Status and Future of TrigNet, South Africa's network of Continuously Operating Reference Stations

Aslam PARKER, South Africa

Key words: CORS, TrigNet, GNSS modernisation, AFREF

SUMMARY

South Africa's Global Navigation Satellite System (GNSS) Continuously Operating Reference Station (CORS) network, known as TrigNet, remains the cornerstone of the nation's modern terrestrial geodetic infrastructure, providing real-time and post-processed positioning services that underpin surveying, mapping, and geospatial data integration across the country. Managed by the Chief Directorate: National Geo-spatial Information (NGI) of the Department of Land Reform and Rural Development (DLRRD), which is mandated by section 3A of the Land Survey Act 8 of 1997, TrigNet ensures the maintenance of the national reference frame, alignment with the International Terrestrial Reference Frame (ITRF), and supports diverse applications ranging from cadastral surveying, UAV, space weather prediction, geophysical applications to precision agriculture and infrastructure monitoring.

As of December 2025, TrigNet comprises of 70 operational CORS stations strategically distributed to achieve near-national coverage and includes three network real-time kinematic clusters utilising the virtual reference station (VRS) solution.

Network modernization efforts include the migration to multi-constellation, multi-frequency GNSS receivers capable of tracking GPS, Galileo, GLONASS, and BeiDou systems, alongside upgrades to communications infrastructure and data processing software. Enhanced data quality control, automated integrity monitoring, and improved latency have significantly increased reliability and service accessibility for professional users.

Despite these achievements, challenges remain, including aging equipment, communication and power disruptions in remote areas, and the need for sustainable funding to maintain and expand the network. In response, NGI is developing a **TrigNet 2030 Strategy**, which envisions a resilient, user-centric, and interoperable CORS infrastructure integrated with regional and global geodetic frameworks.

The ongoing modernization of TrigNet is not merely a technical upgrade but a strategic national investment. It strengthens South Africa's spatial data infrastructure, supports the Committee for Spatial Information (CSI) objectives, and ensures alignment with the United Nations Global Geodetic Reference Frame (UN-GGRF) vision for a sustainable Global Geodetic Reference Frame (GGRF).

This paper presents an update since the paper published by **Vorster, P. & Koch, S., 2014** and provides a synopsis of the current status, recent upgrades, operational challenges, and forward-looking development plan for TrigNet—highlighting its significant role in advancing geospatial accuracy, national development, and regional geodesy collaboration.

Status and Future of TrigNet, South Africa's network of Continuously Operating Reference Stations

Aslam PARKER, Republic of South Africa

1. INTRODUCTION

The Chief Directorate: National Geospatial Information (CD: NGI), of the Department of Land Reform and Rural Development, is, in terms of the Land Survey Act (Act 8 of 1997), responsible for the establishment and maintenance of the national control survey system of South Africa. This includes the physical horizontal and vertical control survey network, associated coordinates and defining parameters for realisation of the reference system and the reference frame.

The South African horizontal reference system is based on one of the realisations of the International Terrestrial Reference System, being the International Terrestrial Reference Frame 1991 (ITRF91). The ITRF91 reference point used as origin for the South African reference frame is the coordinates of Hartebeesthoek radio astronomy telescope as of 1 January 1994 (epoch 1994.0). The South African datum is, therefore, referred to as the Hartebeesthoek94 Datum (**Vorster, P. & Koch, S., 2014**).

The South African national horizontal and vertical control survey networks comprise of approximately 29,000 trigonometrical beacons, 20,000 town survey marks and approximately 30,000 benchmarks. The positions and heights of these monuments do not change over time and are, therefore, termed a passive network. The coordinates and the heights of the physical markers realise the vertical and horizontal reference frames respectively.

The advent of Global Navigation Satellite Systems (GNSS), particularly Global Positioning Systems (GPS), has necessitated the establishment of networks of permanently installed GNSS receivers that continuously record data from navigation satellites, termed continuously operating reference stations (CORS). The South African CORS network is known as TrigNet and is an extension of the national control survey network.

