
# CARDS EVALUATION REPORT VAKKERLIEN-ROSTVANGEN PROJECT TYNSET, HEDMARK COUNTY, NORWAY

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# 1.0 SUMMARY

On behalf of PLAYFAIR MINING LTD. (PLAYFAIR MINING) a Computer Aided Resources Detection System (CARDS) evaluation was carried out by ALBERT MINING Inc. (ALBERT MINING) over the Vakkerlien-Rostvangen Project located in southern Norway (Tynset municipality, Hedmark County area). The purpose of this study was to identify favorable exploration VMS copper-zinc and nickel-copper Magmatic targets based on the analysis of all available geophysical and assays data using artificial intelligence and data mining techniques.

During the months of March through to May 2019, a total of 974 training points were subjected to evaluation using the Kvikne Airborne Magnetic-Electromagnetic survey (40m resolution), conducted in 2004 and covering 90% of the PLAYFAIR MINING's Vakkerlien & Rostvangen properties in Tynset municipality, Hedmark County area (surface area of 295.96 $km^2$). The variables used for modeling include magnetic and electromagnetic data from the Kvikne survey and the Digital Elevation Model (DEM) data from Geonorge-Kartkatalogen.

ALBERT MINING generated nineteen (19) VMS copper-zinc targets, and eight (8) nickel-copper Magmatic targets located within PLAYFAIR MINING's Vakkerlien & Rostvangen properties (Tynset, Hedmark County area).

The CARDS's algorithms have allowed the Vakkerlien-Rostvangen Project area (Tynset municipality, Hedmark County area) to be highlighted based on the similarities to known VMS copper-zinc and nickel-copper Magmatic mineralized sectors inside the area covered by the geophysical data. Therefore, the VMS copper-zinc and nickel-copper Magmatic targets generated and presented in this report should be evaluated thoroughly by PLAYFAIR MINING in order to define all appropriate exploration targets.

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# 2.0 INTRODUCTION

In March 2019, ALBERT MINING Inc. (ALBERT MINING) was mandated by PLAYFAIR MINING LTD. (PLAYFAIR MINING) to use its proprietary Computer Aided Resource Detection System (CARDS) over the Vakkerlien & Rostvangen properties (Tynset municipality, Hedmark County area), Norway.

The Vakkerlien-Rostvangen project is located in the historic Roros mining district in southern Norway and covers two past producing Besshi-type VMS copper mines (Kvikne & Rostvangen), a nickel-copper magmatic deposit (Vakkerlien) and twenty additional known mineral occurrences (PLAYFAIR MINING's website). These mines, deposit and occurrences lies within strongly folded metasediments and metavolcanics rocks of the Gula Group in the central Norwegian Caledonides (Nilsen & Mukherjee, 1972; Rui, 1973).

This region was well suited for analysis by CARDS due to the large amount of information available. The elements of the databases used to construct the VMS copper-zinc and nickel-copper Magmatic prediction models were entirely provided by PLAYFAIR MINING: DDH & Rock Samples database and the Kvikne 2004 Airborne Magnetic-Electromagnetic survey data. In addition, the Digital Elevation Model (DEM) data from Geonorge-Kartkatalogen (National website for map data and other location information in Norway), was integrated into the modeling process to characterize the topography input.

CARDS uses data mining techniques to analyze compiled exploration data and to identify areas target zones with high statistical similarity to known areas of mineralization.

Using CARDS, ALBERT MINING generated target zones with high similarities to known "signatures" of areas of VMS copper-zinc and nickel-copper Magmatic mineralization.

The purpose of this report is to present the CARDS modeling results over the PLAYFAIR MINING's Vakkerlien & Rostvangen properties (Tynset municipality, Hedmark County area). These results are presented in tables, figures and attached maps, and are discussed at the end of this report.

# 3.0 RELIANCE ON OTHER EXPERTS

In the course of this study, ALBERT MINING used data provided by PLAYFAIR MINING and data downloaded from Geonorge-Kartkatalogen (National website for map data and other location information in Norway). The author has not taken any action to verify or assess reported data. If not commented, the author considers the documentary sources as reliable, technically valid and usable with some restriction related to the present frame of work and the experience of the authors.

Target zones on the Vakkerlien-Rostvangen Project area were generated using ALBERT MINING proprietary Computer Aided Resource Detection System (CARDS) in collaboration with "Data Mining Team" of DIAGNOS Inc. Generation of these targets using "data mining techniques" was carried out by Riadh Kobbi, Data Modeling Manager at DIAGNOS Inc., co-author of sections 6.0 to 9.0 of this report. The author has relied on the opinion and work of Riadh Kobbi responsible for target zone generation using CARDS system of ALBERT MINING.

# 4.0 PROJECT LOCATION AND ACCESSIBILITY

The area of the PLAYFAIR MINING's Vakkerlien-Rostvangen Project covers a total aggregated surface area of 295.56 $km^2$ located in the Tynset municipality, Hedmark County area of Southern Norway (Figure 1), approximately 350 km north of Oslo and 100 km south of Trondheim (Figure 2). This area encompasses the PLAYFAIR MINING's Vakkerlien and Rostvangen properties and is crossed by Norwegian National Road 3 (Rv3) and numerous secondary roads (PLAYFAIR MINING's website).

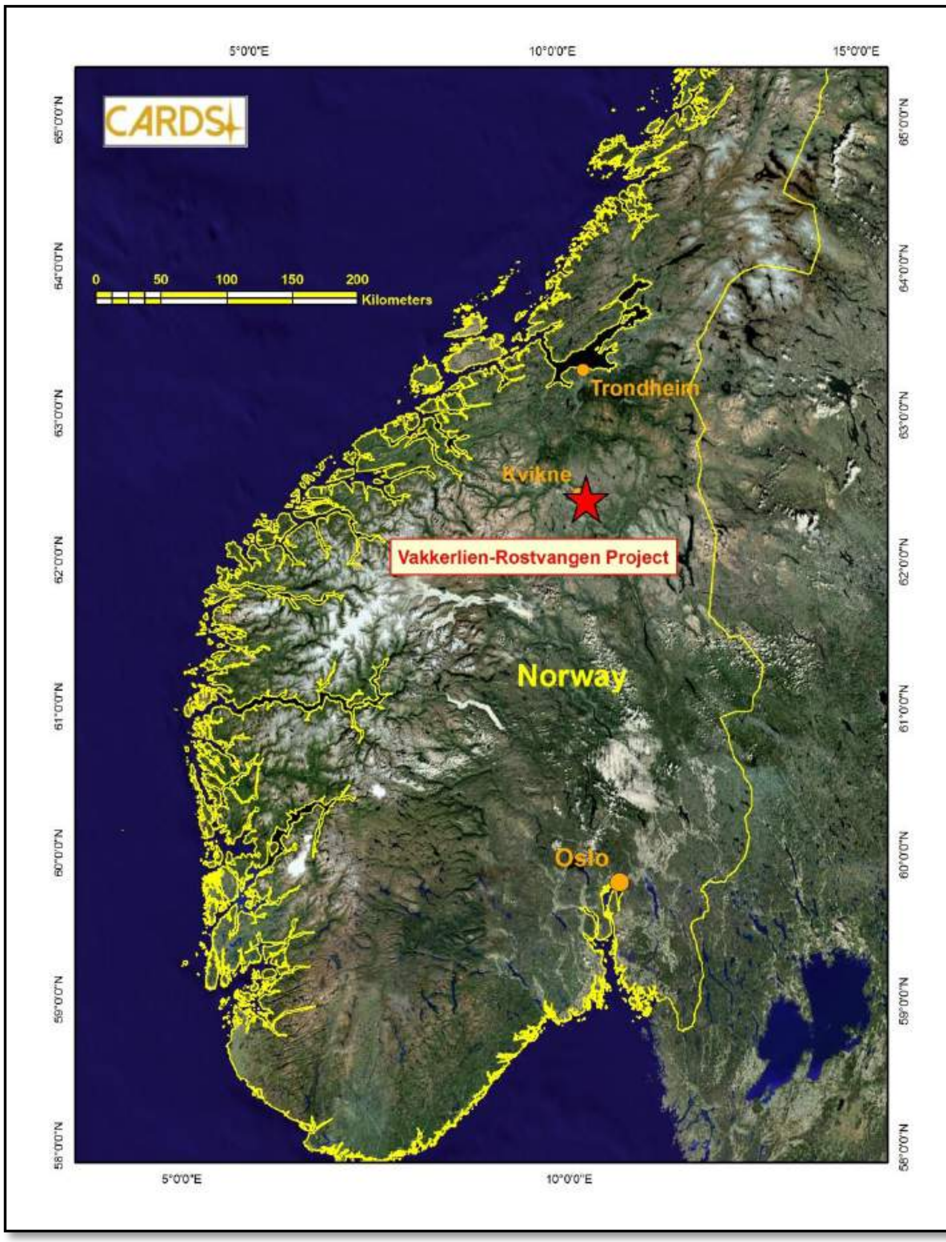


Figure 1 : Vakkerlien-Rostvangen Project Location.

