

## ASX ANNOUNCEMENT

30 January 2012

### CYCLONE ZIRCON PROJECT PREFEASIBILITY STUDY - COMPLETION OF METALLURGICAL TESTWORK AND PROCESS DESIGN

Diatreme Resources Limited is pleased to announce the receipt of independent laboratory results for metallurgical studies and mineral processing designs undertaken as part of the Cyclone Project Prefeasibility Study.

The Company's primary objectives in undertaking the testwork were to:

- Produce a very high grade Heavy Mineral ("HM") concentrate through a wet concentrator process.
- Maximise the recovery of Zircon (the major valuable mineral component of the Cyclone Resource), and
- Develop process flowsheets to be used in engineering designs for the wet and dry HM processing plants.

Testwork on a seven (7) tonne bulk sample has been conducted by CPG Resources - Mineral Technologies over the past year. Key outcomes from the metallurgical testing include:

- The wet concentrator testwork produced a high grade HM concentrate (97.8% HM) utilizing conventional mineral sand separation technology.
- The estimated distribution of zircon from the bulk sample to the wet concentrator process HM concentrate is 95.3%.
- The estimated distribution of zircon from the HM concentrate to the mineral separation plant final Zircon product is 85.0%.
- A mineral separation process has been designed to produce Zircon and two titanium products, HiTi87 (86.6% TiO<sub>2</sub>) and HiTi67 (67.3% TiO<sub>2</sub>).
- The testwork has identified that conventional "off the shelf" technology can be used in the mineral processing at Cyclone.

Diatreme Resources is an Australian based diversified mineral explorer with significant projects in heavy mineral sands, copper, base metals and gold.

The Company owns the world class **Cyclone Zircon Deposit** in Western Australia, situated within the recognised **Eucla Basin province**, along with extensive areas of underexplored ground prospective for heavy mineral sands.

The Board and senior personnel exhibit wide experience, ranging through the exploration and development phases of resource management.

#### Australian Securities Exchange

Codes: DRX and DRXO

#### Securities

Ordinary shares (DRX):

354,597,423

Listed 15c options (30/09/13)(DRXO):

88,650,039

#### Board of Directors

##### Executive:

Tony Fawdon - Chairman/CEO

David Hall - Operations

##### Non-executive:

George White

Andrew Tsang

William Wang

Neil McIntyre

##### Joint Company Secretaries:

Leni Stanley

Tuan Do

#### Key Projects:

- Eucla Basin Cyclone Zircon Project
- Clermont Copper Project
- Anabama Copper Project
- Gilbert River Base Metals Project

#### Diatreme Resources Contact:

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**Tony Fawdon, Diatreme's Executive Chairman and CEO, stated:**

"The Company is very encouraged by the results of the Cyclone Prefeasibility Study metallurgical and process design testwork."

"The three lines of final heavy mineral product selected, being zircon and two high to medium grade titanium products, are of a quality which augers well for attractive market pricing."

"Finalisation of the PFS bulk sample testing has improved Diatreme's understanding and requirements for progressing the Cyclone Zircon Project. It is expected that the maiden ore reserve estimate for Cyclone will be available in the near future, placing the Company in a commanding position to advance the project forward."

"Bulk sampling and current metallurgical testwork has taken eight months to complete and is expected to form an important cornerstone of information for the Definitive Feasibility Study. The Company is very satisfied with the results and the sound work that went into achieving the outcomes."

"Diatreme is now working diligently toward finalisation of the Prefeasibility Study, planned for release in late February."

Please direct enquiries to:

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For further information on the Company visit [www.diatreme.com.au](http://www.diatreme.com.au)

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**About Diatreme Resources**

Diatreme Resources Limited (ASX code: DRX) is a diversified Australian mineral explorer with significant projects in heavy mineral sands, copper, base metals and gold. The Company is seeking to develop a mining operation at its Cyclone Zircon Project located within Western Australia.

**About Zircon**

Zircon is a mineral sand used in the production of ceramics, including sanitary ware, tiles and tableware. It is also used in refractories, TV glass and foundry applications. Zircon is the source material for zirconia and a range of chemicals used in high-tech applications, including fuel cells and abrasives. Zirconium metal is used in nuclear fuel rods, while zirconia is used in jewellery.



