SCS ENGINEERS







Title V
Construction and Operating Permit Application of Royal Pest Solutions for Fumigation Operations at Schilli Distribution Services Port Wentworth, Georgia

Presented to:

Georgia Environmental Protection Division
Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, Georgia 30354

Prepared for:

Royal Pest Solutions Inc.

RPS ROYAL Fumigation
Regional Service. Global Solutions.

53 McCullough Drive
New Castle, Delaware 19720

Prepared by:
SCS ENGINEERS
11260 Roger Bacon Drive, Suite 300
Reston, VA 23502
(703) 471-6150

May 28, 2015
File No. 02209044.00

Offices Nationwide
www.scsengineers.com

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Attachments

1.0 PROJECT DESCRIPTION

Royal Pest Solutions Inc. seeks to operate a fumigation facility within a designated area at Schilli Distribution Services, located at 120 Crossgate Road, Port Wentworth, Georgia in Chatham County. The site, which is owned by the Georgia Ports Authority, encompasses approximately52.88 acres. Fumigation operations will include methyl bromide fumigation of bulk log stacks and shipping containers, under tarpaulins and within a designated, open area of the site. A 60-ft stack will be installed to discharge the methyl bromide following completion of fumigation. A site map and a satellite image of the facility are provided in Attachment A.

The principal business of the facility is the quarantine and pre-shipment (QPS) fumigation of logs destined for export from the Port of Savannah. This fumigation is conducted under the direct, on-site supervision of officers of United States Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS). Methyl bromide is the sole fumigant used and emitted at this facility.

The purpose of this application is to respectfully request an air permit for the fumigation operations detailed in this application. The site will be a major source for Hazardous Air Pollutants (HAPs). Attached to this submittal are the applicable Georgia EPD application forms, an extended description of the project, detailed emissions calculations, site process flow diagram, location map, and dispersion modeling results demonstrating compliance with acceptable ambient levels of methyl bromide. Additionally, a Case-by-Case MACT Analysis for methyl bromide fumigation is provided as Attachment E.

2.0 PROCESS OVERVIEW AND DESCRIPTION

Methyl Bromide Fumigation

The facility will be designed and operated to comply with the requirements of the USDA APHIS, Plant Protection and Quarantine (PPQ) division, the regulatory body that oversees QPS treatments in the United States. The fumigant used at the facility is methyl bromide, which has been the principal QPS fumigation tool of APHIS for over forty years and has been regularly used at various ports and fumigation facilities throughout the United States, including sites in Georgia (e.g., Ultimate Pest Control, Ellabell, GA; East Coast Terminal Company, Savannah, GA).

Although methyl bromide has been a long-standing and principal QPS treatment tool as prescribed by APHIS, the compound was deemed a depleter of stratospheric ozone in 1992 under the terms of an international treaty, the Montreal Protocol on Substances That Deplete the Ozone Layer, and therefore subject to "phase-out" of most of its uses. The federal Environmental Protection Agency (USEPA), in implementing the requirements of the Montreal Protocol, has greatly restricted use of methyl bromide for applications such as soil fumigation. However, its use for QPS applications such as those to be performed at this location has been preserved until such time as there is a replacement for it, and consequently, the compound is specifically authorized by the QPS exemption under Title VI (Stratospheric Ozone Protection) of the Clean Air Act (CAA).

The APHIS officers oversee fumigation of cargo entering the U.S. on which invasive pests, not native to the U.S., are found or are deemed to be present due to past inspections. The cargo is quarantined until it receives treatment in accordance with USDA requirements. APHIS officers also oversee pre-shipment quarantine fumigation treatments that are required by other countries (e.g., China, India, Turkey) to which U.S. goods are to be shipped.

Methyl bromide is a hazardous air pollutant (HAP) under CAA § 112, and a case-by-case MACT analysis is provided in Attachment E. In summary, the MACT analysis concludes that methyl bromide emissions will be managed using a combination of best management practices and engineering controls.

Overview of Fumigation Process

The QPS process is dictated by APHIS protocols for commodities through its Plant Protection and Quarantine (PPQ) division. The APHIS protocols and treatment schedules are published in the 920-page PPQ Treatment Manual. Further, all QPS fumigation conducted by Royal at the Port Wentworth location is performed under the direct, on-site supervision of an APHIS officer. In addition, all fumigation at the site is performed in accordance with USEPA's Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) pesticide label requirements as well as the PPQ Treatment Manual, and applicable international phytosanitary standards.

APHIS has developed a series of detailed fumigation protocols for commodities through its Plant Protection and Quarantine (PPQ) division. The protocols and treatment schedules are published in the PPQ Treatment Manual, a document of over 900 pages. Further, all QPS fumigation conducted by Royal at the Port Wentworth location is performed under the direct, on-site supervision of an APHIS officer. In addition, all fumigation at the site is performed in accordance with USEPA's Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) pesticide label requirements as well as the PPQ Treatment Manual, and applicable international phytosanitary standards.

The treatment protocols published in the Treatment Manual are highly prescriptive and dictate detailed requirements for many aspects of the fumigation process, including but not limited to the following:

- Fumigation chemical (e.g., methyl bromide);
- Dosage - pounds of fumigant per 1,000 cubic feet of fumigated space;
- Maintenance of dosage by monitoring fumigant concentrations at multiple locations within the treatment enclosure throughout the treatment period and periodic addition of fumigant as necessary to maintain the required concentration;
- Treatment duration;
- Forced recirculation within the tarpaulin enclosure to maintain the correct mixture of the fumigant in air throughout the prescribed treatment period;
- Monitoring the temperature of the environment and the commodity at multiple locations within the treatment enclosure throughout the treatment period;
- Weatherization of the treatment enclosure;

- Availability of utilities;
- Arrangement of commodities within the treatment enclosure;
- Aeration of the commodity and treatment enclosure at the conclusion of the treatment period; and
- Safety requirements for release of the commodity and reentry of facility personnel into the area at the end of the treatment.

An overview of the methyl bromide fumigation process for timber is provided below. More detailed descriptions are provided in excerpts from the USDA Treatment Manual (provided as an Appendix to the Case-by-case MACT report).

In summary, the fumigation activities are designed and implemented to comply with the following APHIS Treatment Manual requirements:

- Section 2-4: Methyl Bromide Tarpaulin Fumigation
- Section 2-9: Methyl Bromide Closed-door Container Fumigation

Excerpts from the APHIS Treatment Manual are included as an Attachment to the Case-by-Case MACT Analysis Report. In addition to the requirements specified by the APHIS Treatment Manual, the required methyl bromide dose for softwoods destined for China is specified by the China Protocol. Following fumigation at the Port Wentworth facility, logs are loaded onto ships for export. The fumigation procedures are summarized below.

The containers of logs are tightly aligned in groups, typically of seven to nine (7 to 9) containers. Fumigant injection lines, monitoring lines and circulation fans (to mix the fumigant with the air) are then placed inside the containers.

Following an inspection and approval by an APHIS officer, the container doors are closed, and vents and other potential leakage sites are sealed. The volume inside each container is calculated, and the amount of fumigant appropriate for that volume (and the ambient temperature) is calculated per the Treatment Manual, the type of wood, the target pest, ambient temperature and other atmospheric conditions. The fumigant is then injected into the containers through the lines previously installed.

When the APHIS inspector is satisfied with the preparations, fumigant is injected into the containers, which now function as fumigation enclosures. Methyl bromide from pressurized cylinders (typically 100-pound or 200-pound cylinders) is piped through a "volatilizer," a heat-exchange unit that heats the gas to approximately 140 degrees F. The warmed gas is delivered through reinforced hoses that discharge into the containers. Because methyl bromide converts from a liquid to a gas at 38.5 degrees F, the volatilizer is used to eliminate the possibility of any liquid methyl bromide being present during the fumigation.

Southern yellow pine logs, the principal wood commodity fumigated at the Port Wentworth facility, are exposed to the fumigant for sixteen to twenty- four (16-24) hours, during which time gas concentration levels within the fumigation enclosure are monitored by APHIS officers on a schedule to ensure that an adequate gas concentration over time is maintained to eliminate the target pest. The fumigant concentration readings are taken with an APHIS-approved device,

typically either a Fumiscope® manufactured by Key Chemical or a MB-ContainIR® manufactured by Spectros Instruments. In addition to the gas readings, the fumigators periodically check to see that there are no gas leaks from the fumigation enclosures. During this time a buffer zone is maintained around the perimeter of the treated commodity.

Bulk log fumigations are performed in a similar manner, except the logs are placed in piles on an impermeable surface (e.g., asphalt) prior to covering with the tarpaulin.

At the end of the exposure period, the cargo is aerated using portable ductwork and one or more portable, powerful blowers that will discharge emissions through a 60-ft stack. Aeration will be performed in accordance with the USDA APHIS Treatment Manual (Section 2), which provides requirements regarding aeration flow rates. For example, aerating nonsorptive, non-containerized cargo (indoors and outdoors) requires a minimum 3,500 cfm fan capacity, and requires that the fans provide a minimum of 4 to 15 air exchanges per hour. Aeration using the closed-door container approach requires a minimum 5,200 cfm exhaust fan capacity.

The aeration discharge stack will be placed near the center of the property, as shown on the attached figure. The container doors are then opened, portable ductwork and "j-blowers" are used to conduct the fumigant to the aeration stack, and exhaust fans supply fresh air to remove and dilute any remaining fumigant. The ventilation period lasts a minimum of four hours, and the area is not cleared for re-entry by personnel until the concentration of fumigant in the air is less than 5 parts per million, the level dictated by the USEPA-approved product label.

The APHIS-approved devices for "clearing," or permitting access to the area by persons not wearing personal protective equipment, are colorimetric detector tubes such as those manufactured by Draeger. At any time the 5 ppm level is reached or exceeded, fumigators wear self-contained breathing apparatus with full face masks and other personal protective equipment such as long-sleeved shirts and pants. Once aeration begins, however, fumigant concentrations drop very rapidly.

Once aeration is completed the bulk cargo is loaded into containers, containers that already contain logs are sealed, and all containers are transported to the port for loading onto ships. Each fumigation is documented in detail by Royal, and the APHIS inspector files a USDA Form 429 as the government's record of the fumigation. Thus, two independent, detailed records exist of every fumigation.

3.0 PROCESS EMISSIONS

The emissions from the fumigation facility are methyl bromide, and a trace amount of methyl chloride, which is present as a manufacturing impurity at approximately 0.2 percent according to the Material Safety Data Sheet. For permitting purposes, emissions estimates are conservatively assumed to be equal to the methyl bromide applied for fumigation. In other words, all methyl bromide projected to be applied as a fumigant is assumed to be emitted during the aeration phase of the fumigation process.

Because aeration methods are dictated by USDA APHIS treatment protocols, changes in these protocols for log fumigations could impact project emissions. Future methyl bromide emissions could be reduced if the appropriate U.S. and foreign agencies approve either non-fumigation treatments or the substitution of another fumigant for methyl bromide, currently the only fumigant accepted for QPS fumigations. At present, however, the operator cannot voluntarily limit the methyl bromide fumigation dose unless permitted to so by USDA and international treatment protocols.

Table 1. Methyl Bromide Potential-to-Emit

Compound	PTE (Tons/yr)
Methyl Bromide	75

4.0 REGULATORY ANALYSIS

Methyl bromide is a highly regulated pesticide. Appendix F presents a summary of regulations and advisories, as presented in the Toxicological Profile for Methyl Bromide (ATSDR, 1992). Additional methyl bromide regulatory programs and requirements are discussed below.

Georgia

As shown in Table 2, Georgia provides acceptable ambient air concentration (AAC) limits for methyl bromide in both a 15-minute averaging period and an annual averaging period.

Table 2. State of Georgia Ambient Air Concentrations for Methyl Bromide

Averaging Period	Concentration ($\mu g/m^3$)
15-minute	8000
Annual	5

Dispersion modeling and a toxic impact assessment were conducted for the facility. The results, presented in Attachment D, demonstrate that methyl bromide emissions comply with the applicable short-term and annual ambient air concentration limits.

Federal Clean Air Act (CAA)

As discussed in the Introduction, since 1992 USEPA has implemented restrictions on many uses of methyl bromide in response to phase-out requirements established under the Montreal Protocol and the Clean Air Act. These restrictions were implemented because methyl bromide is considered a stratospheric ozone depleting substance. However, the use of methyl bromide for QPS applications such as those performed at the Royal facility is specifically authorized by the QPS exemption under Title VI (Stratospheric Ozone Protection) of the Clean Air Act. The interim final regulation for the QPS exemption was issued by EPA on July 19, 2001, and the final regulation was published in the Federal Register on January 2, 2003.

There are three exemptions from the phase-out of methyl bromide found in the Montreal Protocol and also in the US implementation of the Protocol through Title VI of the Clean Air Act: (1) emergency use; (2) certain short-term "critical" uses where anticipated alternatives to methyl bromide have not yet become economically and technologically feasible; and (3) QPS. In contrast to the "critical" uses, for which application must be made each year, the QPS exemption is indefinite and will continue until there are alternatives for methyl bromide. Despite the passage of several decades and a myriad of research efforts, however, finding alternatives for QPS methyl bromide treatments has proven extremely difficult.

Methyl bromide is classified as both a HAP and a VOC (reference: 40 CFR 51.100(s)) by USEPA. However, testing has demonstrated that methyl bromide has negligible photochemical reactivity (i.e., negligible ozone generation potential) and it is eligible for exclusion from definition and regulation as a VOC, per EPA policy. A petition to exempt methyl bromide from regulation as an ozone precursor and photochemically reactive VOC was submitted to EPA by the Methyl Bromide Industry Panel of the Chemical Manufacturer's Association in July 1996. The petition was subsequently updated by the American Chemistry Council in about 2008. While EPA has acknowledged that methyl bromide is negligibly reactive based on its low photochemical reactivity, final processing of the petition has not been completed.

Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)

Methyl bromide was introduced as a pesticide in 1932 and was first registered in the U.S. in 1961. Because of advances in science, public policy, and pesticide use practices, USEPA requires that pesticides first registered before November 1, 1984 be re-registered to ensure that they meet today's more stringent standards (USEPA, 2008). The re-registration process for methyl bromide is ongoing.

The USEPA Office of Pesticide Programs (OPP) plays a role in managing QPS uses through its pesticide labeling program established under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). OPP is developing specific methyl bromide labels for both QPS and soil fumigation to more clearly define permissible uses. The OPP is also developing new pesticide use requirements that could include lower maximum application rates, fumigation management plans, good agricultural practices to reduce emissions, lower permeability films (lower mass transfer coefficients) for soil fumigation, and buffers between the treated area and habited structures, schools, hospitals, and day care centers (UNEP 2009b). Any new label requirements that may apply to QPS treatments will of necessity need to be harmonized with USDA APHIS requirements.

USDA Animal and Plant Health Inspection Service (APHIS)

The USDA has developed a series of detailed fumigation protocols for various QPS commodities. The treatment schedules are published in the over-900-page USDA APHIS PPQ Treatment Manual. All quarantine fumigation conducted at the Royal facility is performed under the direct supervision of APHIS officers and in accordance with the Treatment Manual, USEPA-approved product labels and, in certain instances, international phytosanitary standards or commodity trade association standards. Royal also observes industry practice in using the APHIS Treatment Manual as a "default protocol" if it encounters situations that are not covered by any of the other protocols.

As noted in elsewhere in this submittal, the APHIS Treatment Manual is highly prescriptive, dictating procedures in at least thirteen different categories and requiring the use of specific equipment and monitoring devices.

Within the broad range of APHIS protocols for methyl bromide fumigation, there are significant differences in methyl bromide dosages and durations for various commodities.

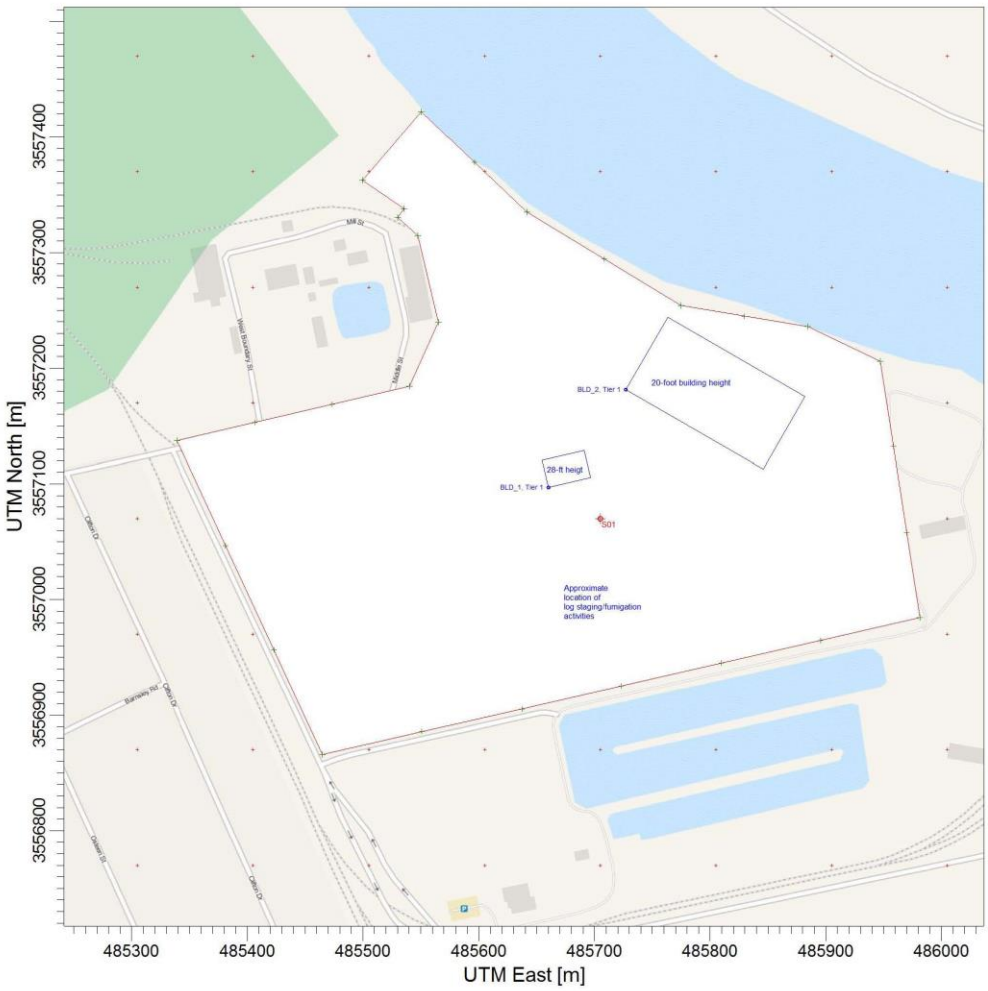
The Treatment Manual is the product of decades of research, often performed by the USDA's Agricultural Research Service and/or in conjunction with universities, dedicated to finding the most effective means of controlling quarantine pests on specific commodities. For this reason, EPA approval of an alternative treatment to methyl bromide is but a first step in its implementation as a QPS treatment. APHIS, in turn, must assess whether a proposed alternative is at least as effective, if not more so, than methyl bromide in removing a specific quarantine pest on a specific commodity (UNEP 2009b). It must also consider whether the treatment will adversely affect the commodity or leave unacceptable residues, often a significant issue with food products.

The process of performing efficacy tests is lengthy. Research is often performed by the country where the pest originates since it presumably has a ready supply of the pest and no quarantine concerns of its own. That research must then be reviewed and approved by APHIS PPQ for each import commodity on which the quarantine pest might be found. Official treatment rates, then, are arrived at by assessing a series of combinations of three variables: country of origin, pest, and commodity (UNEP 2009b).

Attachment A

Facility Location and Site Plan

PROJECT TITLE:
Royal Pest Solutions - Port Wentworth, Georgia
Site Plan



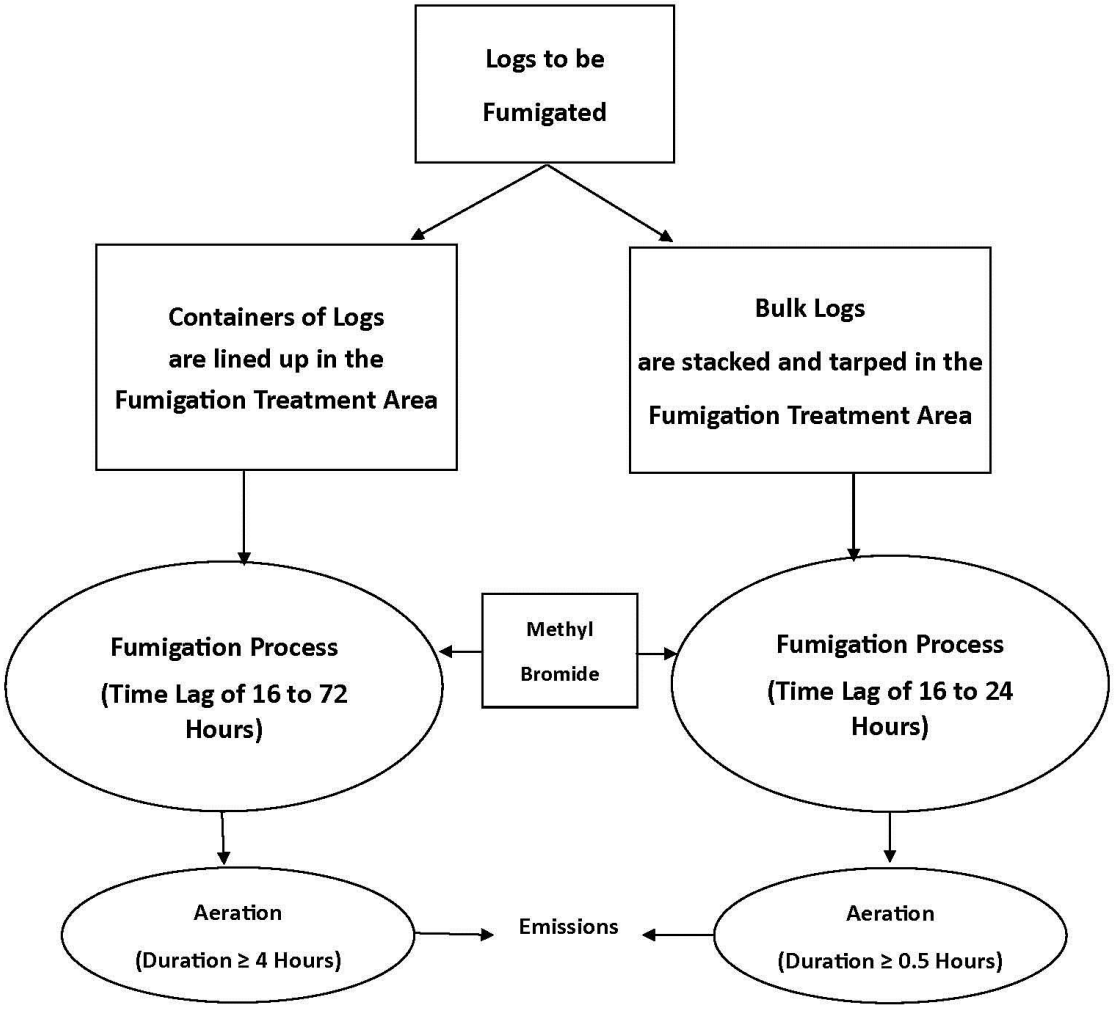
COMMENTS:	SOURCES:	COMPANY NAME:	
Property is surrounded by fence and/or shoreline limiting public access.	**1**	**SCS Engineers**	
	RECEPTORS: **1691**	MODELER: **P. Stickney**	SCS ENGINEERS
		SCALE: 1:5,000 (0 — 0.1 km)	
		DATE: **5/4/2015**	PROJECT NO.: **02209044**

AERMOD View - Lakes Environmental Software
I:\02209044\AERMOD\60RYL07.isc

Attachment B

Process Flow Diagram

Process Flow Diagram
Royal Pest Solutions



Attachment C

Georgia EPD Forms

State of Georgia
Department of Natural Resources
Environmental Protection Division
Air Protection Branch

Stationary Source Permitting Program
4244 International Parkway, Suite 120
Atlanta, Georgia 30354
404/363-7000
Fax: 404/363-7100

SIP AIR PERMIT APPLICATION

EPD Use Only

Date Received: _____ Application No. _____

FORM 1.00: GENERAL INFORMATION

1. Facility Information

Facility Name: Royal Pest Solutions Fumigation Operation (for Schilli Distribution Services as lessee of Georgia Ports Authority)

AIRS No. (if known): 04-13- -

Facility Location: Street: 120 Crossgate Rd.

City: Port Wentworth Georgia Zip: 31407 County: Chatham

Is this facility a "small business" as defined in the instructions? Yes: ☐ No: ☒

2. Facility Coordinates

Latitude: 32° 8' 60" **NORTH** Longitude: 81° 9' 7" **WEST**

UTM Coordinates: 485666.20 **EAST** 3557071.38 **NORTH** **ZONE** 17S

3. Facility Owner

Name of Owner: Royal Pest Solutions

Owner Address Street: 53 McCullough Drive

City: New Castle State: DE Zip: 19720

4. Permitting Contact and Mailing Address

Contact Person: Anne Bookout Title: Vice President and Legal Counsel

Telephone No.: 302-613-5242 Ext. N/A Fax No.: _____

Email Address: Anne.Bookout@royalpest.com

Mailing Address: Same as: Facility Location: ☐ Owner Address: ☒ Other: ☐

If Other: Street Address: _____

City: _____ State: _____ Zip: _____

5. Authorized Official

Name: Roger Richardson, Jr. Title: Director of Fumigation, Royal Pest Solutions

Address of Official Street: 53 McCullough Drive

City: New Castle State: DE Zip: 19720

This application is submitted in accordance with the provisions of the Georgia Rules for Air Quality Control and, to the best of my knowledge, is complete and correct.

Signature:  Date: May 29, 2015

6. Reason for Application: (Check all that apply)

☒ New Facility (to be constructed)

☐ Existing Facility (initial or modification application)

☒ Permit to Construct

☒ Permit to Operate

☐ Change of Location

☐ Permit to Modify Existing Equipment: Affected Permit No.: _____

☐ Revision of Data Submitted in an Earlier Application

Application No.: _____

Date of Original Submittal: _____

7. Permitting Exemption Activities (for permitted facilities only):

Have any exempt modifications based on emission level per Georgia Rule 391-3-1-.03(6)(i)(3) been performed at the facility that have not been previously incorporated in a permit?

☒ **No** ☐ **Yes, please fill out the SIP Exemption Attachment** (See Instructions for the attachment download)

8. Has assistance been provided to you for any part of this application?

☐ **No** ☐ **Yes, SBAP** ☒ **Yes, a consultant has been employed or will be employed.**

If yes, please provide the following information:

Name of Consulting Company: SCS Engineers

Name of Contact: Jeff Marshall

Telephone No.: 703-471-6150 Fax No.: 703-471-6676

Email Address: jmarshall@scsengineers.com

Mailing Address: Street: 11260 Roger Bacon Drive

City: Reston State: VA Zip: 20190

Describe the Consultant's Involvement:

Environmental engineering,computer modeling, Toxic Impact Analysis, and Case-by-Case MACT Assessment.

9. Submitted Application Forms: Select only the necessary forms for the facility application that will be submitted.

No. of Forms	Form
1	2.00 Emission Unit List
	2.01 Boilers and Fuel Burning Equipment
	2.02 Storage Tank Physical Data
	2.03 Printing Operations
	2.04 Surface Coating Operations
	2.05 Waste Incinerators (solid/liquid waste destruction)
1	2.06 Manufacturing and Operational Data
	3.00 Air Pollution Control Devices (APCD)
	3.01 Scrubbers
	3.02 Baghouses & Other Filter Collectors
	3.03 Electrostatic Precipitators
1	4.00 Emissions Data
	5.00 Monitoring Information
	6.00 Fugitive Emission Sources
1	7.00 Air Modeling Information

10. Construction or Modification Date

Estimated Start Date: ASAP (only 2-3 weeks necessary for startup)

11. If confidential information is being submitted in this application, were the guidelines followed in the "Procedures for Requesting that Submitted Information be treated as Confidential"?

☒ No ☐ Yes

12. New Facility Emissions Summary

Criteria Pollutant	New Facility	
	Potential (tpy)	Actual (tpy)
Carbon monoxide (CO)	N/A	N/A
Nitrogen oxides (NOx)	N/A	N/A
Particulate Matter (PM) (filterable only)	N/A	N/A
PM <10 microns (PM10)	N/A	N/A
PM <2.5 microns (PM2.5)	N/A	N/A
Sulfur dioxide (SO_2)	N/A	N/A
Volatile Organic Compounds (VOC)	75	75
Greenhouse Gases (GHGs) (in CO2e)	N/A	N/A
Total Hazardous Air Pollutants (HAPs)	75	75
Individual HAPs Listed Below:		
Methyl bromide (74-83-9)	75	75

13. Existing Facility Emissions Summary

Criteria Pollutant	Current Facility		After Modification	
	Potential (tpy)	Actual (tpy)	Potential (tpy)	Actual (tpy)
Carbon monoxide (CO)	N/A	N/A	N/A	N/A
Nitrogen oxides (NOx)	N/A	N/A	N/A	N/A
Particulate Matter (PM) (filterable only)	N/A	N/A	N/A	N/A
PM <10 microns (PM10)	N/A	N/A	N/A	N/A
PM <2.5 microns (PM2.5)	N/A	N/A	N/A	N/A
Sulfur dioxide (SO_2)	N/A	N/A	N/A	N/A
Volatile Organic Compounds (VOC)	N/A	N/A	N/A	N/A
Greenhouse Gases (GHGs) (in CO2e)	N/A	N/A	N/A	N/A
Total Hazardous Air Pollutants (HAPs)	N/A	N/A	N/A	N/A
Individual HAPs Listed Below:				

14. 4-Digit Facility Identification Code:

SIC Code:	7342	SIC Description:	Disinfecting and pest contol services
NAICS Code:	561710	NAICS Description:	Exterminating and pest control services

15. Description of general production process and operation for which a permit is being requested. If necessary, attach additional sheets to give an adequate description. Include layout drawings, as necessary, to describe each process. References should be made to source codes used in the application.

An air permit is sought for the construction and operation of a log fumigation operations process. Logs destined for other countries (primarily China) are delivered to the site in bulk or in dry shipping containers. Depending upon the requirements of the destination country, the logs may need to be fumigated with methyl bromide

Logs generally are fumigated in one of two arrangements: (1) in stacks upon the ground, covered by heavy plastic "tarps;" or (2) inside their shipping containers (still on chassis) such that the container itself becomes the fumigation enclosure. Royal will employ ductwork from the tarped stack or from the containers that, with the help of exhaust fans, will move the exhaust to a duct that functions as an aeration stack with emissions at a height of approximately 60 feet. The aeration stack (to be constructed) may be fixed or portable, and will be located near the central portion of the property to provide the sufficient distance from fence lines.

The fumigation operations will be designed and implemented in accordance with the requirements of multiple regulatory agencies and programs, including the USEPA pesticide label, under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA); the U.S. Department of Agriculture's Animal and Plant Health Inspection Service, Plant Protection and Quarantine Treatment Manual, which includes detailed APHIS Treatment Schedules, equipment and procedure requirements, and direction, oversight, and documentation of fumigation activities by APHIS inspectors; and the requirements of Certified Pesticide Applicator licensing program, as administered by the Georgia Department of Agriculture, Pesticide Division.

16. Additional information provided in attachments as listed below:

Attachment A - Map of the property showing the location of fumigation operations
Attachment B - Flow diagram
Attachment C - Applicable Georgia EPD Forms
Attachment D - Dispersion Modeling and Toxic Impact Assessment
Attachment E - Case-by-Case MACT Evaluation
Attachment F -

17. Additional Information: Unless previously submitted, include the following two items:

☒ Plot plan/map of facility location or date of previous submittal: See item 16, above.

☐ Flow Diagram or date of previous submittal: See item 16, above.

18. Other Environmental Permitting Needs:

Will this facility/modification trigger the need for environmental permits/approvals (other than air) such as Hazardous Waste Generation, Solid Waste Handling, Water withdrawal, water discharge, SWPPP, mining, landfill, etc.?

☒ **No** ☐ **Yes, please list below:**

Facility Name: Royal Pest Solutions (Schilli Distribution Services) **Date of Application:** May 2015

FORM 2.00 – EMISSION UNIT LIST

Emission Unit ID	Name	Manufacturer and Model Number	Description
EU1	Aeration stack	TBD	60' portable or fixed vertical stack through which emissions are vented

Facility Name: Royal Pest Solutions (Schilli Distribution Services) **Date of Application:** May 2015

FORM 2.06 – MANUFACTURING AND OPERATIONAL DATA

Normal Operating Schedule: will vary hours/day will vary days/week will vary weeks/yr

Additional Data Attached? ☐ - No ☒ - Yes, please include the attachment in list on Form 1.00, Item 16.

Seasonal and/or Peak Operating Periods:

Dates of Annually Occurring Shutdowns: N/A

PRODUCTION INPUT FACTORS

Emission Unit ID	Emission Unit Name	Const. Date	Input Raw Material(s)	Annual Input	Hourly Process Input Rate		
					Design	Normal	Maximum
EU1	Aeration Stack	TBD	Methyl bromide	75 TPY	120 lb/hr	17.12 lb/hr	120 lb/hr

PRODUCTS OF MANUFACTURING

Emission Unit ID	Description of Product	Production Schedule		Hourly Production Rate (Give units: e.g. lb/hr, ton/hr)			
		Tons/yr	Hr/yr	Design	Normal	Maximum	Units
EU1	Fumigated logs for export	varies	varies	varies	varies	varies	varies

Facility Name: Royal Pest Solutions Schilli Distribution Services) **Date of Application:** May 2015

FORM 4.00 – EMISSION INFORMATION

Emission Unit ID	Air Pollution Control Device ID	Stack ID	Pollutant Emitted	Emission Rates				
				Hourly Actual Emissions (lb/hr)	Hourly Potential Emissions (lb/hr)	Actual Annual Emission (tpy)	Potential Annual Emission (tpy)	Method of Determination
EU1	N/A	ST1	Methyl bromide	120	120	75	75	mass-balance (conservatively assumes 100% of methyl bromide applied for fumigation will be emitted

Facility Name: Royal Pest Solutions (Schilli Distribution Services) **Date of Application:** May 2015

FORM 5.00 MONITORING INFORMATION

Emission Unit ID/ APCD ID	Emission Unit/APCD Name	Monitored Parameter		Monitoring Frequency
		Parameter	Units	
EU1	Aeration Stack	N/A*	N/A*	N/A*

Comments:

* - Note that site must follow applicable USEPA FIFRA and US Department of Agriculture APHIS protocol requirements for the fumigation treatment; these requirements include methyl bromide monitoring to demonstrate compliance with worker protection (e.g., OSHA) standards. Further information regarding these national standards is included in the application under the MACT analysis section.

Facility Name: Royal Pest Solutions (Schilli Distribution Services) **Date of Application:** _____

FORM 7.00 – AIR MODELING INFORMATION: Stack Data

Stack ID	Emission Unit ID(s)	Stack Information			Dimensions of largest Structure Near Stack		Exit Gas Conditions at Maximum Emission Rate			
		Height Above Grade (ft)	Inside Diameter (ft)	Exhaust Direction	Height (ft)	Longest Side (ft)	Velocity (ft/sec)	Temperature (°F)	Flow Rate (acfm)	
									Average	Maximum
ST1	EU1	60	0.75	Vertical		~220	566	Ambient	15,000	15,000

NOTE: If emissions are not vented through a stack, describe point of discharge below and, if necessary, include an attachment. List the attachment in Form 1.00 *General Information*, Item 16.

Facility Name: Royal Pest Solutions (Schilli Distribution Services) **Date of Application:** ____________

FORM 7.00 AIR MODELING INFORMATION: Chemicals Data

Chemical	Potential Emission Rate (lb/hr)	Toxicity	Reference	MSDS Attached
Methyl Bromide	120 (short-term) 17.12(average annual)	AAC: 8000mg/m3 (15-min averaging period 5 µg/m3 (annual averaging period)	Georgia APB	☐
				☐
				☐
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Attachment D

Dispersion Modeling and Toxic Impact Assessment

Environmental Consultants
and Contractors

2830 Dairy Drive
Madison, WI 53718-6751

608 224-2830
FAX 608 224-2839
www.scsengineers.com

SCS ENGINEERS

May 6, 2015
File No. 02209044

MEMORANDUM

TO: Project File

FROM: Patti Stickney – SCS Upper Midwest
Jeff Marshall, PE – SCS Reston

SUBJECT: Royal Pest Solutions - Fort Wentworth, Georgia
Dispersion Modeling and Toxic Impact Assessment

Royal Pest Solutions (Royal) is preparing an air permit application for proposed methyl bromide fumigation activities at the Schilli Distribution Services facility in Port Wentworth, Georgia. As recommended by the Georgia Department of Natural Resources, Environmental Protection Division (EPD), Air Protection Branch, a Toxic Impact Assessment (TIA) has been performed using air dispersion modeling to demonstrate that the concentration of methyl bromide emitted from the facility will not present an unacceptable risk to the community. **Results of the TIA demonstrate that proposed emissions of methyl bromide will result in short term and annual Maximum Ground Level Concentrations (MGLCs) below the Acceptable Ambient Concentrations (AACs) allowed by rule.** A description of how the dispersion modeling was performed follows.

SITE DESCRIPTION

Royal will provide commercial fumigation services at the Schilli Distribution Services facility in Port Wentworth, Georgia. The site is bordered by the Savannah River (East), Kraft Steam Electric Generating Plant (South), Georgia-Pacific Chemical (West), and Weyerhauser (North). **Figures 1 and 2** depict a satellite view and map view the site, respectively. In addition, please see the attached printout from EPA Envirofacts showing the neighboring facilities (**Figure 3**). The Schilli Distribution Services facility is surrounded by a fence on all sides except for where the property borders the Savannah River.

SOURCE DESCRIPTION

Fumigation of logs is proposed to take place in the south-central portion of the property. Fumigation events will be sized and staged to limit the hourly methyl bromide emissions to no more than 120 pounds (lb/hr). All emissions are assumed to occur during the first hour of aeration. It is assumed that all of the fumigant applied will be emitted.

Short-term emission rate = 120 lb/hr

However, fumigation does not occur continuously over every hour of the day. The maximum annual application rate proposed in the permit application is 75 tons per year (tpy). The hourly emission rate to be used when predicting annual average ambient air concentrations has been annualized.

Annualized emission rate = 75 tpy * 2,000 lbs/ton / 365 days/year / 24 hours/day
= 17.12 lbs/hr

Royal proposes to erect an exhaust stack at a location near the center of the property, as indicated by the symbol "S01" on the site plans. The stack will have the following dispersion parameters.

Source Parameter	Value
Source Type	Point Source
Exhaust Direction	Up, Unobstructed
Number of Stacks	1
Stack Location (UTM Coordinates)	485705 Easting (m) 3557070 Northing (m)
Stack Height	60 feet
Stack Diameter	0.75 feet
Exhaust Flow Rate	15,000 cubic feet per minute
Stack Exit Velocity	566 feet per second
Exhaust Exit Temperature	Ambient

OVERVIEW OF MODELING APPROACH

The following Georgia EPD guidance documents were followed for this analysis:

- Guideline for Ambient Impact Assessment of Toxic Air Pollutants, Georgia Department of Natural Resources, Environmental Protection Division, Air Protection Branch, Revised June 21, 1998. Source: http://www.georgiaair.org/airpermit/downloads/otherforms/infodocs/toxguide.pdf

- Georgia Air Dispersion Modeling Guidance, developed by the Data & Modeling Unit of Georgia EPD, Last Updated April 23, 2012. Source: http://www.georgiaair.org/airpermit/downloads/sspp/modeling/airdispmodelguidance_april2012.pdf

The short-term and annual AACs for methyl bromide are provided by the following Georgia EPD spreadsheet:

- AAC Spreadsheet, Updated May 21, 2013. Source: http://www.georgiaair.org/airpermit/downloads/sspp/modeling/gaepd_aacs_052113.xls

In addition, Mr. Eric Cornwell, Manager, Stationary Source Permitting Program, Air Protection Branch, was also consulted on April 10, 2015, prior to performing dispersion modeling. Various aspects of modeling were discussed and included model choice, meteorological data, elevation data, receptor spacing, and presentation of results. Mr. Cornwell agreed with the approach presented herein.

The most recent version of AERMOD (currently Julian date 14134) was used in this analysis. AERMOD is a versatile model that can account for point, volume, or area sources, flat or complex terrain, rural or urban land use, building effects, and stable or instable atmospheric conditions. The user interface program AERMODView developed by Lakes Environmental was used to graphically display model input parameters (receptors, building, stacks, topography) and results (location of predicted concentrations). Regulatory default options, including the use of rural dispersion coefficients, were selected when executing the model.

Meteorological Data

Model-ready meteorological data for Savannah, Georgia (surface) and Charleston, South Carolina (upper air), that have been preprocessed using AERMET version 12345 were obtained from the Georgia EPD website. The data span the years 2007 through 2011.

Receptor Network

Public access to the property is restricted by a fence on all sides except for where the property borders the Savannah River. Receptors within the fence line were excluded from this analysis. Following the guidance provided by Georgia EPD, receptors along the fence line were placed at 100-meter (m) intervals. In order to demonstrate that the MGLC has not been exceeded beyond the fence line, a 100-meter spaced Cartesian grid, oriented in the four cardinal directions, was centered at the stack and extends 2 kilometers from the source. Receptor elevations were developed using Digital Elevation Model (DEM) terrain data files from the United States Geological Survey (USGS) that provide elevations in a 30-meter spacing array using the Universal Transverse Mercator (UTM) coordinate system. The DEM data were converted to a model-ready format using the AERMAP terrain processor (using Lakes Environmental's AERMODView modeling software). The receptor network is shown in **Figure 4**.

Building Influences

Building footprints and building heights were provided by Royal (see **Figures 1 and 2**). The Building Profile Input Program (BPIP) was used to obtain building downwash calculation results. The buildings present on the property were determined to have no influence on dispersion.

PRESENTATION OF MODELING RESULTS

Mr. Cornwell provided us with a copy of the "Summary of Ambient Impact Assessment of Toxic Air Pollutant Emissions" spreadsheet (TIA.xls) as a means to report the dispersion modeling results. Please refer to the completed spreadsheet provided as **Attachment 1**.

The reference concentration (RfC) and Short Term Exposure Limit (STEL) for methyl bromide were included in the table (see column B). A safety factor of 10 (see column C) was applied to the STEL to determine the short-term 15-minute average AAC of 8 milligrams per cubic meter (mg/m3) (see column D). The annual AAC refers directly to the RfC which is 0.005 mg/m3 (also column D).

There is a direct proportional relationship between predicted concentration and emission rate when a single stack is evaluated in AERMOD. AERMOD was directed to provide maximum 1-hour and annual average concentrations for each of the five years of meteorological data. A unit emission rate of 1 lb/hour was used in AERMOD to make the predicted results compatible with the Georgia EPD spreadsheet. The worst-case results from the five years of meteorological data were used to calculate the MGLC.

The spreadsheet converts the AERMOD predicted 1-hour concentration to a 15-minute MGLC by using the conversion factor of 1.32 (in column E) and the actual emission rate of 120 lb/hr (see column A). The annual MGLC (see column E) refers to the AERMOD annual average result and the annualized emission rate of 17.12 lb/hr (see column A).

A comparison of MGLC to the AAC is performed in column F of the spreadsheet. The 15-minute and annual impacts were both found to be below their respective AACs and flagged as "Acceptable".

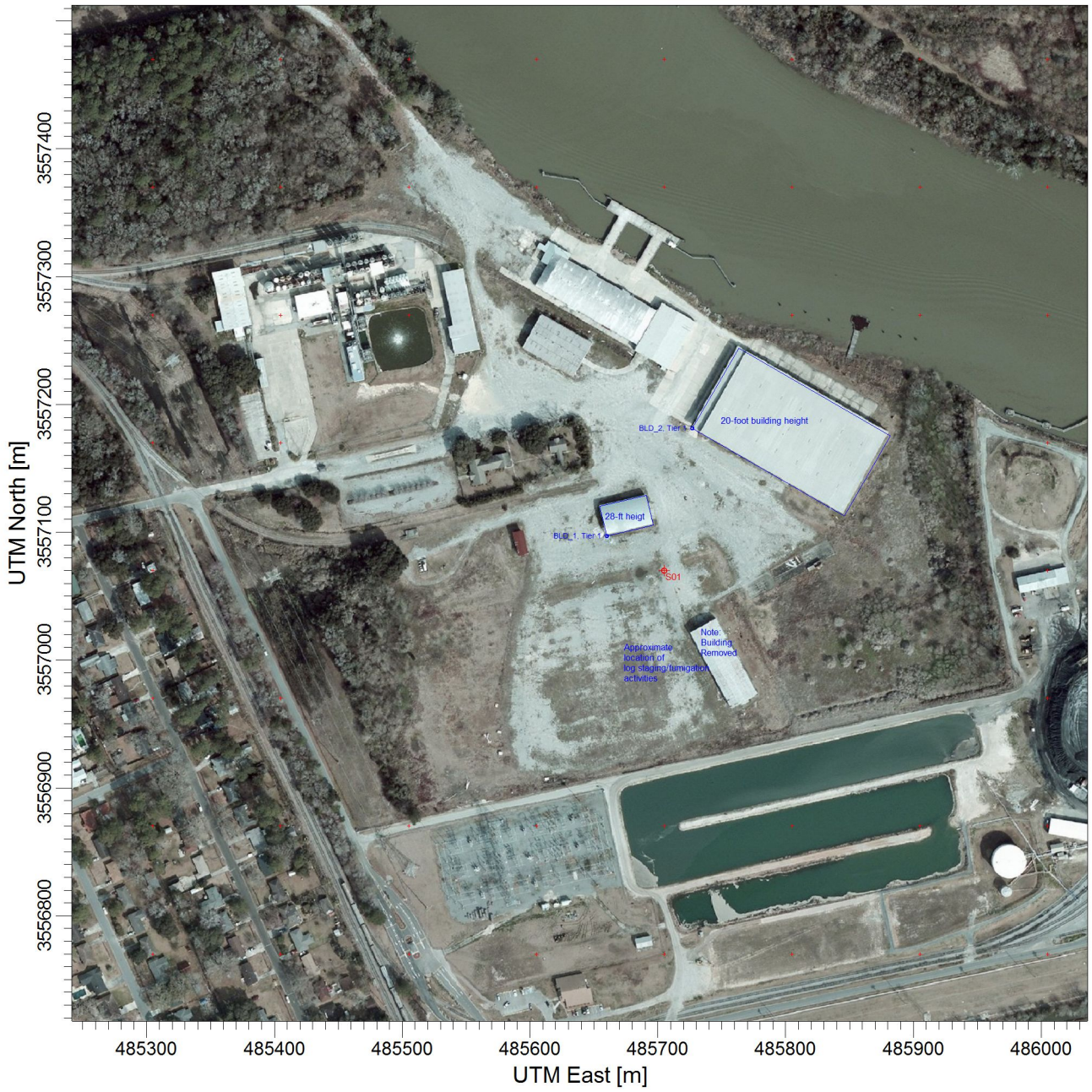
Figures: Figure 1 – Site Plan – Satellite View
Figure 2 – Site Plan – Map View
Figure 3 – EPA Envirofacts Area Printout
Figure 4 – Receptor Grid

Attachments: Summary of Ambient Impact Assessment for Toxic Air Pollutant Emissions
(Electronic AERMOD dispersion model files are available upon request.)

PS/Initials of Admin/MC

PROJECT TITLE:

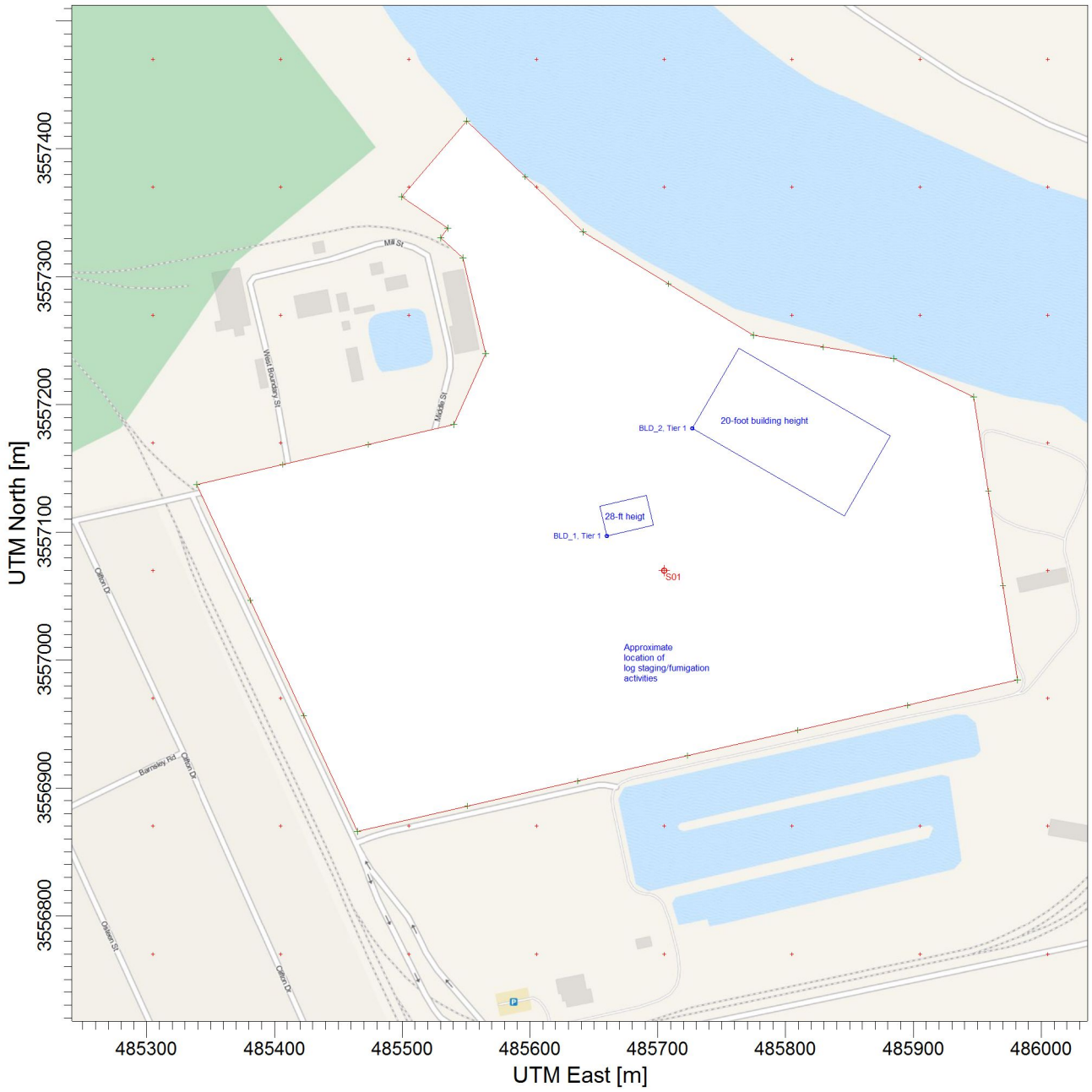
Royal Pest Solutions - Port Wentworth, Georgia
Satellite View



COMMENTS: Property is surrounded by fence and/or shoreline limiting public access.	SOURCES: **1**	COMPANY NAME: **SCS Engineers**	
	RECEPTORS: **1691**	MODELER: **P. Stickney**	SCS ENGINEERS
		SCALE: 1:5,000 0 0.1 km	
		DATE: **5/4/2015**	PROJECT NO.: **02209044**

PROJECT TITLE:

Royal Pest Solutions - Port Wentworth, Georgia
Site Plan

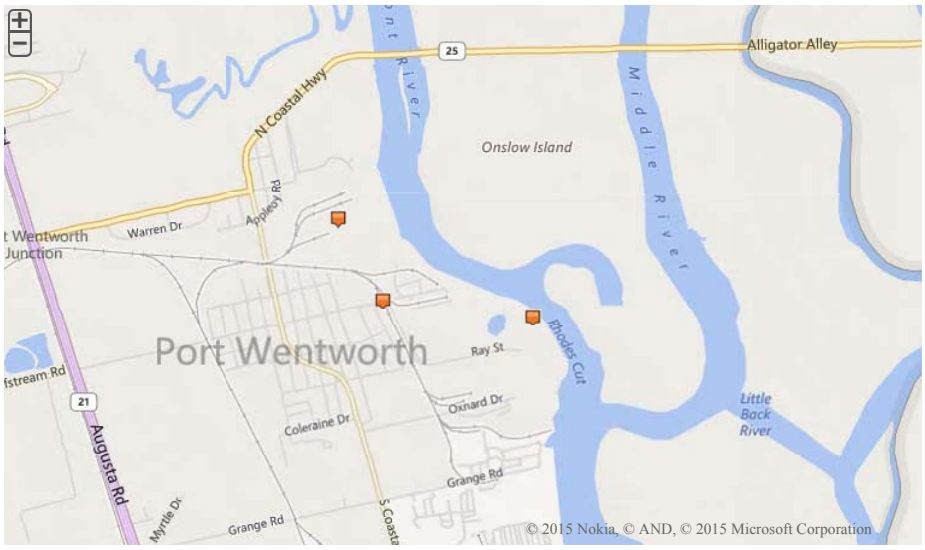


COMMENTS: Property is surrounded by fence and/or shoreline limiting public access.	SOURCES: **1**	COMPANY NAME: **SCS Engineers**	
	RECEPTORS: **1691**	MODELER: **P. Stickney**	SCS ENGINEERS
		SCALE: 1:5,000 0 0.1 km	
		DATE: **5/4/2015**	PROJECT NO.: **02209044**

Envirofacts

Search Results

Search Results for:
Map Recentered



Envirofacts Links

- EF Overview
- Search
- Model
- Data Update
- Multisystem Search User Guide
- Contact Us

Report an Error

The facility list below is based upon the facilities that are visible with the map above. To refine your search to a more targeted area of interest, please visit the Envirofacts Multisystem Search Form. To search Envirofacts via an interactive map, please view your results in EnviroMapper for Envirofacts

List of EPA-Regulated Facilities in Envirofacts

Copy | CSV | Excel | PDF | Print

Showing 1 to 3 of 3 entries Show 10 entries Search:

First Previous 1 Next Last

FACILITY INFORMATION	AFS	ACRES	BR	CERCLIS	GHG	PCS/ICIS	RADInfo	RCRAInfo	TRI	TSCA
GEORGIA -PACIFIC CHEMICALS LLC 130 CROSSGATE ROAD PORT WENTWORTH, GA 31407-1931 Latitude: 32.15044 Longitude: -81.1558 Summary Report Facility Report Compliance Report						View Report		View Report	View Report	
KRAFT STEAM ELECTRIC GENERATING PLANT 110 CROSSGATE ROAD PORT WENTWORTH, GA 31407 Latitude: 32.149444 Longitude: -81.145139 Summary Report Facility Report Compliance Report	View Report				View Report	View Report		View Report	View Report	View Report
WEYERHAEUSER PORT WENTWORTH 1 BONNY BRIDGE ROAD SAVANNAH, GA 31407-1312 Latitude: 32.155424 Longitude: -81.159028 Summary Report Facility Report Compliance Report	View Report	View Report			View Report	View Report		View Report	View Report	

FACILITY INFORMATION AFS ACRES BR CERCLIS GHG PCS/ICIS RADInfo RCRAInfo TRI TSCA

Showing 1 to 3 of 3 entries Show 10 entries Search:

First Previous 1 Next Last

Total Number of Facilities Displayed: 3

Return to more topical information

PROJECT TITLE:

Royal Pest Solutions - Port Wentworth, Georgia
Receptor Locations

COMMENTS: 100-meter spacing along property line and in a grid extending 2 kilometers from the emission point.	SOURCES: **1**	COMPANY NAME: **SCS Engineers**	
	RECEPTORS: **1691**	MODELER: **P. Stickney**	SCS ENGINEERS
		SCALE: 1:25,000 0 1 km	
		DATE: **5/4/2015**	PROJECT NO.: **02209044**

Attachment E

MACT Analysis

SCS ENGINEERS

Application for Case-by-Case MACT Determination For Methyl Bromide Emissions From Fumigation Operations by Royal Pest Solutions at Schilli Distribution Services Port Wentworth, Georgia

AIRS Number: Not Assigned

Presented to:

Royal Pest Solutions Inc.

RPS ROYAL Fumigation

Regional Service. Global Solutions.

53 McCullough Drive
New Castle, Delaware 19720
(302) 322-3600

Presented by:

SCS ENGINEERS
11260 Roger Bacon Drive
Reston, VA 20190
(703) 435-7254

May 28, 2015
File No. 02209044.00

Offices Nationwide
www.scsengineers.com

Application for Case-by-Case MACT Determination For Methyl Bromide Emissions From Fumigation Operations by Royal Pest Solutions at Schilli Distribution Services 120 Crossgate Road Port Wentworth, Georgia 31407

Presented To:

Royal Pest Solutions Inc.
53 McCullough Drive
New Castle, Delaware 19720

Presented By:

SCS ENGINEERS
11260 Roger Bacon Drive
Reston, VA 20190
(703) 435-7254

May 28, 2015
File No. 02209044.00

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List of Tables

Appendices

1 INTRODUCTION

BACKGROUND

Royal Pest Solutions Inc. (Royal) is submitting this application for a case-by-case maximum achievable control technology (MACT) determination pursuant to the U.S. Environmental Protection Agency's (USEPA's) case-by-case MACT regulations at 40 CFR §63.43, as adopted by Georgia Air Quality Rule 391-3-1-.02(9)(b)16.

Royal plans to initiate a new commercial fumigation facility at the Schilli Distribution Services facility in Port Wentworth, Georgia (Port Wentworth). The facility will provide quarantine and pre-shipment (QPS) fumigation services primarily for logs being exported through the facility. The fumigation facility will be designed and operated to comply with the applicable requirements of the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS), the regulatory body that oversees QPS treatments in the U.S.

The primary fumigant that will be used at the facility is methyl bromide (CH_3Br, also commonly known as bromomethane). Methyl bromide has been a principal QPS treatment tool of APHIS for over 40 years. In 1992, however, methyl bromide was deemed a depleter of stratospheric ozone under the terms of an international treaty, the Montreal Protocol on Substances That Deplete the Ozone Layer, and therefore subject to "phase-out" of its use. USEPA, in implementing the requirements of the Montreal Protocol, has greatly restricted use of methyl bromide. Its use for QPS applications such as those that will be performed at Royal's Port Wentworth facility, however, has been preserved until such time as there is a replacement for it, and consequently it is specifically authorized by the QPS exemption under Title VI (Stratospheric Ozone Protection) of the Clean Air Act (CAA).

Methyl bromide is a hazardous air pollutant (HAP) under CAA § 112. Proposed methyl bromide emissions from fumigation activities at Royal's Port Wentworth facility are expected to exceed 10 tons per year. Therefore, the facility will be classified as a major source of HAP emissions. Major sources of HAP emissions are subject to USEPA's MACT requirements under CAA § 112.

USEPA has not established a source category under CAA § 112(c) for fumigation facilities nor promulgated MACT standards for fumigation facilities pursuant to CAA § 112(d). Therefore, the Royal facility is subject to the requirement for a case-by-case MACT determination pursuant to CAA § 112(g).

This document provides the case-by-case MACT application for the Royal facility in support of Royal's application to the Georgia Department of Natural Resources, Environmental Protection Division (EPD) for a permit pursuant Rule 391-3-1-.03. This document, in conjunction with the SIP Permit Application Forms, other supporting documents, and air modeling report, has been prepared to provide the pertinent information required by USEPA's case-by-case MACT regulations at 40 CFR §63.43.

DEFINITIONS

The following regulatory definitions (Reference 40 CFR §63.41) are pertinent to this application:

> ***Maximum achievable control technology (MACT) emission limitation*** means the emission limitation which is not less stringent than the emission limitation achieved in practice by the best controlled similar source, and which reflects the maximum degree of reduction in emissions that the permitting authority, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable by the constructed or reconstructed major source.
>
> ***Similar source*** means a stationary source or process that has comparable emissions and is structurally similar in design and capacity to a constructed or reconstructed major source such that the source could be controlled using the same control technology.
>
> ***Control technology*** means measures, processes, methods, systems, or techniques to limit the emission of hazardous air pollutants through process changes, substitution of materials or other modifications that:
>
> (1) Reduce the quantity of, or eliminate emissions of, such pollutants through process changes, substitution of materials or other modifications;
>
> (2) Enclose systems or processes to eliminate emissions;
>
> (3) Collect, capture, or treat such pollutants when released from a process, stack, storage or fugitive emissions point;
>
> (4) Are design, equipment, work practice, or operational standards (including requirements for operator training or certification) as provided in 42 U.S.C. 7412(h); or
>
> (5) Are a combination of paragraphs (1) through (4) of this definition.

2 APPLICATION INFORMATION

FACILITY NAME AND ADDRESS

Facility Name: Royal Pest Solutions Fumigation Operation at Schilli Distribution Services

Facility Address: 120 Crossgate Road, Port Wentworth, GA 31407

Property Owner: Georgia Ports Authority

AIRS Number: Not Yet Assigned

Primary Point-of-Contact for Air Permitting:

Name: Anne Bookout
Title: Vice President and General Counsel
Address: Royal Pest Solutions Inc., 53 McCullough Drive, New Castle, DE 19720
Phone: (302) 322-3600
e-mail: Anne.Bookout@royalpest.com

A site location map and an aerial photograph of the facility are provided in Appendix A.

FACILITY DESCRIPTION

The proposed fumigation operations will be performed by Royal within a designated area of the Schilli Distribution Services property, as shown on the facility diagram in Appendix A.

The principal business of the facility will be the fumigation of logs destined for export to other countries – primarily softwoods destined for China. This fumigation is conducted under the direct, on-site supervision of officers of USDA APHIS. The APHIS officers oversee fumigation of cargo entering the U.S. on which invasive pests, not native to the U.S., are found or are deemed to be present due to past inspections. The cargo is quarantined until it receives treatment in accordance with USDA requirements. APHIS officers also oversee pre-shipment fumigation treatments for quarantine pests that are required by other countries (e.g., China) to which U.S. goods are to be shipped. Through international treaties, plant protection authorities such as APHIS in each country certify treatments performed before shipment to the destination countries. China, for example, requires that logs being imported from the US be accompanied by an APHIS Phytosanitary Certificate verifying fumigation with methyl bromide in accordance with applicable protocols.

QPS fumigations can take place only at sites approved by APHIS. The area designated for fumigation activities at the Port Wentworth facility is subject to APHIS approval and will be operated under a Compliance Agreement with APHIS.

Quarantine applications, with respect to methyl bromide, are defined by USEPA as treatments to prevent the introduction, establishment and/or spread of quarantine pests (including diseases), or to ensure their official control, where:

i. Official control is that performed by, or authorized by, a national plant, animal or environmental protection or health authority; and

ii. The quarantine pests are pests of potential importance to the areas endangered thereby and not yet present there, or present but not widely distributed and being officially controlled.

Pre-shipment applications are defined by USEPA as those non-quarantine applications applied within 21 days prior to export to meet the official requirements of the importing country or existing official requirements of the exporting country. Official requirements are those that are performed by, or authorized by, a national plant, animal, environmental, health or stored product authority.

APHIS has developed a series of detailed fumigation protocols for commodities through its Plant Protection and Quarantine (PPQ) division. The protocols and treatment schedules are published in the PPQ Treatment Manual, a document of over 900 pages. Further, all QPS fumigation conducted by Royal at the Port Wentworth is performed under the direct, on-site supervision of an APHIS officer. In addition, all fumigation at the site is performed in accordance with USEPA's Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) pesticide label requirements as well as the PPQ Treatment Manual, and applicable international phytosanitary standards.

The treatment protocols published in the Treatment Manual are highly prescriptive and dictate detailed requirements for many aspects of the fumigation process, including but not limited to the following:

- Fumigation chemical (e.g., methyl bromide);
- Dosage - pounds of fumigant per 1,000 cubic feet of fumigated space;
- Maintenance of dosage by monitoring fumigant concentrations at multiple locations within the treatment enclosure throughout the treatment period and periodic addition of fumigant as necessary to maintain the required concentration;
- Treatment duration;
- Forced recirculation within the fumigation enclosure to maintain the correct mixture of the fumigant in air throughout the prescribed treatment period;
- Monitoring the temperature of the environment and the commodity at multiple locations within the treatment enclosure throughout the treatment period;
- Weatherization of the treatment enclosure;
- Availability of utilities;
- Arrangement of commodities within the treatment enclosure;
- Aeration of the commodity and treatment enclosure at the conclusion of the treatment period; and
- Safety requirements for release of the commodity and reentry of facility personnel into the area at the end of the treatment.

An overview of the methyl bromide fumigation process for timber is provided below. More detailed descriptions are provided in excerpts from the USDA Treatment Manual (Appendix E to this document).

In summary, the fumigation activities are designed and implemented to comply with the following APHIS Treatment Manual requirements:

- Section 2-4: Methyl Bromide Tarpaulin Fumigation
- Section 2-9: Methyl Bromide Closed-door Container Fumigation

Excerpts from the APHIS Treatment Manual are included as an Attachment to the Case-by-Case MACT Analysis Report. In addition to the requirements specified by the APHIS Treatment Manual, the required methyl bromide dose for softwoods destined for China is specified by the China Protocol. Following fumigation at the Port Wentworth facility, logs are loaded onto ships for export. The fumigation procedures are summarized below.

The containers of logs are tightly aligned in groups, typically of seven to nine (7 to 9) containers. Fumigant injection lines, monitoring lines and circulation fans (to mix the fumigant with the air) are then placed inside the containers.

Following an inspection and approval by an APHIS officer, the container doors are closed, and vents and other potential leakage sites are sealed. The volume inside each container is calculated, and the amount of fumigant appropriate for that volume (and the ambient temperature) is calculated per the Treatment Manual, the type of wood, the target pest, ambient temperature and other atmospheric conditions. The fumigant is then injected into the containers through the lines previously installed.

When the APHIS inspector is satisfied with the preparations, fumigant is injected into the containers, which now function as fumigation enclosures. Methyl bromide from pressurized cylinders (typically 100-pound or 200-pound cylinders) is piped through a "volatilizer," a heat-exchange unit that heats the gas to approximately 140 degrees F. The warmed gas is delivered through reinforced hoses that discharge into the containers. Because methyl bromide converts from a liquid to a gas at 38.5 degrees F, the volatilizer is used to eliminate the possibility of any liquid methyl bromide being present during the fumigation.

Southern yellow pine logs, the principal wood commodity fumigated at the Port Wentworth facility, are exposed to the fumigant for sixteen to twenty-four (16-24) hours, during which time gas concentration levels within the fumigation enclosure are monitored by APHIS officers on a schedule to ensure that an adequate gas concentration over time is maintained to eliminate the target pest. The fumigant concentration readings are taken with an APHIS-approved device, typically either a Fumiscope® manufactured by Key Chemical or a MB-ContainIR® manufactured by Spectros Instruments. In addition to the gas readings, the fumigators periodically check to see that there are no gas leaks from the fumigation enclosures. During this time a buffer zone is maintained around the perimeter of the treated commodity.

Bulk log fumigations are performed in a similar manner, except the logs are placed in piles on an impermeable surface (e.g., asphalt) prior to being covered with the tarpaulin.

At the end of the exposure period, the cargo is aerated using portable ductwork and one or more portable, powerful blowers that discharge emissions through a 60-ft stack. Aeration will be performed in accordance with the USDA APHIS Treatment Manual (Section 2), which provides requirements regarding aeration flow rates. For example, aerating nonsorptive, non-containerized cargo (indoors and outdoors) requires a minimum 3,500 cfm fan capacity, and requires that the fans provide a minimum of 4 to 15 air exchanges per hour. Aeration using the closed-door container approach requires a minimum 5,200 cfm exhaust fan capacity

The aeration discharge stack will be placed near the center of the property, as shown on the attached figure. The container doors are then opened, portable ductwork and "j-blowers" are used to conduct the fumigant to the aeration stack, and exhaust fans supply fresh air to remove and dilute any remaining fumigant. The ventilation period lasts a minimum of four hours, and the area is not cleared for re-entry by personnel until the concentration of fumigant in the air is less than 5 parts per million, the level dictated by the USEPA-approved product label.

The APHIS-approved devices for "clearing," or permitting access to the area by persons not wearing personal protective equipment, are colorimetric detector tubes such as those manufactured by Draeger. At any time the 5 ppm level is reached or exceeded, fumigators wear self-contained breathing apparatus with full face masks and other personal protective equipment such as long-sleeved shirts and pants.

Once aeration is completed the bulk cargo is loaded into containers, containers that already contain logs are sealed, and all containers are transported to the port for loading onto ships. Each fumigation is documented in detail by Royal, and the APHIS inspector files a USDA Form 429 as the government's record of the fumigation. Thus, two independent, detailed records exist of every fumigation.

FACILITY INDUSTRIAL CODES

The applicable North American Industry Classification System (NAICS) code for Royal's fumigation activities at the Port Wentworth facility is 561710 – Exterminating and Pest Control Services. The following description of NAICS 561710 is provided by the US Census Bureau (http://www.census.gov/eos/www/naics/): "This industry comprises establishments primarily engaged in exterminating and controlling birds, mosquitoes, rodents, termites, and other insects and pests (except for crop production and forestry production). Establishments providing fumigation services are included in this industry."

The facility's Standard Industrial Classification (SIC) code is 7342 – Disinfecting and Pest Control Services.

IDENTIFICATION OF ANY LISTED SOURCE CATEGORY OR MACT STANDARDS

USEPA has not listed fumigation operations in any source category pursuant to CAA § 112(c) nor has USEPA promulgated any MACT standards for fumigation sources pursuant to CAA § 112(d). No case-by-case MACT determination pursuant to CAA § 112(g) has been made for any facility conducting large-scale QPS fumigation using methyl bromide.

IDENTIFICATION OF HAZARDOUS AIR POLLUTANT EMISSIONS

The facility performs QPS fumigation using methyl bromide (aka bromomethane, CAS 74839), which is a hazardous air pollutant. The key chemical and physical properties of methyl bromide are summarized as follows:

Synonyms	Bromomethane; monobromomethane; methyl fume
Trade Names	Embafume®; Terabol®; Brom-O-Gas; Brom-O-Sol; Terr-O-Gas; Meth-O-Gas; Celfume; Kyafume; Methyl-Fume; Brozone; Namfume; etc.
Chemical Formula	CH_3Br
CAS Number	74-83-9
Physical Description	Colorless gas with a chloroform-like odor at high concentrations; odorless at lower concentrations
Molecular Weight	94.95
Boiling Point	38.5ºF
Specific Gravity	1.73 (liquid at 32ºF)
Freezing Point	-137ºF
Vapor Phase Conversion Factor	1 ppm = 3.89 mg/m^3
Vapor Pressure	1,420 mm Hg at 20ºC (68ºF)
Ionization Potential	10.54 eV
Use	Broad spectrum pesticide used as an acaricide, fungicide, herbicide, insecticide, nematicide, and rodenticide; primarily used as a soil fumigant with secondary uses for perishable commodities and treatment of closed structures
Carcinogenicity	NPTN: No IARC: No OSHA: No ACGIH: No

References: NIOSH, 2004; ATSDR, 1992; Meister 1995; NPTN, 2000; Great Lakes Chemical Corp., 2006.

According to the Material Safety Data Sheet for methyl bromide (Great Lakes Chemical Corp., 2006), the product contains approximately 0.2 percent methyl chloride (aka, chloromethane, CAS 74-87-3) and approximately 0.2 percent dimethyl ether (CAS 115-10-6). Methyl chloride is classified as a HAP, while dimethyl ether is not classified as a HAP.

Royal has explored the possibility of performing some log fumigations using sulfuryl fluoride (brand names Vikane and ProFume), a fumigant that is not classified as a HAP, as a replacement for some of its methyl bromide use. Certain countries have accepted logs treated in other parts of the world with sulfuryl fluoride, but not from the U.S. Two requirements would have to be met before sulfuryl fluoride could be used.

First, foreign governments would have to approve sulfuryl fluoride treatment in lieu of methyl bromide for log fumigations. Second, the product labels would have to be amended to include this specific use of sulfuryl fluoride.

The principal U.S. manufacturer of sulfuryl fluoride, Dow AgroSciences, has begun this second step. Dow has obtained a Section 24(c) Special Local Needs Registration, a state label that functions as an amendment to the EPA-approved label, in several states but not yet in Georgia. The 24(c) label recognizes specialized local needs for product uses and permits them without the expense and delay of applying to EPA for a full label amendment. Dow has expressed the opinion that 24(c) labels can often be obtained in a matter of months.[1]

If sulfuryl fluoride were to be used in lieu of methyl bromide, it would be in softwood log fumigations initially, and only where the logs were en route to a country that would accept the treatment. Royal understands that further negotiation at the international and national levels would be necessary before sulfuryl fluoride could be accepted for all log fumigations, or by more countries. Royal is unable to determine whether and how much of its methyl bromide use could be replaced with sulfuryl fluoride in these circumstances due to the vagaries of international commerce, the progress in phytosanitary regulation changes, and the significant variation in the types of logs available or in demand for export at any given time.

IDENTIFICATION OF EMISSION POINTS

At the conclusion of fumigation events, portable ductwork will be placed beneath the tarps or within the shipping containers to extract the methyl bromide fumigant. One or more blowers will be used to pull a vacuum from the fumigation area, and transport the emissions to a tall stack. Methyl bromide emission rates, stack parameters, and the stack location have been selected based on the results of AERMOD modeling and an Ambient Impact Assessment. The stack location, as shown on the site map (see Appendix A) is approximately 143 meters from the nearest property line. The stack will be 60 feet tall, with a discharge diameter of 9 inches. Additional stack details (e.g., fixed vs. portable) will be determined upon approval of the permit to construct.

ESTIMATED EMISSION RATES, CAPACITY UTILIZATION RATES, MAXIMUM UNCONTROLLED EMISSION RATE, OPERATIONAL PARAMETERS, AND SUPPORTING CALCULATIONS

HAP emissions associated with many conventional HAP sources are limited by the capacity of key operating equipment such as a boiler or paint booth. However, the fumigation activities at Port Wentworth do not involve operating equipment that imposes such limitations. Therefore,

[1] In May 2015, it was announced that Dow plans to sell its sulfuryl fluoride business to Douglas Products.

methyl bromide emissions will be limited based upon compliance with short-term and annual ambient concentration limits.

As discussed above, AERMOD modeling and an Ambient Impact Assessment have been performed to calculate the short-term and annual methyl bromide emissions rates that will comply with applicable ambient air limits. Details are presented in the report accompanying the permit application. In summary, methyl bromide emissions will be limited as follows:

- Short-term methyl bromide emissions limit: 120 pounds per hour.
- Annual methyl bromide emissions limit: 75 tons per year. This equates to an emission rate of 17.12 pounds per hour, averaged over 8,760 hours.

The short-term emissions limit assumes that all of the methyl bromide applied for a fumigation event is emitted during the first hour of aeration (i.e., worst case air emissions), although aeration is generally performed for several hours.

The short-term and annual emissions limits assume zero absorption of methyl bromide in the wood.

The number and size (volume) of fumigation events will be monitored to comply with these short-term and annual limits.

Actual annual emissions will depend upon a variety of internal and external factors, including both US and international economic conditions that influence the log export business.

Methyl Chloride

As previously discussed, the MSDS for methyl bromide indicates that the product can contain about 0.2 percent methyl chloride, which is also regulated as a HAP. The resulting methyl chloride limits are calculated at:

- Short-term methyl bromide emissions limit: 0.24pounds per hour.
- Annual methyl bromide emissions limit: 0.15 tons per year. This equates to an emission rate of 0.034 pounds per hour, averaged over 8,760 hours.

FEDERAL, STATE AND LOCAL REQUIREMENTS AFFECTING EMISSIONS FROM THE FACILITY

Methyl bromide is a highly regulated pesticide. Appendix D presents a summary of regulations and advisories, as presented in the Toxicological Profile for Methyl Bromide (ATSDR, 1992). Additional methyl bromide regulatory programs and requirements are discussed below.

Clean Air Act

As discussed in the Introduction, since 1992 USEPA has implemented restrictions on many uses of methyl bromide in response to phase-out requirements established under the Montreal Protocol. These restrictions were implemented because methyl bromide is considered a stratospheric ozone depleting substance. However, the use of methyl bromide for QPS applications such as those performed at the Royal facility is specifically authorized by the QPS exemption under Title VI (Stratospheric Ozone Protection) of the Clean Air Act. The interim final regulation for the QPS exemption was issued by EPA on July 19, 2001, and the final regulation was published in the Federal Register on January 2, 2003.

There are three exemptions from the phase-out of methyl bromide found in the Montreal Protocol and also in the US implementation of the Protocol through Title VI of the Clean Air Act: (1) emergency use; (2) certain short-term "critical" uses where anticipated alternatives to methyl bromide have not yet become economically and technologically feasible; and (3) QPS. In contrast to the "critical" uses, for which application must be made each year, the QPS exemption is indefinite and will continue until there are alternatives for methyl bromide. Despite the passage of several decades and a myriad of research efforts, however, finding alternatives for QPS methyl bromide use has proven extremely difficult.

FIFRA

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires that before anyone can sell or distribute a pesticide in the United States, they must obtain a registration, or license, from EPA. "Pesticide registration is the process through which EPA examines the ingredients of a pesticide; the site or crop on which it is to be used; the amount, frequency and timing of its use; and storage and disposal practices. EPA evaluates the pesticide to ensure that it will not have unreasonable adverse effects on humans, the environment and non-target species. Pesticides must be registered or exempted by EPA's Office of Pesticide Programs before they may be sold or distributed in the U.S. Once registered, a pesticide may not legally be used unless the use is consistent with the approved directions for use on the pesticide's label or labeling." (Reference: http://www.epa.gov/opp00001/regulating/registering/ , April 11, 2013).

Methyl bromide was introduced as a pesticide in 1932 and was first registered in the US in 1961. Because of advances in science, public policy, and pesticide use practices, USEPA requires that pesticides first registered before November 1, 1984 must be re-registered to ensure that they meet today's mores stringent standards (Reference: RED Fact Sheet for Methyl Bromide. USEPA, Office of Pesticide Programs. July 10, 2008).

"Reregistration involves a thorough review of the scientific database underlying a pesticide's registration. The purpose of the Agency's review is to reassess the potential risks arising from the currently registered uses of the pesticide; to determine the need for additional data on health and environmental effects; and to determine whether or not the pesticide meets the "no unreasonable adverse effects" criteria of FIFRA." (Reference: Amended Reregistration Eligibility Decision for Methyl Bromide (soil and non-food structural uses), EPA 738-R-09-311, USEPA Office of Prevention, Pesticides and Toxic Substances, May 2009, page 12).

The reregistration process for methyl bromide was initiated in the late 1990s, and is nearing completion. The USEPA, Office of Pesticide Programs (OPP) is developing separate methyl bromide labels for each of QPS and soil fumigation to more clearly define permissible uses. The OPP is also developing new pesticide use requirements that may include lower maximum application rates, fumigation management plans, good agricultural practices to reduce emissions, lower permeability films (lower mass transfer coefficients) for soil fumigation, and buffers between the treated area and habited structures, schools, hospitals, and day care centers as well (UNEP 2009b). Any new label requirements that may apply to QPS treatments will of necessity need to be harmonized with USDA APHIS requirements.

The new buffer zone lookup tables will be a major component of the revised FIFRA label for methyl bromide. The buffer zones tables for commodity fumigations are being developed using air modeling and risk assessment processes designed to address the unique aspects of commodity fumigation using methyl bromide. The risk assessment process considers facility workers and bystanders (people who may be near the treatment area). The buffer zone tables will consider several variables, including the methyl bromide dose, total commodity volume, stack height, and air exchange rate (i.e., blower emission rate). The buffer zone will provide a distance between the application site and bystanders, allowing airborne residues to disperse before reaching the bystanders. This FIFRA buffer zone approach will reduce the chances that air concentrations where bystanders are located will cause acute adverse health effects.

Variables that will influence the buffer zones include the volume of commodity being fumigated, the methyl bromide dose (specified by the USDA treatment schedule), the stack height, stack discharge orientation (vertical or horizontal) and the air exchange rate (a function of the blower size and capacity).

USDA APHIS

The USDA has developed a series of detailed fumigation protocols for various QPS commodities. The treatment schedules are published in the 920-page USDA APHIS PPQ Treatment Manual. All quarantine fumigation conducted at the Royal facility will be performed under the direct supervision of APHIS officers and in accordance with the Treatment Manual. Royal also observes industry practice in using the APHIS Treatment Manual as a "default protocol" if it encounters situations that are not covered by any of the other protocols.

As noted in the "Facility Description," above, the APHIS Treatment Manual is highly prescriptive, dictating procedures in at least thirteen different categories and requiring the use of specific equipment and monitoring devices.

Within the broad range of APHIS protocols for methyl bromide fumigation, there are significant differences in methyl bromide dosages and durations. Table 1 summarizes key parameters for the fumigation of logs as well as a variety of other commodities that are also fumigated using methyl bromide. The majority of the fumigation performed at the Port Wentworth facility is anticipated to be performed in accordance with the MB dosage rates specified in the China Protocol.

The Treatment Manual is the product of decades of research, often performed by the USDA's Agricultural Research Service and/or in conjunction with universities, dedicated to finding the most effective means of controlling quarantine pests on specific commodities. For this reason, EPA approval of an alternative treatment to methyl bromide is but a first step in its implementation as a QPS treatment. APHIS, in turn, must assess whether a proposed alternative is at least as effective, if not more so, than methyl bromide in removing a specific quarantine pest on a specific commodity (UNEP 2009b). It must also consider whether the treatment will adversely affect the commodity or leave unacceptable residues, often a significant issue with food products.

The process of performing efficacy tests is lengthy. Research is often performed by the country where the pest originates since it presumably has a ready supply of the pest and no quarantine concerns of its own. That research must then be reviewed and approved by APHIS PPQ for each import commodity on which the quarantine pest might be found. Official treatment rates, then, are arrived at by assessing a series of combinations of three variables: country of origin, pest, and commodity (UNEP 2009b).

Georgia Department of Agriculture, Pesticide Division

Royal's fumigation operations at the Port Wentworth facility will be performed under the supervision of a Certified Pesticide Applicator license, as required under the Georgia Pesticide Use and Application Act. The pesticide applicator's licensing program is administered by the Georgia Department of Agriculture, Pesticide Division. Georgia's recertification process for the Certified Pesticide Applicator's license includes a requirement for continuing education units (e.g., refresher training).

Georgia Herbicide and Pesticide Air Permitting Exemption

The Georgia DNR, EPD Air Protection Branch has posted a list of trivial activities[2] that qualify for the following permitting exemption: "Unless otherwise required by the Director, permits shall not be required for the following source activities. Trivial activities may be presumptively omitted from reporting in part 70 permit applications." The list of trivial activities includes:

- Agricultural Operations: Herbicide and pesticide mixing and application activities for on-site use.

Other States' Regulations

Fumigation is an industry that historically has not been subject to air permitting regulations.[3] This is due in part to the Clean Air Act's focus on stationary sources of continuous air pollution such as utilities or chemical manufacturing plants. Several states, however, have considered and rejected the idea of requiring air permits for fumigation. Texas chose to leave regulation of fumigation in the hands of the state's structural pest control board. Under its air regulations,

[2] http://www.georgiaair.org/airpermit/html/sspp/tvmods/triviallist.htm, Accessed May 4, 2015.

[3] In fact, very few states have enacted fumigation-specific requirements for air permits: Arizona, California, Kentucky, Maine, Minnesota and Virginia.

Texas includes among its list of facilities and sources that are de minimis for air emissions (and thus that do not require an air permit) the following:

> Fumigation facility complying with all U.S. Environmental Protection Agency (EPA) Federal Insecticide, Fungicide, and Rodenticide Act requirements including but not limited to the labeling requirements for each specific fumigant used at the site. Any fumigant used at the facility must be registered by the EPA and the Texas Department of Agriculture, Texas Structural Pest Control Board, or Texas Department of State Health Services, as appropriate, prior to use.[4]

Louisiana provides a general exemption from permitting for the distribution or application of pesticides[5] and a specific provision that its toxic air pollutant program does not apply to the distribution or application of pesticides.[6]

A 2011 Virginia law exempts "qualified fumigation facilities" (QFFs) that perform commodity fumigation from the requirement to obtain an air permit to construct and operate under 9 VAC 5 Chapter 80, Article 6. The law defines the types of facilities that are exempted and requires the operators of such facilities to provide written notice to the Department of Environmental Quality (DEQ) prior to conducting fumigation activities. Hourly and annual fumigant emission limits apply, and the potential to emit cannot exceed Title V HAP thresholds. In addition, operators are required to post signage at the site, prior to the application of a fumigant, that is visible and legible from the public right-of-way. Signage is required to remain in place until completion of the aeration process and must be in accordance with the pesticide label.

EMISSION CONTROL TECHNOLOGY

Royal Port Wentworth Facility

No add-on emission capture device such as a scrubber or filter will be employed at the Port Wentworth facility to capture and control methyl bromide emissions during aeration. Rather, Royal will utilize a series of work practices and operating limits to minimize potential impacts from methyl bromide emissions. Details are provided under the heading The MACT Floor.

Royal does have a long history, however, of innovation geared toward control of emissions, safety and efficiency. Royal's innovations include the following:

- A manifold design, now used throughout the industry, for taking gas concentration readings from multiple test lines without having to connect and disconnect the lines. Switching among test lines is accomplished by opening and closing valves. Prior

[4] Texas Commission on Environmental Quality, Air Permits Division, De Minimis Facilities or Sources, Version—August 2009. http://www.tceq.state.tx.us/permitting/air/guidance/newsourcereview/list-of-de-minimis-facilities.html/at_download/file. Accessed May 4, 2015.

[5] LAC 33:III Chapter 5 Permit Procedures (Chapter 5 includes Section 551 for HAP Control at new sources), Section 501 B.1.b.

[6] LAC 33:III Chapter 51. Comprehensive Toxic Air Pollutant Emission Control Program, Subchapter A. Applicability, Definitions, and General Provisions, Section 5101 C.

practice resulted in escape of methyl bromide at each step and potential exposure of personnel to the gas.

- Gas introduction lines reinforced with stainless steel mesh to enable them to withstand the pressure of the heated gas.

- Volatilizers (heat-exchange units) for heating the methyl bromide that are fabricated as closed systems. Volatilizers may simply consist of copper tubing coiled down through a pot of boiling water; Royal fabricates closed, welded units to avoid splashes or spills of the hot water.

- Bundling of gas testing lines into color-coded groups to avoid the tangle of lines (and inaccurate readings) that can occur at large fumigations due to the number and length of the lines.

- Very large fumigation enclosures (in excess of 100,000 cu. ft.) that use methyl bromide more efficiently because the ratio of commodity to air space within the enclosure is larger.

- Lightweight framing made of PVC that enables a fumigation crew to quickly erect an enclosure of precise dimensions, making the calculation of the amount of gas needed more precise.

- A patented fumigation enclosure that hangs from the ceiling of the warehouse and lowers over the commodity to be fumigated, sealing itself to the floor and creating a very tight seal to preclude gas leaks.

- A gas evacuation system that operates without any opening of the tarped enclosure and more efficiently aerates commodities such as perishable produce, which cannot tolerate any overexposure to methyl bromide without damage. (Approval of this system is pending. It is not being used for log fumigations, where overexposure is not in issue.)

Some of Royal's innovations may yield only small savings in emissions, and others can have a profound effect in decreasing emissions. All demonstrate Royal's dedication to controlling emissions while promoting safety and efficiency.

At the completion of a methyl bromide fumigation cycle, aeration procedures are dictated by the particular schedule from the Treatment Manual that is being followed. The Treatment Manual favors exhausting any remaining fumigant as quickly as possible following fumigation, and aeration periods range from a few hours to 48 hours, and occasionally more. Not surprisingly, the methyl bromide concentrations in the emissions are generally greatest in the earliest portion of the aeration cycle and decrease with time. The EPA-approved product labels for methyl bromide simply require aeration until the fumigant concentration in the fumigation area is less than 5 ppm ($\approx$19.45 mg/m^3).

At Royal's facility the methyl bromide vapors will be aerated through a tall exhaust tower into the atmosphere. This results in faster and better dispersion, and the methyl bromide concentrations are quickly reduced before reaching the ambient air at the facility's fence line.

Similar Facilities

EPA's RBLC Database

EPA maintains a RACT/BACT/LAER Clearinghouse database, commonly known as RBLC (See http://cfpub.epa.gov/rblc/htm/bl02.cfm). As described by EPA, the RBLC database:

> …contains case-specific information on the 'Best Available' air pollution technologies that have been required to reduce the emission of air pollutants from stationary sources (e.g., power plants, steel mills, chemical plants, etc.). This information has been provided by State and local permitting agencies. The Clearinghouse also contains a regulation data base that summarizes EPA emission limits required in New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and Maximum Achievable Control Technology (MACT) standards.

The "pollutant name" field of the RBLC database was searched on April 23, 2015 to identify RACT/BACT/LAER facilities with permitted, regulated emissions of "methyl bromide." The database search found only one facility, the M&L Commodities facility in Stanislaus County, California, which was issued a permit to construct but does not have an operating permit. A copy of the RBLC "Comprehensive Report" is provided in Appendix B, and a copy of the Notice of Determination and the statement of findings of fact issued by the San Joaquin Valley Air Pollution Control District is provided in Appendix C.

As indicated by the Comprehensive Report, the M&L Commodities project received an authorization to construct a new greenfield facility by determination dated June 25, 2008. One phase of the project was to provide commodity methyl bromide fumigation services for fruits and vegetables. The emission control method was identified as "81% overall methyl bromide control using carbon adsorption with on-site re-activation using chemical scrubber." Under the terms of the Authority to Construct, a permit to operate would not issue until the facility was completed and inspected "to ensure that it is in compliance with all permit conditions."

The Standard Industrial Classification (SIC) code for M&L is identified as 0723 (Crop Preparation Services for Market, Except Cotton Ginning). The North American Industrial Classification System (NAICS) code for M&L is identified as 115114 (Postharvest Crop Activities (except Cotton Ginning)).

Subsequent research regarding the current status of the proposed M&L Commodities indicates the following:

- The proposed facility includes several warehouses, one of which is planned for use as a fumigation facility for fruits and vegetables. The warehouse has been constructed, but the proposed methyl bromide emission control system has not been

constructed. This indicates that the facility is not currently being used for methyl bromide fumigation.

- A Freedom of Information Act request was submitted to the San Joaquin Valley Air Pollution Control District (SJVAPCD) to obtain information regarding the current status of the proposed facility. Based on the documents provided by SJVAPCD, there is no indication that the methyl bromide control equipment has been installed, and a permit to operate has not been applied for or issued.

- April 27, 2015. Ms. Jordon Bottorss, SJVAPCD Area Inspector (209 557-6417 x 6417) confirmed that M&L has not constructed the fumigation chambers. Although they received a 2-year extension on the original ATC, it has now expired.

In summary, the M&L fumigation was not constructed and its Authorization to Construct has expired; 81% overall control of methyl bromide using carbon adsorption has not been achieved in practice at M&L Commodities or at any other large-scale QPS fumigation facility in the United States.

Virginia Log Fumigation Facilities

Permit applications and MACT analysis reports for two large-scale log fumigation facilities were submitted to the Virginia Department of Environmental Quality (VDEQ) in 2010. The facility operators include Royal and Western Fumigation, and the main commodities subject to fumigation are logs destined for export. Subsequent to the initial submittals, there have been several rounds of supplemental submittals and correspondence between the applicants and VDEQ. As of May 4, 2015, no final permitting decisions or MACT decisions have been issued for these facilities.

Air Pollution Control Equipment Vendors

The websites of several air pollution control equipment vendors present information regarding methyl bromide control systems. As summarized below, we have further investigated these vendors and learned that none of them has provided air pollution control systems for large-scale log QPS fumigation facilities similar to Royal's Port Wentworth facility.

TIGG/Chemtura

According to their website (http://www.tigg.com/industrial-fumigation.html and http://www.tigg.com/news.html) TIGG Corporation and Chemtura Corporation (formerly Great Lakes Corporation) have cooperatively developed a methyl bromide recapture system that is in use at a handful of fumigation facilities in the United States. The system processes air from fumigation chambers through activated carbon to capture approximately 80 percent of the methyl bromide. The spent carbon must then be transported offsite for disposal or thermal reactivation at a permitted facility.

The TIGG website provides photographs of skid-mounted systems with relatively small carbon vessels and blowers that are capable of handling emissions from individual containers. The website also discusses applications for fumigation of food and berries. We note that food

applications use lower concentrations and lower doses of methyl bromide than are required by the APHIS protocols for timber. Table 1 summarizes key parameters for the fumigation of logs, as wells as a variety of other commodities that are also fumigated using methyl bromide.

We contacted TIGG to request information about using its system to capture methyl bromide at wood or timber fumigation facilities. Based on telephone conversations with Mr. Anthony Mazzoni at TIGG (February 2, 2010, August 5, 2013, May 5, 2015), the technology has been installed only at small-scale food fumigation facilities. TIGG has not installed its methyl bromide capture systems at any large-scale log QPS fumigation facilities. In summary, the TIGG/Chemtura carbon capture system is not in use at other existing or similar sources, and does not have the capacity required for the log fumigation activities performed at the Port Wentworth facility.

Value Recovery, Inc.

The following discussion regarding Value Recovery's methyl bromide technology is based on information provided on its website (www.valuerecovery.net); papers presented at the annual Methyl Bromide Alternatives Outreach conferences; a PowerPoint presentation to the Virginia Department of Environmental Quality; our review of permitting documentation (obtained from the San Luis Obispo County Air Pollution Control District) associated with the Guadalupe Cooling Company facility in California; and a meeting held with representatives of Value Recovery on May 6, 2014;[7] documents provided by the Miami-Dade County Department of Regulatory and Economic Resources (RER), Division of Environmental Resources Management, regarding the South Florida Logistics Center, and permitting documentation provided by the Florida Department of Environmental Protection website (http://appprod.dep.state.fl.us/air/emission/apds/listpermits.asp).

Value Recovery, Inc. offers a two-stage system for recovering and destroying methyl bromide emissions from fumigation facilities. We understand that the Authority to Construct (ATC) permit for the M&L Commodities site in California (discussed above) is premised on the use of this system. However, as mentioned above the fumigation system at M&L has not been constructed, and the ATC has expired.

Information provided by the Value Recovery website indicates that the system employs vapor-phase carbon adsorption to capture methyl bromide vapors during the aeration phase. After aeration is complete, methyl bromide is driven off the carbon using warm air, which is then introduced into a scrubber that contains a sodium thiosulfate solution (Note: some of the Value Recovery literature indicates that the system uses sodium thiosulfate, while other documents indicate potassium thiosulfate). The methyl bromide reacts with the sodium thiosulfate to produce methyl thiosulfate and sodium bromide.

The Value Recovery website provides information regarding some laboratory and bench-scale treatability studies using this approach. We can find no information regarding full-scale

[7] Attendees included Peter Joyce and Don Lynch, Value Recovery; Jeff Marshall, SCS Engineers; Mike O'Connor, Kurt Reichert and Miriam Borja, Western Fumigation; and Gary Sheehan, Kilpatrick Townsend and Stockton, LLP.

commercial systems. The website provides drawings, but no photographs, of full-scale commercial systems, and no list of clients or facilities employing such systems is provided.

The first commercial application of Value Recovery's technology was installed at the Guadalupe Cooling Company (GCC) facility in Nipomo, California. The new emission control system is a one-of-a-kind system that will reportedly capture and treat methyl bromide emissions from a facility that fumigates broccoli for export to Taiwan.

A Public Information Request (PIR) was submitted to the San Luis Obispo County Air Pollution Control District (SLOCAPCD) on July 1, 2013. The PIR requested detailed documentation associated with the proposed methyl bromide system for the GCC facility. Much of the following information is based on documents provided by SLOCAPCD.

An Authority to Construct (ATC) was issued to GCC by the San Luis Obispo County Air Pollution Control District (SLOCAPCD) on August 24, 2010. According to the ATC, the methyl bromide fumigation and control system would consist of the following main components:

a. One (1) fumigation chamber, 52,354 cubic feet in volume
b. One (1) heating and injection system
c. One (1) carbon adsorption bed with 15" diameter exhaust stack, 30 ft. from ground level and one 5,350 cfm exhaust blower. (Note that the dimensions of the carbon adsorption bed, and the carbon capacity, are not specified.)
d. One (1) scrubber with two-inch diameter exhaust stack, 55 feet from ground level, and 250 cfm flow rate, and
e. Methyl bromide storage.

The ATC includes a seven-page Engineering Evaluation that provides the following details regarding methyl bromide consumption and emissions:

- Maximum projected use of methyl bromide per fumigation cycle: 209.4 pounds
- Fumigation cycles per day: 2
- Operating days per year: 312

Subsequent to the August 24, 2010 ATC a modification was requested regarding the volume of the fumigation chambers. The initial approach consisted of a single fumigation chamber having a volume of 52,354 cubic feet. The revised approach consists of three fumigation chambers – two chambers at 19,199 cubic feet, and one chamber at 10,097 cubic feet – resulting in a total fumigation chamber volume of 48,495 cubic feet.

Our understanding of the VR control system, as installed, is described below. In summary, the VR control system consists of a two-step process.

Step One – Methyl Bromide Capture using Activated Carbon: The USDA Treatment Protocol for broccoli (T101-n-2) specifies a two-hour fumigation period. Following completion of the two-hour fumigation cycle, the fumigation chamber is swept with ambient air that is pulled from the suction side of the aeration blower and routed through a carbon bed where the methyl

bromide is adsorbed onto the carbon. This aeration cycle is performed for two to four hours, at the following flowrates:

- Chamber 1: 1,920 cfm
- Chamber 2: 1,920 cfm
- Chamber 3: 1,010 cfm

Discharge from the carbon system exhausts to a 40-foot stack.

The concentration of methyl bromide in the gas stream pulled from the fumigation chamber and entering the carbon bed is monitored using an infrared analyzer. The methyl bromide concentration is used to verify that the chamber had been adequately aerated and meets USDA requirements, and to assess when carbon breakthrough may occur.

In addition, a fumigation technician (with self-contained breathing apparatus) checks the methyl bromide concentration inside the fumigation chamber, using a portable monitor, to confirm that it is below the 5 ppm limit.

Step Two – Carbon Desorption and Scrubbing: After the chamber aeration is complete, and before the carbon bed shows appreciable breakthrough of methyl bromide, the methyl bromide desorption and scrubbing cycle is initiated, as follows:

- Air is heated to 110°C and pulled downflow through the carbon bed by the desorption blower, which operates at 200 to 500 cfm. The heated air strips methyl bromide from the carbon.

- The hot air/methyl bromide stream exiting the carbon bed is cooled through a heat exchanger because some downstream components of the scrubbing system cannot tolerate the high temperature.

- The air/methyl bromide stream is fed to a scrubber. The scrubber consists of a 15,000 gallon vessel containing sparger disks, an elastomeric membrane, and a potassium thiosulfate solution. The potassium thiosulfate ($K_2S_2O_3$) reportedly reacts with most of the methyl bromide (CH_3Br), resulting in potassium methylthiosulfate ($KS_2O_3CH_3$) and potassium bromide (KBr). Methyl bromide capture and destruction efficiency is reported at 90 to 95 percent. (Note: Value Recovery uses the term "scrubber" to describe this vessel. The vessel is not a conventional wet scrubber, as is commonly employed to capture acid gases and particulates. We believe that a more accurate description of the vessel would be "reaction vessel".)

- The scrubber includes a 4-inch diameter, 55 ft. tall exhaust stack.

- Make-up water is periodically supplied to the scrubber tank due to water evaporation, which is estimated at 25 to 50 gallons per run.

- The scrubber solution is considered spent after 90 percent of the potassium thiosulfate is consumed. The scrubber solution is disposed as non-hazardous (per California hazardous waste regulations) wastewater. The specific method of wastewater disposal that will be employed by GCC (e.g., disposal to sanitary sewer via industrial wastewater discharge permit; disposal to septic system; transport offsite for treatment/disposal) is not currently known.

Conditions 3 through 7 of the ATC require performance of a source test to demonstrate the effectiveness of the system and compliance with the emission control requirements. The initial round of source testing was performed in May and early June 2013.

The source testing report was provided to SLOCAPCD in late July 2013, and was subject to multiple revisions. A permit to operate (PTO No. 1713-2) the system was issued by SLOCAPCD on February 18, 2014.

Despite the completion of initial source testing under the ATC, the PTO (Conditions 2, 5 and 6) requires that additional source testing be required, at least once every 24 months, "… to quantify the exhaust emissions of the methyl bromide and to measure the control efficiencies of the carbon bed and scrubber system."

VR's second commercial application was installed for fumigation chambers at the South Florida Logistics Center (SFLC, aka Flagler Global Logistics) in Miami. Mr. Joyce stated that the client has imposed a strong confidentiality agreement, and he cannot provide details. He did state, however, that the VR system at SFLC includes some modifications based on the lessons learned from the first generation system at GCC. Details were not provided.

Additional information concerning the status of SFLC was provided by discussions with Mr. Anthony Radhay, with the Miami-Dade County Department of Regulatory and Economic Resources, and the Florida DEP website. A "Non-Title V State of Florida Initial Air Operation Permit" (Number 0251364-002-AO) was issued by Miami-Dade County on August 11, 2014. Key aspects of the permit include:

- The facility is a synthetic minor, Non-Title V source of air pollution.

- The facility engages in methyl bromide fumigation of imported food commodities, using four fumigation chambers.

- Methyl bromide emissions shall not equal or exceed 9.5 tons in any consecutive 12-month period.

- The facility will employ eight (8) activated carbon adsorbers with capacity of 2,000 pounds of carbon, and one activated carbon regenerative system (provided by Value Recovery) equipped to regenerate up to three (3) carbon canisters simultaneously.

There are several concerns and drawbacks to the VR technology, as employed at GCC and SFLC:

- The prototype system at GCC is an order of magnitude smaller than would be required for the Port Wentworth facility. The GCC system has the capability to handle a maximum projected usage of 209.5 pounds of methyl bromide per fumigation cycle with two cycles per day – resulting in a maximum daily methyl bromide usage of 419 pounds. As previously discussed, Port Wentworth is seeking a permit with methyl bromide limitations of 120 pounds per hour (which equates to 2,880 pounds per day) during peak fumigation events. Thus, the capacity of the Value Recovery system at GCC is well below that required for the Port Wentworth facility.

- The reliability associated with the prototype system at GCC has not been adequately demonstrated. For example, a fire occurred during an initial attempt to regenerate the carbon in August 2012. The fire was potentially due to faulty or inadequate temperature monitoring – i.e., a design and/or construction flaw.

- In addition to concerns regarding developmental status and reliability of the system, the 2012 fire raises a serious safety concern.

- The capital and operating costs associated with the prototype system at GCC have not been adequately demonstrated. This is a proprietary system and, to our knowledge, the only system of its kind. Thus, capital and O&M costs are not readily available. However the system is likely to be prohibitively expensive for large-scale log operations.

- The SLOCAPCD Authority to Construct Engineering Evaluation (August 18, 2010) states the following: "Even though this control method is very expensive, Guadalupe Cooling decided to install this type of chamber because currently they truck their broccoli to the Port of Long Beach, have it fumigated there, truck it to Guadalupe for cooling and packing, and then truck it back to Long Beach again to ship it to Taiwan." We understand that the significant expense associated with the VR system is offset by eliminating the ~400 mile refrigerated round trip between Guadalupe and Long Beach.

- Large quantities of electrical energy will be required to regenerate the spent carbon.

- As described, the carbon regeneration process employs air, heated to 110°C, to strip the methyl bromide from the carbon. Carbon reactivation is more commonly achieved using much higher temperatures, and/or the injection of high temperature steam. This requires removal of the carbon from the source, and transport to a facility that operates the specialized, high temperature carbon reactivation equipment. We are concerned that the relatively low temperature regeneration approach employed by Value Recovery is not proven, and may result in operational problems and expenses. For example, the methyl bromide may not be fully removed, the carbon may reach saturation quickly (resulting in breakthrough), and the carbon may require more frequent replacement.

- The system produces a wastewater containing methyl thiosulfate and potassium bromide. The scrubber solution will require frequent replacement and disposal as the

fresh potassium sulfate is consumed. It is unlikely that disposal of the spent solution in the sanitary sewer system will be acceptable to the local POTW, due to the presence of thiosulfates and bromides. Therefore, the wastewater will likely require transportation to an offsite waste treatment facility that has the capability to handle the thiosulfate and bromide contaminants. The specific costs associated with wastewater transportation and treatment/disposal have not been determined. However, it is expected that these costs will be substantial.

In summary, considering the factors discussed above, the Value Recovery system is not proven and demonstrated to be an effective, reliable, and economical control measure for the large-scale log fumigation applications at the Port Wentworth facility.

Nordiko Quarantine Systems

Nordiko Quarantine Systems Pty Ltd (Nordiko), located in Sydney, Australia, provides cargo fumigation systems for the shipping industry. Products identified by its website (www.nordiko.com.au) include fumigation consoles that attach to the rear of individual shipping containers, degassing systems (e.g., small, skid-mounted mobile blowers and ductwork) for individual shipping containers, carbon-adsorption based ventilation systems that can be used to re-capture residual fumigants (i.e., fumigants that have off-gassed from the commodity during transportation) from individual shipping containers, gas circulation and heating systems for tarpaulin fumigation systems, a small under-tarp system, and chiller fumigant recovery systems for individual shipping containers.

The website also includes a trailer-mounted capture system including six 55-gallon drums of carbon, identified as a "Large Scale Mobile Log Stack Fumigant Recapture System." Based on a methyl bromide carbon adsorption capacity range of 5 percent by weight, this system is capable of capturing about 65 pounds of methyl bromide.

As previously discussed, fumigation of a typical batch of logs at the Port Wentworth facility employs up to 120 pounds of methyl bromide per hour. Thus, the capacity of the Nordiko system is well below that required for the Port Wentworth facility.

The Nordiko website (reviewed on multiple dates, most recently April 30, 2015) does not identify fumigant recovery equipment for large-scale log QPS fumigations such as those performed at the Port Wentworth facility. And, as discussed above, there is no indication that Nordiko has an office in the United States.

Desclean Belgie N.V.

Desclean Belgie N.V. (Desclean), based in Antwerp, Belgium, provided services and equipment to support various aspects of the fumigation industry in Europe. Desclean reportedly provided small, carbon-based methyl bromide adsorption systems, similar to those provided by others. We understand that Desclean filed bankruptcy and ceased operations during 2011 or 2012. Its website (www.desclean.be) is no longer active.

Senior Fumigation Industry Representatives

Discussions with senior representatives of Royal and Western Fumigation have not identified any large-scale log QPS fumigation facilities that employ methyl bromide capture systems.

Industry Research

USDA Research Program

The USDA Foreign Agricultural Service (FAS) is responsible for administering the Technical Assistance for Specialty Crops (TASC) grants program. TASC provides funds to eligible organizations, on a grant basis, to implement activities that are intended to address a sanitary, phytosanitary, or related technical barrier that prohibits or threatens the export of U.S. specialty crops that are currently available on a commercial basis. Examples of activities that may be covered under TASC include seminars and workshops, study tours, field surveys, pest and disease research, and pre-clearance programs. (Reference: www.fas.usda.gov/mos/tasc/tasc.asp).

In 2009, the California Dried Plum Board submitted a TASC application entitled "The containment and destruction of methyl bromide and its alternatives following postharvest chamber fumigations: a physiochemical and economic assessment." The background section of this application discusses the fact that the physiochemical processes of methyl bromide-sorbent interaction and destruction have not been adequately mapped out, and additional research is necessary to support the development of commercial-scale capture and destruction technologies. Therefore, the application proposes the performance of laboratory studies on fumigant containment, reuse, combustion, and sorbent catalyzed destruction to specifically address the practical potential of conducting chamber fumigation with reduced or negligible atmospheric impact (i.e., methyl bromide emissions). "Promising technologies will then be scaled and tested in pilot- and commercial-size fumigation chambers and analyzed for their effectiveness and economic feasibility." (California Dried Plum Board, 2009).

Applications of this nature indicate that the basic research necessary to support the design of effective control technologies for large-scale methyl bromide use is either lacking or non-existent at this time.

Annual Methyl Bromide Conferences

Since 1994, the USEPA, USDA and Methyl Bromide Alternatives Outreach (MBAO) and the Crop Protection Coalition have sponsored the Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions. As discussed at the MBAO website (http://mbao.org/):

> Since 1994, agricultural and forestry researchers from governmental, academic and private institutions, as well as extension agents and users, have gathered together in this forum to share information on a variety of laboratory, field, and on-farm research and technology transfer topics. This conference is devoted to the sharing of information on current and ongoing research into methyl bromide

alternatives. Attendance in the past has surpassed 400 researchers, growers, and interested persons, with a significant level of international participation.

The conference proceedings from 1994 through 2014 are posted on the MBAO website. A review of the proceedings indicates that there have been significant international efforts since 1994 to develop a variety of methyl bromide capture and treatment technologies, as well as methyl bromide replacement technologies and alternatives. Nonetheless, no proven and cost-effective capture and treatment system is commercially available for large-scale log QPS fumigation facilities.

Preliminary Evaluation of Carbon Adsorption

Despite the fact that carbon adsorption is not currently being used for methyl bromide capture at large-scale QPS fumigation facilities, the estimated carbon consumption rates and associated costs have been evaluated and are estimated below. This estimate is provided to evaluate whether carbon adsorption could be economically feasible for this application.

Basis and Assumptions:

1. Fumigation of softwood logs following a combination of USDA APHIS Treatment Manual and the China Protocol, which specifies a dosage rate of 5 pounds of methyl bromide (MB) per 1,000 cubic feet (ft^3) at temperatures of 60° F or above, and 7.5 pounds of MB per 1,000(ft^3) at temperatures between 41- and 59° F.
2. Treatment of logs in standard 40-foot shipping containers using the closed door treatment approach. Average shipping container volume of 2,720 ft^3.
3. Zero absorption of MB in wood (e.g., worst case air emissions).
4. Carbon adsorption capacity for methyl bromide: average of 4.5 percent by weight (actual may be lower during hot, humid weather).[8] Additional research and development will likely be required to support the design of a carbon adsorption system for large-scale QPS fumigation using methyl bromide.
5. Methyl bromide capture efficiency: 81 percent. Additional research and development will likely be required to determine if this is practicable.
6. Carbon purchase and disposition cost: $2.60 per pound, including the purchase of new carbon, and transportation and disposition (regeneration via incineration, or landfill disposal) of spent carbon.
7. Assume that the spent carbon is not classified as a hazardous waste under RCRA. If the carbon is classified as a hazardous waste (e.g., hazardous waste code U029), the costs will be substantially higher than those estimated below.

Mass of MB per container:

$$= (7.5 \text{ lb MB} / 1000 \text{ ft}^3) \times (2{,}720 \text{ ft}^3 / \text{container}) = 20.4 \text{ lb MB} / \text{container}$$

[8] Carbon adsorption capacity for methyl bromide: 3 to 6 percent by weight, per May 6, 2014 discussion with Peter Joyce, Value Recovery. The mid-point of this range (i.e., 4.5 percent) has been assumed for the preliminary cost estimate.

Assuming a MB capture efficiency of 81 percent: 0.81 x 20.4 = 16.5 lb MB captured per container.

Based on a carbon adsorption capacity of 4.5 percent (i.e., one pound of carbon adsorbs 0.045 pounds of MB), a total of 367 pounds of carbon is required to treat the methyl bromide released from one fumigation container.

Estimated cost for carbon purchase and disposition:

= (367 lbs carbon / container) x ($2.60/lb carbon) = $954 per container

This cost estimate does not include the capital costs associated with the design, procurement, and construction (or retro-fit) of carbon adsorption equipment at the fumigation warehouses.

The estimated cost increase for carbon ($954 per container) alone is greater than the cost for fumigation of a single container of timber. The carbon cost alone would result in more than doubling the cost to fumigate a container. An increase in price such as this would not be economically viable, and would likely drive the fumigation business away from Royal's Port Wentworth facility.

On an annual basis, an estimated 2.7 million pounds of carbon (an average of about 52,000 pounds per week) would be generated assuming the facility operates at the methyl bromide usage limit of 75 tons. Regardless of the burden on Royal to change out more than 52,000 pounds of carbon each week, there is also a burden on Georgia's landfills in receiving that amount of waste material. If alternatives to landfill disposal were to be considered, similar calculations and problems of large-scale challenges would have to be resolved, perhaps in the areas of wastewater or transportation for incineration.

In summary, the use of carbon adsorption for methyl bromide capture is not "achievable" for Royal's large-scale log QPS fumigation facility in Port Wentworth, Georgia.

Conclusion

There is no viable option for an add-on methyl bromide capture and control system for the large-scale log QPS fumigations conducted at Royal's Port Wentworth facility. There is no large-scale log QPS fumigation facility anywhere in the United States employing an add-on capture and control system for methyl bromide. Thus, add-on capture and control systems such as carbon adsorption and incineration or disposal are not "achieved in practice" by any other similar source. However, there are operational and other work practices, both those specified by USDA APHIS and those proposed by Royal, that can be employed as MACT to reduce the ambient air concentrations of methyl bromide emitted from the Royal facility. These are discussed in the following section.

RECOMMENDED MACT FOR THE ROYAL FACILITY

The MACT Floor

As previously discussed in this application, the use of methyl bromide for fumigation at the facility will be performed in accordance with a series of existing regulations and limitations, including, but not limited to:

- The Quarantine and Pre-shipment exemption under Title VI (Stratospheric Ozone Protection) of the Clean Air Act;
- The U.S. Environmental Protection Agency's pesticide application requirements for methyl bromide, as established under the Federal Insecticide, Fungicide and Rodenticide Act. As previously discussed, FIFRA reregistration for methyl bromide has been ongoing for years, and is expected to be completed in 2015. We understand that the revised FIFRA label will incorporate an expanded buffer zone program (previously buffer zones were set only by the USDA Treatment Manual, not by the product label), and the preparation and implementation of very detailed fumigation management plans;
- The U.S. Department of Agriculture's Animal and Plant Health Inspection Service, Plant Protection and Quarantine Treatment Manual, which includes detailed APHIS Treatment Schedules, equipment and procedure requirements, and direction, oversight, and documentation of fumigation activities by APHIS inspectors; and
- The requirements of the Certified Pesticide Applicator licensing program, as administered by the Georgia Department of Agriculture, Pesticide Division.

The practices employed at Port Wentworth will meet or exceed all of these regulatory requirements.

In addition, a combination of work practices and operating limits are proposed to minimize potential impacts from methyl bromide emissions. AERMOD air emission modeling and risk assessment have been performed to evaluate the benefits associated with a variety of emissions configurations (e.g., stack height, stack diameter, exit velocity, methyl bromide emission rate). Based upon the findings of this MACT assessment and the AERMOD modeling and risk assessment, the following work practice modifications and process improvements are proposed:

- Construction of a single 60 foot tall vertical stack with no exhaust flow obstruction (i.e., rain hat). The stack will be located near the center of the property, and will have a discharge diameter of 0.75 feet.
- Exhaust blower rated at 15,000 cubic feet per minute (cfm) minimum. The exhaust velocity (based on 0.75 ft discharge diameter) is calculated at 566 feet per second.
- Fumigation events will be sized and staged to limit the hourly methyl bromide emissions to no more than 120 pounds.

- Annual methyl bromide emissions will be limited to 75 tons.

Additional Operational and Work Practices that May be "Achievable" in the Future

1. Obtain approval to use a non-HAP fumigant instead of methyl bromide.

The use of sulfuryl fluoride to fumigate logs has been discussed earlier in this document. To reiterate, it has two significant regulatory hurdles to jump. First, the treatment must be approved by destination countries for logs from the US and Canada. Second, the manufacturer must obtain approval to add this treatment to the product label, through a local 24(c) label or an amendment to the FIFRA-approved label.

These modifications obviously cannot be made unilaterally by Royal.

Even assuming all regulatory requirements are met for use of a non-HAP fumigant such as sulfuryl fluoride, this may not result in a "level playing field" from a commercial standpoint. It is not clear at this time what the price differential would be between a log fumigation using methyl bromide and one using sulfuryl fluoride. There is a distinct possibility that the sulfuryl fluoride option would be more expensive and therefore that the substitution of fumigant could result in more expensive treatments in Georgia as compared to other states.

2. Obtain EPA approval to use methyl bromide from one log fumigation on another.

Royal has considered taking the methyl bromide from one container, at the end of a fumigation, and simply piping it into the next container that needs fumigation. That process is not legal under FIFRA, however. Whenever methyl bromide is used for fumigation, it picks up impurities such as water vapor or traces of other substances present in the fumigation environment. The manufacturers of the chemical will not reclaim used methyl bromide because the cost of reprocessing it to remove impurities is too high to be commercially feasible. Used methyl bromide, if it were available, would therefore be an unregistered pesticide under FIFRA and it could not be used legally.

The presence of impurities in used methyl bromide is not likely to pose a problem in fumigating logs. The absence of a valid, legal label is a significant problem. EPA approval of a pesticide use or label is an expensive and lengthy process. To date, no such label has been sought for methyl bromide.

3 REFERENCES

68 FR 237 – 254. Federal Register, Volume 68, Number 1, Page 237-254, Final Rule, Protection of Stratospheric Ozone: Process for Exempting Quarantine and Preshipment Applications of Methyl Bromide. January 2, 2003.

ATSDR, 1992. Toxicological Profile for Bromomethane. Agency for Toxic Substances and Disease Registry, US Public Health Service. September 1992.

California Dried Plum Board, 2009. Grant application entitled "The containment and destruction of methyl bromide and its alternatives following postharvest chamber fumigations: a physiochemical and economic assessment." Prepared by the California Dried Plum Board, 2009, and submitted to the USDA Foreign Agricultural Service, Technical Assistance for Specialty Crops grants program.

Great Lakes Chemical Corp., 2006. Material Safety Data Sheet Number 00055, for Metho-O-Gas® 100, Great Lakes Chemical Corp., July 29, 1006.

Meister, 1995: 1995 Farm Chemicals Handbook, Meister Publishing Company, 1995.

NIOSH, 2004: Pocket Guide to Chemical Hazards, National Institute for Occupational Safety and Health, Department of Health and Human Services, DHHS Publication No. 97-140. February 2004

Nordiko website: www.nordiko.com.au

NPTN, 2000. NPTN Technical Fact Sheet for Methyl Bromide, National Pesticide Telecommunications Network. Updated 2000.

UNEP, 2009a: Report of the UNEP Technology and Economic Assessment Panel, Quarantine and Preshipment Taskforce – Final Report. Montreal Protocol on Substances that Deplete the Ozone Layer, United Nations Environment Programme. October 2009. http://ozone.unep.org/Assessment_Panels/TEAP/Reports/TEAP_Reports/teap-qpstf-october2009.pdf

UNEP 2009b. Methyl Bromide Quarantine And Preshipment Interim National Management Strategy Submission By The United States Of America, United Nations Environment Programme, Ozone Secretariat, October 30, 2009, http://ozone.unep.org/Exemption_Information/Critical_use_nominations_for_methyl_bromide/MeBr_Submissions/USA-QPS_National_Management_Strategy.doc

USCS. US Census Bureau, North American Industrial Classification System website: http://www.census.gov/eos/www/naics/; and Standard Industrial Classification System website: http://www.census.gov/epcd/www/sic.html.

USDA, 2015. USDA Treatment Manual. US Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, updated 4/16/2015. http://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/treatment.pdf

USEPA, July 2008. RED Fact Sheet for Methyl Bromide. US Environmental Protection Agency, Office of Pesticide Programs. July 10, 2008.

USEPA, December 2008. Registration Review: Conventional Cases Schedule: 2009 – 2012. US Environmental Protection Agency, Office of Pesticide Programs. December 15, 2008.

USEPA, May 2009. Amended Reregistration Eligibility Decision for Methyl Bromide (soil and non-food structural uses), EPA 738-R-09- 311. US Environmental Protection Agency, Office of Pesticide Programs. May 2009.

USEPA RACT/BACT/LAER Clearinghouse (RBLC) database; http://cfpub.epa.gov/rblc/htm/bl02.cfm, accessed April 23, 2015.

Value Recovery, Inc. website: www.valuerecovery.net

Table 1. Methyl Bromide Fumigation Requirements for Various APHIS Treatment Schedules and Commodities

APHIS Treatment Schedule / Commodity / Target Pest	Methyl Bromide Dosage Rate (lb MB/1000 cf)	Minimum Methyl Bromide Fumigation Exposure Period (hours)	Minimum Methyl Bromide Concentration at 0.5 hrs
T312-a / Oak logs / Oak wilt disease	15	72	240
T312-a Alternative / Oak logs / Oak wilt disease	15	72	240
T312-b / Oak logs / Oak wilt disease	15	48	240
T404-b-1-1 / Wood products including containers / Various	3 to 5	16	36 to 60
China Protocol for hardwood and softwood**	5.0 to 7.5	16	60 to 80
T305a / Cut flowers and greeners / Leaf miners, hitchhikers, slugs	1.5 to 3.5*	2	19 to 41*
T305-b / Cut flowers and greenery / Borers and soft scales	2.5 to 3.0*	2.0 to 3.5*	NS
T305-c / Cut flowers and greeners / Mealy bugs	2.5 to 4.0 *	2	32 to 48*
T101-z-2 / Strawberry / External feeders	1.5 to 3.0*	2	14 to 38*
T104-a-1 / Various Commodities (fruits & vegetables) / thrips, aphids, scale, etc.	1.5 to 4.0*	2	14 to 48*
T101d-1 / Banana / External feeders	1.5 to 4.0*	2	14 to 48*
T101e-2 / Garlic /Garlic beetle and carpet worm	2.0 to 3.0*	1.5 to 4.0*	NS
T109a-2 / Apples / Fruit moth and spider mite	2.375	2	35
T101-w-1-2 / Citrus / Mediterranean fruit fly	2	2	26
T101-j-2 / Grapefruit & other citrus / Citrus black fly	1.5 to 1.75*	2	12 to 23*
T201-a-2 / Deciduous woody plants / borers	2.0 to 3.0*	2 to 4*	NS
T201-b-1 / Evergreens / external feeders	1.5 to 3.0*	2 to 4*	NS
T101-n-2-1-1 / Herbs & spices, dried / Various	2.0 to 3.0*	24	24 to 36*
T101-n-2 / Herbs, fresh / External feeders and leaf miners	2.0 to 4.0*	2	25 to 48*

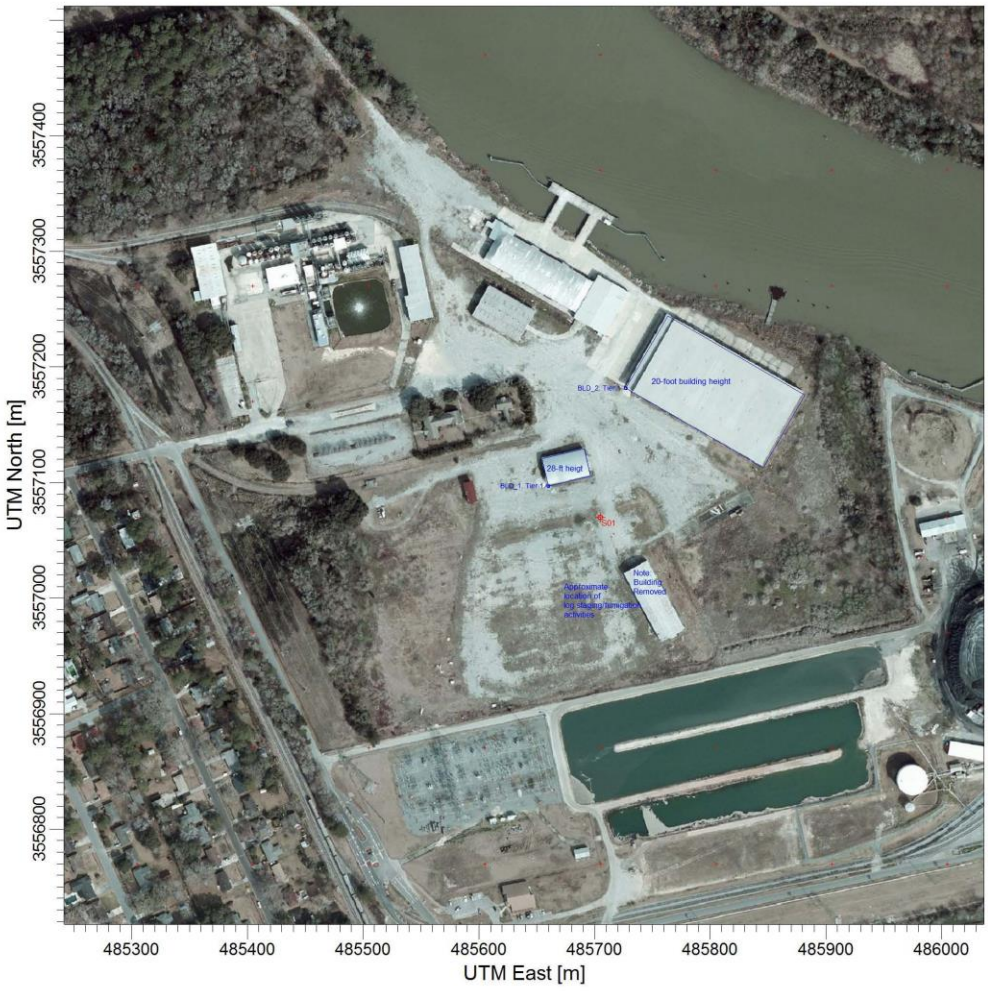
The primary commodity that will be fumigated at the Port Wentworth facility is softwood logs destined for China.
*Dosage, exposure period and MB concentration are temperature dependent
**China is currently considering modification of their treatment protocol to substitute sulfuryl fluoride (which is not a HAP) for methyl bromide.
NS: Not Specified

Appendix A

Figures

PROJECT TITLE:

Royal Pest Solutions - Port Wentworth, Georgia
Satellite View

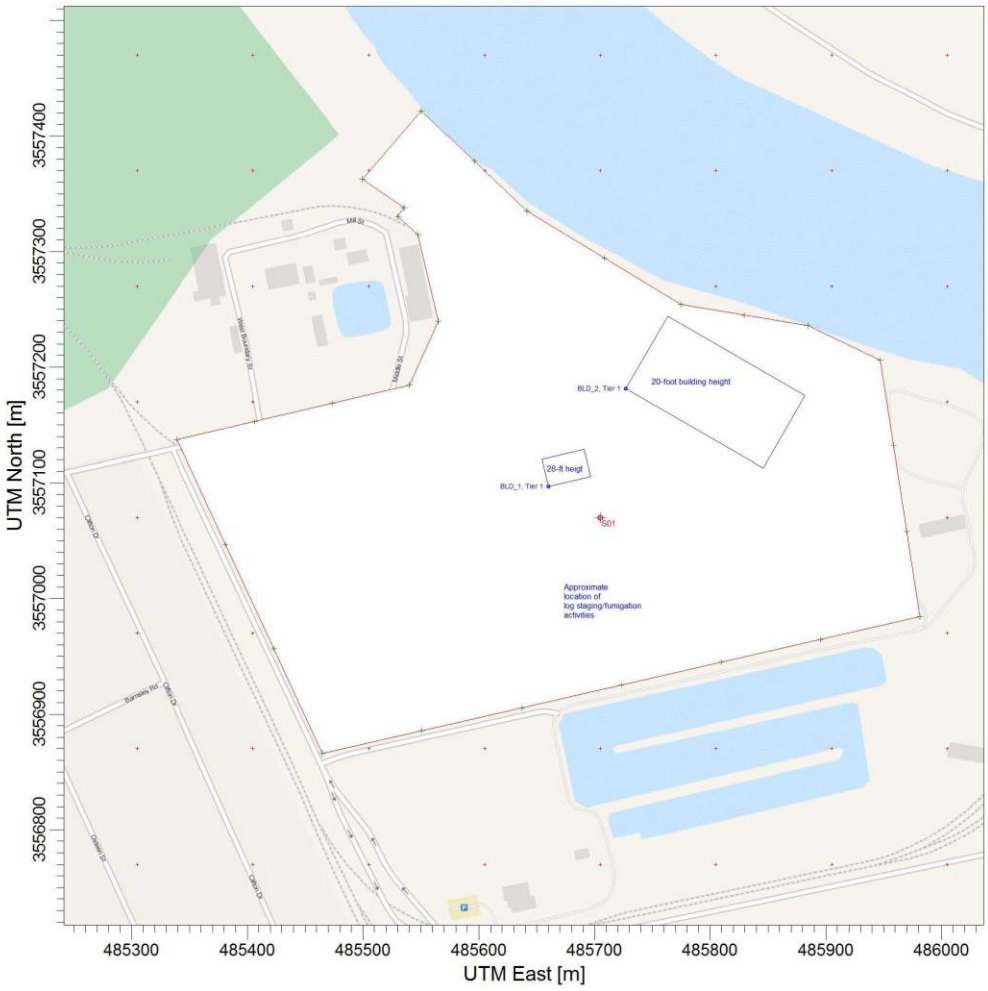


COMMENTS: Property is surrounded by fence and/or shoreline limiting public access.	SOURCES: 1	COMPANY NAME: SCS Engineers	
	RECEPTORS: 1691	MODELER: P. Stickney	SCS ENGINEERS
		SCALE: 1:5,000 (0 — 0.1 km)	
		DATE: 5/4/2015	PROJECT NO.: 02209044

AERMOD View - Lakes Environmental Software

I:\02209044\AERMOD\60RYL07.isc

PROJECT TITLE:
Royal Pest Solutions - Port Wentworth, Georgia
Site Plan



COMMENTS:	SOURCES:	COMPANY NAME:	
Property is surrounded by fence and/or shoreline limiting public access.	1	SCS Engineers	
	RECEPTORS:	MODELER:	
	1691	P. Stickney	SCS ENGINEERS
		SCALE: 1:5,000 0 0.1 km	
		DATE:	PROJECT NO.:
		5/4/2015	02209044

AERMOD View - Lakes Environmental Software I:\02209044\AERMOD\60RYL07.isc

Appendix B

EPA RBLC Database "Comprehensive Report" For Methyl Bromide

http://cfpub.epa.gov/rblc/index.cfm?action=Results.PermitSearchResults
Last updated on 4/23/2015

Technology Transfer Network
Clean Air Technology Center RACT/BACT/LAER Clearinghouse

Clean Air Technology Center | EPA Home | Air Topics | TTN Web's Technology Transfer Network | Clean Air Technology Center
RACT/BACT/LAER Clearinghouse | RBLC Basic Search | RBLC Search Results

RBLC Search Results

List of Reports Help

Your search has found **2** facilities and **2** processes that match your search criteria. You can view details for one or more facilities by clicking on the highlighted RBLC identifier or the process description in the list below. To create a report, select one of the standard output formats from the list of reports at the bottom of this page. Only facilities that are checked in the table below will be included in your report. Click on the check box next to any facility to switch between checked and unchecked or use the "Check" or "Un-Check" all facilities buttons at the top of the list to check or uncheck all records in the list.

Please note that the use of your browser's BACK button to change the search conditions may result in inaccurate results.

Matching Facilities for Search Criteria : Tips

Permit Date Between 01/01/2005 And 04/23/2015
And Pollutant Name is Methyl Bromide

These results are for USA only.

Check | Un-Check **ALL Facilities** New Search

NOTE: Draft determinations are marked with a " * " beside the RBLC ID.

RBLC ID	CORPORATE/COMPANY & FACILITY NAME	PROCESS CODE	PROCESS DESCRIPTION	PERMIT NUMBER & PERMIT DATE
Sort By	Sort By			Sort By
☑ CA-1170	M&L COMMODITIES M&L COMMODITIES	70.400	FUMIGATION	N-7489-1 06/25/2008
☑ CA-1172	M&L COMMODITIES M&L COMMODITIES	70.590	Fumigation chambers	N-7489-1 06/25/2008

Check | Un-Check **ALL Facilities** Back to Top of Page

○ Show All Records ◉ Show Only Selected Records On This Page

Formatting your report may take a while, especially if your facility has a large number of processes and pollutants. The detail reports take the longest amount of time because they include the most information. Please be patient after you select "Create report" Help

○ Process Index Report	◉ TXT	○ pdf
○ Process Type Summary(with Agency Contact Info)	◉ TXT	○ pdf
◉ Comprehensive Report	◉ TXT	○ pdf
○ Free Form Report(Customizable Fields Selection)		
○ Free Form Report	◉ TXT	○ pdf
○ Export/Import Report(ASCII Delineated Text)		

Create report

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COMPREHENSIVE REPORT
Report Date:04/23/2015

Facility Information

RBLC ID:	CA-1170 (final)	**Date Determination Last Updated:**	09/15/2009
Corporate/Company Name:	M&L COMMODITIES	**Permit Number:**	N-7489-1
Facility Name:	M&L COMMODITIES	**Permit Date:**	06/25/2008 (actual)
Facility Contact:		**FRS Number:**	UNKNOWN
Facility Description:		**SIC Code:**	0723
Permit Type:	A: New/Greenfield Facility	**NAICS Code:**	115114
Permit URL:			
EPA Region:	9	**COUNTRY:**	USA
Facility County:	STANISLAUS		
Facility State:	CA		
Facility ZIP Code:	95353		
Permit Issued By:	SAN JOAQUIN VALLEY APCD, CA (Agency Name) MR. JIM SWANEY(Agency Contact) (559)230-6000		
Other Agency Contact Info:	MR. RUBI GILL 209-557-6400 RUPI.GILL@VALLEYAIR.ORG		
Permit Notes:			

Process/Pollutant Information

PROCESS NAME:	FUMIGATION
Process Type:	70.400 (Fruit & Vegetable Processing)
Primary Fuel:	
Throughput:	
Process Notes:	COMMODITY METHYL BROMIDE FUMIGATION

POLLUTANT NAME:	Methyl Bromide
CAS Number:	74-83-9
Test Method:	Unspecified
Pollutant Group(s):	(Hazardous Air Pollutants (HAP) , Organic Compounds (all) , Volatile Organic Compounds (VOC))
Emission Limit 1:	395.0000 LB/D
Emission Limit 2:	
Standard Emission:	
Did factors, other then air pollution technology considerations influence the BACT decisions:	U
Case-by-Case Basis:	BACT-PSD
Other Applicable Requirements:	
Control Method:	(A) 81% OVERALL METHYL BROMIDE CONTROL USING CARBON ADSORPTION WITH ON-SITE RE-ACTIVATION USING CHEMICAL SCRUBBER.
Est. % Efficiency:	81.000
Cost Effectiveness:	0 $/ton
Incremental Cost Effectiveness:	0 $/ton
Compliance Verified:	Unknown
Pollutant/Compliance Notes:	

Previous Page

Facility Information

RBLC ID:	CA-1172 (final)	**Date Determination Last Updated:**	09/12/2011
Corporate/Company Name:	M&L COMMODITIES	**Permit Number:**	N-7489-1
Facility Name:	M&L COMMODITIES	**Permit Date:**	06/25/2008 (actual)

Format RBLC Report Page 2 of 2

Facility Contact:		**FRS Number:**	UNKNOWN
Facility Description:		**SIC Code:**	0723
Permit Type:	A: New/Greenfield Facility	**NAICS Code:**	311999
Permit URL:			
EPA Region:	9	**COUNTRY:**	USA
Facility County:	STANISLAUS		
Facility State:	CA		
Facility ZIP Code:	95353		
Permit Issued By:	SAN JOAQUIN VALLEY APCD - CENTRAL REGIONAL OFFICE, CA (Agency Name)		
Other Agency Contact Info:	Rupi Gill (209)-557-6400 rupi.gill@valleyair.org		
Permit Notes:			

Process/Pollutant Information

PROCESS NAME:	Fumigation chambers
Process Type:	70.590 (Other Agricultural Products)
Primary Fuel:	
Throughput:	0
Process Notes:	

POLLUTANT NAME:	Methyl Bromide
CAS Number:	74-83-9
Test Method:	Unspecified
Pollutant Group(s):	(Hazardous Air Pollutants (HAP) , Organic Compounds (all) , Volatile Organic Compounds (VOC))
Emission Limit 1:	395.0000 LB/D
Emission Limit 2:	
Standard Emission:	
Did factors, other then air pollution technology considerations influence the BACT decisions:	U
Case-by-Case Basis:	BACT-PSD
Other Applicable Requirements:	OTHER
Control Method:	(A) Fumigation building consisting of 3 galvanized steel chambers
Est. % Efficiency:	
Cost Effectiveness:	0 $/ton
Incremental Cost Effectiveness:	0 $/ton
Compliance Verified:	Unknown
Pollutant/Compliance Notes:	

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Appendix C

Notice of Determination for M&L Commodities Fruit Fumigation Facility

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

Notice of Determination

To:	☒ County Clerk		**From:** Public Agency:	San Joaquin Valley Unified Air Pollution Control District
	County:	San Joaquin County	Address:	1990 E. Gettysburg Ave.
	Address:	6 S. El Dorado St., 2nd Floor		Fresno, CA 93726
		Stockton, CA 95202	Contact:	Jessica Willis
			Phone:	(559) 230-5818

Responsible Agency:	San Joaquin Valley Unified Air Pollution Control District
Address:	1990 East Gettysburg Avenue
	Fresno, CA 93726-0244
Contact:	Jessica Willis
Phone:	(559) 230-5818

SUBJECT: **Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.**

State Clearinghouse Number: (if submitted to State Clearinghouse): 2006072109

Project Title: M & L Commodities (dba Inland Cold Storage) Project Number N-1062096

Project Location: The facility will be located at 315 Port Road 5 and 333 Port Road 6 in Stockton, California

Project Description: The San Joaquin Valley Unified Air Pollution Control District (District) received an Authority to Construct (ATC) Application from M & L Commodities to conduct methyl bromide fumigation operation at the Port of Stockton. This operation will be conducted inside three galvanized steel chambers. Upon completion of the fumigation cycle, the spent fumigant will be vented to a carbon bed and scrubber system. This system is expected to control at least 81% of the spent fumigant that would otherwise be emitted into the atmosphere. Since the fumigation chambers will be located inside one building, only one Authority to Construct permit will be issued pursuant to the precedent established under projects N1000890 and N1043018

This is to advise that the San Joaquin Valley Unified Air Pollution Control District, acting as a Responsible Agency, has approved the above described project on 6-25-08, and has made the following determinations regarding the above described project:

1. The project [☒ will ☐ will not] have a significant effect on the environment.
2. ☒ The District considered the Environmental Impact Report as prepared by the Port of Stockton.
   ☐ A Mitigated Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures [☒ were ☐ were not] made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan [☒ was ☐ was not] adopted for this project.
5. A statement of Overriding Considerations [☒ was ☐ was not] adopted for this project.
6. Findings [☒ were ☐ were not] made pursuant to the provisions of CEQA.

This is to certify that the District's Findings Document is available to the General Public at:
Central Region Office 1990 E. Gettysburg Street, Fresno, CA

Signature(Public Agency): _____ Title: Director of Permit Services

Date: June 26, 2008

Printed on recycled paper.

San Joaquin Valley
Air Pollution Control District

M & L Commodities (dba Inland Cold Storage)

Project Number N-1062096

Port of Stockton
Inland Cold Storage Stockton Lease Approval

SCH No. 2006072109

California Environmental Quality Act Statement of Findings, Statement of Overriding Considerations, and Mitigation Monitoring Program

June 2008

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT GOVERNING BOARD 2008

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J. STEVEN WORTHLEY
Supervisor, Tulare County

AIR POLLUTION CONTROL OFFICER

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M & L Commodities (dba Inland Cold Storage) Project Number N-1062096

I. INTRODUCTION

The San Joaquin Valley Unified Air Pollution Control District (District) has received an Authority to Construct application from M & L Commodities (dba Inland Cold Storage) to develop a cold storage facility on 16 acres within the Port of Stockton's East Complex. The facility could store and distribute up to 1,120 million pounds of food products per year. Facility operations would include methyl bromide fumigation of fruits as in accordance with Animal and Plant Health Inspection Service (APHIS) specifications. Fumigation operations will be conducted inside three galvanized steel chambers. Upon completion of the fumigation cycle, the spent fumigant will be vented to a carbon bed and scrubber system. This system is expected to control at least 81% of the spent fumigant that would otherwise be emitted into the atmosphere. Collectively these actions constitute the Project. Since the fumigation chambers will be located inside one building, only one ATC permit will be issued pursuant to the precedent established under projects N1000890 and N1043018. The Port of Stockton is the public agency having principal responsibility for approving the M & L Commodities project. As such, the Port of Stockton serves as the Lead Agency for the project. Under CEQA the Lead Agency is required to:

- Conduct preliminary reviews to determine if applications are subject to CEQA [CCR §15060].
- Conduct review to determine if project is exempt from CEQA [CCR §15061].
- Prepare initial studies for projects that may have adverse environmental impacts [CCR §15063].
- Determine the significance of the environmental effects caused by the project [CCR §15064]
- Prepare Negative Declarations or Mitigated Negative Declarations for projects with no significant environmental impacts [CCR §15070].
- Prepare, or contract to prepare, Environmental Impact Reports (EIR) for projects with significant environmental impacts [CCR §15081].
- Adopt reporting or monitoring programs for the changes made to projects or conditions of project approval, adopted in order to mitigate or avoid significant effects on the environment [PRC §21081.6 & CCR §15097].
- Comply with CEQA noticing and filing requirements.

The Port of Stockton determined that the project would have a significant adverse environmental impact and prepared an Environmental Impact Report (EIR) for the Project. In certifying the Final EIR on August 6, 2007, the Port of Stockton determined that after implementing all feasible mitigation measures the increase in criteria pollutant emissions from truck traffic, maritime activity, and area sources resulting from the proposed project's operations would be significant and unavoidable. The Port of Stockton approved the project and prepared a Statement of Overriding Considerations (SOC), in accordance with CEQA Guidelines §15093(a).

pallets per shipload) will need to be fumigated upon arrival. During the last five (5) days of the sea voyage, the temperature of the fruit will be adjusted such that it will be ready for fumigation. Upon arrival, these pallets will be placed in galvanized steel fumigation chambers. These chambers will be evacuated to form a temporary seal to prevent fumigant leakage. As each type of fruit requires a specific dosage, the methyl bromide will be injected into the sealed chambers in accordance with specifications identified in treating schedules established by APHIS. These treating schedules can be found online at: http://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/treatment_pdf/05_02_t100schedules.pdf.

Upon completion of fumigation, methyl bromide chambers will be vented to a carbon bed for sufficient amount of time period to decrease the methyl bromide concentration to five (5) parts per million (ppm) or less. The carbon bed is expected to adsorb 90% of the methyl bromide injected into the chambers. The remaining 10% will be released to the atmosphere through a 72-foot stack. After completing the adsorption cycle, hot air will be injected evenly through the carbon bed to desorb the trapped methyl bromide. The desorbed methyl bromide will be passed through a diffuser plate type scrubber system containing thiosulfate solution, where methyl bromide reacts with thiosulfates to form non-hazardous products. The scrubber is expected to convert 90% of methyl bromide into a non-hazardous solution.

This facility will be located at 315 Port Road 5 and 333 Port Road 6 in Stockton, California. Neither location is within 1,000 feet of any K-12 school, nor do they trigger a school notice pursuant to California Health and Safety Code Section 42301.6.

III. STATEMENT OF FINDINGS

CEQA requires the District, as a responsible agency, to meet the following standard in making its findings under CEQA Guidelines §15096(h):

A responsible agency must make one or more of three findings pursuant to CEQA Guidelines §15091(a).

(1) Changes have been incorporated in the project to avoid or substantially lessen the identified significant environmental effect.

(2) The changes are within the jurisdiction of another agency and the changes have been or should be adopted by that other agency.

(3) Specific economic, legal, social, technological or other considerations, including provisions of employment opportunities for highly trained workers, make infeasible the mitigation measures or project alternatives identified in the final EIR.

These findings must be explained and supported by substantial evidence in the record.

Pursuant to CEQA Guidelines 15091(a), the District has considered the Final EIR certified by the Port of Stockton on August 6, 2007 for the Inland Cold Storage Stockton Lease Approval project. The District finds that the EIR adequately characterizes the project's potential impact on the environment and that mitigation measures were incorporated into the project that would reduce the potentially significant adverse air quality impacts. Additionally, the District has prepared an Authority to Construct Application Review (Project No. N-1062096) incorporated herein by reference and has determined that compliance with District rules and required mitigation measures will reduce project specific stationary source emissions to less than significant levels.

The following sets forth the District's findings for significant adverse impacts to air quality identified in the EIR. The findings are supported by substantial evidence in the record as explained in each finding.

POTENTIAL AIR QUALITY IMPACTS WHICH CANNOT BE MITIGATED TO A LEVEL OF LESS THAN SIGNIFICANT

1. The increase in emissions of criteria air pollutants from truck traffic, maritime activity, and area sources (mobile sources) as a result of the project would be significant and unavoidable.

Finding: The District makes the following findings with respect to this impact:

The District finds that impacts from mobile source emissions are within the jurisdiction of the California Air Resources Board (ARB).

Explanation: The District has statutory authority for regulating stationary source emissions and, as indicated in the District's engineering evaluation, has imposed permit conditions and required mitigation measures to reduce stationary source emissions to levels below the District's significance thresholds. The ARB, not the District, sets and enforces emission standards for motor vehicles.

POTENTIAL AIR QUALITY IMPACTS WHICH CAN BE MITIGATED TO A LEVEL OF LESS THAN SIGNIFICANT

1. Operational (stationary source) emissions of criteria pollutants will be less than significant.

Finding: The District makes the following findings with respect to this impact:

The District has prepared an Authority to Construct Application Review (N-1062096) incorporated herein by reference and has determined that compliance with District rules and required mitigation measures will reduce project specific stationary source emissions to less than significant levels.

Explanation: The District is a Responsible Agency for the project because of its discretionary approval power over the project via its Permits Rule (Rule 2010) and New Source Review Rule (Rule 2201), (CEQA Guidelines §15381). Rule 2010 requires operators of emission sources to obtain an Authority to Construct (ATC) and Permit to Operate (PTO) from the District. Rule 2201 requires that new and modified stationary sources of emissions mitigate their emissions using best available control technology (BACT). If after applying BACT, the project's emissions still equal or exceed New Source Review offset thresholds, the applicant is required to mitigate the project's emissions to below the significance threshold using Emission Reduction Credits (ERCs). The District has imposed permit conditions requiring the applicant to meet BACT. Thus, the District concludes that through project design elements and permit conditions, project specific stationary source emissions will be reduced and mitigated to less than significant levels.

IV. MITIGATION MONITORING PLAN

CEQA requires an agency to prepare a plan for reporting and monitoring compliance with and implementation of measures to mitigate significant environmental impacts. Mitigation monitoring requirements are included in CEQA Guidelines §15097 which specifically state:

When making findings as required by subdivision (a) of Public Resources Code §21081 or when adopting a Negative Declaration pursuant to Paragraph (2) of subdivision (c) of Public Resources Code §21080, the public agency shall adopt a reporting or monitoring program for the changes to the project which it has adopted or made a condition of project approval in order to mitigate or avoid significant effects on the environment. The reporting or monitoring program shall be designed to ensure compliance during project implementation. For those changes which have been required or incorporated into the project at the request of an agency having jurisdiction by law over natural resources affected by the project, that agency shall, if so requested by the lead or responsible agency, prepare and submit a proposed reporting or monitoring program.

The provisions of CEQA Guidelines §15097 are triggered when the lead agency certifies a CEQA document in which mitigation measures, changes, or alterations have been required or incorporated into the project to avoid or lessen the significance of adverse impacts identified in the CEQA document.

Mitigation Monitoring and Reporting Requirements

Monitoring and reporting requirements will be required as permit conditions of the ATC and the PTO for emission reduction measures for which the District has statutory authority. The District will inspect the facility for compliance with District regulations and permit conditions, as appropriate.

V. CONCLUSION

The District has reviewed the EIR developed by the Port of Stockton and finds it to be adequate. The District has determined that changes or alterations have been incorporated into the project to mitigate or minimize the potentially significant adverse impacts on air quality during operation. The District will issue the ATC and file a Notice of Determination with San Joaquin County. The District will issue the PTO after completion and inspection of the facility to ensure that it is in compliance with all permit conditions.

Arnaud Marjollet
Permit Services Manager

Date

Appendix D

Summary of Regulations and Advisories for Methyl Bromide

7. REGULATIONS AND ADVISORIES

TABLE 7-1. Regulations and Guidelines Applicable to Bromomethane

Agency	Description	Information	References
INTERNATIONAL			
IARC	Carcinogenic classification	Group 3[a]	IARC 1987
NATIONAL			
Regulations:			
a. Air:			
OSHA	PEL TWA	5 ppm (20 mg/m^3), skin	OSHA 1989 (29 CFR 1910.1000) Table Z-1-A
b. Water:			
EPA ODW	Monitoring requirements for unregulated contaminants	Yes	EPA 1987b (40 CFR 142)
EPA OWRS	General permits under NPDES	Yes	40 CFR 122, Appendix D, Table II
	General Pretreatment Regulations for Existing and New Sources of Pollution	Yes	40 CFR 403
	Hazardous substance	Yes	40 CFR 116
	Reportable quantity	1,000 pounds	40 CFR 117.3
c. Food:			
EPA OPP	Tolerances for residues of inorganic bromides resulting from fumigation with methyl bromide in or on raw agricultural commodities	5-240 ppm	40 CFR 180.123
	Tolerances for residues of inorganic bromide resulting from soil treatment with combinations of chloropicrin, methyl bromide and propargyl bromide	25-300 ppm	40 CFR 180.199
FDA	Tolerances of inorganic bromide in processed food as a result of fumigation with methyl bromide	125-400 ppm	21 CFR 193.250
	Tolerances for residues of inorganic bromide from fumigation with methyl bromide on cereal grains and processed grains used in production of fermented malt beverages	125 ppm	21 CFR 193.225, 193.230
d. Other:			
EPA OERR	Reportable quantity	1,000 pounds	EPA 1989a,b 40 CFR 302.4)
	Extremely Hazardous Substance Threshold Planning Quantity	1,000 pounds	EPA 1987a (40 CFR 355)
EPA OPP	Restricted use pesticide	Yes	40 CFR 162.31

7. REGULATIONS AND ADVISORIES

TABLE 7-1 (Continued)

Agency	Description	Information	References
NATIONAL (Cont.)			
EPA OSW	Hazardous Waste Constituent (Appendix VIII)	Yes	EPA 1980b (40 CFR 261)
	Groundwater monitoring list (Appendix IX)	Yes	EPA 1987c (40 CFR 264)
	Land disposal restrictions	Yes	EPA 1987d, 1988b (40 CFR 268)
EPA OTS	Toxic chemical release reporting rule	Yes	EPA 1988a (40 CFR 372)
	Health and safety data reporting rule	Yes	EPA 1988c (40 CFR 716.120)
Guidelines:			
a. Air:			
ACGIH	TLV TWA	5 ppm (19 mg/m^3)	ACGIH 1991
NIOSH	IDLH	2,000 ppm	NIOSH 1990
	REL	carcinogen; lowest feasible concentration	
b. Water:			
EPA OWRS	Ambient Water Quality Criteria		EPA 1980a
	Ingesting water and organisms:	1.9×10^{-4} mg/L^b	
	Ingesting organisms only:	1.57×10^{-2} mg/L^b	
	For noncarcinogenic effects	1.4 mg/L	
c. Other:			
EPA	Carcinogenic Classification	Group D^c	EPA 1989c,
	Oral RfD	1.4×10^{-3} mg/kg/day	IRIS 1989
STATE			
Regulations and Guidelines:			
a. Air:	Acceptable ambient air concentrations		NATICH 1989
Connecticut		400 $\mu g/m^3$ (8 hr)	
Kansas		47.6 $\mu g/m^3$ (annual)	
Massachusetts		2.6 $\mu g/m^3$ (24 hr)	
Nevada		0.476 mg/m^3 (8 hr)	
North Dakota		0.20 mg/m^3 (8 hr)	
Pennsylvania (Philadelphia)		480 $\mu g/m^3$ (1 yr)	
South Carolina		100 $\mu g/m^3$ (24 hr)	
Vermont		0.01 $\mu g/m^3$ (annual)	
Virginia		350 $\mu g/m^3$ (24 hr)	
b. Water:	Drinking water quality standards		FSTRAC 1988
Arizona		2.5 $\mu g/L$	
Kansas		0.19 $\mu g/L$	
Massachusetts		0.01 mg/L	ORS 1989

[a]Group 3: Not classifiable as to carcinogenic potential.
[b]Values for incremental lifetime cancer risk of 10^{-6} for halomethanes as a class based on carcinogenicity of chloroform.
[c]Group D: Not classifiable as to human carcinogenicity.

ACGIH = American Conference of Governmental Industrial Hygienists; EPA = Environmental Protection Agency; FDA = Food and Drug Administration; IARC = International Agency for Research on Cancer; IDLH = Immediately Dangerous to Life or Health Level; NIOSH = National Institute for Occupational Safety and Health; NPDES = National Pollutant Discharge Elimination System; ODW = Office of Drinking Water; OERR = Office of Emergency and Remedial Response; OPP = Office of Pesticide Products; OSHA = Occupational Safety and Health Administration; OSW = Office of Solid Wastes; OTS = Office of Toxic Substances; OWRS = Office of Water Regulations and Standards; PEL = Permissible Exposure Limit; REL = recommended exposure limit; RfD = reference dose; TLV = Threshold Limit Value; TWA = Time-Weighted Average

Reference:

ATSDR, 1992. Toxicological Profile for Bromomethane. Agency for Toxic Substances and Disease Registry, US Public Health Service. September 1992.

Appendix E

Excerpts from APHIS Treatment Manual (16 April 2015) and China Protocol

China Protocol

Section 2-4-1: Fumigants – Methyl Bromide – Tarpaulin Fumigation

Section 2-9-1: Fumigants – Methyl Bromide – Closed Door Container Fumigation

Jul.24. 2009 10:44AM USDA APHIS NORFOLK 757-441-3646 No.3660 P. 1

EXCERPT - General Information

CHINA

LAST UPDATED: July 22, 2009
RESTRICTED PRODUCTS ----------

LOGS ----topic----
(Hardwood and Softwood)

- With bark (**NOTE:** For specific Genus see Product Requirements)

  Phytosanitary certificate (PC) and import permit (IP) required.

  Logs must be treated with:

  - Methyl bromide for wood borers under one of the following schedules:

MB at NAP - Tarpaulin or Chamber					
Temperature	Dose lb/1000Ft³	Concentration 0.5 hours	After 2 hours	Reading 4hours	At: 16 hours
41-59 F	7.5	80	70	60	42
60 F or above	5	60	51	46	42

  OR,

  - Sulfuryl Fluoride under one of the following schedules:

    5 C - 10 C 104g/m3 for 24hrs OR 10 C or above 80g/m3 for 20hrs

    OR,

  - Heat Treatment at 71 C for 75 minutes (log core temp)

    Treatment must be listed on the PC in the treatment section.

2

Treatment Manual

Chemical Treatments

Fumigants • Methyl Bromide • Tarpaulin Fumigation

Contents

Methods and Procedures

The procedures covered in this section provide PPQ officials and commercial fumigators with the methods, responsibilities, and precautions for tarpaulin fumigation.

Materials Needed

PPQ Official Provides

PPQ must provide the equipment in the following bulleted list at PPQ Plant Inspection Stations that have chambers or any fumigation site owned and operated by PPQ.

Effective March 01, 2012, commercial fumigators must provide colorimetric tubes and APHIS-approved gas detection devices. All monitoring equipment must be approved and calibrated in accordance with the guidance in this manual.

Contact your regional treatment program manager for more information.

- Calculator (optional)
- Colorimetric tubes (Refer to *Gas Detector Tube (colorimetric) and Apparatus* ***on page H-1-32*** for a list of APHIS-approved product ranges)
- Desiccant (Drierite®)
- Forms (PPQ Form 429 and APHIS Form 2061 if necessary)
- APHIS-approved leak detection device
- Self-contained breathing apparatus (SCBA) or supplied air respirator to be used by PPQ official
- Tape measure (as back-up for fumigator)
- APHIS-approved gas detection device[1] [2]
- Thermometer (as back-up for fumigator)

Fumigator Provides

- APHIS-approved gas detection device[1] [2]
- Auxiliary pump for purging long gas sample tubes
- Carbon dioxide filter (Ascarite®)
- Colorimetric tubes (Refer to *Gas Detector Tube (colorimetric) and Apparatus* ***on page H-1-32*** for a list of APHIS-approved product ranges)
- Desiccant (Drierite®)
- Electrical wiring (grounded, permanent type), three prong extension cords
- Exhaust blower and ducts

1 If fumigating oak logs or lumber, the unit must be capable of reading 400 oz.
2 Gas detection device must be calibrated annually. Contact the USDA-APHIS-PPQ-S&T-CPHST-AQI (919-855-7450) in Raleigh, North Carolina, for calibration information.

- Fans (circulation, exhaust, and introduction)
- Framework and supports
- Gas introduction line
- Gas sampling tubes (leads)
- Heat supply
- Insecticides and spray equipment
- Loose sand
- Measuring Tape
- Methyl bromide
- Padding
- Sand or water snakes or adhesive sealer
- Scales or dispensers[3]
- Self-contained breathing apparatus (SCBA) or supplied air respirator
- Tape
- Tape measure
- Tarpaulin and supports
- Temperature recorder
- Thermocouples (maximum number of 12)
- Thermometer
- Volatilizer
- Warning signs

Preparing to Fumigate

Step 1—Selecting a Treatment Schedule

Select a treatment schedule to effectively eliminate the plant pest without damaging the commodity being fumigated.

Turn to the Treatment Schedule Index and look up the available treatment schedule(s) by commodity (example—apples, pears, or citrus) or by pest (e.g., Mediterranean fruit fly). Some commodities may have several treatment

3 All scales must be calibrated by the State, a company that is certified to conduct scale calibrations, or by the fumigator under the supervision of PPQ. The source and date of calibration must be posted in a visible location on or with the scale at all times. The scale must be calibrated a minimum of every six months.

schedules. Refer to Residual Effect on **page 2-3-7** for a list of those commodities which may be damaged by MB. Each treatment schedule lists the target pest or pest group (e.g., *Ceratitis capitata*, surface feeders, wood borers...), commodity, or both pest and commodity. If there is no schedule, the commodity may **not** be fumigated. Refer to ***Figure 2-3-1*** on **page 2-3-3** to determine if a schedule is available under a FIFRA Section 18 Exemption. If a treatment is required, go to **Table 2-4-1**.

If a treatment is required:	Then:
As a result of a pest interception	GO to Step 2
As a condition of entry	GO to Step 3

Table 2-4-1 Determine Reporting Requirements

Step 2—Issuing a PPQ Form 523 (Emergency Action Notification)

When an intercepted pest is identified and confirmed by a PPQ Area Identifier as requiring action, issue a PPQ Form 523 (Emergency Action Notification - EAN) to the owner, broker, or representative. Be sure to list all treatment options when completing the PPQ Form 523. Follow instructions in Appendix A for completing and distributing the PPQ Form 523.

Step 3—Determining Section 18 Exemptions and Sampling Requirements

After selecting the treatment schedule, you will be able to determine which treatment schedules are FIFRA Section 18 Exemptions. The schedule will be followed by an “IMPORTANT” note to help you determine the current exemption status. Some treatment schedules are only FIFRA Section 18 Exemptions at specific temperature ranges. Check the treatment schedule and temperature to determine if the fumigation will be a FIFRA Section 18 Exemption.

Residue monitoring by taking samples of the commodity prior to the start of the fumigation and after aeration is no longer required.

Step 4—Selecting a Fumigation Site

Consider the following factors in selecting a fumigation site:

- Well-ventilated, sheltered area
- Ability to heat area (in colder areas)
- Impervious surface
- Nonwork area that can be effectively marked and safeguarded or isolated
- Electrical power supply
- Water supply

- Well-lighted area
- Aeration requirements

Well-Ventilated, Sheltered Area

Select sites that are well-ventilated and in a sheltered area. A well-ventilated site is required for exhausting gas before and when the tarpaulin is removed from the stack. Most piers and warehouses have high ceilings and a number of windows/doors which can be used for ventilation. Some gas will escape from the tarpaulin even in the best conditions. Avoid areas where strong drafts are likely to occur.

In warehouses, an exhaust system must be provided to exhaust MB to the outside of the building. Ensure that the exhausted gas does not reenter the building nor endanger people working outdoors.

When treatments are conducted in a particular location on a regular basis, a permanent site should be designated. At such sites, the fan used to remove the fumigant from the enclosure during aeration must be connected to a permanent stack extending above the roof level.

If fumigations are conducted outside, select a site that is semi-sheltered such as the leeward side of a warehouse, pier, or building that offers some protection from severe winds. Severe winds are defined as sustained winds or gusts of 30 m.p.h. or higher for any time period. Do not conduct outdoor fumigations if there is a forecast from the National Weather Service of severe winds and/or thunderstorms at the beginning of or for the entire length of the fumigation.

Ability to Heat Area

When cooler temperatures (below 40 °F) are expected, the site must be heated to maintain commodity temperatures above 40 °F. Take the ambient temperature 12 inches above the floor. For treatments lasting 6 hours or longer, temperatures must be maintained at or above the starting treatment temperature for the entire duration of the treatment. Additionally, the temperature of the enclosure must be monitored using temperature thermocouples and a temperature recorder. The thermocouples must be evenly placed throughout the enclosure or container. The placement of the thermocouples will vary depending on the item fumigated and the configuration of the fumigation site. Contact CPHST-AQI for instructions regarding exact placement of the thermocouples. Use **Table 2-4-2** to determine the number of thermocouples needed based on size of the enclosure:

Size of Enclosure	Number of Thermocouples
Up to 10,000 ft^3	3
10,001 - 25,000 ft^3	6
25,001 - 55,000 ft^3	9
Larger than 55,000	12

Table 2-4-2 Number of Thermocouples

NOTICE

Do **not** use flame or exposed electrical element heaters under the tarpaulin during treatment because MB may cause the formation of hydrogen bromide. Hydrogen bromide (hydrobromic acid) is a highly corrosive chemical which can cause damage to the heater and to surrounding materials including the commodity. Hot air or radiator type heaters can be used for heating under tarpaulins. When using space heaters to heat warehouses, there must be adequate ventilation.

Impervious Surface

Select an asphalt, concrete, or tight wooden surface—**not** soil, gravel, or other porous material. If you must fumigate on a porous surface, cover the surface with plastic tarpaulins. For large fumigations, covering the surface is **not** usually practical because pallets must be rearranged and heavy equipment used to move the commodity. On docks, wharfs, and piers, check for cracks, holes, and manhole covers which will allow the MB to escape through the floor. Have all cracks, holes, and manhole covers sealed.

Nonwork Area

Select a secure area where traffic and people are restricted from entering and which is isolated from people working. You want a nonwork area to help prevent accidents such as a forklift piercing a tarpaulin and for other safety reasons. Consider either the entire structure area or an area which extends 30 feet from the tarpaulin and is separated by a physical barrier such as ropes, barricades, or walls as the fumigation area. If a wall of gas-impervious material is less than 30 feet from the tarpaulin, the wall may serve as the edge of the secured area. Some states, for example California, require a 100 foot buffer zone. Place placards clearly in sight of all who come near. Placards must meet label requirements regarding specific warnings, information, and language. Placards generally include the name of the fumigant, the fumigation date, time, and the name of the company conducting the fumigation. Restrict access to the fumigation area to the fumigator's employees and PPQ employees monitoring the treatment. Use rope or marker tape to limit access within 30 feet of the enclosure. Do **not** allow motor vehicles (includes forklifts) to operate within 30 feet of the enclosure during the fumigation and aeration periods. The area outside the 30-foot perimeter is usually regarded as a safe distance from the tarpaulin. Gas concentrations exceeding 5.0 ppm (TLV for MB) are seldom recorded by gas monitoring, except during aeration. PPQ officials that work within the 30-foot perimeter must wear (and use) respiratory protection (SCBA), unless the gas levels are safe to breath and validated as safe by gas monitoring. The 30-foot perimeter is **not** specifically mentioned on the MB label, but is required for PPQ officials. When space is tight, it is permissible to overlap two adjoining 30-foot perimeters. However, there must be sufficient space for a person wearing SCBA to walk between the tarpaulins.

Electrical Power Supply

An adequate electrical source must be available to run the circulation fans and the gas detection device. A separate line should be available for the gas detection device. Electrical outlets must be ground and conveniently located in relation to the fumigation area. Generators may be used as a power source *only* under emergency conditions.

Water Supply

A water supply is necessary for safety purposes. Water is necessary for washing off MB if the liquid form is spilled on someone. Water is also used to fill the volatilizer. If no permanent water is present on site, the fumigator must provide a portable, 5-gallon supply of clean water.

Well-Lighted Areas

The area should have adequate lighting for safety purposes and for ease in reading gas concentration, thermometers, and for determining whether a tarpaulin has holes or tears.

Aeration Requirements

Assuming that you've already restricted access and secured the fumigation area, you now must restrict access to the area where the exhaust duct extends beyond the enclosure. Before you start a fumigation, make sure the exhaust duct is located in a safe place.

During the first 10 minutes of aeration, there should be no people within 200 feet down wind of the exhaust duct outlet. If the exhaust duct is **not** used, then the requirement for a 200 foot down-wind buffer zone does **not** necessarily apply. However, personnel in the immediate area should be aware that a release of fumigant gas is about to take place and given the option of wearing SCBA if they choose to continue working in the area. If it is impossible to restrict people from the area of aeration during regular work hours, consider aeration during another time of the day. When securing the duct outlet area, consider the direction of the wind. Face the duct outlet toward an open area, and away from people. Point the duct outlet upward to aid in dispersing the exhausted gas.

After the first 10 minutes of aeration, if an exhaust duct is **not** used, then a perimeter of 30 feet or more from the stack is usually regarded as a safe distance for personnel. However, for personal safety, gas levels should occasionally be monitored at greater distances, especially downwind. Experience provides the best guide.

Step 5—Arranging the Stack

Break Bulk Cargo

Have the cargo arranged in a square or rectangular shape, if possible, to make it easy to cover and to calculate the volume of the stack. An even shaped stack is easy to tarp. The height of the stack should be uniform so dosage can be calculated accurately. For loose cargo, the tarpaulin should be 2 feet above the load and one foot from the sides and ends. Unless specified in the treatment schedule, cargo should **not** exceed two-thirds of the volume of the area to be

fumigated. The maximum size for an enclosure is 25,000 ft^3. Contact the USDA-APHIS-PPQ-S&T-CPHST-AQI in Raleigh, North Carolina, to get approval for any enclosures larger than 25,000 ft^3. For very large enclosures, it may be necessary to:

- Install extra circulation fans
- Add more sampling leads
- Introduce the fumigant at several sites, using multiple volatilizer
- Run the circulation fans longer than just the first 30 minutes, if the difference between the highest and lowest gas concentration readings exceeds 4 ounces

Once CPHST-AQI has approved the site and enclosure, it does **not** require additional approvals for subsequent fumigations. The commodity should be on pallets to permit air movement along the floor and between the cargo. Allow an inch or more of space between pallets. By arranging the stack evenly and with space between pallets or cartons, the fumigant will be effectively distributed and dosage calculation should be easier and more accurate. Dosages are easier to calculate when the dimensions are uniform.

When the fumigation involves multiple stacks, allow 10 feet of space between each uncovered stack. After the stack is tarped, there should be approximately 5 feet between enclosures.

Containerized Cargo

Place no more than eight containers that are 20 to 40 feet in length under a single tarpaulin. APHIS recommends that containers **not** be stacked. Stacking may create too great a safety risk to the person placing the tarp, fans, and gas monitoring leads. If fumigating multiple containers in a single row, have all the rear doors opening on the same side. If multiple containers are placed in two rows, then have all the doors opening on a center aisle toward each other (see ***Figure 2-4-1*** on **page 2-4-9**). The aisle must be at least 3 feet wide. The aisle must be at least 3 feet wide. All doors should be completely open, if possible.

However, APHIS will allow fumigation of containerized cargo with one door open on each container using a configuration such as the one shown in ***Figure 2-4-2*** on **page 2-4-10**, or in a single row of eight containers. Gas should be introduced at both ends of this long row configuration, either at the same time or half at one end and half at the other end. In any case, the single open door on each container must be kept from closing during the fumigation, either taped or blocked open.

CAUTION

APHIS recommends that perishable commodities be fumigated outside their containers. Because it is difficult to aerate the container, the commodity may be damaged by the fumigant if left in the container. Therefore, it is best to remove perishable commodities from their containers before fumigation. When a commodity is removed from the container, spray the emptied container according to **T402-d** as a precaution against leaving the container contaminated with live pests. Pests such as hitchhikers may not remain with the commodity.

However, because of the cost of devanning the commodity most importers choose to have their commodity fumigated inside the container.

Due to safety considerations, containers to be fumigated should **not** be stacked. Also, to conserve methyl bromide use, CPHST-AQI recommends that containers be removed from their chassis prior to fumigation. (If this is not done, then the space beneath the container must be calculated as part of the total volume being fumigated.

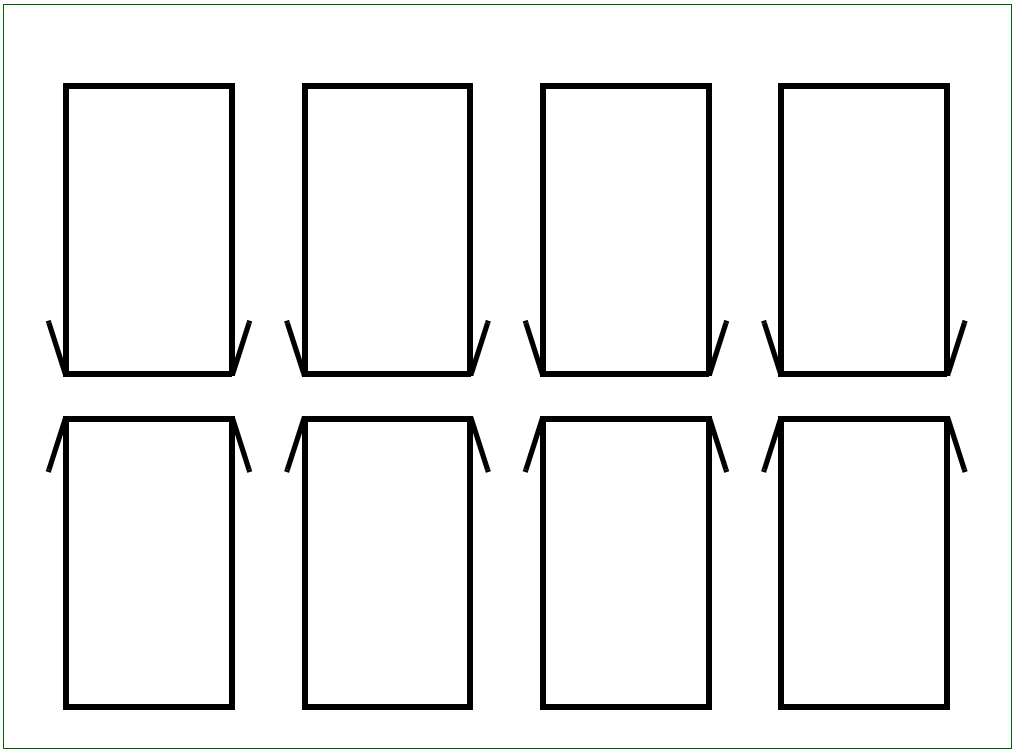

Figure 2-4-1 Container Arrangement in Two Rows

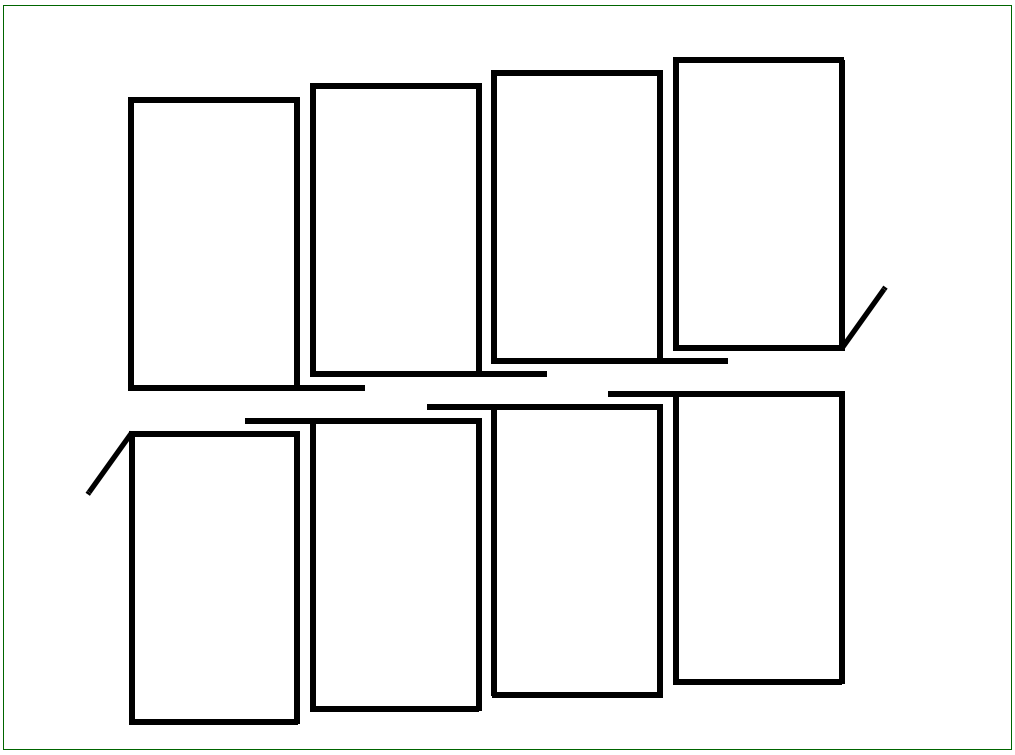

Figure 2-4-2 Container Arrangement in Two Rows

If fumigating multiple containers in a single row, the rear doors should all open on the same side of the stack. If containers are parked parallel to one another and close together, it is permissible to open only the door on the right side of each container, overlapping and taped to the closed left door of the container adjacent to it. In such circumstances, however, one must have a fan positioned high, blowing into the open door of each container, to assure uniform fumigant distribution. If containers are not parked closely together, all doors must be completely open.

Containers should ordinarily not be loaded beyond 80 percent of their capacity. Bulk commodities must be placed in boxes or containers on pallets. The pallets must be loaded in the container so that there is at least two inches of space under the commodity and between each pallet. A space of 20 percent (18 inches) should be provided above the commodity. This facilitates uniform gas distribution and allows a crawl space for placing the gas monitoring leads and fans. (Some restacking of cargo may be necessary to meet this requirement.) If the container is tarped, no additional head space is required between the roof of the container and the tarp, unless the pest is found on the outside of the container.

Gas Penetration and Distribution

MB will penetrate most cargo easily. When fumigating finely milled products (such as flour, cottonseed meal, and baled commodities), provide space every 5 feet in any direction. Penetration is enhanced by the availability of free MB.

Some of the more common types of impermeable materials are cellophane, plastic, wax coated materials, laminated, and waterproofed papers. Tight wooden packing cases are also relatively gas tight. Impermeable materials will allow some gas to penetrate, but make it difficult to aerate and evacuate the gas. Remove, perforate, or open all impermeable materials.

For impermeable wrappers or containers, open the entire top or side and place the package with the open portion on the side.

Step 6—Arranging and Operating Fans

Break Bulk Cargo

Use fans which have the capacity to move a volume in cubic feet per minute equivalent to the total volume of the enclosure. For a 5,000 ft^3 enclosure, use two axial-type (blade) fans of approximately 2,500 cfm. Place one fan on the floor at the rear of the stack facing the front and the other fan at the top front (where the gas is introduced) facing the rear. For enclosures from 5,000 to 7,500 ft^3, add a third fan near the upper middle facing the rear. For enclosures from 7,501 to 10,000 ft^3, add a fourth fan on the floor near the middle facing the front. Enclosures from 10,001 to 25,000 ft^3 may require up to seven fans to provide adequate gas circulation. Enclosures larger than 25,000 ft^3 require approval from the CPHST-AQI in Raleigh, North Carolina.

Turn on all fans to make sure they work. Operate fans during gas introduction and for 30 minutes after the gas is introduced. If after taking gas concentration readings the fumigant is **not** evenly distributed, run the fans until the gas is evenly distributed as indicated by concentration readings (within 4 oz. of each other). Operate fans when adding gas, but only long enough to get even gas distribution.

Containerized Cargo

Use an appropriate number of fans which have the capacity to move the equivalent cubic feet per minute of the total volume of the enclosure. In addition, place one additional fan of at least 2,500 cfm at the top of the load (near door) of each container facing the opposite end of the container.

Place air introduction ducts, for aeration, into the far ends of each container. Also, place exhaust ducts on the ground in front of the end doors of the containers. Place the end of the ducts near the edge of the tarpaulin so they can be pulled under the tarpaulin when aeration begins.

Step 7—Placing the Gas Introduction Lines

MB is converted from a liquid into a gas by a volatilizer. The line that runs from the MB cylinder into the volatilizer must be 3000 PSI hydraulic high pressure hose with a 3/8 inch interior diameter (ID) or larger. From the volatilizer, MB gas is introduced into the structure by means of a gas introduction line. The gas introduction line must be a minimum of 350 PSI with a 1/2 inch ID or larger.

Break Bulk Cargo

Place the gas introduction line directly above the upper front fan. Attach the line to the top of the fan to prevent movement of the hose. An unsecured introduction line could tear the tarpaulin, move the line, or direct it out of the airflow. The fan should be firmly attached to the cargo or have a base that prevents it from toppling (not a pedestal type). Place a piece of impermeable sheeting (example—plastic or rubberized canvas) over the commodity below and to the front of each gas supply line. The sheet will prevent any liquid MB from coming in contact with the cargo.

Containerized Cargo

The number and placement of gas introduction lines will depend upon the number and arrangement of containers to be fumigated.

For single containers, place the introduction line directly above the fan near the rear door of the container.

For multiple containers, place the introduction line near the door end of the containers, but aimed across the open doors rather than directly into one container.

If you are fumigating four or more containers under one tarpaulin, then use two gas introduction lines.

Step 8—Placing the Gas Sampling Tubes

Break Bulk Cargo

Place a minimum of three gas sampling tubes for fumigations up to 10,000 ft^3. Position the gas sampling tubes in the following locations (see **Figure 2-4-3**):

- Front low—front of the load, 3 inches above the floor
- Middle center—center of the load, midway from bottom to top of load
- Rear high—rear of the load, at the extreme top of the load

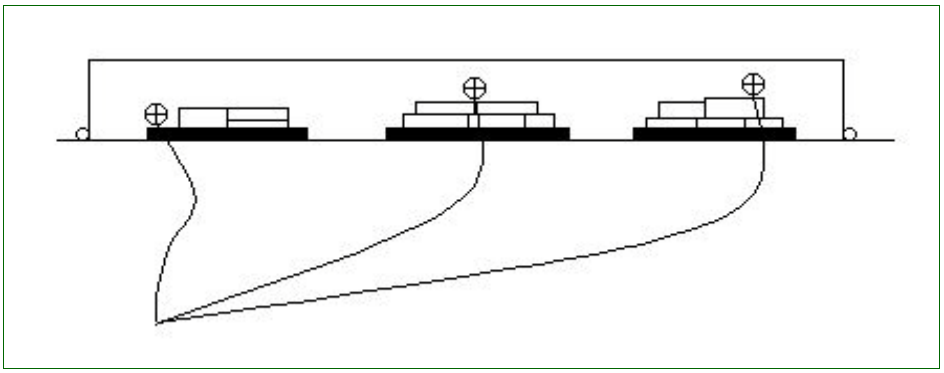

Figure 2-4-3 Gas Lead Position (Side View)

For fumigations from 10,001 to 25,000 ft^3, use six gas sampling tubes. Position the gas sampling tubes in the following locations:

- Front low—front of the load, 3 inches above the floor
- Upper front quarter section
- Middle center—center of the stack, midway from bottom to top
- Upper rear quarter section
- Lower rear quarter section
- Rear high—rear of the stack, at the extreme top

Contact CPHST-AQI in Raleigh, North Carolina, for approval of fumigations larger than 25,000 ft^3, for instructions for number of gas sampling tubes, and for other technical information.

Important

For khapra beetle cargo containing baled, packaged, finely milled, or closely packed commodities, place two additional gas sampling tubes in the center of the bags, packages, or bales. Before placing gas sampling tubes in commodities, place burlap over the end of the tube and secure the burlap to the tube with tape.

Containerized Cargo

For multiple containers (either 20 or 40 feet in length) under the same tarpaulin, use at least three tubes per container. Also, for single containers, use at least three tubes, and for khapra beetle infestations, use two additional tubes. Position the gas sampling tubes as follows:

- Front low—near the floor at the door end of the container
- Rear high—rear of the load at the high end opposite the fan
- Middle center—mid way from front to back, at mid depth

If treating commodities for khapra beetle, you will need the following additional gas sampling tubes:

- High (in the commodity)
- Low (in the commodity)

Cover the end of the gas sampling tube with burlap taped to the tube before insertion into the commodity.

Break Bulk and Containerized Cargo

Use gas sampling tubes of sufficient length to extend from the sampling position inside the enclosure to at least 30 feet beyond the tarpaulin. Have all the gas sampling tubes meet in one area for ease and safety in taking gas concentration readings. Do **not** splice gas sampling tubes. Before starting the fumigation, check for gas sampling tube blockage or pinching by connecting each tube to the gas detection device for a short time. If the tube is blocked, the flow to the device will drop sharply. Replace any defective gas sampling tubes.

Fix all gas sampling tubes securely in place under the tarpaulin and label each one at the end where the gas concentration readings will be taken. By labeling each gas sampling tube, you will be able to record concentration readings easily.

Step 9—Padding Corners

Look for corners and sharp angles which could tear the tarpaulin. Never use commodity to support the tarpaulin. If the sharp angles or corners cannot be eliminated, they must be covered with burlap or other suitable padding (e.g., old tires or cloth) (see ***Figure 2-4-4*** on **page 2-4-14**).

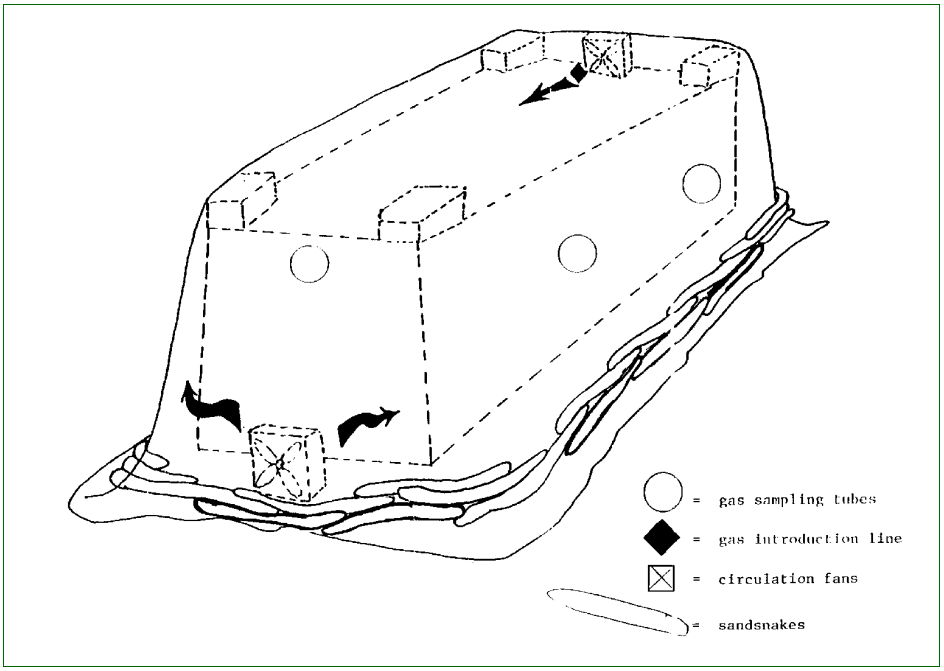

Figure 2-4-4 Typical Stack Arrangement with Fans, Leads, Introduction Line, Padding, and Sand Snakes

Step 10—Measuring the Temperatures

Important

Regardless of the commodity, never fumigate at temperatures below 40 °F.

Temperature recordings should be rounded to the nearest tenth of a degree (°C or °F)

Depending on whether or not you are fumigating a pulpy fruit or vegetable, you may use **either** the commodity temperature **or** an average of the commodity and air temperatures. A pulpy fruit or vegetable can support internal feeding insects, is fleshy and moist, and can be probed with a temperature measuring device. Examples include, but are not limited to peppers, onions, and grapes.

Determine the temperature to use in selecting the proper dosage rate:

- For pulpy fruits, pulpy vegetables, or logs use only the commodity temperature.
- For all other commodities use **Table 2-4-3** to determine the temperature for the proper dosage rate.

To take the temperature readings, use a calibrated bimetallic, mercury, or digital long-stem thermometer. Use **Table 2-4-3** to determine which temperature to use when selecting the proper dosage rate for commodities other than fresh fruits, vegetables, or logs.

NOTICE

The presence of ice indicates temperatures below 40 °F. If ice is present anywhere in the box, pallet, or fumigation enclosure, DO **NOT** fumigate the commodity.

Table 2-4-3 Determine Whether to Use Commodity or Air Temperature for Determining Dosage Rate

If the air temperature is:	And:	Then, for commodities other than pulpy fruits, pulpy vegetables, or logs and lumber:
Higher than the commodity temperature	→	Use the single lowest commodity temperature for determining the dosage rate (Do **not** use the average commodity temperature).
Lower than the commodity temperature	By 9 degrees or less	
	By 10 degrees or more	Use the average of the single lowest air and commodity temperatures for determining the dosage rate (Never initiate a fumigation if any commodity temperature reads lower than 40 °F.)

EXAMPLE: You are about to fumigate guar gum and the commodity temperature is 82 °F and the air temperature is 69 °F. Average the air and commodity temperatures to determine the dosage rate because the air is 13 degrees lower than the commodity temperature. The average of the two temperatures is 75.5 °F. Use 75 °F to determine the dosage rate.

Pulpy Fruits and Pulpy Vegetables

A pulpy fruit or vegetable can support internal feeding insects, is fleshy and moist, and can be probed with a temperature measuring device. Examples include, but are not limited to peppers, onions, and grapes.

For pulpy fruits and pulpy vegetables, insert the thermometer into the pulp. For commodities which have been refrigerated, probe the fruit that have the lowest pulp temperature. Again, fumigate only when the fruit pulp is at 40 °F or higher.


Important

Fresh fruits and vegetables that require fumigation treatment as a condition of entry, must meet the minimum temperature requirement of 40 °F (4.4 °C), at the time of discharge. This may require the gradual warming of the shipment over the later course of the voyage to ensure that the commodity achieves the proper minimum temperature of 40 °F (4.4 °C).

This process will facilitate whether or not the fumigation treatment of the cargo takes place on the same day of arrival.

However, if the commodity has no pulp (for example, peas, beans, grains, herbs, spices, etc.), take the temperature of the air space immediately surrounding the commodity as well as the commodity temperature. With these temperatures, use **Table 2-4-3** to determine the correct temperature for use when selecting the proper dosage rate.

Logs and Lumber

Select several representative locations within the stack at the ends of the logs or pieces of lumber and drill holes in them to accommodate a thermometer. After drilling, wait at least 10 minutes to allow the wood around the holes to cool. Insert the thermometer into the holes drilled. Record the temperature from each hole, and average the readings. All readings (not just the average) must be above 40 °F.

Take temperature readings in each hold. Base the dosage calculation on the lowest reading obtained. (Do **not** average temperatures.) All readings must be above 40 °F to initiate the fumigation. If not, you must postpone it.

Record the temperatures in Block 22 of the PPQ Form 429.

If using the electronic 429 database, record the temperatures in the space and commodity fields in the Treatment form.


Important

When the commodity and air temperature drastically differ, moisture may condense inside the gas sampling tubes or inside the gas detection device and cause inaccurate gas concentration readings. Check the gas sampling tubes frequently for possible puddling of condensed water, and drain it off, as needed, before taking a reading. Also, check the Drierite frequently, and change it as soon as it becomes saturated with water [turns pink], to obtain true gas concentration readings. Never fumigate commodities that are frozen.

Step 11—Covering the Stack

After covering the stack, check the tarpaulin for rips, tears, and holes. Look at the spots that have been taped, and verify they are properly sealed. Have the fumigator repair all holes.

The tarpaulin should be made of a material such as vinyl, polyethylene plastic, or coated nylon. 4 mil vinyl or polyethylene plastic tarpaulins are only approved for one usage; 6 mil vinyl or polyethylene plastic tarpaulins may be used up to four times with the PPQ official's approval for each usage; 10 to 12 mil rubber or plastic coated nylon tarpaulins may be approved for multiple use with the PPQ official's approval for each usage.

The fumigator should cover all corners and sharp ends with burlap or other padding to prevent the tarpaulin from ripping. Have the fumigator pull the tarpaulin over the stack, being careful not to catch or tear the tarpaulin. Make sure there is sufficient structural support to raise the tarpaulin 2 feet above and 1 foot beyond the sides of the commodity.

The tarpaulin must be large enough to provide a floor overlap of at least 18 inches around all sides of the stack. Carefully lay the tarpaulin out to prevent excess folds or wrinkles along the floor, especially around corners.

Important

Sealed containers and vans cannot be considered as "fumigation chambers," and therefore **must be covered by a tarpaulin**, unless they can pass the pressure-leakage test.

Step 12—Sealing the Tarpaulin

Sealing may be accomplished with loose, wet sand, sand snakes, water snakes, adhesives, or a combination. If there is danger of crushing or crimping the gas sampling or introduction tubes, use the loose, wet sand. If using snakes, use two rows of snakes along the sides and three rows on the corners. The snakes should overlap each other by approximately 1 foot. The goal in sealing the tarpaulin is to get the tarpaulin to lie flat against the floor to prevent gas from leaking out. When wind is not a factor, plastic tape may be used for sealing the tarp. The tape must be at least 2 inches in width, and applied (only to a smooth surface) with the aid of high-tack spray adhesive.

Seal corners by laying two sand snakes around the corner and working the tarpaulin until it is flat. Place a third snake on top of the two other snakes to provide additional weight to force the tarpaulin against the floor. Loose, wet sand can be used in the area where the gas introduction line, electrical cords, and gas sampling tubes extend from under the tarpaulin.

Step 13—Measuring the Volume

Using a 100-foot tape measure, carefully measure the length, width, and height of the enclosure. *Never* estimate the measurements. An error in measurement of as little as 12 inches can result in miscalculation of the dosage by as much as 15 percent. When measuring, round off to the nearest quarter foot (example—3 inches =.25 feet). In the case of fumigations of edible commodities, an error can result in an unacceptable level of residue on the

commodity. If the sides of the enclosure slope outward from top to bottom, measure both the top and bottom and average the two to determine the dimension. Enclosure height should always be uniform and not require adjustment.

Formula for determining volume:

Length × width × height = volume in cubic feet

EXAMPLE: A stack with measurements H=10′6″, L=42′3″, and W=10′9″ 10.50 × 42.25 × 10.75 = 4,768.9 ft^3 round to 4,769 ft^3

Record volume in Block 26 of the PPQ Form 429.

If using the electronic 429 database, record the length, width and height in the corresponding fields under the “AMT of Gas Introduced” heading on the Treatment form. The total volume of the enclosure will be calculated.

Step 14—Calculating the Dosage

Calculate dosage by doing the following:

1. Refer to the treatment schedule for the correct dosage rate (lbs./1,000 ft^3) based on temperature (°F) (Step 10).
2. Multiply by the dosage (lbs./1,000 ft^3) rate by the volume (ft^3) to get the dosage in pounds.
3. Rules for rounding. Round to nearest 1/4 pound.

Formula for calculating dosage:

$$\text{dosage (lbs.)} = \text{volume}(ft^3) \times \text{dosage rate (lbs./1,000 } ft^3)$$

$$= \frac{\text{volume}(ft^3) \times \text{dosage rate (lbs.)}}{1{,}000\ ft^3}$$

If using the electronic 429 database, enter the dosage rate in the “dosage” field and the total amount of gas required for the fumigation will be displayed in the “GAS REQUIRED” field.

EXAMPLE: You need to determine the dosage for a stack with a volume of 3,000 ft^3. For 72 °F (air and commodity temperatures), the treatment schedule lists the dosage rate at 2 pounds MB/1,000 ft^3. Determine dosage by doing the following:

1. Volume = 3,000 ft^3
2. Dosage rate = 2 lbs. MB/1,000 ft^3
3. Dosage (lbs.) = volume (ft^3) × dosage rate (lbs./1,000 ft^3)
   = 3,000 ft^3 × 2 lbs. MB/1,000 ft^3
   = $\frac{3{,}000\ ft^3 \times 2\ \text{lbs. MB}}{1{,}000\ ft^3}$

Step 15—Making a Final Check

Just prior to introducing the gas, do the following:

- Turn on all fans and APHIS-approved gas detection devices to make sure they work.
- Warm up gas detection devices at least 30 minutes before zeroing in.
- Start volatilizer and heat water to 200 °F or above. A minimum temperature of 150 °F is required at all times during the introduction process.
- Place fumigant cylinder with gas introduction line on scale and take initial weight reading. Make sure the gas introduction line is attached to the cylinder. After obtaining the correct weight, subtract the dosage to be introduced into the enclosure. After you have introduced the proper amount of gas, the scale will be balanced.
- Check that tarpaulin is placarded and the area is secured. Only people working on the fumigation may be in the area.
- Check tarpaulin to make sure it is free from rips and tears.
- Check that all gas sampling tubes are labeled and are **not** crimped or crushed. Inspect tubes visually, or use an electric or Mityvac hand pump to check tubes. Either a fumiscope or vacuum pump may be used to test leads for unrestricted flow.


Important

When conducting fumigations with methyl bromide, sulfuryl fluoride or phosphine, erroneous readings may occur if the monitoring leads become blocked or crimped. It would be impossible to install a new monitoring lead during a fumigation treatment. Therefore, to avoid an unsuccessful fumigation, you should test monitoring leads before the treatment begins.

Use the following procedure to detect blocked monitoring leads with the use of a Mityvac hand-held pump (for supplier, see Vacuum Pump on **page H-1-75**):

1. Prior to fumigant introduction, connect the Mityvac hand-held vacuum pump to a monitoring lead.
2. Squeeze the handle on the Mityvac unit. If the lead is blocked, a vacuum will be indicated on the vacuum gauge of the Mityvac unit. (The handle should be squeezed two or three times for monitoring leads longer than 25 feet. The Mityvac hand-held pump has the capacity to attain and hold 25 inches of Hg vacuum and a minimum of 7 psig pressure.)
3. Disconnect the Mityvac hand-held pump from the monitoring lead, and repeat this procedure for each monitoring lead. (Connect monitoring leads to the gas analyzer prior to fumigant introduction.)

- Check that there is enough gas in the cylinder and if necessary, that other cylinders are available.
- Check the gas introduction line connections to make sure they are tight and free of leaks (wearing the SCBA).
- Check all safety equipment, especially SCBA, is available and in working order.
- If using a T/C. install Drierite® tube on gas sample line attached to the T/C unit and check to make sure granules are blue, if pink—replace Drierite®. If humidity is high, additional Drierite® tubes or frequent changes may be necessary
- If using a T/C, install Ascarite® tube in line with the Drierite® tube if fumigating living plant and plant products, including fruits and vegetables, timber, flowers, and seed.


Important

Other gas detection devices may not require the use of Drierite® or Ascarite®.

Conducting the Fumigation

Step 1—Introducing the Gas

The acceptable air concentration level for methyl bromide (MB) is 5 ppm. A respirator (approved SCBA or MSHA/NIDSH) is required if the MB concentration level in the air is greater than 5 ppm at any time. You and the fumigator must use your SCBA while introducing the gas, checking for leaks, and when taking aeration readings.

Turn on all fans before introducing the gas. When using large cylinders of MB, have the fumigator open the cylinder valve slightly, then close the valve.

If the officer or fumigator notices a cloud, plume, vapor, or mist coming from the introduction equipment during gas introduction, TURN OFF the valve on the gas cylinder, EVACUATE the area immediately, and ABORT the fumigation. DO NOT place any part of your body into the cloud, plume, vapor, or mist. After the cloud plume has dissipated, don SCBA equipment and measure gas concentration levels at the gas cylinder using any MB label-approved low level gas detection device. When gas concentration levels at the cylinder reach 5 ppm or less, identify the source of the leak and correct it before restarting the fumigation.

When no leaks are found, open the valve to the point where 3 to 4 pounds of MB are being introduced per minute. The water temperature in the volatilizer should never go below 150 °F at any time during gas introduction. The water in the volatilizer may include an antifreeze and should be handled with the appropriate safeguards.

Don't touch the introduction line with your bare hands—you could get burned! Close the cylinder valve once the proper dosage has been introduced.

The fumigation time begins once all the gas has been introduced. Record the time gas introduction was started and completed in Block 32 on the PPQ Form 429.

If using the electronic 429 database, record the fumigation date, gas introduction start and finish time in the corresponding fields under the "GAS INTRODUCTION" heading on the Treatment form.

Run the fans for 30 minutes to achieve even gas distribution. Take the initial concentration reading 30 minutes after all the gas has been introduced.

Do **not** begin counting fumigation time until all the gas has been introduced and valve on the MB tank is closed.

Step 2—Testing for Leaks

Wear the SCBA while checking for leaks. Use an APHIS-approved leak detection device to test for leaks before the 30 minute reading or anytime when the concentration level is unknown or above 5 ppm. Test around the perimeter of the tarpaulin on the floor, corners, and especially where electric cords, gas sampling tubes, or gas introduction lines are present. When you detect leaks, have them sealed using more sand or sand snakes for floor leaks and tape for sealing small holes in the tarpaulin. Use loose, wet sand to reduce leakage from electric cords, gas sampling tubes, gas introduction lines, or uneven flooring.

If an employee encounters unsafe conditions (such as holes in the tarpaulin or a breach in safety protocol) and the condition(s) cannot be corrected in a timely manner, the employee may CANCEL the fumigation. Consult with a PPQ Supervisor prior to cancellation.

If you detect excessive leakage (concentration readings of 50 percent or less of the minimum concentration) in a tarpaulin which cannot be corrected in a practical way, do **not** attempt to correct the problem by adding more gas. Quickly evacuate the remaining gas from the enclosure, eliminate the problem, and construct a new enclosure. Aerate as usual following procedures on **page 2-4-37**. Restart the fumigation in the new enclosure.

Commodities used for food or feed may not be re-treated. If commodities fall into this category, the only options are the following:

- Return to the country of origin
- Reexported to another country if they will accept the shipment
- Destroy by incineration

Step 3—Taking Concentration Readings

Before taking a reading, always purge sampling lines with a mechanical or hand pump. If using a T/C unit, connect it to the sampling lead, adjust the gas flow rate to 1.0, and wait until the meter registering “ounces per thousand cubic feet” stabilizes before taking a reading. (This may take a minute or more, depending upon the length of the tubing and whether or not an auxiliary pump is used.).

Take concentration readings with an APHIS-approved gas detection device to determine the gas concentration and distribution within the enclosure. If used, check desiccant tubes before each reading and change Drierite® if its color is pink.

Living plant and plant products generate carbon dioxide gas, which interferes with the MB reading from the T/C. In order to remove CO_2, install an Ascarite® tube in line with the Drierite® tube if fumigating living plant and plant products, including fruits and vegetables, timber, flowers, and seed.

Depending upon the length of exposure period, take concentration readings at the following times[4]:

- 30 minutes
- 2 hours
- 4 hours
- 6 hours
- 12 hours
- 24 hours
- 36 hours
- 48 hours
- 72 hours
- Any final concentration reading

Avoid using hand-held two-way radios near the T/C unit. Using two-way radios near the T/C unit will interfere with an accurate concentration reading.

Thirty-Minute Reading

The 30-minute reading shows the initial concentration and distribution of gas. The 30-minute reading can indicate leakage, sorption, incorrect dosage calculation, or error in fumigant introduction—all of which require immediate attention. Concentration readings should **not** differ more than 4 ounces among the leads.

Two-Hour Reading

In comparison with the 30-minute reading, the 2-hour reading also will indicate if the tarpaulin is leaking or the commodity is sorbing gas. Readings more than 15 percent lower than the 30-minute reading will require close monitoring and possible corrective action.

EXAMPLE: Your dosage for the fumigation was 4 pounds (64 ounces). The 30 minute reading was 50 ounces (3.125 pounds). The 2-hour reading is 42 ounces (2.625 pounds). The 2-hour reading is more than 15 percent less than the 30 minute reading and would indicate that either a leak or sorption problem may exist. You would need to monitor the fumigation closely until the concentration level stabilizes.

Final Reading

The final reading is required for all tarpaulin fumigations in order to determine if the fumigation has been successfully completed. You may start the final reading before the finishing time of the treatment so that aeration commences at the finishing time. Starting the final reading before finishing time is especially critical when fumigating perishables.

4 If fumigating oak logs or lumber, see “Special Procedures for Adding Gas to Oak Logs and Lumber.”

Additional Readings

Decide the need to take additional readings based on the following:

- Rate of gas concentration decrease
- Any condition which could change the gas concentration such as severe winds, or rain.

When concentration readings differ by more than 4 ounces, run the fans to equalize the gas and record readings on the APHIS 429. Generally, at the 1/2 hour reading, gas should be evenly distributed, and you should not have to restart the fans unless you added gas. If readings continue to differ by more than 4 ounces, continue running the fans until the gas is evenly distributed.

If unpredicted severe winds occur, additional readings must be taken. Any sharp or unusual decreases of the readings in relation to previous readings is a clue to take corrective action and supplementary readings. Take additional readings every 30 minutes until problems are rectified.

Sorptive commodities may also require additional concentration readings.

Step 4—Determining the Need to Add Gas and Adjust Exposure

Use the following table to determine when to add gas or extend the exposure period:

Table 2-4-4 Determine the Need to Add Gas and Adjust Exposure

If the lowest gas reading is:	And the schedule is:	Then:
Below the required minimum concentration	T101-a-1 or equivalent*	SEE ***Table 2-4-6*** on **page 2-4-29** for corrections at 0.5 hour, or ***Table 2-4-7*** on **page 2-4-30** for corrections at 2 hours
	Other than T101-a-1 or equivalent*	See Adding Gas and Extending Exposure Period to Commodities that are Fumigated Using Treatment Schedules other than T101-a-1 or Equivalent (may include perishables) on **page 2-4-25**
At or above required minimum concentration	T101-a-1* or equivalent*	SEE ***Table 2-4-6*** on **page 2-4-29** for corrections at 0.5 hour, or ***Table 2-4-7*** on **page 2-4-30** for corrections at 2 hours
	Other than T101-a-1 or equivalent*	No action necessary

Important

* T101-a-1 or equivalent treatment schedules are those schedules that are:

- **NOT** greater than 2 hours long (exposure time)
- **NOT** greater than 4 lbs. per 1000 ft^3 (dosage rate)
- Minimum concentration readings and temperature ranges match EXACTLY the readings in T101-a-1

If the minimum concentration readings do not meet these requirements, the schedule is NOT equivalent. When schedules are NOT equivalent, use **Table 2-4-5** to determine the length of time to extend exposure and use the formula in **Figure 2-4-5** to determine the amount of gas to add.

Special Procedures for Adding Gas and Extending Exposure Period[5]

Adding Gas and Extending Exposure Period to Commodities that are Fumigated Using Treatment Schedules other than T101-a-1 or Equivalent (may include perishables)

5 The MB label does allow the extension of exposure time due to low gas readings for non-food commodities.

Once you have determined that you need to add gas and extend time, use the formula in **Figure 2-4-5** to calculate the amount of gas to add and **Table 2-4-5** to determine how long to extend the exposure period.

$$1.6 \times \text{number of ounces below minimum} \times \frac{\text{volume in cubic feet}}{1000\,\text{cubic feet}} \times \frac{1}{16} = \text{pounds of gas to add}$$

Figure 2-4-5 Formula for Determining the Amount of Gas to Add

Table 2-4-5 Determine the Extended Exposure Period

If the exposure time is:	And any individual reading is below minimum by:[1]	Then extend exposure:
Less than 12 hours	10 oz. or less	10 percent of the time lapse since the last acceptable reading
	11 oz. or more	30 minutes
12 hours or more	10 oz. or less	10 percent of the time lapse since the last acceptable reading
	11 oz. or more	2 hours or 10 percent of time lapse since last acceptable reading, whichever is greater

1 If any individual reading is 50 percent or more below the minimum concentration reading, then abort the treatment. For example, if the minimum reading is 38 ounces then the reading 50 percent below the minimum is 19 ounces [38 ounces – (38 ounces ×.50) = 19 ounces]. For oak logs (T312-a, T312-a-alternative), refer to *Special Procedures for Adding Gas to Oak Logs Using T312-a or T312-a-Alternative* ***on page 2-4-31*** for specific instructions.

When adding gas, follow these steps:

1. Heat water in volatilizer.
2. Turn on fans.
3. Take weight of the cylinder.
4. With SCBA on, open valve on cylinder and introduce the gas.
5. Close valve when the weight of the cylinder indicates that the needed amount of gas has been added.
6. Record quantity of fumigant added in Block 34 and the additional fan time in Block 30 of the PPQ Form 429.

7. If using the electronic 429, record the amount of additional gas listed in the Treatment Manual in the "Additional Gas Recommended" field and the actual amount of additional gas added in the "ACTUAL ADDITIONAL GAS" field. Record the additional fan time in the "TIME FANS OPERATED" field in the Treatment form.

Note the time the fumigator started introducing additional gas and the time the fumigator finished introducing gas and record in Block 40 (Remarks) of the PPQ Form 429 or in the "Remarks" form in the electronic 429 database. Run the fans for 30 minutes. Turn off fans, then take a concentration reading. If all readings are above minimum concentration levels, then proceed as usual with the remaining scheduled concentration readings.

Excessive leakage in any one tarpaulin enclosure, which cannot be eliminated in a practical way, must **not** be corrected by the addition of MB. (Excessive leakage has occurred when concentration readings are less than or equal to 50 percent of minimum concentration reading). Quickly evacuate remaining gas from such an enclosure, eliminate the problem, and construct a new enclosure. Start a new treatment in the new enclosure.

Commodities used for food or feed may **not** be re-treated. If commodities fall into this category, the only options are the following:

- Return to the country of origin
- Reexport to another country if they will accept the shipment
- Destroy by incineration

Adding Gas to Fruits, Vegetables, or Perishable Commodities Using Schedule T101-a-1 or Equivalent

Use ***Table 2-4-6*** on **page 2-4-29** and ***Table 2-4-7*** on **page 2-4-30** to determine if you need to add gas or extend or decrease the exposure time.Select the proper table based on the time of the gas reading (30 minutes or 2 hours).

Use the formula in **Figure 2-4-6** to determine the amount of gas to add.

$$1.6 \times \text{number of ounces below minimum} \times \frac{\text{volume in cubic feet}}{1000\,\text{cubic feet}} \times \frac{1}{16} = \text{pounds of gas to add}$$

Figure 2-4-6 Formula for Determining the Amount of Gas to Add

DO **NOT** average the concentration readings before using the tables. Base your decision on whether to add gas from the LOWEST gas concentration of any individual gas reading.

Fresh fruits and vegetables are sensitive to MB so you should double check volume calculations and dosage measurements to avoid accidental overdoses. If any 30-minute readings are 50 percent or more above the minimum concentration, it indicates a miscalculation of the dosage. Include a brief report on the PPQ Form 429 stating possible reasons for the overdose. Exposure periods are decreased for fumigations where concentration readings are much higher than required. See tables on the following pages to determine when to reduce exposure periods.

When adding gas, follow these steps:

1. Heat water in volatilizer.
2. Turn on fans.
3. Take weight of the cylinder.
4. With SCBA on, open valve on cylinder and introduce the gas.
5. Close valve when the weight of the cylinder indicates that the needed amount of gas has been added.
6. Record quantity of fumigant added in Block 34 and additional fan time in Block 30 of the PPQ Form 429.

7. If using the electronic 429, record the amount of additional gas listed in the Treatment Manual in the "Additional Gas Recommended" field and the actual amount of additional gas added in the "ACTUAL ADDITIONAL GAS" field. Record the additional fan time in the "TIME FANS OPERATED" field in the Treatment form.

Note the time the fumigator started introducing additional gas and the time the fumigator finished introducing gas and record in Block 40 (Remarks) of the PPQ Form 429 or in the "Remarks" form in the electronic 429 database. Run the fans until there is even gas distribution throughout the stack. Turn off fans, then take a concentration reading 30 minutes after the gas has been introduced. If all readings are above minimum concentration levels, then proceed as usual with the remaining scheduled concentration readings.

Table 2-4-6 Determine Gas Concentration Values and Corrections for Fruits and Vegetables at the 30-Minute Reading of T101-a-1 or Equivalent Schedules

If the schedule is:	And the minimum concentration reading (oz.) in schedule is:	And the lowest concentration reading (oz.) is:	Then:
40-49 °F 4 lbs for 2 hrs	48	65 or greater[1]	REDUCE exposure by 15 minutes
		64-48	TAKE 2 hour reading as scheduled
		Lower than 48	1. ADD gas, and 2. EXTEND exposure 15 minutes
50-59 °F 3 lbs for 2 hrs	38	52 or greater[1]	REDUCE exposure by 15 minutes
		51-38	TAKE 2 hour reading as scheduled
		Lower than 38	1. ADD gas, and 2. EXTEND exposure 15 minutes
60-69 °F 2.5 lbs for 2 hrs	32	48 or greater[1]	REDUCE exposure by 15 minutes
		47-32	TAKE 2 hour reading as scheduled
		Lower than 32	1. ADD gas, and 2. EXTEND exposure 15 minutes
70-79 °F 2 lbs for 2 hrs	26	37 or greater[1]	REDUCE exposure by 15 minutes
		36-26	TAKE 2 hour reading as scheduled
		Lower than 26	1. ADD gas, and 2. EXTEND exposure 15 minutes
80-89 °F 1.5 lbs for 2 hrs	19	27 or greater[1]	REDUCE exposure by 15 minutes
		26-19	TAKE 2 hour reading as scheduled
		Lower than 19	1. ADD gas, and 2. EXTEND exposure 15 minutes

1 If concentration reading is more than 50 percent above the minimum concentration reading, it indicates a problem. An immediate check should be made to determine the cause and to correct it.

Table 2-4-7 Determine Gas Concentration Values and Corrections for Fruits and Vegetables at the 2-Hour Reading of T101-a-1 or Equivalent Schedules

If the schedule is:	And the lowest concentration reading at 2 hours is:	Then do not add gas, but:
40-49 °F 4 lbs for 2 hours	38 and above	AERATE commodity
	37-28	EXTEND exposure by 15 minutes
	27-25	EXTEND exposure by 30 minutes
	Lower than 25	ABORT
50-59 °F 3 lbs for 2 hrs	29 and above	AERATE commodity
	28-24	EXTEND exposure by 15 minutes
	23-21	EXTEND exposure by 30 minutes
	Lower than 21	ABORT
60-69 °F 2.5 lbs for 2 hrs	24 and above	AERATE commodity
	23-21	EXTEND exposure by 15 minutes
	20-18	EXTEND exposure by 30 minutes
	Lower than 18	ABORT
70-79 °F 2 lbs for 2 hrs	19 and above	AERATE commodity
	18-16	EXTEND exposure by 15 minutes
	15-13	EXTEND exposure by 30 minutes
	Lower than 13	ABORT
80-89 °F 1.5 lbs for 2 hrs	14 and above	AERATE commodity)
	13-12	EXTEND exposure by 15 minutes
	11-10	EXTEND exposure by 30 minutes
	Lower than 10	ABORT

Special Procedures for Adding Gas to Oak Logs Using T312-a or T312-a-Alternative

There are two alternative treatments for the MB fumigation of Oak logs. Refer to **Table 2-4-8** and **Table 2-4-9** for actions to take during the fumigation of Oak Logs using T312-a or T312-a-Alternative.

Use the following formula to calculate the amount of gas to add to the enclosure:

1.6 × (number of oz. below the required minimum) × (volume in ft^3)/1,000 ft^3 = oz. of gas to add. To convert ounces to pounds, use the formula:

$$\frac{\text{oz. of gas to add}}{16\frac{\text{oz.}}{\text{lbs.}}} = \text{pounds (lbs.) of gas to add}$$

After adding gas, run the fans for 30 minutes and take additional gas concentration readings.

Refer to **Table 2-4-8** if using T312-a and **Table 2-4-9** if using T312-a-Alternative to determine how much additional time must be added to the fumigation to compensate for the low gas concentrations.

EXAMPLE: The treatment schedule is T312-a-Alternative. The size of the enclosure is 2400 ft^3. The required reading at 48 hours must be a minimum of 140 ounces. The actual lowest reading is 132 ounces. Calculate the amount of gas to add to the enclosure using the formula:
1.6 x (the number of ounces below 140) x (volume in ft^3)/1000 ft^3
ANSWER:
140-132=8
1.6 x 8 x 2400=30,720/1000 = 30.72 ounces of gas to add
30.72/16 = 1.92 pounds of gas to add

Determine the amount of time to add by referring to **Table 2-4-9**. In this example, 1 hour will be added to the total fumigation time.
Take the regularly scheduled reading at 72 hours (the minimum should be 100 ounces.)
Take another reading at 73 hours (the minimum should be 100 ounces.)
If the minimum is not 100 ounces, add more gas and time according to **Table 2-4-9**.

Instructions for Adding Gas and Time to Schedule T312-a

Do **not** combine schedules T312-a and T312-a-Alternative. The treatment must be aborted if any individual gas concentration readings are 50 percent or more below the minimum required concentration.

Table 2-4-8 Determine Gas Concentration Values and Corrections for Oak Log Fumigations Using Schedule T312-a

If the Reading is Taken At:	And the lowest individual concentration reading is:	Then:
0.5 hour	121-239	1. ADD gas, and 2. EXTEND exposure by 0.5 hour
	0-120	ABORT
2 hours	160-239	1. ADD gas, and 2. EXTEND exposure by 0.5 hour
	121-159	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	0-120	ABORT
12 hours	190-199	1. ADD gas, and 2. EXTEND exposure by 0.5 hour
	180-189	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	170-179	1. ADD gas, and 2. EXTEND exposure by 1.5 hours
	160-169	1. ADD gas, and 2. EXTEND exposure by 2.0 hours
	150-159	1. ADD gas, and 2. EXTEND exposure by 2.5 hours
	140-149	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	130-139	1. ADD gas, and 2. EXTEND exposure by 3.5 hours
	120-129	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	110-119	1. ADD gas, and 2. EXTEND exposure by 4.5 hours
	101-109	1. ADD gas, and 2. EXTEND exposure by 5.0 hours
	0-100	ABORT

Table 2-4-8 Determine Gas Concentration Values and Corrections for Oak Log Fumigations Using Schedule T312-a (continued)

If the Reading is Taken At:	And the lowest individual concentration reading is:	Then:
24 hours	120-239	1. Add gas to bring the total concentration to 240 ounces. 2. DO **NOT** ADD TIME.
	110-119	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	100-109	1. ADD gas, and 2. EXTEND exposure by 2.0 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	70-79	1. ADD gas, and 2. EXTEND exposure by 5.0 hours
	61-69	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	0-60	ABORT
36 hours	150-159	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	140-149	1. ADD gas, and 2. EXTEND exposure by 1.5 hours
	130-139	1. ADD gas, and 2. EXTEND exposure by 2.5 hours
	120-129	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	110-119	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	100-109	1. ADD gas, and 2. EXTEND exposure by 4.5 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 5.5 hours
	81-89	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	0-80	ABORT

Table 2-4-8 Determine Gas Concentration Values and Corrections for Oak Log Fumigations Using Schedule T312-a (continued)

If the Reading is Taken At:	And the lowest individual concentration reading is:	Then:
48 hours	110-119	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	100-109	1. ADD gas, and 2. EXTEND exposure by 2.0 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	70-79	1. ADD gas, and 2. EXTEND exposure by 5.0 hours
	61-69	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	0-60	ABORT
72 hours	70-79	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	60-69	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	50-59	1. ADD gas, and 2. EXTEND exposure by 9.0 hours
	41-49	1. ADD gas, and 2. EXTEND exposure by 12.0 hours
	0-40	ABORT

Important

If additional time has been added to the treatment, the 72 hour reading AND the extended time reading MUST be taken. If the minimum of 80 ounces is **not** met, time and gas MUST be added according to this Table.

Instructions for Adding Gas and Time to Schedule T312-a-Alternative

Do **not** combine schedules T312-a and T312-a-Alternative.

Table 2-4-9 Determine Gas Concentration Values and Corrections for Oak Log Fumigations using Schedule T312-a-Alternative

If the Reading is Taken At:	And any individual concentration reading is:	Then:
0.5 hours	121-239	1. ADD gas, and 2. DO **NOT** EXTEND exposure.
	0-120	ABORT
2 hours	160-239	1. ADD gas, and 2. DO **NOT** EXTEND exposure
	121-159	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	0-120	ABORT
24 hours	140-239	1. Add gas to bring the total concentration to 240 ounces. 2. DO **NOT** ADD TIME.
	130-139	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	120-129	1. ADD gas, and 2. EXTEND exposure by 2.5 hours
	110-119	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	100-109	1. ADD gas, and 2. EXTEND exposure by 5.5 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 7.0 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 8.5 hours
	71-79	1. ADD gas, and 2. EXTEND exposure by 10.0 hours
	0-70	ABORT

Table 2-4-9 Determine Gas Concentration Values and Corrections for Oak Log Fumigations using Schedule T312-a-Alternative (continued)

If the Reading is Taken At:	And any individual concentration reading is:	Then:
48 hours	130-139	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	120-129	1. ADD gas, and 2. EXTEND exposure by 2.5 hours
	110-119	1. ADD gas, and 2. EXTEND exposure by 4.5 hours
	100-109	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 8.5 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 9.5 hours
	71-79	1. ADD gas, and 2. EXTEND exposure by 11 hours
	0-70	ABORT
72 hours	90-99	1. ADD gas, and 2. EXTEND exposure by 1.5 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	70-79	1. ADD gas, and 2. EXTEND exposure by 7.5 hours
	60-69	1. ADD gas, and 2. EXTEND exposure by 8.5 hours
	51-59	1. ADD gas, and 2. EXTEND exposure by 11.0 hours
	0-50	ABORT

Important

If additional time has been added to the treatment, the 72 hour reading AND the extended time reading MUST be taken. If the minimum of 100 ounces is **not** met, time and gas MUST be added according to this Table.

Step 5—Exhausting the Gas

Exhaust the gas at the completion of the exposure period. If the treatment schedule is a FIFRA Section 18 Exemption, then the PPQ official must monitor the aeration of the commodity. Detector tube readings and the time interval from the aeration must be recorded in the corresponding fields in the "DETECTOR READINGS" form.

Aerating the Enclosure

Aeration procedures are designed to provide safe working conditions during the aeration period and to assure that commodities are safe for handling, storage, and transportation. A fumigant must be aerated in accordance with Environmental Protection Agency (EPA) label requirements, the Occupational Safety and Health Administration (OSHA), and the PPQ Treatment Manual.

When treatments are conducted in a particular location on a regular basis, a permanent site should be designated. At such sites, the fan used to remove the fumigant from the enclosure during aeration must be connected to a permanent stack extending above the roof level.

Aeration of fumigated structures and ships are covered within those particular sections.

Responsibility for Aerating the Commodity

The label requires that at least two people trained in the use of the fumigant must be present at all times during gas introduction, treatment, and aeration. The PPQ official, however, is **not** required to be present at the fumigation site throughout the aeration process unless specified by the label or by State or local regulations.

If the fumigation is performed under a Section 18 Exemption, then a PPQ official must be present at the initiation of aeration **and** to verify the final aeration readings.

Table 2-4-10 Determine Responsibility for Aerating the Commodity

If the Treatment Schedule is:	Then:
A FIFRA Section 18 Exemption	1. PPQ must MONITOR the aeration of the enclosure, and 2. USE **Table 2-4-12 on page-2-4-40** to determine which aeration procedure to follow
A labeled Treatment Schedule	1. RELEASE the fumigation to the fumigator to aerate according to label instructions and the conditions of the compliance agreement. 2. RELEASE the commodity.

If the fumigation is performed under a Section 18 exemption **and** is aerated using a horizontal duct, the fumigator is responsible for meeting the conditions in **Table 2-4-11**. If the enclosure includes both Section 18 and non-Section 18 commodities, the buffer zones in **Table 2-4-11** must still be followed.

Table 2-4-11 Buffer Zones for Section 18 Fumigations

Enclosure Volume (ft^3)	Buffer Zone (ft) Minimum air exchange rate = 10 times per hour
2,000	33
5,000	131
10,000	213
25,000	361
50,000	525
100,000	771
250,000	1,296

Materials Needed

The following materials will be needed to aerate the enclosure:

- SCBA[6]
- Colorimetric tubes (Draeger or Kitagawa for example)
- Exhaust fan[7]
- Exhaust duct[9]
- Danger signs and materials for limiting access to area (barricades, rope)[7]
- PPQ Form 429[8]

The following procedures apply to the aeration of all tarpaulin fumigations.

Securing the Area

Assuming that you have already restricted access and secured the fumigation area, you now must restrict access to the area where the exhaust duct extends on the ground beyond the enclosure.

During the first 10 minutes of aeration, it is recommended that no one be within 200 feet of the exhaust duct outlet.

If this buffer zone is regulated by the State or municipality where the fumigation takes place, local regulations must be followed.

6 Materials required for both PPQ and the commercial fumigator.
7 Materials to be furnished by the commercial fumigator.

If it is impossible to restrict people from the area of aeration during regular work hours, consider aeration during another time of the day. When securing the duct outlet area, consider the direction of the wind. Face the duct outlet toward an open area, and away from people. Point the duct outlet upward to aid in dispersing the exhausted gas.

Advise the fumigator to use a physical barrier such as ropes, barricades, or walls to secure the area.

Placard the secure area near the exhaust outlet with the appropriate DANGER/ PELIGRO signs. Make sure the placards meet the appropriate fumigant label or labeling requirements. The skull and crossbones should be present as well as "AREA UNDER FUMIGATION, DO **NOT** ENTER/**NO** ENTRE"; date of the fumigation; name of the fumigant used; and the name, address, and telephone number of the fumigator. Unless you authorize their use, do **not** allow motorized vehicles to operate within the secure area.

Wearing Respiratory Protection

The fumigator and the PPQ official monitoring the aeration must wear approved respiratory protection (SCBA, air supplied respirator, or a combination unit) when:

- Installing the exhaust system
- Opening the tarpaulin for aeration
- Removing the tarpaulin if measured levels of fumigant are above 5 ppm
- Anytime during the aeration process when a risk of exposure to concentrations above 5 ppm exists. This includes any time the concentration is unknown.

Refer to the following table to determine which Aeration Procedure to use when monitoring aeration.

Table 2-4-12 Determine the Aeration Procedure

If:	And:	And:	Then:
Nonsorptive	Containerized	→	GO to **page 2-4-40**
	Noncontainerized	Fresh fruits and vegetables, and cut flowers	GO to **page 2-4-43**
		Other than fresh fruits and vegetables, and cut flowers	GO to **page 2-4-41**
Sorptive, including yams and chestnuts (See **page 2-3-6** for list of sorptive commodities)	Containerized	→	GO to **page 2-4-46**
	Noncontainerized	→	GO to **page 2-4-45**

Aerating Nonsorptive, Containerized Cargo—Indoors and Outdoors

Step 1—Installing Exhaust System

Advise the fumigator to:

1. Install an exhaust fan (minimum of 5,200 cfm capacity) to a 16 inch, or greater, diameter duct located at the floor near rear doors of the container.
2. Install an air introduction duct system consisting of a 3,750 cfm, or greater, fan attached to a 12 inch, or larger, duct which reaches two-thirds of the length of the container at the top of the load. Have the ducts installed prior to the start of the fumigation. For indoor fumigation, extend the exhaust duct at least 30 feet beyond the building or through a vertical stack extending through the roof. For outdoor fumigations, extend the exhaust duct at least 30 feet beyond the container.

Important

(1) Volume of enclosure (in cubic feet) divided by the sum of cubic feet per minute (cfm) of the exhaust fan(s) or exhaust blower equals the number of minutes required per complete gas volume exchange. (2) Sixty minutes divided by the number of minutes per gas volume exchange equals the number of complete gas exchanges per hour. The result should be in the range of 4 to 15. The faster the rate of aeration the better, particularly for perishable commodities. If the exhaust flow is connected to a methyl bromide recovery system, this device must **not** impede the flow rate to less than 4 volumes per hour.

Step 2—Aerating the Commodity

Advise the fumigator to:

1. Connect the exhaust duct to the exhaust fan.
2. Start the exhaust fan(s) and lift the end of the tarpaulin opposite the end at which the exhaust fan and duct are located.
3. Aerate for **3 hours.**
4. Stop the aeration fans.
5. Use a colorimetric tube to take a concentration reading in the airspace around and, when feasible, within the carton or box**.** Exceptions may include compressed cotton and other very difficult to probe commodities. Obtain prior approval from CHPST for exceptions to this rule.

For FIFRA Section 18 exemptions, record the concentration reading (in ppm), date, and time in Block 39 of PPQ Form 429. If using the electronic 429 database, record the date, time and detector reading (in ppm) in the "Detector Readings" form.

Then use **Table 2-4-13** to determine when to release the commodity.

Table 2-4-13 Determine When to Release the Commodity

If the gas concentration level is:	Then:
5 ppm or less	RELEASE the commodity
6 ppm or more	1. CONTINUE aeration until the concentration is 5 ppm or less, then 2. RELEASE the commodity

Aerating Nonsorptive, Noncontainerized Cargo—Indoors and Outdoors

Step 1—Installing the Exhaust System

Advise the fumigator to:

1. Install an exhaust duct (minimally one 3,500 cfm capacity fan connected to an exhaust duct). An exhaust duct is optional for outdoor fumigations.
2. Extend the exhaust duct outlet to an outside area where there is adequate ventilation and at least 30 feet away from the building or through a vertical exhaust stack extending through the roof.

(1) Volume of enclosure (in cubic feet) divided by the sum of cubic feet per minute (cfm) of the exhaust fan(s) or exhaust blower equals the number of minutes required per complete gas volume exchange. (2) Sixty minutes divided by the number of minutes per gas volume exchange equals the number of complete gas exchanges per hour. The result should be in the range of 4 to 15. The faster the rate of aeration the better, particularly for perishable commodities. If the exhaust flow is connected to a methyl bromide recovery system, this device must **not** impede the flow rate to less than 4 volumes per hour.

Step 2—Aerating the Commodity

Advise the fumigator to:

1. Start the exhaust fan.
2. Lift the end of the tarpaulin opposite the end with the exhaust fan and duct (if used).
3. Aerate the enclosure for **2 hours.**

Outdoor Fumigations

Advise the fumigator to:

1. Stop the fans.
2. Remove the tarpaulin.
3. Take concentration readings with colorimetric tubes in the airspace around and, when feasible, inside the box or cartons.

For FIFRA Section 18 exemptions, record the concentration reading (in ppm), date, and time in Block 39 of PPQ Form 429. If using the electronic 429 database, record the date, time and detector reading (in ppm) in the "Detector Readings" form. If using the electronic 429, record the time and detector reading (in ppm) in the "Detector Readings" form.

Then use **Table 2-4-14** to determine when to release the commodity.

Table 2-4-14 Determine When to Release the Commodity for Outdoor Fumigations

If the gas concentration level is:	Then:
5 ppm or less	RELEASE the commodity
6 ppm or more	1. CONTINUE aeration and take concentration readings until the level is 5 ppm or less, then 2. RELEASE the commodity

Indoor Fumigations

Advise the fumigator to:

1. Stop the fans.
2. Take concentration readings with colorimetric tubes in the airspace around and, when feasible, in the carton or box.

For FIFRA Section 18 exemptions, record the concentration reading (in ppm), date, and time in Block 39 of PPQ Form 429. If using the electronic 429, record the time and detector reading (in ppm) in the "Detector Readings" form.

Then use **Table 2-4-15** to determine when to release the commodity.

Table 2-4-15 Determine When to Release the Commodity for Indoor Fumigations

If the gas concentration level is:	Then:
5 ppm or less	1. ADVISE fumigator to REMOVE the tarpaulin, and 2. RELEASE the commodity
6 ppm to 99 ppm	1. ADVISE fumigator to REMOVE the tarpaulin, and 2. CONTINUE aeration until the concentration is 5 ppm or less, then 3. RELEASE the commodity
100 ppm or above	1. CONTINUE aeration and take concentration readings until the concentration level is below 100 ppm, then remove the tarpaulin, and 2. CONTINUE aeration until concentration is 5 ppm or less, then 3. RELEASE the commodity

Aeration Procedures for Fresh Fruits, Vegetables, and Cut Flowers—Indoors or Outdoors

Important

Do **not** use these procedures for fresh chestnuts or yams. (see procedures for sorptive commodities on **page 2-4-47**)

Step 1—Installing Exhaust System

Use **Table 2-4-16** to determine which size fan to use.

Table 2-4-16 Determine Number of Fans

If the enclosure is:	Then:
Up to 1000 cu ft	USE one fan, 67-350 cfm
1001-15,000 cu ft	USE one or 2 fans. The volume of the enclosure divided by the sum of the cfm of the fans should equal a figure of 15 or less. Connect fan(s) to 3-ft diameter exhaust duct(s) 3 ft in diameter.
15,001-25,000 cu ft	USE two fans, each 1,000 to 5,000 cfm. The volume of the enclosure divided by the sum of the cfm of the fans should equal a figure of 15 or less. Connect fan(s) to exhaust duct(s) 3 ft in diameter.
More than 25,000 cu ft	CONTACT the CPHST-AQI in Raleigh, North Carolina, for advice prior to conducting the first fumigation.

An alternate procedure to using exhaust fans and ducts is to aerate through a vertical stack.


Important

(1) Volume of enclosure (in cubic feet) divided by the sum of cubic feet per minute (cfm) of the exhaust fan(s) or exhaust blower equals the number of minutes required per complete gas volume exchange. (2) Sixty minutes divided by the number of minutes per gas volume exchange equals the number of complete gas exchanges per hour. The result should be in the range of 4 to 15. The faster the rate of aeration the better, particularly for perishable commodities. If the exhaust flow is connected to a methyl bromide recovery system, this device must **not** impede the flow rate to less than 4 volumes per hour.

Step 2—Aerating the Commodity

Advise the fumigator to:

1. Connect the exhaust duct to the exhaust fan.
2. Start the exhaust fan(s) and lift the end of the tarpaulin opposite the end at which the exhaust fan and duct are located.
3. Aerate for **2 hours.**
4. Remove the tarpaulin and allow **2 hours** for passive aeration.
5. Stop the fans and take concentration readings with colorimetric tubes in the airspace around and, when feasible, inside the cartons or boxes.

For FIFRA Section 18 exemptions, record the concentration reading (in ppm), date, and time in Block 39 of PPQ Form 429. If using the electronic 429, record the time and detector reading (in ppm) in the “Detector Readings” form.

Then use **Table 2-4-17** to determine when to release the commodity.

Table 2-4-17 Determine When to Release the Commodity

If the gas concentration level is:	Then:
5 ppm or less	RELEASE the commodity
6 ppm or more	1. CONTINUE aeration and take concentration readings until the level is 5ppm or less, then 2. RELEASE the commodity


Important

If using the electronic 429 database, follow the instructions for distribution in the “Help” section of the database. If using a paper copy of the form 429, give the original and one copy to your supervisor for review. The supervisor should keep the original for port files and send one copy to:

USDA-APHIS-PPQ-S&T-CPHST-AQI
1730 Varsity Drive, Suite 300
Raleigh, NC 27606
919-855-7450

Aerating Sorptive, Noncontainerized Cargo—Indoors and Outdoors

Step 1—Installing the Exhaust System

Advise the fumigator to:

1. Install an exhaust duct (minimally one 3,500 cfm capacity fan connected to an exhaust duct).
2. Extend the exhaust duct outlet to an outside area where there is adequate ventilation and at least 30 feet away from the building or through a vertical exhaust stack extending through the roof.

Step 2—Aerating the Commodity

Outdoor Fumigations

Advise the fumigator to:

1. Lift both ends of the tarpaulin.
2. Start the circulation fans and exhaust fans (if available).
3. Aerate Oak logs and lumber a minimum of **48 hours**. If, after 48 hours, the concentration is 5 ppm or greater, continue aeration for 24 more hours. Continue this procedure until concentration readings are less than 5 ppm.
4. Run the fans for **4 hours** for commodities other than Oak logs and lumber.
5. Remove the tarpaulin.
6. Stop the fans and take concentration readings with colorimetric tubes in the airspace around and, when feasible, inside the cartons or boxes.

For FIFRA Section 18 exemptions, record the concentration reading (in ppm), date, and time in Block 39 of PPQ Form 429. If using the electronic 429 database, record the date, time and detector reading (in ppm) in the “Detector Readings” form.

Then use **Table 2-4-18** to determine when to release the commodity.

Table 2-4-18 Determine when to Release the Commodity

If the gas concentration level is:	Then:
5 ppm or less	RELEASE the commodity
6 ppm or more	1. CONTINUE aeration and take concentration readings until the level is 5ppm or less, then 2. RELEASE the commodity

Indoor Fumigations

Advise the fumigator to:

1. Complete the installation of the exhaust duct.
2. Start the circulation fans and exhaust fans.
3. Lift the end of the tarpaulin opposite the exhaust fan.
4. Aerate Oak logs and lumber a minimum of **48 hours**. If, after 48 hours, the concentration is 5 ppm or greater, continue aeration for 24 more hours. Continue this procedure until concentration readings are less than 5 ppm.
5. Run the fans for **4 hours** for commodities other than Oak logs and lumber.
6. Stop the fans and take concentration readings with colorimetric tubes in the airspace around and, when feasible, inside the carton or box.
7. Remove the tarpaulin.

For FIFRA Section 18 exemptions, record the concentration reading (in ppm), date, and time in Block 39 of PPQ Form 429. If using the electronic 429 database, record the date, time and detector reading (in ppm) in the "Detector Readings" form.

Then use **Table 2-4-19** to determine when to release the commodity. Take successive readings at intervals of **not** less than 2 hours.

Table 2-4-19 Determine When to Release the Commodity for Indoor Fumigations

If the gas concentration level is:	Then:
5 ppm or less	1. REMOVE the tarpaulin, and 2. RELEASE the commodity
6 ppm to 99 ppm	1. REMOVE the tarpaulin, and 2. CONTINUE aeration until the concentration is 5 ppm or less, then 3. RELEASE the commodity
100 ppm or above	1. CONTINUE aeration and take concentration readings until the concentration level is below 100 ppm, then remove the tarpaulin, and 2. CONTINUE aeration until concentration is 5 ppm or less, then 3. RELEASE the commodity

Aerating Sorptive Commodities in Containers—Indoors and Outdoors

Step 1—Installing the Exhaust System

Advise the fumigator to:

1. Install an exhaust fan (minimum of 5,200 cfm capacity) to a 16 inch or greater diameter duct located at the floor near rear doors or the container.
2. Install an air introduction duct system consisting of a 3,750 cfm or greater fan attached to a 12 inch or greater duct which reaches two-thirds of the length of the container at the top of the load. Have the ducts installed prior to the start of the fumigation. For indoor fumigations, extend the exhaust duct at least 30 feet beyond the building or through a vertical stack extending through the roof. For outdoor fumigations, extend the exhaust duct 30 feet beyond the container.

Step 2—Aerating the Commodity

Indoors

Advise the fumigator to:

1. Complete installation of exhaust duct and begin exhaust fan operation.
2. Lift both ends of the tarpaulin and begin exhaust fan operation. Do **not** remove the tarpaulin until the gas concentration level is below 100 ppm (see **Table 2-4-20**).
3. Start the circulation and air introduction fans. Require a minimum of **4 hours** aeration for all sorptive commodities. Sorptive commodities generally require 12 hours or longer to aerate, however, since sorptive commodities vary in their rates of desorption, aeration may be completed in less than 12 hours.
4. Aerate Oak logs and lumber a minimum of **48 hours**. If, after 48 hours, the concentration is 5 ppm or greater, continue aeration for 24 more hours. Continue this procedure until concentration readings are less than 5 ppm.
5. Stop the fans and take concentration readings with colorimetric tubes in the airspace around and, when feasible, inside the carton or box.

For FIFRA Section 18 exemptions, record the concentration reading (in ppm), date, and time in Block 39 of PPQ Form 429. If using the electronic 429 database, record the date, time and detector reading (in ppm) in the “Detector Readings” form.

Then use **Table 2-4-20** to determine when to release the commodity.

Table 2-4-20 Determine when to Release the Commodity

If the gas concentration level is:	Then:
5 ppm or less	1. ADVISE fumigator to REMOVE the tarpaulin, and 2. RELEASE the commodity
6 ppm to 99 ppm	1. HAVE fumigator REMOVE the tarpaulin, and 2. CONTINUE aeration until the concentration is 5 ppm or less, then 3. RELEASE the commodity
100 ppm or above	1. CONTINUE aeration and take concentration readings until the concentration level is below 100 ppm, then remove the tarpaulin, and 2. CONTINUE aeration until concentration is 5 ppm or less, then 3. RELEASE the commodity

Outdoors

Advise the fumigator to:

1. Complete installation of exhaust duct and begin exhaust fan.
2. Lift both ends of the tarpaulin that are furthest from exhaust fan.
3. Start the circulation and air introduction fans. Require a minimum of **4 hours** aeration for all sorptive commodities. Sorptive commodities generally require 12 hours or longer to aerate, however. since sorptive commodities vary in their rates of desorption, aeration may be completed in less than 12 hours.
4. Aerate Oak logs and lumber a minimum of **48 hours**. If, after 48 hours, the concentration is 5 ppm or greater, continue aeration for 24 more hours. Continue this procedure until concentration readings are less than 5 ppm.
5. Remove the tarpaulin after 4 hours aeration.
6. Stop the circulation fans and take concentration readings with colorimetric tubes in the airspace around and, when feasible, inside the cartons or boxes.

For FIFRA Section 18 exemptions, record the concentration reading (in ppm), date, and time in Block 39 of PPQ Form 429. If using the electronic 429 database, record the date, time and detector reading (in ppm) in the “Detector Readings” form.

Then use **Table 2-4-21** to determine when to release the commodity.

Table 2-4-21 Determine when to Release the Commodity

If the gas concentration level is:	Then:
5 ppm or less	RELEASE the commodity
6 ppm or more	1. CONTINUE aeration and take concentration readings until the level is 5ppm or less, then 2. RELEASE the commodity

2

Treatment Manual

Chemical Treatments

Fumigants • Methyl Bromide • Closed-door Container Fumigation

Contents

Methods and Procedures

The procedures covered in this section provide PPQ officials and commercial fumigators with the methods, responsibilities, and precautions for closed-door container fumigations.

Materials Needed

PPQ Official Provides

Important

PPQ must provide the equipment in the following bulleted list at PPQ Plant Inspection Stations that have chambers or any fumigation site owned and operated by PPQ.

Effective March 01, 2012, commercial fumigators must provide colorimetric tubes and APHIS-approved gas detection devices. All monitoring equipment must be approved and calibrated in accordance with the guidance in this manual.

Contact your regional treatment program manager for more information.

- Calculator (optional)
- Carbon dioxide filter (Ascarite®)
- Colorimetric tubes (Refer to *Gas Detector Tube (colorimetric) and Apparatus* ***on page H-1-32*** for a list of APHIS-approved product ranges)

- Desiccant (Drierite®)
- Forms (PPQ Form 429 and APHIS Form 2061 if necessary)
- APHIS-approved leak detection device
- Self-contained breathing apparatus (SCBA) or supplied air respirator to be used by PPQ official
- Tape measure (as back-up for fumigator)
- APHIS-approved gas detection device[1], [2]
- Thermometer (as back-up for fumigator)

Fumigator Provides

- APHIS-approved gas detection device [1] [2]
- Auxiliary pump for purging long gas sample tubes
- Carbon dioxide filter (Ascarite®)
- Colorimetric tubes (Refer to *Gas Detector Tube (colorimetric) and Apparatus* ***on page H-1-32*** for a list of APHIS-approved product ranges)
- Desiccant (Drierite®)
- Electrical wiring (grounded, permanent type), three prong extension cords
- Exhaust blower and ducts
- Fans (circulation, exhaust, and introduction)
- Framework and supports
- Gas introduction line
- Gas sampling tubes (leads)
- Heat supply
- Insecticides and spray equipment
- Loose sand
- Measuring Tape
- Methyl bromide
- Padding
- Sand or water snakes or adhesive sealer
- Scales or dispensers[3]

1 If fumigating oak logs or lumber, the unit must be capable of reading 400 oz.
2 Gas detection device must be calibrated annually. Contact USDA-APHIS-PPQ-S&T-CPHST-AQI (919-855-7450) in Raleigh, North Carolina, for calibration information.

- Self-contained breathing apparatus (SCBA) or supplied air respirator
- Tape
- Tape measure
- Tarpaulin and supports
- Temperature recorder
- Temperature sensors (maximum number of 12)
- Thermometer
- Volatilizer
- Warning signs

Preparing to Fumigate

APHIS has historically required dry box ocean containers (non-refrigerated containers with a tongue-and-groove flooring) be fumigated under tarp with the doors open. The total methyl bromide gas introduced is based on the entire volume under the tarpaulin. This is referred to as “open-door container fumigation.”As an alternative to the “open-door” procedure, APHIS also allows for the fumigation of wood products (includes logs, lumber, and bamboo) in dry box containers with the doors closed. This procedure eliminates the need to include the empty space under the container as part of the total volume fumigated. This procedure is referred to as “closed-door container fumigation” and can be used ONLY with the following treatment schedules:

- T312-a
- T312-a-Alternative
- T312-b
- T404-b-1-1
- T404-d
- T404-e-1

Step 1—Selecting the Container

The fumigator must obtain a letter of authorization from the owner of the container prior to attempting to gain access through the container doors or making any structural changes to the containers. The fumigator will maintain

3 All scales must be calibrated by the State, a company that is certified to conduct scale calibrations, or by the fumigator under the supervision of PPQ. The source and date of calibration must be posted in a visible location on or with the scale at all times. The scale must be calibrated a minimum of every six months.

the letters of authorization and provide copies to the local PPQ office. PPQ will not be held responsible for any damage incurred by the fumigator due to modification or manipulation of a container's original condition.

No dry box container will be permitted to be fumigated using this procedure if it has side doors, if the rear gasket is missing, or if the gasket is damaged such that gas lines cannot be placed effectively with the doors closed. PPQ officers must ensure that all vents are sealed on each container to be fumigated. If this cannot be accomplished, the fumigator will be required to fumigate with the doors open.

Step 2—Selecting a Fumigation Site

Consider the following factors when selecting a fumigation site:

- **Well-ventilated, Sheltered Area**
- **Impervious Surface**
- **Ability to Heat**
- **Nonwork Area**
- **Electrical Power Supply**y
- **Water Supply**
- **Well-Lighted Areas**
- **Aeration Requirements**s

Well-ventilated, Sheltered Area

Select sites that are well-ventilated and in a sheltered area. A well-ventilated site is required for exhausting gas before and when the tarpaulin is removed from the container(s). Most warehouses have high ceilings and a number of windows/doors which can be used for ventilation. Some gas will escape from the tarpaulin even in the best conditions. Avoid areas where strong drafts are likely to occur.

In warehouses, an exhaust system must be provided to exhaust MB to the outside of the building. Ensure that the exhausted gas does not reenter the building nor endanger people working outdoors.

When treatments are conducted in a particular location on a regular basis, a permanent site should be designated. At such sites, the fan used to remove the fumigant from the enclosure during aeration must be connected to a permanent stack extending above the roof level.

If fumigations are conducted outside, select a site that is semi-sheltered such as the leeward side of a warehouse, pier, or building that offers some protection from severe winds. Severe winds are defined as sustained winds or gusts of 30

m.p.h. or higher for any time period. Do not conduct outdoor fumigations if there is a forecast from the National Weather Service of severe winds and/or thunderstorms at the beginning of or for the entire length of the fumigation.

Impervious Surface

Select an asphalt, concrete, or tight wooden surface—**not** soil, gravel, or other porous material. However, if you must fumigate on a porous surface, cover the surface with plastic tarpaulins. For large fumigations, covering the surface is **not** usually practical because pallets must be rearranged and heavy equipment used to move the commodity. On docks, wharfs, and piers, check for cracks, holes, and manhole covers which will allow the MB to escape through the floor. Have all cracks, holes, and manhole covers sealed.

Ability to Heat

When cooler temperatures (below 40 °F) are expected, maintain commodity temperatures above 40 °F. Take the ambient (air) temperature 12 inches above the ground. Temperatures must be maintained at or above the starting treatment temperature for the entire duration of the treatment. Additionally, the temperature of the container must be monitored using a temperature sensor and a temperature recorder. Specifications for the temperature recording system are:

- Accurate to within +/-1 °F in the range of 40 °F to 80 °F
- Calibrated annually by the National Institute of Standards and Technology (NIST) or by PPQ using the *Calibration of Temperature Sensors* ***on page 3-7-4*** or
- Capable of printing all temperature readings or downloading data to a secure source once per hour throughout the entire treatment (all temperature data must be accessible at a safe distance during the fumigation)
- Function in both AC and DC modes
- Tamper-proof

Any fumigation in which one or more temperature readings dip below 40 °F will be considered a failed treatment. The container must be heated to 40 °F or above and the fumigation restarted. The gas remaining in the container does not need to be evacuated, but additional gas may need to be added to meet the required concentration readings for a new fumigation. Fumigations in which one or more readings dip below the minimum temperature required for the selected dosage rate (but are still above 40 °F) must also be restarted. There are two options for re-treatment, depending on the treatment schedule used.

1. Reheat the container and restart the fumigation at the original dosage rate. The gas remaining in the container does not need to be evacuated, but additional gas may need to be added to meet the required concentration readings for a new fumigation.
2. Re-fumigate the container at the lower temperature using the dosage required by the Treatment Manual for that temperature. (This option may not be available for all schedules.) The gas remaining in the container does not need to be evacuated, but additional gas may need to be added to meet the required concentration readings for a new fumigation.

Place one temperature sensor in each container in the coldest location in the container, which will be near the floor towards the middle of the container at the end of a log-stack. If there is only one log-stack in a container, place the temperature sensor near the floor at the end of the stack closest to the container doors. Refer to **Figure 2-9-1** for further information on temperature sensor placement.

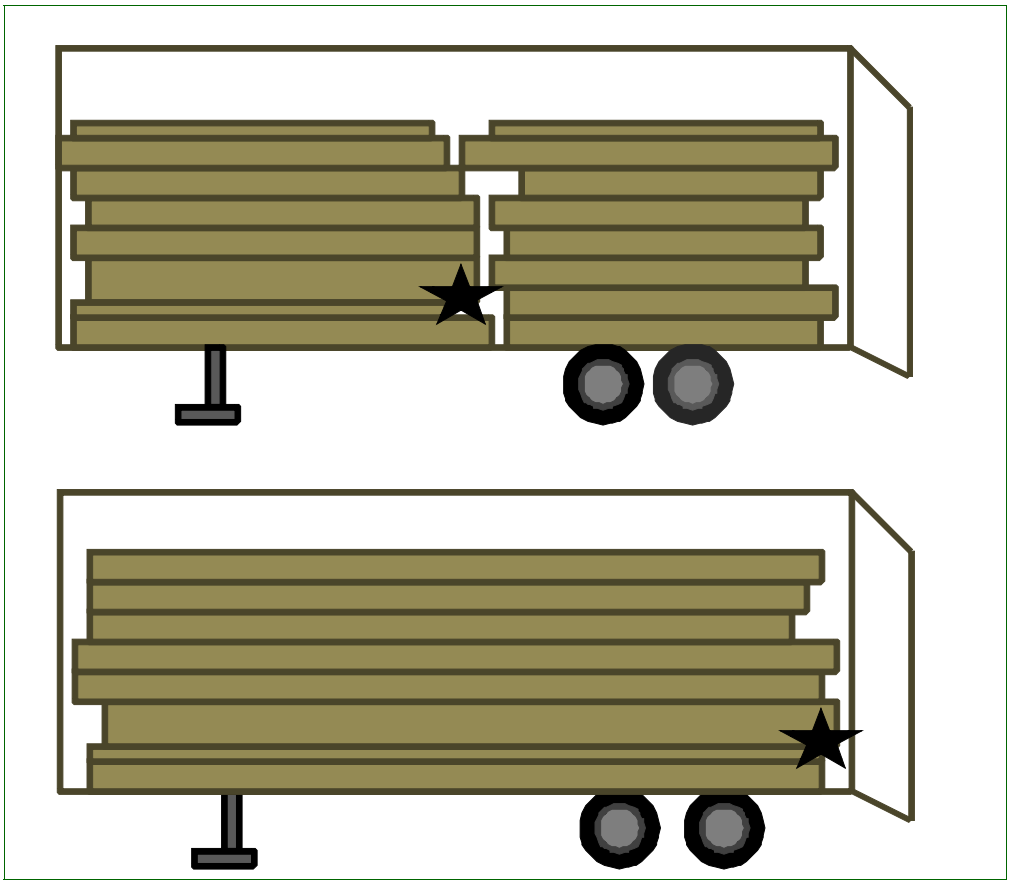

Figure 2-9-1 Diagram of placement of temperature sensors, represented by a star

Nonwork Area

Select a secure area where traffic and people are restricted from entering and which is isolated from people working. Place placards clearly in sight of all who come near. Placards must meet label requirements regarding specific warnings, information, and language. Placards generally include the name of the fumigant, the fumigation date, time, and the name of the company conducting the fumigation. Restrict access to the warehouse to the fumigator's employees and PPQ employees monitoring the treatment. PPQ officials who work within the 30-foot perimeter must wear (and use) respiratory protection (SCBA), until the gas levels are safe to breathe and validated as safe by gas monitoring. The 30-foot perimeter is **not** specifically mentioned on the MB label, but is required for PPQ officials. When space is tight, it is permissible to overlap two adjoining 30-foot perimeters. However, there must be sufficient space for a person wearing SCBA to walk between the tarpaulins.

Electrical Power Supply

An adequate electrical source must be available to run the circulation fans and the gas detection device. A separate line should be available for the gas detection device. Electrical outlets must be grounded and conveniently located in relation to the fumigation area. Generators may be used as a power source *only* under emergency conditions and must be approved by local PPQ authorities before use.

Water Supply

A water supply is necessary for safety purposes. Water is necessary for washing off MB if the liquid form is spilled on someone. Water is also used to fill the volatilizer. If no permanent water is present on a temporary site, the fumigator must provide a portable shower that meets OSHA specifications or a 5-gallon supply of clean water. All permanent fumigation sites must have a safety shower/eyewash station installed and maintained in good working order throughout the year or when fumigations are performed at the site.

Well-Lighted Areas

The area should have adequate lighting for safety purposes and for ease in reading gas concentration, thermometers, and for determining whether a tarpaulin has holes or tears.

Aeration Requirements

Restrict the access to the area where the exhaust duct extends beyond the enclosure. During the first 10 minutes of aeration, there should be no one within 200 feet of the exhaust duct outlet. If it is impossible to restrict people from the area of aeration during regular work hours, consider aeration during another time of the day.

After the first 10 minutes of aeration, if an exhaust duct is **not** used, then a perimeter of 30 feet or more from the stack is usually regarded as a safe distance for personnel. However, for personal safety, gas levels should occasionally be monitored at greater distances, especially downwind.

Step 3—Arranging the Containers

Place no more than 8 containers that are 20 to 40 feet in length under a single tarpaulin. APHIS does not allow stacking of containers. Stacking may create too great a safety risk to the person placing the tarp, fans, and gas monitoring leads.

Containers should ordinarily not be loaded beyond 80 percent of their capacity. If the container is tarped, no additional head space is required between the roof of the container and the tarp, unless the pest is found on the outside of the container.

Step 4—Arranging and Operating Fans

For proper gas circulation, place two axial-type (blade) fans in each container. The fans must have the capacity to move a volume in cubic feet per minute (CFM) equivalent to the total volume of the container. Place one fan at the rear of the container (doors) pointed inward, and the second fan placed in the front (nose) of the container pointed in the opposite direction. In addition, place the exhaust fans and ducts as instructed in "Step 1—Installing the Exhaust System" on **page 2-9-24**.

Step 5—Placing the Gas Introduction Lines

MB is converted from a liquid into a gas by a volatilizer. The hose that runs from the MB cylinder into the volatilizer must be 3000 PSI hydraulic high pressure hose with a 3/8 inch inner diameter (ID) or larger. From the volatilizer, MB gas is introduced into the structure by means of a gas introduction line. The gas introduction line must be a minimum of 350 PSI with a 1/2 inch ID or larger. Place the introduction line directly above the fan at the rear door of the container. Each container must have a gas introduction line.

Step 6—Placing the Gas Sampling Tubes

Use at least three gas sampling tubes per container. For khapra beetle infestations, use two additional tubes. Position the gas sampling tubes as follows:

- Front low—near the floor at the door end of the container
- Rear high—rear of the load at the high end opposite the fan
- Middle center—mid way from front to back, at mid depth

If treating for khapra beetle, you will need the following additional gas sampling tubes:

- High (in the commodity)
- Low (in the commodity)

Use gas sampling tubes of sufficient length to extend from the sampling position inside the container to at least 30 feet beyond the tarpaulin. Have all the gas sampling tubes meet in one area for ease and safety in taking gas concentration readings. Do **not** splice gas sampling tubes. Before starting the fumigation, check for gas sampling tube blockage or pinching by connecting each tube to the gas detection device for a short time. If the line is blocked, the flow to the device will drop sharply. Tubes can also be checked with a MityVac hand pump or other air pump device. Replace any defective gas sampling tubes.

Secure all gas sampling tubes under the tarpaulin and label each one at the end where the gas concentration readings will be taken. By labeling each gas sampling tube, you will be able to record concentration readings easily.

Step 7—Padding Corners

Look for corners and sharp angles which could tear the tarpaulin. Never use the commodity to support the tarpaulin. If the sharp angles or corners cannot be eliminated, they must be covered with burlap or other suitable padding (e.g., old tires or cloth).

Step 8—Measuring the Temperatures

Use a calibrated bimetallic, mercury, or digital long-stem thermometer to measure the commodity temperature.

Regardless of the commodity, never fumigate at temperatures below 40 °F.

Temperature recordings should be rounded to the nearest tenth of a degree (°C or °F)

Select several representative locations within the stack at the ends of the logs or pieces of lumber and drill holes in them to accommodate a thermometer. After drilling, wait at least 10 minutes to allow the wood around the holes to cool. Insert the thermometer into the holes drilled. All readings (not just the average) must be above 40 °F.

If fumigating multiple containers under one tarp, take temperature readings in each container under the tarp. Base the dosage calculation on the lowest reading obtained. (Do **not** average temperatures.) All readings must be above 40 °F to initiate the fumigation. If not, you must postpone it.

Record the temperatures in Block 22 of the PPQ Form 429.

If using the electronic 429 database, record the temperatures in the space and commodity fields in the Treatment form.

When the commodity and air temperature drastically differ, moisture may condense inside the gas sampling tubes or inside the gas detection device and cause inaccurate gas concentration readings. Check the gas sampling tubes frequently for possible puddling of condensed water, and drain it off, as needed, before taking a reading. Also, check the Drierite frequently, and change it as soon as it becomes saturated with water [turns pink], to obtain true gas concentration readings. Never fumigate commodities that are frozen.

Step 9—Covering the Stack

After covering the stack, check the tarpaulin for rips, tears, and holes. Look at the spots that have been taped, and verify they are properly sealed. Have the fumigator repair all holes.

The tarpaulin should be made of a material such as vinyl, polyethylene plastic, or coated nylon. 4 mil vinyl or polyethylene plastic tarpaulins are only approved for one usage; 6 mil vinyl or polyethylene plastic tarpaulins may be used up to four times with the PPQ official's approval for each usage; 10 to 12 mil rubber or plastic coated nylon tarpaulins may be approved for multiple use with the PPQ official's approval for each usage.

The fumigator should cover all corners and sharp ends with burlap or other padding to prevent the tarpaulin from ripping. Have the fumigator pull the tarpaulin over the containers, being careful not to catch or tear the tarpaulin.The tarpaulin must be large enough to provide a floor overlap of at least 18 inches around all sides of the stack. Carefully lay the tarpaulin out to prevent excess folds or wrinkles along the floor, especially around corners.

Step 10—Sealing the Tarpaulin

Sealing may be accomplished with loose, wet sand, sand snakes, water snakes, adhesives, or a combination. If there is danger of crushing or crimping the gas sampling or introduction tubes, use the loose, wet sand. If using snakes, use two rows of snakes along the sides and three rows on the corners. The snakes should overlap each other by approximately 1 foot. The goal in sealing the tarpaulin is to get the tarpaulin to lie flat against the floor to prevent gas from leaking out. Plastic tape may also be used for sealing the tarp. The tape must be at least 2 inches in width, and applied (only to a smooth surface) with the aid of high-tack spray adhesive.

Seal corners by laying two sand snakes around the corner and working the tarpaulin until it is flat. Place a third snake on top of the two other snakes to provide additional weight to force the tarpaulin against the floor. Loose, wet sand can be used in the area where the gas introduction line, electrical cords, and gas sampling tubes extend from under the tarpaulin.

Step 11—Measuring the Volume

Using a 100-foot tape measure, carefully measure the length, width, and height of the container. The area underneath the container is not included in the calculations. *Never* estimate the measurements. When measuring, round off to the nearest quarter foot (example—3 inches =.25 feet).

Formula for determining volume:

Length × width × height = volume in cubic feet

EXAMPLE: A stack with measurements H=10′6″, L=42′3″, and W=10′9″ 10.50 × 42.25 × 10.75 = 4,768.9 ft^3 round to 4,769 ft^3

Record volume in Block 26 of the PPQ Form 429.

If using the electronic 429 database, record the length, width and height in the corresponding fields under the "AMT of Gas Introduced" heading on the Treatment form. The total volume of the enclosure will be calculated.

Step 12—Calculating the Dosage

Calculate dosage by doing the following:

1. Refer to the treatment schedule for the correct dosage rate (lbs./1,000 ft^3) based on temperature (°F).
2. Multiply by the dosage (lbs./1,000 ft^3) rate by the volume (ft^3) to get the dosage in pounds.

   Round to nearest 1/4 pound.

Formula for calculating dosage:

$$\text{dosage (lbs.)} = \text{volume}(ft^3) \times \text{dosage rate (lbs./1,000 } ft^3)$$

$$= \frac{\text{volume}(ft^3) \times \text{dosage rate (lbs.)}}{1{,}000\ ft^3}$$

If using the electronic 429 database, enter the dosage rate in the "dosage" field and the total amount of gas required for the fumigation will be displayed in the "GAS REQUIRED" field.

Step 13—Making a Final Check

Just prior to introducing the gas, do the following:

- Turn on all fans and APHIS-approved gas detection devices to make sure they work.
- