

# Understanding the Namibian surficial environment through the Regional Geochemical Baseline Mapping Programme

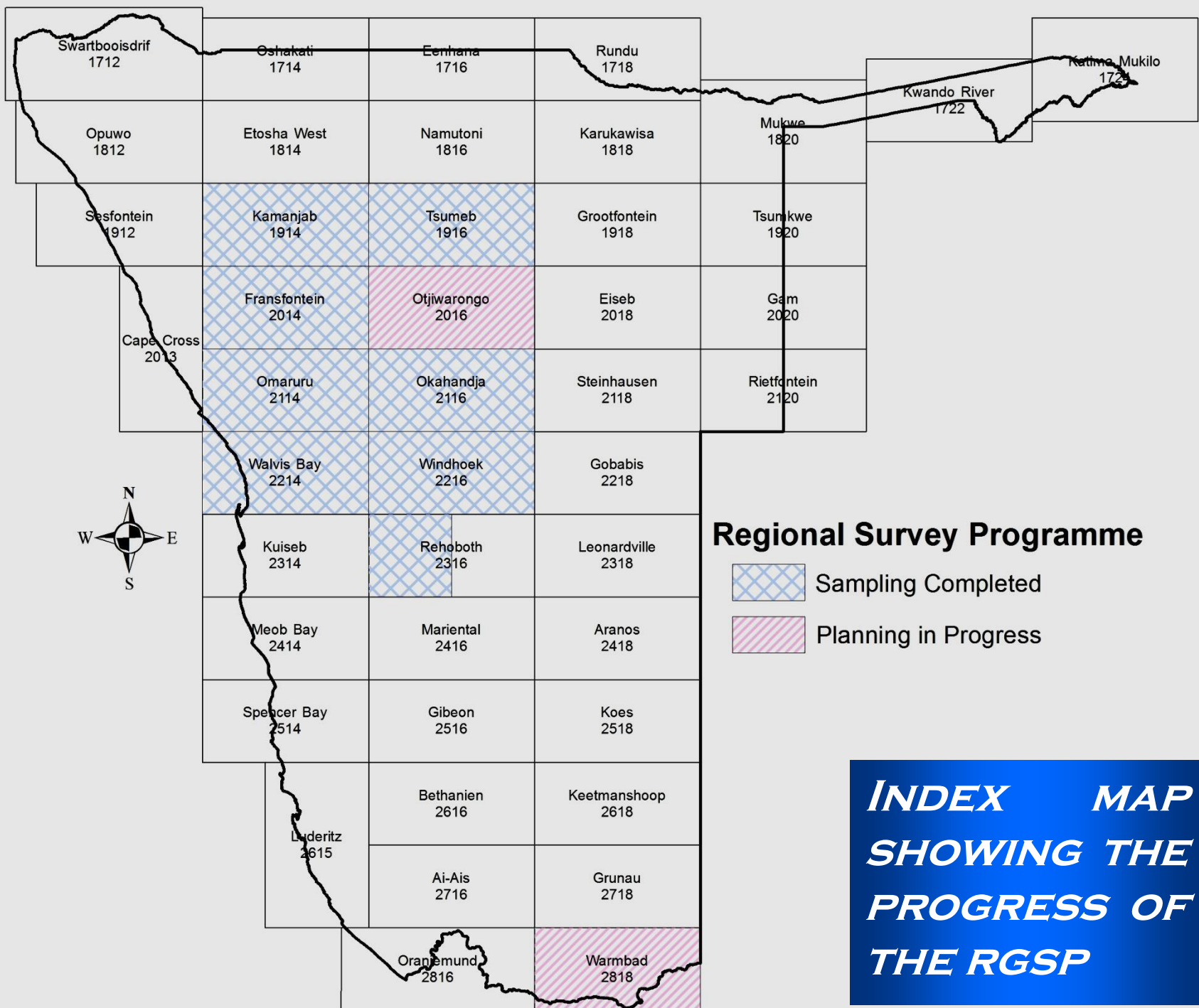
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**Ministry of Mines & Energy**  
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- **Geochemical baseline studies have been proved over the years in various countries as an important index in environmental assessment.**
- **At present the geochemical baseline of the Namibian land has not yet been fully defined.**
- **To fill this significant knowledge gap the Geological Survey of Namibia (GSN) embarked on a regional geochemical baseline mapping programme in 1999.**



- **The need to study and understand the structure, composition and dynamics of the Namibian landforms is driven by:**
  - The growing demands on mineral and energy resources, water, soils and materials, problems of pollution and waste disposal, and vulnerability of human life to natural anthropogenic hazards.

