THE WORLD BELOW 400 GHz

The Periodical Newsletter of the
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NZART BRANCH 81

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JUNE 2025 ISSUE

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General Meeting June 2025

A General Meeting of the Waikato VHF Group will be held on

Sunday, 22nd June 2025, 1:30pm

at the Silver Fern Farms Event Centre, (aka Te Aroha Events Centre),
44 Stanley Ave, Te Aroha (Ballance Room, our usual venue)

Our guest speaker will be Dennis ZL1UET who'll tell us about building a 23cm transverter surface mount style, with boards and a few overhead drawings plus picture of the construction.

The "WaiPlenty" 2m network on 146.950 will be monitored prior to the meeting for anyone requiring directions.

Supporting amateur radio on VHF and higher frequencies across the Waikato & Bay of Plenty since 1963

Read our history at https://www.zl1is.info/docs/WVHF_Group_History.pdf

Is your subscription paid up?

At the time of distributing this newsletter, a few past members are yet to renew their Waikato VHF Group subscription for 2025. If the covering email distributing this newsletter says “Subscribed” in the subject line, then you’ve paid and will have been emailed a receipt, or are a Life Member receiving a complimentary copy, so don’t need to take any action.

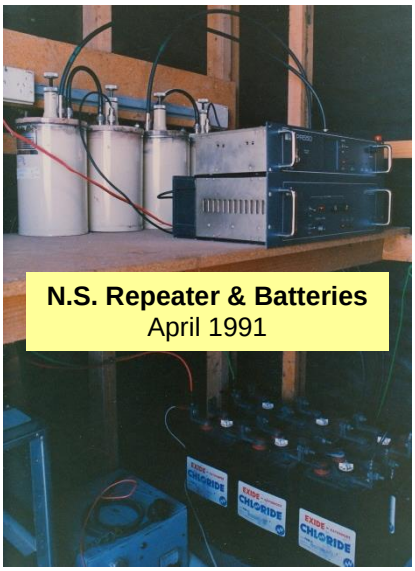
However if the subject line says “prior member”, then you haven’t paid for the current year, so we’d appreciate a renewal subscription from you to assist in offsetting our operating costs. If you don’t renew before our September newsletter is distributed, then this will be your last Waikato VHF Group newsletter.

Kaimai (Takaurunga) site update, plus a little of its History:

Our National System ‘485 repeater was replaced with a Spectra MX800 repeater and associated Low Voltage Disconnect (LVD), plus the Meshtastic repeater was installed during a site visit by John ZL1PO, Dennis ZL1UET and Ian ZL1TAT on 10th April. It had been eleven months since a previous visit to install the loan Motorola DR3000 repeater for the National System, and several maintenance issues were observed to be followed up during summer 2025-26. These include replacing rusted door hinges with grade 316 stainless steel ones, installing a new “Danger Live Cable Buried Here” sign, and upgrading the DC Distribution block interconnecting items connected to the National System battery.

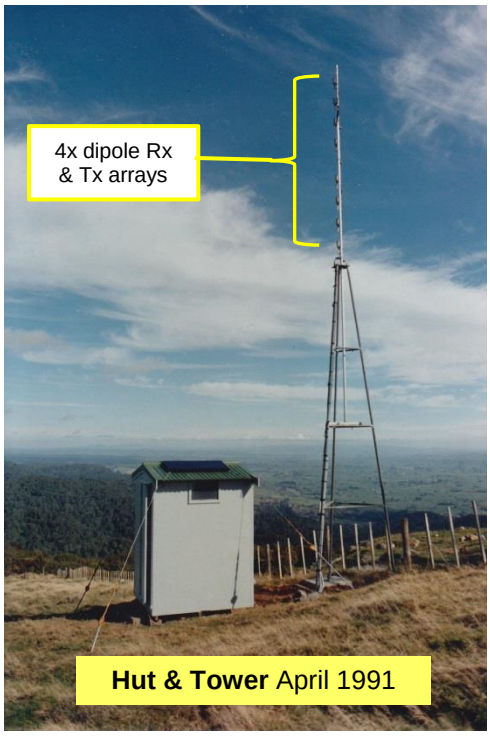
Air along the top of the Kaimai Range is laden with salt blown in from the east coast (35km away), resulting in an ongoing battle with rust. Over the years we’ve replaced two towers there, with the present tower, installed in 2009, being the first specifically designed and constructed for that site.

