

TARANAKI MOUNGA VOLCANIC ASH EXERCISE REPORT



Photo by [Yoann Laheurte](#) on [Unsplash](#)

Published 1 December 2023
(*Corrected exercise date.*)

1. INTRODUCTION

1.1 Taranaki Mouna or Mount Taranaki, which lies beneath the flight path of both domestic and international air traffic, has been periodically erupting for around 130,000 years, with large eruptions typically every 150 years, and smaller eruptions typically every 90 years. The last large eruption was in 1655, with the smaller eruptions in the 1800s – in short, it's been a while¹.

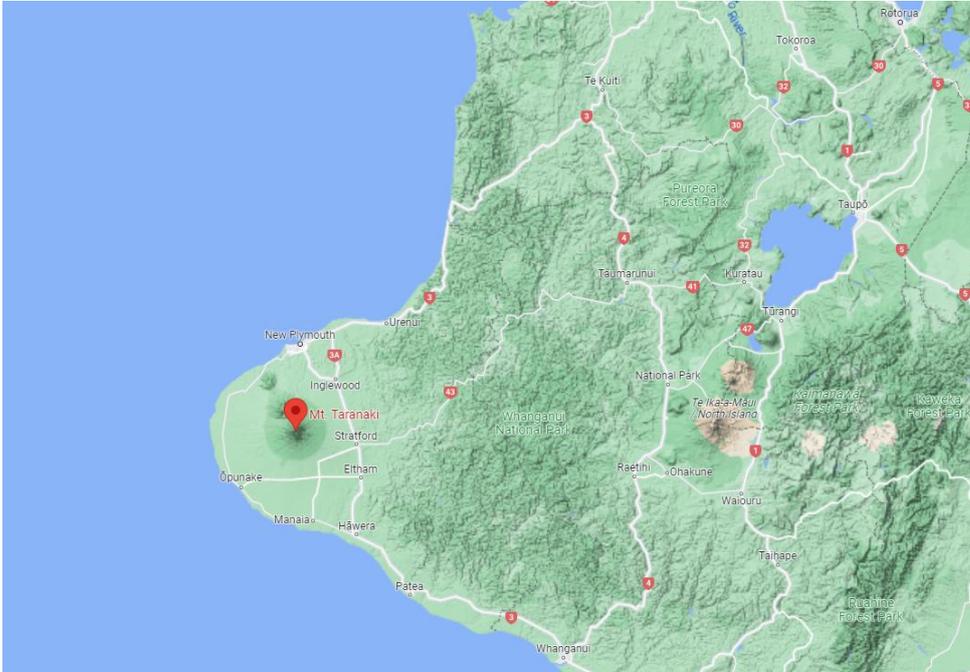


Figure 1: Location of Mt Taranaki – Google Maps

1.2 The International Civil Aviation Organization (ICAO) recommends volcanic ash exercises should be conducted regularly, to practice response and to improve inter-agency response to volcanic activity. This benefits the aviation system through improved safety and efficiency in the event of volcanic unrest, including eruption.

1.3 The Taranaki Mouna exercise also included participation by maritime representatives, due to the potential for volcanic ashfall to damage ship engines and onboard systems, as well as posing a health risk to crew and passengers. Unlike the ICAO IAVW² system, there is no coordinated international system in place to inform mariners of volcanic hazards. Of interest to maritime is information on current volcanic activity to inform risk management processes, and information on expected volcanic ashfall.

1.4 The Civil Aviation Authority of New Zealand (CAA NZ) organised and conducted the Taranaki Mouna exercise on 10 August 2023 as a virtual exercise, with participants joining from their own locations. Exercise messages and supplementary information was shared via a combination of email, WhatsApp and through operational aviation communication systems with appropriate 'exercise' labelling (volcanic ash advisories and SIGMET only).

¹ <https://www.gns.cri.nz/our-science/natural-hazards-and-risks/volcanoes/new-zealands-volcanoes/>

² The ICAO international airways volcano watch (IAVW) defines a set of international arrangements for monitoring and providing information to aviation on volcanic activity, including the presence of volcanic ash in the atmosphere.

1.5 Exercise participants included GNS Science, MetService NZ, Airways NZ, New Plymouth Airport, Air New Zealand, Qantas, the Royal New Zealand Airforce (RNZAF) and Maritime New Zealand. In addition, other aviation organisations and service providers observed the exercise and provided advice or observations as necessary to the participants. For a full list of participants and observers, please see [Appendix A](#).

2. EXERCISE PREPARATION

2.1 The selection of the volcano Taranaki Mouna for this exercise was for the following reasons:

- The volcano is considered ‘overdue’ for an eruption, based on the geological record of previous eruptions.
- The volcano is located under domestic and international air routes, and near to both an airport and a maritime port which are both designated as lifeline utilities.³
- The volcano does not have an existing Volcanic Hazard Zone (VHZ)⁴.

2.2 The scenario for the exercise was designed to exercise how forecast and observed volcanic ashfall might be communicated across the aviation system, in coordination with the communication of ashfall through the civil defence and emergency management system.

2.3 Exercise SIGMETs and volcanic ash advisories (VAA) were issued using the usual official aviation channels, employing the status indicator “EXER”. All other exercise messages were disseminated via email directly to participant email addresses. All exercise messages were also shared in a designated WhatsApp group chat, with additional information shared by participants on related (exercise) actions they would take as the scenario progressed.

2.4 While the exercise Directive did not *script* the exercise, the Wellington volcanic ash advisory centre (VAAC) – operated by MetService, and GNS Science – as the New Zealand State volcano observatory (SVO), were provided with high level guidance on where the simulated volcanic ash should move to and where ashfall should occur.

2.5 A live NOTAM was issued for the NZZC Flight Information Region (FIR) one day prior to the exercise, advising users of the upcoming exercise and ensuring they would not be unduly alarmed by any exercise messages referring to a Taranaki eruption. A copy of this NOTAM and all exercise messages can be found in [Appendix B](#).

2.6 A pre-exercise coordination virtual meeting was held the day prior to the exercise, to confirm participants were ready for the exercise and to ask any last-minute clarification questions.

³ [Civil Defence Emergency Management Act 2002 No 33 \(as at 21 March 2023\), Public Act Schedule 1 Lifeline utilities – New Zealand Legislation](#)

⁴ Permanent VHZ are in place for Raoul Island, Whaakari/White Island, Tongariro, Ngāuruhoe and Ruapehu. Further permanent or temporary VHZ may be designated by the CAA in the future, in the event of other New Zealand volcanoes – such as Mount Taranaki – becoming active.

3. EXERCISE TIMELINE - UNREST

3.1 GNS Science started the exercise at 0930 (all times are in NZDT, unless explicitly stated otherwise) by emailing to participants a Volcanic Activity Bulletin (VAB) and a Volcano Observatory Notice to Aviation (VONA) advising that Mt Taranaki was experiencing increased unrest and so the Volcanic Alert Level (VAL) had been increased to Level 2 and the Aviation Colour Code had been raised to Orange.

3.2 The receipt of these messages prompted the request by MetService for a NOTAM to be issued describing the size of a VHZ around Mt Taranaki, in accordance with their usual procedures when a VAL is either increased or decreased through a value of at least 2.

3.3 Because the VHZ would be a new airspace designation, rather than a resizing of an existing VHZ, it would require coordination by the NOTAM office with the CAA NZ Aeronautical Services Unit in the first instance. Therefore, the resulting NOTAM would likely take longer to issue than a NOTAM for any change in size of a permanent VHZ (for Mt Ruapehu, for example).

