ANNEXURE 1

TERMS OF REFERENCE

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Figures

1. SCOPE OF WORK FOR PROSPECTIVE BIDDER

The ground gravity surveys requested in this bid forms part of the on-going regional integrated interpretation project to provide ground gravity data for the entire Warmbad sheet, which will subsequently be integrated with the airborne magnetic and radiometric data for qualitative interpretation. The survey areas are shown on the survey index map in Figure 1.

The ground gravity data acquisition and processing will be undertaken according to professionally accepted survey practices. The contractor must provide one qualified geophysicist (minimum Bachelor of Science honours in geophysics and a minimum of four years working experience) to work full time on the project.

In general the scope of work involves in collecting of gravity data (using a gravity meter) at every 1 kilometres intervals along roads (main roads, farm roads and district roads) and collecting of positions and heights data using a Differential Global Positioning System (DGPS)) at each station were gravity is collected. Processing of airborne magnetic and radiometric data over the Warmbad sheet. Interpretation of airborne magnetic and radiometric data over the Warmbad sheet. A preliminary interpretation of data integration (Collected ground gravity, airborne magnetic and radiometric, aster, hyperspectral and geological data) will be done by the bidder. The bidder will assistance with marketing of the end product to prospective end-user clients (Investors, Government organisations and the public).

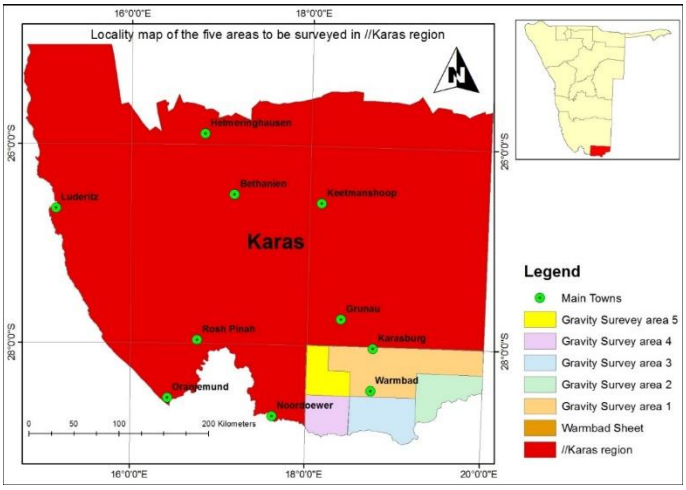


Figure 1: Combined geophysical area to be surveyed

2. Responsibilities

2.1 Introduction

The survey calls for the acquisition of approximately 4200 high precision gravity data points in the //Karas region ((Warmbad sheet) Fig: 1). The data will be gathered along public roads (Main roads, districts roads and farm roads) at 1kilometer interval. The amount of work may be increased or decreased according to budgetary considerations. The bidder is required to provide a minimum of two to three-person crew to carry out the work. Safety of the survey crew and protections on the public are paramount and is the responsibility of the bidder.

2.2 Technical Inspections

The work should be performed to the satisfaction and subject to the acceptance of the Project Manager who will be a MME staff member under the Geophysics Division of the Department of Geological Survey, within Ministry of Mines and Energy. The Project Manager and/or authorised representative, will make periodic trips to the survey area to monitor field operations and to ensure that operations are being conducted in accordance with the survey specifications. All costs of the Project Manager will be borne by the bidder. It is anticipated that the Project Manager visits will be of about 7 days duration at intervals of 3 weeks (i.e. once a month) starting from the commencement of the survey, to the end of the survey.

The Project Manager and/or authorised representative will also visit the data processing centres to ensure that data processing conforms to the survey requirements. The timing and duration of such visits will be coordinated with the bidder and the costs of the Project Manager will be borne by the bidder. The Project Manager will endeavour to ensure that decisions affecting data acquisition and processing are made timeously, particularly those relating to acceptance of data or processing parameters.

All officials visiting to the survey sites and data processing centres will carry proof of authority and identification. Any amendments to survey parameters and specifications can only be authorized by the Project Manager/ QA/QC Geophysicist.

2.3 Responsibilities of the Ministry of Mines and Energy (MME) and department of Geological Survey (GSN)

(a) The MME/GSN as the appointing authority will prepare a bid with terms of references for the bidder. The bid will contain the payment schedule.

(b) The MME/GSN will provide appointment and support letters to enable the bidder to obtain visas, permits, licences and all other necessary documents.

2.4 Responsibilities of the bidder

2.4.1 General responsibilities

(a) The bidder must conduct all survey operations in accordance with "Best Practice in Gravity Surveying" by Murray et al., (2001) or "A guide to high precision land gravimeter surveys" by Seigel, (1995).

(b) The bidder must conduct all survey operations with due diligence to professional standards in accordance with the technical specifications;

(c) The bidder must conduct all field operations to minimize the potential environmental impact;

(d) The bidder must maintain the confidentiality of the ground gravity geophysical data and respect the copyright of the Government of Namibia;

(e) The bidder must cooperate fully with the Project Manager and other authorized officers and to ensure that the data are available for inspection at all times.

2.4.2 Specific Responsibilities

The bidder must:

(a) Supply, maintain and provide logistical support to the operations of a suitable gravity meter and the differential global position system (DGPS) instruments.

(b) Obtain all necessary visas, permits, licenses, authorisations and other documents necessary to carry out the survey (with the assistance of MME/GSN see section).

(c) Obtain, where necessary, suitable air photographs and topographic maps and to submit proposed survey plans and procedures for approval to the Project Manager prior to survey commencement.

(d) Provide suitably qualified staff to conduct the survey and in particular to carry out the following functions:

(i) Project management

(ii) Operation and maintenance of geophysical instruments

(iii) Data compilation, quality control, processing, interpretation and merging the data to the Namibian gravity data base

(e) Provide accommodation, meals, subsistence and incidental expenses incurred by company's personnel (temporal & permanent) attached to the project.

(f) Provide accommodation, daily allowance and meals for the Project Manager and/or authorised representative during visits to the survey sites in Namibia.

(g) Supply all equipment, instruments and spare parts necessary to carry out the survey effectively.

