS and EIA stages is approximately $16M.

Table 26.1
Cost Components for the next Stage of Development

Cost Components	Year 1	Year 2	Year 3	Totals ($000's)
1.0 Staffing and administration				
1.1 Technical services team	$300	$650	$650	**$1,600**
1.2 Management team	$100	$250	$300	**$650**
1.3 Environment, Permitting & Sustainability	$250	$500	$600	**$1,350**
2.0 Geology and Field Programs				
2.1 Phase 1 Infill drilling + geotechnical	$1,600			**$1,600**
2.2 Phase 2 bulk sample + infill drilling		$2,800		**$2,800**
3.0 Evaluation, Permitting and Detailed Design				
3.1 Post-PFS optimization		$300		**$300**
3.2 Feasibility Study		$900	$1,100	**$2,000**
3.3 Baseline environmental monitoring	$500	$2,000	$500	**$3,000**
3.4 Environmental Impact Assessment		$1,500	$1,500	**$3,000**
Totals ($000's)	**$2,750**	**$8,900**	**$4,650**	**$16,300**

27 REFERENCES

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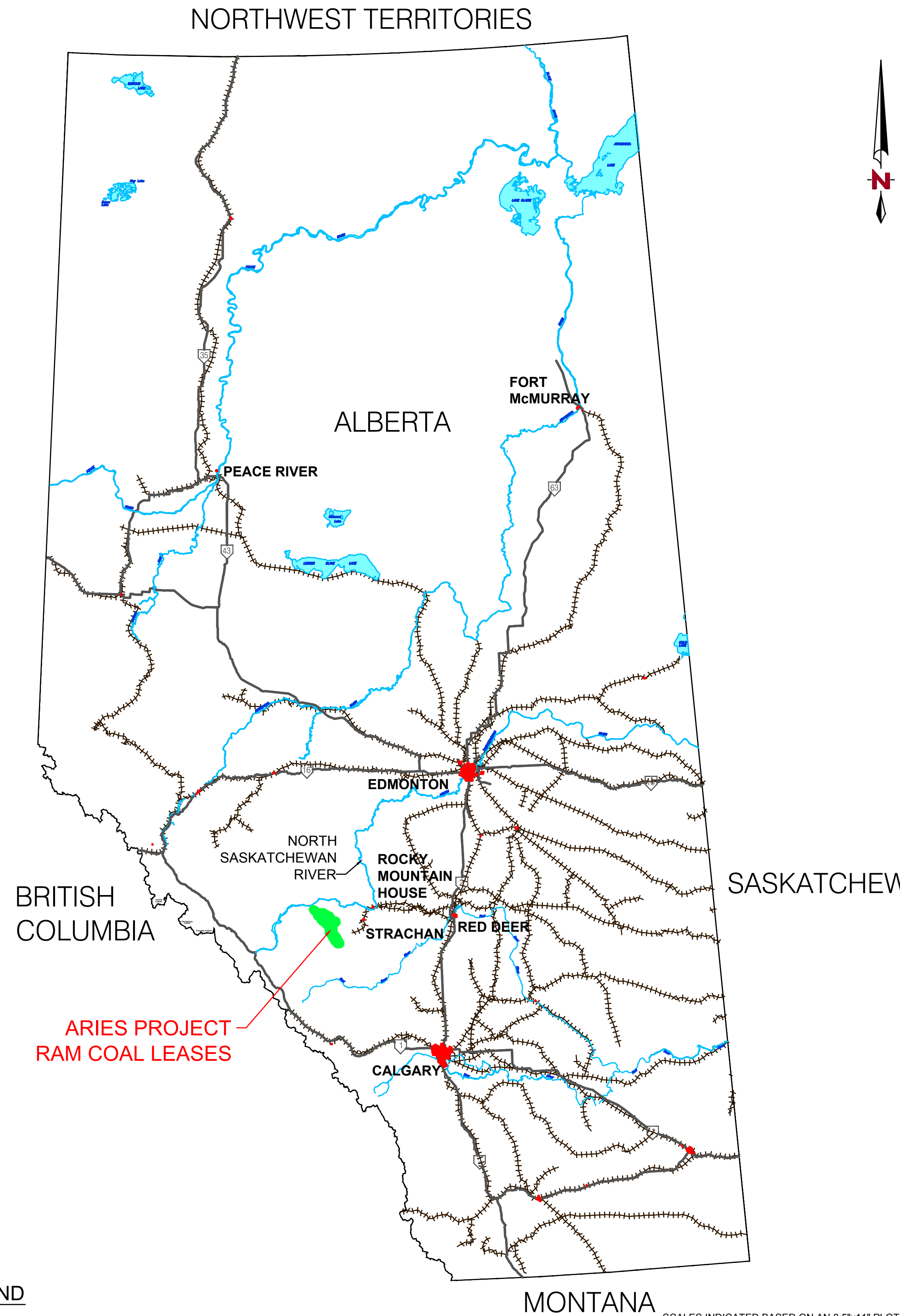
28 GLOSSARY

3DBM	Three-dimensional Block Model
adb	Air-dried Basis
AER	Alberta Energy Regulators
APEGA	Association of Professional Engineers and Geoscientists
BCM	Bank Cubic Metre
BMP	Best Management Practices
CCA	Coal Conservation Act
CCME	Canadian Council of Ministers of the Environment
CCTV	Closed Circuit Television
CHPP	Coal Handling and Processing Plant
CMI	Centrifugal & Mechanical Industries
COSR	Cut-off Strip Ratio
CPP	Coal Preparation Plant
CSR	Coke Strength Ratio
CV	Calorific Values
DOL	Direct On-Line
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plant
EOM	End of Mine
EPC	Engineering, Procurement, and Construction
EPEA	Environment Enhancement and Protection Act
FC	Fixed Carbon
FEL	Front End Loader
FSI	Free Swelling Index
FW	Footwall
G&A	General and Administration
GET	Ground Engaging Tools
GOA	Government of Alberta
GSC	Geological Survey of Canada
GSM	Gridded Seam Model
HCC	Hard Coking Coal

HGI	Hardgrove Grindability Indices
HMC	Heavy Media Cyclone
IRPs	Integrated Resources Plans
IRR	Internal Rate of Return
LD	Large Diameter
LiDAR	Light Detection and Ranging
LUF	Land-use Framework
MARC	Maintenance and Repair Contract
MCC	Motor Control Centre – needs reference in text
MFSP	Mine Financial Security Program
MOU	Memorandum of Understanding
MRSF	Mine Rock Storage Facility
NEBC	Northeastern British Columbia
NO2	Nitrogen Dioxide
NOC	Notice of Commencement
NPV	Net Present Value
NSRP	North Saskatchewan Regional Plan
OMS	Operation, Maintenance and Surveillance
OSD	Out of Seam
PAH	Polycyclic Aromatic Hydrocarbons
PCI	Pulverized Coal Injection
PD	Project Description
PEA	Preliminary Economic Assessment
PFS	Preliminary Feasibility Study
PLC	Programmable Logic Controllers
POS	Point of Sales
RAM	Ram River Coal Corporation
RLO	Rail Load Out
RMSH	Run of Mine Ash
ROM	Run of Mine
SEBC	Southeastern British Columbia
SG	Specific Gravity
SMU	Service Meter Unit
SO2	Sulphur Dioxide
RLO	Train Loadout Facility

TPH	Tonner per Hour
VFD	Variable Frequency Drive
VM	Volatile Matter
VWP	Vibrating Wire Piezometers

29 ILLUSTRATIONS



LEGEND

- MAJOR WATERWAYS
- HIGHWAY
- RAILROAD
- CITY
- ARIES PROJECT

SCALES INDICATED BASED ON AN 8.5"x11" PLOT CONFIGURATION

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
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RAMCOAL

RAM COAL

ARIES PROJECT

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DATE:	2017-02-28
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	KM
DSG'N BY:	--
REV'D BY:	MA
APP'D BY:	SE

DRAWING 1
SITE LOCATION MAP

NORWEST

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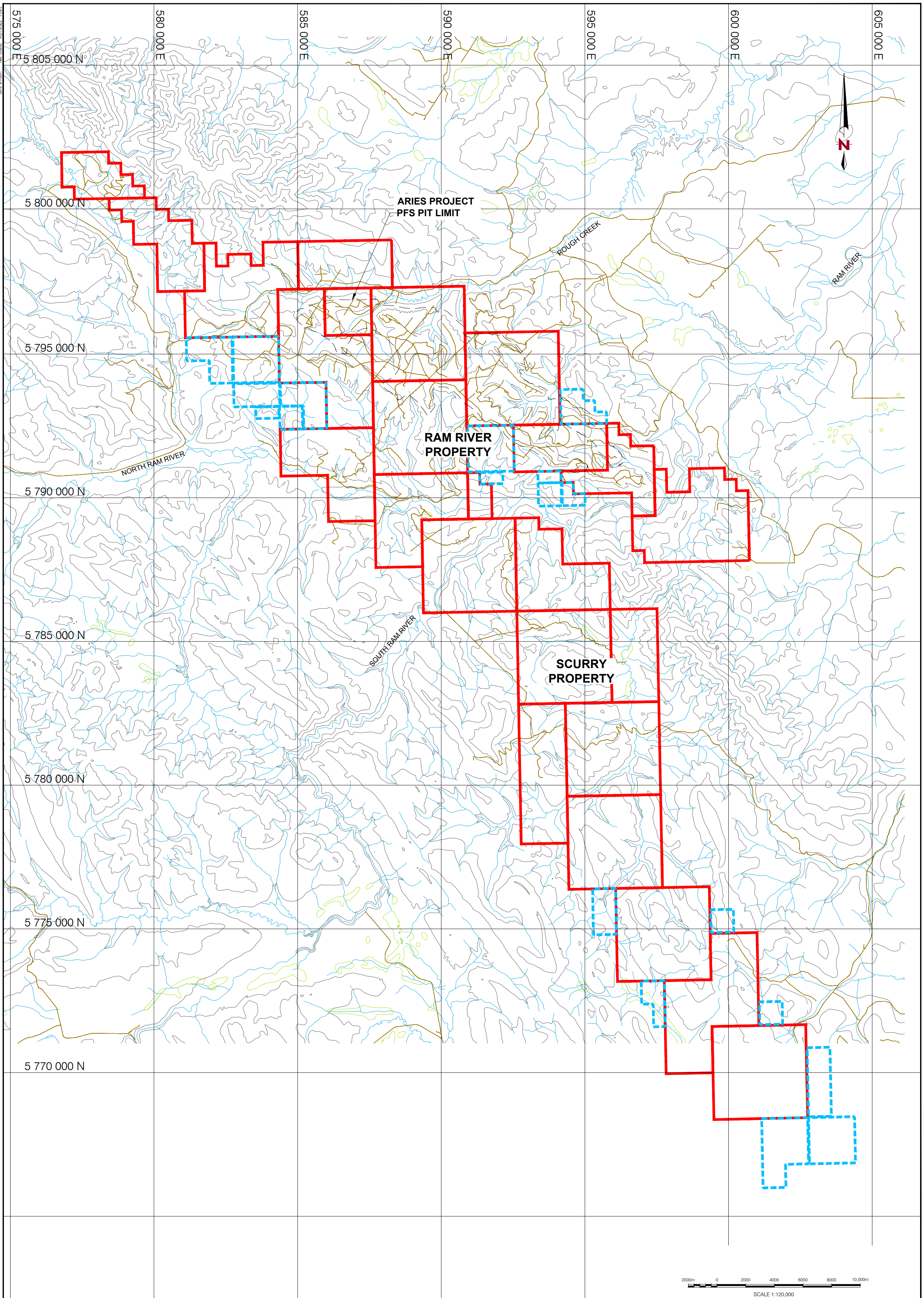

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SCALE 1:120,000

LEGEND

- LEASE BOUNDARY
- LEASE UNDER APPLICATION BOUNDARY
- ULTIMATE PIT BOUNDARY
- ROAD OR TRAIL
- RIVER AND TRIBUTARY

SCALES INDICATED BASED ON AN 11"x17" PLOT CONFIGURATION

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RAMCOAL

RAM COAL

ARIES PROJECT

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CO-ORD. SYS.:	UTM83-10
DRW'N BY:	KM
DSG'N BY:	--
REV'D BY:	MA
APP'D BY:	SE

DRAWING 2
COAL PROPERTIES
AND COAL TENURE PLAN

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
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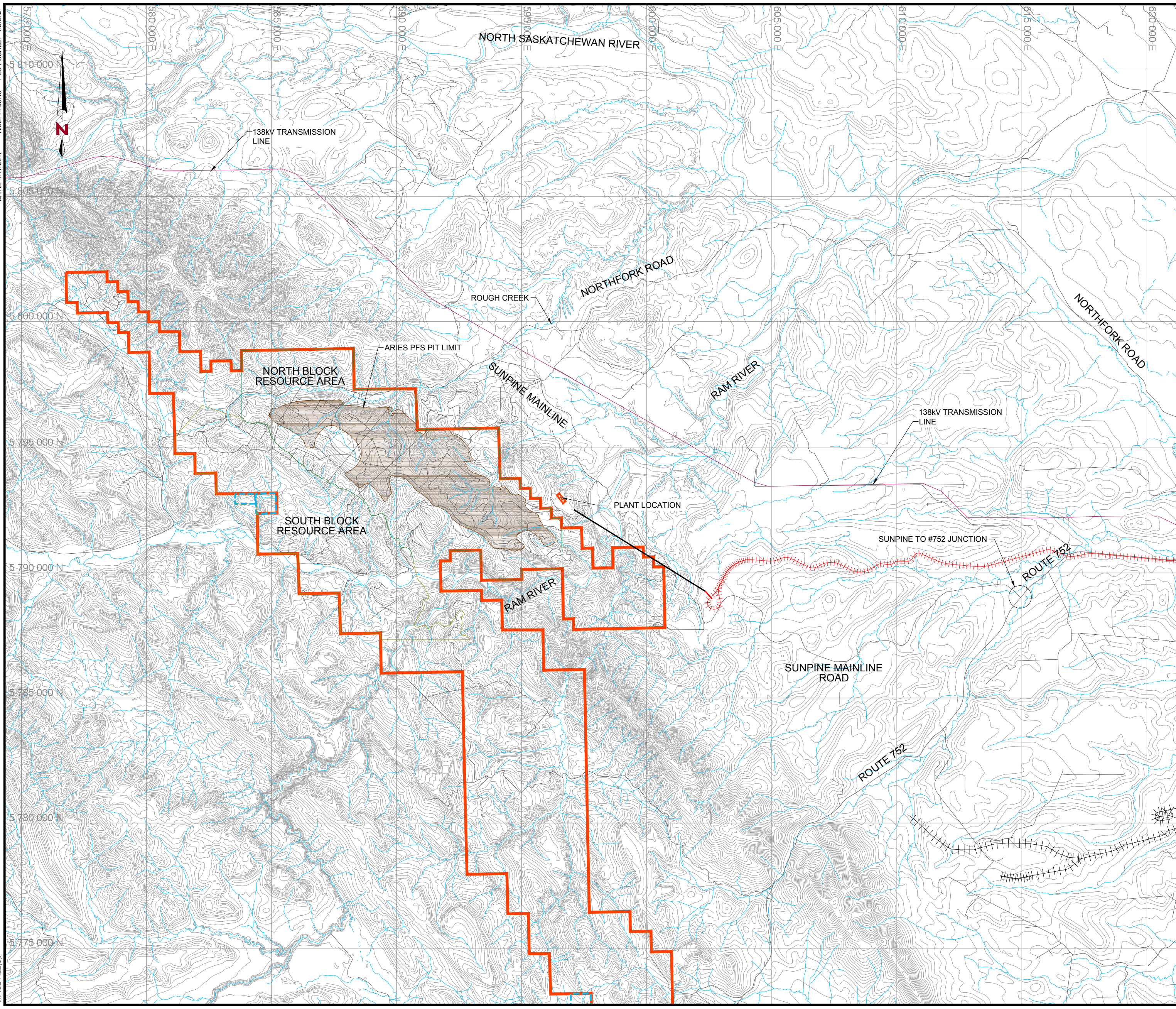

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RAMCOAL

RAM COAL

ARIES PROJECT

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CO-ORD. SYS.:	UTM83-10
DRW'N BY:	SC/KM
DSG'N BY:	--
REV'D BY:	MA
APP'D BY:	SE