3.4 CAA NZ Aeronautical Services Unit noted that, in a real situation, it would need to be made aware of the request for a VHZ by an agency, through established emergency airspace procedures and channels. The NOTAM office noted that the preference is for any NOTAM requests to be made using the IFIS NOTAM template.

[Recommendation 1: NZ NOTAM Office will propose to CAA for acceptance, a process, and template\(s\) to streamline the designation of a temporary VHZ. The process should include consideration of templates for active volcanoes without existing VHZ, and the process for subsequent VHZ NOTAM requests once the new VHZ is established.](#)

3.5 Once the NOTAM was issued, information was passed to relevant air traffic control sectors, who in turn would pass to affected airborne aircraft. The VHZ was entered into the ATM system (SkyLine) and displayed as a map on the controllers' surveillance screen.

3.6 The Graphical NZ Significant Weather (GNZSIGWX) chart was updated to also reflect the increased VAL and subsequent VHZ NOTAM issuance. The practice of displaying the VAL (when VAL is at least 2, but no eruption resulting in airborne ash has occurred) is intended to increase situational awareness of the elevated risk posed by the volcano.

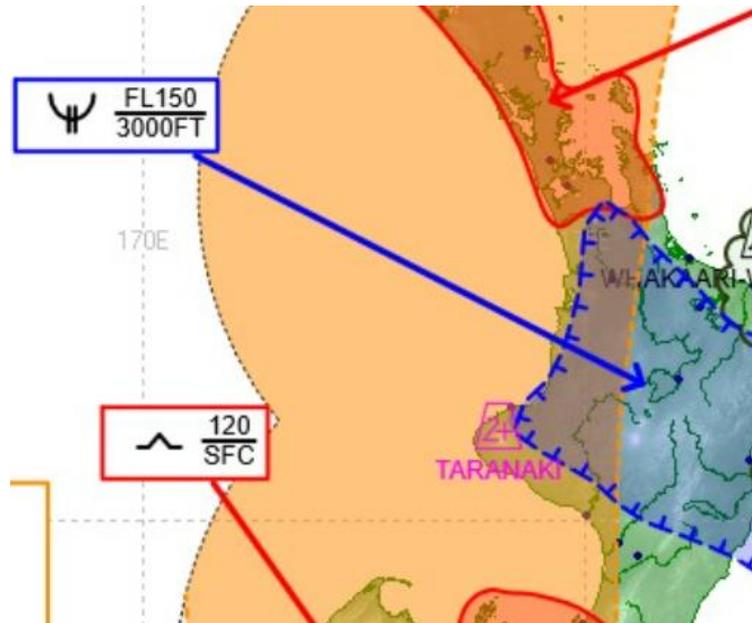


Figure 2: Close up of GNZSIGWX chart, reflecting change in VAL for Mt Taranaki. The footer of the chart includes the text: “Volcano Alert Level 2+, see NOTAM for VHZ information”.

3.7 The information on increased unrest was communicated through organisations, with airlines advising of the initiation of procedures related to the increased risk of eruption, such as restrictions in operations around the volcano and the instigation of a ‘volcano watch’. Further, New Plymouth Airport initiated external communications with local airline representatives, while GNS Science initiated coordination with the National Emergency Management Agency, and the NZ Science Advisory Panel – for the purpose of sharing data with the wider volcano science community.

3.8 In addition, the VAB advising of increased unrest also prompted other actions in support of the health and safety of local air navigation service provider (ANSP) and airport staff, and of the status of local navigation and communication equipment, due to the earthquakes associated with the unrest (as specified in the exercise VAB). In addition, some organisations also initiated communication preparedness for likely media enquiries.

4. EXERCISE TIMELINE⁵ – ERUPTION

4.1 At 1015, GNS Science advised the exercise participants that an eruption of Mt Taranaki had been observed at 1010 and that they had discussed this with the VAAC forecaster and an initial VAB was imminent.

4.2 The initial VA SIGMET was issued by MetService alerting airspace users to the eruption, the initial VAA followed shortly after. The initial SIGMET and initial VAA included information on the observed ash cloud, but no information on the forecast ash cloud positions, due to the ash dispersion model still running. It was noted that the graphical display of NZCC SIGMETs (‘Graphical SIGMET Monitor’ or GSM) did not reflect the exercise nature of the SIGMET issued and so could unduly misinform users of a real Mt Taranaki eruption – despite the intention of the GSM to be supplementary to text SIGMETs, not to be used in their place.

⁵ Note, for the purposes of the exercise, messages were issued, where possible, with a timeline that would be similar to that of a real event.

Recommendation 2: MetService ensure graphical displays for forecast information including status indicators adequately represent the exercise or test nature of that information, as appropriate.

4.3 The initial VAB was provided at 1020, with the VONA a few minutes later, advising simply that an eruption of Mt Taranaki had occurred, that the VAL was now 4, the aviation colour code was now red, and that plume height was being assessed.

4.4 Given the change to VAL 4, this prompted a NOTAM update requests from MetService and CAA to the NZ NOTAM office, to increase the size of the VHZ for Mt Taranaki. Further, an alert message regarding the eruption was sent to all ATC operational workstations.

4.5 Airways and airport advised they would initiate their internal crisis management processes (including mobilising additional staff), while the communications teams of several organisations indicated they would seek to align messaging to social channels for consistency. Further, Airways initiated a group call to airlines, airports and MetService to coordinate communication, plus initiated a user alert via their flight information service platform, while airlines sent ACARS messages to all impacted flights.

4.6 Analysis of the eruption plume by the VAAC and GNS Science determined a height of around 16,000ft, which was then used to initiate the ash dispersion model, and to be included in an updated VAB, issued at 1055. The updated VAB simply gave the plume height and indicated that the eruption was ongoing, with more information to be provided when available.

4.7 A full VAA was issued at 1056, followed soon after by the full SIGMET. The VAA indicated that the initial south-eastward direction of the observed plume would soon shift northwards as the winds changed southerly, therefore likely impacting New Plymouth Airport. The aerodrome forecast (TAF) for New Plymouth Airport was updated to include a 40% probability of volcanic ash reducing visibility to 5000 metres from 1100 local time, noting that this would be updated for more precise timings following coordination with GNS Science, when their ashfall model information became available.

4.8 Airways indicated that they would now start assessing impact on both the domestic (NZZC) and Oceanic (NZZO) FIRs, as well as initiate discussions with CAA on the potential for convening a contingency group. Both airlines indicated that they were assessing the impact on operations, with operations cancelled in and out of New Plymouth Airport and routing changes required for some other flights.

4.9 At 1115, New Plymouth Airport advised that ashfall was now being observed. Following consultation with Airways and airlines, the airport was closed to all traffic till 1200 local the following day. A NOTAM was then requested to inform all users, while the existing VHZ NOTAM was updated to reflect the usual practice of referring users to the VAB and requesting any pilot observations of volcanic ash and/or volcanic activity to be reported. Further, Airways activated NP tower contingency due to the tower closure, and following consultation with management and airlines, would utilise the Raglan contingency flight plan routes⁶ to manage aircraft around the affected area – NOTAM were issued to advise users.

⁶ The Raglan contingency plan prescribes a route system which diverts aircraft around the Raglan air traffic control sector, when ATC is unavailable within the sector, which provided appropriate alternate routes in this case.