(h) Establish base stations for the surveys, mobilize survey equipment and personnel to the survey area in Namibia prior to survey operations and demobilization from survey site, when the data acquisition has been completed to the satisfaction of the Project Manager.

(j) Quality control at the field base, and recollecting those paths (roads) where the data is out of specification. The Contractor/bidder should ensure that base camps pose minimal environmental disturbances and restore the area to its original state when the survey is completed.

(k) Acquire and install the relevant software for data processing on a designated workstation at the GSN offices in Windhoek or on site at field base camp. This should include training of GSN geophysicists on data processing and provide preliminary contour maps and/or images for quality control.

(l) Assist with the promotion of the ground gravity and interpretation of the Warmbad sheet at two international conferences and expositions (Australian Exploration Geoscience Conference (AEGC 2022) and South Africa Geophysical Association (SAGA 2022)). This will include conference registration, daily allowance, and meals, printing of posters, airport transfers and air ticket to and from (RSA and Australia) attendance by two GSN geophysicists.

(m) Submit all the equipment, data and products listed to the Department of Geological Survey (Geophysics division), Ministry of Mines and Energy on completion of the survey.

2.4 Specifications and parameters of the survey areas

The selected survey areas are shown in figure 1 and in detail, in the respective sections together with the boundary coordinates. Five areas have

been identified for this survey and the actual coverage will depend on bidder prices and availability of funds. It is therefore required that each survey area should be quoted on its own in a detailed quotation of the bidder. This will enable the GSN to prioritise the survey areas depending on the availability of funds.

Bidders are requested to provide a detailed bill of quantity based quotations for conducting the survey over each survey area. Bidders bidding for more than two areas will be expected to deploy more than one team as surveys will run parallel. Each team should comprise of:

- At least one qualified geophysicist with a minimum B.Sc. honours in geophysics with 4 years' experience on similar/geophysical projects.
- Two field technicians to assist in data collection and carrying of equipment and a driver(drivers can be the technicians)

2.4.1 Gravity Survey Area 1

The Gravity Survey Area 1 has an area of ~ 68119 km^2 and it includes Karasburg, Warmbad and Ariamsvlei gravity base stations but do not have gravity values, therefore, the closest gravity base station with gravity value is Keetmanshop. The base station must be used for the survey and any new created base station must be documented and marked with a gold plate that will be provided by the geophysics division. Road bench marks can be used for the elevations. Road shape file can be collected at the geophysics division after purchasing of the bid document to help calculated costing. This area calls for the acquisition of approximately 2000 high precision gravity data points in the //Karas region (Warmbad sheet).

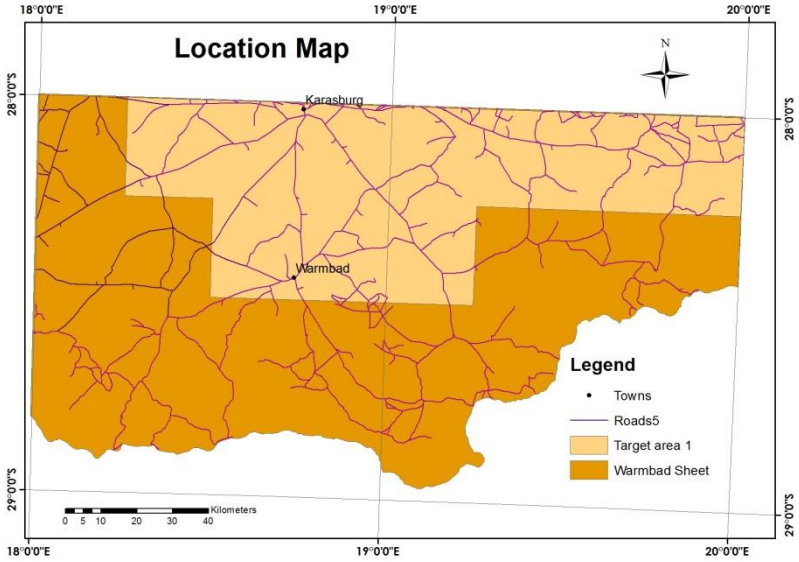


Figure 2: Geophysical survey area 1

2.4.2 Gravity Survey Area 2

Survey Area 2 is 2627 km^2 and is closer to the Warmbad, Velloordrift and Ariamsvlei gravity base stations which do not have gravity values and hence base station to be used is Keetmanshoop. New base station created must be documented and mark with a gold plate which will be provided by the geophysics division. This area calls for the acquisition of approximately 500 high precision gravity data points in the //Karas region (Warmbad sheet).

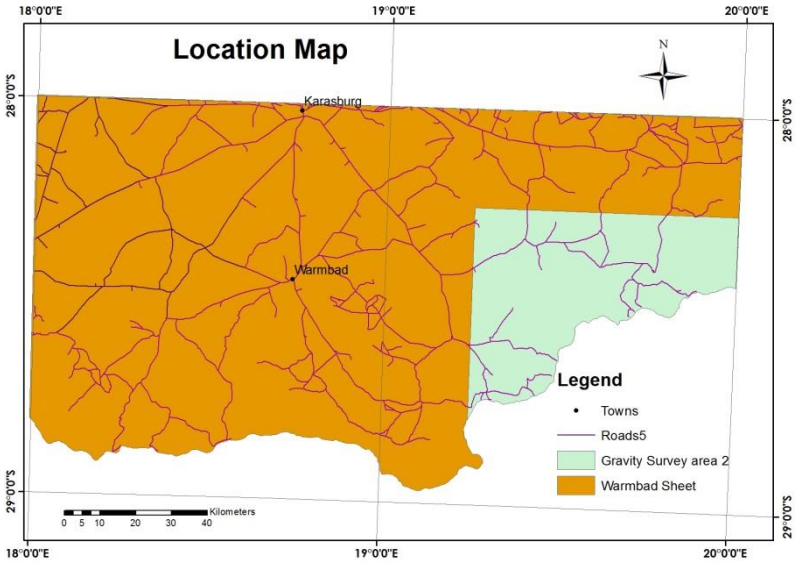


Figure 3: Geophysical survey area 2

2.4.3 Gravity Survey Area 3

The Area is 3152 km^2 and a minimum of three new gravity base stations must be created within the area tied to the existing Warmbad gravity base station (with no gravity value) which should be tied to Keetmanshoop. The same procedure will follows as in the top survey areas. This area calls for the acquisition of approximately 700 high precision gravity data points in the //Karas region (Warmbad sheet).

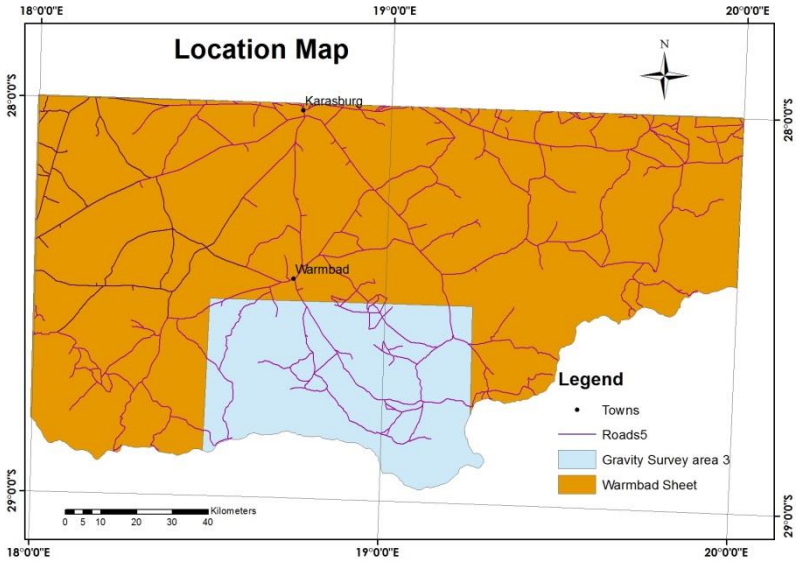


Figure 4: Gravity Survey Area 3

2.4.4 Gravity Survey Area 4

These areas is 2126 km^2 and has no known gravity base station within it, hence minimum of three permanent base stations should be created using the Noordoewer or Warmbad gravity base (have not gravity values) but shouls also be tied from Keetmanshoop. This area calls for the acquisition of approximately 450 high precision gravity data points in the //Karas region (Warmbad sheet).

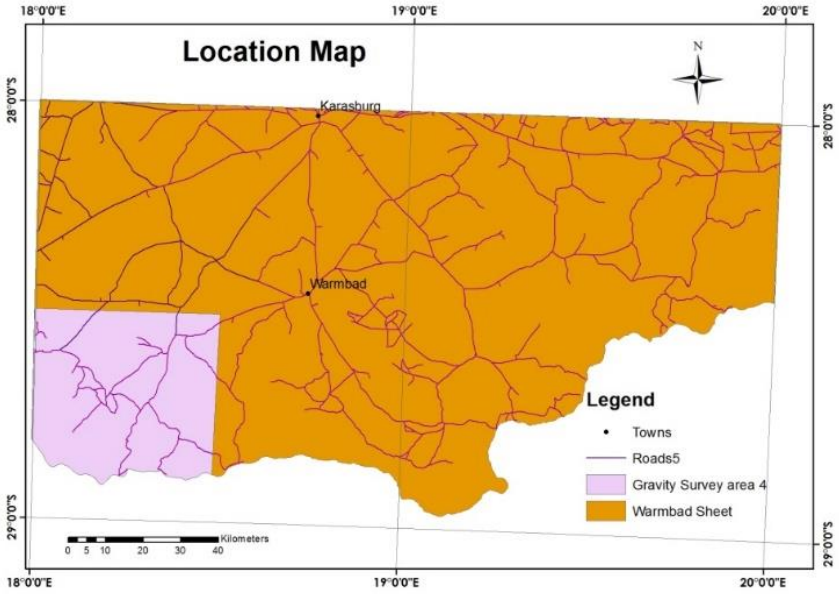


Figure 5: Gravity Survey Area 4

2.4.5 Gravity Survey Area 5

Area is about 2043 km2 and no gravity base station hence a minimum of three permanent gravity base stations should be created using either the Warmbad or Noordoewer gravity base stations(with not gravity base station value) after tying with Keetmanshoop base stations. This area calls for the acquisition of approximately 550 high precision gravity data points in the //Karas region (Warmbad sheet).

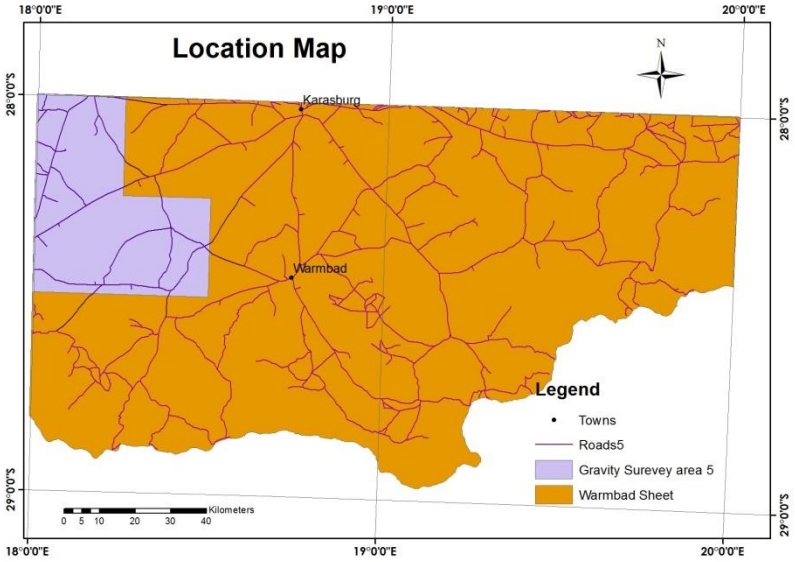


Figure 6: Gravity Survey Area 5

2.5 Requirements for execution of the gravity survey

2.5.1 Safety

The work is to be carried out in a safe and professional manner with utmost regard to public safety, crew safety and the environment. As the survey is to be conducted along public roads, the bidder is to ensure that:

- Its vehicles are clearly marked (magnetic reflective strips are suggested), vehicles use a roof-mounted 360° degree beacon and four-way flashers to warn other motorists,
- Crew members wear reflective safety vests and traffic cones are deployed when vehicles are stopped.
- Crew members are to work in pairs.
- Measurements should not be made on the road surface but on the shoulder or curb,
- Vehicles should be parked in such a way as to minimize disruption to traffic and should be pulled off the roadway wherever possible.