Attachment to Diatreme Resources Limited ASX release entitled "CYCLONE ZIRCON PROJECT PREFEASIBILITY STUDY - COMPLETION OF METALLURGICAL TESTWORK AND PROCESS DESIGN" dated 30 January 2012

## TECHNICAL DETAILS

### SUMMARY OF METALLURGICAL TESTWORK RESULTS

#### MINERAL PRODUCTS

CPG Resources - Mineral Technologies ("CPG") was engaged to conduct processing testwork on a seven (7) tonne representative bulk sample from the Cyclone Deposit. The testwork is now complete and reports produced by CPG include details of processing the bulk sample, flowsheet design, specifications for products, and mineral recovery estimates.

The Cyclone Project is expected to produce three mineral products with estimated average annual quantities based on a mining rate of 10 million tonne per year as shown in the following tables. The production rate estimates are based on mineral distributions from the bulk sample to final products and allow for the difference in bulk sample grade and resource model estimated grade for the sample. Chemical assay specifications for the products are also shown in the tables.

#### Zircon: 65,000 tonnes per year

ZrO <sub>2</sub> %	FE <sub>2</sub> O <sub>3</sub> %	SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	TiO <sub>2</sub> %	P <sub>2</sub> O <sub>5</sub> %	U+Th ppm	CeO <sub>2</sub> %
66.0	0.10	32.8	0.20	0.31	0.07	369	0.020

#### HiTi87: 10,000 tonnes per year

TiO <sub>2</sub> %	FE <sub>2</sub> O <sub>3</sub> %	SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	ZrO <sub>2</sub> %	MgO %	MnO %	CaO %	CR <sub>2</sub> O <sub>3</sub> %	U+Th ppm
86.6	2.6	5.0	1.01	3.3	0.04	0.02	0.03	0.06	84

#### HiTi67: 46,000 tonnes per year

TiO <sub>2</sub> %	FE <sub>2</sub> O <sub>3</sub> %	SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	ZrO <sub>2</sub> %	MgO %	MnO %	CaO %	CR <sub>2</sub> O <sub>3</sub> %	U+Th ppm
67.3	20.1	6.3	1.75	0.5	0.10	0.42	0.07	0.08	94

Testwork demonstrated that up to 2,000 tonnes per year of rutile could be produced but the variability of rutile grade in the resource and a desire to reduce the complexity of the mineral separation process has resulted in a decision to produce a non-magnetic HiTi (HiTi87) product which includes all rutile that will be recovered. This HiTi product has a chemical assay of 86.6% TiO<sub>2</sub>.

#### MINERAL RECOVERY

Mineral recoveries have been estimated from mineral distributions using:

- Quantitative Evaluation of Minerals by Scanning Electron Microscopy ("QEMSCAN®") and chemical analysis of the bulk sample.
- Analysis of concentrate produced from the Wet Concentrator Plant ("WCP") gravity concentration process tests.
- Analysis of final products produced from the Mineral Separation Plant ("MSP") process tests.
- Process simulation and back-calculation of feed grades

The estimated mineral distributions from WCP feed (bulk sample) to WCP HM concentrate are:

- Zircon 95.3%
- Rutile 75.3%
- Leucoxene 36.4%
- HiTi 29.8%
- Altered Ilmenite 68.0%
- SiTiOx 36.7%



These mineral distributions have been estimated from simulated flows and QEMSCAN® particle classifications. Altered Ilmenite distribution has been estimated to be similar to the total heavy mineral (“HM”) distribution (68.0%).

The estimated Zircon mineral distribution from WCP HM concentrate to Zircon product from the MSP is 85%.

There are five titanium minerals of significance that report in various quantities to the two HiTi products. The main minerals that are recovered to HiTi87 are Rutile, Leucoxene, HiTi, and SiTiOx and the main minerals that report to HiTi67 are Leucoxene, HiTi, Altered Ilmenite, and SiTiOx. The table below shows the estimated percent distribution of the five titanium minerals from WCP HM concentrate to the two HiTi mineral products.