The establishment of a network of permanent GNSS base stations in South Africa was first proposed in 1997, with the first four stations were installed by staff of the Chief Directorate: Surveys and Mapping, now the Chief Directorate: National Geospatial Information, in 1999. The TrigNet service commenced with the provision of GPS data for post processing purposes to users, via email, as per user requests. An internet-based data provision service was introduced in 2003. Users could then access the file transfer protocol (ftp) site and download data as and when required, thus greatly improving the efficiency of the service.

In 2005 the CD: NGI received funding in order to replace and upgrade the outdated receivers and network management software. The original choke ring antennas were retained. The upgraded network management software enabled the introduction of various real-time services, both single station (RTK) and network RTK solutions in 2006.

2. CURRENT STATUS

The continuity of TrigNet's services, particularly real-time services, relies on the continual operation of equipment, power and data communication. The TrigNet network is currently characterised by the following:

2.1. TrigNet Station Distribution

The TrigNet network currently comprises 70 operational stations (as of December 2025). The CD: NGI has installed stations at various new sites in the past years. Co-operative agreements with primarily public and State entities, that have agreed to house and assist with the monitoring of the equipment, have resulted in the establishment of TrigNet stations at those offices. The real-time network can be viewed at: http://www.trignet.co.za/Map/SensorMap.aspx .

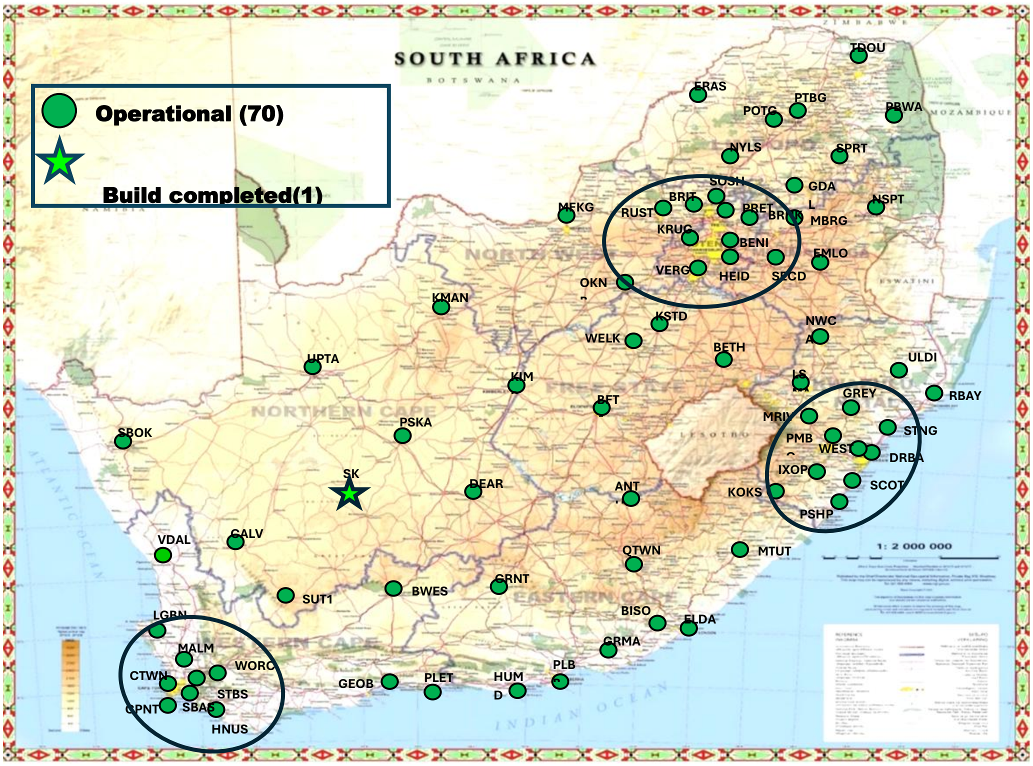

Figure 1. TrigNet and IGS stations as of December 2025

2.2. Remote Stations Redundancy

Receiver redundancy was built into the initial TrigNet stations design through the installation of two receivers at each station, with each receiver communicating through its own controlling computer. This configuration was discontinued at all stations due to the inability to fund additional receivers from the annual granted budget. Fortunately, it is our experience that receivers last significantly longer than the stated lifespan. The densification of the TrigNet network, particularly in the Gauteng, Kwazulu-Natal and Western Cape provinces, has provided a certain level of redundancy for operations like static surveys. On the other hand, the lack of spares presents a real and serious risk for real time operations, which requires 24/7 uptime, particularly in areas with network RTK \ VRS clusters in Western Cape, Gauteng and KwaZulu Natal, should any single receiver fail.

2.3. Control Centre Server Environment

TrigNet's Control Centre, based at CD: NGI head office in Mowbray Cape Town consists of four processing servers that house TrigNet's functions, processes, data and services. This Control Centre has recently been moved to a new virtualized server environment. The original server environment currently serves as an interim secondary failover site until an additional environment is secured for this purpose. Both control centres have a fibre optic connection between them that allows them to run in parallel, serving as backup to each other should either Control Centre suffer a failure. Both server rooms have environment monitoring and control, fire suppression and access control devices.

2.3.1. Backup Power Supply

Each TrigNet station is connected to an Uninterrupted Power Supply (UPS) or to a local emergency power supply. The Primary Control Centre is connected to both a UPS and a primary and secondary emergency diesel generator.

2.4. Data Services

Data from TrigNet stations is streamed back to the Control Centre, located in Mowbray, at a 1 second epoch rate and this is processed into the various post processing products and real-time services. Post processing data products, being daily files of GPS and GLONASS L1/L2 1 second epoch and L1/L2 30 second data, are backed up and archived.

2.5. Communication

Prior to March 2025 communication between the TrigNet stations and the Mowbray Control Centre occurred via leased (copper) lines, some via VSAT (Very Small Aperture Terminal), in a frame relay cloud. The frame relay cloud provides alternative routing of the leased lines should failure occur in a particular exchange. Since March 2025, all the lines have been converted to 4G/LTE based mobile network with network redundancy. When the primary service provider fails, it automatically transmits through the secondary service provider. The TrigNet stations' data transmission converge at the Rondebosch exchange, and two microwave lines are used between the Rondebosch exchange and Mowbray.

TrigNet's products and services are provided to users via the internet, which is administered by the Internet Service Provider (ISP). The server that provides the products and services to the ISP is housed within the Primary Control Centre. The demand for TrigNet products and services, especially Real-Time Kinematic (RTK) services, has necessitated this connection's bandwidth be increased incrementally to ensure delivery to the user.

2.6. Network Management

TrigNet's network management software controls all aspects relating to TrigNet's operations, which includes monitoring network stability, data download, data processing and the generation and distribution of products and services. This is done though the Trimble Pivot Platform (TPP) Infrastructure Monitoring and Network Management software to manage and monitor this network on a 24/7 basis. The software processes the data received into TrigNet's post processing products and generates Radio Technical Commission Maritime (RTCM) to be streamed to TrigNet's real-time services.

2.7. TrigNet Users

Users are required to register on the TrigNet website (www.trignet.co.za) in order to access TrigNet's real-time services. Post processing data is downloaded via the anonymous ftp site (ftp.trignet.co.za). Registered users receive e-mails, letters and notifications relating to TrigNet.

The TrigNet website contains *Status Messages* notifying users of station outages, maintenance shutdowns, system changes, system upgrades and related messages. Users generally do not make use of this service and, therefore, either an SMS notification service or a social media platform is being considered as an additional means of communicating TrigNet notifications.

2.7.1. National Users

Current feedback suggests that the TrigNet RTK data service is the most frequently used service for cadastral and engineering survey projects, with a significant increase in use by drone operators and in precision agriculture. Since 2012 the CMR+ service, primarily being used by the farming sector in the northern and western Free State, has seen a steady increase in demand. TrigNet data for post processing is primarily being used by aerial imagery contractors and the GIS community and surveyors doing post processing kinematic and static surveys. It is also the primary dataset use for geodetic analysis.

The South African Space Agency (SANSA) uses TrigNet as a continuous "sensor array" for space-weather monitoring by analysing how GNSS signals are delayed and disturbed as they pass through the ionosphere. In practice, SANSA processes the dual-frequency GNSS observations from TrigNet stations to derive ionospheric products such as Total Electron Content (TEC) and its rapid variability, which are key indicators of ionospheric storms, scintillation risk, and other space-weather impacts that can degrade GNSS positioning, timing, HF radio propagation, and satellite communications; these near-real-time ionospheric diagnostics are then used for monitoring and situational awareness, and can support warnings/alerts during geomagnetic storm conditions (Matamba, T.M, 2022). Co-operation between the NGI and SANSA in the application of TrigNet data in space weather research is ongoing.

2.7.2. International Users

TrigNet data is used extensively by the international scientific community. The International GNSS Service (IGS) has adopted 7 TrigNet stations as IGS stations for its post processing data services. The Crustal Dynamics Data Information System (CDDIS), an IGS Global Data Centre, uses high-rate post processing data from these stations to compute near real-time products that include satellite ephemerides, clocks, and earth rotation parameters. TrigNet also streams real-time data from 3 stations to the IGS for its real-time services that commenced in April 2013.

The National Ocean and Atmospheric Administration (NOAA) draw TrigNet data from 7 stations in order to compute variables used in global weather forecasting and global weather models. The Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC) project uses radio signals from GPS satellites, which includes data from 1 TrigNet station, in conjunction with its 6 low earth orbit satellites, to compute radio occultation soundings for atmospheric research.

2.8. Services and Products

TrigNet offers real-time and post processing products to a wide variety of local and international users.

2.8.1. Post processing products

Post processing products, containing GNSS observables, are made available in Receiver Independent Exchange Format (RINEX). RINEX is an open format and can be used in any GNSS data processing software suite. Since 15 April 2025 all data is available in Receiver Independent Exchange Format (RINEX) 3.05 format.

The table below provides a summary of TrigNet post processing products that can be downloaded via the ftp TrigNet site ftp.trignet.co.za.

Post Processing Products	Comments
1 second LIL2 hourly files	Available ±40 minutes after the hour – Unchecked for completeness
1 second L1L2 24-hour files	Available the following day – Checked for completeness
5 second L1 24-hour files	Available the following day – used by GIS & mapping community
30 second L1L2 24-hour files	Available the following day – used mainly by scientific community

Table 1. TrigNet post processing products

The *Reference* Data *Shop* facility, which is available on the TrigNet website, enables users to customise their post processing data product by specifying the data epoch rate, data period and data content from a specific TrigNet station.

Variables	Selection Example
TrigNet Station	Cape Town (CTWN)
Data epoch rate	4 seconds
Data period	**Start**: 11/04/2014 11h36 SAST, **Duration**: 6h 13m
Data Content	L1 & L2 (GPS and GLONASS)

Table 2: User defined dataset via the *Reference Data Shop*

The maximum data epoch rate is 1 second (1Hz), which is the highest rate at which TrigNet stations record data. The receivers within the network are, however, capable of recording data at an epoch rate of 0.05 seconds (20Hz). Users requiring data at epoch rates exceeding 1 second for a defined period may lodge a special request. Each request will be considered on a case-by-case basis.

2.8.2. Real-Time Services

Real-time services are provided in RTCM format which is receiver independent and is an open format. Differential GPS (DGPS) corrections are provided in RTCM version 2.3. RTK corrections are transmitted in RTCM version 3.1. The provision of Compact Measurement Record plus (CMR +) formatted data that was specifically provided for and used in precision agricultural applications and machine control was stopped entirely to ensure receiver independence of TrigNet services.

The service is provided via the internet using Networked Transport of RTCM via Internet Protocol (NTRIP), with real-time data access:

- Internet Protocol (IP) address: 196.15.132.2
- Internet Port: 2101
- User Security: Username and password.

The Virtual Reference Station (VRS) technology, that forms part of the RTK service, has two-way communication where the software receives the user's three-dimensional position and generates virtual corrections for that position and supplies these to the user. These virtual corrections are derived from data sourced from a group of TrigNet stations with inter-station distances of not more than 80km. According to Inside GNSS (2011), VRS network models GNSS errors across the region (mainly ionosphere + troposphere + satellite orbit/clock residuals), and then creates a “virtual” base station near your rover so your RTK baseline becomes very short (often a few metres to a few km, virtually). That short “virtual baseline” is what gives creates reliable cm-level accuracy over a wide area.

2.9. Third Party Co-operation

The previously used third-party co-operation model has evolved and remains as a result of third parties requesting assistance from the NGI in installing CORS stations for incorporation into the TrigNet network.

In this model the third party is responsible for:

- The purchase of the antenna and receiver that is compliant with NGI’s TrigNet specifications.
- The provision of a suitable facility to house the operational CORS (TrigNet) station.
- The provision of a suitable and reliable power source and backup power supply.
- The maintenance, repair and upgrade of the receiver and antenna.

The NGI is responsible for:

- Selecting the antenna position and installing the equipment at the third party’s site.
- Providing the operational communication facilities to stream the data to the Control Centre in Mowbray.
- Incorporating the CORS (TrigNet) station into the TrigNet network.

This model is being reviewed as it does present risks when the third party withdraws their commitment from the agreement, be it physical equipment of other provisions such as power, facility etc.

2.10. Geodetic Reference Frame

All TrigNet station coordinates are transmitted in the ITRF2014 epoch 2018.18 reference frame. The ITRF2014 epoch 2018.18 coordinates were computed using Bernese GNSS software version 5.2. The planimetric average shift from the official reference frame, Hartebeesthoek94 / ITRF91 (epoch 1994.0), to ITRF2014 epoch 2018.18, is:

	dy (westings)	**dx (southings)**	**Distance**	**Direction (from north)**
	(m)	**(m)**	**m**	**dd**
Average	**0.34**	**0.57**	**0.66**	**30.314**
Stdev	**0.07**	**0.06**	**0.05**	**6.367**
Max	0.49	0.73	0.78	41
Min	0.16	0.43	0.50	15

This does require users of TrigNet who need to work in the official datum, to calibrate to known points (trigonometric beacons and town survey marks, or points already in Hartebeesthoek94 Datum) to establish a localised transformation parameter to precise work.

2.11. On-line GNSS Post Processing Services

A number national and international organisations host free online GNSS data processing services that provide post processing services to users anywhere in the world. GNSS data that has been collected by the user is uploaded to the service in RINEX format. The service then computes an optimum solution by sourcing data from GNSS base stations in the IGS network and applying differential processing techniques. Users receive e-mailed reports containing these optimum co- ordinates in an International Terrestrial Reference Frame realisation or some other national reference frame.

An on-line GNSS Post Processing Service has been implemented for incorporation into TrigNet's products and services. The user provides RINEX GNSS data to which differential processing techniques is applied using base station data from the TrigNet network and, where applicable, the IGS network. The results and quality indicators are provided to the user.
This service allows you to upload GNSS observation data and receive absolute positioning calculations based on the reference stations in the network.
Additional information and requirements of the service includes:

- Supported data formats are RINEX 2. xx, RINEX 3.xx, Hatanaka-compressed RINEX files, Trimble proprietary data formats (DAT, TGD, T01, T02 and T04).
- Data files must be static only.
- Data files must contain dual frequency pseudo-range and carrier phase observations (L1 and L2).
- If your observation data consists of several files, please compress them to a ZIP archive and upload the zipped file. All files inside the archive must belong to the same station and have identical header information regarding receiver type and antenna type.

3. TRIGNET FUTURE

Despite the achievements to date, challenges remain, including aging equipment, communication and power disruptions in remote areas, and the need for sustainable funding to maintain and expand the network. In response, NGI is developing a **TrigNet 2030 Strategy**, which envisions a resilient, user-centric, and interoperable CORS infrastructure integrated with regional and global geodetic frameworks. Some of the key considerations are expanded on below:

3.1. TrigNet Network Expansion and Densification

TrigNet stations are currently not evenly distributed across South Africa (see figure 1), with the current inter-station spacing ranges from approximately 40km to 300km. The areas of highest density are the developing areas which are Gauteng, Kwa-Zulu Natal and the southern part of the Western Cape. Areas of lowest density are the Northern Cape and the northern part of the Western Cape.

Future densification of the TrigNet network will focus on the Western and Eastern Cape, Free State, Kwa-Zulu Natal, Mpumalanga and Limpopo Provinces with a view to realising an inter-station spacing of between 40km and 150km in these areas. The Department of Land Reform and Rural The reduction in inter-station spacing in the Northern Cape and North West Provinces must also be realised. Development corridors and areas of significant mineral exploration and activity will be prioritised.

3.2. Multi-GNSS upgrade

All the established TrigNet stations are currently GLONASS enabled, providing GLONASS observables within the real-time data stream and post processing dataset. Other available GNSS, such as Galileo (European), China's BeiDou Navigation Satellite System (BDS) and Japan's Quasi Zenith Satellite System (QZSS), are not incorporated into TrigNet at this time as not all the receivers and antennas are multi-GNSS capable and most that are capable, such as the Trimble Alloy receivers are not multi-GNSS enabled. This was done primarily for cost reasons, both from a procurement perspective and, at the time the perceived lack of need.

3.2.1. GNSS Receivers upgrade

The current complement of GNSS CORS receivers date back to 2006. The analysis of these, in the table below, indicates that thirty (30) of these receivers have reached end-of-life and require urgent replacement.

Vintage	Receiver Type	No.	Current (Primary)	Current (Backup)	Total in use	With-drawn	Comment
2006	Trimble Net RS	80	0	0	0	80	End of life / GPS only
2007	Trimble Net R3	12	0	0	0	12	End of life / GPS & GLONASS

2010	Trimble Net R5	11	0	2	2	9	End of life / GPS & GLONASS
2012-18	Trimble Net R9	28	26	2	28	0	End of life / GPS & GLONASS
2019-23	Trimble Alloy	42	42	0	42	0	
2024	Leica GR50	3	3	0	3	0	
	Totals	**170**	**71**	**4**	**75**	**101**	

Table 4: Status of TrigNet receivers (Jan 2026)

The purchase and replacement of approximately 30 receivers are planned in the very near term and a strong case for budget is made for to replace all remaining receivers that are out of warrantee/end of life. In addition, the intention is also to upgrade TrigNet stations with receivers that have all constellations enabled.

3.2.2. Antennas

Many of the antennas in the TrigNet network are the original choke ring antennas purchased when TrigNet commenced in 1999. The three-dimensional position of a TrigNet station is referred to the bottom of antenna mount. The antenna must, therefore, remain in an undisturbed operational state for as long as possible in order to provide continuity between computed co-ordinate positions at various points in time. The TrigNet network currently has a variety of antennas from three manufacturers. Antennas installed in the TrigNet network must have an IGS approved absolute calibration rating.

The current complement of antennas includes GNSS CORS antennas date back to 1999. The analysis of these antennas, in the table below, indicates that thirty-five (35) of these receivers have been in service for twenty-six years and require urgent replacement.

Vintage	**Antenna Type**	**No.**	**Current**	**Total in use**	**With-drawn**	**Comment**
1999-2000	Ashtech Choke Ring	38	35	35	3	Original Antennas
2006-2022	Leica Choke Ring	9	8	8	1	Antennas are, generally, more robust than GNSS receivers.
2006-2023	Trimble Choke Ring	17	15	15	2	
2006-2022	Trimble Zephyr	13	13	13	0	
Totals		**77**	**71**	**71**	**6**	

Table 4: Status of TrigNet antennas (Jan 2026)

3.3. Network Management

TrigNet's network management software has recently been upgraded and contains functionality that has not been activated as yet. These functions have been investigated and, wherever feasible, will be implemented and incorporated within TrigNet's services and products. Of particular interest is the functionality to automatically update data when communication to remote stations were severed.

3.4. Site Infrastructure

As far as monumentation is concerned, the stability of each station will be closely evaluated. New stations will as far as possible follow IGS mounting guidelines. Solar power will be considered for certain sites which are prone to power outages will and supplemented with batteries sized for for ≥48–72 h autonomy; AC mains with uninterrupted power supply (UPS) with smart Maximum Power Point Tracking (MPPT) and remote telemetry. As far as security is concerned, anti-vandal enclosures, tamper sensors, CCTV and secure perimeter fencing will be considered.

3.5. Communication protocols

The above stated intention of upgrading receivers and antennas to multi-GNSS requires the adoption of RTCM MSM (Multiple Signal Messages). RTCM MSM is a new universal real time correction data format, that contains all GNSS observation data in generic form. This message type got introduced as the current key RTCM-3 concept by defining the RTCM v3.2 standard. The MSM standardization process started in 2012 by creating a dedicated MSM Working Group. Most of the professional GNSS vendors actively participated. That's why the MSM standard is highly compatible with all the different GNSS receivers (**GeneSys Elektronik GmbH**, 2024).

3.6. Towards a Regional Associate Analysis Centre and AFREF data archive

CD: NGI, in collaboration with other stakeholders of the South African Geodesy Working Group intends to set up a **Regional Associate Analysis Centre** and continue as **AFREF data archive** in order to strengthen geodetic sustainability, improve the quality and availability of GNSS/CORS products, and support the long-term maintenance of the African Geodetic Reference Frame (AFREF). Post processing data of contributing stations can be found at ftp://ftp.trignet.co.za/AfrefData/ . The rationale is that NGI is already positioned as South Africa's national mapping and geodetic authority with established infrastructure, technical capability, and institutional mandate to host, quality-control, archive, and disseminate highvalue geodetic datasets. By providing reliable regional analysis and secure archival services, CD: NGI will help ensure consistent access to validated GNSS observations and derived reference frame products, reduce fragmentation and loss of critical geodetic records, and improve regional interoperability for surveying, mapping, land administration, disaster risk management, climate and sea-level monitoring, and scientific research. This role further supports Africa's alignment with global geodesy initiatives by enabling consistent integration with international standards and services, while building regional capacity and resilience through trusted, locally hosted geodetic data stewardship.

4. CONCLUSION

The ongoing modernization of TrigNet is not merely a technical upgrade but a strategic national investment. It strengthens South Africa's spatial data infrastructure, supports the Committee for Spatial Information (CSI) objectives, and ensures alignment with the United Nations Global Geodetic Reference Frame (UN-GGRF) vision for a sustainable Global Geodetic Reference Frame (GGRF).

5. REFERENCES

GeneSys Elektronik GmbH (2024) *RTCM MSM (Multiple Signal Messages).* Updated 20 August 2024. Available at: https://genesys-offenburg.de/support/application-aids/gnss-basics/the-rtcm-multiple-signal-messages-msm/ (Accessed: 10 January 2026).

Inside GNSS (2011) *What is a virtual reference station and how does it work?* Inside GNSS, 11 July. Available at: https://insidegnss.com/what-is-a-virtual-reference-station-and-how-does-it-work/ (Accessed: 10 January 2026).

Matamba, T.M. (2022) 'Development and Evaluation of Near-Real Time TEC and Ancillary Products for SANSA Space Weather', *Space Weather*, 20(4), e2021SW003013. Available at: Wiley Online Library.

National Department of Land Reform and Rural Development/ Government of South Africa (n.d.) *Policy Framework for Geodetic Surveying, Aerial Imagery and Mapping* (references TrigNet in national geodetic infrastructure context).

Vorster, P. & Koch, S. (2014) *TrigNet, South Africa's GNSS base station network: past, present and future*. AfricaGEO Conference Proceedings (paper). AfricaGEO

BIOGRAPHICAL NOTES

Aslam Parker is the Chief Director of the Chief Directorate: National Geospatial Information, the Government component responsible for the national control survey system, aerial imagery, mapping and topographic mapping programmes. He has a BSc in Geomatics and MSc in Engineering from the University of Cape Town. He is registered professional land surveyor, a member of the South African Geomatics Council and a member of the UN GGIM Subcommittee on Geodesy representing south Africa and has 30 years' experience in surveying and geodesy.

CONTACTS

Aslam Parker, Chief Director: National Geospatial Information, Department of Land Reform and Rural Development, Republic of South Africa. Email aslam.parker@dlrrd.gov.za ; aparker.dla@gmail.com , www.ngi.gov.za