4.10 VAAC Wellington advised that at this point they would request the Japan Meteorology Agency, via the Australian Bureau of Meteorology, to organise rapid satellite refresh updates, to provide more frequent satellite imagery of the eruption plume.

4.11 At 1130 Maritime NZ issued a Coastal Navigation Warning to all mariners, advising of the observed and forecast ash areas, using the VAA polygons given each had an ash cloud base of ‘surface’. Further, the warning advised mariners that ‘Ash can be corrosive, effect stability, navigational systems and be hazardous to people’. The warning was updated 20 minutes later due to the unavailability of Taranaki maritime radio site due to the eruption.

4.12 Because the VAA is for airborne ash, rather than ashfall, with the use of ‘surface’ for forecast polygons in part due to the uncertainty in ash cloud base during the early phase of the eruption, it may not be a suitable source of ashfall information for the maritime system.⁷

Recommendation 3: Maritime NZ coordinate with GNS Science for receipt of appropriate ashfall information after an ash-bearing eruption, to help inform any Coastal Navigation Warning.

4.13 Airways overlayed the updated VHZ area on their radar screens, allowing air traffic control to coordinate traffic around, as appropriate. Further development of the affected route NOTAM was initiated, utilising enroute charts and database material, based on the increased size of the VHZ.



Figure 3: Overlay of VHZ area on Airways radar screen (left) and overlay of VHZ with published routes (right).

4.14 It was noted that a VHZ does not necessarily coincide with where any volcanic ash is observed and/or forecast, and therefore while the affected route NOTAM based on the VHZ ensures air traffic does not inadvertently enter the VHZ, it does not separate the routes from any airborne volcanic ash as described by a SIGMET.

⁷ The use of VAA for maritime purposes in this instance was an artefact of the exercise process, noting that there is an ICAO directive whereby dedicated aviation information is not permitted to be utilised directly outside the aviation system.

4.15 This process does not protect airspace users from the volcanic ash emitted during an active eruption, but rather protects users from future explosive eruptions, or unexpected encounters with volcanic emissions in instrument meteorological conditions or in nighttime.

4.16 It was suggested that it may be of use to disseminate the route restrictions as part of the NOTAM describing the VHZ, stating that operations on the ATS routes within the VHZ will only be available upon pilot request, in accordance with CAR Part 91.137 (Volcanic Hazard Zones).

Recommendation 4: CAA, in consultation with airspace users, to determine the usefulness and/or requirements for promulgation of NOTAM for flight routes affected by either a permanent or temporary VHZ.

4.17 Regarding avoiding the volcanic ash itself, airlines indicated that they would build their own alternative routes, based on their own risk management processes – which could vary between airlines.

4.18 Airways and New Plymouth Airport both indicated that they would be considering the health, safety, and wellbeing of both staff and of any passengers stranded at the airport. For the airport, the building ventilation system would be shut down to prevent damage from ash ingress.

4.19 A mid-exercise check-in was held at 1210 via a Microsoft Teams meeting, for participants to outline messages issued and/or received and any actions taken, as well as any issues they may be encountering during the exercise. The issue around exercise SIGMETs not displaying obviously as exercise messages was highlighted again, with some confusion reported across both ATS and airline users. MetService informed participants that a fix has been quickly implemented for SIGMETs displayed in the flight briefing tool PreFlight, showing an “EXERCISE ONLY” label. It was suggested that additional exercise messaging should be added to the landing page of MetService flight briefing tools MetJet and PreFlight, to avoid any further confusion – this was enacted immediately.

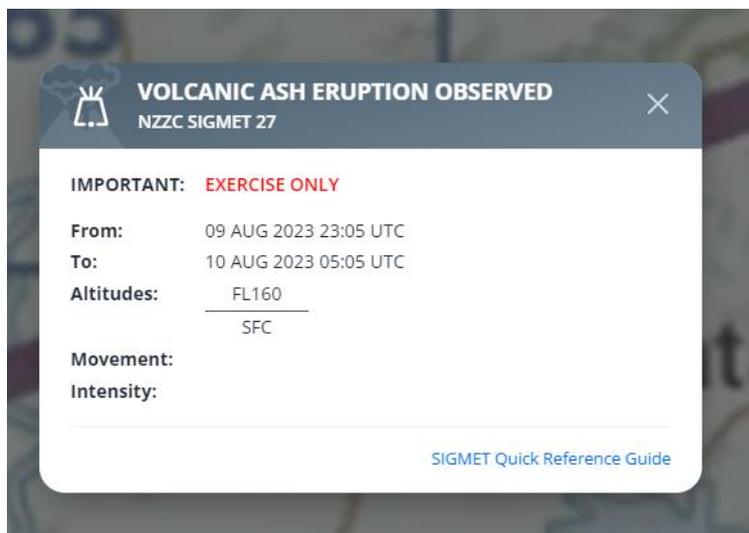


Figure 4: Image of Taranaki exercise SIGMET information in PreFlight, following addition of exercise label.

4.20 The second phase of the exercise started at 1236, with GNS Science issuing an updated VAB to include information on both the eruption plume movement and reported ashfall. Further, information on the expected total ash thickness for New Plymouth over 12 hours was provided in graphical format. This prompted a new TAF for New Plymouth Airport, with the visibility reduced to 5000 metres till 1500 local, then changing to a 30% chance of visibility reducing to 5000 metres in volcanic ash after 1500, until the end of the TAF validity at midnight that night.

4.21 As an aside to the exercise material, both VAAC Wellington and GNS Science respectively provided ash dispersion and ashfall imagery to exercise participants, showing what an eruption on the day of the exercise could lead to. The strong westerly flow being experienced across New Zealand on the exercise day would have resulted in a volcanic ash plume extending across to Hawke's Bay and therefore result in any north-south air traffic needing to traverse the central North Island having to fly west of Mt Taranaki and over the Tasman Sea. This would have caused an issue for some domestic operators who were not equipped with over water systems required by New Zealand Civil Aviation Rule Part 121.363.

4.22 Exercise participants then discussed the potential utility of incorporating into the aviation system information on ashfall at an aerodrome, noting that the GNS Science information in the VAB may not be immediately available to all aviation users. It was agreed that information being shared via NOTAM would be of use to a wider range of users, due to alternative mechanisms such as the VAB or the ICAO Annex aerodrome warnings not being disseminated to international operators. Further, including information on expected ashfall at an aerodrome, if possible (ie due to a forecast wind change), would be of use for planning and preparation for operational staff located at airports (ie covering equipment) and also potential relocation of aircraft.

4.23 It was also noted that the information on imminent eruption (via VAB or VONA) was useful to users as part of their risk minimisation planning processes, for example not overnighing aircraft at a potentially affected aerodrome.

4.24 Discussion was held on the utility of a NOTAM identifying affected air routes, noting that information contained within on affected routes would be extensive and given that operators will have differing risk profiles and needs, may not necessarily be the most useful tool for ensuring safe air navigation.

4.25 At 1400, due to queries around the non-exercise labelling of exercise SIGMETs on the graphical SIGMET display, and the appearance of exercise SIGMETs and VAA in one operator's flight planning tool, the remaining exercise SIGMET was cancelled and exercise VAA finalised.

4.26 The issue of reporting volcanic ashfall as a runway contaminant was also raised, given the runway condition reporting format is for water-based contaminants. It was noted that the *Handbook on the International Airways Volcano Watch* (ICAO Doc 9766) contains information on issuing NOTAM to inform users of ash contamination of a runway.

