

## Increased Ore Reserve for Browns Range Project

### Highlights

- Updated Ore Reserve for the Browns Range Project of **3.8Mt of ore containing 2,294,000kg dysprosium<sup>1</sup> and 26,375,000kg Total Rare Earth Oxide (TREO)** - reported in accordance with the JORC Code 2012.
- The Ore Reserve Statement is based on the outcomes of the Browns Range Project's Definitive Feasibility Study and the Mineral Resource update estimate announced 23 February 2015.
- The Ore Reserve is classified as 100% Probable Ore Reserve.

Northern Minerals (ASX: NTU) is pleased to announce an updated Ore Reserve for its flagship Browns Range Project (the Project) in northern Western Australia.

The Ore Reserve, reported in accordance with the JORC 2012 code, is detailed in Table 1 below.

The Project as proposed will include open pit and underground mines producing ore containing rare earths at a rate of 585,000 tonnes per annum (tpa). Ore will be processed via an on-site beneficiation and hydrometallurgy plant, to produce a final high grade, mixed rare earth (RE) carbonate product.

Northern Minerals' Managing Director George Bauk said:

"The increased Ore Reserve reinforces the robustness of the Project, with the Project now firmly on track to becoming a significant supplier of high value dysprosium for a growing global market."

*Table 1– Browns Range Ore Reserve Statement*

Deposit	Class-ification	Ore Tonnes	TREO		Dy <sub>2</sub> O <sub>3</sub>		Y <sub>2</sub> O <sub>3</sub>		Tb <sub>4</sub> O <sub>7</sub>	
			kg/t	kg contained	kg/t	kg contained	kg/t	kg contained	kg/t	kg contained
<b>OPEN PIT</b>										
Wolverine	Probable	833,000	6.15	5,124,000	0.55	460,000	3.59	2,989,000	0.08	66,000
Gambit West	Probable	219,000	10.10	2,212,000	0.83	182,000	5.52	1,209,000	0.11	25,000
Gambit	Probable	37,000	8.05	298,000	0.68	25,000	4.74	176,000	0.09	3,000
Area 5	Probable	467,000	2.24	1,048,000	0.14	65,000	0.99	463,000	0.02	10,000
<b>UNDER-GROUND</b>										
Wolverine	Probable	2,104,000	8.00	16,833,000	0.70	1,483,000	4.71	9,908,000	0.10	221,000
Gambit West	Probable	90,000	9.54	860,000	0.88	79,000	5.78	521,000	0.11	10,000
<b>TOTAL<sup>2</sup></b>	<b>Probable</b>	<b>3,750,000</b>	<b>7.03</b>	<b>26,375,000</b>	<b>0.61</b>	<b>2,294,000</b>	<b>4.07</b>	<b>15,266,000</b>	<b>0.09</b>	<b>335,000</b>

<sup>1</sup> - In this report dysprosium is to be read as dysprosium oxide (Dy<sub>2</sub>O<sub>3</sub>) unless otherwise stated. Other elements are referred to similarly.

<sup>2</sup> - Rounding may cause some computational discrepancies

**TREO = Total Rare Earth Oxides** – La<sub>2</sub>O<sub>3</sub>, CeO<sub>2</sub>, Pr<sub>6</sub>O<sub>11</sub>, Nd<sub>2</sub>O<sub>3</sub>, Sm<sub>2</sub>O<sub>3</sub>, Eu<sub>2</sub>O<sub>3</sub>, Gd<sub>2</sub>O<sub>3</sub>, Tb<sub>4</sub>O<sub>7</sub>, Dy<sub>2</sub>O<sub>3</sub>, Ho<sub>2</sub>O<sub>3</sub>, Er<sub>2</sub>O<sub>3</sub>, Tm<sub>2</sub>O<sub>3</sub>, Yb<sub>2</sub>O<sub>3</sub>, Lu<sub>2</sub>O<sub>3</sub>, Y<sub>2</sub>O<sub>3</sub>

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### Mineral Resource

The Ore Reserve is based entirely on the Mineral Resource, as released, in accordance with the JORC 2012 Code, by the company on 23 February 2015. ("Increased Mineral Resource delivers more good news"). The quantity and classification of this Mineral Resource is stated below in Table 2. The Mineral Resource is inclusive of the Ore Reserves.

