

**PRESS RELEASE**  
10 July 2019

ASX/TSX: CDV  
2019-12

## **CARDINAL REPORTS FURTHER SHALLOW HIGH-GRADE GOLD AT NDONGO EAST**

**Cardinal Resources Limited** (ASX/TSX: CDV) (“**Cardinal**” or “**the Company**”) is pleased to announce further intersections of shallow, high-grade gold mineralisation from a 15-hole, 883 metre Diamond Drill programme at the Ndongo East discovery located approximately 24km north and within hauling distance of the Company’s Namdini Gold Project for which Cardinal declared an **Ore Reserve of 5.1Moz** (0.4Moz Proved and 4.7Moz Probable) on 02 April 2019 (Figure 1).

### **Highlights**

**New significant gold intersections include:**

**5.3m @ 13.9g/t Au** from 78m in NDDD063  
**5.5m @ 3.8g/t Au** from 31m in NDDD072  
**3.7m @ 3.3g/t Au** from 59m in NDDD064  
**2.7m @ 7.7g/t Au** from 19m in NDDD068  
**2.0m @ 18.3g/t Au** from 59m in NDDD066

**Previously reported gold intersections: \***

**14m @ 7.0g/t Au** from 69m in NDDD046  
**9m @ 23.3g/t Au** from 60m in NDRC248  
**8.3m @ 11.3g/t Au** from 76m in NDDD059  
**7m @ 4.4 g/t Au** from 14m in NDRC216  
**6m @ 12.6g/t Au** from 2m in NDRC275  
**5.2m @ 4.5g/t Au** from 60m in NDDD060  
**3m @ 29.3g/t Au** from 45m in NDDD036

*\* Refer to press releases dated 16 July and 29 August 2018, 23 January and 25 March 2019*

- **Results provide further confidence in the potential to define high grade satellite pits within hauling distance of the 5.1Moz open pit Ore Reserve at the Namdini Project**
- **Geophysical surveys and auger soil drilling programmes underway to identify additional drill targets within the much broader target area spanning approximately 7kms**

**Cardinal’s Chief Executive Officer / Managing Director, Archie Koimtsidis stated:**

“The Ndongo East discovery is particularly encouraging as the close spaced drilling has now delineated a well-defined mineralised zone over a strike length of 150 metres within the initial 450 metre mineralised discovery zone.

“These new shallow high-grade results further increase our level of confidence to continue drilling along strike and at depth as we have only drilled down to approximately 80 metres vertically below surface.

“Along strike from this initial 450 metre discovery zone, we are enthusiastic about the additional corridor of 750 metres of gold mineralisation previously intersected, which may provide a large number of additional shallow gold targets”.

The Ndongo East discovery lies within a much larger target area which currently covers a strike length of approximately 7km. Ground geophysical surveys and auger soil drilling programmes are ongoing to evaluate this larger target area and are expected to generate further drill targets which could develop into high-grade satellite pits to provide additional ounces of gold for our developing Namdini Project which has a 5.1Moz Ore Reserve from surface located only 24km away.

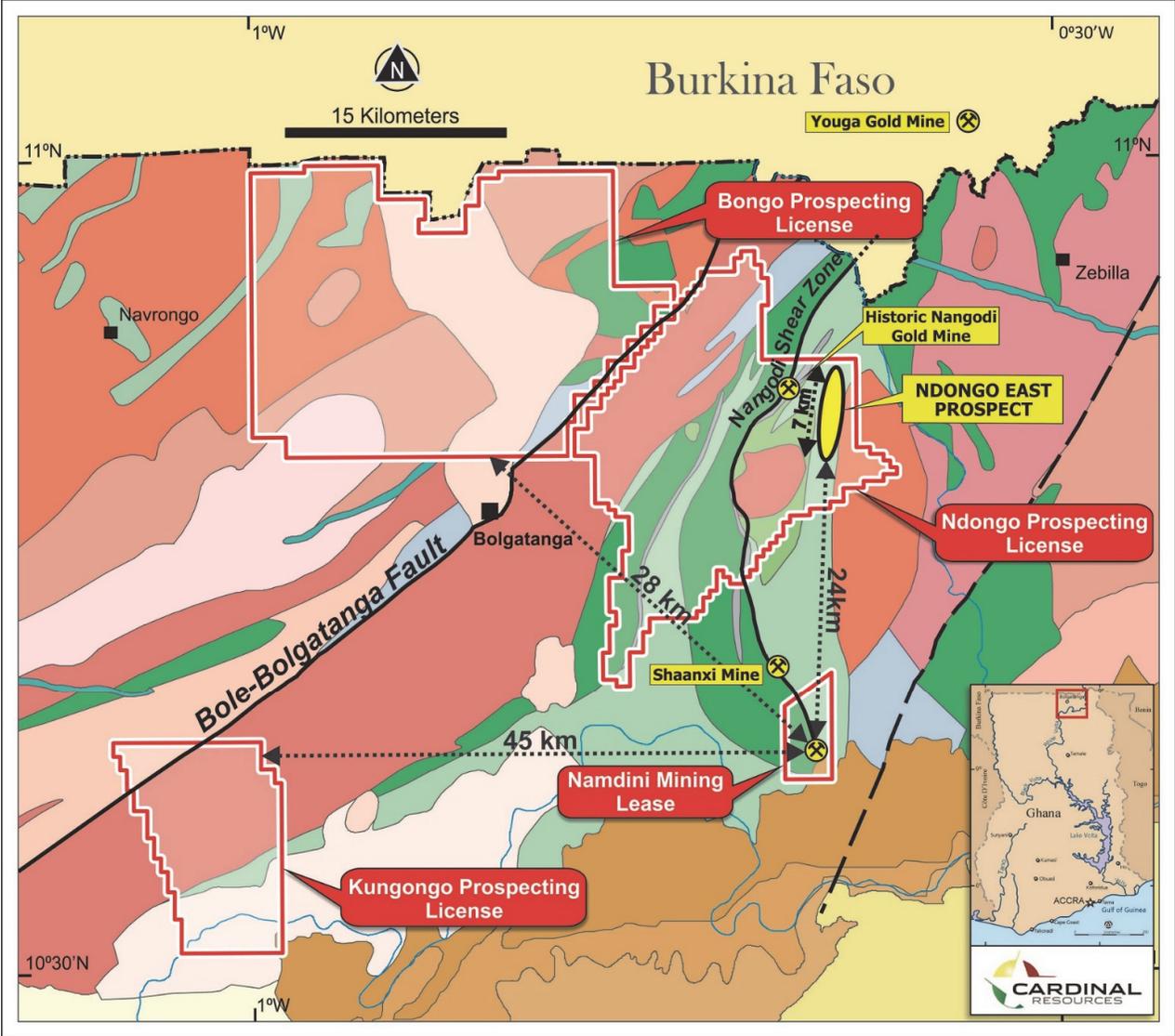


Figure 1: Cardinal’s Tenements comprising the Bolgatanga and Namdini Projects

**Ndongo Prospecting License**

The Ndongo Prospecting License covers an area of 295 km<sup>2</sup> and is considered highly prospective for the discovery of economic gold mineralisation associated with the prolific Nangodi Shear Zone, a splay fault off the main regional-scale Bole-Bolgatanga Shear. Elsewhere, the Nangodi Shear Zone is spatially related to no fewer than four gold discoveries, including the Company’s Namdini Gold Project with a 5.1Moz Ore Reserve, the Shaanxi Gold Mine, the historical Nangodi Gold Mine and the Youga Gold Mine in Burkina Faso, adjacent to the Ghanaian border. In addition, there are numerous historical shallow artisanal workings along many parts of this shear zone ~15 to 25 km north of the Namdini Gold Project (Figure 1).

### ***Ndongo East Prospect***

The Ndongo East Prospect is located within northeast-southwest trending Birimian metavolcanics and metasediments. Gold mineralisation is developed mostly along diorite-granodiorite contact zones where competency contrasts create brittle fracturing allowing the ingress and precipitation of gold mineralising fluids (Figures 2, 3 and 4). The mineralised horizons contain variable chlorite-silica-carbonate-sericite alteration with sulphides (mainly pyrite with very minor arsenopyrite). Occasional visible gold grains and blebs have been observed in the core.

The gold mineralisation at Ndongo East is confined to specific gold – bearing, pyrite-silica-ankerite carbonate altered, shear zones which dip to the northwest. Drilling indicates two orientations to the mineralisation, namely a steeply-dipping northwest orientation and a shallower west-southwest plunging orientation.

A marker horizon comprising a very narrow, thinly bedded, black pyritic mudstone has been observed to occur at the base of the mineralised intersections within the metavolcanics (Figures 3, 4, 5 and 6) and could mark a hiatus in the continuation of volcanic activity in the area. Although this marker horizon appears to be unrelated to mineralisation within the metavolcanics, it will be a very useful marker as more shallow diamond drilling is completed further along strike.

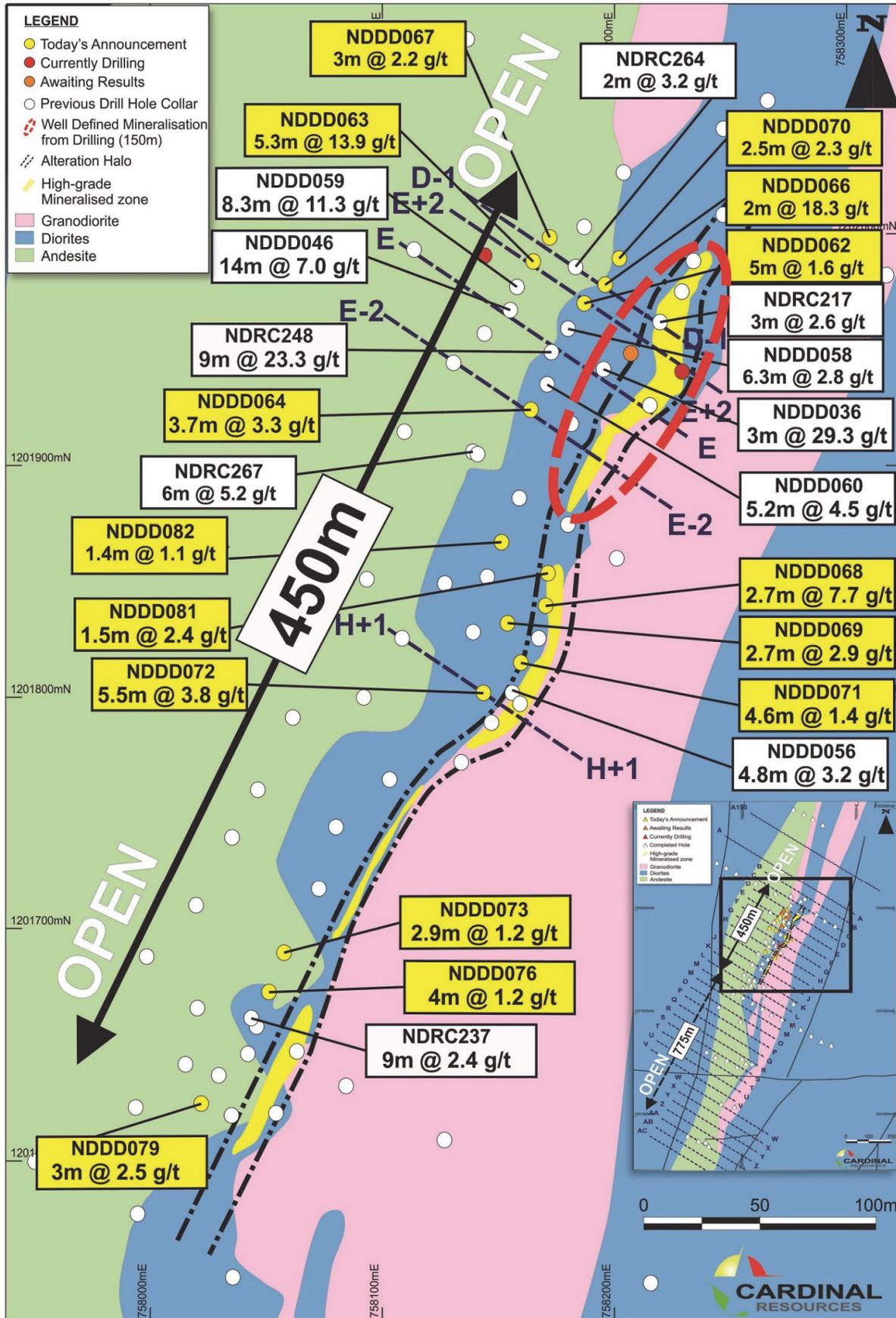
Today's results include the follow-up systematic close spaced infill and step-out shallow diamond drilling from existing RC holes, for a total of 882.5m at Ndongo East along strike to better define the geometry, extent and continuity of the high-grade mineralised zones. These additional drill holes will determine the strike and depth extent of the mineralised system and will evaluate the structural components of the various lithological units (Figure 2).

12.5m step out diamond drilling from the initial section line E-E was carried out to ensure that plunges of the mineralised structures are understood before embarking on a wider spaced drill campaign along strike. The drilling has now delineated a well-defined mineralised zone over a strike length of 150 metres within the initial 450 metre mineralised discovery zone (Figure 2).

A full table of the results is included at the end of this report in Table 2 in Schedule 1.

The high-grade mineralised structures have been tested to a shallow depth of approximately 70m vertically below surface (Figures 3,4,5 and 6). The Company plans to steadily increase exploration at Ndongo East after evaluating further drill core and assay results to determine the strike and depth extents of the mineralised system as well as the structural components of the various lithological units. Furthermore, Infill auger drilling and Gradient Array IP (GAIP) geophysical surveys commenced over the Ndongo East deposit and its southern extension of ~7km strike length to delineate additional drill targets within this structurally controlled mineralised shear system.

Previously announced drilling intersected higher-grade mineralised structures concentrated in the northern portion of the shear zone with coincident gold-in-soil and geophysical targets defined to a strike length of 450m northeast-southwest (Figure 2). Subsequent RC drilling along fence lines further to the southwest along strike and at depth has proven encouraging with further high-grade intercepts within the mineralised structures. This indicates that the mineralised system is open along a northeast-southwest strike and at depth with multiple mineralised intersections. The furthest drill fence to the southwest intersected 2m at 27.0g/t Au from 10m downhole in NDRC247 which suggests a strike potential up to 1.2km (refer to Cardinal's ASX/TSX Press Release 29 August 2018 "Cardinal Extends Ndongo East Discovery Strike Length").



**Drill Section E+2 – E+2** (Figure 3) comprises drill holes NDDD062 and NDDD063. These two drill holes have intersected shallow gold mineralisation to a vertical depth of 72m with the mineralised halos between 5m to 6m wide with very encouraging grades. Refer to the full results in Table 2 in Schedule 1.