After an estimated 40 man/days of effort by combined branches from Bay of Plenty and Waikato, a **National System repeater was established at this site in April 1991**. Using a Pye PR550 receiver and PT550 transmitter (photo right) with independent 4x dipole Rx and Tx arrays supplied by Mike ZL1BTB. The hut came from Rotorua, and tower from Te Puke. Three tower footings designed by Ernie ZL1AFC to support the rigged tower at 137km/hr wind velocity each contain 662kg of concrete (all materials being man-handled onto that site!). After initially coming on the air as a solar powered installation with Exide flooded Lead-Acid batteries (220Ah capacity), mains electricity was connected to the hut in June 1991 after a working bee by many to dig a 105 metre long 0.6m deep trench for the cable.



N.S. Repeater & Batteries April 1991

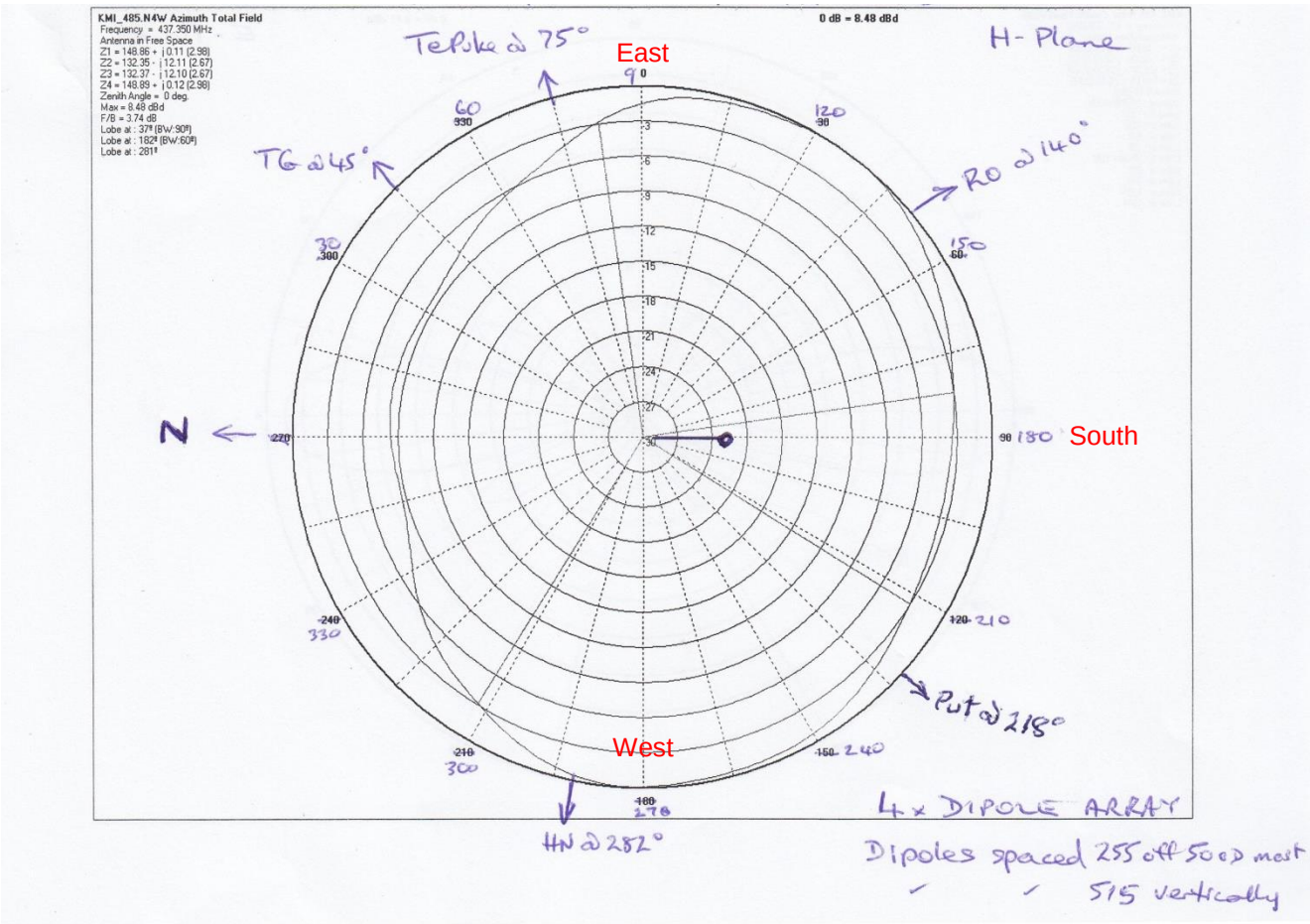
This site was upgraded in February 2002 when Tait T345/T346 radio equipment with a ZL1AKX controller (a popular configuration throughout the National System at that time) was installed along with Yuasa UXL1100 batteries configured as 12V/550Ah, and the original tower replaced.