*Table 2 – Browns Range Mineral Resource Estimate as at 23 February 2015*

Deposit	Category	Mt	TREO %	Dy <sub>2</sub> O <sub>3</sub> kg/t	Y <sub>2</sub> O <sub>3</sub> kg/t	Tb <sub>4</sub> O <sub>7</sub> kg/t	HREO %	TREO kg
Wolverine	Indicated	2.99	0.83	0.73	4.86	0.11	89	24,952,000
	Inferred	1.97	0.89	0.76	5.13	0.11	88	17,609,000
	Total <sup>1</sup>	4.97	0.86	0.74	4.97	0.11	89	42,560,000
Gambit West	Indicated	0.27	1.26	1.07	7.06	0.14	90	3,424,000
	Inferred	0.12	0.64	0.54	3.67	0.07	85	753,000
	Total <sup>1</sup>	0.39	1.07	0.91	6.04	0.12	89	4,177,000
Gambit	Indicated	0.05	1.06	0.92	6.62	0.12	97	533,000
	Inferred	0.06	1.2	1.01	6.8	0.15	95	671,000
	Total <sup>1</sup>	0.11	1.13	0.97	6.72	0.13	96	1,204,000
Area 5	Indicated	1.38	0.29	0.18	1.27	0.03	69	3,953,000
	Inferred	0.14	0.27	0.17	1.17	0.03	70	394,000
	Total <sup>1</sup>	1.52	0.29	0.18	1.26	0.03	69	4,347,000
Cyclops	Indicated	-	-	-	-	-	-	-
	Inferred	0.33	0.27	0.18	1.24	0.03	70	891,000
	Total <sup>1</sup>	0.33	0.27	0.18	1.24	0.03	70	891,000
Banshee	Indicated	-	-	-	-	-	-	-
	Inferred	1.66	0.21	0.16	1.17	0.02	87	3,484,000
	Total <sup>1</sup>	1.66	0.21	0.16	1.17	0.02	87	3,484,000
Total <sup>1</sup>	Indicated	4.69	0.70	0.59	3.95	0.09	87	32,862,000
	Inferred	4.28	0.56	0.46	3.15	0.07	87	23,802,000
	Total <sup>1</sup>	8.98	0.63	0.53	3.56	0.08	87	56,663,000

<sup>1</sup> - Rounding may cause some computational discrepancies

TREO = Total Rare Earth Oxides – La<sub>2</sub>O<sub>3</sub>, CeO<sub>2</sub>, Pr<sub>6</sub>O<sub>11</sub>, Nd<sub>2</sub>O<sub>3</sub>, Sm<sub>2</sub>O<sub>3</sub>, Eu<sub>2</sub>O<sub>3</sub>, Gd<sub>2</sub>O<sub>3</sub>, Tb<sub>4</sub>O<sub>7</sub>, Dy<sub>2</sub>O<sub>3</sub>, Ho<sub>2</sub>O<sub>3</sub>, Er<sub>2</sub>O<sub>3</sub>, Tm<sub>2</sub>O<sub>3</sub>, Yb<sub>2</sub>O<sub>3</sub>, Lu<sub>2</sub>O<sub>3</sub>, Y<sub>2</sub>O<sub>3</sub>

HREO = Heavy Rare Earth Oxides – Total of Sm<sub>2</sub>O<sub>3</sub>, Eu<sub>2</sub>O<sub>3</sub>, Gd<sub>2</sub>O<sub>3</sub>, Tb<sub>4</sub>O<sub>7</sub>, Dy<sub>2</sub>O<sub>3</sub>, Ho<sub>2</sub>O<sub>3</sub>, Er<sub>2</sub>O<sub>3</sub>, Tm<sub>2</sub>O<sub>3</sub>, Yb<sub>2</sub>O<sub>3</sub>, Lu<sub>2</sub>O<sub>3</sub>, Y<sub>2</sub>O<sub>3</sub>

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### Definitive Feasibility Study (DFS) Outcome

Entech Pty Ltd (Entech) prepared a DFS level technical mining study on behalf of Northern Minerals. As part of this study Entech:

- 1) Developed open pit mine designs for the Wolverine; Gambit; Gambit West and Area 5 deposits.
- 2) Developed underground mine designs for the Wolverine and Gambit West deposits.
- 3) Estimated costs for mining operations including quotations from mining contractors.
- 4) Reviewed and validated all other inputs provided by Northern Minerals (including general and administrative costs, processing costs and recoveries, other overhead costs, metal pricing) as being suitable to support the Ore Reserve Estimate.

It should be noted that the mining plan was developed to DFS level for the Wolverine Open Pit, Wolverine Underground and Gambit West Open Pit mines. These three mines represent approximately 90% of the metal contained within the Probable Ore Reserves. The mining plans for other deposits remain at a PFS level with respect to geotechnical guidance, albeit production rates and operating costs were projected from those developed to support the DFS.

Entech advise that the mining aspects that underpin the Browns Range Ore Reserve are technically feasible and economically viable.

### Mine design and optimisation

Open pit mine design is based on Lerchs-Grossman optimised pit shells produced by Entech using Datamine NPV Scheduler (NVPS) software. Several pits were generated at varying revenue factors. Wolverine and Gambit West pit shells were selected after consideration of the economic crossover point for underground mining. For the other pits, shells were selected where the incremental reward between successive shells was marginal.

Material modifying factors used as inputs to the optimisations are listed in Table 3. The contents of the resulting pit designs are shown in Table 4.

Open cut operations have been designed to suit conventional open cut mining methods.

Underground operations have been designed to suit conventional mobile underground fleet with decline access. Preliminary optimisations were performed in Datamine Mineable Shape Optimizer (MSO) software by applying the material modifying factors in Table 3. Detailed mine layouts and sequences have been developed for the two underground mines using Datamine Studio 5DP software.

The mining technique at the Wolverine underground mine is longhole open stoping (LHOS) with post extraction backfill using cemented pastefill. The mining technique at the Gambit West underground mine is narrow bench and fill stoping with post extraction backfill using unconsolidated run-of-mine waste. Mining costs were then estimated, including quotations from mining contractors, to allow financial evaluation of the Project.

Table 3: Summary of the material modifying factors

Item	Unit	Value
<b>Mining cost</b>		
• Open Pit (Average, varies with depth and rocktype)	\$AUD / Tonne	3.75
• Underground	\$AUD / Ore Tonne	115
<b>Mining Oreloss</b>		
• Open Pit Wolverine	%	12
• Open Pit Gambit West	%	4
• Open Pit Gambit	%	19
• Open Pit Area 5	%	2
• Underground Wolverine	%	7
• Underground Gambit West	%	20
<b>Mining dilution</b>		
• Open Pit Wolverine	%	16
• Open Pit Gambit West	%	11
• Open Pit Gambit	%	36
• Open Pit Area 5	%	35
• Underground Wolverine	m (skin)	0.4 each wall
• Underground Gambit West	m (skin)	0.4 each wall + 20% backfill
Production rate target	Tonnes TREO per annum	3,000 - 3,200
Ore Related Downstream Costs, Typical (including Processing, Rehandle, Admin, Transporting to Customer, Cost of Sales, Grade Control) <i>(Note, actual costs varies proportionally to head grade, typical at 0.66% TREO)</i>	\$AUD/t ore feed	147
Processing Input Target	Tonnes per annum	585,000
Processing recovery average (varies with each element)	%	80.2
Average Product Price (varies with REO composition)	A\$/kg TREO	117
Basis of Cutoff	Net Processing Revenue (NPR) \$/t	Open pit material within shell processed if NPR > 0 and spare plant capacity. Wolverine Underground NPR > \$AUD80 / tonne Gambit West Underground NPR > \$AUD180 / tonne
Royalties	%	4.5

Table 4: Pit design contents

Pit Designs	Ore (t)	Waste (t)	Stripping Ratio (waste/ore)
<b>Wolverine</b>	833,000	11,493,000	14:1
<b>Gambit West</b>	219,000	3,587,000	16.1
<b>Gambit</b>	37,000	1,559,000	42:1
<b>Area 5</b>	467,000	2,285,000	5:1

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### Processing method

Northern Minerals has developed a sequential processing flowsheet which has been demonstrated to provide high recoveries for the Brown Range xenotime hosted rare earths. The major steps of the flowsheet are as follows:

#### Beneficiation

- 1) Crushing and grinding
- 2) Magnetic separation
- 3) Flotation

#### Hydrometallurgical

- 4) Sulphation bake
- 5) Water leach
- 6) Purification
- 7) Carbonate precipitation
- 8) Product drying

The final saleable product is a mixed rare earth carbonate, containing 52% rare earth oxides.

### Infrastructure

The Browns Range site is in a remote part of northern Western Australia. All supporting infrastructure needs to be constructed, including:

**Mining** – It is assumed that mining will be contracted out, and the majority of associated items will be costed through the contracting arrangement. A pastefill plant will be constructed on surface.

**Beneficiation Plant**– ROM pad, comminution, wet high gradient magnetic separation, flotation, concentrate thickening and dewatering, concentrate storage and reagents.

**Hydrometallurgical Plant** – Sulphation bake, water leach, purification, ion exchange, carbonate precipitation and drying, product handling and storage and reagents.

**Plant Infrastructure** – Plant services such as water, air and fuel, pipe racks, electrical equipment, site earthworks, roads, buildings, communications, waste water treatment plant, tailings treatment plant and storage facility and water management ponds.

**Other Infrastructure** – Offsite water pipelines, access road, power station and power distribution, water bore network, accommodation village and airstrip.

Northern Minerals and its consultants have completed a DFS standard study demonstrating capital and operating costs for all aspects of the infrastructure required for the Project.

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### Consulting team

In addition to its own team, Northern Minerals would like to acknowledge the substantial contribution of the following specialists in their field to the delivery of the Browns Range DFS.

Consultant	Scope Area
Entech	Mine design and scheduling
DRA Global	Beneficiation plant, power station, airstrip
Lycopodium	Hydrometallurgical plant, Waste Water Treatment
Sargon Engineering	METSIM modelling
Knight Piésold Consulting Engineers	Tailings management and storage
Golder Associates	Water management and infrastructure geotechnical
Klohn Crippen Berger	Project water supply
RSA Engineering	Accommodation Village
Shawmac	Access roads
ICRG Logistics	Project logistics
NAGROM Laboratories	Beneficiation and hydrometallurgical testwork
SGS Australia	Beneficiation pilot plant
ANSTO Minerals	Hydrometallurgical pilot plant
ALS Ammtec	Hydrometallurgical testwork

### Environmental assessment, land access and tenure

The Project deposits (Wolverine, Gambit, Gambit West and Area 5) are contained within the granted mining lease M80/627. All ancillary tenements required to operate the project are also granted.