DRAWING 3
PROPERTY AND REGIONAL
INFRASTURCTURE MAP

NORWEST

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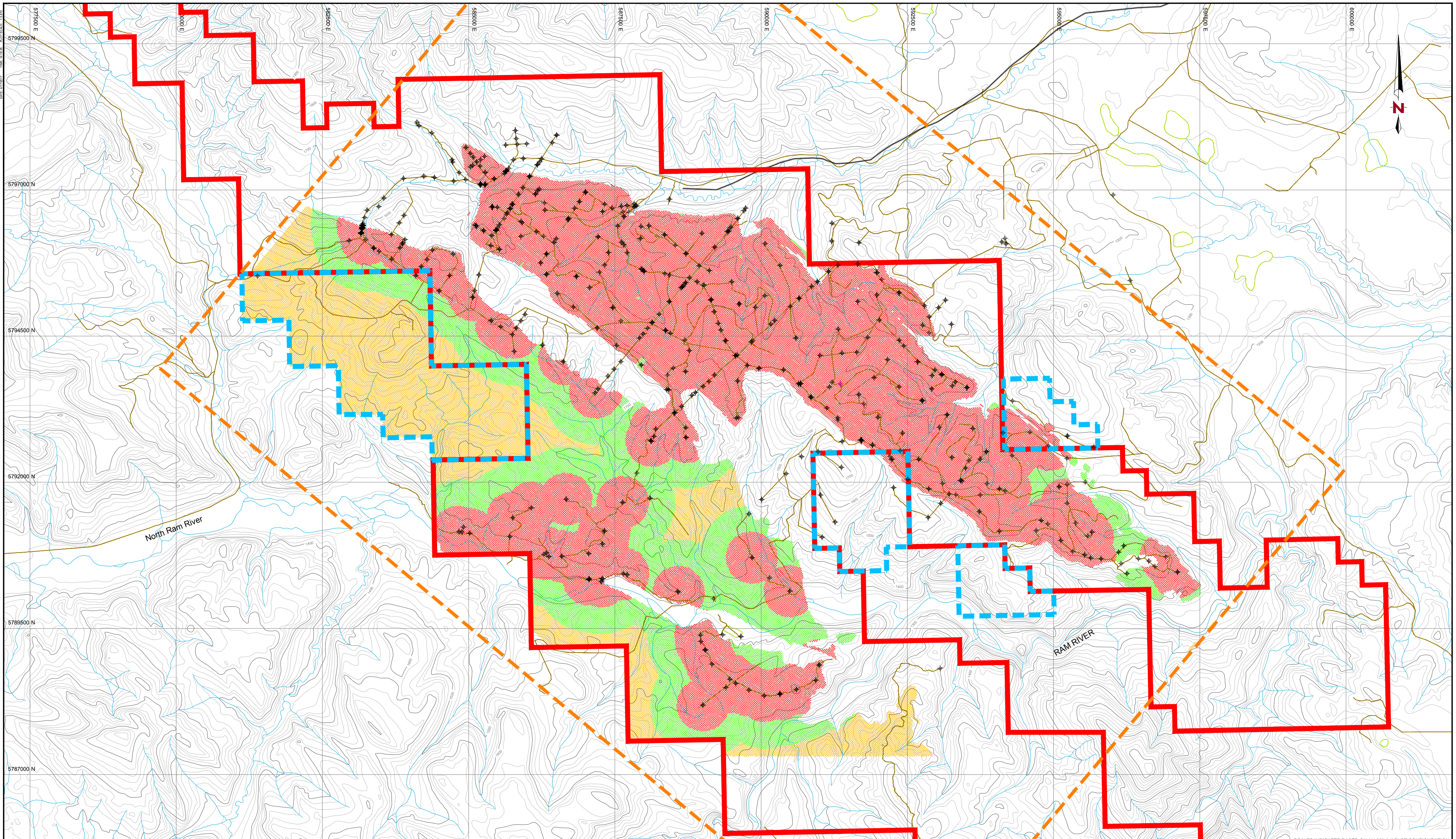

LEGEND

- LEASE BOUNDARY
- LEASE UNDER APPLICATION BOUNDARY
- MODEL BOUNDARY
- ROAD OR TRAIL
- RIVER AND TRIBUTARY
- DRILL HOLES (UP TO 2014)

RESOURCE CLASS

- MEASURED
- INDICATED
- INFERRED

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SCALE 1:30,000

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DRW'N BY:	KM	REV'D BY:	MA
DSG'N BY:	IM	APP'D BY:	SE

RAMCOAL

RAM COAL

ARIES PROJECT

DRAWING 4
SEAM 3
RESOURCE CLASSIFICATION MAP

NORWEST

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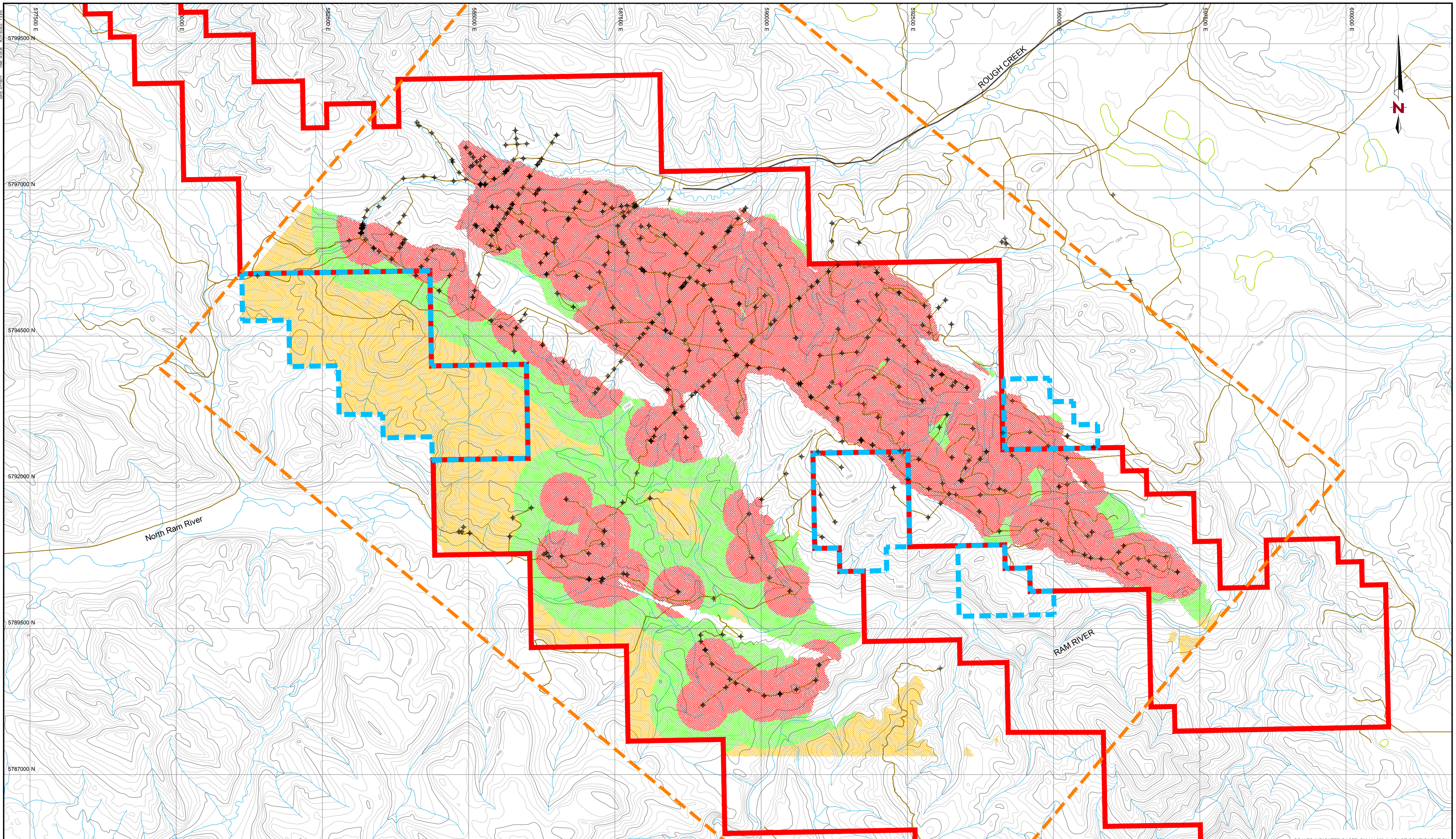

SCALES INDICATED BASED ON AN 22"x34" PLOT CONFIGURATION

LEGEND

- LEASE BOUNDARY
- LEASE UNDER APPLICATION BOUNDARY
- MODEL BOUNDARY
- ROAD OR TRAIL
- RIVER AND TRIBUTARY
- DRILL HOLES (UP TO 2014)

RESOURCE CLASS

- MEASURED
- INDICATED
- INFERRED

500m 0 500 1000 1500 2000 2500m

SCALE 1:30,000

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DATE:	2017-02-28		
CO-ORD. SYS.:	UTM83-10		
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DSG'N BY:	IM	APP'D BY:	SE

RAM COAL

ARIES PROJECT

DRAWING 5
SEAM 2
RESOURCE CLASSIFICATION MAP

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
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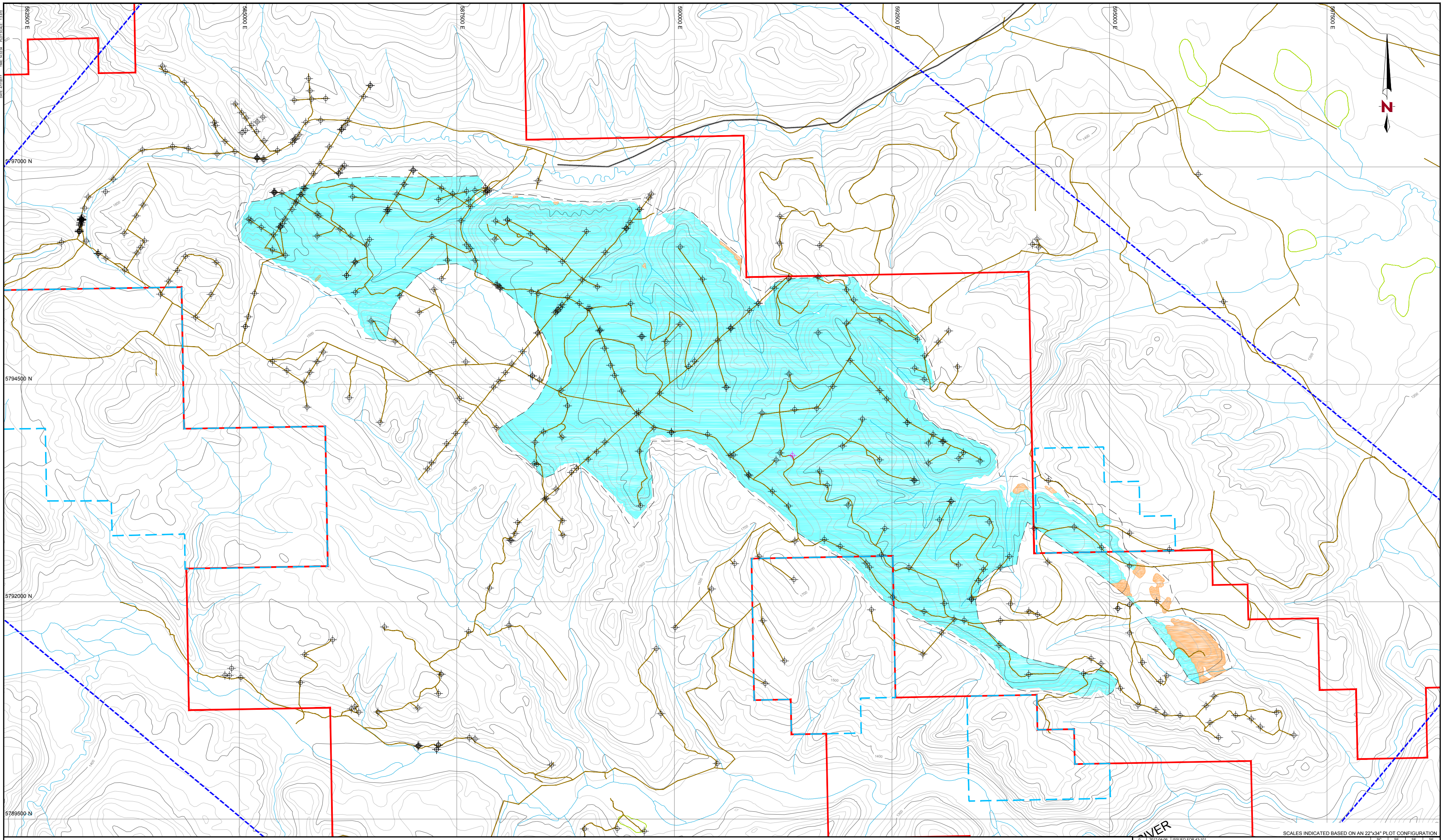

SCALES INDICATED BASED ON AN 22"x34" PLOT CONFIGURATION

LEGEND

- LEASE BOUNDARY
- LEASE UNDER APPLICATION BOUNDARY
- ULTIMATE PIT BOUNDARY
- MODEL BOUNDARY
- ROAD OR TRAIL
- RIVER AND TRIBUTARY
- DRILL HOLES (UP TO 2014)

RESERVE CLASS

- PROVEN
- PROBABLE

500m 0 500 1000m

SCALE 1:20,000

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DSG'N BY:	SE	APP'D BY:	SE

RAM COAL

ARIES PROJECT

DRAWING 6
SEAM 3 RESERVE
CLASSIFICATION MAP

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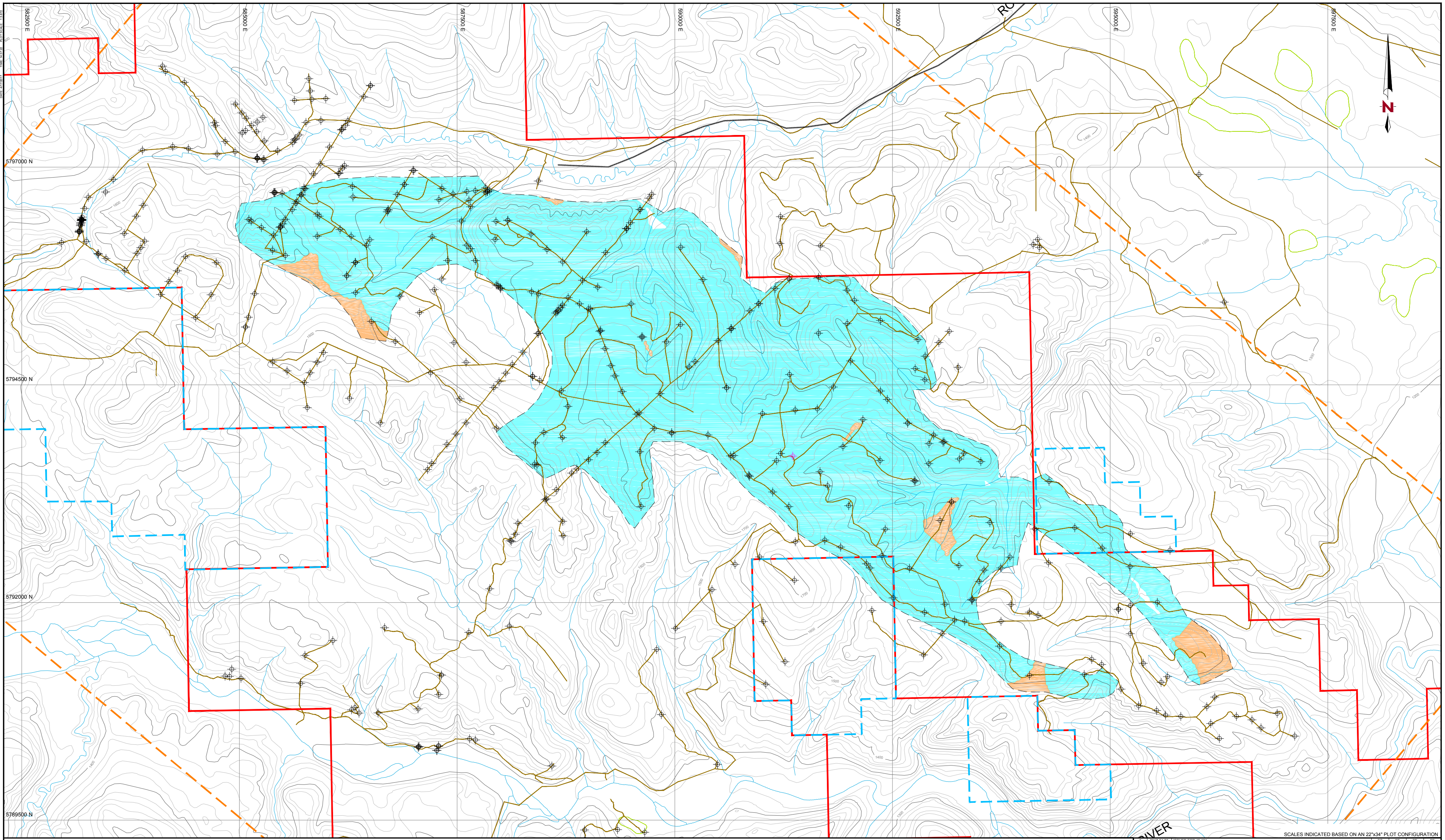