Hut & Tower April 1991

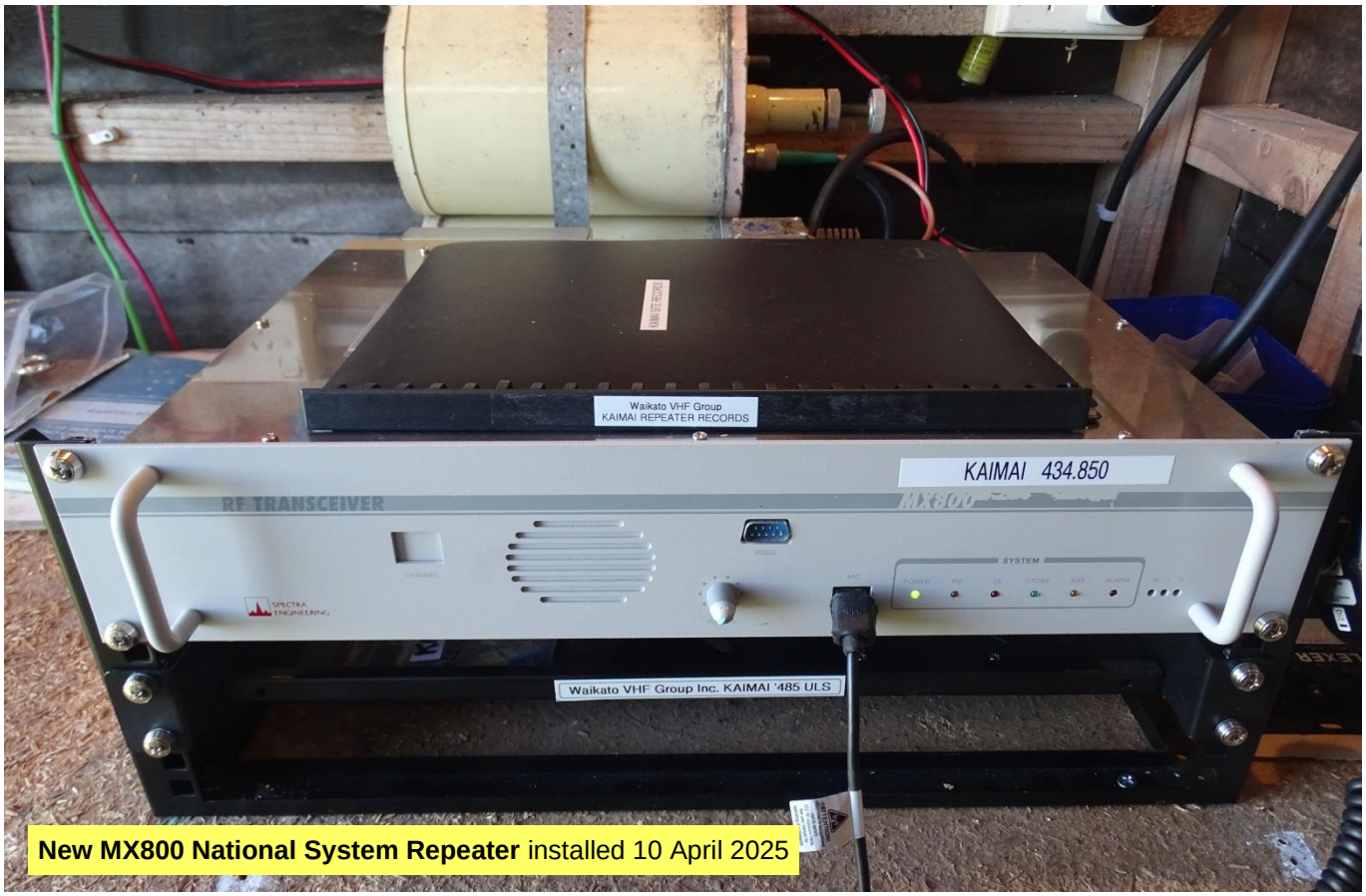
A major site upgrade was carried out over two days in February 2009 when the hut’s crumbling concrete piles were replaced and its floor strengthened. A new tower designed by Noel ZL3GR and fabricated in Te Puke specifically for that site was installed on the original foundations, plus our 12cm beacon was also installed. A new 4x folded dipole UHF antenna array designed by ZL1TAT to produce a predominantly south-east and west radiation pattern (predicted radiation pattern on next page) employing commercially manufactured dipoles was installed. That antenna array was mounted back-to-back with a 2x dipole array initially used for our ‘540 Data repeater, and from December 2019 for the newly installed ‘4575 APRS repeater. Photos of the present installation are on our web site at https://www.zl1is.info/sites.html#kaimais