M80/627 is located entirely within the area of the registered native title claim on behalf of the Jaru People (WAD45/2012). NTU has executed a Co-existence Agreement with the Jaru Native Title Claim group. An environmental impact assessment has been completed, the primary environmental assessment by the Environmental Protection Authority has culminated in a Ministerial approval (Ministerial Statement 986) being granted on 20 October 2014. The project was determined not to be a “controlled action” under Commonwealth environmental legislation. Accordingly, no environmental approval is required at federal level.

Northern Minerals considers that outstanding approvals and licences to operate are well advanced towards approval in line with expected process and timelines in Western Australia.

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### Competent Person and Compliance Statement

The information in this announcement that relate to Ore Reserves are based on information compiled under the direction of Mr Daniel Donald. Mr Donald is a Member of the Australasian Institute of Mining and Metallurgy employed by Entech. Mr Donald has experience relevant to the type of deposit under consideration to qualify as a Competent Person as defined in the 2012 JORC Code. Mr Donald consents to the inclusion in the announcement of the matters based on this information in the form and context in which it appears.

The information in the announcement that relates to the Mineral Resource Estimates of the Wolverine deposit is extracted from the report entitled “Increased Mineral Resource delivers more good news” dated 23 February 2015 and is available to view on the Company’s website ([www.northernminerals.com.au](http://www.northernminerals.com.au)). The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. The company confirms that the form and context in which the Competent Person’s findings are presented have not been materially modified from the original market announcement.

The information in the announcement that relates to the Mineral Resource Estimates of the Cyclops and Banshee deposits is extracted from the report entitled “Further Increase in Brown Range Mineral Resource” dated 15 October 2014 and is available to view on the Company’s website ([www.northernminerals.com.au](http://www.northernminerals.com.au)). The company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. The company confirms that the form and context in which the Competent Person’s findings are presented have not been materially modified from the original market announcement.

The information in the announcement that relates to the Mineral Resource Estimates of the Gambit, Gambit West and Area 5 deposits is extracted from the report entitled “Wolverine Total Resource Doubled in a Major Upgrade of Browns Range HRE Mineral Resource Estimate” dated 26 February 2014 and is available to view on the Company’s website ([www.northernminerals.com.au](http://www.northernminerals.com.au)). The company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. The company confirms that the form and context in which the Competent Person’s findings are presented have not been materially modified from the original market announcement.

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### About Northern Minerals:

Northern Minerals Limited (ASX: NTU; the Company) is focussed on the becoming a globally significant producer of the heavy rare earth (HRE), dysprosium. The Company has a large landholding in Western Australia and the Northern Territory that is highly prospective for this element.

Northern Minerals' 100% owned flagship project is the Browns Range Project (the Project), where it has a number of deposits and prospects containing high value dysprosium and other HREs, hosted in xenotime mineralisation. Dysprosium is an essential ingredient in the production of NdFeB (neodymium iron-boron) magnets used in clean energy and high technology solutions. As a result of increasing global demand for these applications dysprosium supply is critical. The Project's xenotime mineralisation facilitates the use of a relatively simple and cost effective processing flowsheet to produce a high grade dysprosium rich mixed rare earth carbonate. Northern Minerals is targeting construction to commence in 2015, followed by production in late 2016.

Exploration is also underway at the geologically similar John Galt and Boulder Ridge projects.

For more information [northernminerals.com.au](http://northernminerals.com.au).



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### APPENDIX A

#### JORC 2012 Checklist of Assessment and Reporting Criteria

##### Section 1 Sampling Techniques and Data

Criteria	JORC Code explanation	Commentary
	<ul style="list-style-type: none"> <li>This ore reserve is based entirely on previously released Mineral Resources (previously released details are available at <a href="http://www.northernminerals.com.au">www.northernminerals.com.au</a>). No new Mineral Resources or exploration results are being released.</li> </ul>	

##### Section 2 Reporting of Exploration Results

Criteria	JORC Code explanation	Commentary
	<ul style="list-style-type: none"> <li>This ore reserve is based entirely on previously released Mineral Resources (previously released details are available at <a href="http://www.northernminerals.com.au">www.northernminerals.com.au</a>). No new exploration results are being released.</li> </ul>	

##### Section 3 Estimation and Reporting of Mineral Resources

Criteria	JORC Code explanation	Commentary
	<ul style="list-style-type: none"> <li>This ore reserve is based entirely on previously released Mineral Resources (previously released details are available at <a href="http://www.northernminerals.com.au">www.northernminerals.com.au</a>). No new Mineral Resources are being released.</li> </ul>	

##### Section 4 Estimation and Reporting of Ore Reserves

Criteria	JORC Code explanation	Commentary
<i>Mineral Resource estimate for conversion to Ore Reserves</i>	<ul style="list-style-type: none"> <li><i>Description of the Mineral Resource estimate used as a basis for the conversion to an Ore Reserve.</i></li> <li><i>Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Ore Reserves.</i></li> </ul>	<ul style="list-style-type: none"> <li>This ore reserve is based entirely on the Indicated portion of the current reported Mineral Resources at Wolverine, Gambit, Gambit West and Area 5 deposits (previously released details are available at <a href="http://www.northernminerals.com.au">www.northernminerals.com.au</a>).</li> </ul>

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Criteria	JORC Code explanation	Commentary
		<ul style="list-style-type: none"> <li>Mineral Resources are reported inclusive of the Ore Reserves.</li> </ul>
Site visits	<ul style="list-style-type: none"> <li>Comment on any site visits undertaken by the Competent Person and the outcome of those visits.</li> <li>If no site visits have been undertaken indicate why this is the case.</li> </ul>	<ul style="list-style-type: none"> <li>The competent person has not visited the site.</li> <li>The competent person is comfortable relying on reports from other independent consultants, and other Entech staff, who have visited site and other operations in the area respectively.</li> </ul>
Study status	<ul style="list-style-type: none"> <li>The type and level of study undertaken to enable Mineral Resources to be converted to Ore Reserves.</li> <li>The Code requires that a study to at least Pre-Feasibility Study level has been undertaken to convert Mineral Resources to Ore Reserves. Such studies will have been carried out and will have determined a mine plan that is technically achievable and economically viable, and that material Modifying Factors have been considered.</li> </ul>	<ul style="list-style-type: none"> <li>The portion of the mining study supporting the Ore Reserves at Wolverine Open Pit, Wolverine Underground and Gambit West Open Pit have been completed to a detailed feasibility level, whilst the portion of the mining study supporting the Ore Reserves at Gambit West Underground and Area 5 Open Pit have been completed to a pre-feasibility level.</li> <li>Modifying factors accurate to the study level have been applied. The resulting mine plan is technically achievable and economically viable.</li> </ul>
Cut-off parameters	<ul style="list-style-type: none"> <li>The basis of the cut-off grade(s) or quality parameters applied.</li> </ul>	<ul style="list-style-type: none"> <li>A "Net Processing Return" (NPR) function was modelled at the block level, based on block grades, recovery processing cost and pricing. Open cut material was stockpiled and available for processing if NPR &gt;0. For Wolverine underground a NPR &gt;\$AUD80 was the basis of cutoff. For Gambit West underground a NPR &gt;\$AUD180 was the basis of cutoff.</li> </ul>
Mining factors or assumptions	<ul style="list-style-type: none"> <li>The method and assumptions used as reported in the Pre-Feasibility or Feasibility Study to convert the Mineral Resource to an Ore Reserve (i.e. either by application of appropriate factors by optimisation or by preliminary or detailed design).</li> <li>The choice, nature and appropriateness of the selected mining method(s) and other mining parameters including associated design issues such as pre-strip, access, etc.</li> <li>The assumptions made regarding geotechnical parameters (eg pit slopes, stope sizes, etc), grade control and pre-production drilling.</li> <li>The major assumptions made and Mineral Resource model used for pit and stope optimisation (if appropriate).</li> </ul>	<ul style="list-style-type: none"> <li>Conventional mining methods have been chosen. Open cut operations are planned around a 200t-class excavator and 90t dump trucks. Underground operations use rubber tyred diesel equipment, 1:7 decline, 60t class trucks. Underground production will be predominantly from longhole open stopes with post extraction paste backfill.</li> <li>Independent consultants prepared the geotechnical analysis. This forms the basis of pit design criteria. Also, underground design parameters including stope size, fill method and additional support installation have been analysed with the resulting analysis used in mine design.</li> </ul>

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Criteria	JORC Code explanation	Commentary
	<ul style="list-style-type: none"> <li>• <i>The mining dilution factors used.</i></li> <li>• <i>The mining recovery factors used.</i></li> <li>• <i>Any minimum mining widths used.</i></li> <li>• <i>The manner in which Inferred Mineral Resources are utilised in mining studies and the sensitivity of the outcome to their inclusion.</i></li> <li>• <i>The infrastructure requirements of the selected mining methods.</i></li> </ul>	<ul style="list-style-type: none"> <li>• Only the Indicated portion of the Mineral Resource was used to estimate the Ore Reserve.</li> <li>• Underground stopes were designed inclusive of minimum mining width plus dilution skins. For Wolverine this comprised a minimum planned width of 1.7m plus 0.4m dilution skin on both the hangingwall and footwall, for a total minimum stope width of 2.5m at 25m sub-level intervals. For Gambit West a minimum planned width of 1.7m plus 0.4m dilution skins on both the hangingwall and footwall (for a total minimum width of 2.5m) and 20% dilution from backfill was used as the basis of the design at 20m sub-level intervals.</li> <li>• Wolverine open pit mining blocks were diluted by 16%; Area 5 diluted by 35%; Gambit West diluted by 11% and Gambit diluted by 36%.</li> <li>• Mining Recovery of 93% was assumed for the stopes at Wolverine underground operations, with ore development at 100% mining recovery.</li> <li>• Assumed mining recoveries for the pits are: Wolverine 88%; Gambit West 96%; Gambit 81% and Area 5 98%.</li> <li>• Open Cuts have been designed to suit 90 tonne dump trucks.</li> <li>• Minimum mining width for underground stopes is 2.5m.</li> <li>• Feasibility level mine designs were created to support the Ore Reserve estimation, hence targeting only the Indicated Mineral Resource. Only minor Inferred Mineral Resource occurs within these mine designs. The Ore Reserve is technically and economically viable without the inclusion of Inferred Mineral Resource. The DFS study identified substantial Inferred Mineral Resource at depth below the proposed Wolverine underground mine which could potentially add value to future mining scenarios, however this material forms no part of the Ore Reserve statement.</li> <li>• The following infrastructure will be required and is included in the DFS capital and operating cost estimate: – Backfill Plant, Tailings Storage Facility, Waste Rock Landform- Administration</li> </ul>

