Alaska
Interagency Operating Plan for Volcanic Ash Episodes

June 1, 2014

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1.0 Introduction

Drifting ash clouds and ash fall from North Pacific volcanoes can threaten aircraft operations in Alaska and throughout the Nation. Volcanic ash also can significantly impact Alaskan communities, infrastructure, and human health. A well-coordinated response is required to facilitate the flow of timely, consistent, useful information to those at risk. This Interagency Operating Plan provides an overview of an integrated, multi-agency response to the threat of volcanic ash in Alaska. It presents an agency-by-agency description of roles and responsibilities during volcanic ash events. The plan is supported by more detailed standard operating procedures maintained by each participating agency or operating unit.

This plan covers the State of Alaska and the adjacent United States airspace Flight Information Regions (FIRs). This plan also discusses responsibility for volcanic ash transported from volcanoes outside the United States into Alaskan airspace, such as those in Kamchatka and the Kurile Islands, Russia.

The Interagency Operating Plan for Volcanic Ash Episodes in Alaska is an integral part of the Volcano Hazards Implementation Plan that supports a formal Agreement between the National Oceanic and Atmospheric Administration (NOAA) and the Federal Aviation Administration (FAA) on the topic of volcanic hazards. Support from the U.S. Geological Survey (USGS) to this NOAA/FAA Agreement has been formalized in a Letter of Agreement. As such, this Alaska plan describes communication links and actions necessary to support the NOAA/FAA/USGS Volcano Hazards Implementation Plan. The Alaska plan is referenced in the 2007 National Volcanic Ash Operations Plan for Aviation published by the Office of the Federal Coordinator for Meteorological Services (http://www.ofcm.gov/p35-nvaopa/pdf/FCM-P35-2007-NVAOPA.pdf).

1.1 Information Coordination

Agencies relaying information about volcanic ash events, forecast ash cloud trajectory, and potential impacts must deliver a consistent message. To achieve this, close collaboration via telephone and other means during unrest and eruptions is essential.

Each participant agency may be the first to receive a report of volcanic unrest. Timely validation, processing, and dissemination of information are crucial steps in a successful multi-agency response. Considering the comparative rarity of volcanic ash events but high potential for catastrophic loss, all reports should be taken seriously.

1.2 Dissemination of Warning Products

Each agency distributes alert and safety information through a variety of communication portals. National Weather Service (NWS) uses NOAA Weather Wire, marine High Frequency (HF) and Very High Frequency (VHF) radio, NOAA Weather Radio (NWR), the statewide Alaska television weathercast, and the Emergency Alert System (EAS) in addition to distribution of text and graphics by its own telecommunications Gateway and through telephone facsimile, and the Internet. FAA distributes aviation weather forecasts, advisories and warnings from the NWS, flight information, pilot reports, and terminal information via its Aeronautical Fixed Telecommunications Network (AFTN) data links. The DHS&EM State Emergency Operations Center (SEOC) can redistribute critical information via the First Class email system, commercial radio, television, cable and Internet service in addition to the Alaska Warning and Alert System (AKWAS) and the EAS. The Alaska Volcano Observatory uses the Internet, telephone, and facsimile as primary means for communication. Details of procedures for sharing information are provided in individual agency sections. By using diverse methods to disseminate information, the collective ability to reach as many people as quickly as possible is optimized. The suite of warning products for volcanic events in Alaska is shown in appendix J.

2.0 Responsibilities of the Participating Agencies

The following sections contain general outlines of each agency's actions in response to volcanic unrest and eruption.

2.1 DIVISION OF HOMELAND SECURITY AND EMERGENCY MANAGEMENT (DHS&EM)

DHS&EM will conduct the following actions upon notification from AVO that any volcano has been upgraded to Code **ORANGE/WATCH** or Code **RED/WARNING**. The purpose is to coordinate State and community actions for a single imminent volcanic event:

A. Determine the appropriate level of activation for the State Emergency Operations Center (SEOC).

B. Notify potentially affected political subdivisions and/or communities of the situation.

C. Determine if any of the above political subdivisions and/or communities intend to activate local emergency operations centers for the incident.

D. Determine if any of the above political subdivisions and/or communities want to participate in a volcano briefing conference call, coordinated by DHS&EM.

   For a volcano upgraded to **RED/WARNING,** the conference call will be scheduled approximately 1 hour after the upgrade or as soon as practical.

   For a volcano upgraded to **ORANGE/WATCH,** DHS&EM will consult with AVO and NWS to determine if a conference call is needed based upon the potential community impacts and need for information.

Conference calls will include representation from the Alaska Volcano Observatory, the National Weather Service, the Alaska Department of Environmental Conservation (for air quality information), Alaska Department of Health and Social Services (Division of Public Health), DHS&EM, and other agencies as appropriate.

The purpose of the conference call is to:

(1) Allow AVO and NWS to provide a situational briefing on current conditions and potential impacts.

(2) Provide the opportunity for the local representatives to ask questions.

(3) Coordinate any State or local response actions.

(4) Determine if additional coordinating conference calls will be needed, at what time, and with what agencies, communities or individuals participating. DHS&EM will make arrangements for and host any needed conference calls.

E. Post situation information in the DHS&EM First Class system, SEOC Situation Reports, DHS&EM Web site and other information systems as appropriate.

F. Brief the DHS&EM Public Information Officer (PIO) and provide information for Social Media and press releases as appropriate.

G. Coordinate with DEC, the Municipality of Anchorage (MOA) Department of Health and Human Services (DHHS), and local communities to distribute appropriate emergency preparedness information.

2.2 ALASKA VOLCANO OBSERVATORY (AVO)

AVO is a joint program of the USGS, the University of Alaska Fairbanks Geophysical Institute (UAFGI), and the Alaska Division of Geological and Geophysical Surveys (ADGGS). In keeping with the statutory responsibilities of its component agencies, AVO has two primary objectives:

A. To conduct monitoring and other interpretive scientific investigations in order to assess the style, timing, duration, and impacts of volcanic activity.

B. To provide timely and accurate information on volcanic hazards, warnings of dangerous activity, and eruption notifications to local, State, and Federal officials and the public.

2.2.1 Organization

AVO consists of scientists and staff at offices in Fairbanks (UAFGI, ADGGS) and Anchorage (USGS). Geologists and geophysicists at all three agencies share research, data processing, analysis, and hazard communication duties. The AVO facility at the USGS Volcano Science Center in Anchorage serves as the response and operations center during times of increased volcanic activity. Each facility can serve as limited backup to the other.

Managerial responsibility for AVO rests with a Scientist-in-Charge (SIC) and a Coordinating Scientist (CS), as described below.

SCIENTIST-IN-CHARGE (SIC) – USGS/AVO – ANCHORAGE, ALASKA

The SIC is a USGS employee based at the USGS Volcano Science Center in Anchorage, Alaska, and is the official spokesperson and line-manager for AVO/USGS staff. The SIC coordinates all AVO monitoring, hazards assessment, and information dissemination and carries a cell phone 24 hours a day. The SIC ensures that (1) monitoring and hazard assessments are thorough and effective; (2) monitoring and hazard data are adequately analyzed and reviewed; and (3) accurate and timely hazard assessments, forecasts, warnings, and supporting scientific information are issued to all concerned parties, including local, State, and Federal officials, and the public.

COORDINATING SCIENTIST (CS), UAFGI/AVO - FAIRBANKS

The CS is currently based at the UAFGI in Fairbanks and acts as principal liaison between the UAFGI and ADGGS in Fairbanks and the SIC in Anchorage. The CS ensures timely communication of monitoring and scientific information gathered at the UAFGI and/or ADGGS to the SIC and AVO staff.

DUTY SCIENTISTS, USGS/UAFGI/ADGGS/AVO – ANCHORAGE AND FAIRBANKS

Duty Scientists from the AVO science staff in Anchorage maintain operational awareness of volcanic activity, respond to inquiries regarding suspected volcanic activity, prepare daily status reports and other messages, and carry a cell phone 24 hours a day.

Duty Seismologists, Duty Satellite Analyst, and Duty Webmaster conduct daily monitoring checks and provide 24/7 points of contact for key elements of monitoring and Web site communication; these duty scientists may be located in Anchorage or Fairbanks.

2.2.2 General Operational Procedures

During periods of volcanic quiet, AVO scientists acquire, interpret, and archive monitoring data, gather geologic information to develop eruption scenarios and hazard assessments, and conduct research and outreach. During heightened volcanic activity, AVO at the USGS in Anchorage becomes the principal point of contact for government agencies, the media, and the public regarding information on volcanic activity and hazards assessment. AVO staff at DGGS in Fairbanks responds to public inquiries received via the AVO Web email system. AVO staff from all three institutions assists in response duties. As needed, AVO may involve

other USGS staff from Volcano Observatories in the Cascades (CVO), Hawaii (HVO), California (CalVO), and Yellowstone (YVO) or other USGS offices.

AVO issues notification of volcanic activity via telephone call-down to key State and Federal government agencies (see section 2.2.2.2) as well as email, fax, and Web site postings. AVO communicates with International agencies involved in volcanic ash cloud and ash fall warnings including the Geological Survey of Canada (GSC) and the Canadian Meteorological Centre (CMC). AVO assists in responding to significant eruptions from Russian volcanoes (see sections 2.2.4 and 2.2.5).

2.2.2.1 Hours of Operation, Monitoring Network, and Frequency of Data Checks

Normal business hours for AVO are 9:00 a.m. to 5:00 p.m. Monday through Friday. After hours and on weekends, AVO staff can be contacted through an answering service and cell phones.

As of January 2014, AVO seismic monitoring networks are operating at 29 Alaskan volcanoes (appendixes A and B). Earthquake activity at these volcanoes is checked twice daily. Occasional station outages and telecommunications problems may occasionally place a volcano in 'unmonitored status.' When necessary, these outages will be formally announced in an AVO Information Release.

AVO Satellite Analysts review satellite imagery and Web camera images of Alaska volcanoes daily to look for elevated temperatures and ash clouds. AVO uses a publically available Web-based tool "VolcView" to examine satellite data (http://volcview.wr.usgs.gov/). Web camera imagery is available on our public Web site (http://www.avo.alaska.edu/webcam/).

A number of Alaskan volcanoes have real-time GPS networks to detect ground motion that may be related to volcanic unrest (Okmok, Makushin, Akutan, Westdahl, Shishaldin, Augustine, Redoubt, and Spurr). AVO maintains several infrasound arrays to detect volcanic explosions. AVO also utilizes Web cameras, conducts periodic observational overflights, airborne volcanic gas measurements, and other monitoring activities as needed and as resources allow.

Once a volcano has become restless and is elevated to **YELLOW/ADVISORY** or **ORANGE/WATCH** status (see section 2.2.7), AVO or other VSC staff may examine seismic data at an increased frequency to be determined by the SIC. AVO also may increase the frequency of satellite image analysis. A daily status report is issued for all volcanoes at **YELLOW/ADVISORY** (see section 2.2.7), or higher. With proper notification, the AVO SIC may choose to suspend daily status reports for volcanoes with chronic, low-level unrest.

If a volcano reaches **RED/WARNING** (see section 2.2.7), or at any time the SIC determines that the level of activity warrants around-the-clock, on-site surveillance, AVO begins in-office, 24-hour watch in Anchorage or Fairbanks or both locations.

AVO continues to develop operational seismic, satellite, and other alarm systems to notify staff should monitoring parameters exceed a pre-defined threshold.

2.2.2.2 Volcanic Activity Notifications

Continuous recording of seismic activity at Alaskan volcanoes, in combination with other monitoring techniques, usually allows AVO to issue warnings of unrest and the possibility of a volcanic eruption hours to weeks in advance.

As of 2014, more than a dozen historically active volcanoes in Alaska are not monitored with real-time seismic networks (appendixes A and B). For these volcanoes, AVO relies on satellite surveillance, infrasound, and reporting from other sources including mariners, flight crews, citizens, and others to detect unrest and eruptive activity. Thus, detection and notification of unrest and eruptive activity may be delayed, and future activity cannot be reliably forecast.

Once a volcano becomes restless (for example, shows an increasing level of earthquake or other precursory activity), the following actions are taken:

A. The SIC is notified and may choose to activate the call-down procedure immediately or take further action to evaluate the situation.