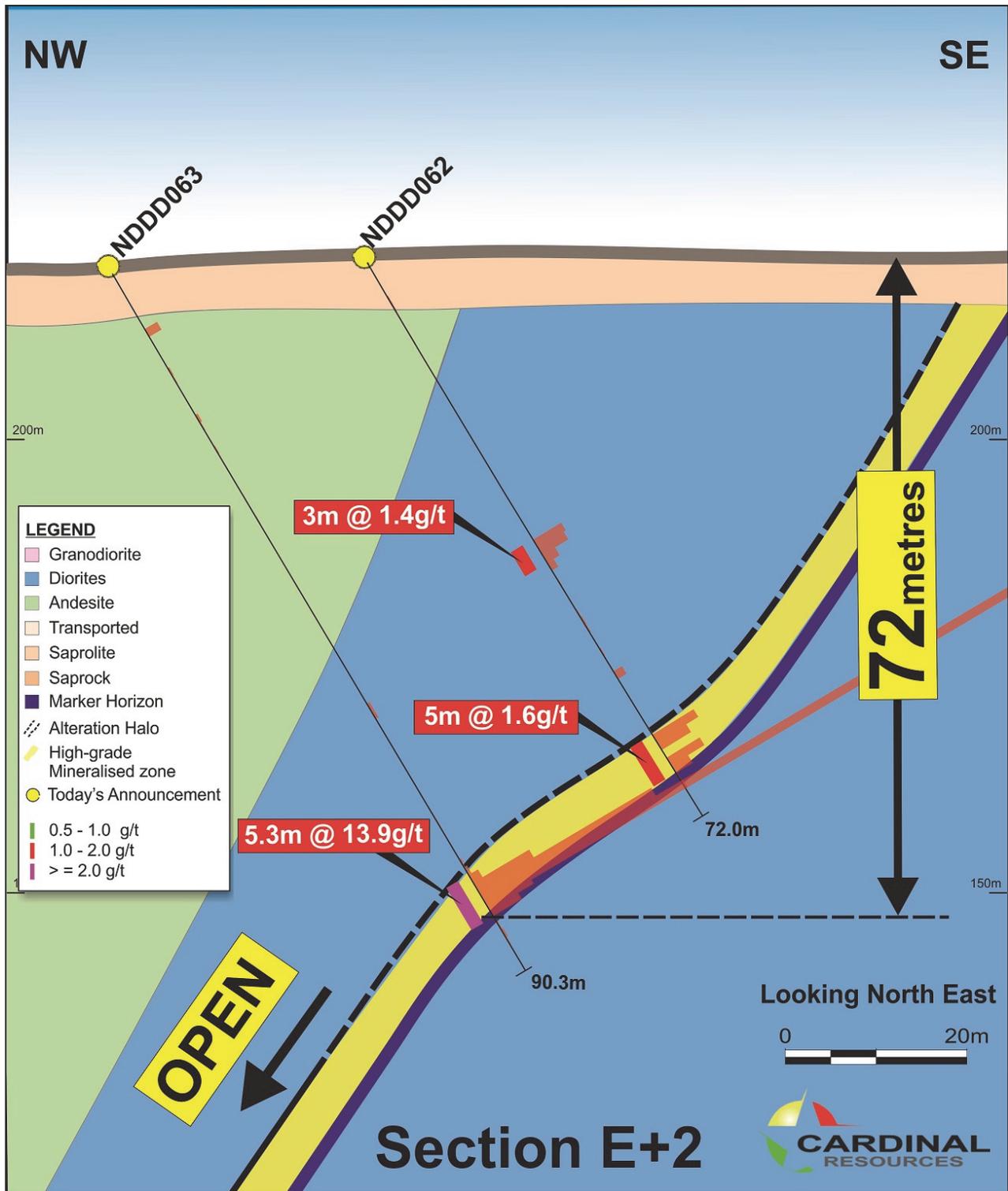


Figure 3: Ndongo East Prospect Section E+2 – E+2

**Drill Section E-2 – E-2** (Figure 4) comprises diamond drill hole NDDD064 as well as previously drilled RC drill holes NDRC262 and NDRC265 (reported in press release dated 29 August 2018). These three drill holes have intersected shallow gold mineralised halos with encouraging grades including 3.7m@2.2g/t Au from 59m, 4m@2.2g/t Au from 44m and 3m@2.2g/t Au from 83m respectively. Refer to the full results in Table 2 in Schedule 1.