The bidder may also wish to consider scheduling work in more populous areas for times and days of the week when traffic could be expected to be lighter.

The bidders is to skip or relocate any stations that it is considers hazardous. If conditions require that segments of the roads be skipped, alternative stations may be substituted with the approval of the Project Manager from the Ministry.

The bidders are to include, in their report, a description of the following:
(a) Safety procedures;
(b) Issues that arose during the course of the survey; and
(c) How the issues were resolved.

It is anticipated that field crew will come into daily contact with members of the public. It is expected that the bidder's crew members will respond to questions from the public courteously and in a forthright manner. Any concerns expressed by the public should be immediately reported to the Project Manager.

2.5.2 Equipment

(i) Gravimeters

It is preferred that digitally recording gravimeters be used on these surveys, however suitably precise analogue instruments will be acceptable. A minimum of two gravimeters (one for each crew) must be provided for this survey. The relative gravimeters required for this survey will have a minimum reading resolution of 0.01 mGal. Acceptable gravimeters for the survey are:

- Lacoste and Romberg model G meters
- Scintrex CG-3, CG-3$^+$ or CG-5 meters
- ZLS Automated Burris meters

There will be weekly sensitivity checks for analogue gravity meters, if used, and verification of drift correction for automated meters, if used.

(ii) Geographic Positioning System (GPS)

In the interests of absolute accuracy only DGPS (Differential Global Positioning System) acquired positioning will be considered. The DGPS rover and base must be geodetic quality. The DGPS must be capable of providing GPS data to support high accuracy geodetic measurements in a variety of field survey operations. Known trig beacons and road bench marks will be used to erect the base station

of DGPS. Real time kinematic (RTK) and post processing can be used as long as they are corrected and proof is shown how correction was done.

Positional Accuracy Requirements from GPS Survey

The required accuracy of the GPS positioning is: 0.003 m horizontal and 0.005 m vertical

(iii) Processing Equipment

The bidders is to be equipped with sufficient computer capacity and peripherals to process data in the field base of operations. Processing of the gravity data is to be performed using recognized gravity data reduction software. Bidders are required to provide sufficient details of the processing software to show that it is capable of meeting the processing and deliverables requirements contained within this bid document.

(iv) Vehicles

The bidders are to supply suitable and sufficient vehicles to mobilize the crews to the Project area and maintain the efficient operation of the survey.

2.6 Survey procedure

2.6.1 Station Recording

The following data elements will be collected for each station reading:

(a) Station number, date, time in UTC.

(b) X,Y,Z, gravity reading, instrument base height above ground, GPS antenna height above the instrument base, Hammer inclinometer observations (Zones B and C; 2 metres and 50 metres), and comments.

Regardless of the type of gravity meter used, these data will be recorded in a field notebook.

2.6.2 Measurement Interval

The nominal station spacing is 1 km. It is recognized that, for a number of reasons (such as safety, poor GPS signal, unstable ground), stations may have to be shifted.

A variance of up to ±500 m is allowed for 1km stations. The station number is to be marked at every fifth station.

2.6.3 Gravity Base Stations

A Namibian Absolute Gravity Network (NAGN) gravity base station in the south is located in Keetmanshoop. Primary and secondary base stations were created from the absolute base in Keetmanshoop. The stations are marked but do not have gravity values and are at the following places: Grunau, Karasburg, Ariamsvlei, Warmbad and Velloordrift. The bidder must measure the primary and secondary tertiary base station values. The bidder may create a tertiary near the bidder's accommodations or within the survey area. This will be achieved by tie-ins to the nearest existing primary or secondary base station, with a minimum of three good tie-ins with each gravimeter. Station descriptions and principal facts are available from the Geological Survey of Namibia (Geophysics division). As a quality check on the instrument scale factor, at the beginning and end of the survey, readings will be taken at two of the identified primary or secondary base stations with all instruments to be used on the survey.

All new tertiary bases must be documented in the following manner:

(a) Two photographs, (one close-up and one distant view) are required for the new control station using a high quality camera. All pictures should be taken with the camera held horizontally. Both photos should contain the gravimeter sitting on the tripod in the exact location of the control station measurement. The photos should be archived on DVD or CD-ROM.

(b) A sketch of the station is to be drawn (in situ) and entered into the field book in the back pages. The sketch should specify horizontal distances from nearby permanent reference points such as the top of a foundation, steps, the corner of a building, etc. Metric units should be used for all measurements. The orientation of the sketch must be indicated with an arrow indicating the north direction.

(c) A short written description of the control station location. It should describe the general locale of the site in sufficient detail to facilitate subsequent re-occupation. Specific information such as roads numbers, street names, building names or numbers, contact person for restricted sites, etc should be included. Vertical measurements to points of reference such as window frames, top of steps etc. should also be recorded here.

2.6.4 Closure Errors and Repeat Readings

Traverses will begin and end each day or within a day on a NAGN, primary, secondary or tertiary gravity base station (see 2.6.3 "Gravity Base Stations"). Traverses must be closed and open with three base reading on the day of the traverse or will be rejected and must be done again.

Traverse closure errors should be as small as possible. It is expected that the majority of traverse closures will be less than 0.100 mGal after correcting for Earth tide. Traverses with a closure error in excess of 0.200 mGal after correcting for Earth tide must be re-observed in their entirety with greater care.

Gravity and DGPS repeat measurements are to comprise a minimum of 5 percent of the final number of stations for quality evaluation. Repeat readings should be taken at all stages of the survey, in nearly every traverse. Two of the stations from the previous day's traverses will be re-occupied during each traverse by each crew. Repeat stations are to be noted in the field book. The final report should discuss the results of the repeat measurements and comment on the overall accuracy of the survey.

If a gravimeter experiences a shock during a traverse, the previous station must be re-occupied to determine that a tare has not occurred. This should be noted in the field book.

Note that repeat readings are not considered billable. They must be performed at the tenderer's own expense.