	Rutile %	Leucoxene %	HiTi %	Altered Ilmenite %	SiTiOx %
HiTi87	86.1	35.7	3.2	-	6.7
HiTi67	-	40.5	63.7	89.0	82.1

***Mineral distributions to products from MSP feed***

The total estimated mineral recovery from the bulk sample to final products including these mineral distributions in the WCP and MSP, and inclusion of other minor minerals that are recovered to the products is shown in the following table. Minor minerals account for approximately 1% of the Zircon product, 3% of the HiTi87 product and 2% of the HiTi67 mineral products.

	Zircon %	Rutile %	Leucoxene %	HiTi %	Altered Ilmenite %	SiTiOx %
Zircon	81.8	-	-	-	-	-
HiTi87	-	66.8	13.4	1.0	-	2.6
HiTi67	-	-	15.0	19.4	61.7	30.7

***Recovery of WCP feed to products***

Testwork and process simulation produced a range of possible Zircon recoveries dependent on the analytical method used, due to variations in chemical assays, QEMSCAN® mineral classification, and back calculated feed comparisons. The Zircon recovery reported here is at the top end of the estimated range (75.4% to 81.8%). The variation in estimated mineral distribution for Altered Ilmenite to HiTi67 was 2.2% and the variation in Rutile distribution to HiTi87 was 9.6%.

The top end of the ranges for recoveries have been used for all minerals for the following reasons:

- The upper part of the dune sample was found to contain a high proportion of coated and stained minerals. This bulk sample material was found to be more difficult to process and consequently a decision made to exclude it from the mine plan, indicating potential for improved process performance.
- The grade of the bulk sample, estimated from drilling and the resource model, is lower than the CPG measured grade, indicating potential for the current resource estimate to be conservative.
- This testwork has been based on one representative bulk sample and future testwork will use several bulk samples to optimise the process for the feed variability in distinct areas of the resource.

**BULK SAMPLE**

The bulk sample used in the metallurgical testwork was collected from drill holes across the area of the Cyclone mineralisation that has been estimated suitable for mining. The bulk sample was initially prepared as three separate bulk samples representing the three geological zones (dune, beach, and nearshore). The following table is a summary of the details of the three samples including mass, HM%, oversize, average particle size for the sand portion less than 2 millimetres, and slimes (<38 micron).

	Mass (kg)	HM %	Oversize % (+2mm)	Particle size (micron)	Slimes %
Dune	2,235	2.14	16.6	220	4.17
Beach	3,792	3.50	3.3	220	1.61
Nearshore	948	2.12	8.8	149	3.22
Total (average)	6,975	2.88	6.9	197	2.66

***Bulk sample details***



The average bulk sample grade at 2.88% HM is higher than the grade of 2.49% HM that was estimated using Diatreme's normal resource data collection procedures. This is a positive outcome as the resource estimation methodology could be conservative and the difference requires further investigation. All zones are low in slimes and dune is significantly higher in oversize. HM% and particle size are in the normal range expected for mineral sand processing.

Before undergoing processing testwork, sub samples were taken from the three bulk samples and subjected to additional characterisation tests to understand the processing variability of the samples and to identify any issues with the samples that could arise during processing testwork. The samples were processed on a shaking table to produce HM concentrate, and the concentrates were subjected to magnetic fractionation and then separated in heavy liquid with a density of 4.05 specific gravity ("SG") to check potential variability in recovery of Zircon.

The results of the bulk samples characterisation tests demonstrated that 17% of the HM in the samples reported to the table tailings fraction. This is due to the relatively large component of low value light titanium minerals in the samples which are not considered economic to extract. Zircon recovered very well to concentrate and made up 94.3% of the +4.05SG fraction. All magnetic fractions and SG fractions were inspected under a microscope confirming the presence of coated and stained minerals, and significant proportions of altered ilmenite and leucoxene grains. This information was used for planning the processing testwork.