History of this site has been compiled from Ernie ZL1AFC (SK)’s records and calculations passed onto to Secretary ZL1GWP and recovered following Gavin’s passing in August 2024. Photographic and additional records are from ZL1TAT’s archive.



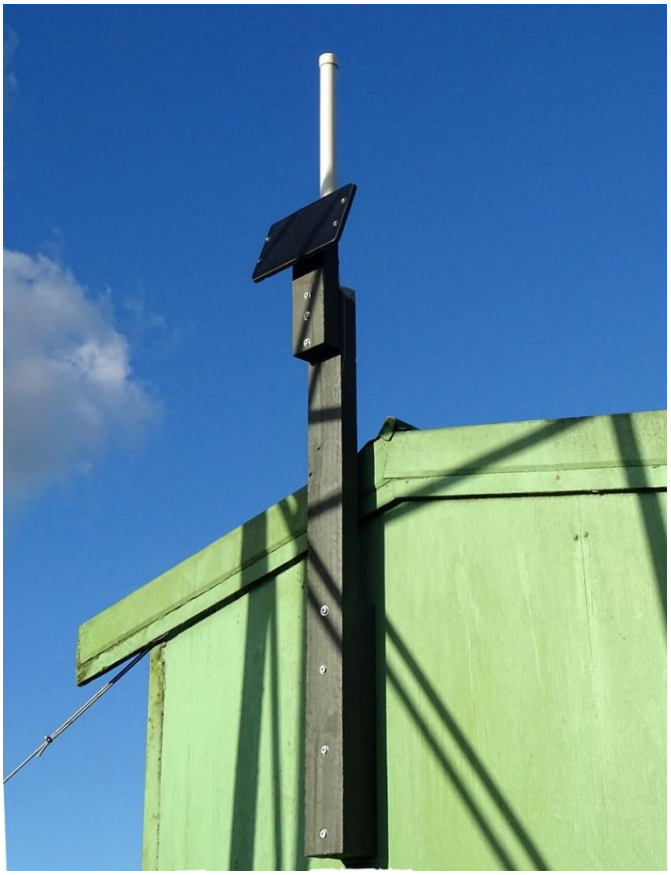
H-Plane Polar Plot for Kaimai ‘485 predicted radiation pattern

This plot indicates the 4x dipole array yielding 8.48dBd gain at two maximums having -3dB points between 82ºT and 182ºT (taking in Rotorua at 140ºT), and 212ºT and 302ºT (taking in Putararu-Tokoroa, Hamilton and Klondyke). Gain due north (up the Kaimai Range) is 8.15dB below those peaks, i.e. +0.3dBd.



New MX800 National System Repeater installed 10 April 2025

Inside our Hut, showing 12cm Beacon below window plus Charger for NS Battery and Band-Pass filters behind NS Repeater. Spares are on top of Battery Box below bench.



Meshtastic repeater, mounted above west wall of hut. This stand-alone solar powered repeater extends Waikato coverage into the Bay of Plenty.

In late afternoon, shadows from our tower pass across the solar panel slightly reducing its output to the already fully charged battery.

For more about Meshtastic which operates in the 915~928MHz (licence free) ISM band providing text only messaging without requiring a cellular connection (useful for communication during civil emergencies), see https://meshtastic.org/docs/introduction/

Since its original installation at Takaurunga, Kaimai, that Meshtastic repeater has been reprogrammed with MeshCore firmware. Refer to article on next page for information about MeshCore radio.