- **Regional Geochemical Baseline Surveying Programme (RGSP) is a development project solely funded by the Government.**
- **Approx. 20,000 geochemical samples collected from 8 (1:250,000 scale) map sheets, namely Windhoek, Rehoboth, Okahandja, Walvis Bay, Omaruru, Fransfontein, Kamanjab and Tsumeb.**





## Regional Survey Programme

-  Sampling Completed
-  Planning in Progress

***INDEX MAP  
SHOWING THE  
PROGRESS OF  
THE RGSP***



- **Some of the unique landmarks in Namibia, the Brandberg marking the highest point in altitude (2606 m above sea level)**



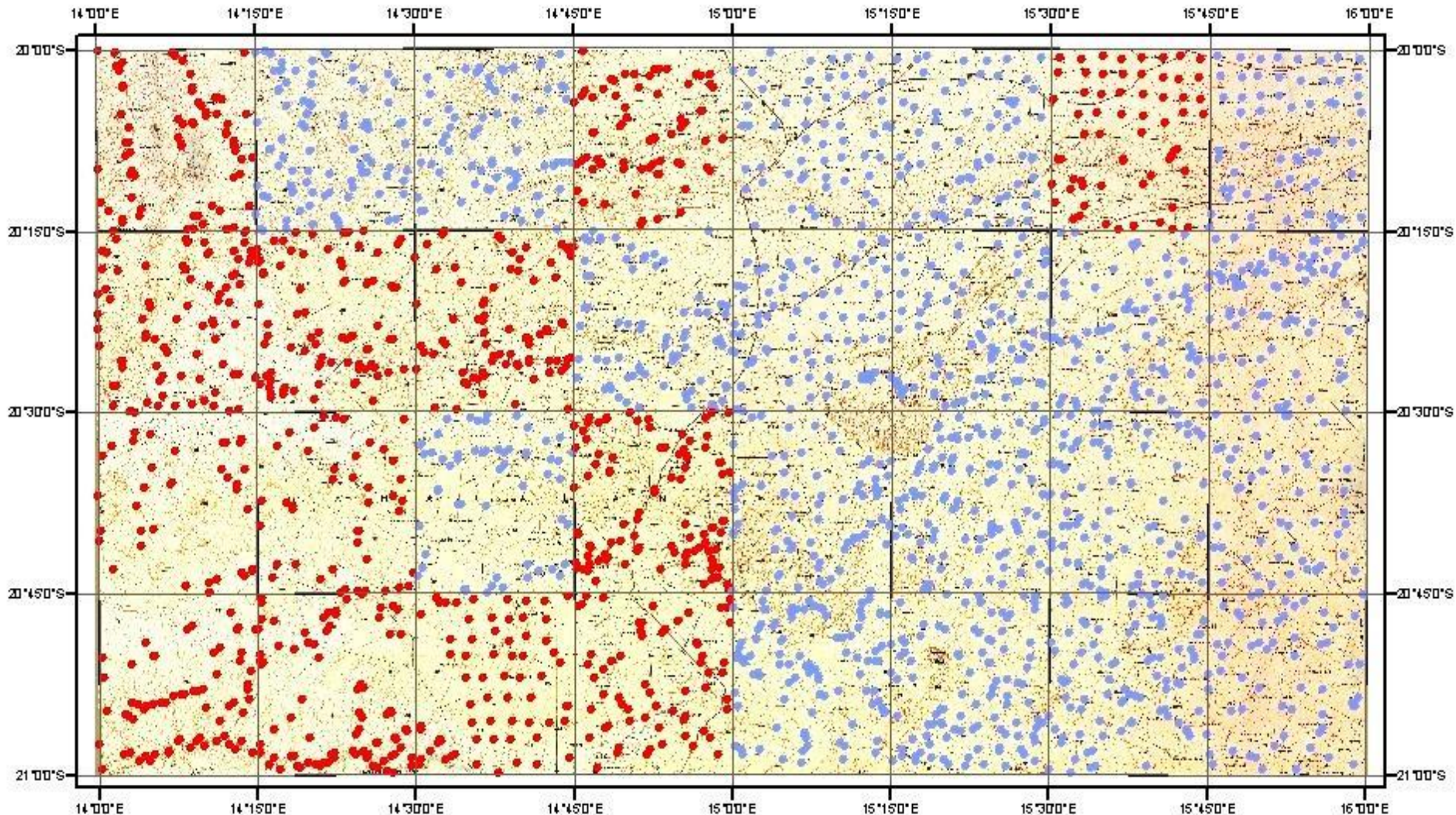
## ***WHY THIS PROJECT?***

- **Sustainable development requires balancing of many factors, including the health of the environment and the utilisation of natural resources, both of which require management through a comprehensive high-quality geochemical database.**
- **Knowledge of surface geochemistry is relevant for economic and environmental management decisions and policies for sustainable development**



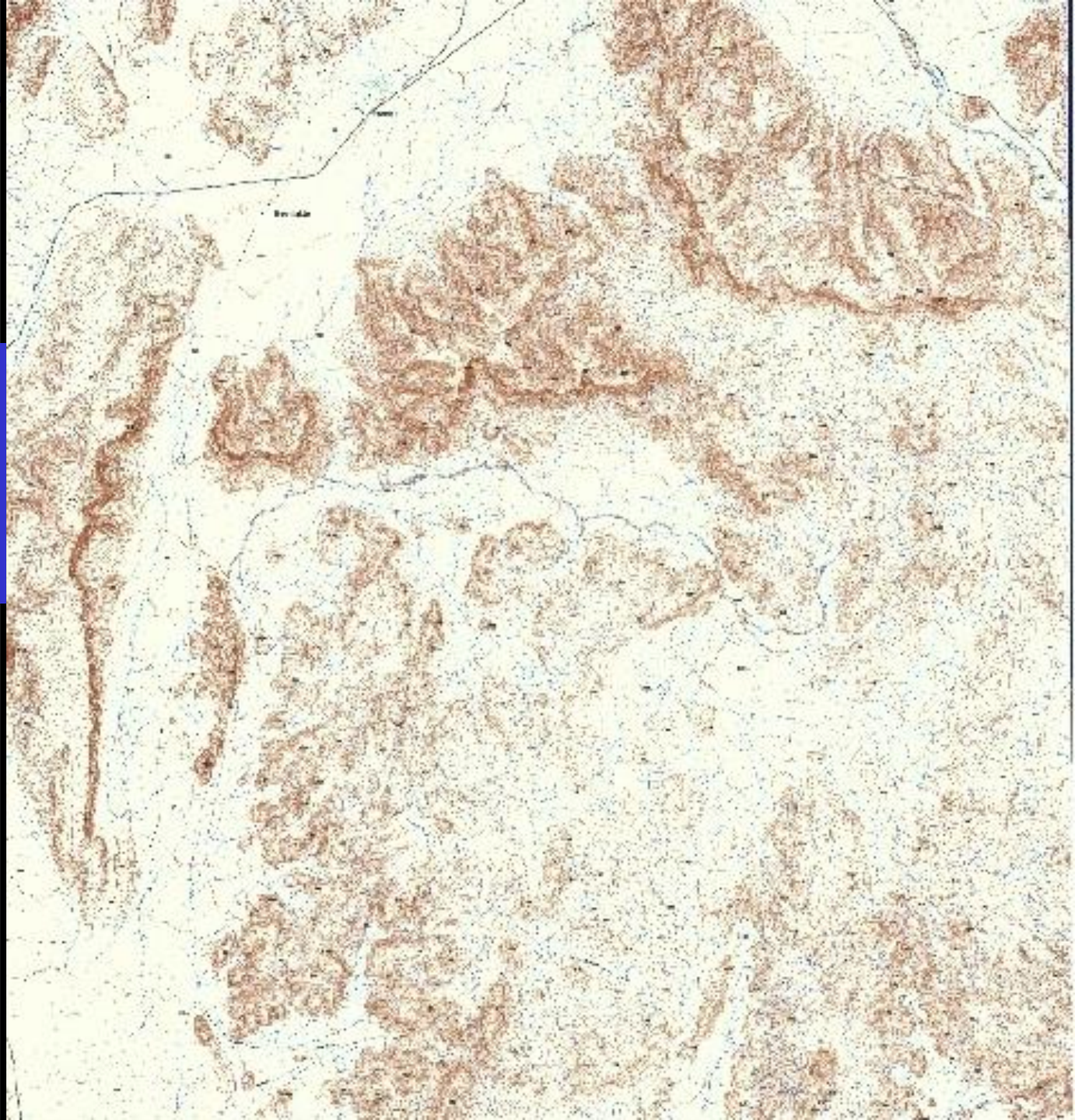
- **The RGSP has a number of stages involved:**
  - **Survey design and sample collection;**
  - **sample preparation and analysis;**
  - **data analysis and interpretation; and**
  - **production of baseline geochemical maps for all possible elements.**
- **Incorporation of all data and reports in the National Geochemical Database**