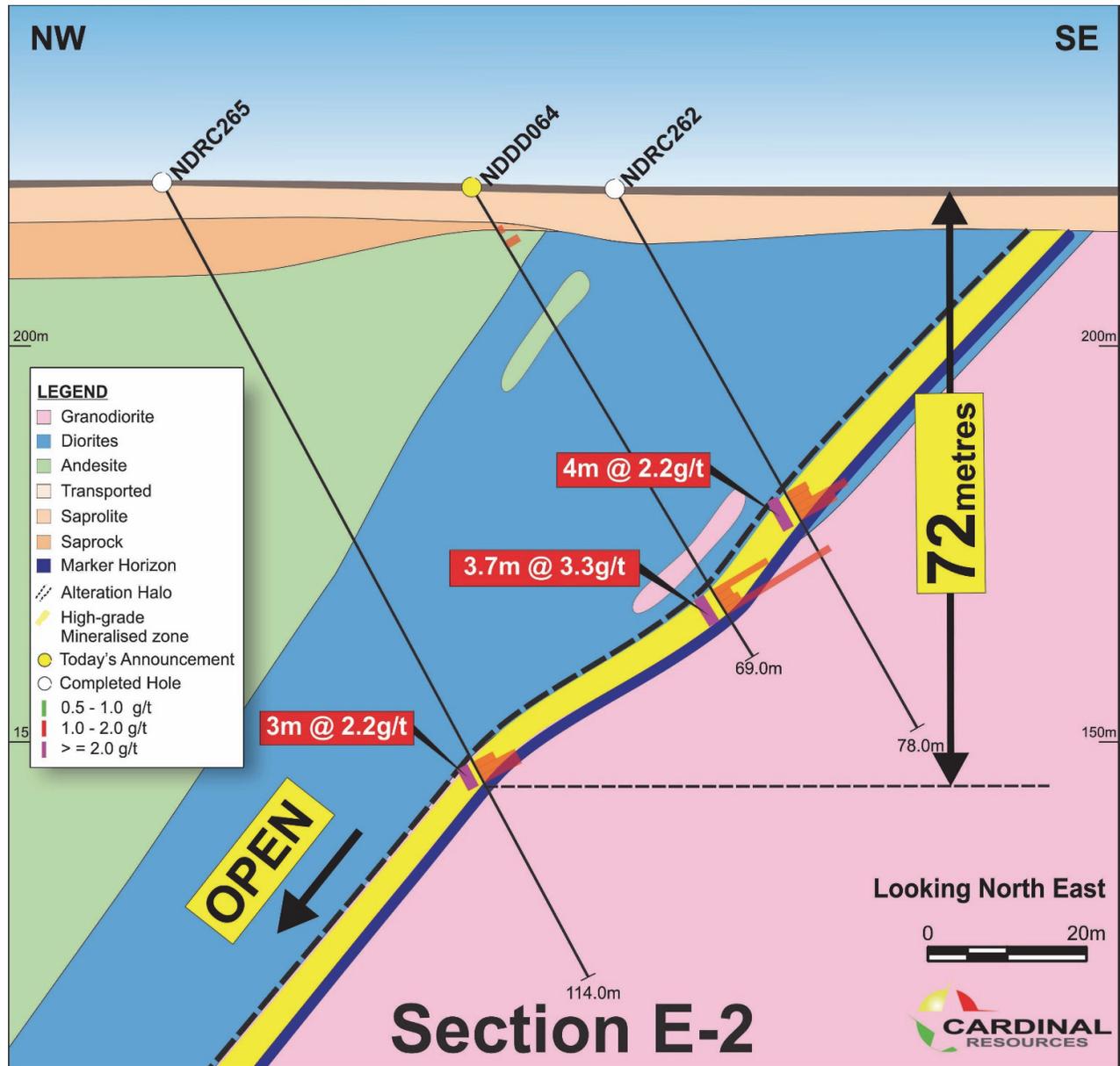


Figure 4: Ndongo East Prospect Section E-2 – E-2

**Drill Section H+1 – H+1** (Figure 5) shows drill hole NDDD072 which intersected a shallow gold mineralised halo with encouraging grades of 5.5m@3.8g/t Au from 31m and previously announced drill holes. Refer to the full results in Table 2 in Schedule 1.