2.6.5 Data Reduction

The gravity values must be referenced to the IGSN71 datum and theoretical gravity must be derived from GRS67, {International Gravity Standardization Net 1971 (IGSN71) and the Geodetic Reference System 1967 (GRS67); (see Woolard, G.P., 1979. The new gravity system - changes in international gravity base values and anomaly values: Geophysics, v.44p.1352-1366.)}, for inclusion in the Namibian Gravity Data Base. Gravity data reduction is to be done using a recognized software package (for example Geosoft's Xcelleration – Gravity Reduction and Terrain Correction package). Latitude and tidal corrections must be an integral part of the data reduction program. Tenderers are required to include a description of the data reduction program that it proposes to use for this project.

As almost all of the topographic relief in the area is contained within Namaqua Metamorphic rock, the Bouguer gravity is to be calculated using a density of 2.1 g/cm^3.

The bidders are required to calculate a regional gradient for each profile and obtain the residual gravity by subtracting the regional from the Bouguer gravity. It is suggested that a profile-based upward continuation calculation be used to determine the regional gradient. The regional gradient calculation is to be made in consultation with the Ministry Project Manager (Geophysicist).

2.6.6 Equipment Log Book

The instrument operator must maintain and update an Equipment Log Book noting all equipment replacement and repairs throughout the survey and the results of calibration tests carried out on the equipment.

2.7 General notes

2.7.1 Halt of Operations

- Major earthquakes will halt survey

- Rain will halt operations until ground is deemed dry by the bidder and agreed to by the Project Manager.

2.7.2 Recollections

Tenderers must specify the quality control procedures they propose to adopt for the survey. Any data outside the given tolerances will be recollected at the bidder's expense.

3 QUALITY ASSURANCE (QA)/QUALITY CONTROL (QC) CONSIDERATIONS TO BE ADDRESSED BY TENDERER

The bidder shall be solely responsible for the quality of the work and must ensure that adequate quality control procedures are in place and are being strictly followed, so as to ensure such quality of work. The quality of the gravity data and the digital and hardcopy products is essential. The QA/QC, Project Manager or Geophysicist will be available for consultation on technical problems that may arise during the course of the field work and have the authority to approve, in writing, changes to the Technical Specifications that will not affect the general scope of the work to be performed.

The bidders are required to implement stringent QA/QC procedures including but not limited to the following:

3.1 Pre-survey

- ✓ The gravimeter has been heated and stable for more than 48 hours.
- ✓ All internal constants have been checked (digital meter).
- ✓ Reading line has been checked (analogue meter).
- ✓ X and Y tilt sensitivities have been checked and are within the gravimeter manufacturer tolerances.

- ✓ GPS accuracy is checked against benchmark heights.

3.2 Survey

- ✓ Daily instrument drift (after tidal correction) is monitored and charted for each gravimeter.
- ✓ Loop closures (after tidal correction) are verified to be within specification.
- ✓ Check to see that the gravimeter is correctly levelled before each reading and remains levelled until after the reading is completed.
- ✓ If gravimeter is jolted, repeat previous reading to determine if a tare has occurred.
- ✓ Ensure that internal gravimeter temperature remains stable.
- ✓ Reoccupy and repeat gravity measurements > 5% of stations.
- ✓ GPS staff height is recorded accurately and measured periodically.
- ✓ GPS location precision is to be checked at each station to ensure that it is within specification.
- ✓ Care should be taken to position stations away from steep slopes, if possible.

3.3 On-site processing

- ✓ Initial station location recovery and full inspection of all data will be done at the field office.
- ✓ Data acquired should be reduced on the same day.
- ✓ Repeated readings are to be compared and checked for consistency.
- ✓ Single point stations (spikes) are to be flagged and re-occupied and re-measured.
- ✓ Check that all specified roads have been surveyed in their entirety (except where safety or GPS signal is obscured).

3.4 Final processing

- ✓ Verify that on-site processing was completed correctly.
- ✓ Ensure that the digital archive is complete and formatted as specified.
- ✓ Check that the report includes all items specified in the Deliverables.
- ✓ Make sure that all other survey Deliverables are provided.

4 SCOPE OF DELIVERABLES

4.1 Outline

The final product will include all raw data (including gravity and DGPS location and elevation data), final data in the format of Geosoft data Gravity Database and a Project Report including maps as outlined below. Note that the final X, Y locations will be in Lat, Long, UTM ZONE 33S and datum WGS84 coordinates. The Report will include information such that it is understood how the survey was done and any of the problems encountered.

4.2 Weekly Progress Report

The bidder's Project Manager shall submit weekly reports each Monday morning describing the state of progress of the various aspects of the work as well as projections as to timelines for the completion of the work. These reports will be faxed or emailed to the Ministry Project Manager or QA/QC Geophysicist at locations or addresses to be designated.

Included in the reports will be:

(a) Base of operations utilized;

(b) Description of work
   - The number of stations, total to report date.
   - Field crew list and any changes in personnel.

(c) A statement of weather; downtime due to unserviceability (instruments, equipment);

(d) Visits by the Ministry Project Manager or QA/QC Geophysicist or other authorized persons;

(e) A sketch map (letter size) showing the area of data acquisition data.

4.3 Final Products

The bidder is responsible to deliver to the Ministry within three months after completion of data acquisition.

1) One master copy of each CD / DVD suitable for duplication and publication; for a period of 4 months, the bidder shall deliver a remaster to the Ministry if, and when, errors in the digital data are discovered; the remaster will be delivered at most, weekly, for the duration of the five-month period.

Copies of all digital data must be stored by the bidder for one (1) year after the safe delivery of the same data to the Ministry. During this time the data may not be erased except by explicit written authorization of the Ministry Project Manager or QA/QC Geophysicist.

After delivery of all final maps, any related materials, (including field notebooks and equipment logs) used to produce the final products will be delivered to the Ministry. The bidder must prepare a catalogue (as part of the Project Report) for all of these data and will submit it to the Ministry.

There are two main objectives to consider when preparing the final products. These are:

a) final products will be copied by the Ministry and distributed directly to clients; and
b) Final products must be complete, so that alternative data correction and processing procedures may be applied now or in the future.