B. Initial communication of increasing volcano hazard is by telephone call-down to the following interagency list, and then, by fax, email, and Web posting:

CALL-DOWN RESPONSIBILITY OF AVO FOR ALASKAN VOLCANOES (*back-up number)

Call-down responsibility of AVO Anchorage

1. FAA Anchorage Air Route Traffic Control Center	907-269-1103 907-269-1108*
2. NWS Aviation Weather Unit/Anchorage VAAC	907-266-5110
3. NWS Center Weather Service Unit	907-338-1010 907-269-1145*
4. USAF/USA Joint Base Elmendorf-Richardson Weather Station	907-552-4397
5. USAF 2ND Weather Squadron, AFWA, Offutt AFB	402-294-7264
6. NOAA/SAB Washington VAAC	301-683-1401 1400*
7. Canadian Meteorological Center/Montreal VAAC	514-421-4635
8. U.S. Coast Guard, Juneau	907-463-2000 2001*

Call-down responsibility of AVO Fairbanks

1. DHS&EM	800-478-7100
2. Alaska Governor's Office	907-465-3500
3. Eielson AFB Command Post	907-377-1500

Call-down messages are brief and include the following general information:

Name of caller Volcano name and location Nature of activity and source of information (seismicity, pilot report, etc.) Aviation Color Code and Volcano Alert Level status or change in status (see section 2.2.7) Start and stop time of event or activity (if known) Height of eruption cloud, how determined, and direction of cloud motion (if known)

Additions or modifications to this call down list require approval of the SIC.

C. AVO may contact citizens, pilots, mariners, and other contacts at remote sites for additional information, as needed.

D. AVO will keep in close telephone contact with NWS and FAA so that each agency may provide updates on critical information as it becomes available. Coordination and sharing of information on eruption cloud height and movement is paramount.

E. A written volcanic activity notification (see section 2.2.3) is transmitted by fax and email and is posted to the AVO Web site as soon as possible.

F. Call-downs also will occur during each significant change in the status of an eruption or change in aviation color code or alert level; this includes the end of eruptive episodes when ash emission has ceased (see section 2.2.7).

G. AVO may attempt to overfly or visit the volcano to assess the situation. Airborne gas measurements, deployment of portable seismic and other recording instrumentation, increased satellite surveillance, and field visits also may occur depending on the location of the eruption and severity of hazards.

H. As required, AVO will communicate with appropriate Federal, State, and private land managers who have jurisdiction over the land encompassing the volcano of concern to obtain access permission and coordinate other logistics.

2.2.3 Text and Graphical Products for Situational Awareness

The following products are issued by AVO to notify others of volcano hazards or other important information. All are posted on the AVO Web site and users may receive these products via email by subscribing to the Volcano Notification System (VNS): http://volcanoes.usgs.gov/vns/.

Volcanic Activity Notice (VAN)

Upon verification of an eruption and following the call-down procedure, a formatted text message describing the location, time, type, size of the eruption, and likely hazards is distributed by AVO to Web site, Federal, State, and local government agencies, the media, members of the public and private sectors including airlines, by Internet fax service and email systems. This message, called a Volcanic Activity Notice (VAN), also is immediately posted to the AVO Web site. Additional VANs are released as needed, depending on changes in volcanic activity, alert levels, or hazards. VANs also are used to declare the 'all clear' when an eruption is waning or has ceased.

Volcano Observatory Notice for Aviation (VONA)

A VONA is a derivative product of the VAN and contains information in a format specifically intended for aviation users of volcano hazard information.

Daily Status Report

AVO typically issues a Daily Status Report for any Alaskan volcano at an elevated alert level or elevated aviation color code. This procedure may be suspended for chronic, low-level unrest at the discretion of the SIC and upon appropriate notification of Interagency partners and the public. These daily reports are posted to the AVO Web site, sent by email to interested parties, and faxed to the Alaska Aviation Weather Unit (AAWU).

Weekly Update

AVO issues a weekly summary of volcanic activity in Alaska each Friday. These reports are posted to the AVO Web site, sent by email to interested parties, and faxed to recipients upon request.

Information Statements

AVO issues Information Statements that announce items of interest such as new monitored volcanoes, significant operational or monitoring capacity changes, and expanded descriptions of volcanic unrest and likely outcomes.

Informal Web Updates and Use of Social Media

As needed, AVO may institute a Web-only update message to provide users with a very brief, time-appropriate comment on the status of an erupting volcano. AVO uses Facebook https://www.facebook.com/alaska.avo and Twitter https://twitter.com/alaska_avo to distribute informal updates and other information.

Recorded Telephone Message and Web Site

AVO maintains a recorded phone message line (907-786-7478) that will be updated frequently during significant eruptive activity. The most current information about the status of activity at Alaskan volcanoes can be found at the AVO Web site http://www.avo.alaska.edu or the USGS Volcano Hazards Web site: http://volcanoes.usgs.gov.

Ash Fall and Ash Cloud Forecasting and Reporting

USGS has developed a graphical ash fall forecast tool (Ash3D) that is used to support NWS ash fall statements and warnings. Graphical products from Ash3D will soon be available to the public via the AVO Web site.

NOAA Air Resources Laboratory produces forward trajectory graphics using the HYSPLIT model. These are available on the AVO Web site activity page for restless volcanoes.

AVO offers internet access for users to run the PUFF model via the AVO Web site: http://volcview.wr.usgs.gov/puff/main.pl.

AVO and the National Weather Service solicit information about ash fall to improve ash fall warning products (see section 2.5.1.3), and study ash fall processes. The public is encouraged to file reports of ash fall and other observations on the "*Is Ash Falling*?" page on the AVO Web site: https://www.avo.alaska.edu/ashfall/ashreport.php.

AVO also welcomes citizen participation in sampling volcanic ash fall to improve our analyses of eruptions. Detailed instructions are available on the AVO Web site: (http://www.avo.alaska.edu/ashfall.php).

Satellite Remote Sensing Tools

AVO uses an online tool for display and analysis of near-real time remote sensing data for the North Pacific. It can be accessed at this Web site: http://volcview.wr.usgs.gov/.

2.2.4 Kamchatka Volcanic Eruption Response Team (KVERT)

KVERT provides information on volcanic activity in Kamchatka and the northern Kurile Islands to international air navigation services. KVERT consists of scientists from the Institute of Volcanology and Seismology (IVS) in Petropavlovsk, Kamchatsky. They utilize seismic information from the Kamchatkan Branch of Geophysical Services (KBGS) who seismically monitors 11 volcanoes of the Kamchatka Peninsula and Paramushir Island in the northern Kuriles (appendixes C and D). KVERT also receives occasional ground observer reports from several field stations and examines daily satellite data for Kamchatka and the northern Kuriles.

KVERT sends daily and weekly updates and Volcanic Activity Notices to a standing list of aviation and meteorology authorities in the region including Anchorage Volcano Ash Advisory Center (VAAC), AVO, Tokyo VAAC, and many others. These notices are posted on the KVERT Web site at http://www.kscnet.ru/ivs/kvert/index_eng.php. Requests to be added to this email distribution can be sent to: girina@kscnet.ru.

In the event of a major eruption, KVERT notifies the Hydrometeorological Survey at Elizovo Airport near Petropavlovsk (also known as the Aviation Meteorology Center), the Department of Civil Emergencies, Russian media, and local officials by telephone.

KVERT uses the same Aviation Color Code as AVO to indicate the level of aviation hazard at Kurile volcanoes.

AVO staff maintains situational awareness of volcanic activity in Russia and will assist with analysis and interpretation of Russian volcanic activity, principally using remote sensing tools, as needed. AVO will conduct an abbreviated call down in the event of a large or new volcanic event in Kamchatka and the northern Kurile Islands.

2.2.5 Sakhalin (Kurile) Volcanic Eruption Response Team (SVERT)

The Sakhalin Volcanic Eruption Response Team provides information on volcanic activity in the central and southern Kurile Islands (appendixes E and F). SVERT scientists are based at the Institute of Marine Geology and Geophysics in Yuzhno-Sakhalinsk. SVERT utilizes MODIS and NOAA satellite imagery daily to look for evidence of volcanic activity. There are no real-time seismic networks on any Kurile volcano other than an intermittently functional network on Atlasova Island (Alaid Volcano) near the southern tip of Kamchatka.

SVERT sends daily (Monday – Friday) and weekly updates and Volcanic Activity Notices to a standing list of aviation and meteorology authorities in the region including Anchorage Volcano Ash Advisory Center (VAAC), AVO, Tokyo VAAC, and many others.

SVERT has a written eruption response plan that includes telephone notification of Air Traffic Control and Aviation Weather authorities in Sakhalin, and email notification to AVO, the Anchorage and Tokyo VAAC, and others if any sign of volcanic activity is detected. These notices are currently posted on the SVERT Web site at http://www.imgg.ru/?id_d=659. Requests to be added to the email distribution list can be sent to: rybin@imgg.ru.

SVERT uses the same Aviation Color Code as KVERT and AVO to indicate the level of aviation hazard at Kurile volcanoes.

AVO staff maintains situational awareness of volcanic activity in the Kurile Islands and will assist with analysis and interpretation of Russian volcanic activity, principally using remote sensing tools, as needed. To ensure that proper US authorities are alerted, AVO will conduct an abbreviated call down in the event of a large or new volcanic event in the Kurile Islands.

CALL DOWN RESPONSIBILITY OF AVO FOR SIGNIFICANT RUSSIAN VOLCANIC ACTIVITY (*back-up number)	
1. FAA Anchorage Air Route Traffic Control Center	907-269-1103 907-269-1108*
2. NWS Aviation Weather Unit/Anchorage VAAC	907-266-5110
3. NWS Center Weather Service Unit	907-338-1010 907-269-1145*
4. USAF/USA Joint Base Elmendorf-Richardson Weather Office	907-552-4397
5. US Coast Guard Juneau	907-463-2001

2.2.6 Coordination with Other Government Agencies

AVO maintains frequent contact with NWS, FAA, DOD, DHS&EM, USCG, DEC, and other Federal, State, and local agencies to ensure effective communication of observational data and consistent interpretations and notifications of volcanic activity and hazards.

AVO's responsibility overlaps and integrates with that of NWS once an ash cloud has been generated, is drifting with the wind, and has the potential to produce ash fall. AVO and NWS strive to communicate frequently to ensure consistent messages regarding ash cloud height, motion, and potential impacts (including ash fall). AVO and NWS work together to ensure formal NWS warning messages (for example, ash fall advisories, marine weather advisories, SIGMETs, etc.) and AVO volcanic activity notifications are well-coordinated and as accurate as possible.

AVO will coordinate as needed with appropriate Federal (USFWS, NPS), State (DNR), and private land managers who have jurisdiction over the land encompassing an active or restless volcano.

2.2.7 Aviation Color Code and Volcano Alert Level Terms

US Volcano Observatories utilize a dual system of alerts. To address aviation hazards, US Observatories use an Aviation Color Code. US Observatories also issue a Volcano Alert Level to indicate the overall status of the volcano and its ground-based hazards (for example, ash fall, lahar or mudflow, pyroclastic flow) that employs the terms '**NORMAL, ADVISORY, WATCH, and WARNING**'. Definitions of these terms are shown in the tables that follow. Changing aviation color codes and volcano alert levels indicate increasing severity and likelihood of potential impacts and are similar to those used by NWS for severe weather alerts.

The SIC, in consultation with the CS, also may assign an aviation color code and alert level to a volcano that is not seismically monitored based on its past eruptive history, pilot or ground-based observations, and/or remote sensing data. However, non-seismically monitored volcanoes can never be in aviation color code **GREEN**/ alert level **NORMAL** because we cannot definitively say the volcano is quiet. AVO will not be able to track increases in seismic activity at volcanoes without a seismic network and, in most cases, will not be able to issue warning or notification of an impending eruption. In those cases, the volcano is listed as Volcano Alert Level **UNASSIGNED**. A status of **UNASSIGNED** indicates that AVO does not have enough information to evaluate whether or not the volcano is at a background (quiet) state of activity.

VOLCANO ALERT LEVELS

NORMAL	Volcano is in typical background, noneruptive state.
	Or, after a change from a higher level:
	Volcanic activity has ceased and volcano reverted to its noneruptive state
ADVISORY	Volcano is exhibiting signs of elevated unrest above known background level.
	Or, after a change from a higher level:
	Volcanic activity has decreased significantly but continues to be closely monitored for possible renewed increase.
WATCH	Volcano is exhibiting heightened or escalating unrest with increased potential of eruption, timeframe uncertain.
	Or:
	Eruption is underway but poses limited hazards.
WARNING	Highly hazardous eruption is imminent, underway, or suspected.

AVIATION COLOR CODES

Aviation color codes indicate the likelihood or presence of airborne ash and ash clouds that threaten aircraft.

GREEN	Volcano is in typical background, noneruptive state.
	Or, after a change from a higher level:
	Volcanic activity has ceased and volcano has returned to noneruptive background state
YELLOW	Volcano is exhibiting signs of elevated unrest above known background level.
	Or, after a change from a higher level:
	Volcanic activity has decreased significantly but continues to be closely monitored for possible renewed increase.
ORANGE	Volcano is exhibiting heightened or escalating unrest with increased potential of eruption, timeframe uncertain.
	Or:
	Eruption is underway with no or minor ash emissions [ash-plume height specified, if possible].
RED	Eruption is imminent with significant emission of volcanic ash into the atmosphere likely.
	Or:
	Eruption is underway or suspected with significant emission of volcanic ash into the atmosphere [ash-plume height specified, if possible].

2.2.8 Designation of Authority

The Federal Government, through the Stafford Disaster Relief and Emergency Assistance Act of 1974 (Public Law 93-288), states that the U.S. Geological Survey (USGS) has been delegated the responsibility to issue disaster warnings "... for an earthquake, volcanic eruption, landslide, or other geologic catastrophe."

The Alaska State Legislature has similarly directed that the Alaska Division of Geological and Geophysical Surveys (ADGGS) conduct scientific investigations to assess geologic hazards to buildings and transportation facilities (AS 41.08.020).

The Geophysical Institute of the University of Alaska Fairbanks (UAFGI) is instructed to collect and archive seismic data on volcanic eruptions, to assess eruption hazards, and to inform the public, public officials, and industry of risks to lives and property (AS 14.40.075).

The Memorandum of Understanding establishing the Alaska Volcano Observatory coordinates fulfillment of these State and Federal obligations among the USGS, ADGGS, and UAFGI.

2.3 DEPARTMENT OF DEFENSE (DOD)

The 3rd Operations Support Squadron Weather Flight (WF) at Joint Base Elmendorf-Richardson (JBER) has DOD coordination responsibility for this plan. The WF is the primary liaison between the AVO and JBER. When a volcanic episode alert or update is sent from the AVO to the WF, the WF will initiate a checklist and start a call down.

The WF will notify the 673 Air Base Wing Command Post (673 ABW/CP) via telephone and an email with the applicable details. The 673 ABW/CP will then notify key personnel on JBER, including base commanders, of any potential threat. Additionally, based on the specific color code change and severity of the situation, the WF will notify the Alaskan Command Joint Operations Center (ALCOM JOC)/Joint Task Force Alaska (JTF-AK), the Mission Control Center, the 11th Air Force Rescue Coordination Center (RCC), the Civil Applications Committee Alaska Liaison, as well as the 611th Air Operations Center's Weather Support Team (611 AOC/CODW). The 611 AOC/CODW will then notify the Alaskan North American Aerospace Defense Command Region (ANR). The United States Coast Guard has the responsibility of informing their key personnel.

NOTE:
The 2d Weather Squadron (2 WS), Air Force Weather Agency (AFWA) at Offutt Air Force Base has the responsibility of informing key personnel at the US Northern Command's Domestic Warning Center, Peterson AFB, Colorado, North American Aerospace Defense Command, Peterson AFB, CO, and the Air Mobility Command's Tanker Control Center (TACC), Scott AFB, Illinois of any volcanic activity which may affect their operations.

2.3.1 Procedures

The WF, via the 17 OWS, will coordinate to provide imagery from the Defense Meteorological Satellite Program (DMSP) polar orbiting satellites. DMSP imagery will be made available through the normal communication means and will be provided as long as no scheduling conflicts occur with Air Force mission requirements. In case of a conflict, Air Force requirements will be met first, and any excess satellite time will be devoted to volcanic activity imaging.

The 17 OWS and weather units from JBER (3 OSS/OSW), Eielson AFB (354 OSS/OSW), and Fort Wainwright (1st WS, Det 3) will transmit both civilian and military pilot weather reports (PIREPS) that they receive containing volcanic activity information and will encode them as Urgent PIREPs (UAA) in accordance with Air Force Manual (AFMAN) 15-124. In the event of a significant volcanic eruption, these weather units will also ensure aircrews requesting weather briefings are made aware of the estimated horizontal and vertical extent of the ash cloud.

2.4 FEDERAL AVIATION ADMINISTRATION (FAA)

The FAA Anchorage Air Route Traffic Control Center (ARTCC) collects and disseminates volcanic information received from various sources, including AVO, the FAA Regional Operations Center (ROC), the Air Force Regional Air Operations Center (RAOC), the Anchorage VAAC, the Tokyo VAAC, KVERT, SVERT, airline operators, pilot reports (PIREPs), other FAA facilities, or the public. The FAA does not generate primary information pertaining to volcanic ash episodes, nor track or predict volcanic ash cloud movement. The FAA relies on information provided by NWS, AVO, and pilot reports for current and forecast conditions.

2.4.1 Procedures

The Alaskan Region FAA contact is the Anchorage ARTCC Watch Supervisor. The Anchorage ARTCC Watch Supervisor can be contacted at 907-269-1103.

Upon receiving notification of an eruption or possible eruption:

A. Watch Supervisor will:

1) Verify the occurrence of volcanic activity with the AVO.

    a. Non Eruptive event (Cook Inlet - Augustine/Iliamna/Redoubt/Spurr)

        i. If the AVO advises there is increased seismic or other precursory activity of a Cook Inlet volcano, but an eruptive event has ***not*** occurred, issue an Increased Volcanic Activity Notice to Airmen (NOTAM) and notify personnel and facilities as listed in 2.4.1 A. 2).a). If the aviation color code has been elevated to "**ORANGE**" or "**RED**" notify personnel and facilities listed in 2.4.1 A.2).b) as well.

b. Non Eruptive event (All other volcanoes)

i. If the AVO advises there is increased seismic or other precursory activity of any volcano from anywhere other than Cook Inlet, but an eruptive event has ***not*** occurred, issue an Increased Volcanic Activity NOTAM and notify personnel and facilities listed in 2.4.1 A.2).a).

2) Take the following action if a volcanic eruption is verified by the AVO.

a. All volcanoes, notify:

– The Center Weather Service Unit (CWSU). If an eruption occurs when the CWSU meteorologist is not on duty, the Weather Coordinator (WC) will issue an Urgent Pilot Report (UUA), contact the Alaska Aviation Weather Unit (AAWU) and if required, contact a CWSU Meteorologist to report immediately to Anchorage Air Route Traffic Control Center (ARTCC).
– Frontline Manager **(**FLM)/Controller-in-Charge (CIC).
– Regional Operations Center (ROC).
– Traffic Management Unit (TMU).

b. Cook Inlet volcano or other volcanic eruptions affecting air traffic within ZAN FIR, notify:

– Anchorage ARTCC Air Traffic Manager (ATM).
– Anchorage ARTCC Staff Manager.
– Traffic Management Officer (TMO).
– Operations Manager (OM) of affected area.
– Flight Service Station (FSS) closest to the volcanic activity.
– Anchorage Approach (A11) Watch Supervisor.
– Service Operations Center (SOC).
– Air Traffic Control System Command Center (ATCSCC).

c. Issue an FDC Flight Restriction NOTAM (TFR) if it is determined that the volcanic event could endanger airborne aircraft and occupants.

d. Designate a Weather Coordinator (WC) if necessary.

e. Issue a Volcanic Ash Advisory NOTAM, including the aviation color code "**ORANGE**" or "**RED**", if any ash may be present.

f. When requested by AVO, assist them in relaying and/or obtaining information from KVERT through coordination with Petropavlovsk-Kamchatsky ACC.

B. FLM/CIC will:

1) Ensure that PIREPs are solicited by controllers and recorded on a PIREP form.

2) Disseminate NOTAM, PIREP, TFR, MIS, SIGMET, and current conditions information to controllers on duty.

C. Traffic Management Unit will:

1) Provide assistance to the Watch Supervisor as needed.

2) Evaluate the areas impacted by volcanic activity to determine if any Traffic Management Initiatives (TMIs) are required.

3) Prior to initiating TMIs, advise the Watch Supervisor and FLM/CIC.

4) Coordinate TMIs with affected facilities and the ATCSCC.

5) Monitor the affected area and any resulting TMIs, and modify as needed.

6) Request AVO to participate in Telcons to provide volcanic activity updates as needed.

D. Controllers will:

1) Ensure that all aircraft in the affected area are aware of the most current information available concerning the volcanic eruption and any resultant ash dispersal.

2) With pilot concurrence, suggest headings or reroutes around known ash or possible ash cloud locations.

3) Assist VFR aircraft to the extent possible in avoiding known ash cloud locations.

4) Solicit PIREP information and record on a PIREP form. Forward this information to the FLM/CIC.

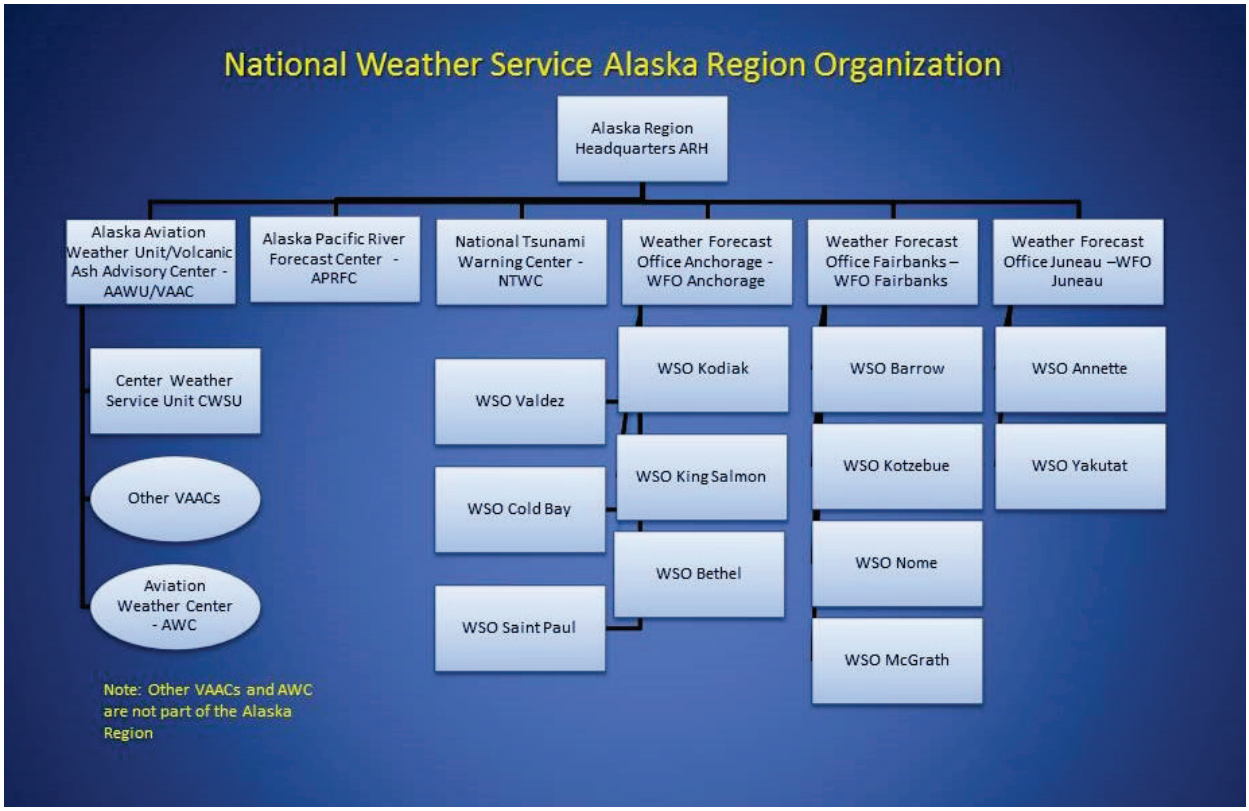
5) Broadcast information received relating to the volcanic event/ash drift.

2.5 NATIONAL WEATHER SERVICE (NWS)

2.5.1 NWS ALASKAN OFFICES

Alaska NWS offices (AAWU, CWSU, WFOs, and WSOs) provide the Alaska aviation community, other government agencies, and the public with forecasts and warnings for volcanic ash in the atmosphere, including ash fall forecasts. Meteorological information beyond the level of the forecast also is provided to the Alaska Volcano Observatory (AVO), Federal Aviation Administration (FAA), Department of Defense (DOD) (Air Force), and Department of Homeland Security and Emergency Management (DHS&EM). These meteorological details consist of: satellite imagery interpretations of ash plume boundaries, ash plume top measurements, ash plume movement from radar, forecasts, and warnings for the location of volcanic ash in the atmosphere, and summaries of pilot reports containing volcanic ash information.

In Alaska, detection of ash plumes and confirmation of ash plume height and direction are done in collaboration with internal NWS offices (AAWU, CWSU, WFO, and WSOs) and external partners (AVO). The Alaska Region's Regional Operations Center (ROC) supports NWS field offices and ensures that upper management is briefed during a high impact significant volcanic ash event.



2.5.1.1 Alaska Aviation Weather Unit (AAWU)

The AAWU is the only International Civil Aviation Organization (ICAO) Meteorological office in the world that is both a Volcanic Ash Advisory Center (VAAC) and a Meteorological Watch Office (MWO). The AAWU MWO covers the Alaska Flight Information Region (FIR) boundaries and is responsible for issuing Volcanic Ash Significant Meteorological Information statements (SIGMET). The AAWU Volcanic Ash Advisory Center covers the Alaska FIR and the far northeast Russia, north of 60 degrees North latitude and east of 150 degrees East longitude, and produces Volcanic Ash Advisories (VAAs). The AAWU is the NWS Alaska Region lead for all Volcanic Ash warnings, advisories, and forecasts.

The Significant Meteorological Information statement (SIGMET) serves as the primary warning product to the aviation community of the hazard of volcanic ash. The initial eruption or ash SIGMET contains limited information and is issued as soon as possible, ideally within 5 minutes from the time of notification of volcanic ash impacting the Anchorage FIR. Follow-up SIGMETs, if needed, identify the spatial and vertical extent of a volcanic ash hazard for a 6-hour period. A SIGMET is canceled as soon as it is reliably confirmed an ash hazard no longer exists in an area.

A VAA product contains information on the volcano, volcanic eruption, current aerial and vertical extent of ash, and a forecast of the ash hazard 18 hours from issuance time, and any other pertinent information. The VAA is issued every 6 hours with updates as necessary. In an ash event where ash is approaching the Anchorage VAAC airspace, the Anchorage VAAC will issue a Near VAA, which alerts customers and partners of approaching ash. The Near VAA provides information about the current VAA issued by the neighboring VAAC.

2.5.1.2 Center Weather Service Unit (CWSU)

The Anchorage CWSU, located at the FAA's Anchorage Air Route Traffic Control Center (ARTCC), is staffed by four NWS meteorologists and operates 16 hours a day (5:00 a.m. to 9:00 p.m. local time). The Anchorage CWSU Meteorologist-In-Charge (MIC) is the NWS liaison to Alaska FAA Air Traffic Managers.

The Anchorage CWSU collaborates with the AAWU and the AVO during volcanic eruptive events relaying pertinent information to Air Traffic Managers via on-demand briefings and internally disseminated SIGMETs and VAAs. If needed, the CWSU may issue Center Weather Advisories (CWAs), valid 0–2 hours for conditions meeting or nearly meeting SIGMET criteria; Meteorological Impact Statements (MISs), valid up to 12 hours, to advise Air Traffic of enroute hazards; and graphical volcanic ash MISs.

The Graphical Volcanic Ash MIS is a graphical representation of volcanic ash location and forecasted aerial coverage up to 12 hours and disseminated to an FAA specified list of users via facsimile. A Graphical MIS is issued when an AAWU SIGMET or VAA has not been issued. Once an AAWU SIGMET or VAA is issued, the Graphical MIS is no longer in effect.

2.5.1.3 WFOs and WSOs

Weather Forecast Offices (WFO) in Alaska participate in the volcanic eruption response by issuing volcanic ash fall statements, advisories, and warnings to the public. The WFOs also share observations of eruptions and the resulting volcanic ash fall with AVO and other agencies as needed. The Weather Service Offices (WSO) assists in coordinating information (e.g., soliciting ash fall reports) and briefing local communities on the volcanic ash events.

Public and/or Marine Ash Fall Ashfall Warnings, Advisories, and Statements are products designed to alert the public when ash fall is expected in the WFO area of responsibility. These products contain the spatial extent and progress of the ash as coordinated with other NWS products and the AVO.

2.5.1.4 ALASKA REGION REGIONAL OPERATIONS CENTER (ROC)

The NWS Alaska Regional Operations Center (ROC) will become activated during significant, high impact volcanic ash events over the State of Alaska. The ROC will provide support to the NWS field offices, help to facilitate interagency collaboration telephone conferences, and provide NWS, NOAA, and Department of Commerce leadership with frequent reports on the event.

2.5.2 NWS OFFICES OUTSIDE ALASKA

2.5.2.1 Ocean Prediction Center (OPC)

The OPC will issue a statement regarding ash fall hazard in the High Seas Forecast that is disseminated via SafetyNet, a satellite-based service; this includes all coastal Alaska WFO areas. OPC will coordinate as needed with the WFO and the AVO to ensure the statements contain up to date information about expected ash fall and other potential impacts.

2.5.2.2 Washington VAAC

The Washington VAAC is composed of the NCEP Senior Duty Meteorologist and the National Environmental Satellite, Data, and Information Service's (NESDIS) Satellite Applications Branch. The Washington VAAC collaborates with the AAWU during the running of the Volcanic Ash Forecast Transport and Dispersion (HYSPLIT) model, satellite imagery interpretation, transfer of VAAC responsibility, and/or the ending of an event.

2.5.2.3 Aviation Weather Center (AWC)

The AWC collaborates with the AAWU and Washington VAAC on Volcanic Ash SIGMETs near and over the Oakland FIR.

2.5.3 External NWS Partners

2.5.3.1 AVO/KVERT/SVERT

The AAWU, CWSU, and WFO receive and/or request information from AVO (or KVERT or SVERT) for geologic information such as seismic data, ground-based observations, and preliminary estimation of plume height and/or direction. AVO also provides background knowledge of eruptive history and type of eruptions that can be expected. Collaboration on satellite imagery interpretation also may occur.

AVO also can provide information on suspected volcanic eruptions occurring on the Kamchatka Peninsula and in the Kurile Islands of Russia.

2.5.3.2 Automated Flight Service Stations/Flight Service Stations, and FAA Air Traffic Control Towers

AAWU and CWSU contact Automated Flight Service Stations, Flight Service Stations, and FAA Air Traffic Control Towers to solicit additional PIREPs or other volcanic information (spotter reports) as well as to share volcanic information, products, and warnings.

2.5.3.3 Anchorage Air Route Traffic Control Center (ARTCC)

CWSU (AAWU if CWSU is closed) solicits PIREPs and shares volcanic information, products and warnings, with FAA Anchorage ARTCC Air Traffic Managers. Anchorage ARTCC Air Traffic Managers forward pertinent PIREPs and other volcanic information to the CWSU and/or AAWU.

2.5.3.4 Tokyo VAAC

AAWU and JMA Tokyo use a bi-lingual handover request sheet to conduct two-way collaboration and sharing of information, including text and graphics products, for possible and confirmed volcanic eruptions in Kamchatka and the Kuriles.

2.5.3.5 Montreal VAAC (Canadian Meteorological Centre, Meteorological Services of Canada (MSC))

AAWU collaborates with the Montreal VAAC who runs the Modele Lagrangien de Dispersion des Particules (MLDP0), the Montreal VAAC operational dispersion model, and coordinates event details, products involving ash in the vicinity of Canadian airspace, and possible transfer of VAAC responsibility.

2.5.4 NWS Procedures

2.5.4.1 Overview and Basic Procedures

Notification of a potential volcanic ash hazard can be made by the AAWU, the CWSU WFOs, WSOs and/or by AVO. The following are the NWS procedures following notification of a volcanic eruption. Many of these actions occur simultaneously as each office completes their checklists:

A. Initial notification of an eruption via AVO call-down; CWSU, AAWU, and/or WFO discovery via PIREP, radar, satellite, and/or webcam data; initiates initial collaboration calls between the AAWU, AVO, CWSU, and WFO. Initial consensus of the height and direction of the plume and areas where there may be ashfall are reached.

B. The CWSU shares preliminary information with all Air Traffic Managers; and PIREPs are solicited.

C. The AAWU issues a preliminary SIGMET, if required, ideally within 5 minutes of notification of the volcanic eruption.

D. The CWSU ensures SIGMET(s) and VAA(s) are disseminated to the Anchorage ARTCC Watch Supervisor, Traffic Management Unit (TMU), front line managers (FLMs), and controllers. Informal briefings as needed or requested are conducted throughout the event.

E. The AAWU Notifies Alaska Region ROC for (1) any volcanic eruption which causes significant impact to Alaskan airspace and (2) any Cook Inlet eruption.

F. The WFO initiates a collaboration call with DHS&EM SEOC.

G. The AAWU requests, if required, for the SDM at NCEP to initiate and disseminate the HYSPLIT.

H. The AAWU issues a follow-up SIGMET and VAA, if necessary, which contains volcanic ash observed and forecast areas as well as height and direction of the plume.

I. The WFO issues public and/or marine ashfall products, if required. WFOs may issue warnings and statements as public and marine products when volcanic ash is present or is expected to be present within their area of responsibility. Warnings and statements contain the spatial extent and progress of the ash. Warnings and statements should be consistent with the location of the ash as given in SIGMETs issued by AAWU or provided in the graphical volcanic ash MISs issued by the CWSU.

J. Follow-up collaboration calls are made, as needed, between the AAWU, CWSU, AVO, WFO and WSO as ash trajectory, height, and volume of the ash continue to be analyzed. Follow-up products are issued as necessary based on ongoing analysis and available data.

2.5.4.2 Specific Office Procedures Beyond the Initial Collaboration and Warning Process

2.5.4.2.1 AAWU Procedures

Subsequent coordination is made with other partner organizations when the volcanic ash hazard is expected to impact or is impacting those partner areas of responsibility. Partner organizations include the Washington VAAC, Tokyo VAAC, Montreal VAAC, the AWC, and affected Alaska NWS offices.

A. Handoffs to partner VAACs and/or the ending of an event are preceded by a conference call will with the CWSU, AVO, and any other principle units involved in the event (except Tokyo VAAC where handoffs are accomplished via the bilingual handover request sheet [HRS]) to achieve a consensus on further actions.

2.5.4.2.2 CWSU Procedures

A. If no AAWU SIGMET is in effect, a Graphical Volcanic Ash MIS may be prepared and faxed to the Anchorage ARTCC TMU defined list of customers. Once a SIGMET is issued, the Graphical Volcanic Ash MIS is no longer in effect.

B. A graphic of either the SIGMET or Graphical Volcanic Ash MIS is prepared and transmitted to the seven internal briefing terminals within the Anchorage ARTCC.

2.5.4.2.3 Alaska Region ROC Procedures

A. During a Cook Inlet volcanic eruption, or any eruption expected to cause significant impacts across the State, the Alaska Region ROC (AR ROC) will be notified by the Anchorage VAAC and will spin up operations.

B. The AR ROC will monitor the NWSChat volcanochat chatroom and communicate via chat, phone with NWS field offices, and other partners as necessary.

C. AR ROC may lead teleconference calls periodically to facilitate collaboration and gain situational awareness of the event.

D. AR ROC will prepare "For-The-Record" (FTR) reports for NWS and NOAA senior leadership as required.

2.5.4.2.4 WFO and WSO Procedures

A. The WFO(s) and WSO(s) refer all public questions on the effects of ash fallout relating to public health and safety to the DHSS and DEC.

B. The WFO(s) and WSO(s) refer all public questions on the geological aspects of the eruption to the AVO in Anchorage.

C. Follow-up collaboration calls with the AVO, DHS&EM, AAWU, WFO(s), WSO(s), and CWSU are conducted as needed.

2.5.4.3 Ash Trajectory Forecasts and Numerical Computer Models Used in the Forecast Process

When a volcano with a high potential to impact the Alaskan FIR goes to color code **ORANGE**, the AAWU may request that NCEP produce automatic 3 hourly HYSPLIT model runs. In addition, AVO produces automatic Ash3D model runs for NWS use. Other publically available dispersion products from Ash3D are in development.

NWS Meteorological definitions of minor, significant, and major eruptions:

Minor Eruption = Estimated vertical extent ash is below 20,000 feet.

Significant Eruption = Estimated vertical extent ash extends to or above 20,000 feet up to 40,000 feet.

Major Eruption = Estimated vertical extent ash extends to or above 40,000 feet.

A. PUFF Model
The AAWU should initiate the PUFF trajectory model available on the local area network at the VAAC when a volcanic eruption is suspected or has occurred. PUFF is intended to provide guidance to forecasters for preparing the initial ash SIGMET and VAA. PUFF is also useful for minor ash producing eruptions with the potential to affect airports within 40 nautical miles of the volcano. Output from PUFF is not disseminated.

B. HYSPLIT
The primary eruption response ash tracking model is the NWS HYSPLIT model. HYSPLIT is initiated by a request from the Anchorage VAAC. The VAAC should initiate the HYSPLIT for all significant or major eruptions affecting Alaska FIRs. Issuing the HYSPLIT for minor eruptions will be at the discretion of the AAWU senior forecaster based on coordination with the AVO and the NCEP NCO Senior Duty Meteorologist (SDM).

In the event HYSPLIT is not available, a request should be made by the AAWU lead forecaster for the MODELE LAGRANGIEN DE DISPERSION DES PARTICULES (MLDP0) through the CMC. The request is made by calling CMC in Montreal, Canada. Output from the MLDP0 is available via telephone, fax, or the Internet.

HYSPLIT products from the request are used by the AAWU via web interface. A request from the AAWU forecaster to the Senior Duty Meteorologist at NCEP is required for dissemination of the HYSPLIT products to external customers. HYSPLIT products should be disseminated for significant and major eruptions to airlines operating in Alaska, DOD, USCG, and the FAA Flight Service Stations; and the World Area Forecast Service (WAFS) to government, national commercial, and international commercial customers.

Hypothetical HYSPLIT graphics run at regular intervals are available on the AVO webpage (http://www.avo.alaska.edu/) for volcanoes at elevated alert levels.

2.5.5 Dissemination of Products

2.5.5.1 Operationally Maintained Dissemination Systems

Meteorological information, products, and warnings from the NWS about volcanic ash are disseminated through the following operational reliable systems where maintenance is on call 24 hours a day, 7 days a week, such as:

A. NWS's Telecommunications Gateway for Volcanic Ash Advisories, Volcanic Ash International SIGMETs, public and marine text products.

B. FAA's Aeronautical Information System Replacement (AISR) via WMSCR for text CWAs, MISs, and PIREPs (routine and urgent).

C. NOAA Weather Wire for public and marine text products.

D. NOAA Weather Radio, which is the link to the Emergency Alert System, for public and marine text products.

E. NWS marine HF and VHF radios for marine text products.

F. The WAFS for HYSPLIT graphic products.

G. Internet Fax Service for the Graphical Volcanic Ash MIS.

2.5.5.2 CoastWatch Dissemination System

Volcanic ash advisories, public and marine text/graphic products, HYSPLIT, MLDP0, satellite and radar imagery applicable to the eruption and volcanic ash also are available through the Internet and CoastWatch. The Internet and CoastWatch are not as reliable as the preceding operational systems because posting of the products could be disrupted without repair service outside of the regular business hours at night, on weekends, and on holidays.

2.5.5.3 DHS&EM Email System Dissemination System

The warnings and statements for the public also are disseminated by DHS&EM through the DHS&EM First Class email system, the DHS&EM Daily Situation Update and the DHS&EM Website (http://www.ready.alaska.gov/). This network reaches the majority of the emergency services organizations in Alaska.

2.6 UNITED STATES COAST GUARD (USCG)

Coast Guard aviation assets fly missions on a routine basis throughout the State of Alaska. If during these missions, Coast Guard aircrews notice any suspected volcanic activity, they shall attempt to report that activity to the nearest FAA Flight Service Station.

During eruptions, the USCG may issue a Marine Information Broadcast to alert mariners of hazardous conditions related to volcanic activity. NWS will email Marine Weather Statements (WHAKF8 PAFC) and Special Marine Warnings (FZAK78 PAFC) related to a volcanic eruption and subsequent ash fall to the three USCG command centers in Alaska. Upon receipt of these weather statements and special marine warnings, the USCG will issue a Marine Information Broadcast for the impacted area(s). The USCG email addresses are:

17th District command center – JRCCJuneau@uscg.mil
Sector Juneau command center – SCCJuneau@uscg.mil
Sector Anchorage command center – Sector.Anchorage@uscg.mil

Should direct contact or confirmation of receipt be necessary the three command center watches can be reached at:

17th District command center – 907-463-2000
Sector Juneau command center – 907-463-2990
Sector Anchorage command center – 907-271-6769

2.7 DEPARTMENT OF ENVIRONMENTAL CONSERVATION (DEC)

2.7.1 DIVISION OF AIR QUALITY (DEC AQ)

Timely notification of explosive eruptions by AVO to the DEC AQ manager will initiate a call down by the DEC AQ manager to the MOA Air Quality manager (if ash fall is expected in Municipality of Anchorage) and the Alaska State Department of Health and Social Services (DHSS) to allow time for preemptive action if needed. Once an ash cloud is reported and the levels of ash due to ash cloud motion and fallout are expected to exceed the National Ambient Air Quality Standards (NAAQS) for particulates or monitoring data indicates that high levels of ash exist, DEC AQ will issue an air quality advisory. The decision to issue the advisory is based on input from the NWS and AVO regarding the intensity and movement of the ash cloud. Advisories are often forecast in nature and will be adjusted once observations of ash or actual monitoring data are

received. Standards are violated when the average concentration of ash greater than 10 microns in diameter (PM-10; considered inhalable) exceeds 150 µg/m^3 for 24 hours. This is equivalent to an Air Quality Index (AQI) value of 100 (see table below). The air quality advisory will contain information concerning the predicted movement of the ash cloud, where ash is expected to fall, anticipated duration of poor air quality, and how bad the air quality is expected to become. The advisory also identifies steps the public can take to protect their health and the health of other sensitive individuals if they encounter ash fall. The following chart depicts air quality categories:

Table of PM-10 Particulate Levels and the Air Quality Index

Categories	Cautionary Statements	AQI
Good	None	0 - 50
Moderate	Unusually sensitive people should consider reducing prolonged or heavy exertion.	51 - 100
Unhealthy for Sensitive Individuals	People with respiratory or heart disease, the elderly and children should limit prolonged exertion.	101 - 150
Unhealthy	People with respiratory or heart disease, the elderly and children should avoid prolonged exertion; everyone else should limit prolonged exertion.	151 - 200
Very Unhealthy	People with respiratory or heart disease, the elderly and children should avoid outdoor activity; everyone else should avoid prolonged exertion.	201 - 300
Hazardous	Everyone should avoid outdoor exertion; people with respiratory or heart disease, the elderly and children should remain indoors.	301 - 500

Advisories will be posted to the State DEC AQ Web page at: https://myalaska.state.ak.us/dec/air/airtoolsweb/Advisories.aspx. On this Web page, there also are links to sign up for email and/or Twitter notification. Advisories will automatically be disseminated via email and Twitter to anyone who signs up. This includes individuals and local and State government agencies who request updates. During an ash fall event, the Alaska State Department of Health and Social Services (DHSS) coordinates with Department of Environmental Conservation (DEC) to include appropriate health information and guidance in Public Service Announcements for the

general public and special needs populations such as those with chronic respiratory conditions. People who experience respiratory difficulty during an ash fall event are advised to contact their local healthcare provider. After ash fallout, DHSS coordinates with DEC to assure that personnel performing recovery operations are aware of health risks and personal protection required during clean up.

Upon notification of increased seismic or volcanic activity in Alaska, the DEC Air Quality staff will evaluate the need for deploying particulate monitors to measure levels of airborne ash in the event of an eruption. Monitoring site location(s) will be selected based on the potential ash fall trajectory, ability to physically site a monitor, and the protection of public health. Additional consideration will be given to local emergency response needs, availability of onsite technical support, proximity to population centers and anticipated duration of the event. Other DEC programs will be contacted to provide technical assistance as needed. Near real-time particulate data (i.e., hourly averages) are available for the State's population centers. The data and associated AQI can be viewed at http://dec.alaska.gov/applications/air/envistaweb/.

2.7.2 DIVISION OF ENVIRONMENTAL HEALTH, DRINKING WATER PROGRAM

2.7.2.1 Notification of Ash Producing Events

AVO will coordinate with the Alaska Department of Environmental Conservation (DEC) Drinking Water Program during ash fall events by providing information on the expected distribution and timing of ash fall during eruptions in Alaska. This information also may be provided by NWS as part of their ash fall statements and advisory products. At their discretion, the DEC Drinking Water Program staff will communicate with operators of public water systems (PWS) to inform them of possible or pending ash fall and discuss appropriate guidance for dealing with ash-impacted water (i.e., fill tanks before ash fall begins, etc.) and emergency response. During an ash fall event, the Alaska Department of Health and Social Services (DHSS) coordinates with the DEC to include appropriate health information and guidance in Public Service Announcements for the general public and special needs populations.

2.7.2.2 Ash Leachates

If ash leachates are expected to cause water quality to exceed national drinking water standards or monitoring data indicates that high levels of ash leachates exist, the DEC Drinking Water Program will determine whether it is appropriate to issue a Drinking Water Advisory. Advisory statements are often forecasts in nature and will be adjusted once observations of ash leachates or actual monitoring data are received. Monitoring data may include water quality information from PWS operators or ash leachate analyses provided by AVO. The Drinking Water Program will determine whether the Environmental Protection Agency's (EPA) Maximum Contaminant Level (MCL) standards have been exceeded for a regulated contaminant following an ash-fall event. The Drinking Water Program staff will independently work with operators of public water systems to determine the appropriate course of action to protect public health following a MCL exceedance. EPA drinking water standards can be found at this URL: http://water.epa.gov/drink/contaminants/index.cfm#List.

Drinking Water Advisories or guidance statements will contain information concerning regulated contaminants and water quality parameters, such as pH value, sulfate levels, etc., in the ash-impacted water. The advisory also identifies steps the public can take to protect their health and the health of other sensitive individuals if they encounter ash in their water as well as information about what is being done by PWS operators and other officials to ensure good water quality.

3.0 Plan Management

This is the seventh edition of the Alaska Interagency Operating Plan for Volcanic Ash Episodes. The plan should be reviewed and updated every 2 years. The plan will be maintained by the US Geological Survey or the National Weather Service Alaska Region (Environmental and Scientific Services Division) or other plan participant as needed.

Prior editions from 1994, 1997, 2001, 2004, 2008, and 2011 are on file at the Alaska Volcano Observatory in Anchorage. Most recent plans are available at: https://www.avo.alaska.edu/downloads/reference.php?citid=3996

4.0 List of Acronyms

AAWU	Alaska Aviation Weather Unit
ACC	Area Control Center
ADGGS	Alaska Division of Geological and Geophysical Surveys
AFB	Air Force Base
AFTN	Aeronautical Fixed Telecommunications Network
AFWA	Air Force Weather Agency
AISR	Aeronautical Information System Replacement
ALCOM	Alaskan Command
ANR	Alaska North American Aerospace Defense Command
AQ	Air Quality
AQI	Air Quality Index
ARTCC	Air Route Traffic Control Center
ATCSCC	Air Traffic Control System Command Center
AVO	Alaska Volcano Observatory
AWC	Aviation Weather Center
AWIPS	Advanced Weather Information Processing System
CANERM	Canadian Emergency Response Model
CIC	Controller in Charge
CMC	Canadian Meteorological Centre
CVO	Cascades Volcano Observatory
CWA	Center Weather Advisory
CWSU	Center Weather Service Unit
CWT	Combat Weather Team
DAWN	Digital Aviation Weather Network
DEC	Alaska Department of Environmental Conservation
DHS&EM	Alaska Division of Homeland Security and Emergency Management
DHSS	Alaska Department of Health and Social Services
DHHS	Municipality of Anchorage Department of Health and Human Services
DMSP	Defense Meteorological Satellite Program
DOC	Department of Commerce
DOD	Department of Defense
EAS	Emergency Alert System
FAA	Federal Aviation Administration
FDC	Flight Data Center
FIR	Flight Information Region
FLM	Front Line Manager
FSS	Flight Service Station
FTP	File Transfer Protocol
GSC	Geological Survey of Canada
HF	High Frequency
HVO	Hawaiian Volcano Observatory
ICAO	International Civil Aviation Organization
IVS	Institute of Volcanology and Seismology

JBER	Joint Base Elmendorf-Richardson
JMA	Japan Meteorological Agency
JTF-AK	Joint Task Force Alaska
KBGS	Kamchatkan Branch of Geophysical Services
KVERT	Kamchatkan Volcanic Eruption Response Team
LVO	Long Valley California Volcano Observatory
METSAT	Meteorological Satellite
MIS	Meteorological Impact Statement
MLDP0	Modele Lagrangien de Dispersion des Particules
MSC	Meteorological Services of Canada
MWO	Meteorological Watch Office
NAAQS	National Ambient Air Quality Standards
NCEP	National Centers for Environmental Prediction
NOAA	National Oceanic and Atmospheric Administration
NOPAC	NOrth PACific
NOTAM	NOTice to AirMen
NWR	NOAA Weather Radio
NWS	National Weather Service
OM	Operations Manager
168 ARW	168th Air Refueling Wing
OSIC	Operational Supervisor-in-Charge
OSS	Operations Support Squadron
OSW	Operations Support Weather
OWS	Operational Weather Squadron
PIREP	Pilot Weather Report
PM-10	Particulate Matter, 10 microns and smaller
PWS	Public Water Supply
RAOC	Air Force Regional Air Operations Center
ROC	Regional Operations Center (NWS)
SAB	Satellite Analysis Branch
SDM	Senior Duty Meteorologist
SEOC	State Emergency Operations Center
17 OWS	17th Operational Weather Squadron
SIC	Scientist-In-Charge
SIGMET	SIGnificant METeorological Information
611 AOC/CODW	611th Air Operations Center Weather Support Team
673 ABW/CP	673rd Air Base Wing Command Post
SOC	Service Operations Center
SVERT	Sakhalin Volcanic Eruptions Response Team
TFR	Temporary Flight Restriction
3 WG/CP	3rd Wing Command Center
354 FW/CP	354th Fighter Wing Command Center
TMI	Traffic Management Initiative
TMO	Traffic Management Officer
TMU	Traffic Management Unit
UAFGI	University of Alaska Fairbanks Geophysical Institute
USARAK	United States Army Alaska

USCG	United States Coast Guard
USGS	United States Geological Survey
UUA	Urgent Pilot Report
VAAC	Volcanic Ash Advisory Center
VAA	Volcanic Ash Advisory
VACT	Volcanic Ash Collaboration Tool
VAFTAD	Volcanic Ash Forecast Transport and Dispersion
VAN	Volcanic Activity Notice
VONA	Volcano Observatory Notice for Aviation
VHF	Very High Frequency
WAFS	World Area Forecast Service
WARP	Weather and Radar Processor
WC	Weather Coordinator
WFO	Weather Forecast Office
WMSCR	Weather Message Switching Center Replacement
WS	Weather Squadron
WSO	Weather Service Office
YVO	Yellowstone Volcano Observatory
ZAN	Anchorage Air Route Traffic Control Center

6.0 Principal Contacts and Agency Web Pages

ALASKA VOLCANO OBSERVATORY
http://www.avo.alaska.edu/
http://volcanoes.usgs.gov/ash/
http://volcanoes.usgs.gov

DIVISION OF HOMELAND SECURITY AND EMERGENCY MANAGEMENT
http://www.ready.alaska.gov/

FEDERAL AVIATION ADMINISTRATION
http://www.faa.gov
Alaskan Region: http://www.alaska.faa.gov

NATIONAL WEATHER SERVICE
Alaska Region: http://www.arh.noaa.gov
AAWU: http://aawu.arh.noaa.gov
CWSU: http://cwsu.arh.noaa.gov
Anchorage VAAC: http://vaac.arh.noaa.gov/

UNITED STATES AIR FORCE
Air Force Weather Agency: https://weather.afwa.af.mil
(.mil or .gov domain sites only)

UNITED STATES COAST GUARD
http://www.uscg.mil/d17/

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Main Website: http://www.dec.state.ak.us/index.htm
Air Quality Advisories: http://dec.alaska.gov/Applications/Air/airtoolsweb/Advisories/
Volcanic Ash Info: http://www.dec.state.ak.us/air/volcano.htm
Drinking Water Volcano Preparedness:
http://dec.alaska.gov/eh/dw/security/sec_Natural_disaster.html

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7.0 Signature Page

1 June 2014 //Signed//
Date
John W. Madden
Director
Division of Homeland Security and Emergency Management

1 June 2014 //Signed//
Date
John Power
Scientist-in-Charge
Alaska Volcano Observatory
U.S. Geological Survey

1 June 2014 //Signed//
Date
Kyle W. VanPeursem, Capt., USAF
Weather Flight Commander, 3 OSS/OSW
Joint Base Elmendorf-Richardson, AK

1 June 2014 //Signed//
Date
Greg Holt
Acting Regional Administrator
Federal Aviation Administration
Alaskan Region

1 June 2014 //Signed//
Date
Aimee Devaris
Acting Director
National Weather Service
Alaska Region

1 June 2014 //Signed//
Date
Jason Brennell, LCDR, USCG
Command Center Chief
Seventeenth Coast Guard District

1 June 2014 //Signed//
Date
Larry Hartig
Commissioner
Department of Environmental Conservation

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Appendix A. Active Volcanoes of Alaska – List of Volcanoes, GVP Number, Location in Latitude and Longitude, Last Historical Eruption, Elevation in Feet and Meters

MAP#	NAME	GVP Number[1]	LOCATION	LAST HISTORICAL ERUPTION	ELEVATION
1	Wrangell	315020	62°00'N, 144°01'W	1902?	14,163'; 4,317 m
2	Spurr	313040	61°18'N, 152°15'W	1992	11,070'; 3,374 m
3	Redoubt	313030	61°28'N, 152°45'W	2009	10,197'; 3,108 m
4	*Iliamna*	*313020*	*60°02'N, 153°06'W*	**	*10,016'; 3,053 m*
5	Augustine	313010	59°23'N, 153°26'W	2005-2006	4,134'; 1,260 m
6	*Douglas*	*312270*	*58°52'N, 153°32'W*	**	*7021'; 2,140 m*
7	Fourpeaked	312260	58°46'N, 153°40'W	2006	*6,903'; 2,104 m*
8	*Kukak*	*312230*	*58°27'N, 154°21'W*	**	*6,693'; 2,040 m*
9	*Snowy*	*312200*	*58°20'N, 154°41'W*	**	*7,090'; 2,161 m*
10	*Griggs*	*312190*	*58°21'N, 155°06'W*	**	*7,602'; 2,317 m*
11	Katmai	312170	58°16'N, 154°59'W	1912	6,716'; 2,047 m
12	Novarupta	312180	58°16'N, 155°09'W	1912	2,759'; 841 m
13	Trident	312160	58°14'N, 155°07'W	1953-74	3,599'; 1,097 m
14	*Mageik*	*312150*	*58°11'N, 155°14'W*	**	*7,103'; 2,165 m*
15	*Martin*	*312140*	*58°10'N, 155°21'W*	**	*6,102'; 1,860 m*
16	Ugashik-Peulik	312130	57°45'N, 156°21'W	1852?	4,836'; 1,474 m
17	Ukinrek	312131	57°50'N, 156°30'W	1977	299'; 91 m
18	*Chiginagak*	*312110*	*57°08'N, 157°00'W*	*1971?*	*7,005'; 2,135 m*
19	Aniakchak	312090	56°53'N, 158°10'W	1931	4,400'; 1,341 m
20	Veniaminof	312070	56°10'N, 159°23'W	2013	8,225'; 2,507 m
21	*Kupreanof*	*312060*	*56°45'N, 159°47'W*	**	*6,217'; 1,895 m*
22	Pavlof	312030	55°25'N, 161°54'W	2013	8,261'; 2,518 m
23	*Emmons Lake*	*312020*	*55°20'N, 162°04'W*	**	*4806'; 1,465 m*
24	*Dutton*	*312011*	*55°11'N, 162°16'W*	**	*4,833'; 1,473 m*
25	*Amak*	*311390*	*55°25'N, 163°09'W*	**	*1,683'; 513 m*
26	Shishaldin	311360	54°45'N, 163°58'W	2014	9,373'; 2,857 m
27	Fisher	311350	54°39'N, 164°26'W	1830?	3,648'; 1,112 m
28	Westdahl	311340	54°31'N, 164°39'W	1991-92	5,118'; 1,560 m
29	*Gilbert*	*No entry*	*54°15'N, 165°40'W*	**	*2,684'; 818 m*
30	Akutan	311320	54°08'N, 165°58'W	1992	4,275'; 1,303 m
31	Makushin	311310	53°53'N, 166°56'W	1995	6,680'; 2,036 m
32	Bogoslof	311300	53°56'N, 168°02'W	1992	492'; 150 m
33	Okmok	311290	53°24'N, 168°10'W	2008	3,520'; 1,073 m
34	*Recheshnoi*	*311280*	*53°09'N, 168°32'W*	**	*6,509'; 1,984 m*
35	*Vsevidof*	*311270*	*53°08'N, 168°41'W*	*1957?*	*7,050'; 2,149 m*
36	*Kagamil*	*311260*	*52°58'N, 169°43'W*	*1929?*	*2,930'; 893 m*
37	*Carlisle*	*311230*	*52°54'N, 170°03'W*	*1987?*	*5,315'; 1,620 m*
38	Cleveland	311240	52°49'N, 169°57'W	2014	5,676'; 1,730 m
39	Yunaska	311210	52°38'N, 170°38'W	1937	1,804'; 550 m
40	Amukta	311190	52°30'N, 171°15'W	1996	3,497'; 1,066 m
41	Seguam (Pyre Peak)	311180	52°19'N, 172°31'W	1993	3,458'; 1,054 m
42	Korovin (Atka Is.)	311161	52°23'N, 174°09'W	2006	5,029'; 1,533 m
43	Kliuchef (Atka Is.)	311160	52°20'N, 174°08'W	1995?	5,030'; 1,533 m
44	Kasatochi	311130	52°11'N, 175°30'W	2008	1,030'; 314 m
45	Great Sitkin	311120	52°05'N, 176°08'W	1974	5,709'; 1,740 m
46	Kanaga	311110	51°55'N, 177°10'W	2012	4,288'; 1,307 m
47	Tanaga	311080	51°53'N, 178°08'W	1914	5,925'; 1,806 m
48	Gareloi	311070	51°47'N, 178°48'W	1996?	3,458'; 1,573 m

Appendix A. Active Volcanoes of Alaska – List of Volcanoes, GVP Number, Location in Latitude and Longitude, Last Historical Eruption, Elevation in Feet and Meters—Continued

49	Semisopochnoi (Cerberus)	311060	51°56'N, 179°35'E	1987	2,625'; 800 m
50	Little Sitkin	311050	51°57'N, 178°32'E	1900?	3,898'; 1,188 m
51	*Segula*	*311030*	*52°50'N, 178°08'E*	**	*3,783'; 1,153 m*
52	Kiska	311020	52°06'N, 177°36'E	1990	4,003'; 1,220 m

[1]This unique number has been assigned to each volcano by the Global Volcanism Project of the Smithsonian Institution and replaces the old numbers from the Catalog of Active Volcanoes. http://www.volcano.si.edu/

***Italics: Volcanoes with no historical (AD 1760–present) eruptions but considered hazardous because of plausible historical eruptions, vigorous fumarolic activity, intense earthquake swarms, or volcanic deformation.*

Data sources: (1) Miller, T.P., and others, 1998, Catalog of the historically active volcanoes of Alaska: U.S. Geological Survey Open-File Report 98-582, 104 p; (2) the on-line database of the Global Volcanism Program of the Smithsonian Institution (http://www.volcano.si.edu/); (3) published and unpublished AVO reports and internal files; (4) AVO's Web site and online database of volcanoes called GEODIVA. Some inconsistencies among data sources remain unresolved. This list may change through time as new information becomes available.

Appendix B. Active Volcanoes of Alaska

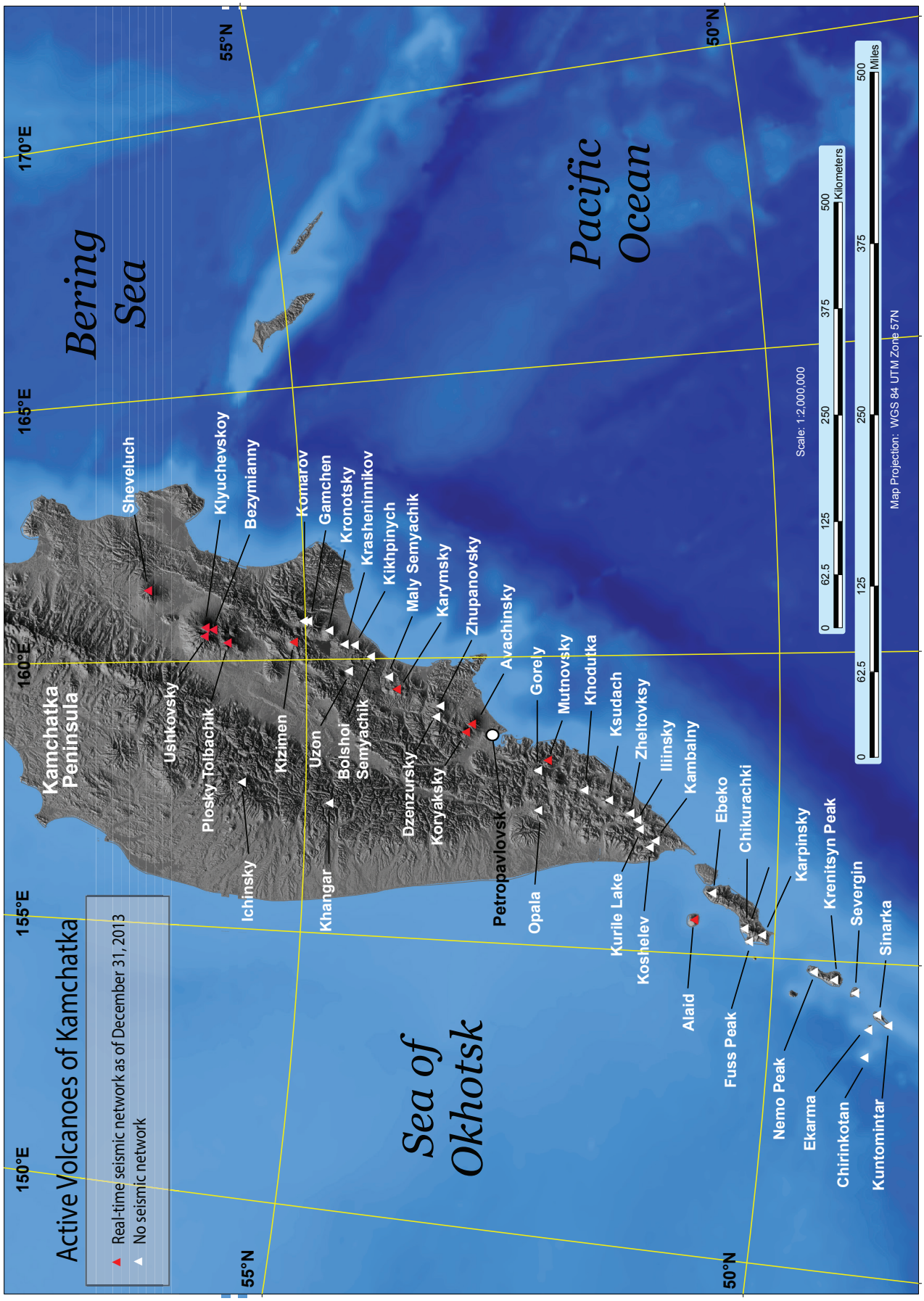
Appendix C. Active Volcanoes of Kamchatka and the Northern Kuriles – List of Volcanoes, GVP Number, Location in Latitude and Longitude, Last Historical Eruption, Elevation in Feet and Meters

MAP#	NAME	GVP Number[1]	LOCATION	LAST HISTORICAL ERUPTION	ELEVATION
NORTH					
1	Sheveluch	300270	56°39'N, 161°21'E	2014	10,768'; 3,283 m
				active lava dome	~8,200'; ~2,500 m
2	Klyuchevskoy	300260	56°03'N, 160°39'E	2013	15,584'; 4,750 m
3	Ushkovsky	300261	56°04'N, 160°29'E	1890	12,933'; 3,943 m
4	Bezymianny	300250	55°58'N, 160°36'E	2012	9,498'; 2,895 m
5	Plosky Tolbachik	300240	55°49'N, 160°24'E	2013	10,121'; 3,085 m
6	*Ichinsky*	*300280*	*55°40'N, 157°43'E*	**	*11,877'; 3,621 m*
CENTRAL					
7	Kizimen	300230	55°12'N, 160°19'E	2010-2013	8,151'; 2,485 m
8	*Gamchen*	*300210*	*54°58'N, 160°42'E*	**	*8,449'; 2,576 m*
9	*Komarov*	*300220*	*55°04'N, 160°43'E*	**	*6,790'; 2,070 m*
10	Kronotsky	300200	54°45'N, 160°30'E	1922-23	11,572'; 3,528 m
11	*Krasheninnikov*	*300190*	*54°35'N, 160°16'E*	**	*6,088'; 1,856 m*
12	*Kikhpinych*	*300180*	*54°29'N, 160°14'E*	**	*5,091'; 1,552 m*
13	Uzon	300170	54°30'N, 159°55'E	1986	5,303'; 1,617 m
14	Bolshoi Semiachik	300150	54°19'N, 160°01'E	1953?	5,642'; 1,720 m
15	Maly Semiachik	300140	54°08'N, 159°40'E	1952	5,117'; 1560 m
16	Karymsky	300130	54°03'N, 159°27'E	1996-2014	4,874'; 1,486 m
17	*Dzenzursky*	*300110*	*53°37'N, 159°00'E*	**	*7,497'; 2,285 m*
18	Zhupanovsky	300120	53°35'N, 159°08'E	2013	9,702'; 2,958 m
19	Koryaksky	300090	53°19'N, 158°41'E	2008-2009	11,336'; 3,456 m
20	Avachinsky	300100	53°15'N, 158°51'E	1991	8,890'; 2,751 m
SOUTH					
21	Opala	300080	52°32'N, 157°20'E	1894	8,118'; 2,475 m
22	Gorely	300070	52°33'N, 158°02'E	1984-1986	6,000'; 1,829 m
23	Mutnovsky	300060	52°27'N, 158°12'E	2013	7,621'; 2,323 m
24	Ksudach	300050	51°49'N, 157°32'E	1907	3,539'; 1,079 m
25	Zheltovsky	300040	51°35'N, 157°20'E	1923	6,406'; 1,953 m
26	Iliyinsky	300030	51°30'N, 157°12'E	1901	5,176'; 1,578 m
27	Koshelev	300020	51°21'N, 156°45'E	1690?	5,943'; 1,812 m
28	Kambalny	300010	51°18'N, 156°54'E	1769	7,072'; 2,156 m
Other potentially active volcanoes of Kamchatka					
30	*Khodutka*	*300053*	*52°04'N, 157°42'E*	**	*6,855'; 2,090 m*
31	*Kurile Lake*	*300023*	*51°28'N, 157°06'E*	**	*400'; 122 m*
32	*Khangar*	*300272*	*54°45'N, 157°22'E*	**	*6,560'; 2,000 m*
SECTION ATLASOVA AND PARAMUSHIR ISLANDS (Northern Kuriles)					
32	Alaid	290390	50°52'N, 155°34'E	2012	7,674'; 2,339 m
33	Ebeko	290380	50°41'N, 156°01'E	2009	3,793'; 1,156 m
34	Chikurachki	290360	50°19'N, 155°28'E	2008	5,958'; 1,816 m
35	Fuss Peak	290340	50°16'N, 155°15'E	1854	5,814'; 1,772 m
36	Karpinsky Group	290350	50°08'N, 155°22'E	1952	4,413'; 1,345 m

[1]*This unique number has been assigned to each volcano by the Global Volcanism Project of the Smithsonian Institution and replaces the old numbers from the Catalog of Active Volcanoes. http://www.volcano.si.edu/.*

Italics: Last eruption date unknown or highly uncertain. Data sources: (1) On-line database of the Global Volcanism Program of the Smithsonian Institution http://www.volcano.si.edu/; (2) Active Volcanoes of Kamchatka, S.A. Fedotov and Yu. P. Masurenkov, (eds.), Moscow Nauka Publishers (Moscow), vols. 1, 2; (3) KVERT information and other published and unpublished AVO reports and internal files. Some inconsistencies among data sources remain unresolved.

Appendix D. Map of Active Volcanoes of Kamchatka



Appendix E. Active Volcanoes of the Kurile Islands – List of Volcanoes, GVP Number, Location in Latitude and Longitude, Last Historical Eruption, Elevation in Feet and Meters

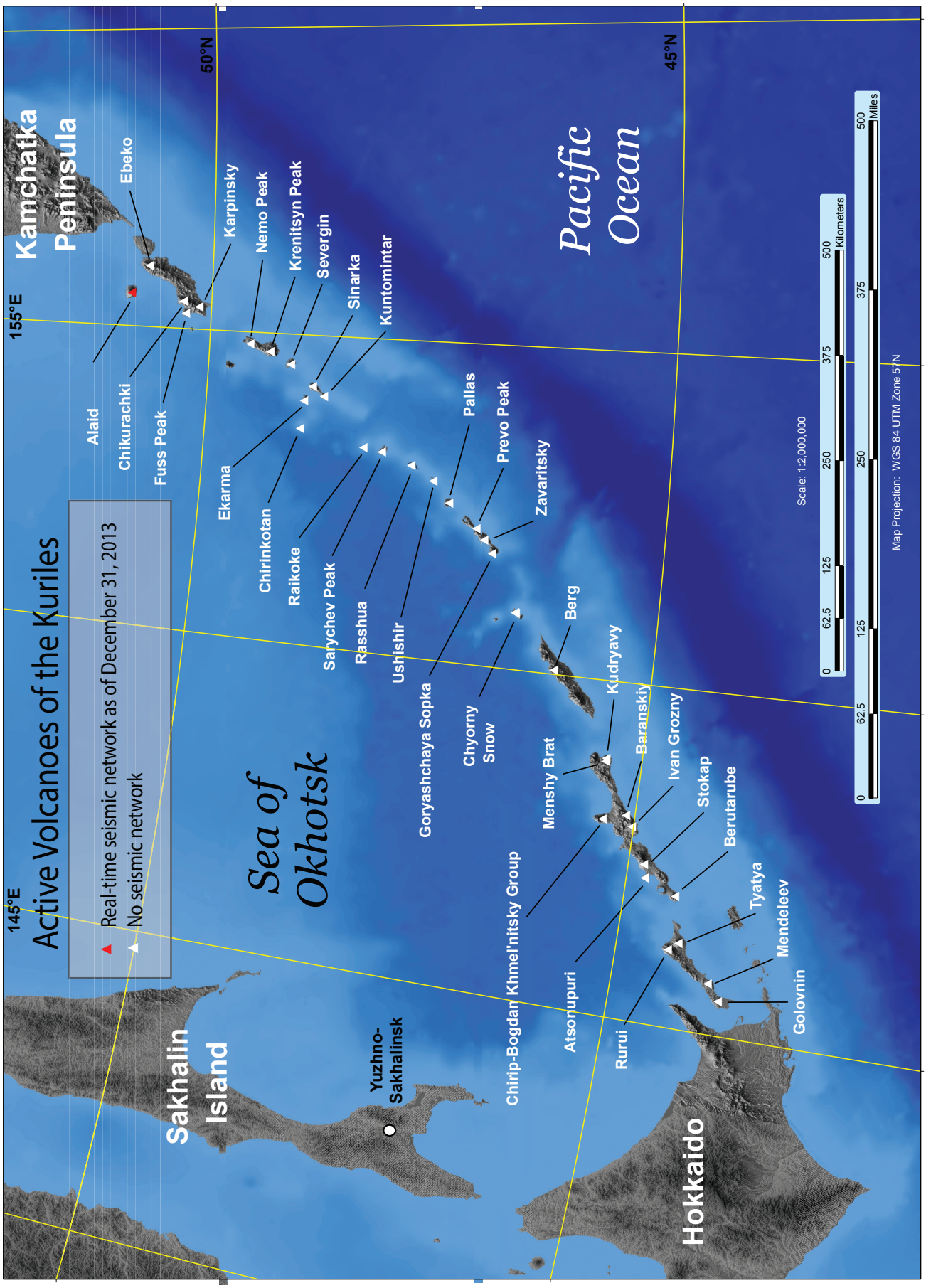
MAP#	NAME	GVP Number[1]	LOCATION	LAST HISTORICAL ERUPTION	ELEVATION
NORTHERN KURILES (1-13 are also shown on Kamchatka Map, Appendix D)					
1	Alaid (Atlasova Is.)	290390	50°52'N, 155°34'E	1986	7,674'; 2,339 m
2	Ebeko (Paramushir Is.)	290380	50°41'N, 156°01'E	2009	3,793'; 1,156 m
3	Chikurachki (Paramushir Is.)	290360	50°19'N, 155°28'E	2008	5,959'; 1,816 m
4	*Tatarinova (Paramushir Is.)*	*No entry*	*50°18'N, 155°27'E*	**	*5,020'; 1,530 m*
5	Fuss Peak (Paramushir Is.)	290340	50°16'N, 155°15'E	1854	5,814'; 1,772 m
6	Karpinsky Group (Paramushir Is.)	290350	50°08'N, 155°22'E	1952	4,413'; 1,345 m
7	Nemo Peak (Onekotan Is.)	290320	49°34'N, 154°48'E	1938	3,342'; 1,019 m
8	Krenitzyn Peak (Tao-Rusyr Caldera; Onekotan Is.)	290310	49°21'N, 154°42'E	1952	4,344'; 1,324 m
9	Severgin (Harimkotan Is.)	290300	49°07'N, 154°30'E	2007?	3,796'; 1,157 m
10	Sinarka (Shiashkotan Is.)	290290	48°52'N, 154°11'E	2003?	3,064'; 934 m
11	Kuntomintar (Shiashkotan Is.)	No entry	48°45'N, 154°01'E	1924	2,717'; 828 m
12	Ekarma (Ekarma Is.)	290270	48°57'N, 153°56'E	2010	3,842'; 1,171 m
13	Chirinkotan (Chirinkotan Is.)	290260	48°59'N, 153°28'E	2004	2,375'; 724 m
CENTRAL KURILES					
14	Raikoke (Raikoke Is.)	290250	48°17'N, 153°15'E	1924	1,808'; 551 m
15	Sarychev Peak (Matua Is.)	290240	48°06'N, 153°12'E	2009	4,744'; 1,446 m
16	Rasshua (Rasshua Is.)	290220	47°45'N, 153°01'E	1957?	3,113'; 949 m
17	*Ushishir (Yankich Is.)*	*290210*	*47°31'N, 152°48'E*	**	*1,276'; 389 m*
18	Ketoi (Pallas Peak; Ketoi Is.)	290200	47°20'N, 152°29'E	1960	3,248'; 990 m
19	Prevo Peak (Simushur Is.)	290190	47°01'N, 152°07'E	1914	4,462'; 1360 m
20	Zavaritzii (Simushur Is.)	290180	46°55'N, 151°57'E	1957	2,050'; 625 m
21	Goryachaya sopka (Simushur Is.)	290170	46°50'N, 151°45'E	1944?	2,923'; 891 m
SOUTHERN KURILES					
22	Cherny (Chirpoi Is.)	290150	46°31'N, 150°52'E	1857	2,047'; 624 m
23	Snow (Chirpoi Is.)	290150	46°31'N, 150°52'E	2012	1,296'; 395 m
24	Berg (Kolokol Group, Urup Is.)	290120	46°03'N, 150°04'E	2009?	3,215'; 980 m
25	Kudryavy (Medvezhii; Iturup Is.) Also called Moyorodake	290	45°23'N, 148°50'E	1999	3,235'; 986 m
26	*Men'shiy Brat (Iturup Is.)*	*No entry*	*45°23'N, 148°47'E*	*~400 yrs BP*	*1,847'; 563 m*
27	Chirip cluster (Bogdan Khmelnitzky; Iturup Is.)	290090	45°23'N, 147°55'E	1860?	5,131'; 1,564 m
28	Baransky (Iturup Is.) Also called Sashiusudake	290080	45°06'N, 148°01'E	1951	3,717'; 1,133 m
29	Ivan Grozny (Iturup Is.) Also called Etorofu-Yake-yama	290070	45°01'N, 147°52'E	2013	3,802'; 1,159 m
30	*Stokap or Bogatyr Ridge (Iturup Is.) Also called Nishihitokappuya*	*290060*	*44°50'N, 147°20'E*	**	*5,361'; 1,634 m*
31	Atsonupuri (Iturup Is.)	290050	44°48'N, 147°08'E	1932	3,953'; 1,205 m
32	*Berutarube (Iturup Is.)*	*290040*	*44°27'N, 146°56'E*	*1812*	*4,003'; 1,220 m*
33	*Ruruy or Smirnov (Kunashir Is.) Also called Ruruidake*	*290021*	*44°27'N, 146°08'E*	**	*4,872'; 1,485 m*
34	Tyatya (Kunashir Is.) Also called Chachadake	290030	44°27'N, 146°15'E	1973	5,968'; 1,819 m
35	Mendeleev (Kunashir Is.) Also called Raususan	290020	43°59'N, 145°44'E	1977	2,910'; 887 m
36	*Mendeleev (Kunashir Is.) Also called Raususan Golovnin (Kunashir Is.)Also called Tomariyama*	*290010*	*43°51'N, 145°30'E*	*~1900 yrs BP*	*1,775'; 541 m*