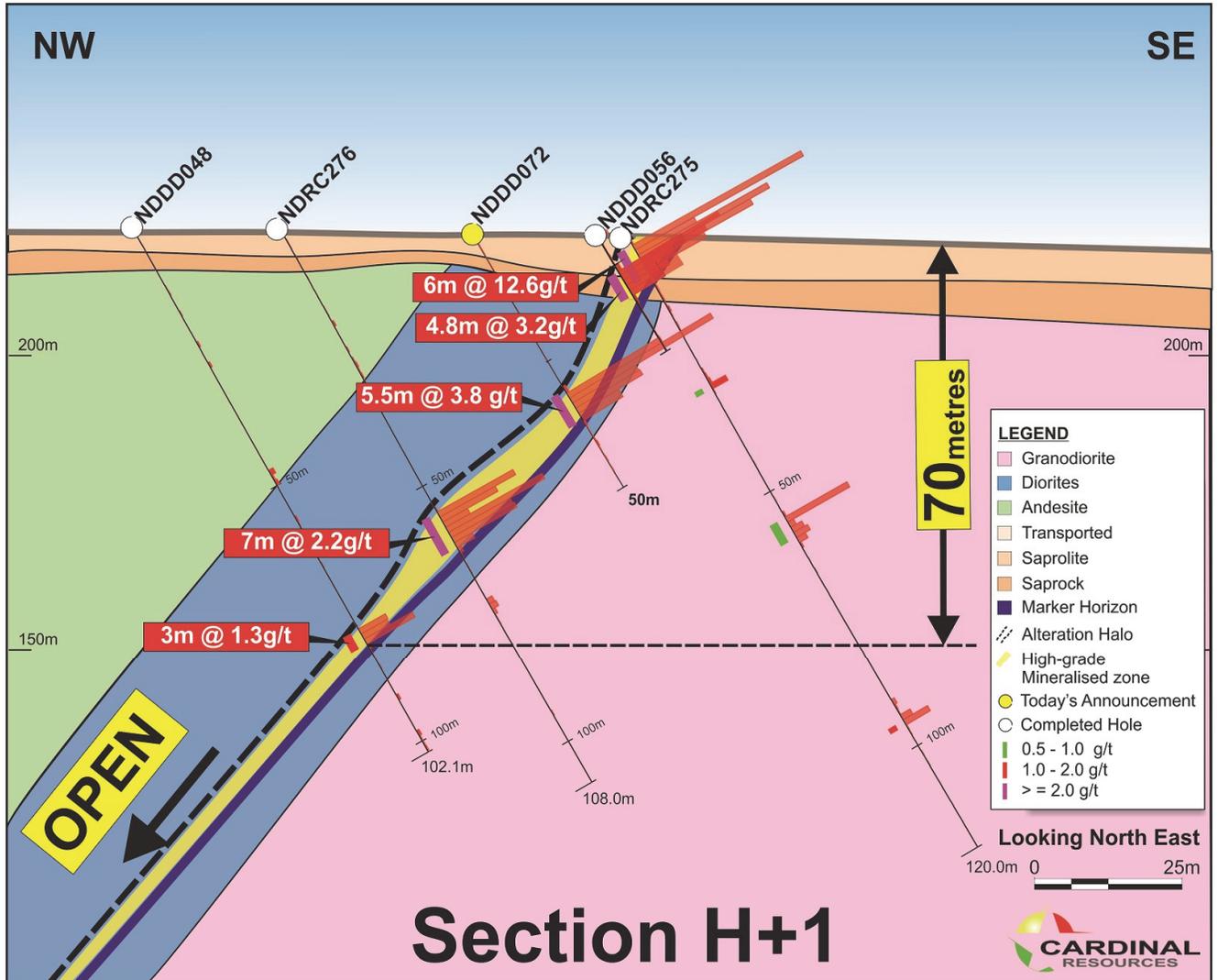


Figure 5: Ndongo East Prospect Section H+1 – H+1

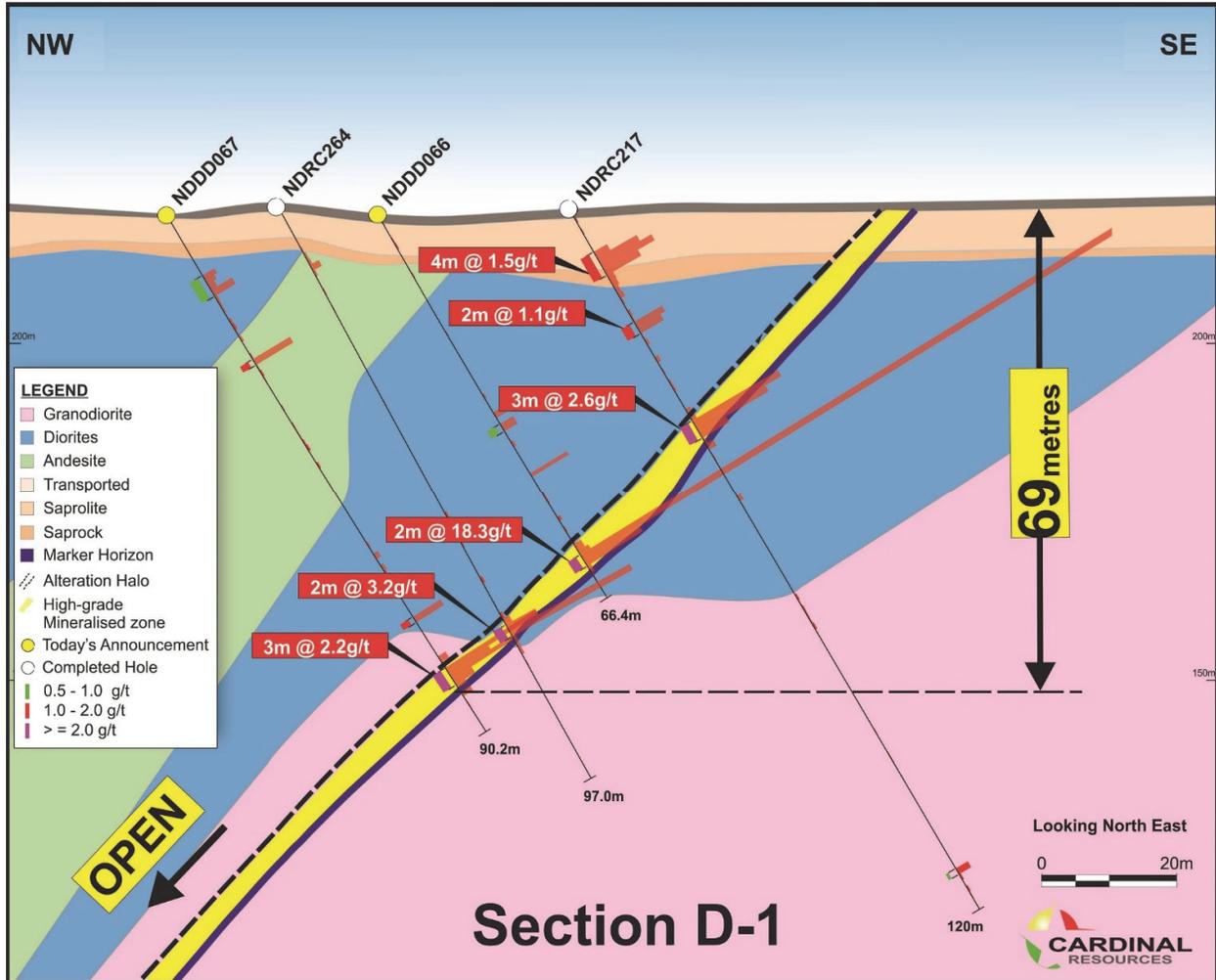


Figure 6: Ndongo East Prospect Section D-1 – D-1



## ABOUT CARDINAL

Cardinal Resources Limited (ASX/TSX: CDV) is a West African gold-focused exploration and development Company that holds interests in tenements within Ghana, West Africa.

The Company is focused on the development of the Namdini Project with a gold **Ore Reserve of 5.1Moz** (0.4Moz Proved and 4.7Moz Probable) and a soon to be completed Feasibility Study.

Exploration programmes are also underway at the Company's Bolgatanga (Northern Ghana) and Subranum (Southern Ghana) Projects.

Cardinal confirms that it is not aware of any new information or data that materially affects the information included in its announcement of the Ore Reserve of 3 April 2019. All material assumptions and technical parameters underpinning this estimate continue to apply and have not materially changed.

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***This release has been independently reviewed by CSA Global (Perth) for compliance with the JORC Code and Canadian NI 43-101/CIM requirements. CSA Global have not verified the results presented.***

## Competent Person's / Qualified Person's Statement

The information in this press release that relates to Exploration Results is based on information prepared by Mr. Paul Abbott who is a member of the Geological Society of South Africa. Mr. Abbott has more than five years' experience relevant to the styles of mineralisation and type of deposits under consideration and to the activity which is being undertaken to qualify as a Competent Person, as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves". Mr. Abbott is a full-time employee of Cardinal and holds equity securities in the Company. Mr. Abbott has consented to the inclusion of the matters in this report based on the information in the form and context in which it appears.

The information in this press release that relates to Exploration Results has been compiled and reviewed by Mr. Ekow Taylor, a Chartered Professional Geologist with the Australasian Institute of Mining and Metallurgy. Mr. Taylor has more than five years' experience relevant to the styles of mineralisation and type of deposits under consideration and to the activity which is being undertaken to qualify as a Competent Person, as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves" and as a Qualified Person as defined by the NI43-101 instrument. Mr. Taylor is a full-time employee of Cardinal and holds equity securities in the Company. Mr. Taylor has consented to the inclusion of the matters in this report based on the information in the form and context in which it appears.

### **Disclaimer**

This ASX / TSX press release has been prepared by Cardinal Resources Limited (ABN: 56 147 325 620) (“Cardinal” or “the Company”). Neither the ASX or the TSX, nor their regulation service providers accept responsibility for the adequacy or accuracy of this press release.

This press release contains summary information about Cardinal, its subsidiaries and their activities, which is current as at the date of this press release. The information in this press release is of a general nature and does not purport to be complete nor does it contain all the information, which a prospective investor may require in evaluating a possible investment in Cardinal.

By its very nature exploration for minerals is a high-risk business and is not suitable for certain investors. Cardinal’s securities are speculative. Potential investors should consult their stockbroker or financial advisor. There are a number of risks, both specific to Cardinal and of a general nature which may affect the future operating and financial performance of Cardinal and the value of an investment in Cardinal including but not limited to economic conditions, stock market fluctuations, gold price movements, regional infrastructure constraints, timing of approvals from relevant authorities, regulatory risks, operational risks and reliance on key personnel and foreign currency fluctuations.

Except for statutory liability which cannot be excluded and subject to applicable law, each of Cardinal’s officers, employees and advisors expressly disclaim any responsibility for the accuracy or completeness of the material contained in this press release and excludes all liability whatsoever (including in negligence) for any loss or damage which may be suffered by any person as a consequence of any information in this Announcement or any error or omission here from. Except as required by applicable law, the Company is under no obligation to update any person regarding any inaccuracy, omission or change in information in this press release or any other information made available to a person nor any obligation to furnish the person with any further information. Recipients of this press release should make their own independent assessment and determination as to the Company’s prospects, its business, assets and liabilities as well as the matters covered in this press release.

### **Forward-looking statements**

Certain statements contained in this press release, including information as to the future financial or operating performance of Cardinal and its projects may also include statements which are ‘forward-looking statements’ that may include, amongst other things, statements regarding targets, anticipated timing of the feasibility study (FS) on the Namdini project, estimates and assumptions in respect of mineral resources and anticipated grades and recovery rates, production and prices, recovery costs and results, capital expenditures and are or may be based on assumptions and estimates related to future technical, economic, market, political, social and other conditions. These ‘forward – looking statements’ are necessarily based upon a number of estimates and assumptions that, while considered reasonable by Cardinal, are inherently subject to significant technical, business, economic, competitive, political and social uncertainties and contingencies and involve known and unknown risks and uncertainties that could cause actual events or results to differ materially from estimated or anticipated events or results reflected in such forward-looking statements.

Cardinal disclaims any intent or obligation to update publicly or release any revisions to any forward-looking statements, whether as a result of new information, future events, circumstances or results or otherwise after today’s date or to reflect the occurrence of unanticipated events, other than required by the Corporations Act and ASX and TSX Listing Rules. The words ‘believe’, ‘expect’, ‘anticipate’, ‘indicate’, ‘contemplate’, ‘target’, ‘plan’, ‘intends’, ‘continue’, ‘budget’, ‘estimate’, ‘may’, ‘will’, ‘schedule’ and similar expressions identify forward-looking statements.

All forward-looking statements made in this press release are qualified by the foregoing cautionary statements. Investors are cautioned that forward-looking statements are not guarantees of future performance and accordingly investors are cautioned not to put undue reliance on forward-looking statements due to the inherent uncertainty therein.