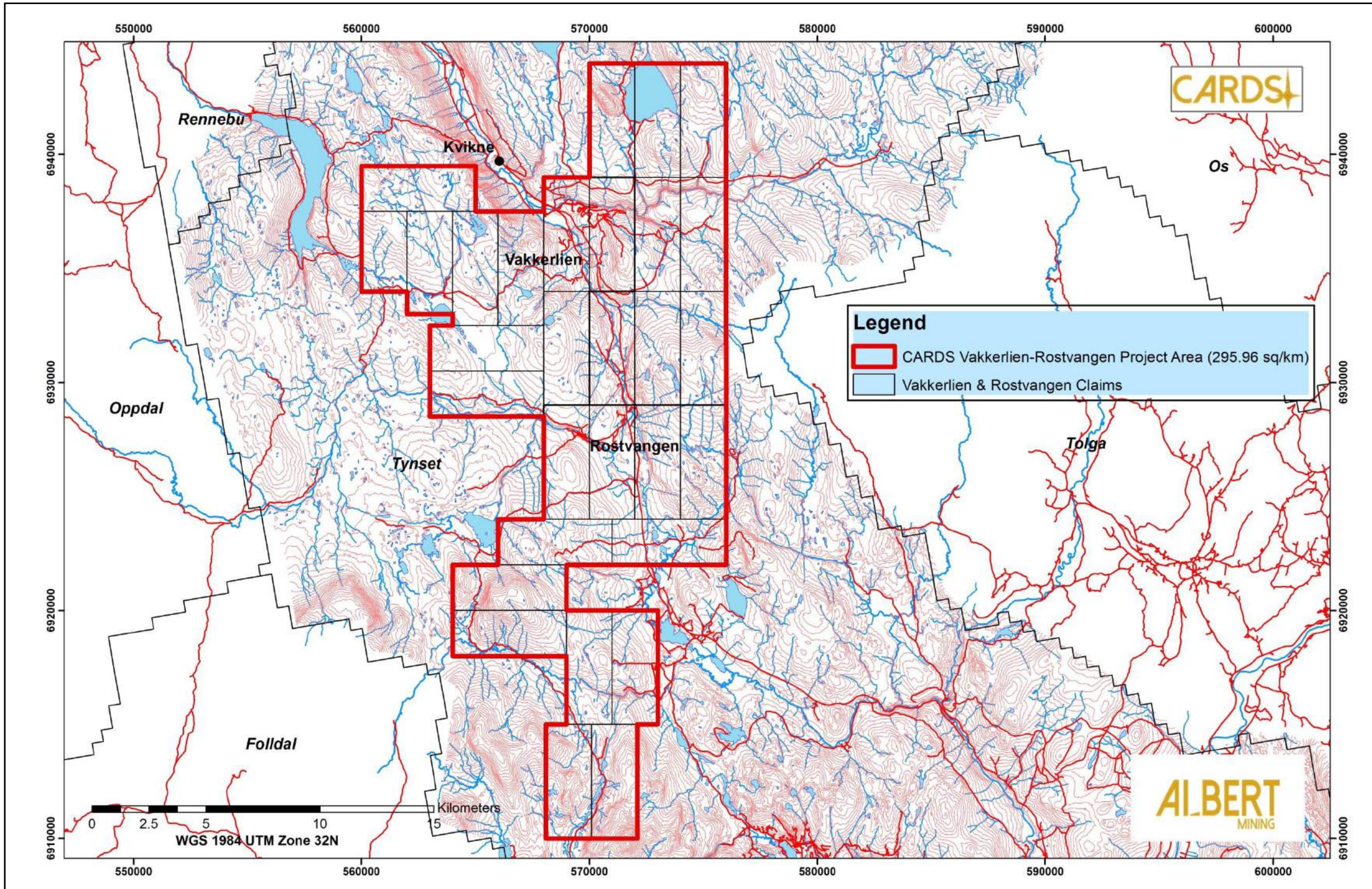


Figure 2: CARDS Vakkerlien-Rostvangen Project Model Location.

# 5.0 GEOLOGICAL SETTING

The regional geology has been taken in their integral form from Thompson, J. F. H., Nixon, F. and Sivertsen, R., 1980: "*The geology of the Vakkerlien nickel prospect, Kvikne, Norway*". While, the mineralization section has been taken in their integral form from: (1) Nilsen, O. & Mukherjee, A.D., 1972: "*Geology of the Kvikne mines with special reference to the sulphide ore mineralization*"; and (2) Rui, I.J., 1973: "*Geology and structures of the Rostvangen sulphide deposit in the Kvikne district, central Norwegian Caledonides*".

## 5.1 Regional Geology

The Vakkerlien-Rostvangen Project is located within the Gula group of the central Scandinavian Caledonides (Figure 3). "The Gula group is considered to be the oldest unit of the Trondheim or 'Upper' nappe, the highest allochthonous slice in this part of the Caledonides. Regional tectonic models (Gee, 1975 a, b, and 1978) suggest a major tectonic break between the Trondheim or 'Upper' nappe and the units to the east, based on faunal evidence characterizing two different Palaeozoic faunal provinces (Gee and Zachrisson, 1974). Internal tectonic breaks within this nappe have also been proposed, including a break between the Gula on trace element geochemistry (Gale and Roberts, 1974). Such breaks present problems when correlating the Gula group in regional tectonic models".

"The Gula group has been postulated to be Cambrian in age, based on circumstantial evidence and the age of overlying units (Wolff, 1967). The presence of a variety of possible tectonic breaks places this age in doubt. Recent work in the Guga group, however (D. I. Rainey, pers. comm.), may clarify some of these problems, suggesting a more continuous stratigraphic sequence and confirming a Cambro-Ordivician age for the Gula group".

"The Gula group consists of largely psammitic, calcareous, graphitic and politic schists with subordinate amphibolites and rare bodies of ultramafic and gabbroic affinities. Various studies in the Gula of Sor Trandelag have assigned it a medium to high amphibolite grade (Nilson and Mukherjee, 1972; Guezou et al., 1972; Pinna, 1973; Rui and Bakke, 1975)".

"Structural observations on the Gula group north of Trondheim have delineated four phases of deformation (Roberts et al., 1970), the major deformation being two isoclinal fold phases. Similar structural observations have been made south of Kvikne at Rostvangen (Rui, 1973), and at the Kvikne mines (Nilson and Mukherjee, 1972)".

"All the Gula group rocks are found in the Kvikne region striking parallel to the regional foliation. An attempt at establishing a stratigraphy has been made at Rostvangen (Rui, 1973), although repetition by isoclinal folding prevents establishing any uniform stratigraphy regionally. In the immediate vicinity of the Vakkerlien metagabbro bodies, banded and laminated pelitic and calc-silicate schists predominate with minor psammitic bands. The contact mapped on the Litlinna arbitrary one based on an increase in psammitic and graphitic bands. The complex interbanding of different rocks and the resultant chemical inhomogeneity have resulted in reactions occurring between layers during metamorphism and, consequently, no uniform pelitic or calc-silicate system can be found to define metamorphic grade".

"Felsic intrusions, largely trondhjemites, with subordinate diorites and pegmatites, are common throughout the region. Their form varies from large masses to minor bodies and concordant and discordant sheets. A range of cross-cutting relationships indicates a complex sequence of intrusion, although all the bodies in the Vakkerlien grid area postdate the major isoclinal folding events".

## 5.2 Mineralization

The Vakkerlien-Rostvangen project is located in the historic Roros mining district in southern Norway and covers two past producing Besshi-type VMS copper mines (Kvikne & Rostvangen), a nickel-copper deposit (Vakkerlien) and twenty additional known mineral occurrences (PLAYFAIR MINING's website). These mines, deposits and occurrences lies within strongly folded metasediments and metavolcanics rocks of the Gula Group in the central Norwegian Caledonides.

According to the Norwegian Geological Survey (NGU), (from PLAYFAIR MINING's website):

- Kvikne mine produced about 250,000 tons of ore between 1629 and 1789. Dump samples taken by NGU in 1998 assayed up to 3.14% copper, 6.35% zinc and 0.06%.

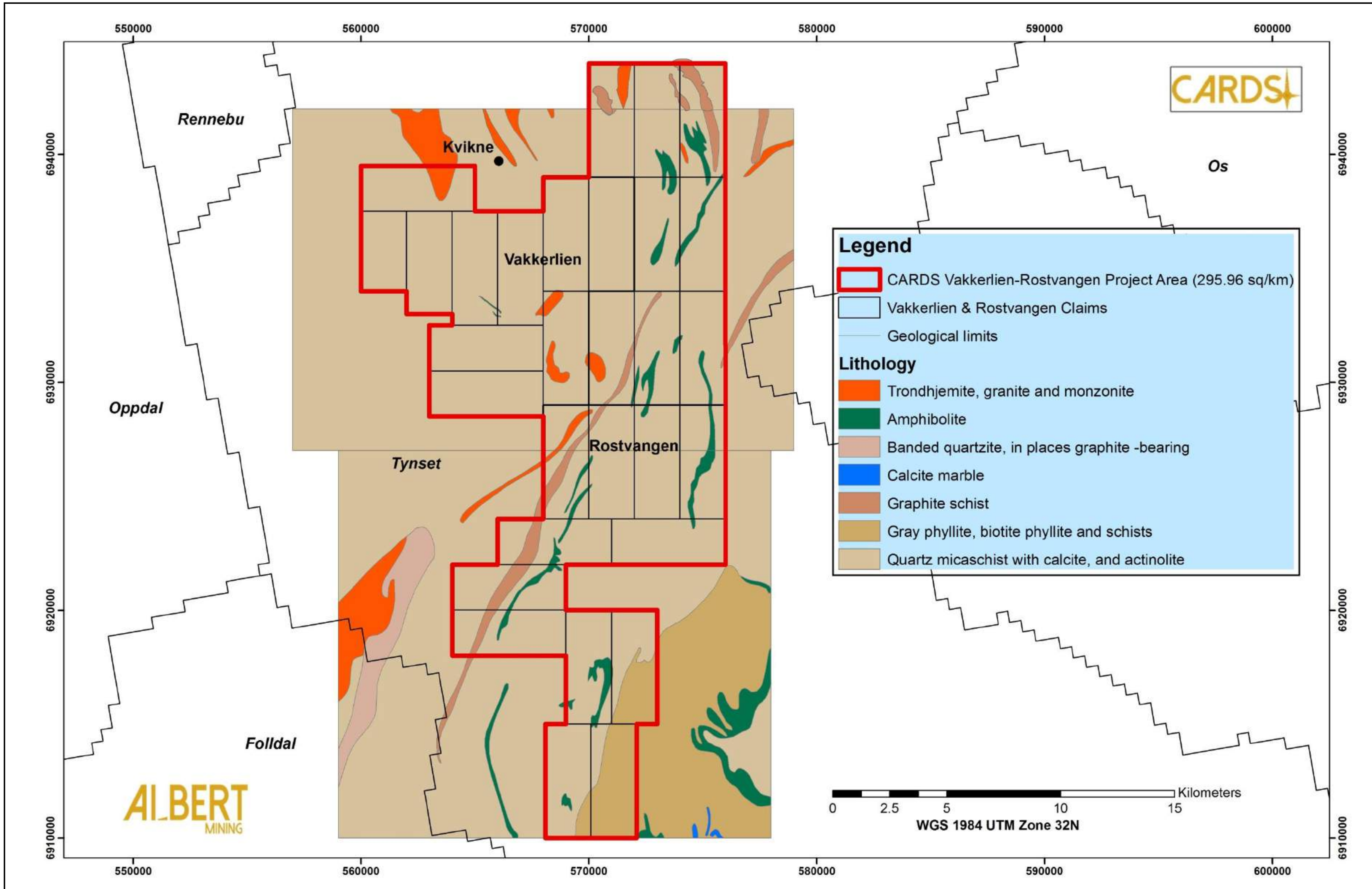


Figure 3: Bedrock Geology Map of the Vakkerlien-Rostvangen Project.