[1]This unique number has been assigned to each volcano by the Global Volcanism Project of the Smithsonian Institution and replaces the old numbers from the Catalog of Active Volcanoes. http://www.volcano.si.edu/.

** *Italics: Last eruption date unknown or highly uncertain. These volcanoes often display thermal activity at the surface.*

Data sources: (1) Alexander Rybin and Marina Chibasova, IMGG (working from Russian maps at scales of 1:50,000 and 1:200,000), (2) On-line database of the Global Volcanism Program of the Smithsonian Institution (http://www.volcano.si.edu/). Some inconsistencies between sources remain unresolved. This list may change as new geological information becomes available.

Appendix F. Map of Active Volcanoes of the Kuriles



APPENDIX G. PUBLIC Phone Numbers for Volcanic Ash Episodes in Greater Cook Inlet

GENERAL PREPARDNESS
Alaska Homeland Security and Emergency Management
(907) 428-7000 or 1-800-478-2337

VOLCANO / VOLCANIC ACTIVITY INFORMATION
Alaska Volcano Observatory (AVO)
(907) 786-7497
AVO Recording on the Status of Alaska's Volcanoes
(907) 786-7478

ASHFALL WARNINGS, MARINE ADVISORIES and SIGMETS (NOAA/NWS)
SIGMETS Alaska Aviation Weather Unit Lead Desk
(907) 266-5110
Ash fall and Marine Advisories
(907) 266-5105 use Option 1 for recorded info, use Option 4 to speak with a forecaster
Alaska Weather Information Line
(907) 266-5145 or 1-800-472-0391

FLIGHT RESTRICTIONS (FAA)
Anchorage Air Route Traffic Control Center Watch Desk
(907) 269-1103

MARINE SAFETY
USCG
Command Center District 17 Search and Rescue or related topics
1-800-478-5555 or (907) 463-2000
Coast Guard Sector Anchorage (Kodiak, Cook Inlet, Prince William Sound)
(907) 271-6700

HEALTH – ASH IMPACTS
Alaska Department of Health and Social Services: Section of Epidemiology
Public Health Emergencies
(907) 269-8000 or (800) 478-0084 after hours

AIR QUALITY MONITORING
Alaska Department of Environmental Conservation - Division of Air Quality
(907) 269-7676
Municipality of Anchorage Air Quality Hotline
(907) 343-4899

LAND MANAGER
Alaska Department of Natural Resources
(907) 269-8566
Alaska Region NPS Public Relations (Anchorage)
(907) 644-3513 and (907) 644-3512
Katmai National Park and Preserve (King Salmon)
(907) 246-3305
Lake Clark National Park and Preserve (Homer)
(907) 235-7903

LOCAL BOROUGHS/MUNICIPALITIES
Bristol Bay Borough
(907) 246-4224
Lake and Peninsula Borough
(907) 246-3421 and 800-764-3421
Kenai Peninsula Borough Office of Emergency Management
(OEM) (907) 262-4910
Kodiak Borough Manager's Office
(907) 486-9300 use Option 1 for Manager's Office
Anchorage Office of Emergency Management
(907) 343-1401

APPENDIX H. PUBLIC web sites for Volcanic Ash Episodes in Greater Cook Inlet

GENERAL PREPARDNESS
Alaska Department of Homeland Security and Emergency Management
http://www.ak-prepared.com/

VOLCANIC ACTIVITY INFORMATION
Alaska Volcano Observatory (AVO) http://www.avo.alaska.edu/

ASHFALL WARNINGS, MARINE ADVISORIES and SIGMETS (NOAA/NWS)
Ash fall and Marine Advisories http://pafc.arh.noaa.gov/
SIGMET, AIRMET http://aawu.arh.noaa.gov/
HYSPLIT wind trajectories http://www.arl.noaa.gov/ready/traj_alaska.html
NWS RADAR http://www.arh.noaa.gov/radar.php
Anchorage Volcanic Ash Advisory Center http://vaac.arh.noaa.gov

TSUNAMI WARNINGS
West Coast Alaska Tsunami Warning Center http://wcatwc.arh.noaa.gov/

FLIGHT RESTRICTIONS (FAA)
TFRs http://tfr.faa.gov/tfr2/list.jsp
NOTAMs https://www.notams.faa.gov/

MARINE SAFETY
US Coast Guard District 17 Search and Rescue http://www.uscg.mil/d17/
US Coast Guard Alaska Public Affairs http://www.uscgalaska.com

HEALTH – ASH IMPACTS
Alaska Department of Health and Human Services; Volcano Information
http://www.epi.hss.state.ak.us/volcanoes/default.htm

AIR QUALITY MONITORING
Alaska Department of Environmental Conservation - Division of Air Quality https://myalaska.state.ak.us/dec/air/airtoolsweb/Advisories.aspx

LAND MANAGERS
Alaska Department of Natural Resources http://wwwdggs.dnr.state.ak.us/
Katmai National Park and Preserve http://www.nps.gov/katm/
Lake Clark National Park and Preserve http://www.nps.gov/lacl/

LOCAL BOROUGHS/MUNICIPALITIES
Bristol Bay Borough http://www.theborough.com/
Lake and Peninsula Borough http://www.lakeandpen.com/
Kenai Peninsula Borough http://www.borough.kenai.ak.us/emergency/
Kodiak Borough http://www.kodiakak.us/
Municipality of Anchorage http://www.muni.org/departments/oem/pages/default.aspx

Appendix I. Ash Fall Severity Terms in Use in Alaska

[Official text products from NWS and other agencies, attempt to utilize consistent terminology when describing ash fall events and amounts]

TERM	APPROXIMATE ACCUMULATION	NWS MESSAGE	KEY IMPACTS (cumulative with increasing ash)	RECOMMENDATIONS (cumulative with increasing ash)
Trace or Dusting	< 1/32 in 0.031 in < 0.8 mm	Special Weather Statement Marine Weather Statement	Eye and respiratory irritant. Very low-level impacts for most people.	Avoid excessive exposure to ash, especially those with respiratory sensitivities. Protect critical electronics and other equipment from contamination.
Minor	1/32 - 1/4 in 0.031 - 0.25 in 0.8 - 6.4 mm	Ash Fall Advisory Marine Weather Statement	Possible harm to crops, animals; minor equipment and infrastructure damage. Reduced visibility. Widespread clean-up may be necessary.	Seal windows and doors. Protect electronics and cover air intakes and open water supplies. Minimize driving. Listen to your radio station for further information.
Substantial	1/4 - 1 in 0.25 - 1 in 6.4 - 25.4 mm	Ash Fall Warning Special Marine Warning	Disruption of services and utilities (water, sewer, electric) possible. Ash removal efforts significant.	Seal windows and doors. Protect electronics and cover air intakes. Avoid driving. Listen to your radio station for further information.
Heavy	1 - 4 in 25.4 - 100 mm	Ash Fall Warning Special Marine Warning	Weaker roofs and structures can fail at ~4-5 inches of wet ash (~40 lbs/square ft). Crop damage. Livestock loss. Services, utilities interrupted.	Remain indoors unless absolutely necessary. Use extreme caution clearing rooftops of ash. Avoid driving. Listen to your radio station for further information.
Severe	> 4 in > 100 mm	Ash Fall Warning Special Marine Warning	Significant danger of roof collapse; heavy damage to trees and crops. Essential services severely disrupted. Heavy animal loss. Roads unusable.	Remain indoors unless absolutely necessary. Use extreme caution clearing rooftops pf ash. Avoid driving. Listen to your radio station for further information.

Appendix J. Official Volcano Warning Products in Use in Alaska

[Primary warning agencies in Alaska involved in volcanic eruption hazard communication and the names of public warning products for events in Alaska and the Flight Information Region of the Alaska Aviation Weather Unit. Some messages are very specific in their intended audience (e.g. Notices to Airmen [NOTAMs] and Urgent Pilot Reports [UUAs] are for airlines and pilots) and others are of broader use (e.g. Ashfall Advisories, Air Quality Advisories, and Information Releases). Significant redundancy is inherent in this system and proactive coordination is necessary to ensure that messages are consistent. UUAs can be issued by either FAA or NWS personnel. Not all messages will be issued for every eruption or episode of volcanic unrest]

Alaska Volcano Observatory (AVO)	National Weather Service (NWS)	Federal Aviation Administration (FAA)	Alaska Department of Homeland Security and Emergency Management (DSHEM)	U.S. Coast Guard (USCG)	Alaska Department of Environmental Conservation, Division of Air Quality (DEC)	Alaska Department of Environmental Conservation, Drinking Water Program (DEC)	Alaska Department of Public Health (DPH)	Municipality of Anchorage (MOA)
Information Release	SIGMET (Significant Meteorologic Information)	NOTAM (Notice to Airmen)	SITREP (Situation Report)	Notice to Mariners	Air Quality Advisory	Drinking Water Advisory or guidance statements	Public Service Announcement	Air Quality Advisory
Weekly Report	VAA (Volcanic Ash Advisory	UUA (Urgent Pilot Report)	Community Alert					
Daily Status Report	MIS (Meteorologic Impact Statement)							
(VAN) Volcanic Activity Notice	CWA (Center Weather Advisory)							
(VONA) Volcano Observatory Notice for Aviation	Ashfall Advisory, Warning							
	Marine Advisory							
	Special Weather or Marine Statements							