The following is a summary list of final products. Additional details are provided later in this section. These product descriptions are provided as a template, as certain products are dependent on the type of System (e.g. gravity gradiometer). The contracted final products will be prepared in consultation with the bidder.

Table 1: Final Products for Publication

Point Data Archive	Gravity and Ancillary Data	ASCII	WBGRAV.XYZ
	Gravity and Ancillary Data	Montaj, binary	WBGRAV.GDB
Grid Files	DTM	ASCII, WGS84	WBDEM84.GXF
	DTM	Binary, WGS84	WBDEM84.GRD
	Free-air Gravity Field	ASCII, WGS84	WBFAGRAV84.GXF
	Free-air Gravity Field	Binary, WGS84	WBFAGRAV84.GRD
	Bouguer Gravity Field	ASCII, WGS84	WBBOGRAV84.GXF
	Bouguer Gravity Field	Binary, WGS84	WBBOGRAV84.GRD
	Residual Bouguer Gravity Field	ASCII, WGS84	WBRBGRAV84.GXF
	Residual Bouguer Gravity Field	Binary, WGS84	WBRBGRAV84.GRD
TIF Files	Residual Bouguer gravity field grid + planimetric base	GeoTIFF, WGS84	WBRBGRAV84.TIF
Vector Files	Gravity stations	DXF, WGS84	WBSTNS84.DXF
	Residual Bouguer gravity contours	DXF, WGS84	WBRBGRAV84.DXF

Report	Logistics, processing and product documentation	WORD	WARMBAD.DOC
	Logistics, processing and product documentation	PDF	WARMBAD.PDF
1:50,000 Map	Residual Bouguer gravity field grid + contours + base	WGS84	
1:50,000 profiles	Profiles of elevation, bouguer gravity, regional gradient & residual bouguer gravity	WGS84	WBxxPROF.map[1]
1:50,000 profiles	Profiles of elevation, bouguer gravity, regional gradient & residual bouguer gravity	WGS84	WBxxPROF.PDF[1]

1. Where "xx" is an assigned road number

4.4 Point Data Archive

The raw and processed data are to be delivered as an ASCII text file in GEOSOFT database format. The same data are to be delivered as a Geosoft® point database in GDB format. The WGS84 data format with UTM 33S addition is as follows:

TABLE 2: FORMAT OF THE DATABASE LOAD RECORD

COLUMNS	FIELD	MEANING
2 – 8	PROJ	project number in the form CCYYNNN where CCYY is the year of observation and NNN is a unique number
9	SECURITY	code (=3) to qualify data as secure or releasable
10 – 20	STN	numeric identifier in the form NNNNNNCCYY where NNNNNN is a unique 1 to 6-digit number and CCYY is the year
22 – 22	STN_TYPE	type of observation (not currently used)
26 – 30	INST	instrument identifier (e.g. G0932, W0431, X0054, etc)
32 – 42	DATE	date of observation in the form DD-MON-YYYY
44 – 47	TIME	time (GMT) of observation in the form HHMM
56 – 65	DECLAT	latitude in decimal degrees to (-ve south), WGS84 datum

67 – 77	DECLONG	longitude in decimal degrees to (+ve east), WGS84 datum
79 – 84	CAV	accuracy of the coordinates in metres (as code)
86	CSF	source code for coordinates (see Quality Values/Factors)
88 – 95	ELEV	elevation in metres above sea level
97 – 101	EAV	accuracy of the elevation in metres (as code)
103	ESF	source code for elevation (see Quality Values/ Factors)
115 – 119	DAV	accuracy of the depth or thickness in metres (as per form)
123 – 129	AJMT	adjustment to observed gravity in milligals (not used)
131 – 140	ADJG	adjusted gravity in milligals (referenced to IGSN71)
141 – 147	GAV	accuracy of adjusted gravity in milligals (as code)
149 – 154	TCOR	terrain correction in milligals (See formulae for Anomaly Computation)
156 – 160	TAV	accuracy of the terrain correction in milligals
162	TSF	source of terrain correction (as code)
164 – 172	EOTVOS	eotvos correction in milligals for dynamic gravity stations
174 – 183	BMID	bench mark identifier if applicable
185 – 191	FREEAIR	free air anomaly in milligals (See formulae for Anomaly Computation)
193 – 197	FAV	accuracy of the free air anomaly in milligals; computed using the accuracies of the values used in its computation
199 – 205	BOUGUER	Bouguer anomaly in milligals
207 – 211	BAV	accuracy of the Bouguer anomaly in milligals; computed using the accuracies of the values used in its computation
213	STATUS	status of the observation, as follows: A = Active D = Deleted
215 – 224	SPARE	spare field used for cross-reference numbering, etc
226 – 236	REVISED	date that record was processed or revised in the form DD-MON-CCYY
237 – 246	UTM 33S - X	WGS84, X location
247 – 256	UTM 33S – Y	WGS84, Y location

Notes:

1) Any position with no information is recorded as *. Terrain correction derived from Hammer B and C zone observations.
2) For all errors not directly measured, but estimated, the method of estimate will be included in the report notes.

3) Various items in the archive are identified as code. A form "Anomaly Database, Quality Control Values and Factors" originating with the Geological survey of Namibia, Geophysics Division will be made available to the bidder after contract signature.

4.5 Gridded Data

The following grids will be derived directly from the corresponding profile archive channels, unless otherwise noted. The grid resolution will be 50 m x 50 m. The minimum curvature gridding algorithm is recommended, but other gridding methods will be authorized with prior approval of the Ministry, particularly if they can be demonstrated to produce superior grids from the current survey data.

The QA/QC Geophysicist or Project Manager will work with the bidder to determine the regional Bouguer gravity field.

4.6 Profile Plots

The bidder is to prepare a 1:50,000 scale profile plot for each traverse. The plots are to contain:

(a) profiles of elevation;
(b) bouguer gravity;
(c) regional gradient; and
(d) Residual gravity.

The offset scales should be consistent between traverses and chosen for maximum clarity. A digital version of each profile plot is to be delivered in Oasis-Montaj™ map and PDF formats.