The results of the bulk sample characterisation tests demonstrated that although there would be some benefits in processing the zones separately, the added complexity in processing and mining resulted in a decision to combine the three samples for detailed metallurgical testwork and process design. The primary objectives for the metallurgical testwork were to maximise the recovery of Zircon and to maximise the WCP HM concentrate grade. The characterisation tests demonstrated these objectives could be achieved from the combined bulk sample giving due consideration to mineral concentration and separation issues associated with a high proportion of stained and coated minerals and low SG titanium minerals.

## **WET CONCENTRATOR PLANT**

The combined bulk sample was screened at 3mm prior to commencing WCP spiral testwork. The first stage of gravity concentration used MG6.3 spirals as the rougher spirals operating at 1.6tph and 2.0tph. Release Curves were developed to provide a predictive tool characterising the separation performance of the prepared sample. The tests indicated that Zircon in the sample readily responded to gravity separation using spirals, and titanium minerals were less efficiently separated due to a high proportion of lower SG Ti minerals. The middlings stream from the rougher spirals was also tested on MG6.3 spirals.

The concentrate from the rougher and mid scavenger spirals was screened at 1mm to prevent coarse sand becoming a problem with recirculating streams, and the oversize was rejected. The remaining -1mm sand was processed using HG10i spirals at 1.5tph and 1.8tph to generate separation data for the cleaner stage. The lower feed rate produced better performance. HG10i spirals were also used for re-cleaner stage tests which indicated an additional finishing stage would be required to upgrade the concentrate to a high HM grade with high Zircon recovery.

Finisher stage testwork involved HG10i and WW6 spirals, WHIMS and an up current classifier ("UCC"). The UCC tests produced superior performance with the underflow containing more than 80% of the stage feed HM and a grade exceeding 97% HM. The UCC overflow was then processed using HG10i spirals and shaking tables to produce a final concentrate from the fine sand fraction. The table concentrate grade was in excess of 98% with a stage recovery of 98% Zircon.

Performance simulation of the WCP was conducted using data generated from the testwork. Small variations were noted for modelled intermediate stream data. The simulation results indicated a HMC containing 97.8% HM would be produced at a rate of 25.9tph for a plant feed rate of 1300tph. Total HM recovery would be in the order of +65% from the plant feed while VHM recovery of +90% was achievable. Notable from the testwork was a lower ZrO<sub>2</sub> recovery compared to VHM recovery indicating that some ZrO<sub>2</sub> losses were due to composite minerals with ZrO<sub>2</sub> attachments or inclusions rather than free or liberated zircon.

## **MINERAL SEPARATION PLANT**

The concentrate produced from the WCP testwork was screened at 425 microns before being subjected to MSP processing tests. Selected process streams that were generated throughout the initial testwork were examined and retested as necessary to improve product recoveries and quality.



An altered ilmenite rich stream was produced using electrostatic and rare earth roll (“RER”) magnetic separators. This magnetic stream was of suitable quality for the HiTi67 product.

The non-magnetic stream from the RER was processed through magnetic and electrostatic separators to produce a rutile pre-concentrate. Additional gravity, magnetic, and electrostatic processes were used to produce a rutile product. Due to the low rutile production rate and the variability of rutile grade in the resource a decision has been made to reduce the complexity of the process and produce a rutile pre-concentrate (HiTi) which includes all rutile recovered from the feed. This stream is of suitable quality for the HiTi87 product.

The electrostatic and magnetic separations performed on the HM concentrate generated a non-conductor stream that was processed for recovery of zircon using a combination of wet and dry processes. A hot acid leach (“HAL”) process was used to clean surface coatings and staining from the feed to the zircon process. The HAL process improved both the efficiency of the zircon separation and the product quality. A relatively complex middling circuit was necessary to achieve elevated recovery of Zircon due to the complexity and range of titanium minerals with low magnetic and low conducting properties.

The HiTi87 product has a SiO<sub>2</sub> assay of 5.0% and the HiTi67 product has a SiO<sub>2</sub> assay of 6.3%. The high SiO<sub>2</sub> content of the HiTi products is due to the presence of silica bearing titanium minerals and not free silica. The Zircon product has an assay of 0.3% TiO<sub>2</sub> which ranks it as standard grade Zircon. Combined uranium and thorium in the Zircon product is 369 ppm and this has been identified as a positive aspect for marketing.

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