4.27 The task of ashfall clean up was noted to likely be a multi-day, multi-organisation activity for any significant ashfall. Further, in dry conditions, nearby ash deposits can be remobilised during windy days to re-contaminate the runway.

4.28 The exercise concluded at 1450. The live NOTAM advising airspace users of the exercise being held was cancelled.

4.29 The initial exercise debrief was held at 1500, where each participant outlined their thoughts on how the exercise went for them and highlighted any further issues encountered. A summary of the debrief discussion follows:

- It was suggested that early exercise notification (eg in AIP SUP) would allow flight planning tool providers to appropriately manage exercise messages. However, the use of EXER and TEST status indicators has been in place for nearly four years and so it's anticipated that tool providers would be able to manage these without requiring manual intervention (eg user control to allow any EXER messages to be displayed).

- It was noted that the VHZ in place at VAL 2 was set at FL150, however the eruption (while fictional in this case), reached FL160. During recent periods of unrest, volcanoes at VAL 2 tend to have an aviation colour code of yellow. If, as in this case, a VAL of 2 (highest level before eruption occurs) is applied along with aviation colour code orange (indicating greater risk to aviation), it may be prudent to increase the height of the VHZ in place.

[Recommendation 5: CAA to consider reviewing VHZ airspace in New Zealand and consider the role of aviation colour code within.](#)

- Including maritime operators in the volcanic ash information system would have value for the entire transport system, whereby encouraging the provision of ash observations from the maritime community would feed back into VAAC and GNS Science models and improve the resulting output for all users. Both MetService and GNS Science highlighted the importance of observations to their work and noted that is important to note that observations of volcanic ash should go to both organisations.
- Quick and clear communication is essential in the early stages of an eruption is critical – wherever pre-prepared templates can be used (such as VHZ designation); this would be helpful as they could potentially be promulgated quickly by the NOTAM office.
- Sharing ashfall information through the aviation system was seen as useful by exercise participants, ideally using existing aviation mechanisms, such as NOTAM.
- Clean up after ashfall at an aerodrome would be a significant task – not just removing ash from runway but mitigating recontamination of the airfield. Further, ensuring equipment functionality would be a challenge, due to potential ash contamination.

5. FURTHER CONSIDERATIONS POST EXERCISE

5.1 New Plymouth Airport noted that initial notification of a Taranaki eruption would be most useful if made directly (such as a phone call), given there could be a delay in awareness of any messages issued. It may be as a lifeline utility, this contact would be made via Civil Defence Emergency Management mechanisms, rather than through the aviation system.

[Recommendation 6: New Plymouth Airport coordinate with New Plymouth Airport Tower and/or Taranaki Civil Defence Emergency Management group to confirm or otherwise arrange a mechanism for direct contact in the event of a Taranaki eruption.](#)

In addition, there is a potential need to inform other aerodromes that there may be diversions – this is especially relevant if the volcanic ash is affecting an international aerodrome, which may result in an increased workload, at short notice, at the aerodrome(s) being diverted to.

[Recommendation 7: CAA to share this report with other aerodromes for their consideration of any lessons learned, for application in emergency planning in preparation for natural disasters such as volcanic eruptions, and to consider flow-on impacts such as unexpected workload increase due to diversions.](#)

5.2 MetService noted a potential area for improvement in working with GNS Science to find a way to access and display volcanic ashfall information to inform inclusion of volcanic ash in TAF. This could also help information NOTAM requests for potential ashfall at an aerodrome.

Recommendation 8: MetService, GNS Science, CAA work together to determine how ashfall information can be optimised to inform inclusion of ash presence and ashfall at an aerodrome, via TAF and NOTAM.

6. CONCLUSION

6.1 The Taranaki Mouna exercise was seen by participants as an interesting and useful opportunity to come together to not only practice their own volcanic activity related processes and procedures, but to also practice those processes in coordination with others and to find opportunities for improvement of the system as a whole.

6.2 For a full set of exercise messages issued, please refer to [Appendix B](#). (Full VAB are provided in [Appendix D](#).)

6.3 For a full list of exercise recommendations, please refer to [Appendix C](#).

Appendix A – Participants and Observers

Participants

Area of Responsibility	Agency
Volcanic activity alerting (VONA)	GNS Science
Volcanic ash advisory information (VAA/VAG)	VAAC Wellington (MetService)
SIGMET	MWO Wellington (MetService)
Air Traffic Control	Airways NZ
Aeronautical information service	Airways NZ
Disaster recovery assistance	RNZAF
Airlines	Air New Zealand
	Qantas
Marine Navigation Warnings	Maritime NZ
Regulation	CAA New Zealand

Observers:

VAAC Darwin

VAAC Tokyo

CASA Papua New Guinea

National Weather Service - Papua New Guinea

Ministry of Transport (MoT) NZ

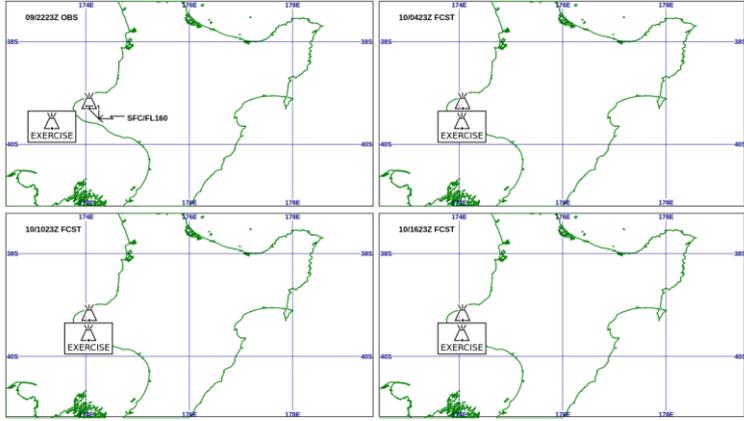
Ministry of Business, Innovation and Employment (MBIE) NZ

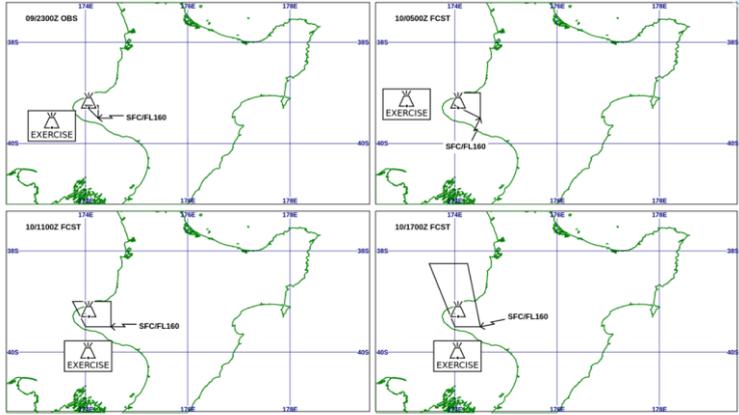
National Emergency Management Agency (NEMA) NZ