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Criteria	JORC Code explanation	Commentary
<p><i>Metallurgical factors or assumptions</i></p>	<ul style="list-style-type: none"> <li>• <i>The metallurgical process proposed and the appropriateness of that process to the style of mineralisation.</i></li> <li>• <i>Whether the metallurgical process is well-tested technology or novel in nature.</i></li> <li>• <i>The nature, amount and representativeness of metallurgical test work undertaken, the nature of the metallurgical domaining applied and the corresponding metallurgical recovery factors applied.</i></li> <li>• <i>Any assumptions or allowances made for deleterious elements.</i></li> <li>• <i>The existence of any bulk sample or pilot scale test work and the degree to which such samples are considered representative of the orebody as a whole.</i></li> <li>• <i>For minerals that are defined by a specification, has the ore reserve estimation been based on the appropriate mineralogy to meet the specifications?</i></li> </ul>	<p>buildings– Stores and maintenance facilities– Power generation and Reticulation– Waste water treatment facilities – Water catchment dams, bore fields , evaporation ponds– Accommodation village - Airstrip– Beneficiation and Hydrometallurgical Plants– Site access road</p> <ul style="list-style-type: none"> <li>• The metallurgical process was developed to a definitive feasibility level including the development of a flowsheet and capital and operating costs. The flowsheet consists of the following: Beneficiation Process (comminution, physical magnetic separation followed by flotation);Hydrometallurgical flowsheet (sulphation bake, water leach, purification, rare earth carbonate precipitation and drying)</li> <li>• The process stages are based on well understood conventional unit processes. There are no un-tested novel processes used within the flowsheet. Extensive bench and pilot scale test work has confirmed the process flowsheet is effective in achieving high recoveries from the xenotime hosted mineralisation.</li> <li>• Bench scale testwork has been completed for all process elements. A pilot scale test has been completed on the beneficiation circuit and three 5 day pilot scale tests treating 1200kg of mineral concentrate have been completed on the hydrometallurgical circuit.; Representivity of the testwork is assumed based on similar xenotime host mineralisation across the deposits and has been demonstrated for the Wolverine and Gambit West deposits.; For beneficiation, a 86.7% TREO recovery was applied. Individual rare earth oxide recoveries range from 51.8% - 90.7% recovery for the remaining rare earths, with HREO recoveries significantly greater than LREO. A Hydrometallurgical, recovery of 92.7% TREO has been applied. Individual rare earth oxide recoveries range from 82.3 - 94.1%</li> </ul>

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		<p>with HREO recoveries significantly greater than LREO.</p> <ul style="list-style-type: none"> <li>The flowsheet has been designed and demonstrated to reject deleterious elements in the Hydrometallurgy stage and to produce a high purity mixed rare earth carbonate that satisfies the requirements for downstream processing.</li> <li>A bulk samples totalling 98.3t was collected from Browns Range in late 2013, which included 15.5t of drill core sample, with 8.6t from Wolverine and 6.9t from the Gambit West deposit. The sample processed through the pilot facility at SGS Perth consisted of 90.2 tonnes of the bulk sample, which was composited into three discrete master composite samples. Three 5 day continuous pilot plant campaigns were performed at ANSTO using 1,200kg of the 20% TREO mineral concentrate. The robustness and the simplicity of the flowsheet were confirmed under the continuous pilot plant conditions. Representativeness of these samples to the entirety of the Browns Range Ore Reserve has been assumed due to the similar xenotime mineralogy. This assumption has been proven for Wolverine down to 450m, but is yet to be demonstrated for all other deposits. Improving the representativeness of the metallurgical testwork is the focus of ongoing testwork.</li> <li>Rare Earth Oxides are not minerals defined by a specification. The mineralogical structure is converted to an oxide compound.</li> </ul>
<i>Environmental</i>	<ul style="list-style-type: none"> <li><i>The status of studies of potential environmental impacts of the mining and processing operation. Details of waste rock characterisation and the consideration of potential sites, status of design options considered and, where applicable, the status of approvals for process residue storage and waste dumps should be reported.</i></li> </ul>	<ul style="list-style-type: none"> <li>Baseline environmental studies commenced in 2012 and have been completed. The WA EPA completed its assessment of the project in August 2014. Ministerial approval was granted on 20 October 2014. No federal environmental approval is required, as the project was determined not to be a “controlled action” under the Commonwealth <i>Environment Protection and Biodiversity</i></li> </ul>