LEGEND

- LEASE BOUNDARY
- LEASE UNDER APPLICATION BOUNDARY
- ULTIMATE PIT BOUNDARY
- MODEL BOUNDARY
- ROAD OR TRAIL
- RIVER AND TRIBUTARY
- DRILL HOLES (UP TO 2014)

RESERVE CLASS

- PROVEN
- PROBABLE

500m 0 500 1000m

SCALE 1:20,000

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DSG'N BY:	SE	APP'D BY:	SE

RAM COAL

ARIES PROJECT

DRAWING 7
SEAM 2 RESERVE
CLASSIFICATION MAP

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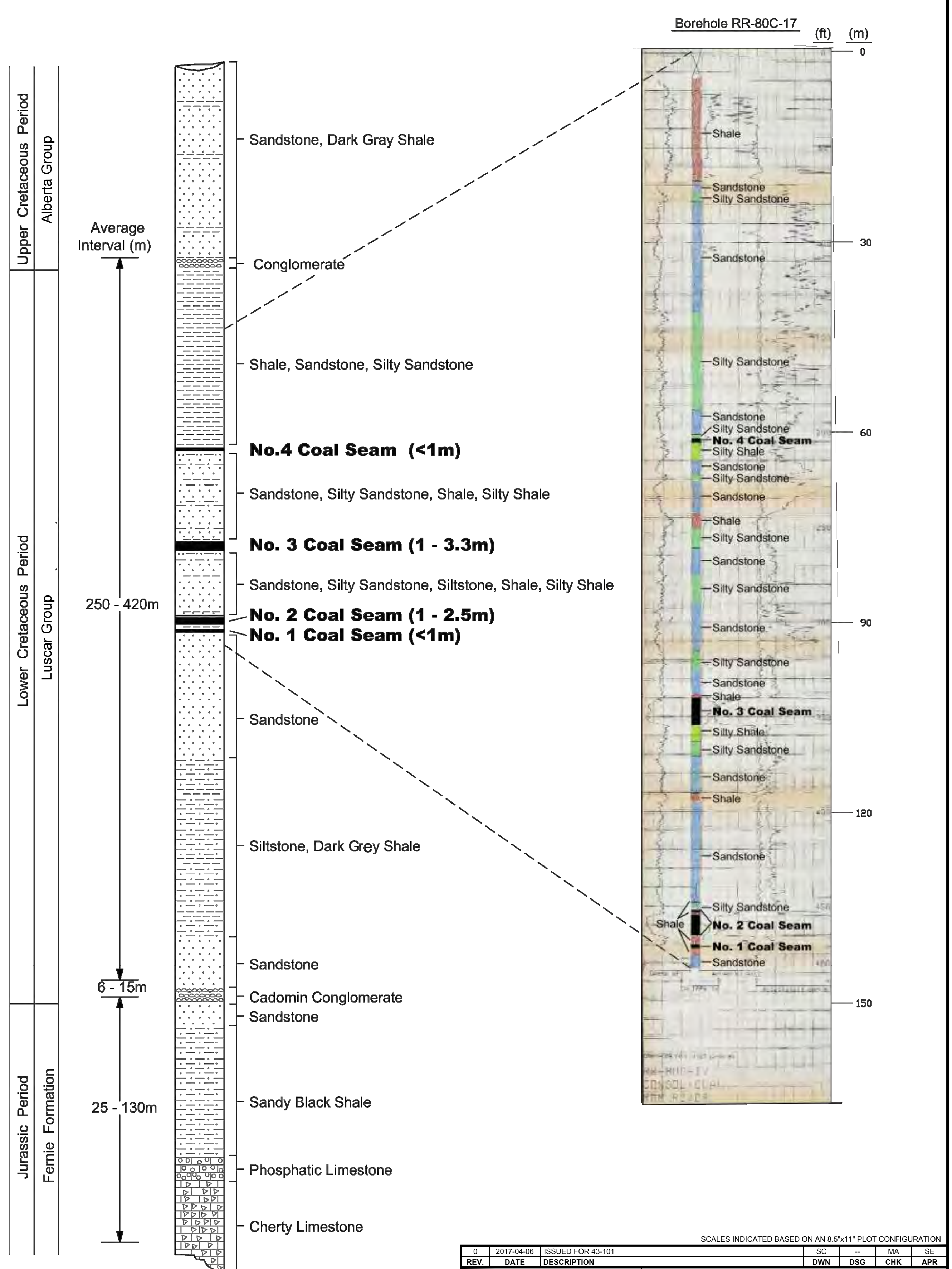

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RAMCOAL

RAM COAL

ARIES PROJECT

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DATE:	2017-02-28
CO-ORD. SYS.:	N/A
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DSG'N BY:	--
REV'D BY:	MA
APP'D BY:	SE

DRAWING 8
STRATIGRAPHIC COLUMN

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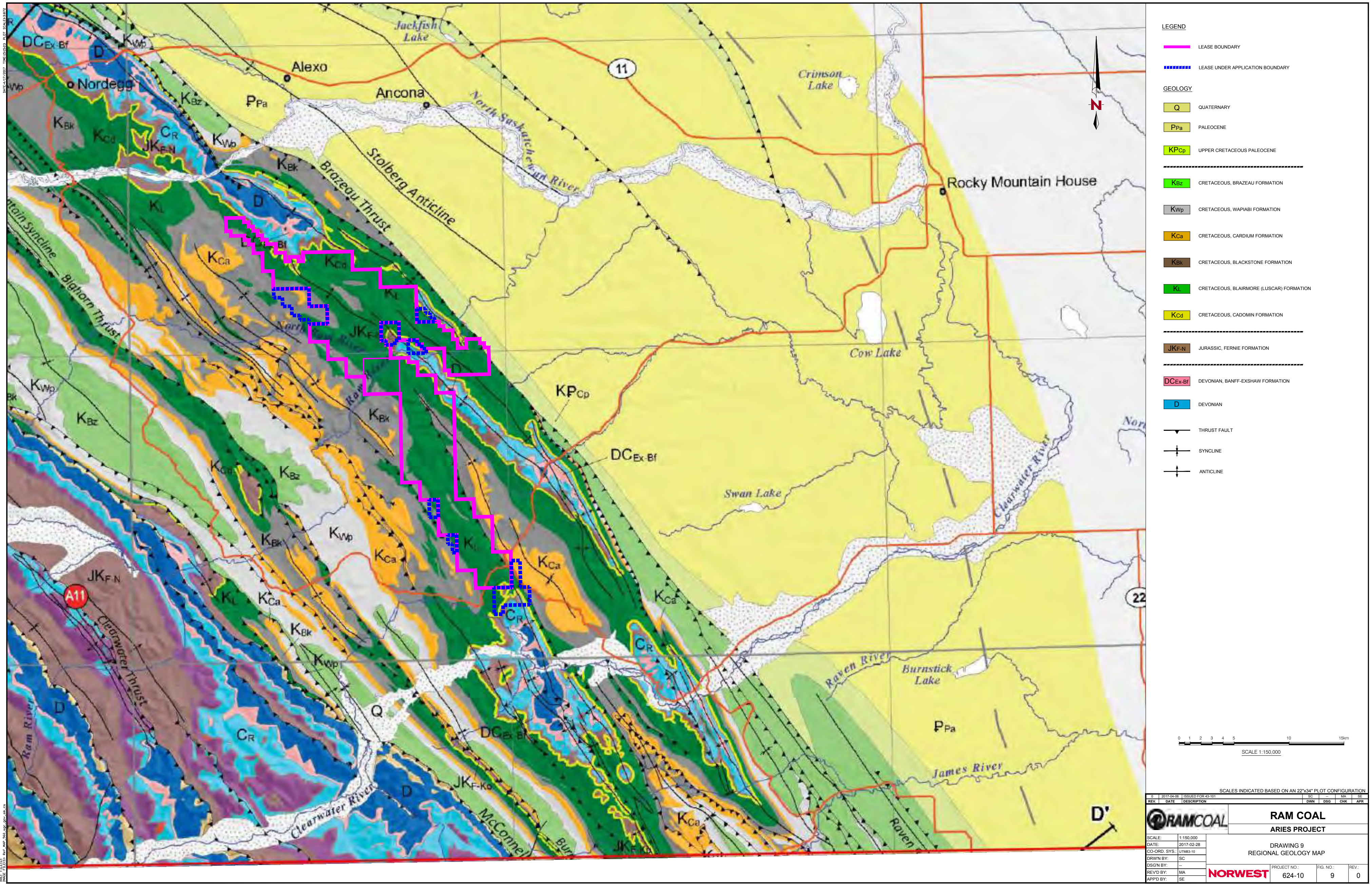
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LEASE UNDER APPLICATION BOUNDARY
GEOLOGY
Q QUATERNARY
PPa PALEOCENE
KPCp UPPER CRETACEOUS PALEOCENE
KBz CRETACEOUS, BRAZEAU FORMATION
KWp CRETACEOUS, WAPIABI FORMATION
KCa CRETACEOUS, CARDIUM FORMATION
KBk CRETACEOUS, BLACKSTONE FORMATION
KL CRETACEOUS, BLAIRMORE (LUSCAR) FORMATION
KCd CRETACEOUS, CADOMIN FORMATION
JKF-N JURASSIC, FERNIE FORMATION
DCEx-Bf DEVONIAN, BANFF-EXSHAW FORMATION
D DEVONIAN
THRUST FAULT
SYNCLINE
ANTICLINE
N
Jackfish Lake
Alexo
Ancona
Nordegg
11
Crimson Lake
North Saskatchewan River
Rocky Mountain House
Brazeau Thrust
Stolberg Anticline
Bighorn Thrust
North Ram River
Ram River
Cow Lake
Swan Lake
Clearwater River
Clearwater Thrust
A11
Raven River
Burnstick Lake
James River
McConnell
Raven
22
D'
0 1 2 3 4 5 10 15km
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SCALES INDICATED BASED ON AN 22"x34" PLOT CONFIGURATION
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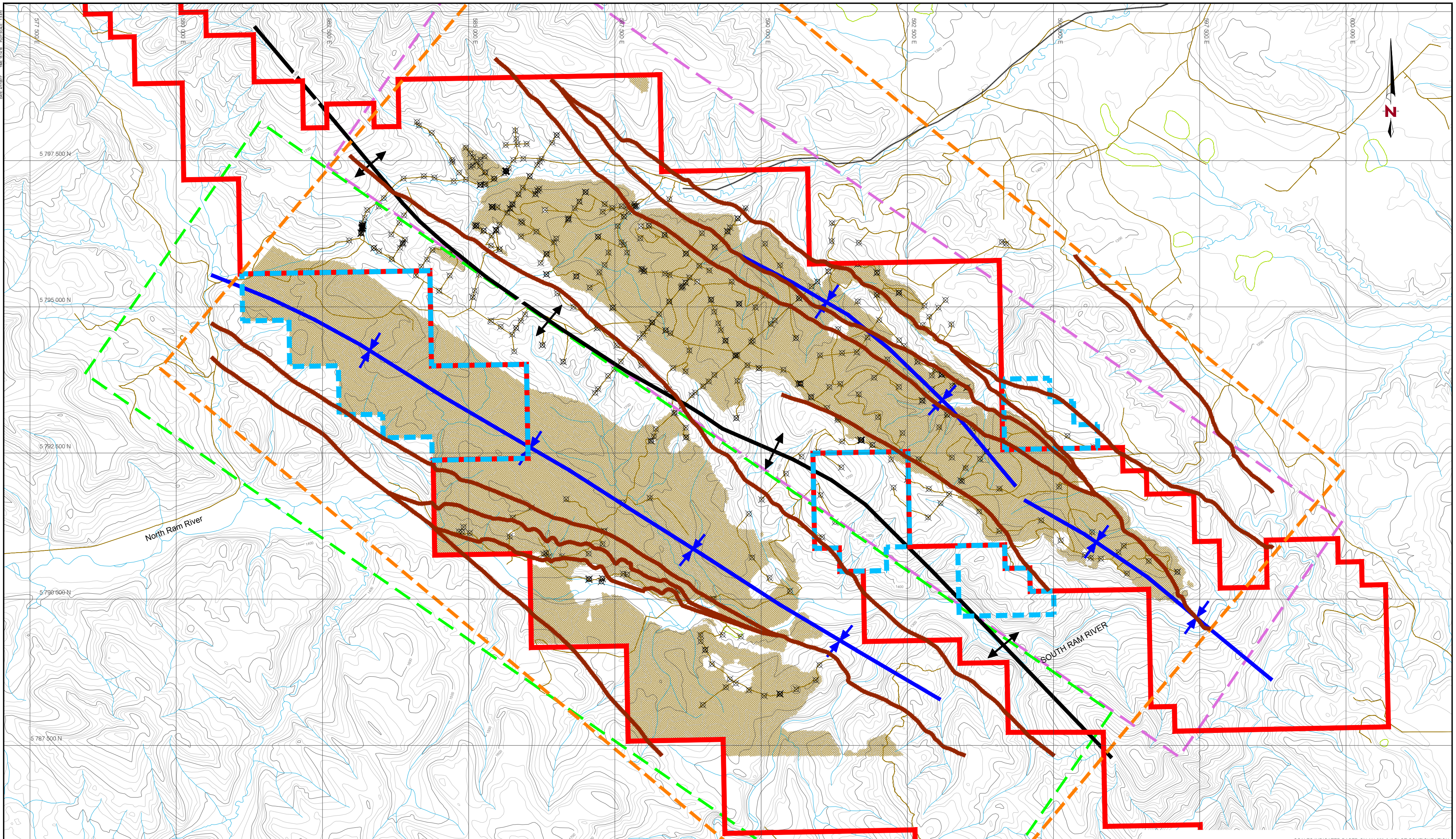
REV. | DATE | DESCRIPTION | DWN | DSG | CHK | APR
RAMCOAL
RAM COAL
ARIES PROJECT
SCALE: 1:150,000
DATE: 2017-02-28
CO-ORD. SYS.: UTM83-10
DRW'N BY: SC
DSG'N BY: --
REV'D BY: MA
APP'D BY: SE
DRAWING 9
REGIONAL GEOLOGY MAP
NORWEST
PROJECT NO.: 624-10
FIG. NO.: 9
REV.: 0



LEGEND

LEASE BOUNDARY	MODELED COAL WITHIN LEASE BOUNDARY
LEASE UNDER APPLICATION BOUNDARY	SOUTH BLOCK MODEL BOUNDARY
ROAD OR TRAIL	NORTH BLOCK MODEL BOUNDARY
MODEL BOUNDARY	THRUST FAULT
DRILL HOLES	ANTICLINE
COAL QUALITY DATA	SYNCLINE

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SCALE 1:30,000

SCALES INDICATED BASED ON AN 22"x34" PLOT CONFIGURATION

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
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RAMCOAL

RAM COAL

ARIES PROJECT

SCALE:	1:30,000
DATE:	2017-02-28
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	SC
DSG'N BY:	--
REV'D BY:	MA
APP'D BY:	SE

DRAWING 10
STRUCTURAL GEOLOGY MAP

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
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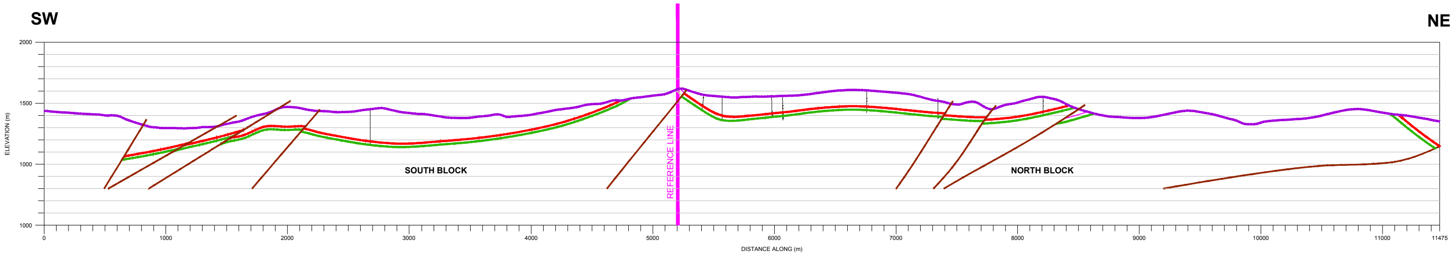


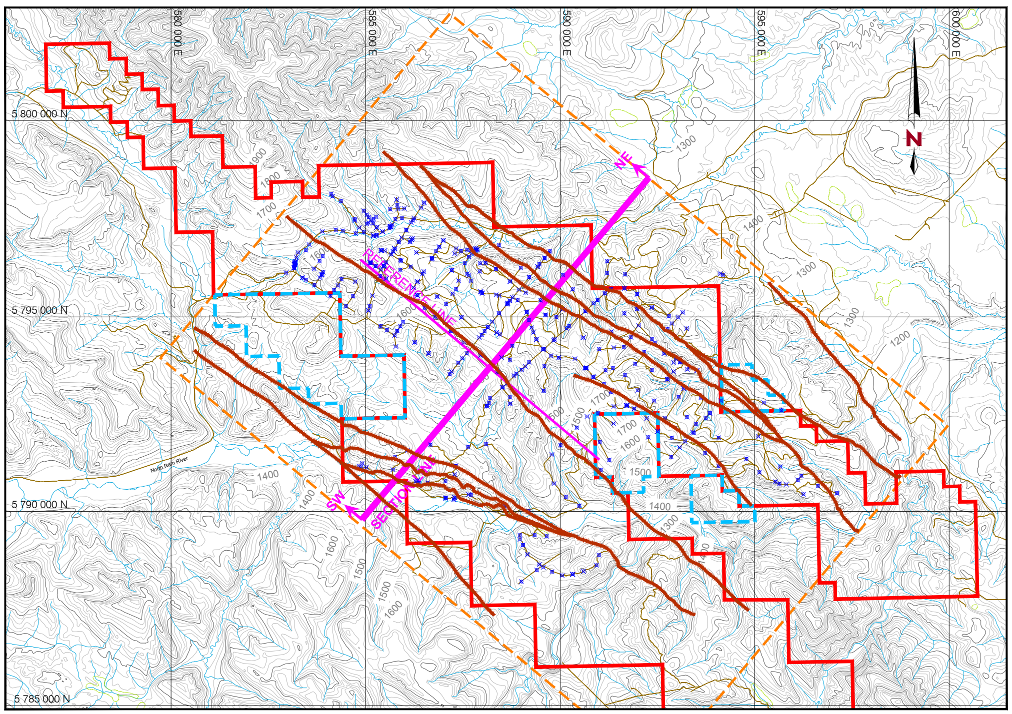
LEGEND

- SEAM 2
- SEAM 3
- TOPO
- FAULT

CROSS-SECTION

1000m 500 0 1000 2000m

SCALE 1:40,000



SECTION LINE LOCATION MAP

2500m 0 1000 2000 3000 4000 5000 10000m

SCALE 1:125,000

LEGEND

- LEASE BOUNDARY
- LEASE UNDER APPLICATION BOUNDARY
- TOPOGRAPHY SURFACE
- FAULT TRACES
- MODEL BOUNDARY
- DRILL HOLES
- DRILL HOLES (UP TO 2014)

SCALES INDICATED BASED ON AN 11"x17" PLOT CONFIGURATION

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	SC	--	MA	SE

RAMCOAL

RAM COAL

ARIES PROJECT

SCALE:	AS SHOWN
DATE:	2017-02-28
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	SC
DSG'N BY:	--
REV'D BY:	MA
APP'D BY:	SE

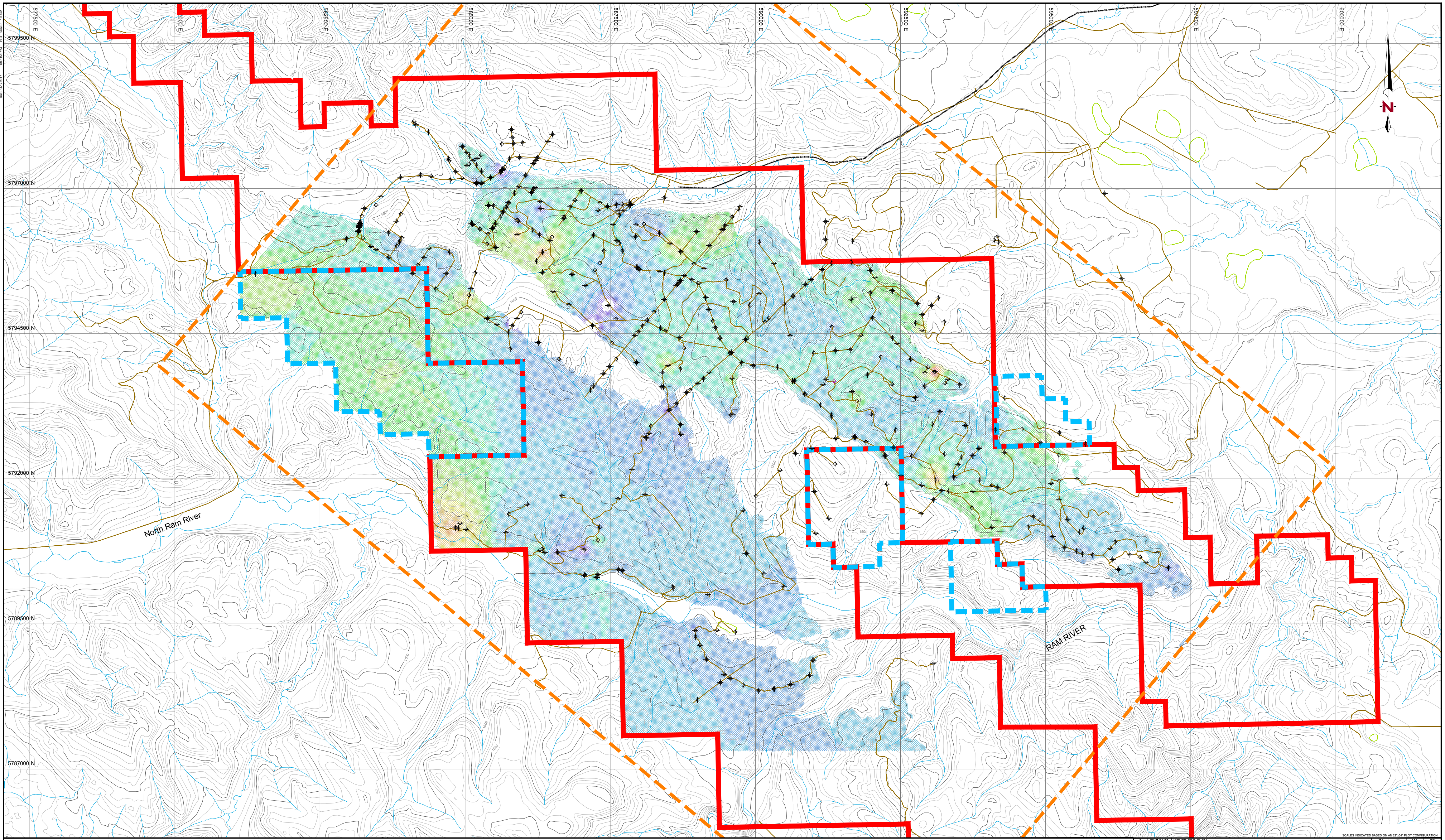
DRAWING 11
GEOLOGICAL CROSS-SECTION

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	11	

DATE: 4/17/2017 TIME:15:11:03 PLOT SCALE: 1:3.872

FILENAME: I:\PROJECTDATA\RAM COAL_624\624-10_2016 PFS\DISC\DRAFTING\05_43-101\05_CURRENT DRAWINGS\11 TYPICAL SW-NE CROSS-SECTION.DWG
XREF FILE(S): Ref_Base Map
IMAGE FILE(S):



LEGEND

- LEASE BOUNDARY
- LEASE UNDER APPLICATION BOUNDARY
- MODEL BOUNDARY
- ROAD OR TRAIL
- RIVER AND TRIBUTARY
- DRILL HOLES (UP TO 2014)

SEAM 3 THICKNESS (METRES)

1.5 - 2.0	4.5 - 5.0	>= 7.5
2.0 - 2.5	5.0 - 5.5	
2.5 - 3.0	5.5 - 6.0	
3.0 - 3.5	6.0 - 6.5	
3.5 - 4.0	6.5 - 7.0	
4.0 - 4.5	7.0 - 7.5	

500m 0 500 1000 1500 2000 2500m

SCALE 1:30,000

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	KM	IM	MA	SE

SCALE:	1:30,000		
DATE:	2017-02-28		
CO-ORD. SYS.:	UTM83-10		
DRW'N BY:	KM	REV'D BY:	MA
DSG'N BY:	IM	APP'D BY:	SE

RAMCOAL

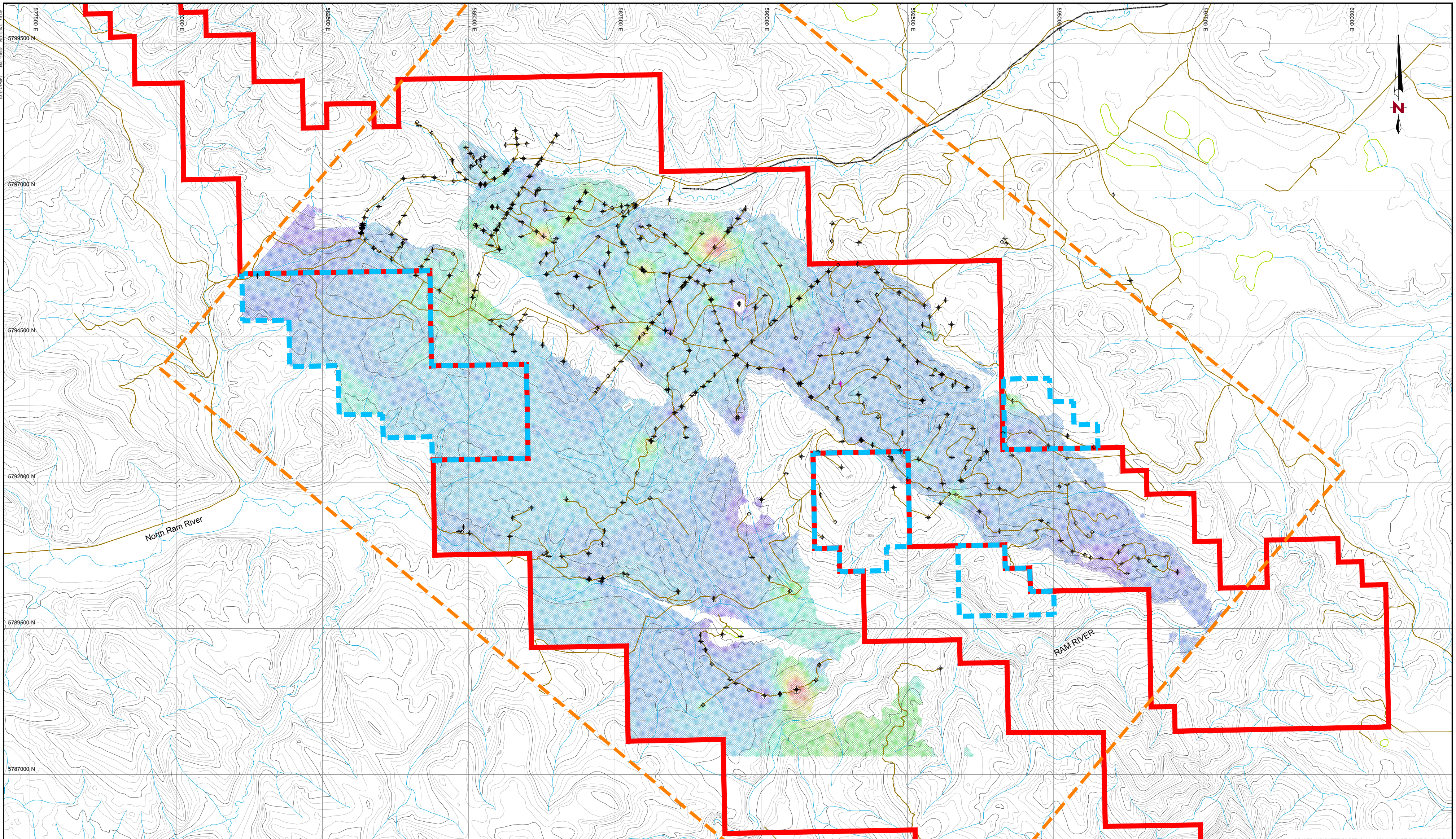
RAM COAL

ARIES PROJECT

DRAWING 12
SEAM 3
THICKNESS MAP

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	12	0



SCALES INDICATED BASED ON AN 22"x34" PLOT CONFIGURATION

LEGEND

- LEASE BOUNDARY
- LEASE UNDER APPLICATION BOUNDARY
- MODEL BOUNDARY
- ROAD OR TRAIL
- RIVER AND TRIBUTARY
- DRILL HOLES (UP TO 2014)

SEAM 2 THICKNESS (METRES)

- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- 5.0 - 5.5
- 5.5 - 6.0
- 6.0 - 6.5
- 6.5 - 7.0
- 7.0 - 7.5
- >= 7.5

500m 0 500 1000 1500 2000 2500m

SCALE 1:30,000

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	KM	IM	MA	SE

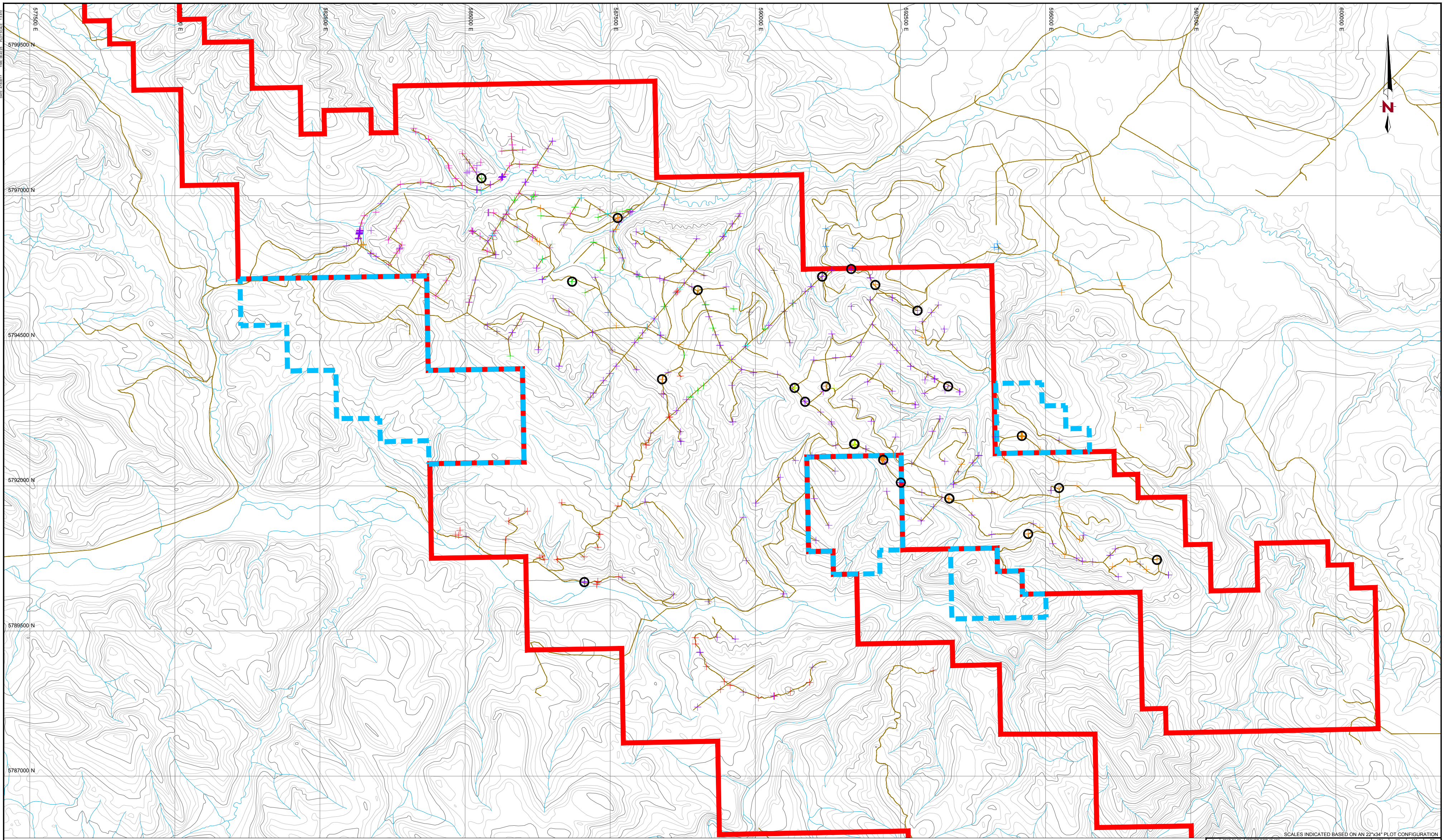
SCALE:	1:30,000		
DATE:	2017-02-28		
CO-ORD. SYS.:	UTM83-10		
DRW'N BY:	KM	REV'D BY:	MA
DSG'N BY:	IM	APP'D BY:	SE