4.7 Map product

The following map product must be prepared in digital form:
1:50,000 scale colour-filled contours of residual Bouguer gravity with Ministry-supplied planimetric base and map surrounds;

Map Layout:

The map tiles at 1:50,000-scale will be prepared by the Ministry and will make best use of E-size (and longer) map sheets. The maps will incorporate relevant geographic references (i.e. UTM co-ordinates, latitude/longitude co-ordinates, township boundaries), index maps, titles, technical descriptions, scale bars, contour legends, flight line legends, descriptive notes, and other map face elements determined by the Ministry. The OGS Data Manager will prepare, in consultation with the Supplier/Vendor and the QA/QC Geophysicist, the planimetric base map and the map surrounds for each map product and each tile, as an OASIS montaj MAP file. The tenderer shall incorporate the relevant geophysical image and vector data while maintaining the integrity of the map tiles supplied by the Ministry.

4.8 Report

The final Report provides documentation for all stages and aspects of the survey. It will include information on the purpose, planning, field operation, logistics and data processing. It should not be particularly long, but it should contain all the technical facts that influenced how the data were collected and processed. The final report should comprise two parts:

(a) A Field Operations Report; and

(b) A Data Processing Report.

(c) An Interpretive Report

This should be completed within two (2) month of the end of the field survey. An interpretive report is required.

4.8.1 Field Operations Report

The objective of the Field Operations Report is to provide pertinent facts related to the actual field operations such as logistics and transportation, data collection, instrument performance and problems, processing problems, etc. It should include such information as:

Type of Survey – Regional Detail

1) Purpose and region of the survey
   a. objective of the survey;
   b. location map of the survey;
   c. Map references.

2) Project Elements
   (a) time frame;
   (b) personnel;
   (c) safety;
   (d) transportation;
   (e) instrumentation – gravity meters, GPS receivers and antenna, etc.;
   (f) gravity field books used;
   (g) gravity control stations established and sequences used;
   (h) station spacing (includes comments on accessibility and variances);
   (i) Brief discussion of methods used for gravity and horizontal and vertical control.

4.8.2 Data Processing Report

The data processing report will be written on completion of all data collection and processing, and forms part of the Final Report. This is to review and document both the procedures used and problems encountered in observing and processing the data, and make specific recommendations for improvement of data collection, processing and quality control.

The Data Processing Report should contain the following:

1) Gravity control network and gravity metre calibration procedures
   - estimated precision and/or accuracy
   - methods of quality control
   - problems and recommendations for improvement

2) Horizontal Control procedures
    - estimated precision and/or accuracy
    - methods of quality control
    - problems and recommendations for improvement

3) Vertical Control procedures
    - estimated precision and/or accuracy
    - methods of quality control
    - problems and recommendations for improvement
4) Gravity Traverse Data procedures
    - estimated precision and/or accuracy
    - methods of quality control
    - problems and recommendations for improvement

Complete documentation of all digital data and products is required, forming an appendix to the survey report. The document must describe the content, units and co-ordinate systems for all profile archive channels, grids, digital maps and other data. The Ministry will provide to the bidder a template for the report prior to the completion of the production data collection.

4.8.3 Data Interpretation Report

The interpretation data report will be written on completion of all data collection and processing, and forms part of the Final Report. This is to review and document both the procedures used and problems encountered in observing and interpreting the data, and make specific recommendations for improvement of data collection, processing, interpreting and quality control. Latest map geological should be used with the data during interpretation.

4.9 International Gravity Standardization Net (IGSN) Compliance

A statement of compliance with the standards set forth by the International Gravity Standardization Net 1971 (IGSN71) and the Geodetic Reference System 1967 (GRS67) will be required and should be included as part of the report.

4.10 Warranty

The digital final products submitted and approved by the Ministry will be subject to a one-year warranty period following the completion of the fiscal year in which the Project is carried out. The warranty period will end **August 31, 2023**. If, during that period, the Ministry discovers any errors in a final product and notifies the bidder, then the bidder must repair the error at its own expense and resubmit any and all final products that have been affected by the error within thirty (30) days of the notification.

5 PROJECT SCHEDULE

The following is a provisional Project Schedule: **December 31, 2022** – Data acquisition completed: **April 30, 2023** – Delivery of all survey products completed. Regardless of the completion date for data acquisition, the three-month period allowed for delivery of all survey products from that date will be strictly adhered to.

Table 3

	% OF CONTRACT ALLOCATION RELEASED	MILESTONE THAT TRIGGERS PAYMENT	MEASURE THAT MILESTONE IS COMPLETED
1	7	Survey plan, incorporating the deployment of crews, schedule for data acquisition and delivery of interim and final products. Due: four week after notification of contract award.	Ministry receives certification from QA/QC Geophysicist or Project Manager that an acceptable survey plan has been received.
2	7	QA/QC plan, incorporating in-field and post-field QA/QC. Due: after meeting with QA/QC Geophysicist or Project Manager but prior to survey mobilization.	Ministry receives certification from QA/QC Geophysicist or Project Manager that an acceptable QA/QC plan has been received.
3	10	Completion of 25% of survey.	Ministry receives from QA/QC Geophysicist or Project Manager production certification.

4	10	Completion of 50% of survey	Ministry receives from QA/QC Geophysicist or Project Manager production certification.
5	10	Completion of 75% of survey.	Ministry receives from QA/QC Geophysicist or Project Manager production certification.
6	10	Completion of 100% of survey and Delivery of all production data. Due: prior to demobilization from survey site.	Ministry receives from QA/QC Geophysicist or Project Manager production certification.
7	11	Delivery of "1st. draft" of publication products to QA/QC Geophysicist. Due: within two month after completion of data acquisition, but no later than June 15, 2019	Ministry receives acceptance note from QA/QC Geophysicist or Project Manager.
8	15	Delivery of final publication review interim products to QA/QC Geophysicist. Due: within three months after completion of data acquisition, but no later than June 30, 2019	Ministry receives acceptance note from bidder Data Manager and QA/QC Geophysicist or Project Manager.
9	20	Delivery of all final Master DVD/CD-ROM products (publication and plot files) to OGS Data Manager. Due: within three months after completion of data acquisition, but no later than June 31, 2019	Ministry receives acceptance note from Bidder Data Manager.
	100		

6 CARTOGRAPHIC SPECIFICATIONS

The Ministry will provide the bidder with

- all Geosoft map files containing topographic base map and legend
- technical specifications for data to be added by bidder

Data groups collected by the contractor/bidder must be added to the "data view" of each Geosoft map file, symbolized as per the technical specifications supplied. The only exception would be the colour bar, which is to be added to the "legend view".