- In Rostvangen mine, 388,000 tons were mined from 1908 to 1920 and 100,000 were left in "reserves". Bedrock samples taken by NGU in 1998 assayed up to 6.96% copper,0.59% zinc and 0.08%
- A (non 43-101 compliant) resource of 400,000 tons of 1.0% nickel and 0.4% copper was calculated by Falconbridge Nickel Mines in 1977 at Vakkerlien deposit.

"The major ore deposits at Kvikne mine are confined to the amphibolite horizons in the area and occur usually at the border between the amphibolite and altered varieties of the enclosing mica schists. Deposits within the amphibolite are never seen, but sulphide mineralizations frequently occur in the schists adjacent to the amphibolite. The deposits can be divided into two principal classes: Pyritic/Chalcopyritic ore deposits and Pyrrhotitic ore deposits. The deposits of the first class comprise from an economical point of view the most important sulphide mineralizations in the area on which the most extensive exploitation has taken place. The second class of deposits often accompanies the ores of the first class and occurs in general as a border zone between the mica schists and the amphibolite. They are all deficient in copper ore and must be regarded as pyrrhotite-impregnated wall rocks of the amphibolite".

"The Rostvangen mine consists of a series of elongated, lenticular small bodies of massive ore mutually arranged in an overlapping en echelon pattern. The massive ore bodies at Røstvangen mine are chiefly composed of fine to medium-grained aggregates of sub- to euhedral pyrite embedded in a matrix which comprises mainly chalcopyrite, pyrrhotite, and minor amounts of sphalerite. In addition there are local concentrations of massive magnetite ores low in sulphides and of high-grade chalcopyrite-pyrrhotite ores".

"The Vakkerlien nickel prospect is a small sulfide mineralized zone centrally located within a metagabbro body. The body, and a second barren metagabbro, is elongated parallel to the regional lineation. Both are compositionally zoned across the bodies from ultramafic to metagabbro. The composition of the bodies suggests that they may represent a differentiated mafic sheet, the sheet being disrupted into its present form during regional deformation. Pyrrhotite, pentlandite and chalcopyrite are the major sulfide mineral phases in the mineralized zone. Three sulfide types are defined, two of which were clearly remobilized during deformation. The third sulfide type may have remained in place, and it is suggested that the mineralized zone occupies a partially primary position with additional concentration during deformation".

# 6.0 CARDS MODELING AND PREDICTION SYSTEM

CARDS is a state of the art computer system that uses the latest artificial intelligence and pattern recognition algorithms to analyze large digital exploration data sets and produce exploration targets. CARDS Uses many layers of gridded data (variables) to learn the "signature" of known mineralized sites (positive cells) in a given area. The area is then scored and cells with a high similarity to the sought "signature" are identified.

The primary layers of gridded data can be:

- Geophysical surveys: MAG, EM, IP, gravity, radiometry;
- Geochemical surveys: lake bottom sediment, stream sediment, soil and till;
- Digital elevation models (topography);
- Satellite imagery;
- Geological maps: rock type, alteration;
- Proximity to interpreted lineaments, mapped faults and shear zones;
- Proximity to lithological contacts or specific intrusive suites;
- Proximity to a geochemical anomaly.

But these data layers may contain only part of the information because single point readings taken alone have little meaning. The neighborhood around each individual cell also contains important information and patterns. For example, there is no good reason for mineralization to occur at a single elevation; but when all the cells of the topography grid are combined, patterns such as: linear ridges, drainage patterns, circular patterns, etc. can appear and in some cases be an indicator of structure or lithology. The same logic applies to geophysical grids; it might be that certain slopes near a high values have statistical significance. Such patterns can be represented by: 1) calculating the derivatives of the primary grids; and 2) calculating "neighborhood" variables, which allow the characteristics of all cells within a specified distance (neighborhood) to be weighed into the evaluation of each individual cell.

These many extra calculated layers are imputed in CARDS along with the primary layers creating an important training database. Each cell in this database is identified as positive or unknown, based on drill hole and rock sample assays, and linked to its own set of characteristics (primary, derivative and neighboring variables). Several algorithms are then used to identify the unknown cells that have a set of characteristics most similar to the signature of the positive cells.

The quality and usefulness of results derived from CARDS modeling is dependent on a variety of factors including the coverage, quantity, variety and quality of geoscientific and historical exploration data processed. In addition, where interpreted data is used, it is also dependent on the adequacy of the interpretation.

Targets generated by CARDS should be evaluated in conjunction with all readily available geological data in the evaluation of the economic potential of a property as well as in the outlining of exploration targets.

## 6.1 Modeling

In order to study the accuracy of predictions and to validate modeling results, several methods are used and compared on the modeling area.

### *6.1.1 AGEO (Aggregation of GEO-referenced models)*

The AGEO algorithm, developed at ALBERT MINING, is the main prediction algorithm used during the modeling phase. Based on ensemble learning methods[1] and semi-supervised learning methods[2], AGEO uses multiple classifiers, called decision trees[3], to discriminate between labeled (positive) and unlabeled (unknown) cells. The results of each classifier are then aggregated to produce the final model results.

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[1] Ensemble learning methods generate many classifiers and aggregate their results. In fact, ensemble methods use multiple models to obtain a better predictive performance than could be obtained from any of the constituent models.

[2] Semi-supervised learning is a class of machine learning techniques that makes use of both labeled and unlabeled data for training, typically a small amount of labeled data with a large amount of unlabeled data. Semi-supervised learning falls between unsupervised learning (without any labeled training data) and supervised learning (with completely labeled training data).

[3] The decision tree represents the classification process as a series of nested choices or questions which enable the identification of the predictable attributes. At each step (node) in the process, a single binary or multinomial question is posed, and the answer determines the next set of choices to be made. The path between the root (first node) and the leaf (terminal node) of the decision tree is an assignment rule of the type "if condition, then conclusion", and the hierarchical rules of the tree constitute the prediction model.

The advantage of using a decision tree based algorithm is that this type of prediction model permits the identification of the most important or discriminant variables. The importance of a variable may be due to its (possibly complex) interaction with other variables, but in the main, variables that appear frequently and in the top levels of AGEO's decision trees are more important.

As the modeling progresses, "Data Mining Team" of DIAGNOS constantly evaluates the performance of the AGEO models in collaboration with the geoscientific team of Albert Mining. This evaluation is based both on the importance of variables in the decision trees and on the comparison with other statistic models. By coupling the modeling and model evaluation phases, certain aspects of the model can be controlled. For example, if a data layer considered weak by the geoscientific team appears to be too discriminant, it can be removed from the final model.

### *6.1.2 C-Cluster (Clustering for Classification)*

The C-Cluster algorithm, developed at ALBERT MINING, is used to compare and validate predictions generated by the AGEO algorithm. It is a predictive approach based on re-sampling techniques and clustering[4].

C-Cluster classifies all cells (positive and unknown) in clusters of similarity and scores the unknown cells of each cluster according to the proportion of positive cells in the cluster. The higher is this proportion in a particular cluster, the higher scored are the unknown cells of the cluster. Multiple runs of the clustering algorithm assign multiple scores to each unknown cell, and the average of these scores gives the final value of similarity.

The C-Cluster algorithm lacks transparency when compared with the AGEO method. In C-Cluster, all variables are weighted equally and therefore, the identification of particular variables influencing the model results is impossible.

[4] When there is no specified class, clustering is used to group items that seem to fall naturally together.

## 6.2 Methodology

The modeling process can be summarized as follows:

1- Prepare the database

- Compile all available gridded data layers covering the modeling area (geophysical, geochemical, topographic, etc.).
- Calculate derivatives (dx, dy, dz, 2dz, analytical signal, tilt, etc.) for magnetic and topographic layers.
- Use a moving window to capture the neighbouring patterns around each point and create the 22 neighborhood grids for each primary layer and each derivative layer.
- Identify the positive points according to an established threshold and associate them to their closest cell.

2- Run the AGEO algorithm

- Run a base learning algorithm (base model) to narrow the modeling area and keep only the zones that are most similar to the areas that have been subject to mineral exploration (drilling and surface rock sampling).
- Run a prediction learning algorithm to discriminate between labeled positive cells and unlabeled unknown cells for training. This algorithm uses multiple models based on decision trees.
- Generate a signature that discriminates between the positive and unknown cells using all the existing data layers (variables).
- Aggregate the different rules of all the trees and assign to each cell a probability score between 0 (unlike-positive) and 1 (like-positive) computed as the average of the different scores this cell received. This probability score represents the level of similarity of each point to the existing positive sites based on all variables used in the modeling.

3- Run the C-Cluster algorithm

- Using all positive cells and an equal amount of randomly selected unknown cells, create many separate clusters for which all variables are similar. Assign a score to the unknown cells of each cluster corresponding to the proportion of positive cells in the cluster. Repeat these operations until all unknown cells have been assigned a score.

- Repeat the clustering algorithm described above at least 5 times.

- Assign a final probability score to each unknown cell corresponding to the average of scores this cell received. This probability score represents the level of similarity of each point to the existing positive sites based on all variables used in the modeling.

4- Visually compare the images of targets generated by the AGEO and C-Cluster models and decide the relevance and priorities of these targets in conjunction with the geological setting.