Mesh Radio: *Article supplied by Brett Martin ZL1BRT*

The small solar powered mesh radio installed on the Waikato VHF Group hut is a RAK 19003 base with the 4631 LoRa radio. It was purchased as a Meshtastic kit. This little device has the LoRa radio as well as bluetooth capability and measures just 30mm x 35mm with USB C for programming and power as well as a solar and battery input.
https://store.rakwireless.com/products/wisblock-meshtastic-starter-kit?variant=43884035080390

This RAK board is the heart of the system and has a 6dBi omni antenna plus 2x 18650 batteries in parallel all mounted on a foam sled (see image below) which is slid into a 40mm piece of conduit. A 6W 5V regulated solar panel keeps it going.

The 7Ah battery capacity it will keep it running for about a month give or take a bit with no solar input. The foam sled helps reduce the amount of air in the tube so it doesn't breath in as much moisture and provides a nice mounting structure for all the bits. The conduit has a cap at the top which is glued on. It remains open at the bottom, just a loose fitting foam plug to assist any moisture escape. This is mounted to a small piece of treated 100x50 timber, which allows for mounting of the 40mm counduit, solar panel and provides an easy installation on site in a number of different mounting scenarios.

System assembly prior to installation within 40mm conduit housing.
Stubby antenna on the left here is replaced by a 6dBi antenna in the final configuration (below).

Well what does it do ?

Not much without firmware.

Initially it was installed with Meshtastic firmware, but on 5 May was changed to run on MeshCore firmware (a relative newcomer to the mesh radio field). https://meshcore.co.uk/index.html

From the link above you can also look at a world map showing node deployment and zoom in to check out NZ coverage to date.

Why the change? Meshtastic uses flood routing which tends to be problematic for reliability; there is also a lot of background traffic, beacons, telemetry and GPS data loading up the network. Couple that with a 7 hop limit (how many repeaters it passes through) and the poor performance experienced by users in the mesh both here and overseas lead me to look at MeshCore. I checked it out a few months ago but it wasnt ready for an easy deployment. A couple of weeks ago I had a look and swapped a few repeaters over for a test and was most impressed with performance, so are now changing over the Waikato infrastructure to MeshCore.

[as a side note, Meshtastic has started to look at some form of routing]

About MeshCore

MeshCore is a text messaging system that uses companion radios which can message to other companion radios or work through repeaters to cover a larger area. Note *messaging only*, no voice. Thees LoRa radios operate in the ISM band around 920MHz with 100mW. They're a very low power device which works surprisingly well, however they do need line of site and don't have much bend around objects or building penetration. They do not use the mobile network/internet, it is a completly stand alone off grid system.

MeshCore is a lightweight, portable C++ library that enables multi-hop packet routing for embedded projects using LoRa and other packet radios. It is designed for developers who want to create resilient, decentralized communication networks that work without the internet.

□ Key Features

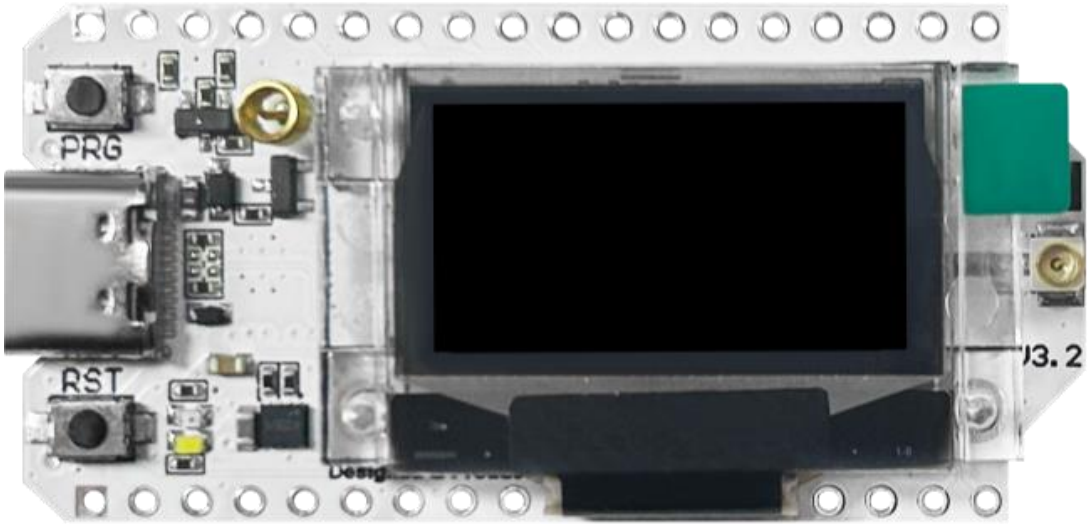
- Multi-Hop Packet Routing – Devices can forward messages across multiple nodes, extending range beyond a single radio's reach. MeshCore supports up to a configurable number of hops to balance network efficiency and prevent excessive traffic.
- Supports LoRa Radios – Works with Heltec, RAK Wireless, and other LoRa-based hardware.
- Decentralized & Resilient – No central server or internet required; the network is self-healing.
- Low Power Consumption – Ideal for battery-powered or solar-powered devices.
- Simple to Deploy – Pre-built example applications make it easy to get started.