Appendix B – Exercise Messages

Time (local)	Messages issued prior to Taranaki Mounga exercise	Notes																																																			
Issued 9 August 2023	(B4977/23 NOTAMN Q) NZZC/QWELW/IV/BO /W /000/999/3918S17404E008 A) NZZC B) 2308092130 C) 2308100330 E) VOLCANIC ASH EXERCISE WILL TAKE PLACE. VOLCANO: TARANAKI, NEW ZEALAND PSN 39 18 S 174 04 E EXERCISE SIGMETS AND EXERCISE VOLCANIC ASH ADVISORIES WILL USE STATUS INDICATOR 'EXER' AS PER ANNEX 3. FREE TEXT OF PROMULGATED EXERCISE VOLCANIC ASH ADVISORIES START WITH: VA EXERCISE F) SFC G) UNL)	Live NOTAM for NZZC FIR notifying airspace users of Taranaki exercise.																																																			
	Messages issued during Taranaki Mounga exercise, 10 August 2023 (all local time)																																																				
0930	<p>Volcanic unrest increases at Mt Taranaki. Volcanic Alert Level raised to Level 2.</p> <p>VOLCANIC ACTIVITY BULLETIN: TAR – 2023/01 ##TARANAKI EXERCISE## 2023-09-09 09:30 NZST; Mt Taranaki Volcanic Alert Level raised to Level 2 Aviation Colour Code raised to Orange</p> <p>See Appendix D for full VAB.</p>	VAB issued by GNS Science, advising of increased Taranaki unrest, with VAL raised to Level 2.																																																			
0935	<p>VOLCANO OBSERVATORY NOTICE FOR AVIATION (VONA)</p> <table border="1"> <thead> <tr> <th>Item No</th> <th>Element</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message title</td> <td>VOLCANO OBSERVATORY NOTICE FOR AVIATION ##TAR EXE (Taranaki Ash Exercise##)</td> </tr> <tr> <td>2</td> <td>Issued:</td> <td>20230810/0930Z</td> </tr> <tr> <td>3</td> <td>Volcano:</td> <td>Taranaki</td> </tr> <tr> <td>4</td> <td>Current Aviation Color Code:</td> <td>Orange</td> </tr> <tr> <td>5</td> <td>Previous Aviation Color Code:</td> <td>Yellow</td> </tr> <tr> <td>6</td> <td>Source:</td> <td>GNS Science, New Zealand</td> </tr> <tr> <td>7</td> <td>Notice Number:</td> <td>NZ VONA 2023/01</td> </tr> <tr> <td>8</td> <td>Volcano Location:</td> <td>39 17S 174 03E</td> </tr> <tr> <td>9</td> <td>Area:</td> <td>Mt Taranaki, North Is, New Zealand</td> </tr> <tr> <td>10</td> <td>Summit Elevation:</td> <td>8261 FT</td> </tr> <tr> <td>11</td> <td>Volcanic Activity Summary:</td> <td>Moderate to heightened volcanic unrest</td> </tr> <tr> <td>12</td> <td>Volcanic Cloud Height:</td> <td>NIL</td> </tr> <tr> <td>13</td> <td>Other Volcanic Cloud information:</td> <td>NIL</td> </tr> <tr> <td>14</td> <td>Remarks:</td> <td>Volcanic tremor is strong. Significant number of earthquakes under the volcano. Volcanic gases indicate new magma. Ground deformation suggest magma is shallow beneath summit.</td> </tr> <tr> <td>15</td> <td>Contacts:</td> <td>Duty Volcanologist, +6473748211ph,+6473748199fax</td> </tr> <tr> <td>16</td> <td>Next Notice:</td> <td>Will be issued when conditions at the volcano warrant changing the aviation color code or when a significant volcanic event occurs within the current color code.</td> </tr> </tbody> </table>	Item No	Element	Content	1	Message title	VOLCANO OBSERVATORY NOTICE FOR AVIATION ##TAR EXE (Taranaki Ash Exercise##)	2	Issued:	20230810/0930Z	3	Volcano:	Taranaki	4	Current Aviation Color Code:	Orange	5	Previous Aviation Color Code:	Yellow	6	Source:	GNS Science, New Zealand	7	Notice Number:	NZ VONA 2023/01	8	Volcano Location:	39 17S 174 03E	9	Area:	Mt Taranaki, North Is, New Zealand	10	Summit Elevation:	8261 FT	11	Volcanic Activity Summary:	Moderate to heightened volcanic unrest	12	Volcanic Cloud Height:	NIL	13	Other Volcanic Cloud information:	NIL	14	Remarks:	Volcanic tremor is strong. Significant number of earthquakes under the volcano. Volcanic gases indicate new magma. Ground deformation suggest magma is shallow beneath summit.	15	Contacts:	Duty Volcanologist, +6473748211ph,+6473748199fax	16	Next Notice:	Will be issued when conditions at the volcano warrant changing the aviation color code or when a significant volcanic event occurs within the current color code.	VONA issued by GNS Science, advising of increased Taranaki unrest, with aviation colour code raised to orange.
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16	Next Notice:	Will be issued when conditions at the volcano warrant changing the aviation color code or when a significant volcanic event occurs within the current color code.																																																			

<p>0939</p>		<p>Updated GNZSIGWX chart, highlighting elevated VAL and VHZ NOTAM.</p>
<p>1004</p>	<p>A) NZCC B) 2308092200 C) 2308122200 E) DUE TO VOLCANIC UNREST MT TARANAKI IS ALERT LEVEL 2. TEMPO VOLCANIC HAZARD ZONE NZV997 (MT TARANAKI, TARANAKI) IS PRESCRIBED AS FLW: ALL THAT AIRSPACE BOUNDED BY A CIRCLE, WITH RADIUS 8 NM, CENTRED ON: 39 18 00 S 174 04 00 E PRESCRIBED PURSUANT TO CIVIL AVIATION RULE PART 71 UNDER A DELEGATED AUTHORITY ISSUED BY THE DIRECTOR OF CIVIL AVIATION F) SFC G) FL150 AMSL)</p>	<p>Designation of a VHZ centred on Mt Taranaki.</p>
<p>1018</p>	<p>WVN221 NZKL 092208 NZZC SIGMET 24 VALID 092218/100418 NZKL- NZZC NEW ZEALAND FIR EXER VA ERUPTION MT TARANAKI PSN S3918 E17404 VA CLD OBS AT 1010Z S3918 E17404 SFC/FL160=</p>	<p>Initial SIGMET, based upon advice of eruption – to be updated once dispersion model guidance available.</p>
<p>1010</p>	<p>FVPS01 NZKL 092223 VA ADVISORY STATUS: EXER DTG: 20230809/2223Z VAAC: WELLINGTON VOLCANO: TARANAKI 241030 PSN: S3918 E17404 AREA: NEW ZEALAND SUMMIT ELEV: 2518M ADVISORY NR: 2023/1 INFO SOURCE: VA EXER AVIATION COLOUR CODE: RED ERUPTION DETAILS: ERUPTION AT 20230809/2210Z VA EXERCISE VA EXERCISE OBS VA DTG: 09/2223Z OBS VA CLD: SFC/FL160 S3915 E17400 - S3915 E17415 - S3930 E17415 MOV NE 10KT</p>	<p>Initial VAA issued upon advice of eruption – to be updated once dispersion model guidance available.</p>

	<p>FCST VA CLD +6 HR: 10/0423Z NOT AVBL FCST VA CLD +12 HR: 10/1023Z NOT AVBL FCST VA CLD +18 HR: 10/1623Z NOT AVBL RMK: VA EXERCISE VA EXERCISE VA EXERCISE NXT ADVISORY: NO LATER THAN 20230810/0409Z=</p>  <p>VOLCANIC ASH ADVISORY DTG: 202308092232Z VAC: WELLINGTON VOLCANO: TARANAKI 241030 PSN: S3918 E17404 AREA: NEW ZEALAND</p> <p>SUMMIT ELEV: 2518M ADVISORY NR: 2023/2 INFO SOURCE: VA EXER AVIATION COLOUR CODE: RED ERUPTION DETAILS: ERUPTION AT 202308092210Z VA EXERCISE VA EXERCISE RMK: VA EXERCISE VA EXERCISE VA EXERCISE NXT ADVISORY: NO LATER THAN 202308100409Z=</p>	
1039	<p>B1235/23 NOTAMR B1234/23 Q) NZZC/WWLW/IV/NBO/W/000/480/3918S17404E027 A) NZZC B) 2308092234 C) 2308122200 E) VA EXERCISE. DUE TO VOLCANIC UNREST MT TARANAKI IS ALERT LEVEL 4. TEMPO VOLCANIC HAZARD ZONE NZV997 (MT TARANAKI, TARANAKI) IS PRESCRIBED AS FLW: ALL THAT AIRSPACE BOUNDED BY A CIRCLE, WITH RADIUS 27 NM, CENTRED ON: 39 18 00 S 174 04 00 E PRESCRIBED PURSUANT TO CIVIL AVIATION RULE PART 71 UNDER A DELEGATED AUTHORITY ISSUED BY THE DIRECTOR OF CIVIL AVIATION VA EXERCISE VA EXERCISE VA EXERCISE F) SFC G) FL480)</p>	New VHZ NOTAM, describing increased airspace size due to elevated VAL.
1055	<p>Mt Taranaki eruption – update #1</p> <p>VOLCANIC ACTIVITY BULLETIN: TAR – 2023/03 ##TARANAKI EXERCISE## 2023-09-09 11:00 NZST; Mt Taranaki Volcanic Alert Level remains at Level 4 Aviation Colour Code remains at Red</p> <p>See Appendix D for full VAB.</p>	VAB issued by GNS Science, advising of Taranaki eruption, with VAL raised to Level 4.
1100	<p>FVPS01 NZKL 092300~ VA ADVISORY STATUS: EXER DTG: 20230809/2300Z VAAC: WELLINGTON VOLCANO: TARANAKI 241030 PSN: S3918 E17404 AREA: NEW ZEALAND SUMMIT ELEV: 2518M ADVISORY NR: 2023/2 INFO SOURCE: VA EXERCISE AVIATION COLOUR CODE: RED ERUPTION DETAILS: ERUPTION AT 20230809/2210Z TEST EXAMPLE FOR VOLCEX SCENARIO TEST OBS VA DTG: 09/2300Z OBS VA CLD: SFC/FL160 S3915 E17400 - S3915 E17415 - S3930 E17415 MOV NE 10KT</p>	Updated VAAC Wellington VAA and VAG.

	<p>FCST VA CLD +6 HR: 10/0500Z SFC/FL160 S3915 E17400 - S3900 E17400 - S3900 E17430 - S3930 E17430 FCST VA CLD +12 HR: 10/1100Z SFC/FL160 S3930 E17400 - S3900 E17345 - S3900 E17430 - S3930 E17430 FCST VA CLD +18 HR: 10/1700Z SFC/FL160 S3930 E17400 - S3815 E17330 - S3815 E17415 - S3930 E17430</p> <p>RMK: TEST EXAMPLE FOR VOLCEX SCENARIO TEST NXT ADVISORY: NO LATER THAN 20230810/0409Z</p>  <p>VOLCANIC ASH ADVISORY DTG: 202308092300Z VAAC: WELLINGTON VOLCANO: TARANAKI 241030 PSN: 33918 E17400 AREA: NEW ZEALAND</p> <p>SUMMIT ELEV: 2518M ADVISORY NR: 202302 INFO SOURCE: VA EXERCISE AVIATION COLOUR CODE: RED ERUPTION DETAILS: ERUPTION AT 202308092310Z TEST EXAMPLE FOR VOLCEX SCENARIO TEST RMK: TEST EXAMPLE FOR VOLCEX SCENARIO TEST NXT ADVISORY: NO LATER THAN 202308100409Z</p>	
1104	<p>WVN21 NZKL 092301 NZZC SIGMET 27 VALID 092304/100504 NZKL- NZZC NEW ZEALAND FIR EXER VA ERUPTION MT TARANAKI PSN S3918 E17404 VA CLD OBS WI S3915 E17400 - S3915 E17415 - S3930 E17415 - S3915 E17400 SFC/FL160 FCST AT 0500Z WI S3915 E17400 - S3900 E17400 - S3900 E17430 - S3930 E17430 - S3915 E17400</p>	Updated NZZC SIGMET, based on updated VAA.
1108	<p>TAF AMD NZNP 0923/1006 28012KT 20KM -SHRA SCT030 TEMPO 0923/1001 4000 SHRA FEW0020TCU PROB40 TEMPO 0923/1006 5000 VA BECMG 1000/1002 17010KT 2000FT WIND 30020KT BECMG 1000/1002 17015KT QNH MNM 1008 MAX 1017</p>	Updated New Plymouth Airport TAF, reflecting observed and expected volcanic ashfall.
1121	<p>A1234/23 Q) NZZC/FALC/IV/NBO/W/000/480/3918S17404E005 A) NZNP B) 2308092315 C02308110000 E) VA EXERCISE. AD CLSD DUE ASH DETECTED FM MT TARANAKI ERUPTION. VA EXERCISE.</p>	NOTAM advising of New Plymouth Airport closure due to volcanic ash contamination.
1124	<p>B1236/23 NOTAMR B1235/23 Q) NZZC/WWLW/IV/NBO/W/000/480/3918S17404E027 A) NZZC B) 2308092322 C) 2308122200 E) VA EXERCISE. DUE TO VOLCANIC UNREST MT TARANAKI IS ALERT LEVEL 4. TEMPO VOLCANIC HAZARD ZONE NZV997 (MT TARANAKI, TARANAKI) IS PRESCRIBED AS FLW: ALL THAT AIRSPACE BOUNDED BY A CIRCLE, WITH RADIUS 27 NM, CENTRED ON: 39 18 00 S 174 04 00 E PILOTS ARE REQ TO REP LOCATION OF VA AND ANY VOLCANIC ACT OBS. PRESCRIBED PURSUANT TO CIVIL AVIATION RULE PART 71 UNDER A DELEGATED AUTHORITY ISSUED BY THE DIRECTOR OF CIVIL AVIATION SEE GEONET.ORG.NZ FOR VOLCANIC ACTIVITY BULLETIN DETAILING VOLCANIC HAZARDS VA EXERCISE VA EXERCISE VA EXERCISE F) SFC G) FL480)</p>	Updated NOTAM for VHZ, including reference to VAB and reference to requirement for pilots to report any observed volcanic ash or activity.
1130	<p>EXERCISE EXERCISE EXERCISE NEW ZEALAND COASTAL NAVIGATION WARNING 183/23 AREA RAGLAN</p>	Coastal Navigation Warning to mariners issued.