The sampling surveys are designed on the basis of 1:250,000 scale map sheets



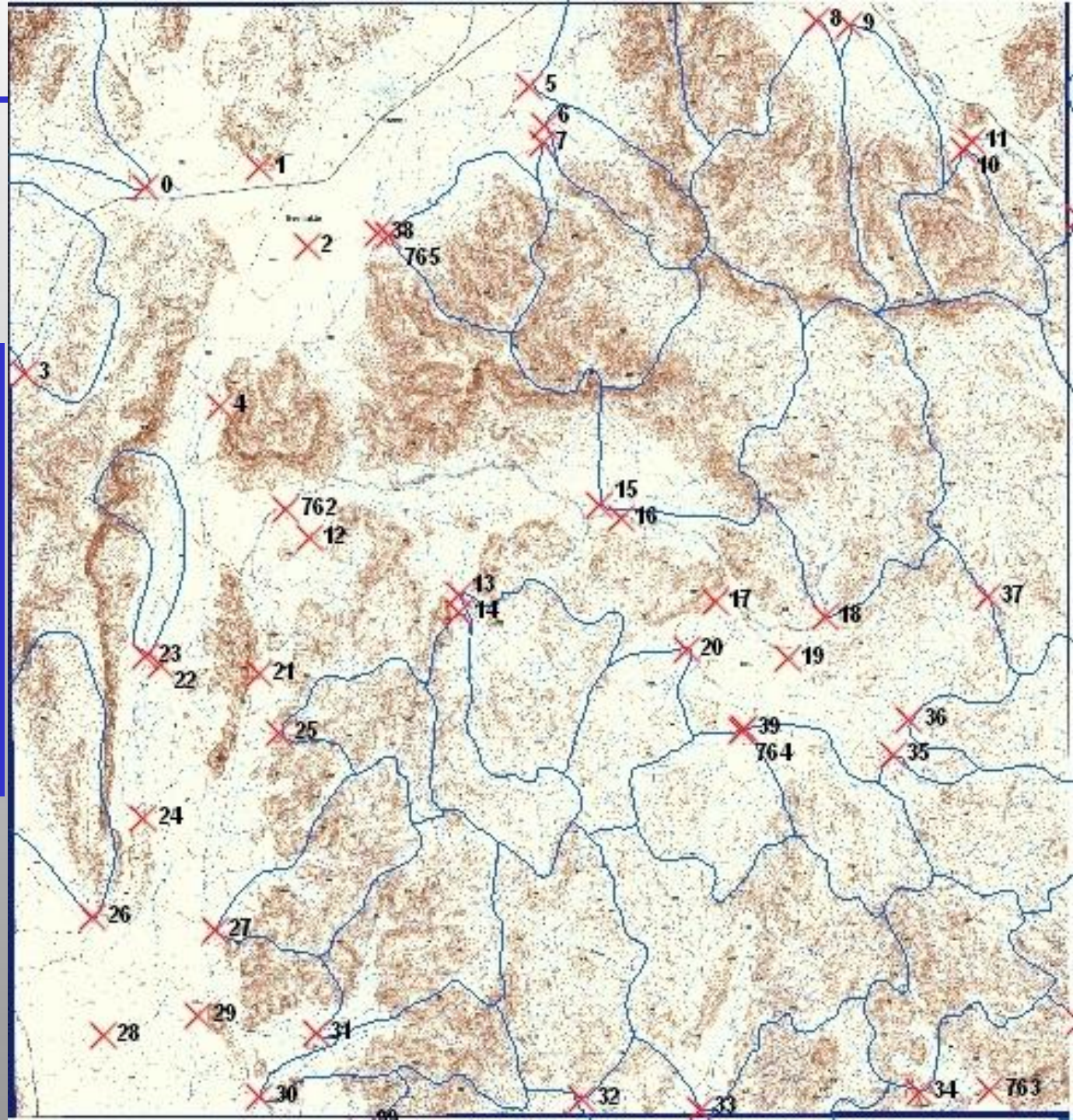
***GSN*** ←

*1:50,000  
scale  
topographic  
map*



# ***GSN***

*1:50,000  
scale  
topographic  
map with  
sample sites  
and  
catchments*





**GSN**

*Sampling Contractors*



# GSN

## Sampling Equipment



# GSN

## Sampling Process





The composite sample is screened (dry sieving) in the field to produce two size fractions.