Companion Radios

You can buy companion radios that are completly stand alone (have a screen and keyboard) or bluetooth to the companion radio with phone or tablet and use the phones keyboard and screen to interact.

Here is a link to the **SenseCAP T1000-E radio** https://www.seeedstudio.com/SenseCAP-Card-Tracker-T1000-E-for-Meshtastic-p-5913.html?srsltid=AfmBOopgYebia8QJQf5mIdtLlUjrSpYZPuEWXip31ru6rQQ9Mox4sJmH

Another popular choice is the **Heltac V3** https://heltec.org/project/wifi-lora-32-v3/



This is just the populated board, it will require a case and battery. There are too many to mention here.

If you're looking at getting one of these, a couple of pointers;

1. Look at AliExpress, shipping is often free,
   (This can be a biggy and can be as much as the bit you are buying sometimes so check carefully.)
2. The other thing to note is you require the 920 MHz variant for NZ.
3. On batteries, the 18650 type is readily available in NZ,
4. Some enclosures require flat pak batteries which are hard to get in NZ,
5. I have heard that https://www.makerfocus.com/collections/battery
   can get these into NZ but I have not tested this so be aware it could be a problem.

If you've made it this far, you may be interested in trying mesh radio ….

Radio parameters NZ is using **freq=917.375, bw=250, cr=5, sf=11**

You will need to download the MeshCore app from the app store, its free.

Plus you will need a radio as above.

Flash the firmware from here: https://flasher.meshcore.co.uk/

Some links:

How to get started with MeshCore: https://www.youtube.com/watch?v=t1qne8uJBAc

MeshCore vs Meshtastic: https://www.youtube.com/watch?v=T56GTiHvZuE

Andy Kirby from YouTube has a lot more on MeshCore and Meshtastic.

Brett ZL1BRT

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New Constitution:

Our 2025 Constitution, proposed at our 16 March AGM, was sent to NZART HQ on 17th March for Council approval. NZART responded "until we know the outcome of remit 2, we don't know whether Branches will be allowed to have non- NZART members as associate members".

Remits 1 and 2 were passed with minor modifications at NZART's Annual Conference over Kings Birthday weekend, and Remit 3 was withdrawn. After NZART approve our draft constitution, our next step is to submit it to the Registrar of Incorporated Societies for registration. Our 2025 document will then become the Waikato VHF Group's official Constitution, and be published in full on our web site.

NZART 2025 Remits:

Nine NZART members affiliated to Branch 81 were able to have their vote recorded with the Waikato VHF Group at NZART Kings Birthday 99th AGM conference at Lower Hutt. Each of those NZART members recorded as affiliated to Branch 81 were emailed on 11th May seeking their votes, which were then summarized and sent to NZART HQ. This year's remits were published on pages 41 to 43 of the March/April 2025 Break-In. As indicated above, remits 1 and 2 were passed with minor modifications, and Remit 3 was withdrawn.

'For Sale' items on our Web site:

When our new web site was created last year, we included a page for items offered for sale, see https://www.zl1is.info/sale.html Links to this are under the home page header 'SALE' tab.

Also under the 'Resources' tab is an archive of the last twenty years of our newsletters, plus links to a range of useful web sites. Members are welcome to submit items for listing on our web site.

Alphine Fault Network *from Peter Mott ZL3PWM, Coordinator, ALPINE FAULT NETWORK*

The Alpine Fault Network (AFN) is a team of New Zealand volunteer amateur radio operators passionate about disaster relief communications. We exercise monthly on the first Sunday of each month, using both voice (phone) and Winlink Vara HF / FM (email).