## SCHEDULE 1

### NDONGO LICENSE AREA DRILL RESULTS

Hole_ID	Depth (m)	Dip (°)	Azimuth (°)	Grid_ID	mEast	mNorth	mRI
NDDD062	72.1	-60	118	UTM WGS84 Zone 30 North	758,184.10	1,201,971.13	220.24
NDDD063	90.3	-60	117	UTM WGS84 Zone 30 North	758,166.22	1,201,989.49	220.63
NDDD064	69.1	-60	117	UTM WGS84 Zone 30 North	758,164.63	1,201,924.69	220.21
NDDD066	66.4	-60	119	UTM WGS84 Zone 30 North	758,195.81	1,201,980.59	220.07
NDDD067	90.2	-60	120	UTM WGS84 Zone 30 North	758,170.37	1,201,999.05	220.65
NDDD068	27.5	-60	121	UTM WGS84 Zone 30 North	758,170.40	1,201,840.11	219.62
NDDD069	45.2	-60	119	UTM WGS84 Zone 30 North	758,152.32	1,201,830.61	219.823
NDDD070	68.6	-60	119	UTM WGS84 Zone 30 North	758,203.22	1,201,992.16	219.87
NDDD071	32.5	-60	117	UTM WGS84 Zone 30 North	758,152.64	1,201,815.68	219.91
NDDD072	50.0	-60	120	UTM WGS84 Zone 30 North	758,133.56	1,201,813.62	220.16
NDDD073	59.5	-60	121	UTM WGS84 Zone 30 North	758,059.14	1,201,692.60	221.21
NDDD076	59.6	-60	120	UTM WGS84 Zone 30 North	758,048.45	1,201,670.12	221.22
NDDD079	69.0	-60	120	UTM WGS84 Zone 30 North	758,023.80	1,201,628.39	220.99
NDDD081	28.3	-60	121	UTM WGS84 Zone 30 North	758,173.22	1,201,852.60	219.76
NDDD082	54.2	-60	120	UTM WGS84 Zone 30 North	758,150.12	1,201,865.13	219.98

**Table 1: Meta-Data Listing of Drill Holes**

Hole_ID	mFrom	mTo	mWidth	Au g/t
NDDD062	36.3	39.3	3.0	1.4
NDDD062	53.3	54.3	1.0	0.6
NDDD062	61.5	66.5	5.0	1.6
NDDD063	8.0	9.0	1.0	0.8
NDDD063	78	83.3	5.3	13.9
NDDD064	8.0	9.0	1.0	0.8
NDDD064	59.1	62.8	3.7	3.3
NDDD066	34.0	35.0	1.0	0.5
NDDD066	36	37.3	1.3	0.6
NDDD066	58.9	60.9	2.0	18.3
NDDD067	13.0	14.1	1.1	0.9
NDDD067	25.0	26.0	1.0	1.6
NDDD067	70.1	71.1	1.0	1.2
NDDD067	79.0	82.0	3.0	2.2
NDDD068	18.8	21.5	2.7	7.7
NDDD069	29.0	31.7	2.7	2.9
NDDD070	58.4	60.9	2.5	2.3
NDDD070	66.9	67.9	1.0	1.3
NDDD071	19.0	23.6	4.6	1.4
NDDD072	31.3	36.8	5.5	3.8
NDDD073	14.0	15.0	1.0	1.1
NDDD073	37.1	40.0	2.9	1.2
NDDD076	11.0	12.0	1.0	0.6
NDDD076	23.0	24.0	1.0	0.6
NDDD076	42.0	46.0	4.0	1.2
NDDD079	12.0	13.0	1.0	0.7
NDDD079	15.0	16.0	1.0	0.8
NDDD079	53.5	56.5	3.0	2.5
NDDD081	25.0	26.5	1.5	2.4
NDDD082	29.0	30.0	1.0	0.6
NDDD082	45.7	47.1	1.4	1.1

**Table 2: Summary of Individual Intersections**

**Notes:**

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- The intercepts were calculated, using a nominal 0.5 g/t Au cut-off, which approximates the cut-off for Reasonable Prospects of Eventual Economic Extraction (“RPEEE”) as per the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (“JORC Code”) 2012 and the Canadian Institute of Mining (“CIM”) 2010 guidelines, and internal dilution of no more than 3m at <0.5g/t Au.

## APPENDIX 1

### JORC CODE 2012 EDITION

#### TABLE 1 REPORTING OF EXPLORATION RESULTS

##### Section 1 – Sampling Technique and Data

Criteria	JORC Code Explanation	Commentary
<b>Sampling techniques</b>	Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc.). These examples should not be taken as limiting the broad meaning of sampling.	Reverse Circulation (RC) drill samples are collected by using downhole sampling hammers with nominal 140mm diameters. Samples are collected through a cyclone and immediately weighed to determine recoveries; the entire sample is then split by a three-tier riffle splitter. Two samples (~2.5-3.0 kg) are collected, one for the laboratory, the other a duplicate stored at the Bolgatanga sample shed.  Diamond sampling is by half-core samples of HQ core size.
	Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.	Sampling is guided by Cardinal Resources protocols and Quality Control procedures as per industry standard.  To ensure representative sampling: 1m RC samples are collected from a cyclone, passing them through a 3-tier riffle splitter, and taking duplicate samples every 20th sample.  HQ core samples are taken selectively through the altered, silicified and shear zones, with minimum 0.5m and maximum 1.5m lengths of sample.
	Aspects of the determination of mineralisation that are Material to the Public Report.  In cases where 'industry standard' work has been done this would be relatively simple (e.g. 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases, more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.	The determination of mineralisation is based on observed alterations, silicification and shearing of the lithologies.  RC samples are crushed to -2mm, then a <1kg split sample is pulverised via LM2 Ring Pulveriser to a nominal 85% passing -75µm.  Diamond drill samples are crushed to -2mm, and a <1kg split sample is then pulverised via LM2 Ring Pulveriser to a nominal 85% passing -75µm.  A 200g sub-sample is taken from the pulverised material for analysis. A 50g charge weight is fused with litharge-based flux, cupelled and the prill dissolved in aqua regia. The gold tenor is then determined by AAS.

Criteria	JORC Code Explanation	Commentary
<b>Drilling techniques</b>	Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc.).	<p>Reverse circulation drilling uses sampling hammer of nominal 140mm diameter.</p> <p>Diamond core drilling is completed with core size of HQ with a standard tube. Triple tube is used in saprolite at the tops of the holes. Core is orientated to determine both azimuth and dip using digital Reflex ACT II RD orientation tool.</p> <p>Drill holes are inclined at -45° to -60° angles for optimal zone intersection. All drill collars are surveyed using Trimble R8 RTK GPS with downhole surveying every 30m using Reflex digital surveying instruments.</p>
<b>Drill sample recovery</b>	Method of recording and assessing core and chip sample recoveries and results assessed.	<p>Diamond core recovery is logged and captured into the database. The Method of recording chip and core sample recoveries was to enter the relevant data on a hand-held Motion F5te Tablet PC using a set of standard templates supplied by Maxwell Geoservices, Perth (Maxwell).</p> <p>Reverse circulation sampling is good. RC chips are logged, weighed and captured to the database. RC sample recoveries are assessed by weighing 1m samples from the cyclone on a scale in the field and comparing with the theoretical volume contained in a 1m x 140mm diameter hole to calculate an estimated percentage sample recovery.</p> <p>Core recovered from each drill run is measured and compared with the drill run length drilled to calculate an estimated percentage core recovery. For core drilling overall recoveries are excellent with weighted average recovery greater than 98%.</p>
	Measures taken to maximise sample recovery and ensure representative nature of the samples.	<p>Measures taken include the use of bigger HQ core size diamond drilling to maximise recovery, having a geologist onsite to examine core and core metres marked and orientated to check against the driller's blocks and ensuring that all core loss is taken into account.</p> <p>At the reverse circulation rig, sampling systems are routinely cleaned to minimise the opportunity for contamination and drilling methods are focused on sample quality. The measures taken to maximise RC sample recovery are through a cyclone and a 3-tier riffle splitter. Each 1m sample is passed twice through the splitter before sampling to</p>