RAM COAL

ARIES PROJECT

DRAWING 13
SEAM 2
THICKNESS MAP

PROJECT NO.:	FIG. NO.:	REV.:
624-10	13	0



LEGEND

- LEASE BOUNDARY
- LEASE UNDER APPLICATION BOUNDARY
- ROAD OR TRAIL
- RIVER AND TRIBUTARY
- DRILL HOLE - YEAR 1970
- DRILL HOLE - YEAR 1973
- DRILL HOLE - YEAR 1974
- DRILL HOLE - YEAR 1975
- DRILL HOLE - YEAR 1980
- DRILL HOLE - YEAR 1981
- DRILL HOLE - YEAR 2012
- DRILL HOLE - YEAR 2013
- DRILL HOLE - YEAR 2014
- COAL QUALITY DATA

500m 0 500 1000 1500 2000 2500m

SCALE 1:30,000

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
1	2017-04-06	ISSUED FOR 43-101	KM	IM	MA	SE

RAM COAL

ARIES PROJECT

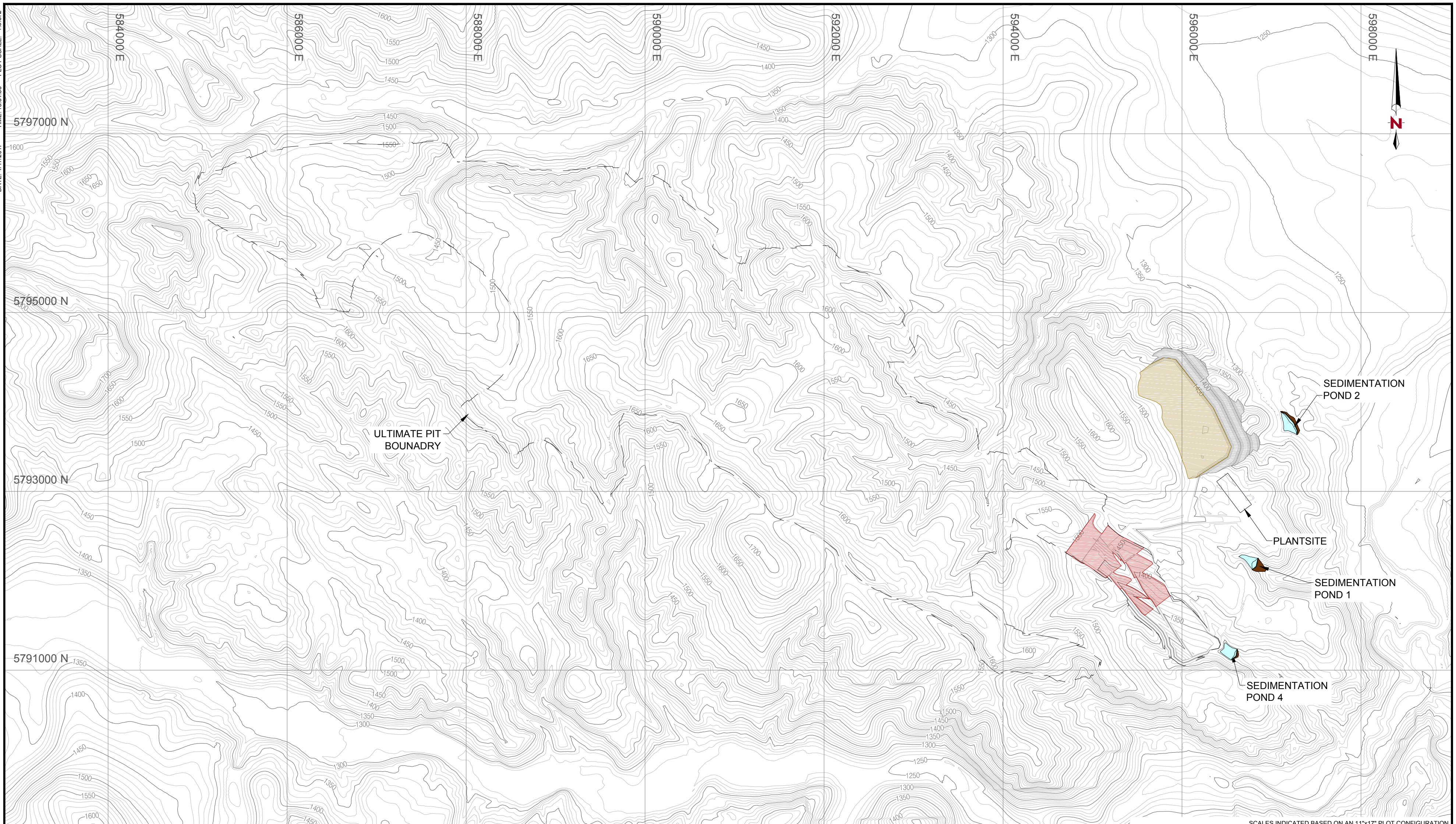
SCALE:	1:30,000
DATE:	2017-03-09
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	KM
DSG'N BY:	IM
REV'D BY:	MA
APP'D BY:	SE

DRAWING 14
DRILLHOLE LOCATIONS MAP

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	14	1

DATE: 4/17/2017 TIME: 15:34:33 PLOT SCALE: 1:3.872
FILENAME: I:\PROJECTDATA\RAM COAL_624\624-10_2016 PFS\DISC\DRAFTING\05_43-101\05_CURRENT DRAWINGS\15 END OF YEAR 1 Q4.DWG
XREF FILE(S): _Contours; _Dump; _Pit; 170202_Sediment Ponds; Ultimate Pit Boundary
IMAGE FILE(S):



SCALES INDICATED BASED ON AN 11"x17" PLOT CONFIGURATION

LEGEND

10m CONTOURS	EXISTING MRSF AREA
DITCH ALIGNMENT	ACTIVE MINING AREA
ULTIMATE PIT BOUNDARY	ACTIVE MSRF AREA

1000m 500 0 1000 2000m

SCALE 1:40,000

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	KM	SP	MA	SE

RAM COAL

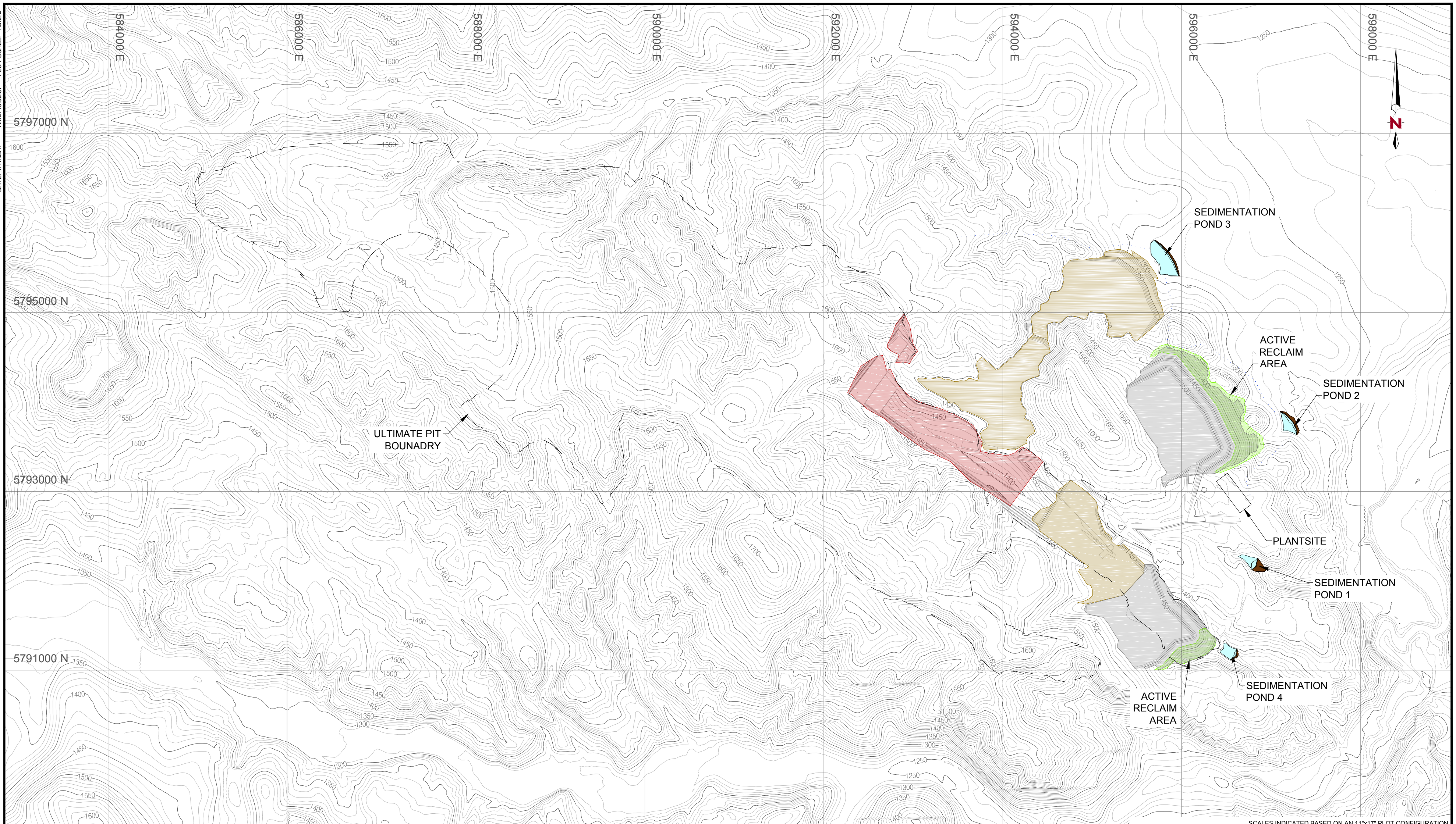
ARIES PROJECT

SCALE:	1:40,000
DATE:	2017-03-15
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	KM
DSG'N BY:	SP
REV'D BY:	MA
APP'D BY:	SE

DRAWING 15
END OF PERIOD MAP
Q4 - YEAR 1

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	15	0



SCALES INDICATED BASED ON AN 11"x17" PLOT CONFIGURATION

LEGEND

- 10m CONTOURS
- DITCH ALIGNMENT
- ULTIMATE PIT BOUNDARY
- EXISTING MRSF AREA
- ACTIVE MINING AREA
- ACTIVE MSRF AREA
- ACTIVE RECLAIM AREA

1000m 500 0 1000 2000m

SCALE 1:40,000

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	KM	SP	MA	SE

RAMCOAL

RAM COAL

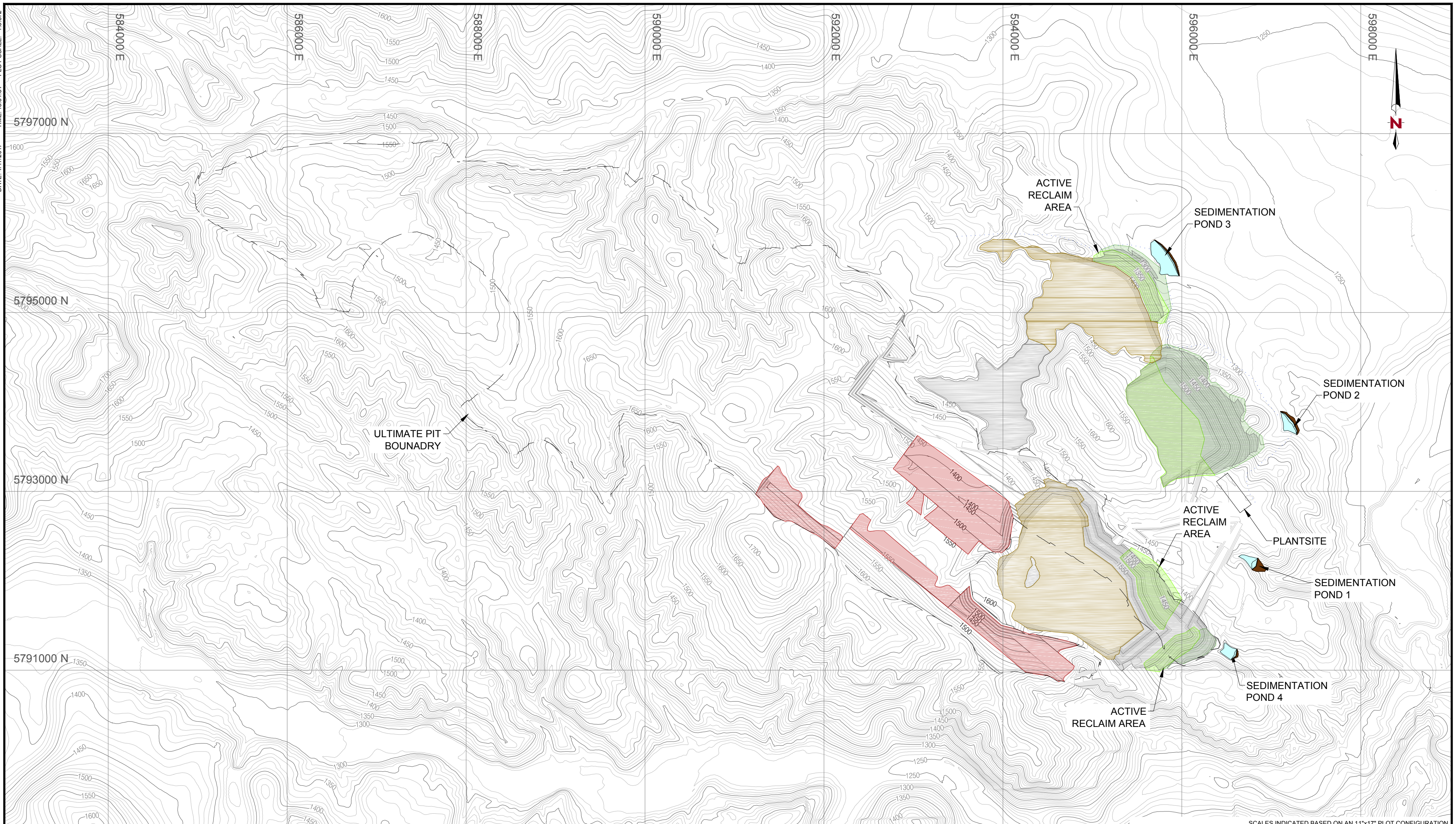
ARIES PROJECT

SCALE:	1:40,000
DATE:	2017-03-09
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	KM
DSG'N BY:	SP
REV'D BY:	MA
APP'D BY:	SE

DRAWING 16
END OF PERIOD MAP
YEAR 3

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	16	0



SCALES INDICATED BASED ON AN 11"x17" PLOT CONFIGURATION

LEGEND

- 10m CONTOURS
- DITCH ALIGNMENT
- ULTIMATE PIT BOUNDARY
- EXISTING MRSF AREA
- EXISTING RECLAIMED AREA
- ACTIVE MINING AREA
- ACTIVE MSRF AREA
- ACTIVE RECLAIM AREA

1000m 500 0 1000 2000m

SCALE 1:40,000

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	KM	SP	MA	SE

RAMCOAL

RAM COAL

ARIES PROJECT

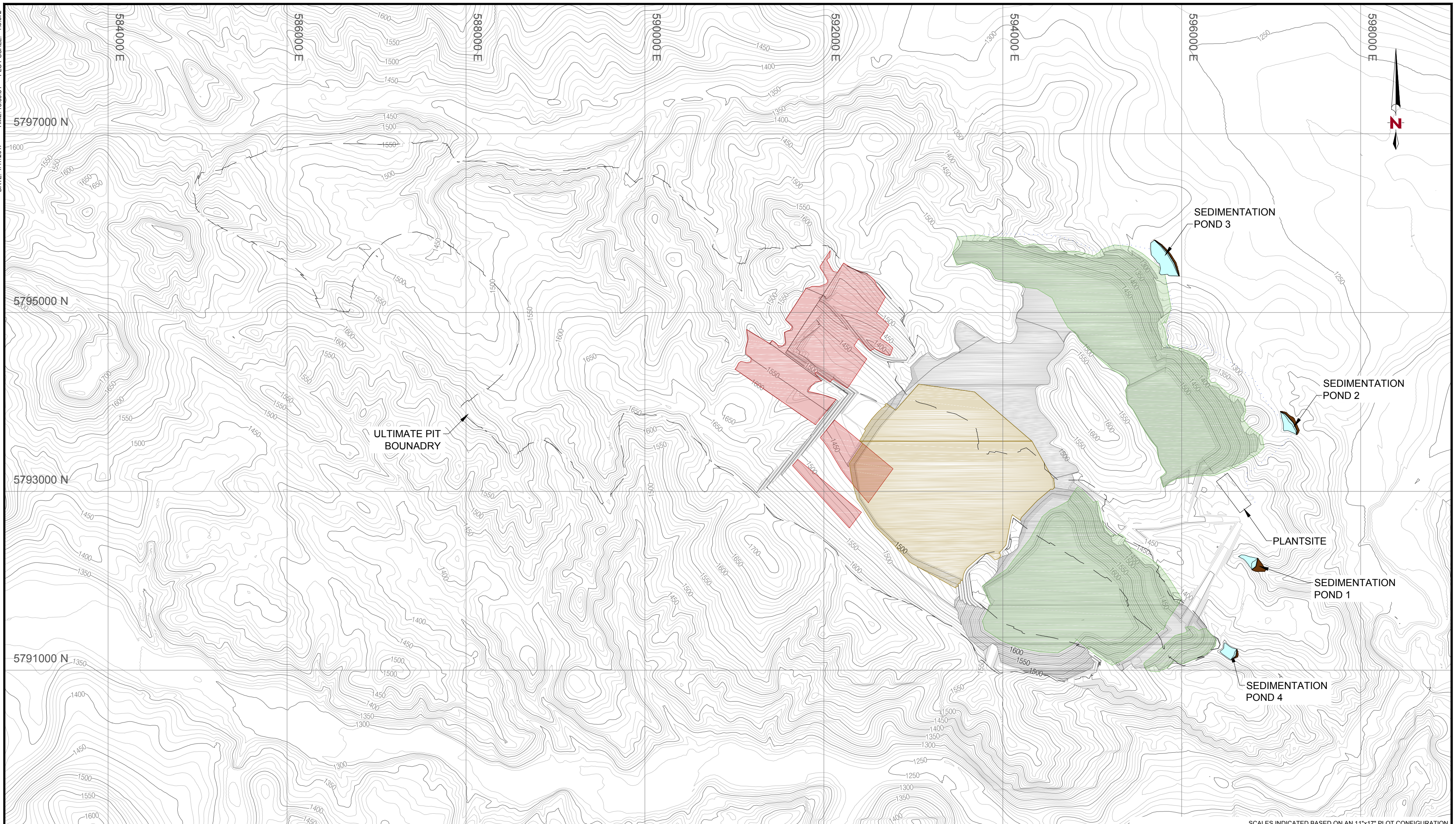
SCALE:	1:40,000
DATE:	2017-03-13
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	KM
DSG'N BY:	SP
REV'D BY:	MA
APP'D BY:	SE