The groups, within the "data view" are to be ranked as follows (front to back)

MNDM supplied / tenderer supplied

- neatline
- lat & long
- annotation
- annotation drainage
- gravity stations

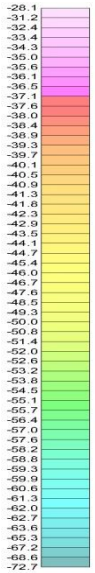
- contours
- colour image
- roads primary
- roads secondary
- roads trail
- railroad
- power line
- pipeline
- rivers
- UTM grid
- Administrative boundary

Table 4: 1:50 000 Ground Gravity Survey

(Including Calculated Bouguer Gravity Contours and Station locations)

Description	**Symbol**	**Cartographic Specifications**			**Notes on Usage**
		Font Paper size (mm) - Ground units <m>	Line thickness Paper size (mm) Ground units <m>	Colour (R,G,B)	
Magnetic Contours	**N.B. contour interval may vary according to complexity of field**				
1 milliGal			(0.1) - <5>	Red (255,0,0)	
5 milliGal			(0.15) - <7.5>	Red (255,0,0)	
25 milliGal			(0.25) - <12.5>	Red (255,0,0)	
100 milliGal			(0.35) - <17.5>	Red (255,0,0)	
Gravity depression			(0.1) - <5>	Red (255,0,0)	triangle base = 1mm triangle height = 1.5mm
Contour number		Arial True Type Font (1.75) - <87.5>		Red (255,0,0)	
Gravity station		Arial True Type Font (1.5) - <75>		Black (0,0,0)	black outline, white fill

Table 5: 1:50 000 Ground Gravity Survey
(Including Calculated Bouguer Gravity Contours and Station locations)

Description	Symbol	Cartographic Specifications			Notes on Usage
		Font Paper size (mm) - Ground units <m>	Line thickness Paper size (mm) Ground units <m>	Colour (R,G,B)	
Colour Bar					use the pastel.tbl colour breaks should match contour intervals insert grid colour bar into the "legend view"; positioned within the box provided
Colour bar number		Arial True Type Font (2.0) - <100>		Black (0,0,0)	Bouguer gravity (mGal) values 1 decimals
Colour bar box			(0.15) - <7.5>	Black (0,0,0)	colour boxes: box height 6 mm box width 14 mm

RATE BID FORM

RATE BID TABLE 6: GROUND GRAVITY SURVEY					
Conducting regional integrated interpretation and ground gravity geophysical surveys in the //Karas Region, Warmbad sheet					
BIDDER'S LEGAL NAME:_____					
Number of Stations to be Surveyed (Exclusive of repeat stations)		**Mobilization and Demobilization Cost**	**Gravity cost per station**	**Gravity Survey Total Cost** (Columns A+C+(BxD))	**Data Promotion at 2 international conferences**
Column A	Column B	Column C	Column D	Column E	
New Base Stations (5)	4200 + 5 base stations	N$_____	N$_____ per station	N$_____	
Subtotal:				**N$**	
Vat:				**N$**	
TOTAL (This total will be used for Evaluation purposes)				**N$**	_____

- Bidders must not amend this Form in any way other than by providing the requested information.
- No other fees or charges are payable for the Deliverables other than those set out on this Form.
- A bidder's proposal may be disqualified if a price category is left blank.
- **Note:** This part/form must be removed and must be inserted into the financial proposal envelope

7 ANNEXURE 2: EVALUATION CRITERIA

The Ministry of Mines and Energy is using the set standards as included in the Procurement Act, 2015. Bidders will be evaluated for Compliance with the obligatory Namibian Tender Regulation and Requirements:

7.1 Completion of tender document

a) All compulsory pages must be initialled
b) Incomplete tender documents and omission of relevant information leads to disqualification from further tender evaluation.
c) Failure to initial each page of the tender documents leads to disqualification of the tender offer.

7.2 The following obligatory documentary evidence is required and should be attached during the submission of the tenders

7.2.1 Have a valid **company Registration Certificate**;

7.2.2 Have an original valid **good Standing Tax Certificate**;

7.2.3 Have an original valid good **Standing Social Security Certificate**;

7.2.4 Have a valid certified copy of **Affirmative Action Compliance Certificate, proof from Employment Equity Commissioner** that bidder is not a relevant employer, or exemption issued in terms of Section 42 of the Affirmative Action Act, 1998

7.2.5 Have a valid SME certificate

NB: For international companies (**foreign companies)**/bidder, please provide **company registration**. The eligibility criteria above applies to the local companies.

7.3 Technical evaluation (70%)

7.3.1. The technical evaluation will count twenty (**70%)** and whereas financial will count 30%

7.3.2 Furthermore, Bidders will be evaluated for compliance with the terms of reference.

Criteria, sub-criteria, and point system for the evaluation of Full Technical Proposals are:

Points

(a). Technical Approach and Methodology [14]

(b). Survey equipment's and Instrumentation

i. Gravity Meter (s) x 2 [5]

ii. Differential positioning system (s) x 2 [5]

Total points for criterion (a & b): [24]

(c) Key professional staff qualifications and competence for the assignment:

i) Team Leader x1 [5]

ii) Technicians x 2 [10]

iii) Geophysicist x 2 [10]

iv) Geologist x 1 [5]

Total points for criterion (c): [30]

(d) Work Plan

(i) Logistical plan (Pre-survey, Survey and Post- survey) [10]

(ii) Project Schedule [6]

Total points for criterion (d): [16]

Total points for the four criteria: [70]

7.4 Financial (30%)

7.4.1The price is of essence and the lowest bidder within the budgeted amount will be allocated the highest score (**30 marks**)

7.5 Cumulative Score and Selection of Highest Scoring tenderer

At the conclusion of point 4, all scores from point 2 and point 3 will be added and, subject to satisfactory reference checks, completed security clearances (if required) and the express and implied rights of the Ministry, the highest scoring proponent will be awarded the bid.