Criteria	JORC Code Explanation	Commentary
		<p>ensure maximum homogenisation of each sample and to collect an unbiased representative sample to be assayed.</p> <p>The reverse circulation rigs have auxiliary compressors and boosters to help maintain dry samples. Where wet samples are encountered, the reverse circulation drilling is discontinued.</p>
	<p>Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.</p>	<p>No relationship is seen to exist between sample recovery and grade, and no sample bias has occurred due to preferential loss/gain of any fine/coarse material due to the acceptable sample recoveries obtained by the drilling methods employed.</p>
<b>Logging</b>	<p>Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.</p>	<p>All drill holes are fully logged. The lithology, alteration and geotechnical characteristics of core are logged directly to a digital format on a Field Toughbook laptop logging system following procedures and using Cardinal geologic codes. Data is imported into Cardinal's central database after validation in LogChief™.</p> <p>In the opinion of the Component Persons all geological logging is to a level of detail to support future Mineral Resource estimation.</p>
	<p>Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.</p>	<p>Logging is both quantitative and qualitative.</p> <p>Both RC chips in trays and HQ core are photographed both in dry and wet form.</p>
	<p>The total length and percentage of the relevant intersections logged.</p>	<p>All drill holes are logged in full and to the total length of each drill hole.</p>
<b>Sub-sampling techniques and sample preparation</b>	<p>If core, whether cut or sawn and whether quarter, half or all core taken.</p>	<p>Orientation of core is completed for all diamond holes and all are marked prior to sampling. Longitudinally cut half core samples are produced using a Core Saw with diamond impregnated blades. Samples are weighed and recorded.</p>
	<p>If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry.</p>	<p>RC samples are split using a three-tier riffle splitter. The majority of RC samples are dry. On occasions that wet samples are encountered, they are dried prior to splitting with a riffle splitter.</p>
	<p>For all sample types, the nature, quality and appropriateness of the sample preparation technique.</p>	<p>RC drill samples are sorted and dried in an oven for 8 hours and weighed. They are then crushed to -2mm using a RSD Boyd crusher and a &lt;1.0kg split is taken. The reject sample is retained in the original bag and stored. The split is pulverised in a LM2 Ring Pulveriser to a nominal 85% passing 75µm and a 200g sub-sample is used for analysis.</p>

Criteria	JORC Code Explanation	Commentary
		<p>Drill core samples are sorted, dried at 105°C for 4 hours and weighed. Samples are crushed through Jaques crusher to nominal -10mm. A second stage crushing is through Boyd crusher to nominal -2mm and then split to &lt;1.0kg. The reject sample is retained in the original bag and stored. The split is pulverised in a LM2 Ring Pulveriser to a nominal 85% passing 75µm and approximately 200g sub-sample of the pulverised material is used for fire assay.</p> <p>All preparation equipment is flushed with barren material prior to commencement of the job.</p>
	<p>Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.</p>	<p>Cardinal Resources has protocols that cover the sample preparation at the laboratories and the collection and assessment of data to ensure that accurate steps are used in producing representative samples for the analytical process. Key performance indices include:</p> <ul style="list-style-type: none"> <li>• Contamination index of 95% (that is at least 95% of blanks pass); failures can only be attributed to probable minor laboratory contamination.</li> <li>• Crushed Size index of 95% passing 2 mm (1:50 sample screened).</li> <li>• Grind Size index of 85% passing 75 microns (minimum 1:50 sample screened).</li> <li>• Check Samples returning at worst 20% precision at 90th percentile and bias of 5% or better.</li> </ul> <p>Crusher and pulveriser are flushed with barren material at the start of every batch.</p>
	<p>Measures taken to ensure that the sampling is representative of the in- situ material collected, including for instance results for field duplicate/second-half sampling.</p>	<p>Measures taken to ensure that the RC sampling is representative of the in-situ material collected are to take field duplicate samples every 20th sample. Approximately 3kg samples from the splitter are retained from each sample and stored at the company's secured premises for possible re-assay.</p> <p>Measures taken to ensure that the core sampling is representative is to sample half core at 0.5m (minimum) to 1.5m (maximum) intervals through the recognisable altered, silicified, mineralised shear zones.</p> <p>Results of field duplicates for RC samples and Check Samples for both RC and DD samples</p>

Criteria	JORC Code Explanation	Commentary
		<p>are all evaluated to ensure that the results of each assay batch are acceptable.</p> <p>1:20 grind quality checks are completed for 85% passing 75µm criteria to ensure the representativeness of sub-samples.</p>
	<p>Whether sample sizes are appropriate to the grain size of the material being sampled.</p>	<p>Sample sizes are considered appropriate to the grain size.</p>
<p><b>Quality of Assay data and laboratory tests</b></p>	<p>The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.</p>	<p>All samples are analysed for gold by lead collection fire assay of a 50g charge with AAS finish; the assay charge is fused with the litharge-based flux, cupelled and prill dissolved in aqua regia with gold tenor determined by flame AAS. Fire assay is considered a total assay technique.</p> <p>In the opinion of the Competent Persons, the analytical method is considered appropriate for the mineralisation style and is of industry standard.</p>
	<p>For geophysical tools, spectrometers, handheld XRF instruments, etc., the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.</p>	<p>No hand-held geophysical tools are used.</p>
	<p>Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.</p>	<p>Cardinal's QAQC protocol is considered industry standard with certified reference materials (CRMs) submitted on a regular basis with routine samples. The CRMs having a range of values and blanks are inserted in the ratio of 1:20. Duplicates are taken at the riffle splitter every 20<sup>th</sup> sample. No duplicate samples are taken from core samples.</p> <p>Pulps are submitted to a secondary laboratory for checks on the accuracy and precision of the primary laboratory.</p> <p>Coarse rejects are submitted back to the primary laboratory to assess the adequacy of the sub-sampling process.</p> <p>Laboratories' QAQC involves the use of internal laboratory standards using certified reference material and blanks.</p>
<p><b>Verification of sampling and assaying</b></p>	<p>The verification of significant intersections by either independent or alternative company personnel.</p>	<p>Significant intersections have been verified by alternative company personnel.</p>
	<p>The use of twinned holes.</p>	<p>None of the drill holes in this report are twinned.</p>
	<p>Documentation of primary data, data entry procedures, data verification, data</p>	<p>Primary data are captured on field tough book laptops using LogChief™ Software. The software has validation routines and data is</p>

Criteria	JORC Code Explanation	Commentary
	storage (physical and electronic) protocols.	then imported onto a secure central database.
	Discuss any adjustment to assay data.	The primary data is always kept and is never replaced by adjusted or interpreted data.
<b>Location of data points</b>	Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.	Initially drill hole collar coordinates are obtained using handheld Garmin GPSmap 64s GPS within $\pm 3\text{m}$ accuracy.  Subsequently all drill collars are accurately surveyed using Trimble R8 RTK DGPS system within $\pm 10\text{mm}$ of accuracy (X, Y, Z).  Coordinates are based on three control stations established at Namdini by Sahara Mining Services.  Accuracy and quality of downhole surveys of RC and DD drill holes are determined by using Reflex Ez-Shot survey instrument at regular 30m intervals.
	Specification of the grid system used.	Coordinate and azimuth are reported in UTM WGS84 Zone 30 North.
	Quality and adequacy of topographic control.	Topographic control at Ndongo was supplied by Southern Geoscience Consultants (Perth) using satellite imagery.
<b>Data spacing and distribution</b>	Data spacing for reporting of exploration results.	The RC drilling was carried out on variably spaced fence lines (30m to 775m apart) with hole spacing of 50m along lines testing mineralisation to a vertical depth of approximately 100m and covering a strike length of 1.25km  The DD drilling was carried out initially on a spacing of 50m to 100m along fence lines testing mineralisation to a vertical depth of approximately 75m and to confirm the mineralisation intersected by the previous RC drilling.  Some step out diamond drilling at 12.5m spacing from the initial high-grade section lines was carried out to ensure that plunges of the mineralised structures are understood before embarking on a wider spaced drill campaign along strike
	Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.	Exploration is at the early stage, and as such drill data spacing and distribution are insufficient to establish geological and grade continuity that are appropriate for reporting Mineral Resources and Ore Reserves.
	Whether sample compositing has been applied.	No sample compositing has been applied.