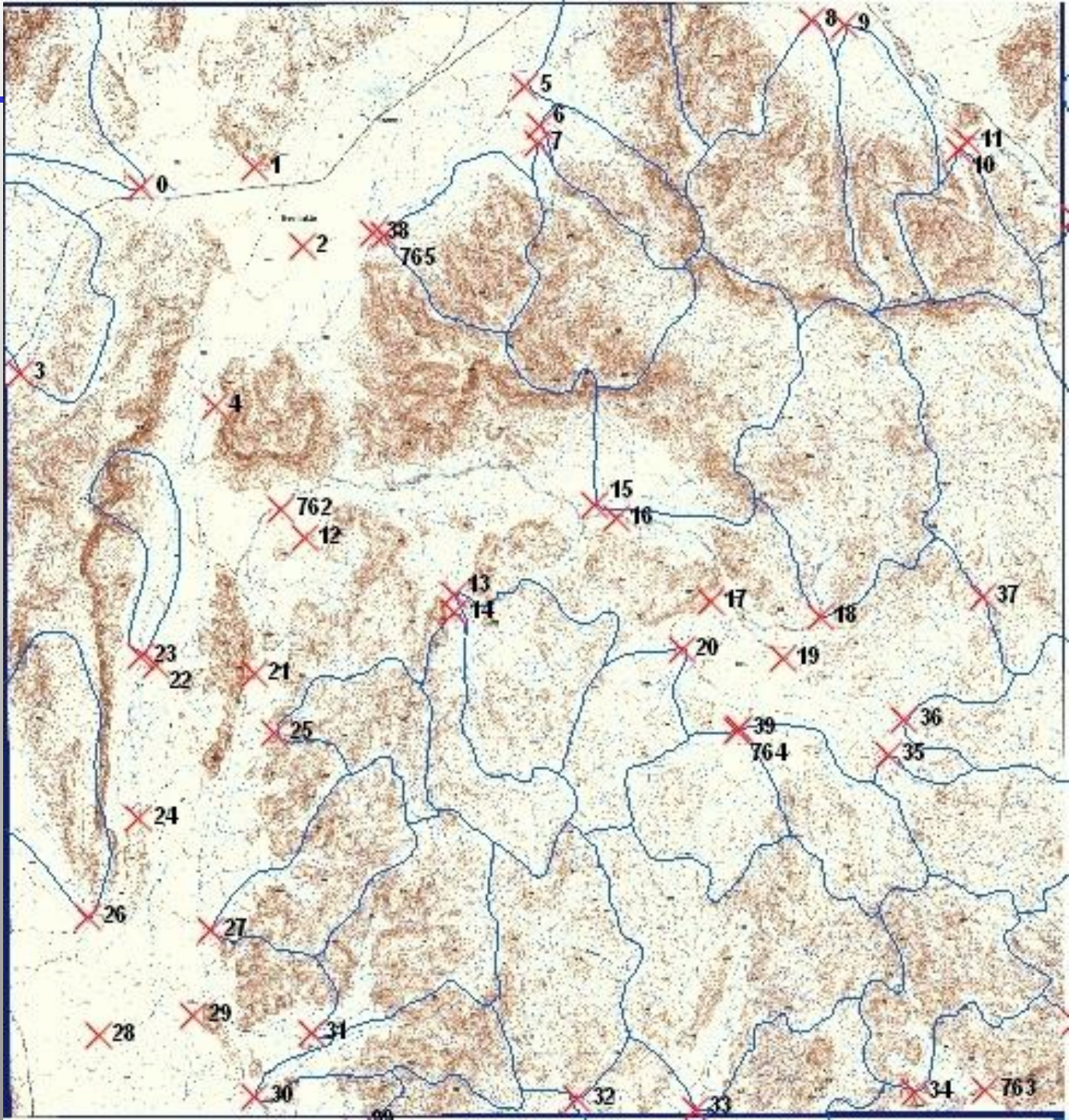




Archival  
Sample  
Storage  
Facility

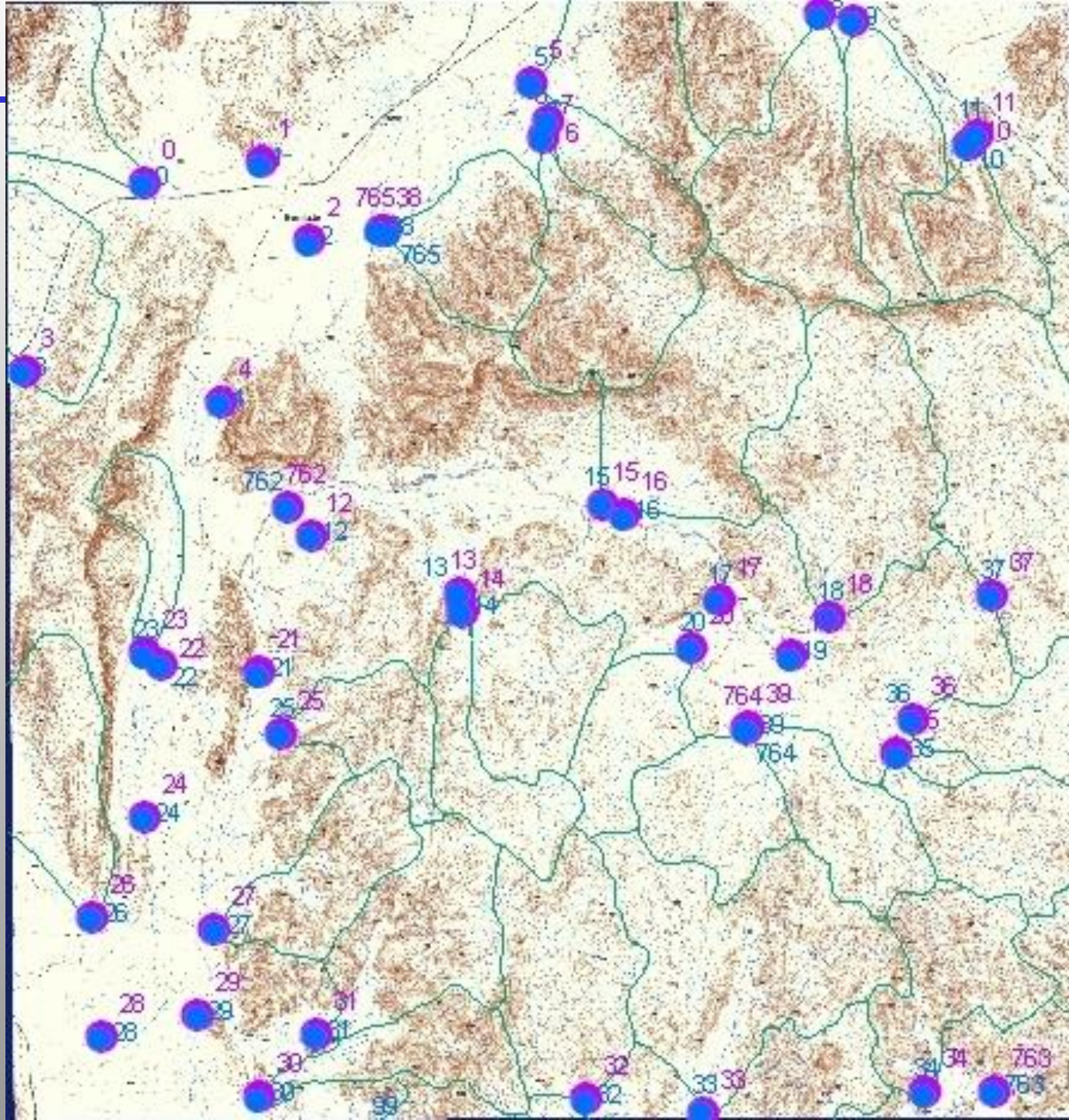
# ***GSN***

*Monitoring  
and Site  
Inspections*



# ***GSN***

*Monitoring  
and Site  
Inspections*



# Monitoring



**Site inspections involves checking whether:**

- **the sampling site is based on GSN coordinates**
- **Sample point marked correctly**
- **Peg have the correct sample number**
- **Aluminium tag is there with the correct numbering**

# GSN

## Sample preparation



Milling of samples



Pressed Pellets  
and Glass  
Beads for XRF

Sample Digestion



Sample solutions for ICP

# GSN

## Sample analysis

WD-XRF



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# ***GSN***

## *Sample analysis*



**ICP-AES**

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## *DATA processing*

- **Elements and oxides analysis:**