Membership of AFN is free of charge, the only requirement for participation being a radio amateur operator working off grid at the time of calling into one of our exercises.

Our membership of about 80 are located in all regions of New Zealand, but we need more!

Branch members with an interest in disaster relief communication can join our team here; https://afn.org.nz/join/

Full information about the Alpine Fault Network is located on our web site https://afn.org.nz

REWARD OFFERED

A reward of 500 microfarads is offered for information leading to the arrest of this desperate criminal - Hop-A-Long Capacity,

This unrectified criminal escaped from a western primary cell where he had been clamped in ions awaiting the gauss chamber.

He was charged with the induction of an 18 turn coil named Millihenry who was found choked and robbed of valuable joules.

He is armed with a carbon rod and is a potential killer. If encountered, he may offer series of resistance.

Capacity is also charged with driving a dc motor over a Wheatstone bridge and refusing to let the band-pass.

The electromotive force spent the night searching for him in a magnetic field, where he had gone to earth. They had no success and believed he had returned ohm via a short circuit.

He was last seen riding a kilocycle with his friend eddy current who was playing a harmonic.

With our last meeting being our March AGM, these are the minutes from our last General Meeting ….

WAIKATO VHF GROUP Inc.
NZART Branch 81

Minutes of General Meeting

Held at the Te Aroha Events Centre, 44 Stanley Ave., Te Aroha,
on Sunday, 8th December 2024 at 1.30pm.

Present: - (12 members + 2 visitors) David ZL1DGK (President), Ian ZL1TAT (Treasurer), Neill ZL1TAJ (VP), Ian ZL1AOX, Andy ZL1COP, Morris ZL1ANF, Joline ZL1UJB, Maxine ZL1FW, Dennis ZL1UET, Roy ZL1BPB, Wally ZL1WE, Kevin ZL1KRH, Digby ZL2TUZ, David ZL1TLQ.

Apologies:- Tom ZL1THG, Russell ZL1RWR.

(ZL1DGK /ZL1UET) – accepted

Minutes:- Minutes of our 22 September general meeting as circulated with our 24th November notice of this meeting.

Adopted on motion of ZL1DGK, seconded ZL1TAJ – carried.

Matters Arising:- Appointment of replacement Secretary yet to occur,

David ZL1TLQ has been appointed web master,

Dennis ZL1UET has been appointed co-trustee for Kaimai '485 and 12cm beacon.

Correspondence:-

Inwards

- Auckland VHF Group 'Spectrum' newsletters for October, November, December 2024,
- NZART Infoline Nos 493, 494 and 495,
- Genesis Energy invoices for Kaimai electricity October thru December 2024,
- NZART confirming Branch 81 email forwarding changes have been actioned, and emails re update of Branch 81 listing on NZART web site,
- NetSpeed Ltd invoice for December internet access for Kaimai National System repeater.

Outwards

- December 2024 newsletter to all current members sent on 24th November,
- NZART email confirming changes required to NZART Branch 81 listing, plus emails with changes required to update Branch 81 listing on NZART web site.

That the inward be received and outward approved on motion of ZL1TAT,

seconded ZL1AOX, – carried.

Finances:

- Our bank balances stood at $8,617.11, plus our 12-month Term Deposit ($8,000.00) established on 17 September.
- Committee member David ZL1TLQ has been added as payment authoriser. New Secretary will be added after they're appointed.

Accepted on motion of ZL1TAT, seconded ZL1KRH, – carried.

General Business:

- **Kaimai National System upgrade**: ZL1TAT reported this is progressing, new repeater install possibly early new year 2025.

- **Te Uku** '5675 has lost its Tx modulation but receives with audio relayed onto other WaiPlenty sites, also TeUku's IRLP link Tx has failed. Due to site access restrictions, no remedial action is currently able to be taken.

Guest Speaker: **-** Andy Brill ZL1COP gave a very interesting presentation about how Police communication centres operate including their Telephony, Computer Aided Dispatch, and radio networks, plus how AREC supported Auckland Emergency Management during the Cyclone Gabrielle storm.

The **meeting closed** at 1510 hrs followed by afternoon tea thanks to David ZL1TLQ.

Approved; **D G King ZL1DGK** Chairman Date ……./……./…….