MALREN GEO
FOR SATISFACTORY GEO-SERVICES

MalRen Geo (Pty) Ltd.
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Geological Services

Mineral Exploration

- **Project Planning and Management – Effective development and management of project-specific quality programmes that cater for the clients exploration objectives.**

This includes (but not limited to):

- Community relations and stakeholder engagement.
- Field camp design and site construction.
- Human resources appointment and administration.
- Implementation of health and safety measures.
- Material procurement and supply chain management.
- Logistics and vehicle fleet management.
- Overall Project planning, budgeting and permitting.
- Competent/Qualified Persons, drilling personnel and commercial laboratories contracting.
- Development, planning, application and management of exploration sub-services.

- **Mineral Targeting – Improvement of the orebody search through comprehensive understanding of the target mineral by aid of exploration and field techniques coupled with cutting-edge technologies.**

This includes (but not limited to):

- Geological desktop studies (i.e. literature review, data reconnaissance, etc.).
- Regional- to local-scale geological and structural mapping.
- Application of geospatial analyses and remote sensing techniques (production of interactive and updateable geological/structural/GIS maps and models that help target deposits).
- Field geology (including inspection of terrain and surface exposures).
- Analysis and applicability of related mineral systems (i.e. comparisons and contrasts of the spatial and temporal co-occurrence of mineral deposits within a specific mineral province).
- Dynamic and interactive 3D geological/ore body/structural modelling (i.e. using Leapfrog, DataMine, etc.).
- Delineation of mineralisation controls and mineral grade distributions.

- **Exploration Field/Site Services – Effective methods that best help in interacting and properly understanding the subsurface geology.**

This includes (but not limited to):

- Ground geophysical survey methods and data acquisition.
- Development, planning and implementation of dynamic drilling programmes (including budgeting, drilling method, drilled hole collar and positioning, as well as contracting and management of drilling personnel).
- Implementation of geological/structural logging with the aid of uniform project-specific logging procedures (e.g. core/RC chips/percussion chips logging) that are in compliance with associated logging principles.

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- Establishment of storage facilities (e.g. core yard/storage).
- Development and application of QA/QC procedures pertaining to field services (i.e. effectiveness of the drilling method, logging procedures, storage, correct and uniform database capturing and documentation).

❖ **Sampling Strategies and QA/QC Procedures – Essential for the increase in the accuracy and overall level of confidence in the geological data and resource estimates.**

➢ **This includes:**

- Development and planning of exploration sampling programmes.
- Application of uniform and project-specific sampling methods and collection procedures.
- Development and application of QA/QC procedures (i.e. monitoring sample for collection, storage, recovery, preparation, and analysis at working sites and commercial laboratories).
- Capturing of sampling data in an interactive database system.

❖ **Petrographic and Geochemical Investigations – Delineation of anomalous and target mineralisation through strategic sampling and analysis of selected samples by using advanced laboratory techniques.**

➢ **This includes (but not limited to)**:

- Development and planning of an exploration geochemical programme (including budgeting, as well as contracting and management of commercial laboratories).
- Determination and implementation of project-specific sampling strategies and QA/QC procedures (e.g. drilled core, soil, sediment sampling, etc.).
- Petrographic investigations (microscopic studies including optical microscopy, SEM, TEM, etc.).
- Determination and implementation of relevant geochemical analytical techniques (XRF, XRD, ICP-MS, ICP-AES, LA-ICPMS, EPMA, Fire Assay, etc.).
- Analysis, interpretation and reporting of petrographic and geochemical data.
- Integration of geochemical data with mineral targeting data (i.e. enhance the delineation of mineralisation controls and mineral grade distributions).

Resource and Reserve Estimations

❖ **Geostatistical and Mineral Analysis – Ensures an enhanced understanding of ore deposit grade distribution and continuity, as well as the accurate and precise description and classification of mineral resources and compute selective mining.**

➢ **This includes (but not limited to):**

- Development and planning of a geostatistical and mineral analysis programmes by Competent and Qualified Persons, as per the requirements listed by international reporting codes or standards, such as SAMREC, JORC and NI 43-101.
- Composite length analysis.
- Geological and statistical domaining.
- Statistical analysis (uni-, bi- or multivariate).
- Spatial analysis and de-clustering.
- Multivariate correlation, interdependency, and regression analysis.
- Variographic analyses (raw, pairwise, and Gaussian transforms).
- 2D and 3D environment development for statistical and geostatistical analysis.
- Outlier and top-cut analysis.

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❖ **Grade Estimations – Enables the accurate development of 3D ore grade models by aid of a variety of estimation and simulation strategies.**

➢ **<u>This includes (but not limited to)</u>:**

- Customised statistical and geostatistical analysis.
- Grade interpolation.
- Dynamic and interactive 3D ore body modelling.
- Integration with the 3D geological/structural model.

❖ **Resource Estimations – Systematic application of conditional simulation to mineral resource evaluations in order to create ore mineral resource models.**

➢ **<u>This includes (but not limited to)</u>**:

- Data collection.
- Simulation model building and reporting.
- Mineral resource modelling.
- Simulation model validation.
- Use of simulation results to assess interpolated model ore grade and tonnage predictions.
- Use of simulated models for resource classification and ore/waste delimitation.

Project Audit and Evaluation

❖ **Due diligence investigations – Overall verification and validation of the quality of the geological data and any associated geological risks.**

➢ **<u>This includes</u>:**

- Review of Prospecting and Mineral Rights Applications in South Africa.
- Application of due diligence studies of exploration projects and small-scale operating mines.
- Overall project risk assessments and potential opportunities.
- Contracting of Competent and Qualified Persons, as per the requirements listed by international reporting codes or standards, such as SAMREC, JORC and NI 43-101 for verification and validation.

Mining Geology

❖ **Mine Planning Optimisation and Profitability - Enables the effective reduction in operating costs, increases operation safety, as well as the improvement in ore grades, recovery, and throughput.**

➢ **<u>This includes (but not limited to)</u>**:

- Development, execution and management of underground/open-pit drilling programmes.
- Grade control studies and reconciliation (i.e. by aid of continuous logging and sampling procedures).
- Underground/open-pit geological/structural mapping and evaluation.
- On-site geological modelling, mineral resource estimation and continuous modification of the already compiled models (including the compilation of block models).
- Stockpile control and management.
- Development and compilation of Mine Works Program (MWP) in accordance with Department of Mineral Resources (DMR) regulations.

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Database Setup and Management

- ❖ **A system that ensures accurate and uniform data capturing, validation, integration and management across a wide range of geological sub-services and various MalRen Geo Divisions.**
- ➢ **<u>This includes (but not limited to)</u>**:
- Setup and management of a customised geological database system.
- On-site or office-based data collection and capturing.
- Integrated information systems and their management.
- Data validation and application of QA/QC procedures.

Prospecting and Mineral Rights Applications in South Africa

- ➢ **<u>This includes</u>:**
- Formal Prospecting and Mineral Right applications.
- All geological studies as required by Department of Mineral Resources (DMR) for the Prospecting Right applications.
- Competent and Qualified Persons reports for Prospecting and Mineral Rights Applications (i.e. All required geological and due diligence reports).
- Geological support services for mine operation (i.e. including on-mine exploration and mine geology services).