DRAWING 17
END OF PERIOD MAP
YEAR 5

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	17	0

FILENAME: I:\PROJECTDATA\RAM COAL_624\624-10_2016_PFS\DISC\DRAFTING\05_43-101\05_CURRENT DRAWINGS\17 END OF YEAR 5.DWG
XREF FILE(S): _Contours; _Dump; _Pit; _Reslope; 170202_Sediment Ponds; Ultimate Pit Boundary
IMAGE FILE(S):
DATE: 4/17/2017 TIME: 15:31:54 PLOT SCALE: 1:3.872



SCALES INDICATED BASED ON AN 11"x17" PLOT CONFIGURATION

LEGEND

- 10m CONTOURS
- DITCH ALIGNMENT
- ULTIMATE PIT BOUNDARY
- EXISTING MRSF AREA
- EXISTING RECLAIMED AREA
- ACTIVE MINING AREA
- ACTIVE MSRF AREA

1000m 500 0 1000 2000m

SCALE 1:40,000

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
1	2017-04-06	ISSUED FOR 43-101	KM	SP	MA	SE

RAM COAL

ARIES PROJECT

SCALE:	1:40,000
DATE:	2017-03-15
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	KM
DSG'N BY:	SP
REV'D BY:	MA
APP'D BY:	SE

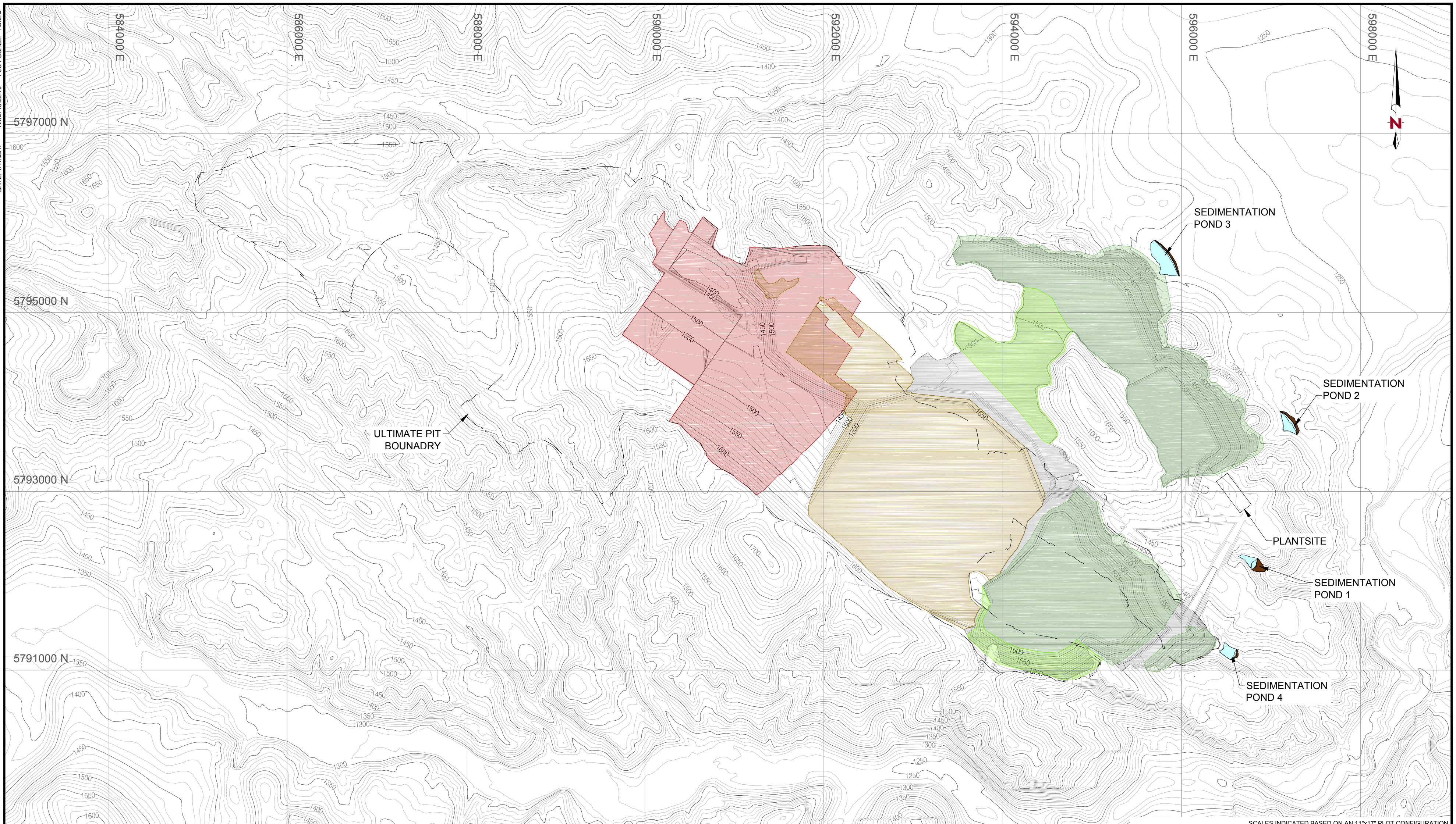
DRAWING 18
END OF PERIOD MAP
YEAR 10

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	18	1

DATE: 4/17/2017 TIME: 15:30:31 PLOT SCALE: 1:3.872

FILENAME: I:\PROJECT\DATA\RAM COAL_624\624-10_2016_PFS\DISC\DRAFTING\05_43-101\05_CURRENT DRAWINGS\18 END OF YEAR 10.DWG
XREF FILE(S): _Contours; _Dump; _Pit; _Reslope; 170202_Sediment Ponds; Ultimate Pit Boundary
IMAGE FILE(S):



SCALES INDICATED BASED ON AN 11"x17" PLOT CONFIGURATION

LEGEND

- 10m CONTOURS
- DITCH ALIGNMENT
- ULTIMATE PIT BOUNDARY
- EXISTING MRSF AREA
- EXISTING RECLAIMED AREA
- ACTIVE MINING AREA
- ACTIVE MSRF AREA
- ACTIVE RECLAIM AREA

1000m 500 0 1000 2000m

SCALE 1:40,000

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
1	2017-04-06	ISSUED FOR 43-101	KM	SP	MA	SE

RAMCOAL

RAM COAL

ARIES PROJECT

SCALE:	1:40,000
DATE:	2017-03-16
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	KM
DSG'N BY:	SP
REV'D BY:	MA
APP'D BY:	SE

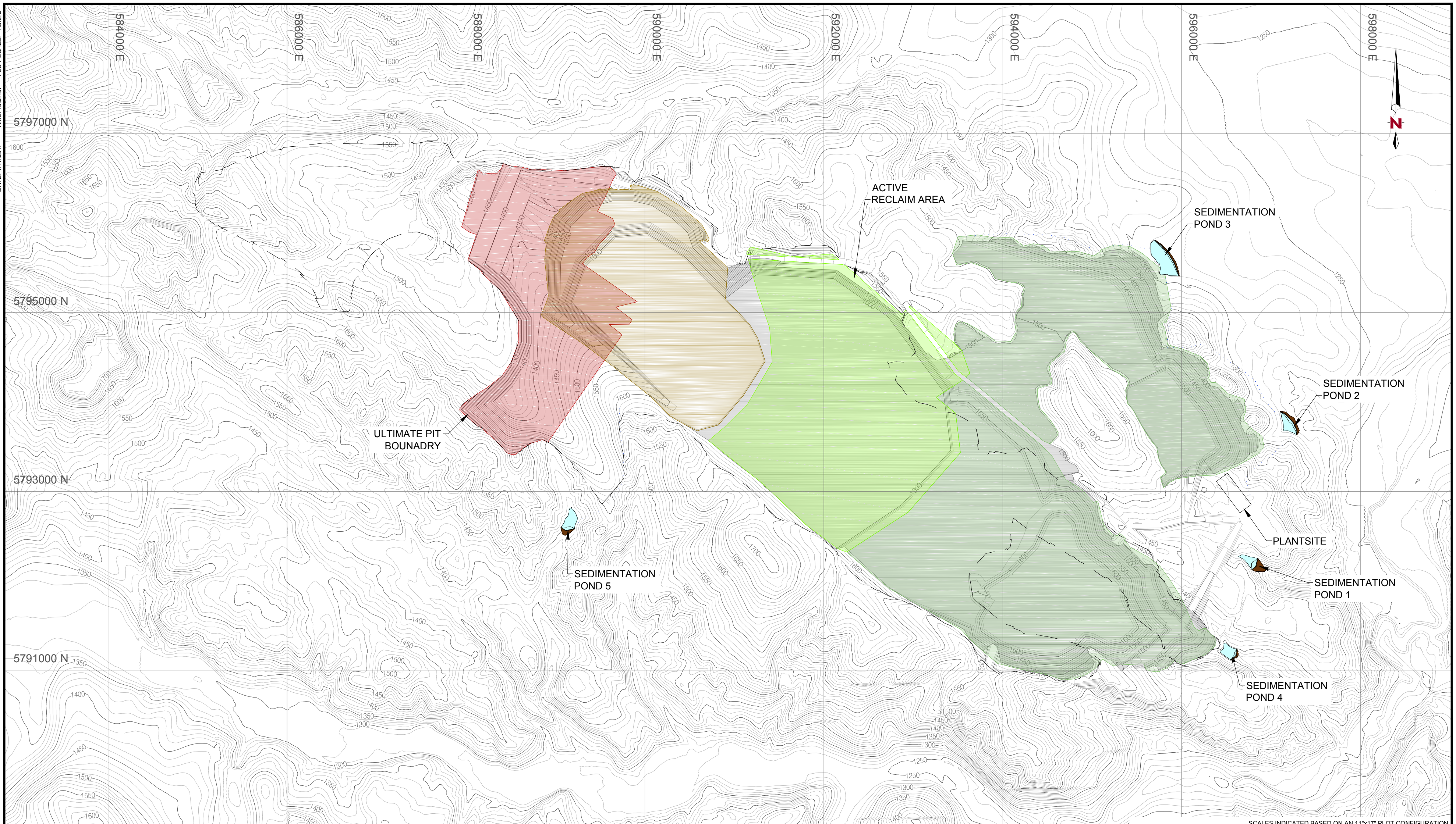
DRAWING 19
END OF PERIOD MAP
YEAR 15

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	19	1

DATE: 4/17/2017 TIME: 15:29:16 PLOT SCALE: 1:3.872

FILENAME: I:\PROJECT\DATA\RAM COAL_624\624-10_2016_PFS\DISC\DRAFTING\05_43-101\05_CURRENT DRAWINGS\19 END OF YEAR 15.DWG
XREF FILE(S): _Contours; _Dump; _Pit; _Reslope; 170202_Sediment Ponds; Ultimate Pit Boundary
IMAGE FILE(S):



LEGEND

- 10m CONTOURS
- DITCH ALIGNMENT
- ULTIMATE PIT BOUNDARY
- EXISTING MRSF AREA
- EXISTING RECLAIMED AREA
- ACTIVE MINING AREA
- ACTIVE MSRF AREA
- ACTIVE RECLAIM AREA

1000m 500 0 1000 2000m

SCALE 1:40,000

SCALES INDICATED BASED ON AN 11"x17" PLOT CONFIGURATION

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
1	2017-04-06	ISSUED FOR 43-101	KM	SP	MA	SE

RAMCOAL

RAM COAL

ARIES PROJECT

SCALE:	1:40,000
DATE:	2017-03-17
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	KM
DSG'N BY:	SP
REV'D BY:	MA
APP'D BY:	SE

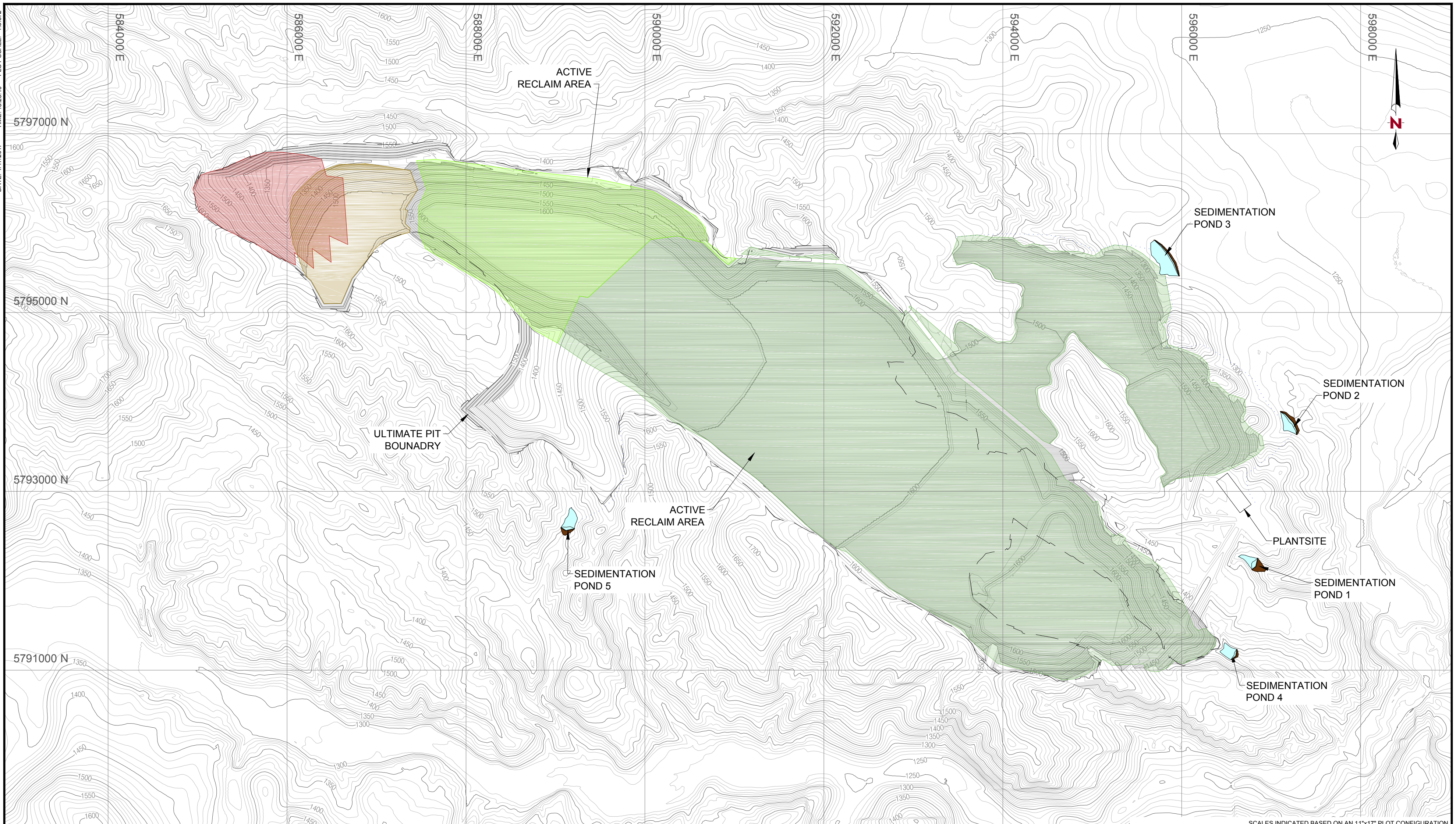
DRAWING 20
END OF PERIOD MAP
YEAR 25

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	20	1

DATE: 4/17/2017 TIME: 15:27:07 PLOT SCALE: 1:3.872

FILENAME: I:\PROJECTDATA\RAM COAL_624\624-10_2016_PFS\DISC\DRAFTING\05_43-101\05_CURRENT DRAWINGS\20 END OF YEAR 25.DWG
XREF FILE(S): _Contours; _Dump; _Pit; _Reslope; 170202_Sediment Ponds; Ultimate Pit Boundary
IMAGE FILE(S):