  - **SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, TFe<sub>2</sub>O<sub>3</sub>, CaO, K<sub>2</sub>O, MgO, Na<sub>2</sub>O, MnO, P<sub>2</sub>O<sub>5</sub>, TiO<sub>2</sub>, Ag, As, Ba, Be, Bi, Cd, Ce, Cl, Co, Cr, Cs, Cu, Dy, Er, Eu, Ga, Gd, Ge, Hf, Ho, La, Lu, Li, Mo, Nb, Nd, Ni, Pb, Pr, Rb, Sb, Sc, Sm, Sn, Sr, Ta, Tb, Th, U, V, W, Y, Yb, Zn and Zr.**
  - **Multivariate geostatistical analysis method will be utilised to evaluate the analytical data.**
  - **Data analysis, visualisation and preparation of the geochemical maps will be performed using Geosoft Geochemistry for ArcGIS.**

- **Geochemical baseline is employed with the understanding that:**
  - It represents a summation of natural and human influence.
  - Indicates the actual content of an element in the superficial environment at a given time.
- **The data and the accompanying element distribution maps resulting from systematically documenting the concentration and spatial distribution of elements in the surface can be a reference against which any future changes can be quantified (Wang, 2012).**
  - As the climate changes, so does the environment
- **Because the parent material strongly influences the soil chemistry, a geochemical baseline should be determined in separate geological regions (Darnley, 1997).**

- **By sponsoring this project, the Namibian Government acknowledges the economic development depends on the environment and that continued environmental degradation could threaten our actual survival.**
- **Since natural processes and human activities are continuously modifying the chemical composition of our environment, it is important to determine the present abundance and spatial distribution of the elements across the Namibian surface in a much more systematic manner.**
- **The data generated through this project is expected to aid exploration for mineral resources, earth science research, environmental assessment and land use planning in Namibia**

# ***GSN***

*Indeed Geology Underlies Everything!*



*Thank you!*

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