	<p>1. VOLCANIC ASH ADVISORY ISSUED BY METSERVICE AT 092300 UTC AUG 2023. VOLCANO TARANAKI ERUPTION.</p> <p>2. ASH OBSERVED AT SURFACE LEVEL IN AREA BOUND BY 39-15S 174-00E 39-15S 174-15E 39-30S 174-15E AT 092300 UTC AUG 2023.</p> <p>3. ASH FORECAST AT SURFACE IN AREAS BOUND BY:</p> <p>A. 39-15S 174-00E 39-00S 174-00E 39-00S 174-30E 39-30S 174-30E AT 100500 UTC AUG 2023</p> <p>B. 39-30S 174-00E 39-00S 173-45E 39-00S 174-30E 39-30S 174-30E AT 101000 UTC AUG 2023</p> <p>C. 39-30S 174-00E 38-15S 173-30E 38-15S 174-15E 39-30S 174-30E AT 101700 UTC AUG 2023</p> <p>4. ASH CAN BE CORROSIVE, EFFECT STABILITY, NAVIGATIONAL SYSTEMS AND BE HAZARDOUS TO PEOPLE.</p> <p>NNNN</p>	
1151	<p>EXERCISE EXERCISE EXERCISE</p> <p>NEW ZEALAND COASTAL NAVIGATION WARNING 184/23</p> <p>AREA RAGLAN AND STEPHENS</p> <p>1. VOLCANIC ASH ADVISORY ISSUED BY METSERVICE AT 092300 UTC AUG 2023. VOLCANO TARANAKI ERUPTION.</p> <p>2. ASH OBSERVED AT SURFACE LEVEL IN AREA BOUND BY 39-15S 174-00E 39-15S 174-15E 39-30S 174-15E AT 092300 UTC AUG 2023.</p> <p>3. ASH FORECAST AT SURFACE IN AREAS BOUND BY:</p> <p>A. 39-15S 174-00E 39-00S 174-00E 39-00S 174-30E 39-30S 174-30E AT 100500 UTC AUG 2023</p> <p>B. 39-30S 174-00E 39-00S 173-45E 39-00S 174-30E 39-30S 174-30E AT 101000 UTC AUG 2023</p> <p>C. 39-30S 174-00E 38-15S 173-30E 38-15S 174-15E 39-30S 174-30E AT 101700 UTC AUG 2023</p> <p>4. ASH CAN BE CORROSIVE, EFFECT STABILITY, NAVIGATIONAL SYSTEMS AND BE HAZARDOUS TO PEOPLE.</p> <p>5. TARANAKI AND EGMONT MARITIME RADIO VHF CHANNEL 16 UNAVAILABLE. VESSELS TRANSITING AREAS RAGLAN AND STEPHENS ARE REQUESTED TO MAINTAIN A LISTENING WATCH ON VHF 16. LIMITED COVERAGE MAY BE AVAILABLE VIA AUCKLAND, PLENTY AND WANGANUI OR TAUPO MARITIME RADIO/ZLM VIA SSB.</p> <p>6. CANCEL NEW ZEALAND COASTAL NAVIGATION WARNING 183/23</p> <p>NNNN</p>	Updated Coastal Navigation Warning noting unavailability of Taranaki maritime radio sites due eruption.
1236	<p>Mt Taranaki eruption – update #2</p> <p>VOLCANIC ACTIVITY BULLETIN: TAR – 2023/04</p> <p>##TARANAKI EXERCISE##</p> <p>2023-09-09 12:35 NZST; Mt Taranaki</p> <p>Volcanic Alert Level remains at Level 4</p> <p>Aviation Colour Code remains at Red</p> <p>See Appendix D for full VAB.</p>	Updated VAB issued by GNS Science, advising of expected volcanic ashfall.
1253	<p>TAF NZNP 1000/1012</p> <p>28018KT 20KM -SHRA SCT025</p> <p>TEMPO 1000/1003 5000 VA</p> <p>TEMPO 1003/1006 4000 SHRA FEW020TCU</p> <p>PROB30 TEMPO 1003/1012 5000 VA</p> <p>BECMG 1003/1005 17012KT</p> <p>2000FT WIND 25020KT</p> <p>BECMG 1003/1005 15020KT</p> <p>QNH MNM 1009 MAX 1018</p>	Updated New Plymouth TAF, indicating volcanic ash expected at aerodrome for next few hours, the risk of further ashfall then reducing after 1500 local.
1404	<p>FVPS01 NZKL 100204~</p> <p>VA ADVISORY</p> <p>STATUS: EXER</p> <p>DTG: 20230810/0204Z</p> <p>VAAC: WELLINGTON</p> <p>VOLCANO: TARANAKI 241030</p> <p>PSN: S3918 E17404</p> <p>AREA: NEW ZEALAND</p>	Final VAA issued by VAAC Wellington.

<p>SUMMIT ELEV: 2518M ADVISORY NR: 2023/3 INFO SOURCE: VA EXERCISE AVIATION COLOUR CODE: UNKNOWN ERUPTION DETAILS: ERUPTION AT 20230809/2210Z VOLCEX SCENARIO TEST NOW CONCLUDED OBS VA DTG: 10/0204Z OBS VA CLD: VA NOT IDENTIFIABLE FM SATELLITE DATA WIND FL010/020 VRB00KT FCST VA CLD +6 HR: 10/0804Z NO VA EXP FCST VA CLD +12 HR: 10/1404Z NO VA EXP FCST VA CLD +18 HR: 10/2004Z NO VA EXP RMK: VOLCEX SCENARIO TEST NOW CONCLUDED NXT ADVISORY: NO FURTHER ADVISORIES=</p>	
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Appendix C – List of Recommendations

1	NZ NOTAM Office will propose to CAA for acceptance, a process, and template(s) to streamline the designation of a temporary VHZ. The process should include consideration of templates for active volcanoes without existing VHZ, and the process for subsequent VHZ NOTAM requests once the new VHZ is established.
2	MetService ensure graphical displays for forecast information including status indicators adequately represent the exercise or test nature of that information, as appropriate.
3	Maritime NZ coordinate with GNS Science for receipt of appropriate ashfall information after an ash-bearing eruption, to help inform any Coastal Navigation Warning.
4	CAA, in consultation with airspace users, to determine the usefulness and/or requirements for promulgation of NOTAM for flight routes affected by either a permanent or temporary VHZ.
5	CAA to consider reviewing VHZ airspace in New Zealand and consider the role of aviation colour code within.
6	New Plymouth Airport coordinate with New Plymouth Airport Tower and/or Taranaki Civil Defence Emergency Management group to confirm or otherwise arrange a mechanism for direct contact in the event of a Taranaki eruption.
7	CAA to share this report with other aerodromes for their consideration of any lessons learned, for application in emergency planning in preparation for natural disasters such as volcanic eruptions, and to consider flow-on impacts such as unexpected workload increase due to diversions.
8	MetService, GNS Science, CAA work together to determine how ashfall information can be optimised to inform inclusion of ash presence and ashfall at an aerodrome, via TAF and NOTAM.

Appendix D – Exercise Volcanic Activity Bulletins

Volcanic unrest increases at Mt Taranaki. Volcanic Alert Level raised to Level 2.

VOLCANIC ACTIVITY BULLETIN: TAR – 2023/01

##TARANAKI EXERCISE##

2023-09-09 09:30 NZST; Mt Taranaki

Volcanic Alert Level raised to **Level 2**

Aviation Colour Code raised to **Orange**



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Earthquake tremor has increased to historically high levels, large number of earthquakes are becoming shallower over the past week, volcanic gas signatures indicate new magma is beneath the volcano, and snow melt areas are extending. We have also observed minor swelling of the edifice on the southeastern area of the summit. The Volcanic Alert Level has been raised to Level 2 and the Aviation Colour Code changed to Orange.

Since early in July 2023, we have recorded low levels of tremor, along with sporadic earthquakes beneath the summit of Mt Taranaki. Over the past three days, the level of tremor has become strong and the number of shallowing earthquakes has increased significantly.