## 7.0 VARIABLES

A total of 414 variables which derived from data provided by PLAYFAIR MINING and data downloaded from Geonorge-Kartkatalogen (National website for map data and other location information in Norway), were used as inputs in the prediction models. These layers of data are classified in three categories:

1. Primary data from Kvikne Airborne Magnetic-Electromagnetic survey conducted in 2004 and from Geonorge-Kartkatalogen:
   - Magnetic data (MAG, Figure 4 & Table 1; from Kvikne Airborne Magnetic-Electromagnetic survey conducted in 2004);
   - Electromagnetic data (Cond_6606 & Cond_7001, Figures 5 & 6 & Table 1; from Kvikne Airborne Magnetic-Electromagnetic survey conducted in 2004);
   - Topography data (DEM, Figure 7 & Table 1; from Geonorge-Kartkatalogen).
2. Derivative data: dx, dy, dz, analytical signal, tilt, etc. for magnetic (MAG) and topography (DEM) layers (Table 1).
3. Neighboring data: sum, median, standard deviation, etc. (Table 2).

The geophysical data set used for the modeling was provided by PLAYFAIR MINING. They consist of the Kvikne Airborne Magnetic-Electromagnetic survey conducted in 2004 (40m resolution), covering 90% of the PLAYFAIR MINING's Vakkerlien & Rostvangen properties (Figures 4 to 6). The Digital Elevation Model (DEM) data (10m resolution) from Geonorge-

Kartkatalogen (Figure 7) was integrated into the modeling process to characterize the topography input.

Table 1: Primary and Derivative Variable Data Set

| Variables | | Description |
|---|---|---|
| 1 | Mag | Merged Total Magnetic Intensity data of Kvikne 2004 Airborne survey |
| 2 | Mag_dx | Calculated derivative of *Mag* in x |
| 3 | Mag_dy | Calculated derivative of *Mag* in y |
| 4 | Mag_dz | Calculated vertical derivative (dz) of *Mag* |
| 5 | Mag_2dz | Calculated second vertical derivative (dz) of *Mag* |
| 6 | Mag_Aaig | Calculated analytical signal of *Mag* |
| 7 | Mag_TDR | Calculated tilt derivative of *Mag* |
| 8 | Mag_HD_TDR | Calculated horizontal derivative of *Mag_TDR* |
| 9 | Cond_6606 | Conductivity 6606 Hz coplanar freq. of Kvikne 2004 Airborne survey |
| 10 | Cond_7001 | Conductivity 7001 Hz coaxial freq. of Kvikne 2004 Airborne survey |
| 11 | DEM | Digital Elevation Model (Geonorge-Kartkatalogen) |
| 12 | DEM_dx | Calculated derivative of *DEM* in x |
| 13 | DEM_dy | Calculated derivative of *DEM* in y |
| 14 | DEM_dz | Calculated vertical derivative (dz) of *DEM* |
| 15 | DEM_ASIG | Calculated second vertical derivative (dz) of *DEM* |
| 16 | DEM_2dz | Calculated analytical signal of *DEM* |
| 17 | DEM_TDR | Calculated tilt derivative of *DEM* |
| 18 | DEM_HD_TDR | Calculated horizontal derivative of *DEM _TDR* |

Neighboring variables (Table 2) has been calculated for all of primary and derivative variables for data set. For this project, a 160m moving window was used around each individual cell in order to select neighboring.

In all, a total of 414 variables [18 x (22 + 1)] were utilized in the modeling process. The primary and derivative variables can be found as grid and database files in the data CD accompanied with this report. Data was then gridded by Albert Mining to a 40m cell size, which corresponds to 170,741 data points.

Table 2: Calculated Neighboring Variables

| **Variable** | | **Description** |
|---|---|---|
| 1 | _hood_sum | Sum in the neighborhood |
| 2 | _hood_abssum | Sum of absolute values in the neighborhood |
| 3 | _hood_min | Minimum in the neighborhood |
| 4 | _hood_max | Maximum in the neighborhood |
| 5 | _hood_avg | Average in the neighborhood |
| 6 | _hood_stddev | Standard deviation in the neighborhood |
| 7 | _hood_reldev | Relative deviation in the neighborhood |
| 8 | _hood_kurtosis | Kurtosis (measure of the "peakedness") in the neighborhood |
| 9 | _MedianGradient | Median gradient in the neighborhood |
| 10 | _DistGravCenter | Distance from gravity center in the neighborhood |
| 11 | _hood_hslope | Horizontal slope in the neighborhood |
| 12 | _hood_hslope_min | Minimum of horizontal slopes in the neighborhood |
| 13 | _hood_hslope_max | Maximum of horizontal slopes in the neighborhood |
| 14 | _hood_hslope_sum | Sum of horizontal slope in the neighborhood |
| 15 | _hood_hslope_avg | Average of horizontal slopes in the neighborhood |
| 16 | _hood_hslope_stddev | Standard deviation of horizontal slopes in the neighborhood |
| 17 | _hood_vslope | Vertical slope in the neighborhood |
| 18 | _hood_vslope_min | Minimum of vertical slopes in the neighborhood |
| 19 | _hood_vslope_max | Maximum of vertical slopes in the neighborhood |
| 20 | _hood_vslope_sum | Sum of vertical slopes in the neighborhood |
| 21 | _hood_vslope_avg | Average of vertical slopes in the neighborhood |
| 22 | _hood_vslope_stddev | Standard deviation of vertical slopes in the neighborhood |

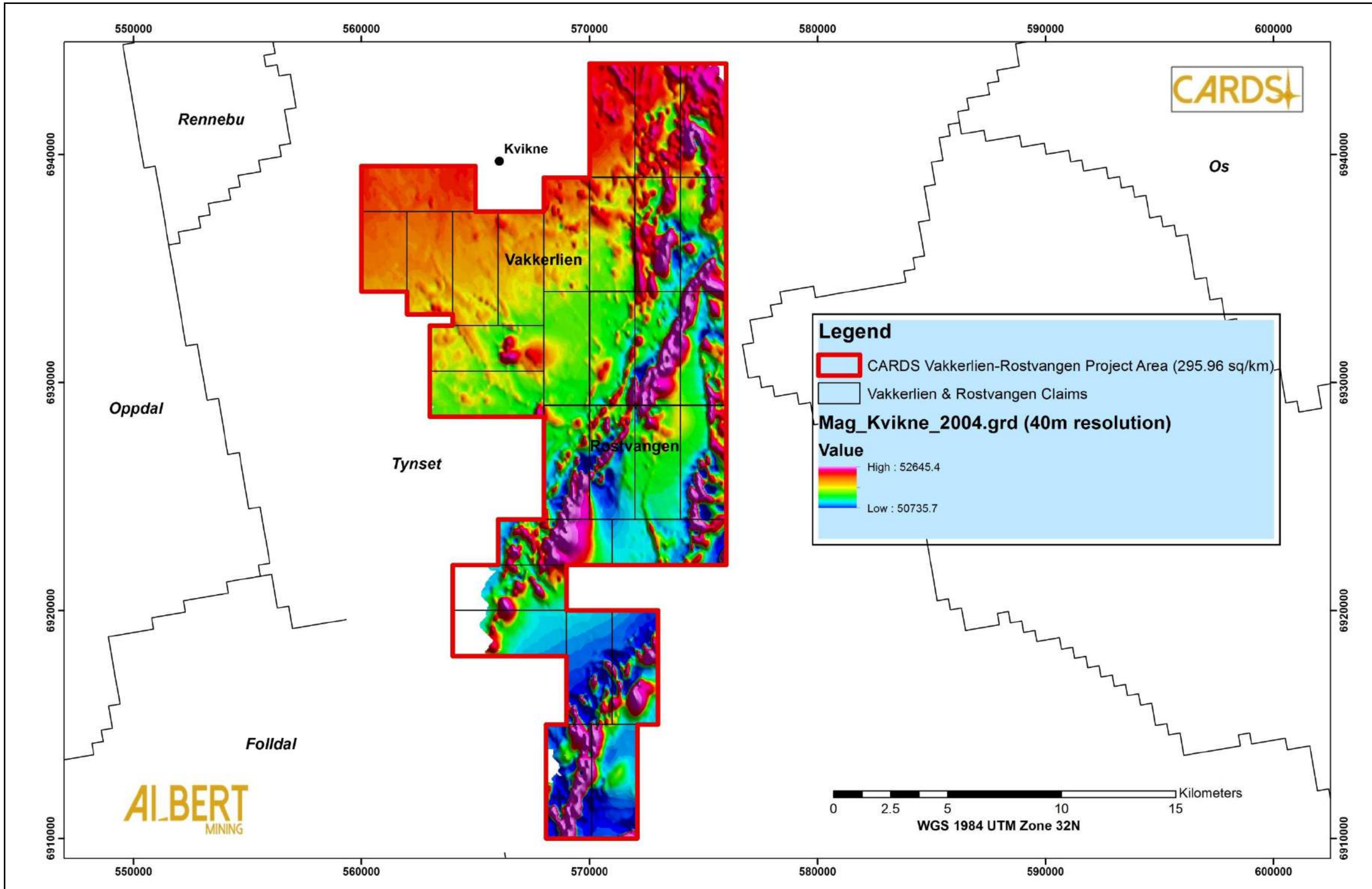


Figure 4: Total Magnetic Intensity data of Kvikne 2004 Airborne Survey.