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<b>Orientation of data in relation to geological structure</b>	Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.	<p>Drill holes are orientated to achieve intersection angles as close to perpendicular to the mineralisation as practicable based on ground magnetic modelling data and previous RC drilling. Some sampling bias may occur.</p> <p>Systematic geological mapping and structural information from the current diamond drilling are required to determine the true orientation of dips and structures of the mineralisation.</p>
	If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.	No significant orientation-based sampling bias is known at this time.
<b>Sample security</b>	The measures taken to ensure sample security.	<p>An independent Ghanaian security contractor is used to ensure sample security.</p> <p>The drilling contractor is accountable for drill core and RC chip production at the drill site. Final delivery from the drill site to the laydown area within the core yard is managed by Cardinal. The core yard technicians, field technicians and Geologists ensure the core and chips are logged, prepared and stored under security until conveyed to a nearby accredited sample preparation laboratory by Cardinal.</p> <p>At the time of sample delivery at the laboratory, a sign-off process between Cardinal and the laboratory ensures that samples and paperwork correspond and samples are receipted against the Cardinal submission sheets. The sample preparation laboratory is responsible for the samples from the time of collection from Cardinal until pulps and rejects are collected and checked by Cardinal Geologists.</p> <p>Two pulp samples are produced:</p> <ul style="list-style-type: none"> <li>• <u>one pulp dispatched by Cardinal to the appropriate laboratory for assay;</u></li> <li>• <u>the duplicate pulp and reject stored by Cardinal in a secure storage facility for possible re-assay or other testwork.</u></li> </ul>
<b>Audits or reviews</b>	The results of any audits or reviews of sampling techniques and data.	Sampling techniques are of industry standards.

**Section 2 – Reporting of Exploration Results**

(Criteria listed in section 1 will also apply to this section where relevant)

Criteria	JORC Code Explanation	Commentary
<b>Mineral Tenement and Land Status</b>	Type, name/reference number, location and ownership including agreements or material issues with third parties including joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.	The Ndongo Exploration Permit is on PL9/22, PL9/13, PL9/19 and PL9/36 licenses over an area of 295 sq. km located in the North-East region of Ghana.
	The security of the tenure held at the time of reporting along with any known impediments to obtaining a license to operate in the area.	All tenements are current and in good standing.
<b>Exploration Done by Other Parties</b>	Acknowledgment and appraisal of exploration by other parties.	<p>Exploration in the region has been undertaken by a number of groups including:</p> <ul style="list-style-type: none"> <li>• 1933 - Colonial discovery of Gold at Nangodi.</li> <li>• 1934 to 1942 - Nangodi Gold Mine production and other small development projects in the area (e.g. Zug, Pelungu, Money Palava).</li> <li>• 1992 to 1994 - BHP conducted regional exploration programmes including regional stream sediment and broad soil sampling to follow-up on stream sediment anomalies. Project was abandoned when BHP withdrew from activity in West Africa.</li> <li>• 1996 to 1997 – Africwest granted regional Reconnaissance License and undertook extensive soil sampling at Nangodi.</li> <li>• 2006 - Etruscan (JV with Red Back): Conducted data review and compilation, soil and rock sampling and RAB drilling. Identified blind mineralisation at Zupeliga.</li> <li>• 2011 - Abzu (JV with Red Back): Completed data compilation, RC/diamond drilling at Nangodi and Zoog.</li> <li>• 2012 - Abzu (JV with Red Back): Conducted trenching, rock sampling, ground geophysics survey (magnetic and EM) and geologic mapping.</li> </ul>
<b>Geology</b>	Deposit type, geological setting and style of mineralisation	Drill samples were collected within sheared and folded rocks containing sulphides; mainly pyrite with minor arsenopyrite.

Criteria	JORC Code Explanation	Commentary
		<p>The geological setting is a Paleoproterozoic Greenstone Belt comprising Birimian metavolcanics, volcanoclastics and metasediments located along portion of the regional Bole-Bolgatanga Shear Zone and a splay off this Shear Zone (the Nangodi Shear Zone).</p> <p>Gold mineralisation occurs within shear zones comprising alteration haloes containing higher grade lenses of altered, silicified, sheared metavolcanics and disseminated sulphides</p>
<b>Drill hole information</b>	<p>A summary of all information material to the understanding of the exploration results including tabulation of the following information for all Material drill holes:</p> <ul style="list-style-type: none"> <li>• Easting and northing of the drill hole collar</li> <li>• Elevation or RL (Reduced Level – elevation above sea level in meters) of the drill hole collar</li> <li>• Dip and azimuth of the hole</li> <li>• Down hole length and interception depth</li> <li>• Hole length</li> </ul>	A summary of drill hole information is provided in this document.
	<p>If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.</p>	There has been no exclusion of information.
<b>Data aggregation methods</b>	<p>In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.</p>	No weighting averaging techniques nor cutting of high grades have yet been undertaken.
	<p>Where aggregated intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.</p>	Aggregated intersections incorporating short lengths of high-grade results within the shear zones are calculated to include no more than intervals of 3m below grades of <0.5 g/t Au when assay results are reported.
	<p>The assumptions used for any reporting of metal equivalent values should be clearly stated.</p>	No metal equivalents are used in the intersection calculation.
<b>Relationship between mineralisation widths and intercept lengths</b>	<p>These relationships are particularly important in the reporting of exploration results.</p>	The relationship between mineralisation widths and intersection lengths from DD drilling are not yet fully understood.
	<p>If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.</p>	The geometry of the mineralisation with respect to the drill hole angles is not yet known.
	<p>If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (e.g. ‘down hole length, true width not known’).</p>	The geometry of the mineralisation is unknown; only downhole length is reported (no true width of mineralisation is reported).

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<b>Diagrams</b>	Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported. These should include, but not be limited to a plane view of drill hole collar locations and appropriate sectional views.	Appropriate locality map, cross sections of the drilling, interpreted geology and assays are included within the body of the accompanying document.
<b>Balanced Reporting</b>	Where comprehensive reporting of all Exploration Results is not practical, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.	The accompanying document is considered to represent a balanced report.
<b>Other substantive exploration data</b>	Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observation; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.	<p>Other exploration data collected is not considered material to this document at this stage.</p> <p>The interpretation of the geological observations shown in the cross sections are subject to possible change as new information is gathered.</p> <p>Further data collection will be reviewed and reported when considered material.</p>
<b>Further Work</b>	<p>The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large – scale step – out drilling).</p> <p>Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.</p>	<p>Geological mapping, surface rock sampling, trenching, geochemical surveys, geophysical surveys and DD/RC drilling are continuing.</p> <p>Once all results have been received, further RC/DD drilling will be considered along strike and at depth to further delineate this gold mineralised zone and to determine whether more sub-parallel mineralised horizons can be located.</p>