Analyses of gas and water samples from active fumaroles and springs on the mountain (including the summit area), indicate that the source for these gases and fluids is partially driven by new magma beneath the volcano.

Satellite remote sensing methods have identified a zone of inflation on the southeastern side of the summit area. Such ground movement is most likely caused by magmatic gas and fluid pressurising the summit area.

Our interpretation of the data is that magma is ascending beneath the volcano and an eruption is possible. We continue to monitor the volcano closely and will provide an update when data comes to hand.

The strong levels of volcanic tremor, high number of shallowing earthquakes, presence of magmatic gas, and ground movement are all consistent with a moderate to heightened level of volcanic unrest at Mt Taranaki. As a result, the Volcanic Alert Level has been raised to Level 2. The Aviation Colour Code has been changed to Orange.

Mt Taranaki is an active volcano and has the potential to erupt with little or no warning when in a state of moderate to heightened volcanic unrest.

The [Volcanic Alert Level](#) reflects the current level of volcanic unrest. The Volcanic Alert Level should not be used to forecast future activity.

Volcanic Alert Level 2 indicates the primary hazards are those expected during volcanic unrest: steam discharge, volcanic gas, earthquakes, landslides, and hydrothermal activity. While Volcanic Alert Level 2 is mostly associated with environmental hazards, potential for eruption hazards also exists and eruptions

can still occur with little or no warning. Volcanic Alert Levels 3, 4 and 5 are reserved for eruptions with varying impact distances.

For information on access to the Mt Taranaki area, please visit the Department of Conservation's website for further updates.

For information about responding to volcanic activity there are guidelines from the National Emergency Management Agency.

<https://getready.govt.nz/emergency/volcanic-activity/>

GNS Science and its National Geohazards Monitoring Centre continue to closely monitor Mt Taranaki for further changes.

Geoff Kilgour,

Duty Volcanologist

Mt Taranaki eruption – update #1

VOLCANIC ACTIVITY BULLETIN: TAR – 2023/03

##TARANAKI EXERCISE##

2023-09-09 11:00 NZST; Mt Taranaki

Volcanic Alert Level remains at **Level 4**

Aviation Colour Code remains at **Red**



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www.gns.cri.nz

An eruption has occurred at Mt Taranaki, generating an ash plume to ~5 km above the summit area. Volcanic ash is being transported downwind of the volcano. The Volcanic Alert Level remains at Level 4 and the Aviation Colour Code remains at Red.

At ~1010 am, Mt Taranaki erupted from the summit vent area. The eruption generated a plume to ~5 km altitude and the eruption continues. It is too soon to determine the duration or future size of the eruption and so we continue to monitor the activity closely. More information will be coming when we can.

During volcanic activity, follow official advice provided by your local [Civil Defence Emergency Management Group](#). To aid in understanding and managing volcanic ash, also visit this [USGS website](#).

More information about Civil Defence in the Taranaki District can be found [here](#).

For information on preparing for earthquakes or responding to volcanic activity, there are guidelines from the National Emergency Management Agency's (NEMA) [Get Ready website](#).

Geoff Kilgour,

Duty Volcanologist

Mt Taranaki eruption – update #2

VOLCANIC ACTIVITY BULLETIN: TAR – 2023/04

##TARANAKI EXERCISE##

2023-09-09 12:35 NZST; Mt Taranaki

Volcanic Alert Level remains at **Level 4**

Aviation Colour Code remains at **Red**



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An eruption has occurred at Mt Taranaki, generating an ash plume to ~5 km above the summit area. Volcanic ash is being transported towards New Plymouth. The Volcanic Alert Level remains at Level 4 and the Aviation Colour Code remains at Red.

At ~1010 am, Mt Taranaki erupted, generating a plume to ~5 km altitude and the eruption continues. Ash is currently being deposited across the Taranaki region, especially to the north of the volcano. Thicknesses of between 1 and 5 mm have been recorded. Based on our assessment of near real time monitoring data, the eruption is building in intensity and a larger eruption is possible.

Below is a model for the dispersion of ash based on the most up to date wind data from MetService. We will continue to update the ash dispersion models when possible.

During volcanic activity, follow official advice provided by your local [Civil Defence Emergency Management Group](#). To aid in understanding and managing volcanic ash, also visit this [USGS website](#).

More information about Civil Defence in the Taranaki District can be found [here](#).

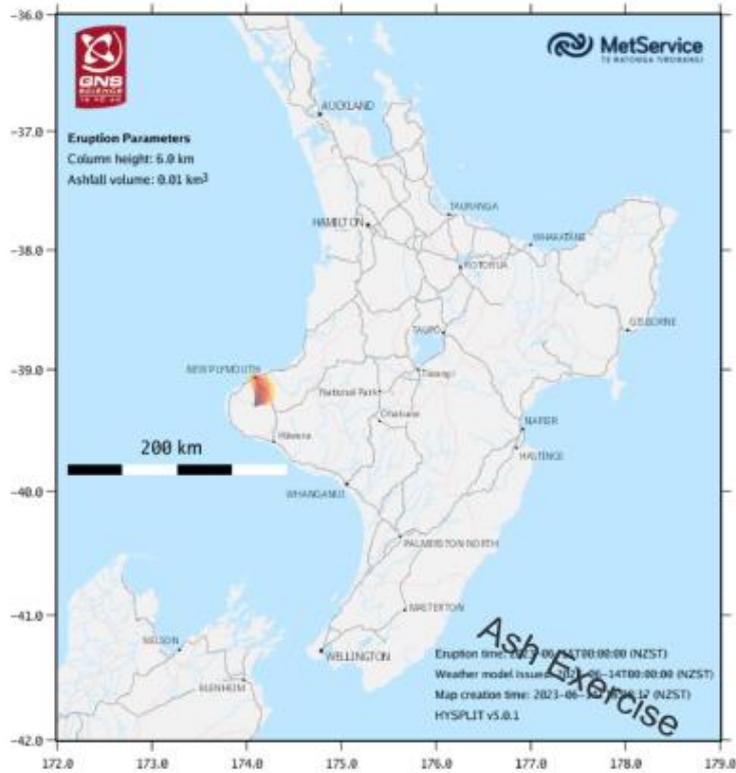
For information on preparing for earthquakes or responding to volcanic activity, there are guidelines from the National Emergency Management Agency's (NEMA) [Get Ready website](#).

Geoff Kilgour,

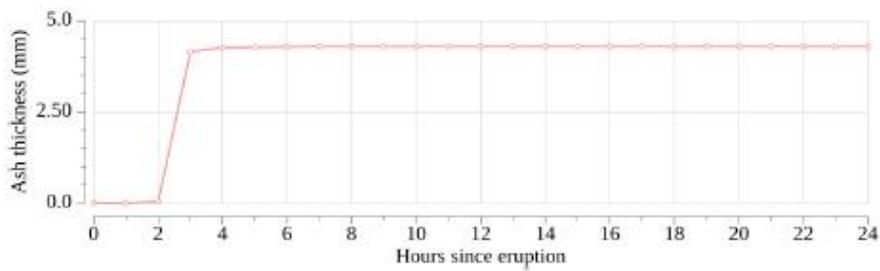
Duty Volcanologist

Taranaki

Ashfall forecast over 12 hours
from 06:00 NZST 10 August 2023



Total ash thickness in mm



Ashfall
forecast for
New
Plymouth