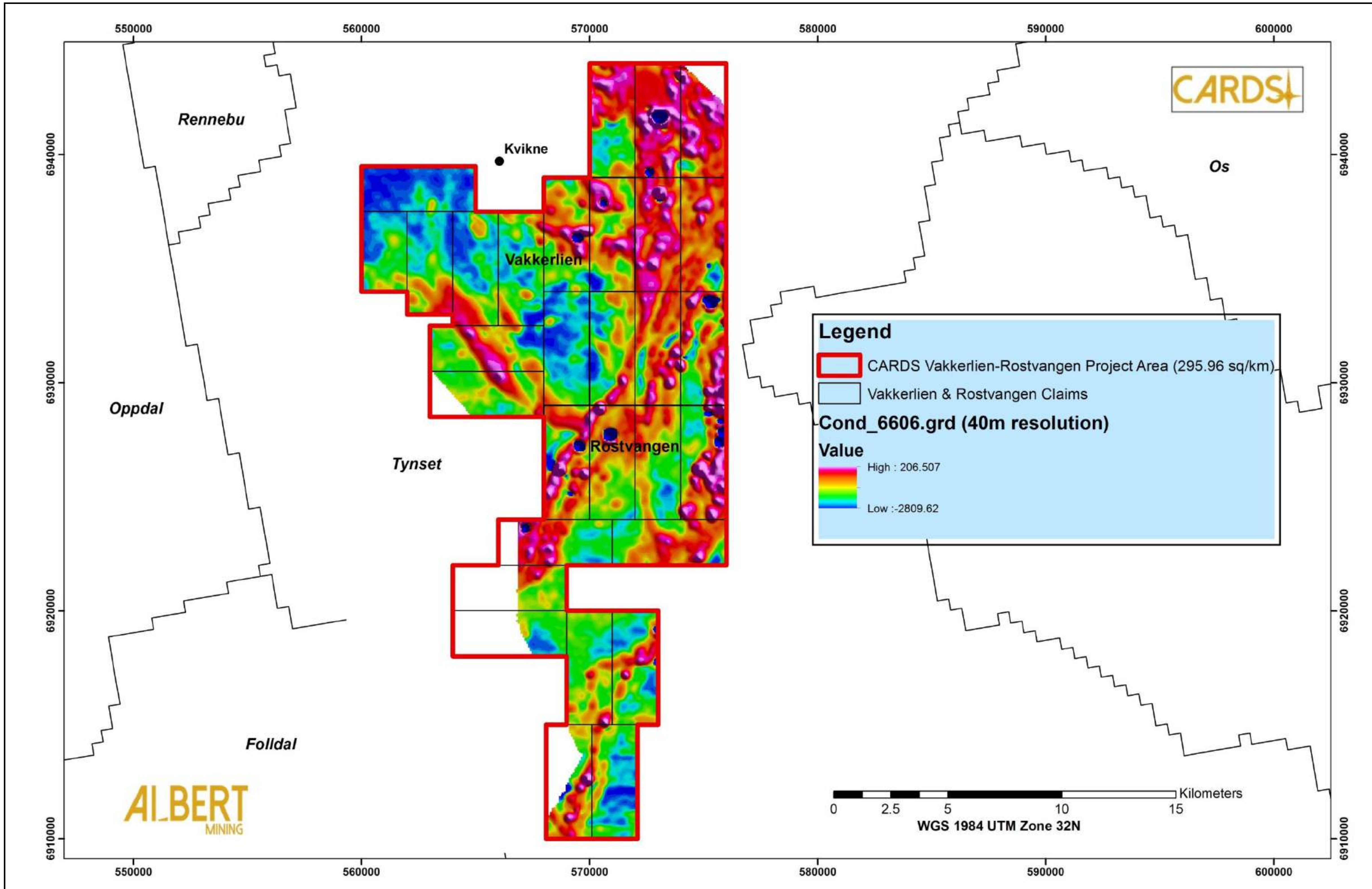


Figure 5: Conductivity 6606 Hz coplanar freq. data of Kvikne 2004 Airborne Survey.

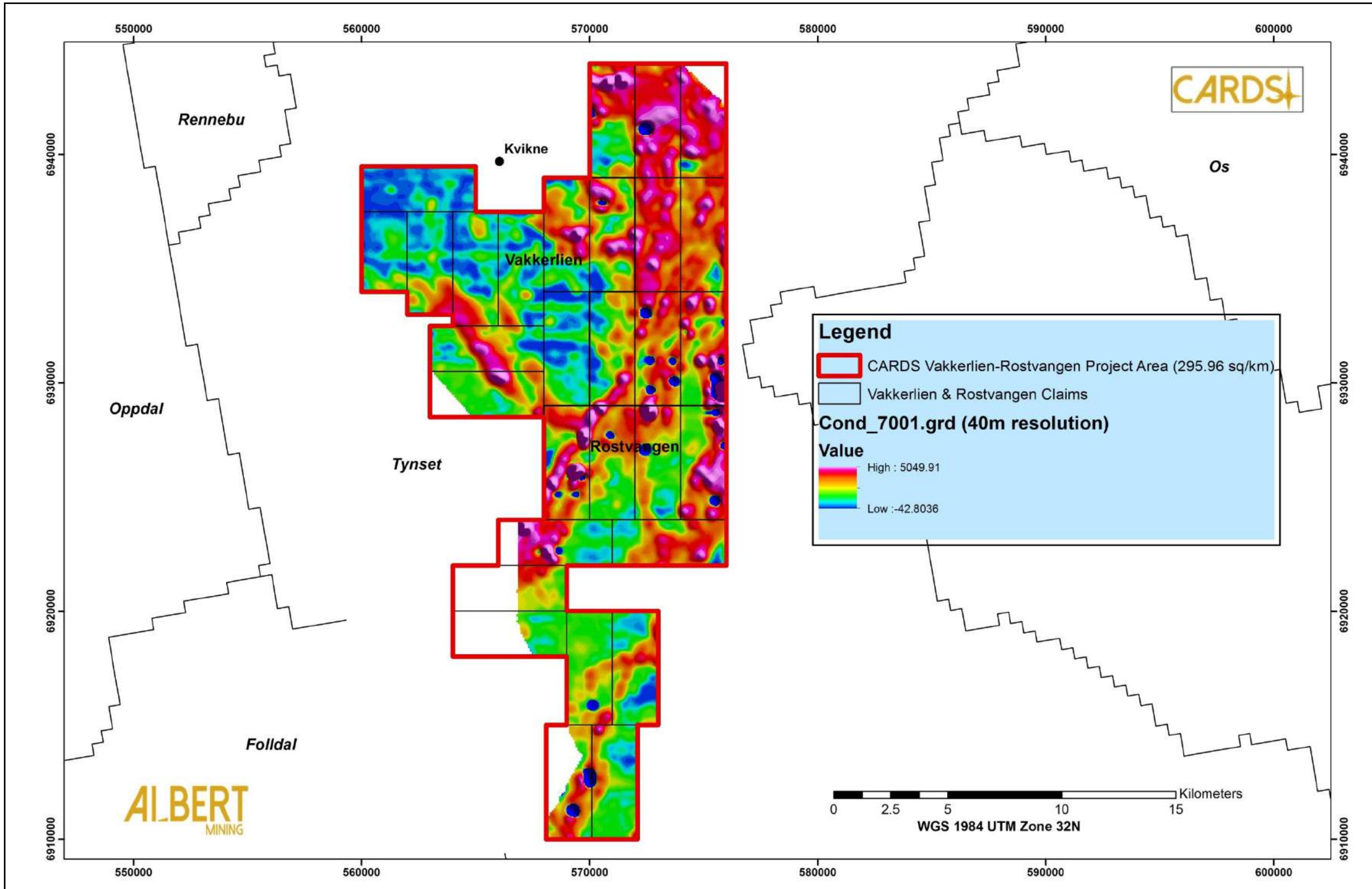


Figure 6: Conductivity 7001 Hz coaxial freq. data of Kvikne 2004 Airborne Survey.

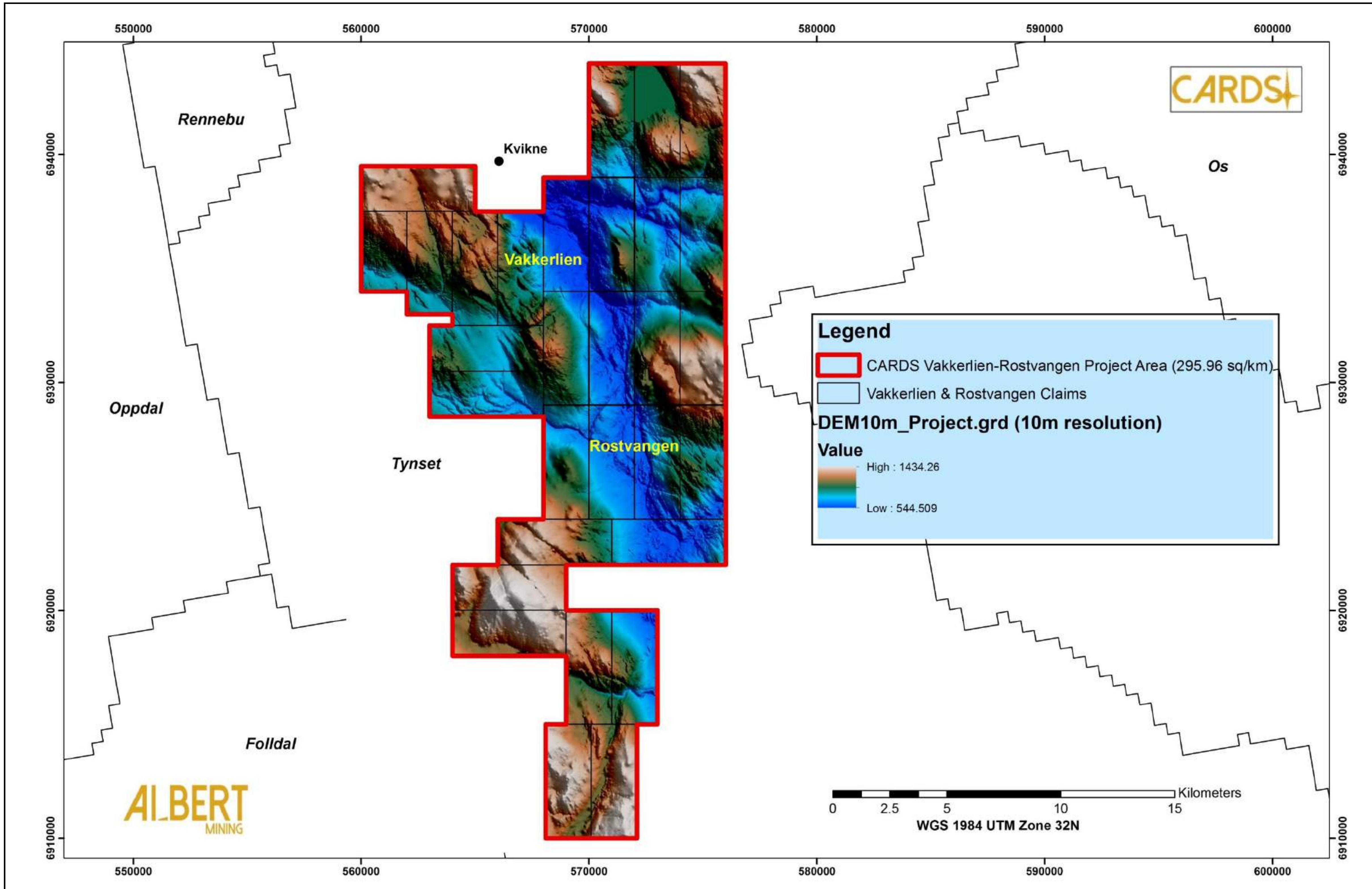


Figure 7: Digital Elevation Model from Geonorge-Kartkatalogen.