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		<i>Conservation Act 1999.</i> The locations of waste rock landforms and the tailings storage facility have been considered taking into account site hydrology, proximity to deposits, preliminary geotechnical information and existing landform features. Waste rock characterisation studies indicate that the waste rock is unlikely to be a risk for acid mine drainage.
Infrastructure	<ul style="list-style-type: none"> <li><i>The existence of appropriate infrastructure: availability of land for plant development, power, water, transportation (particularly for bulk commodities), labour, accommodation; or the ease with which the infrastructure can be provided, or accessed.</i></li> </ul>	<ul style="list-style-type: none"> <li>The site is remote. There is currently no substantial on-site infrastructure, and the DFS study comprehensively estimates the costs for the development of all necessary infrastructure items.</li> </ul>
Costs	<ul style="list-style-type: none"> <li><i>The derivation of, or assumptions made, regarding projected capital costs in the study.</i></li> <li><i>The methodology used to estimate operating costs.</i></li> <li><i>Allowances made for the content of deleterious elements.</i></li> <li><i>The source of exchange rates used in the study.</i></li> <li><i>Derivation of transportation charges.</i></li> <li><i>The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc.</i></li> <li><i>The allowances made for royalties payable, both Government and private.</i></li> </ul>	<ul style="list-style-type: none"> <li>Direct processing plant capital estimates are based on design data. Major plant equipment costs are based on current vendor quotes with bulk material costs based on detailed material take offs. Installation costs are based on rates derived from quotes from contractors. The basis of the DFS is that the mining operations will be undertaken by contractor and therefore the only capital allowance in the DFS is for site establishment and mobilisation. Indirect costs have been built up based on an assessment of temporary construction facilities, owner's costs, first fills, equipment spares, heavy lift cranes, EPCM and commissioning costs.</li> <li>Mining operating costs were largely sourced from quotations provided by mining contractors and first principles estimations by independent consultants. The Area 5 Open Pit and Gambit West Underground economic assessments are conducted on the basis of an incremental blend feedstock at reduced general and administration cost regime. Processing, and general and administration operating costs were built up on a first principles basis from unit activities and the METSIM process mass and energy balance.</li> </ul>

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		<ul style="list-style-type: none"> <li>• The product price has been assigned based on its full expected elemental makeup including all revenue drivers and deleterious components.</li> <li>• NTU maintains internal corporate guidance on exchange rates based on current exchange rate and compilation of external advice.</li> <li>• All infrastructure components and consumables are assumed delivered to site at estimated road haulage rates. Product is considered sold upon delivery to the destination port.</li> <li>• NTU has entered into a non-binding memorandum of understanding (MOU) with Sumitomo Corporation (Sumitomo) for up to half of the forecast annual production (1,500t of TREO per annum), with the intention of converting to a binding MOU after successful completion of advanced technical and financial studies. NTU is also in discussion with a number of other potential offtakers for the remainder of the forecast production from Browns Range.</li> <li>• Allowances has been made for royalties, land access payments and mine rehabilitation fund.</li> </ul>
<b>Revenue factors</b>	<ul style="list-style-type: none"> <li>• <i>The derivation of, or assumptions made regarding revenue factors including head grade, metal or commodity price(s) exchange rates, transportation and treatment charges, penalties, net smelter returns, etc.</i></li> <li>• <i>The derivation of assumptions made of metal or commodity price(s), for the principal metals, minerals and co-products.</i></li> </ul>	<ul style="list-style-type: none"> <li>• The revenue is a function of diluted block modelled grade, modelled comprehensively through the mining, mineral processing and transportation chain where it is expected to be delivered to an offtaker at a forecast price.</li> <li>• The mine planning underpinning the Ore Reserves was conducted using preliminary, fixed point product pricing that was suitable for blockmodel coding and mine design. In the final financial analysis, revenue from Ore deliveries were then recalculated using an updated, time series based pricing model. The Ore Reserves are feasible and economic under both pricing schedules.</li> </ul>

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		<ul style="list-style-type: none"> <li>Following a review of Northern Minerals internal pricing forecast and models and a number of external sources the Company concluded that the forecast provided by Adamas Intelligence's Critical Metal and Minerals Research report, Rare earth Market Outlook: Supply, Demand and Pricing from 2014 – 2020 (Adamas Report) provided the most representative view of the market. The REO pricing forecasts provided in the Adamas report have been adopted for the DFS. The pricing mechanism used to determine the payable price for each REO is based on the MoU with Sumitomo. The product from Browns Range is expected to be sold either as a mixed rare earth (RE) carbonate FOB from Wyndham port or sold as individual RE oxides after toll-separation.</li> </ul>
Market assessment	<ul style="list-style-type: none"> <li><i>The demand, supply and stock situation for the particular commodity, consumption trends and factors likely to affect supply and demand into the future.</i></li> <li><i>A customer and competitor analysis along with the identification of likely market windows for the product.</i></li> <li><i>Price and volume forecasts and the basis for these forecasts.</i></li> <li><i>For industrial minerals the customer specification, testing and acceptance requirements prior to a supply contract.</i></li> </ul>	<ul style="list-style-type: none"> <li>NTU considers the key value drivers of the Project to be dysprosium, yttrium and terbium. Market analysis commissioned for NTU suggests growing demand for these elements into the future, in particular dysprosium.</li> <li>A review of publically released information from potential competitors suggests the Project to be extremely competitive in provision of Rare Earth elements heavier than terbium, with dysprosium being a key value driver for the Project. Browns Range is also likely to be extremely competitive against its peers in the production of yttrium.</li> <li>Based on design plant capacity, NTU forecasts a steady state production of circa 3,000,000kg of TREO contained in the mixed RE carbonate product per annum.</li> <li>Browns Range product is not an industrial mineral. It is a chemical product.</li> </ul>
Economic	<ul style="list-style-type: none"> <li><i>The inputs to the economic analysis to produce the net present value (NPV) in the study, the source and confidence of these economic inputs including estimated inflation, discount rate, etc.</i></li> <li><i>NPV ranges and sensitivity to variations in the significant assumptions and inputs.</i></li> </ul>	<ul style="list-style-type: none"> <li>For the purpose of estimating an Ore Reserve, an NPV was estimated at a discount rate of 10%. The confidence in the inputs is consistent with a Probable classification of the entire Ore Reserve. The project has a positive NPV.</li> <li>The undiscounted cash flow was stress tested using revenue</li> </ul>

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		factors. The Ore Reserve was cash flow positive for revenue factors greater than 80% of those assumed in the optimisation.
Social	<ul style="list-style-type: none"> <li>The status of agreements with key stakeholders and matters leading to social licence to operate.</li> </ul>	<ul style="list-style-type: none"> <li>NTU is actively engaged with all stakeholders in a positive and productive manner. A Co-existence Agreement has been executed with the Traditional Owners, the Jaru People.</li> </ul>
Other	<ul style="list-style-type: none"> <li>To the extent relevant, the impact of the following on the project and/or on the estimation and classification of the Ore Reserves:</li> <li>Any identified material naturally occurring risks.</li> <li>The status of material legal agreements and marketing arrangements.</li> <li>The status of governmental agreements and approvals critical to the viability of the project, such as mineral tenement status, and government and statutory approvals. There must be reasonable grounds to expect that all necessary Government approvals will be received within the timeframes anticipated in the Pre-Feasibility or Feasibility study. Highlight and discuss the materiality of any unresolved matter that is dependent on a third party on which extraction of the reserve is contingent.</li> </ul>	<ul style="list-style-type: none"> <li>A formal process to assess and mitigate naturally occurring risks will form part of ongoing studies, however has not been complete at this stage. Currently, all naturally occurring risks are assumed to have adequate prospects for control and mitigation.</li> <li>NTU has entered into a non-binding memorandum of understanding (MOU) with Sumitomo Corporation (Sumitomo) for up to half of the forecast annual production (1500t of TReO per annum), with the intention of converting to a binding MOU after successful completion of advanced technical and financial studies. NTU is also in discussion with a number of other potential offtakers for the remainder of the forecast production from Browns Range.</li> <li>The mining operation is proposed to occur upon M80/627, which has been granted. There are no grounds to believe that remaining required approvals will not be successfully granted.</li> </ul>
Classification	<ul style="list-style-type: none"> <li>The basis for the classification of the Ore Reserves into varying confidence categories.</li> <li>Whether the result appropriately reflects the Competent Person's view of the deposit.</li> <li>The proportion of Probable Ore Reserves that have been derived from Measured Mineral Resources (if any).</li> </ul>	<ul style="list-style-type: none"> <li>The Probable Ore Reserve is based on that portion of the Indicated Mineral Resource within the mine designs that may be economically extracted and includes an allowance for dilution and ore loss.</li> <li>The result appropriately reflects the Competent Persons view of the deposit.</li> <li>None of the Probable Ore Reserves have been derived from Measured Mineral Resource.</li> </ul>
Audits or reviews	<ul style="list-style-type: none"> <li>The results of any audits or reviews of Ore Reserve estimates.</li> </ul>	<ul style="list-style-type: none"> <li>No external Audits or reviews have been completed.</li> </ul>

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<p><i>Discussion of relative accuracy/ confidence</i></p>	<ul style="list-style-type: none"> <li>• <i>Where appropriate a statement of the relative accuracy and confidence level in the Ore Reserve estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the reserve within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors which could affect the relative accuracy and confidence of the estimate.</i></li> <li>• <i>The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.</i></li> <li>• <i>Accuracy and confidence discussions should extend to specific discussions of any applied Modifying Factors that may have a material impact on Ore Reserve viability, or for which there are remaining areas of uncertainty at the current study stage.</i></li> <li>• <i>It is recognised that this may not be possible or appropriate in all circumstances. These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.</i></li> </ul>	<ul style="list-style-type: none"> <li>• This Ore Reserve is attributed a confidence classification of "Probable" Ore Reserve in its entirety. There is a degree of uncertainty associated with the Mineral Resource estimate and the modifying factors.</li> </ul>