DATE: 4/17/2017 TIME: 15:25:10 PLOT SCALE: 1:3.872

FILENAME: I:\PROJECTDATA\RAM COAL_624\624-10_2016_PFS\DISC\DRAFTING\05_43-101\05_CURRENT DRAWINGS\21 END OF YEAR 33 (EOM).DWG
XREF FILE(S): _Contours; _Dump; _Pit; _Reslope; 170202_Sediment Ponds; Ultimate Pit Boundary
IMAGE FILE(S):

SCALES INDICATED BASED ON AN 11"x17" PLOT CONFIGURATION

LEGEND

- 10m CONTOURS
- DITCH ALIGNMENT
- ULTIMATE PIT BOUNDARY
- EXISTING MRSF AREA
- EXISTING RECLAIMED AREA
- ACTIVE MINING AREA
- ACTIVE MSRF AREA
- ACTIVE RECLAIM AREA

1000m 500 0 1000 2000m

SCALE 1:40,000

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
1	2017-04-06	ISSUED FOR 43-101	KM	SP	MA	SE

RAMCOAL

RAM COAL

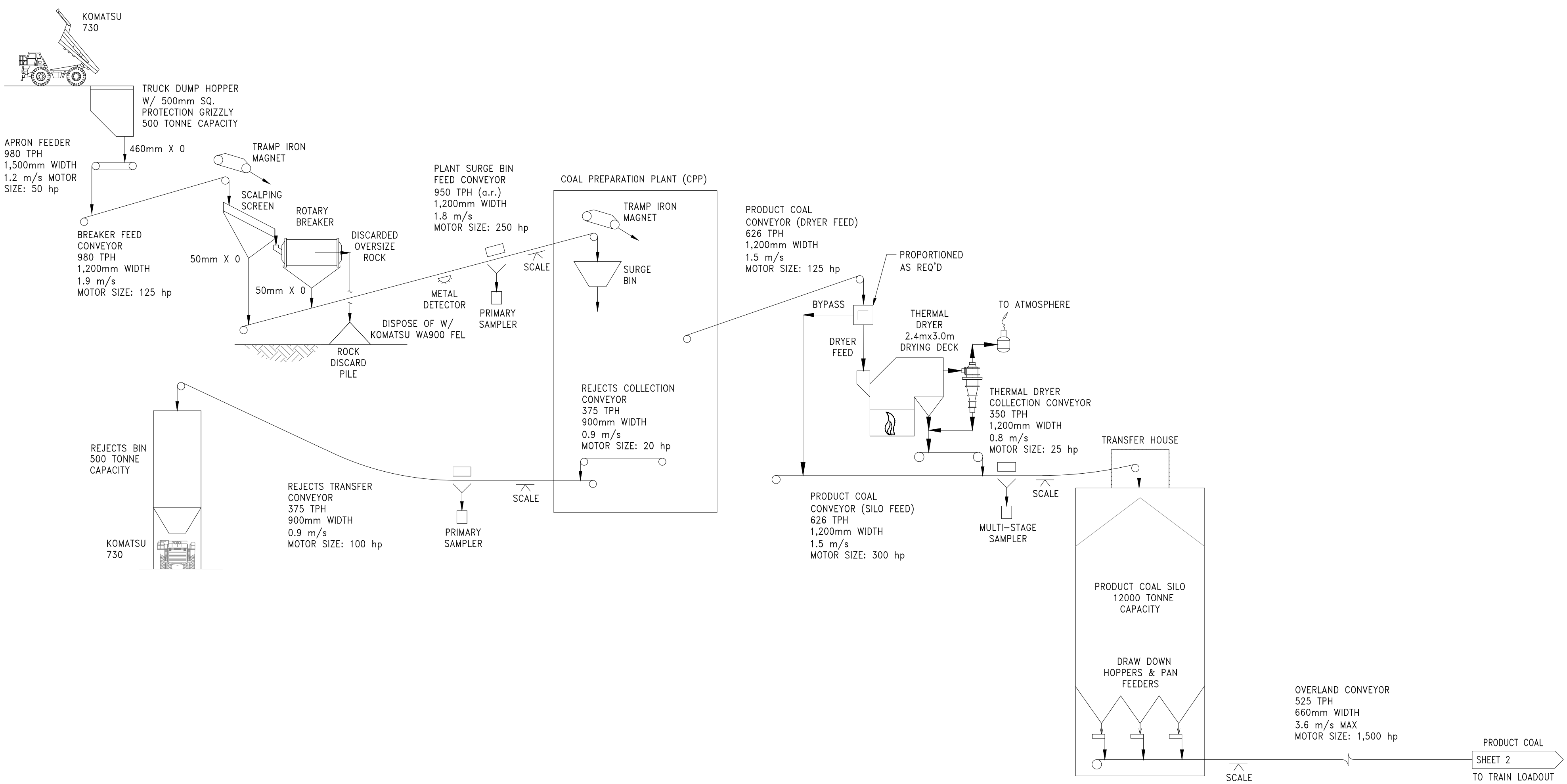
ARIES PROJECT

SCALE:	1:40,000
DATE:	2017-03-17
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	KM
DSG'N BY:	SP
REV'D BY:	MA
APP'D BY:	SE

DRAWING 21
END OF PERIOD MAP
END OF YEAR 33 (EOM)

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	21	1



TPH = TONNE PER HOUR

SCALES INDICATED BASED ON AN 22"x34" PLOT CONFIGURATION

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	GBH/DD	JET	JET	JET

RAM COAL

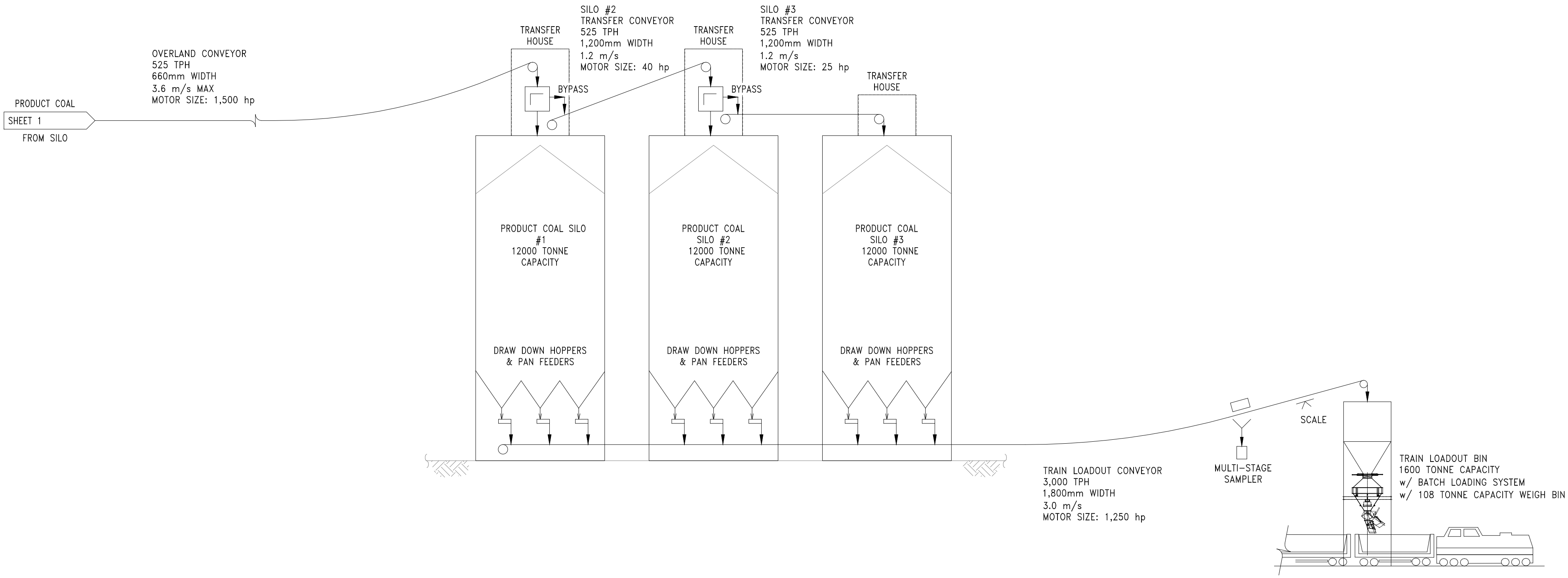
ARIES PROJECT

SCALE:	N.T.S.
DATE:	2016-11-16
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	GBH/DD
DSG'N BY:	JET
REV'D BY:	JET
APP'D BY:	JET

DRAWING 22
MATERIAL HANDLING FLOWSHEET
SHEET 1 OF 2

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	22	0



TPH = TONNE PER HOUR

SCALES INDICATED BASED ON AN 22"x34" PLOT CONFIGURATION

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	GBH/DD	JET	JET	JET

RAM COAL

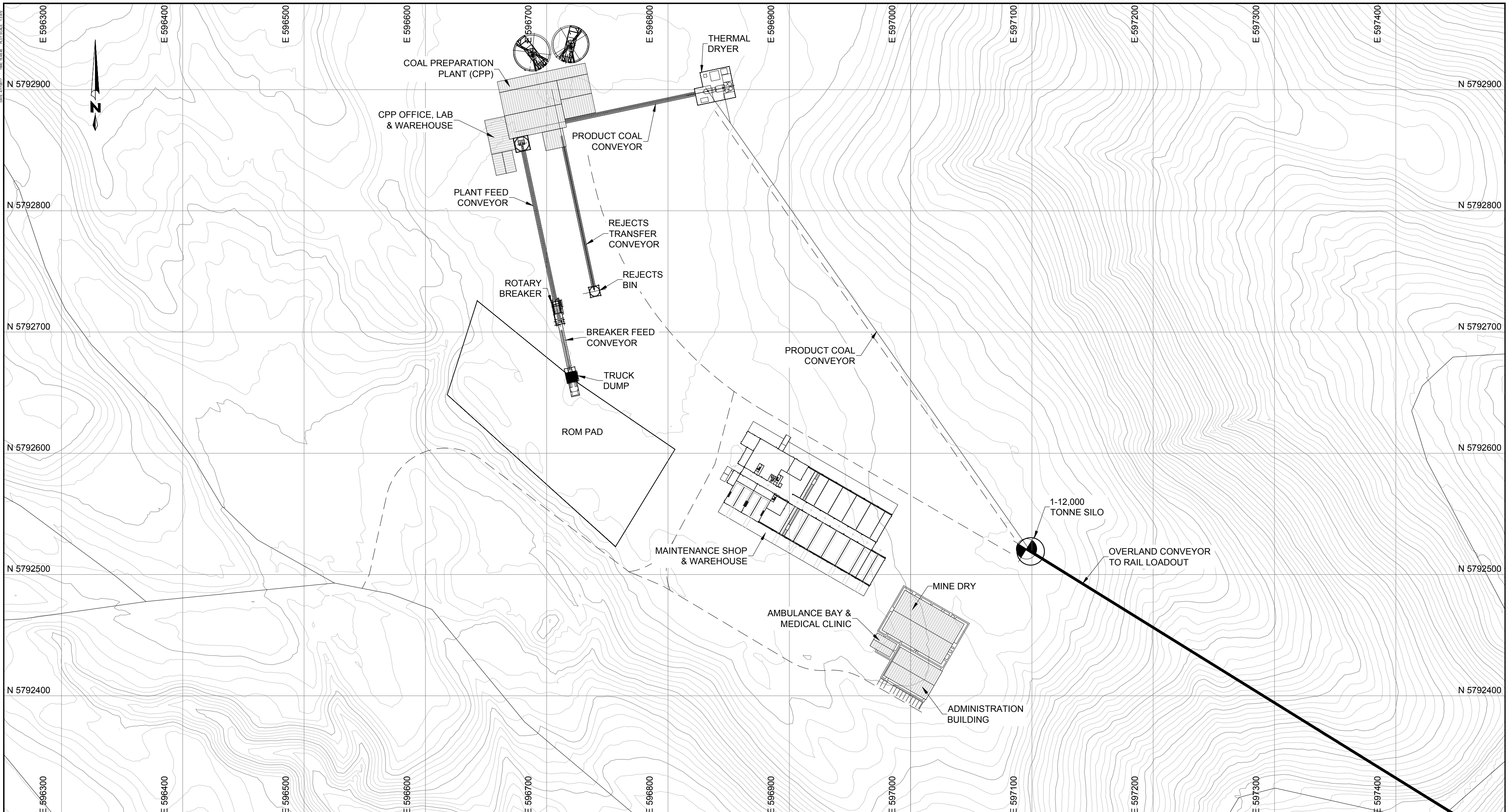
ARIES PROJECT

SCALE:	N.T.S.
DATE:	2016-11-16
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	GBH/DD
DSG'N BY:	JET
REV'D BY:	JET
APP'D BY:	JET

DRAWING 23
MATERIAL HANDLING FLOWSHEET
SHEET 2 OF 2

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	23	0



LEGEND

– – – – – – SITE ROADS

0 — 100 m — 200 m

CONTOUR INVERVAL = 2 metres
MAP PROJECTION: UTM NAD 83
ZONE 11, metres

SCALES INDICATED BASED ON AN 22"x34" PLOT CONFIGURATION

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	DD	JET	JET	JET

RAMCOAL

RAM COAL

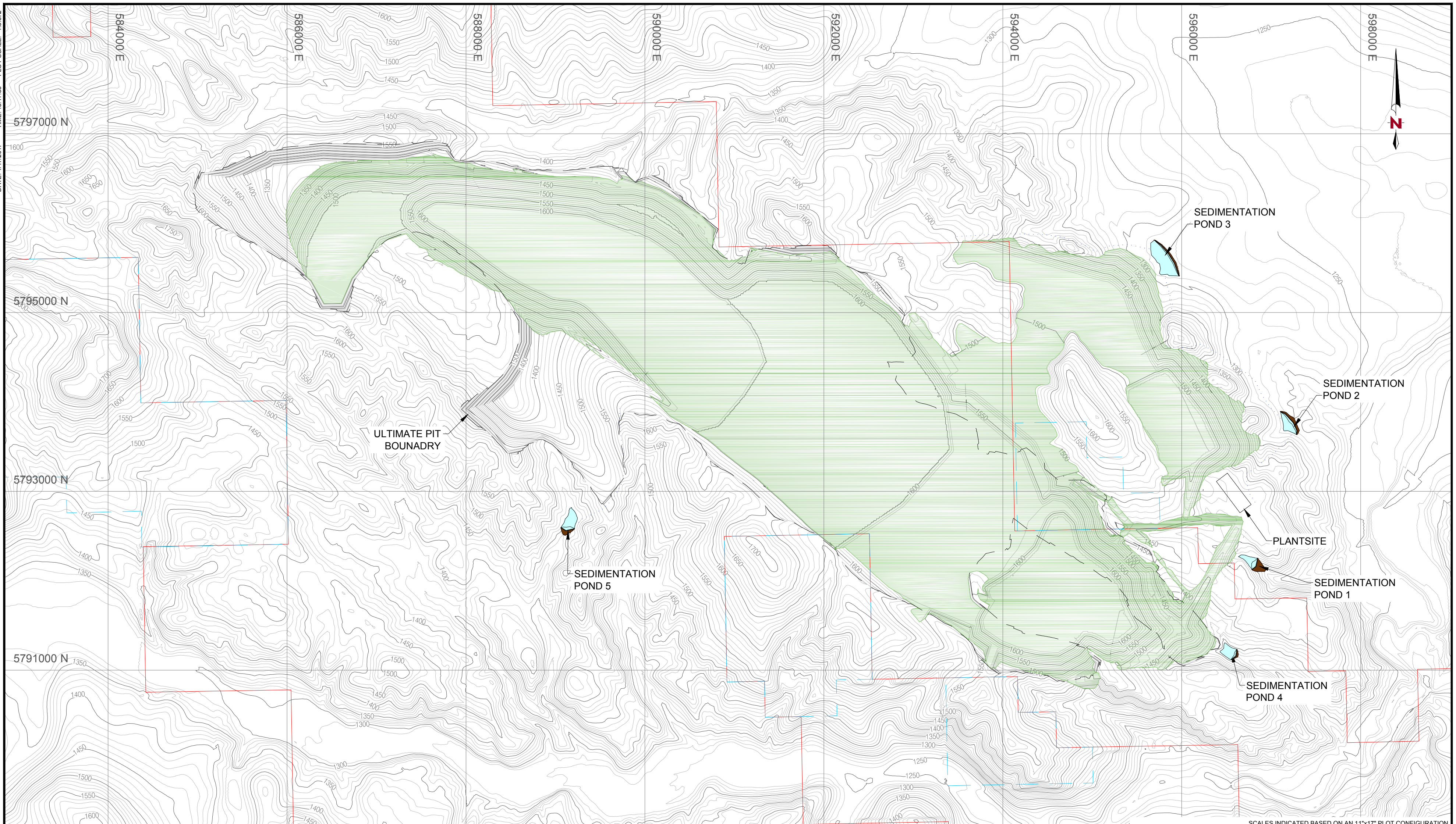
ARIES PROJECT

SCALE:	1:1,500
DATE:	2017-01-09
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	DD
DSG'N BY:	JET
REV'D BY:	JET
APP'D BY:	JET

DRAWING 24
PLANT AND SUPPORT FACILITIES
SITE PLAN

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	24	0



SCALES INDICATED BASED ON AN 11"x17" PLOT CONFIGURATION

LEGEND

- 10m CONTOURS
- LEASE BOUNDARY
- LEASE UNDER APPLICATION BOUNDARY
- DITCH ALIGNMENT
- ULTIMATE PIT BOUNDARY
- RECLAIMED AREA
- SEDIMENT POND

1000m 500 0 1000 2000m

SCALE 1:40,000

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	SC	SP	MA	--

RAMCOAL

RAM COAL

ARIES PROJECT

SCALE:	1:40,000
DATE:	2017-03-24
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	SC
DSG'N BY:	SP
REV'D BY:	MA
APP'D BY:	--

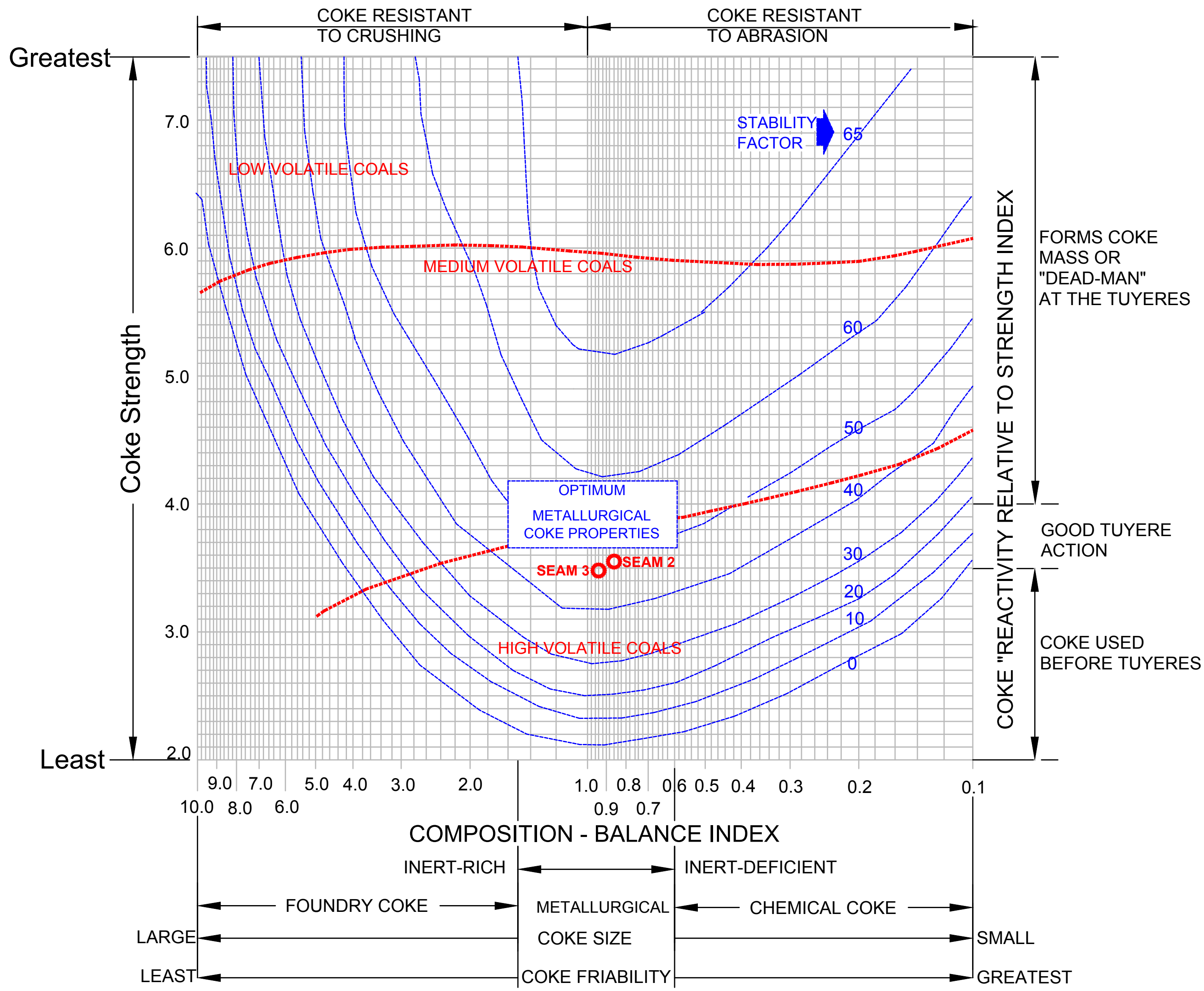
DRAWING 25
WATER MANAGEMENT

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	25	0

FILENAME: I:\PROJECTDATA\RAM COAL_624\624-10_2016_PFS\DISC\DRAFTING\05_43-101\05_CURRENT DRAWINGS\25 WATER MANAGEMENT.DWG
XREF FILE(S): _Contours; _Reclaimed; 170202_Sediment Ponds; Ultimate Pit Boundary
IMAGE FILE(S):

DATE: 4/17/2017 TIME: 15:47:33 PLOT SCALE: 1:3.872



SCALES INDICATED BASED ON AN 11"x17" PLOT CONFIGURATION

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	SC	MA	MA	SE

SCALE:	N.T.S.		
DATE:	2017-01-31		
CO-ORD. SYS.:	N/A		
DRW'N BY:	SC	REV'D BY:	MA
DSG'N BY:	MA	APP'D BY:	SE

RAM COAL

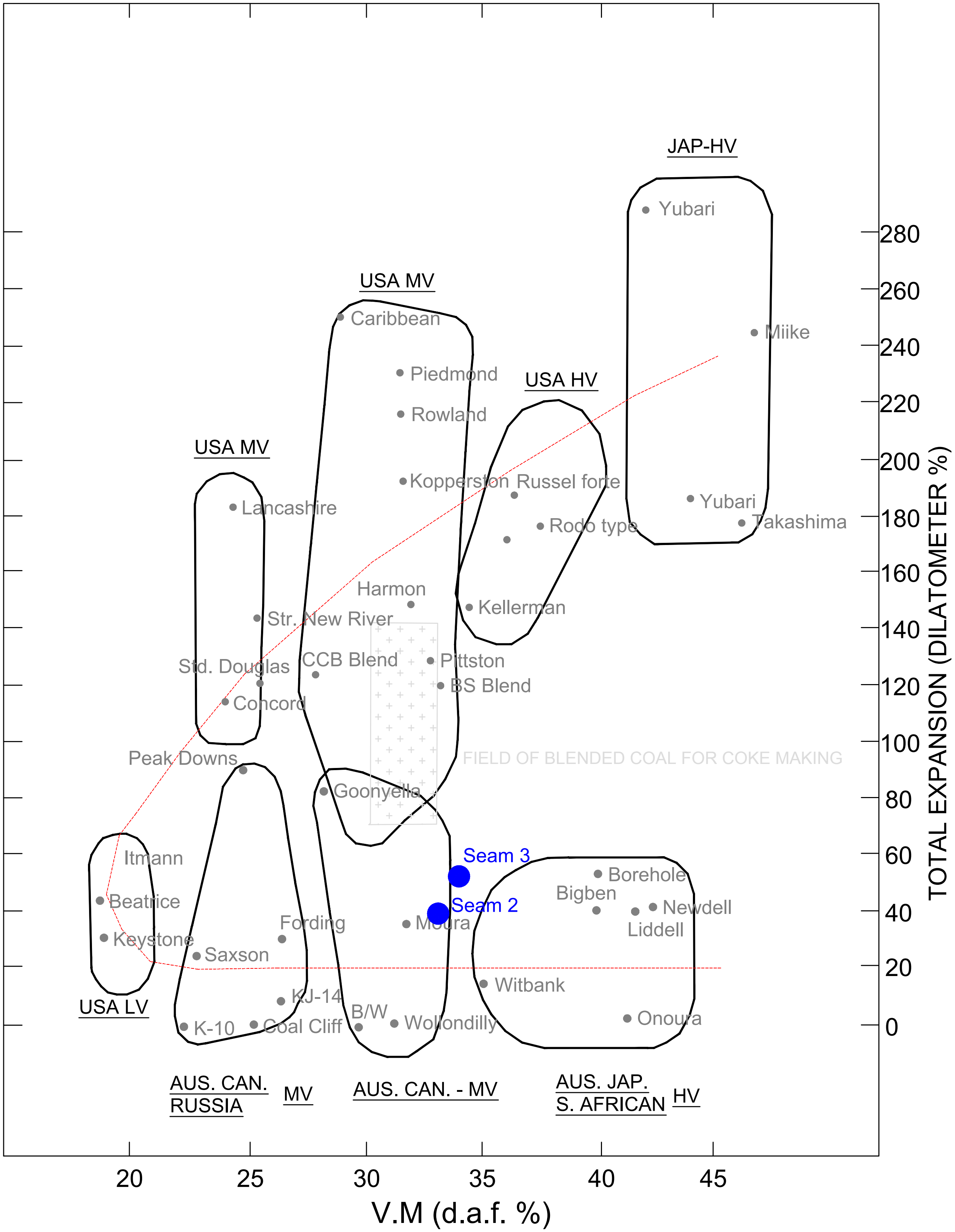
ARIES PROJECT

DRAWING 26
SHAPIRO-GRAY COMPOSITION BALANCE INDEX
COMPARATIVE COKE STRENGTH

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	26	0

FILENAME: I:\PROJECTDATA\RAM COAL_624\624-10_2016 PFS\DISC\DRAFTING\05_43-101\05_CURRENT DRAWINGS\26 SHAPIRO-GRAY COMPOSISTION BALANCE.DWG
XREF FILE(S):
IMAGE FILE(S):
DATE: 4/17/2017 TIME: 15:45:03 PLOT SCALE: 1:3.872



SCALES INDICATED BASED ON AN 8.5"x11" PLOT CONFIGURATION

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	SC	MA	MA	SE

RAMCOAL

RAM COAL

ARIES PROJECT

SCALE:	N.T.S.
DATE:	2017-01-31
CO-ORD. SYS.:	N/A
DRW'N BY:	SC
DSG'N BY:	MA
REV'D BY:	MA
APP'D BY:	SE

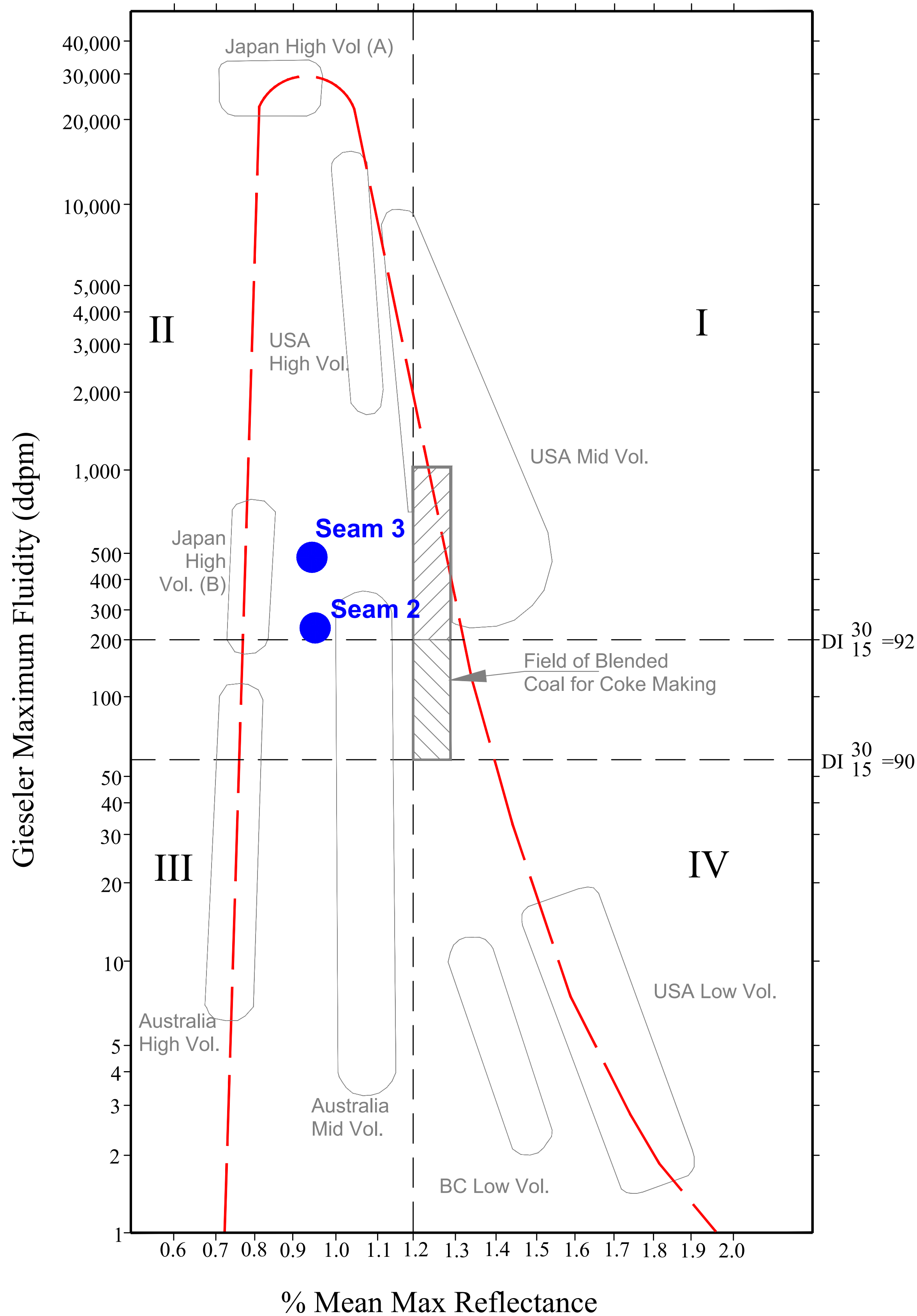
DRAWING 27
THERMAL RHEOLOGY AS FUNCTION OF
RANKRUHR DILATION

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	27	0

FILENAME: I:\PROJECTDATA\RAM COAL_624\624-10_2016 PFS\DISC\DRAFTING\05_43-101\05_CURRENT DRAWINGS\27 THERMAL RHEOLOGY VM-DILATION.DWG
XREF FILE(S):
IMAGE FILE(S):
DATE: 4/17/2017 TIME: 15:43:37 PLOT SCALE: 1:3.872

FILENAME: I:\PROJECTDATA\RAM COAL_624\624-10_2016 PFS\DISC\DRAFTING\05_43-10105_CURRENT DRAWINGS\28 MOF MEAN-MAX GRAPH-DDPM.DWG
XREF FILE(S):
IMAGE FILE(S):
DATE: 4/17/2017 TIME: 15:41:43 PLOT SCALE: 1:3.872



SCALES INDICATED BASED ON AN 8.5"x11" PLOT CONFIGURATION

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2017-04-06	ISSUED FOR 43-101	SC	MA	MA	SE

RAMCOAL

RAM COAL

ARIES PROJECT

SCALE:	N.T.S.
DATE:	2017-01-31
CO-ORD. SYS.:	UTM83-10
DRW'N BY:	SC
DSG'N BY:	MA
REV'D BY:	MA
APP'D BY:	SE

DRAWING 28
RELATIONSHIP OF FLUIDITY AND MEAN MAXIMUM REFLECTANCE MOF DIAGRAM (NKK)

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
624-10	28	0