# 8.0 TRAINING DATA

The training database was constructed in regards on data availability and spatial distribution. The training points in the Vakkerlien-Rostvangen Project database are composed of drillhole assays and rock samples entirely provided by PLAYFAIR MINING. A total of 974 training points from 205 drill holes and 160 rock samples well distributed over the CARDS modeling area of Vakkerlien-Rostvangen Project were used as learning data for the predictive models.

All training points originating from drillholes were reprojected to surface in order to associate each training point with their nearest surface cell of the survey grid which will be used in the modeling process. Reprojection was carried out using survey data information (azimuth & dip) available for all drillholes in the drillhole database of PLAYFAIR MINING.

Due to the two types of deposits VMS Cu-Zn and Ni-Cu Magmatic in the project, Albert Mining generated two models over the same modeling area:

1. A VMS Cu-Zn Model using training points from Kvikne and Rostvangen deposits (Figure 9);
2. A Ni-Cu Magmatic Model using training points from Vakkerlien deposit (Figure 10).

Albert Mining used the following thresholds for the positive training data for each model:

1. Cu & Zn ≥ 5000 ppm (0.5 %) for the VMS Cu-Zn Model
2. Ni & Cu ≥ 5000 ppm (0.5 %) for the Ni-Cu Magmatic Model

Therefore all drill holes and rock sample assays within the modeling area with a reported assay equal or above 5000 ppm for copper & zinc in the VMS Cu-Zn Model, and 5000 ppm for nickel & copper in the Ni-Cu Magmatic Model have been used as positive training points within the training data set (Table 3). The spatial distributions of the training points used in the modeling area are illustrated in Figures 8 & 9.

Table 3: Training Points

| Models | Total Training Points | Positive VMS Copper-Zinc Training Points<br><br>Cu & Zn ≥ 5000 ppm | Positive Nickel-Copper Magmatic Training Points<br><br>Ni & Cu ≥ 5000 ppm |
|---|---|---|---|
| VMS Cu-Zn | 339 | 39 | |
| Ni-Cu Magmatic | 635 | | 80 |

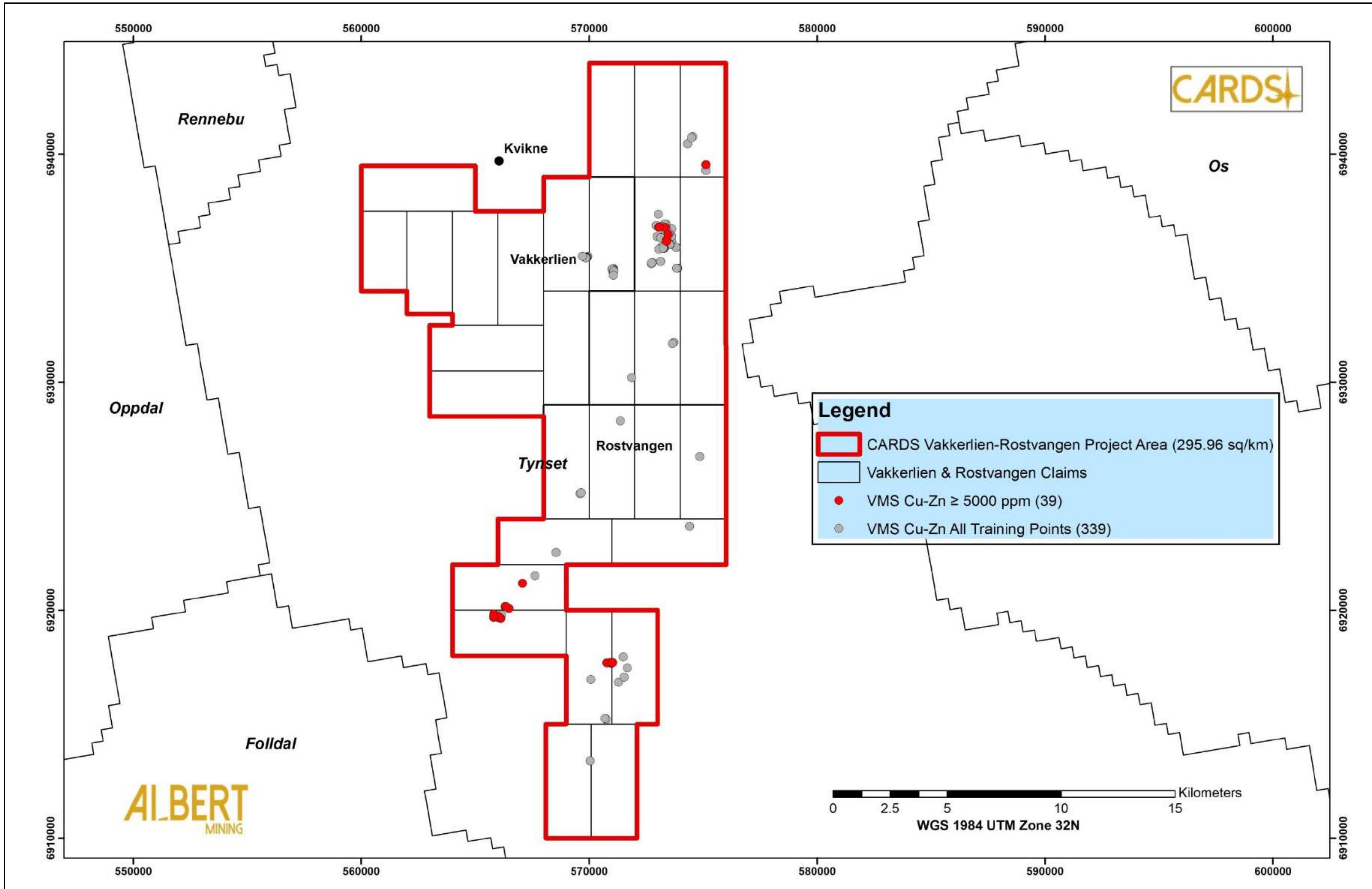


Figure 8: Positive Copper-Zinc Training Points Distribution for the VMS Cu-Zn Model.

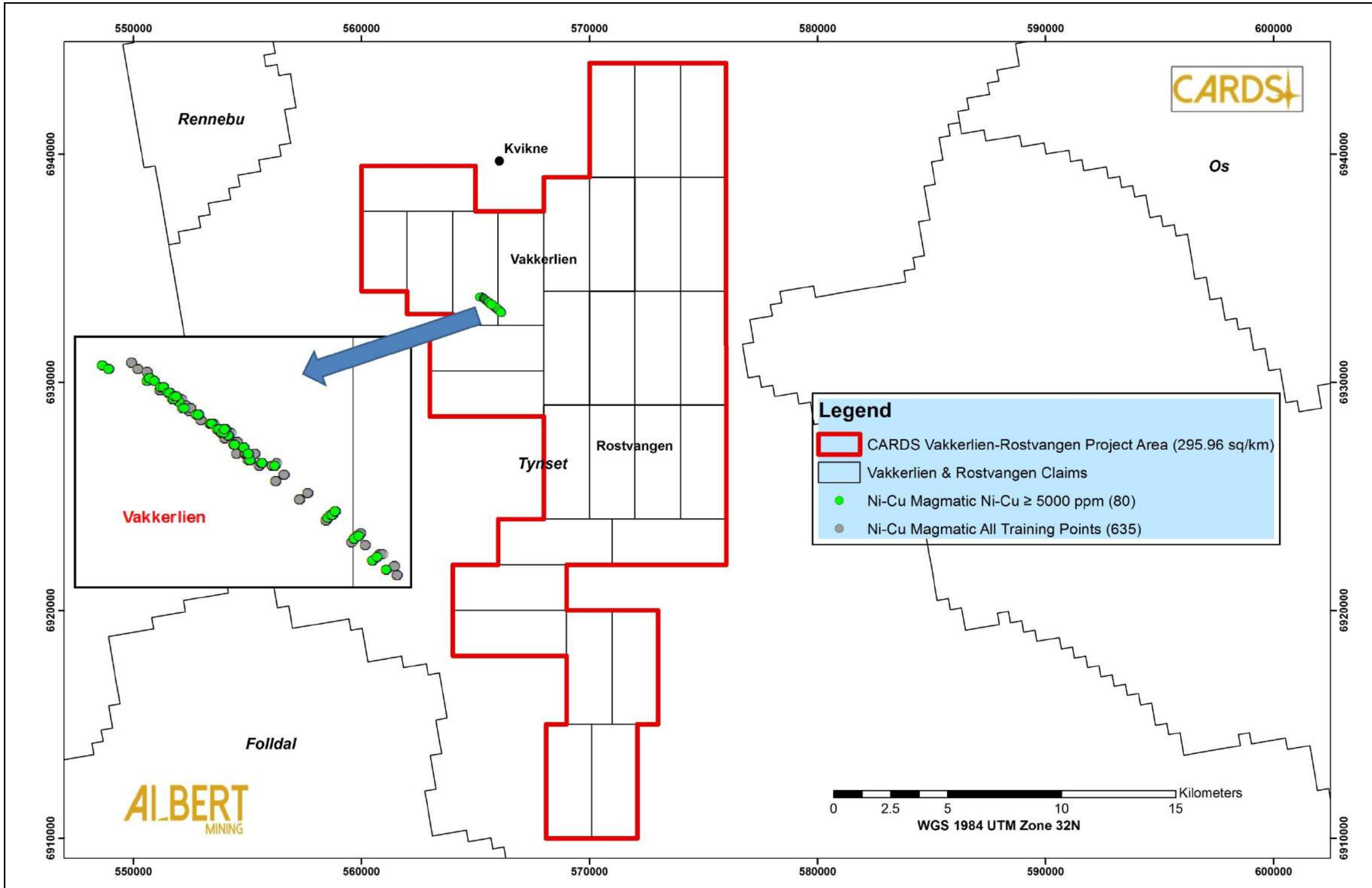


Figure 9: Positive Nickel-Copper Training Points Distribution for the Ni-Cu Magmatic Model.

# 9.0 RESULT DISCUSSION & RESULT MAPS

The prediction results generated on the PLAYFAIR MINING's Vakkerlien-Rostvangen Project are presented as gridded images with a resolution of 40m for both models VMS Cu-Zn and Ni-Cu Magmatic. In these grids, each pixel possesses a numerical value representing a percentage of similarity to the known mineralization signature. The similarity value of a pixel in a CARDS grid, for example 85 % means that this pixel was classified with the positive pixels 85 times out of 100. It should not be viewed as an 85 % probability of finding mineralization.

Albert Mining generated a total of nineteen (19) VMS copper-zinc exploration targets (P_VMS_Cu-Zn_01 to P_VMS_Cu-Zn_19) and eight (8) nickel-copper Magmatic exploration targets (P_Magm_Ni-Cu_01 to P_VMS_Cu-Zn_08) located on PLAYFAIR MINING's Vakkerlien-Rostvangen Project area (Tables 4 & 5; Figures 10 & 11). All targets are represented as rectangular shapes in the attached Maps 1 & 2.

VMS copper-zinc targets are created using the AGEO algorithm (section 6.1.1) based on level of similarity at 85 %. These targets were validated by the C-Cluster algorithm (section 6.1.2) based on level of similarity at 45 %, except targets Nr. 2, 3, 8, 17 and 18 (Table 4). Nickel-copper Magmatic targets are created using the AGEO algorithm based on level of similarity at 75 % and also validated by the C-Cluster algorithm based on level of similarity at 50%, except targets Nr. 6 and 8 (Table 5).

In both models targets highlight possible extensions of known mineralized areas (Targets P_VMS_Cu-Zn_01, P_VMS_Cu-Zn_14 & P_Magm_Ni-Cu_01) and areas close to known mineralized areas (Targets P_VMS_Cu-Zn_02 to P_VMS_Cu-Zn_05, P_VMS_Cu-Zn_15 & P_Magm_Ni-Cu_02 to P_Magm_Ni-Cu_04). These targets (highlighted in green in Tables 4 & 5), should be considered as priority and potentially interesting for future exploration campaigns. However, these targets should be evaluated by PLAYFAIR MINING's exploration team based on the interpretation of all available geoscientific information, and be validated by a reconnaissance field survey.

It should be noted that the target P_Magm_Ni-Cu_06, generated by the Ni-Cu Magmatic Model, highlight an area with high values for Ni from VMS Cu-Zn training points (DDH assays with up to 2.2 % Ni) that are not used in the Ni-Cu Magmatic Model.

Table 4: CARDS VMS Copper-Zinc Targets List

| Nr. | VMS Copper-Zinc Target ID | X WGS 84 UTM Z32N | Y WGS 84 UTM Z32N | Area (sq/)km | Perimeter (km) | Lithology |
|---|---|---|---|---|---|---|
| 1 | P_VMS_Cu-Zn_01 | 572813 | 6937010 | 0.05 | 1.12 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 2 | P_VMS_Cu-Zn_02 | 572544 | 6937440 | 0.04 | 0.96 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 3 | P_VMS_Cu-Zn_03 | 573091 | 6937810 | 0.03 | 1.04 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 4 | P_VMS_Cu-Zn_04 | 573517 | 6938380 | 0.13 | 2.31 | Amphibolite; Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 5 | P_VMS_Cu-Zn_05 | 575375 | 6938300 | 0.10 | 1.58 | Amphibolite; Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 6 | P_VMS_Cu-Zn_06 | 573942 | 6940130 | 0.03 | 0.72 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 7 | P_VMS_Cu-Zn_07 | 575298 | 6940210 | 0.04 | 1.20 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 8 | P_VMS_Cu-Zn_08 | 571880 | 6931500 | 0.09 | 2.38 | Graphite schist; Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 9 | P_VMS_Cu-Zn_09 | 572897 | 6930450 | 0.05 | 1.58 | Amphibolite; Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 10 | P_VMS_Cu-Zn_10 | 570456 | 6928680 | 0.11 | 2.60 | Graphite schist |
| 11 | P_VMS_Cu-Zn_11 | 572340 | 6928540 | 0.11 | 2.15 | Amphibolite; Quartz micaschist with |

| Nr. | VMS Copper-Zinc Target ID | X WGS 84 UTM Z32N | Y WGS 84 UTM Z32N | Area (sq/)km | Perimeter (km) | Lithology |
|---|---|---|---|---|---|---|
| | | | | | | calcite, actinolite, and diopside and clinozoisite |
| 12 | P_VMS_Cu-Zn_12 | 574857 | 6925630 | 0.41 | 5.15 | Amphibolite; Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 13 | P_VMS_Cu-Zn_13 | 574677 | 6923940 | 0.18 | 3.17 | Amphibolite; Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 14 | P_VMS_Cu-Zn_14 | 567030 | 6921360 | 0.07 | 1.19 | Graphite schist; Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 15 | P_VMS_Cu-Zn_15 | 571701 | 6917630 | 0.05 | 1.04 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite; Gray phyllite, biotite phyllite and schists, in some places with kyanite, staurolite and andalusite |
| 16 | P_VMS_Cu-Zn_16 | 570077 | 6913310 | 0.13 | 2.14 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 17 | P_VMS_Cu-Zn_17 | 569615 | 6912490 | 0.07 | 1.51 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 18 | P_VMS_Cu-Zn_18 | 569309 | 6911530 | 0.14 | 2.80 | Amphibolite; Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 19 | P_VMS_Cu-Zn_19 | 568843 | 6910880 | 0.24 | 3.50 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |

Table 5: CARDS Nickel-Copper Magmatic Targets List

| Nr. | Magm Nickel-Copper Target ID | X WGS 84 UTM Z32N | Y WGS 84 UTM Z32N | Area (sq/)km | Perimeter (km) | Lithology |
|---|---|---|---|---|---|---|
| 1 | P_Magm_Ni-Cu_01 | 565020 | 6933800 | 0.05 | 1.09 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 2 | P_Magm_Ni-Cu_02 | 563624 | 6934580 | 0.03 | 0.96 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 3 | P_Magm_Ni-Cu_03 | 566277 | 6933490 | 0.02 | 0.96 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 4 | P_Magm_Ni-Cu_04 | 566956 | 6932370 | 0.01 | 0.56 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 5 | P_Magm_Ni-Cu_05 | 564432 | 6929420 | 0.02 | 0.80 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 6 | P_Magm_Ni-Cu_06 | 571136 | 6934900 | 0.03 | 0.80 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 7 | P_Magm_Ni-Cu_07 | 574708 | 6939370 | 0.10 | 1.99 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |
| 8 | P_Magm_Ni-Cu_08 | 572740 | 6939180 | 0.02 | 0.64 | Quartz micaschist with calcite, actinolite, and diopside and clinozoisite |

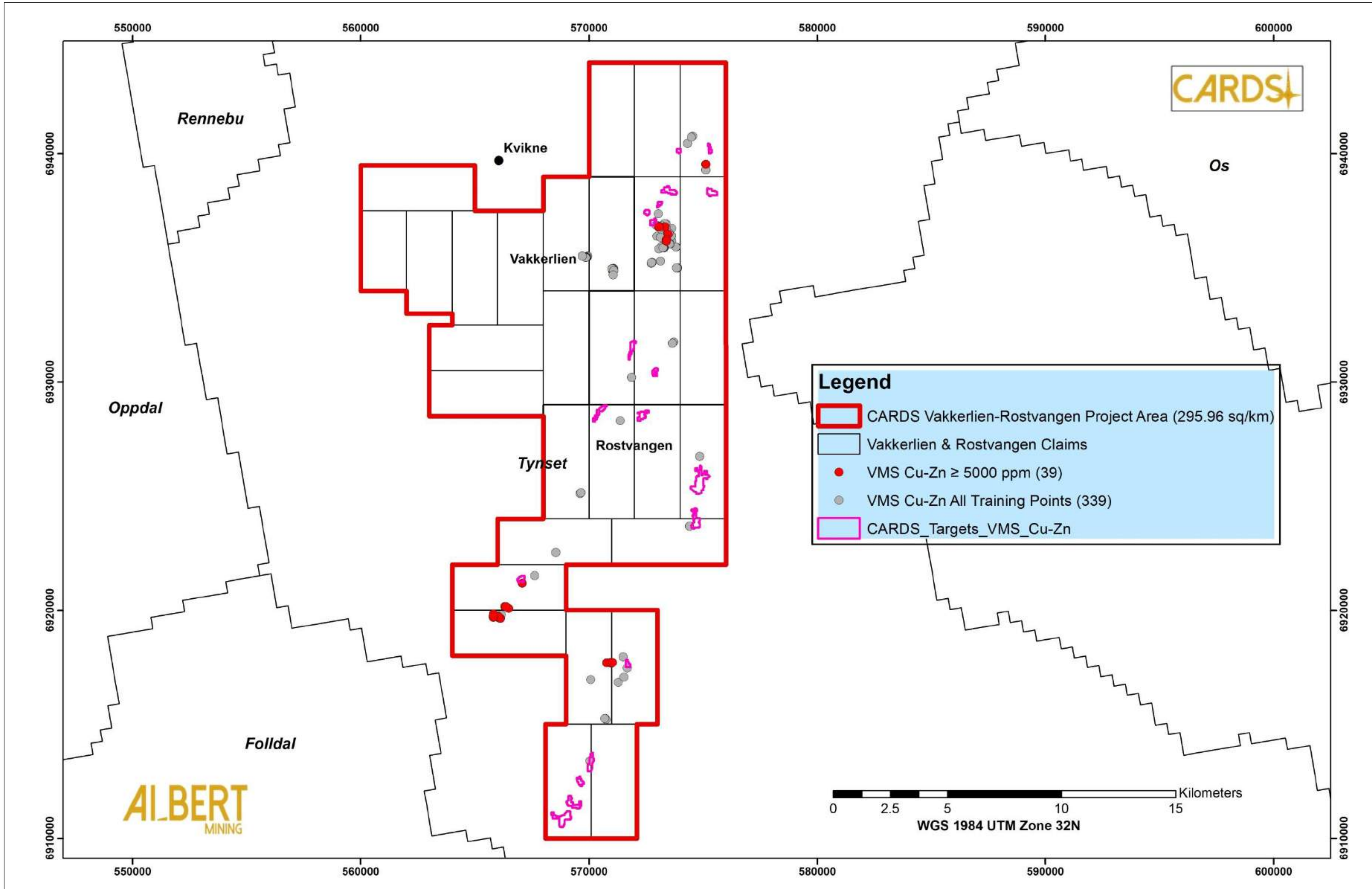


Figure 10: Distribution of CARDS VMS copper-zinc target areas.

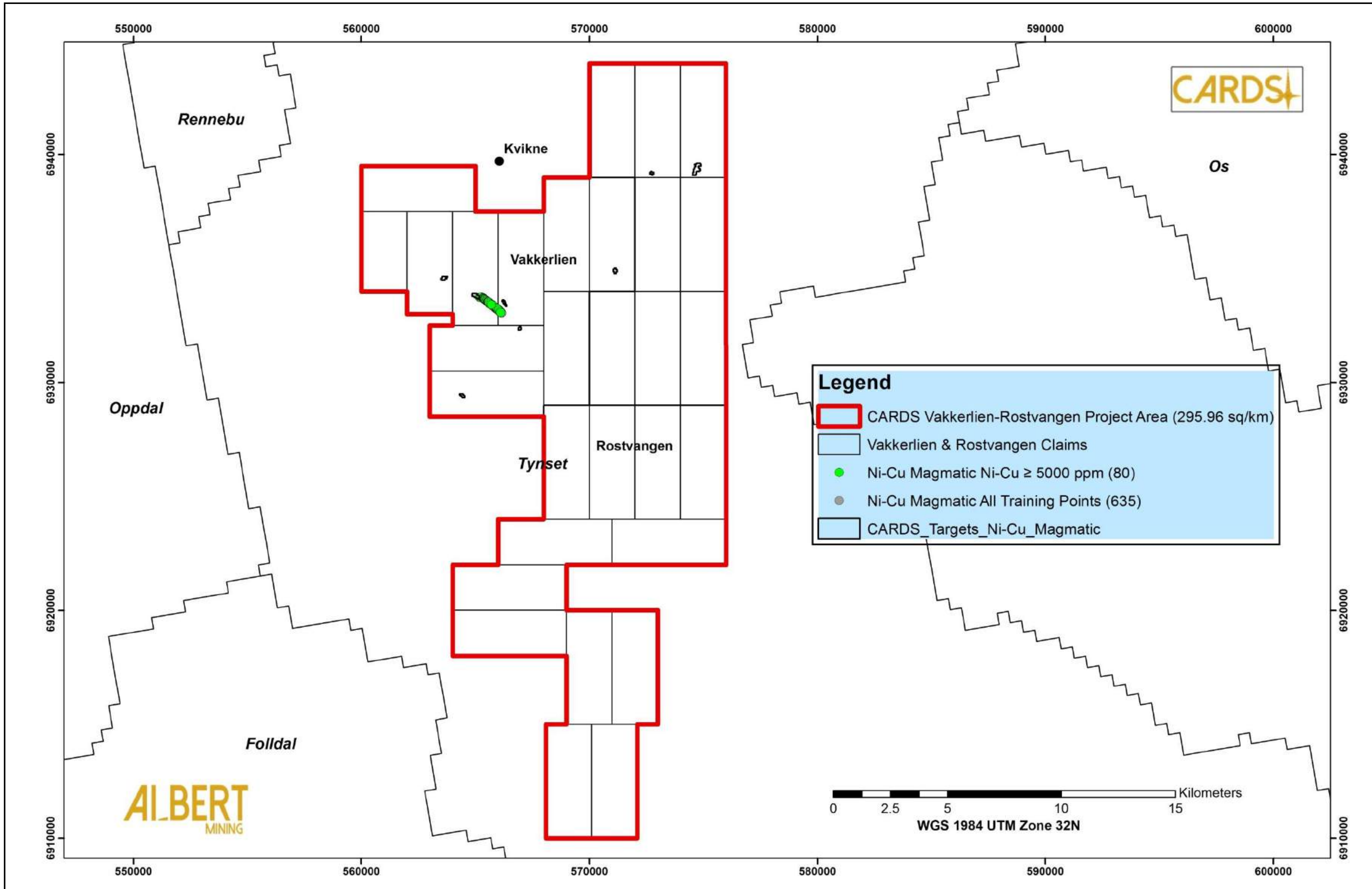


Figure 11: Distribution of CARDS nickel-copper Magmatic target areas.

# 10.0 CONCLUSION & RECOMMENDATIONS

CARDS models have been able to outline areas with interesting potential for VMS copper-zinc and nickel-copper Magmatic mineralization that merit further exploration efforts.

The PLAYFAIR MINING's Vakkerlien-Rostvangen Project area revealed to be well suited for analysis by CARDS due to the amount and the quality of geophysical, drilling and rock sample data available. As PLAYFAIR MINING's exploration program continues to progress, further data such as: higher resolution geophysical surveys along with additional drill holes, surface geochemical assays, alteration and structural data could then be added into local learning models in order to produce more accurate and precise targets.

The PLAYFAIR MINING's Vakkerlien-Rostvangen Project located in the historic Roros mining district in southern Norway remains an area with excellent potential for mineral exploration. Exploration VMS copper-zinc and nickel-copper Magmatic targets generated and presented in this report should be prioritized based on the evaluation of all available geoscientific information and be validated by a reconnaissance field survey. In order to maximize the chances of extending known mineralized zones as well as locating new zones, Albert Mining recommends that further explorative work include:

- Prospecting, mapping and sampling, with particular attention given to CARDS targets highlighting extensions of known mineralized areas (Targets P_VMS_Cu-Zn_01, P_VMS_Cu-Zn_14 & P_Magm_Ni-Cu_01) and areas close to known mineralized areas (Targets P_VMS_Cu-Zn_02 to P_VMS_Cu-Zn_05, P_VMS_Cu-Zn_15 & P_Magm_Ni-Cu_02 to P_Magm_Ni-Cu_04).

- Higher resolution ground geophysical surveys (Mag, EM-VLF & IP) should be conducted throughout the areas of interest in order to locate and define the geometry of the mineralized bodies a depth and to prepare the best drill setup for optimal results.

- Drill setups for obtaining optimal results may be established once proper geophysical techniques have been applied to the PLAYFAIR MINING's Vakkerlien-Rostvangen Project.

Respectfully Submitted

Grigor Heba, Ph.D. Geologist, P. Geo
Riadh Kobbi, Data Modeling Manager

# 11.0 REFERENCES

NILSEN, O. & MUKHERJEE, A.D., 1972, Geology of the Kvikne mines with special reference to the sulphide ore mineralization. Norsk Geologisk Tidsskrift, Vol. 52, p. 151-192. Oslo 1972.

RUI, I.J., 1973, Geology and structures of the Rostvangen sulphide deposit in the Kvikne district, central Norwegian Caledonides. Norsk Geologisk Tidsskrift, Vol. 53, p. 433-442. Oslo 1973.

THOMPSON, J. F. H., NIXON, F. & SIVERTSEN, R., 1980, The geology of the Vakkerlien nickel prospect, Kvikne, Norway. Bull. Geol, Soc. Finland 52, p. 3-21.

*Websites*

Geonorge-Kartkatalogen (National website for map data and other location information in Norway): https://kartkatalog.geonorge.no/search

Playfair Mining Ltd. website: http://www.playfairmining.com

# 12.0 DELIVERABLES

One (1) copy of the following maps in UTM NAD83 Z17N:

| | | |
|---|---|---|
| CARDS Copper-Zinc Targets – VMS Cu-Zn Model | 1 : 40 000 | Map 1 |
| CARDS Nickel-Copper Targets – Ni-Cu Magmatic Model | 1 : 40 000 | Map 2 |

One (1) paper copy of this report

One (1) copy of a disc (CD) containing:

- This report in PDF format
- Two (2) Maps in ArcGIS and PDF formats
- Workspace in ArcGIS
- Geosoft project files

## 13.0 CERTIFICATE OF QUALIFICATION

**Report Title:** CARDS Evaluation Report, Vakkerlien-Rostvangen Project, Tynset, Hedmark County, Norway, Playfair Mining Ltd..

I, Grigor Heba, residing in Brossard, Québec, Canada do hereby certify that:

1. I am a senior Geologist with the firm of Albert Mining Inc. with an office at Suite 340, 7005, Taschereau Boulevard, Brossard, Québec, Canada.
2. I hold a B.Sc. in Geology (1990) from the Polytechnic University of Tirana (Albania), a DEA in Sedimentary Geology, Geochemistry and Geophysics (1997) from the Université des Sciences et Technologies de Lille (France) and a Ph.D. in Mineral Resources (2008) from the Université du Québec à Montréal (UQAM), (Québec, Canada).
3. I am the author of this report and I collaborate with Riadh Kobbi, Data Modeling Manager at DIAGNOS Inc., for the preparation of sections 6.0 to 9.0.
4. I have not visited the Vakkerlien and Rostvangen properties owned by Playfair Mining Ltd..
5. I am a member in good standing of l'Ordre des Géologues du Québec (#1464).
6. I have no direct or indirect interests in the mining claims owned by Playfair Mining Ltd., nor in the securities of the company and have no interest in receiving such interest.
7. The current report is based on compilation of data provided by Playfair Mining Ltd. and data downloaded from Geonorge-Kartkatalogen, using Exploration Best Practices Guidelines.
8. The recommendations from this study are purely the result of mathematical algorithms used on exploration and historical data and should only be considered as such.

Grigor Heba, P. Geo., Ph. D.

GÉOLOGUE / GEOLOGIST * GRIGOR HEBA # 1464 * QUÉBEC

Signed in Brossard, Québec,

Date: 7/05/2019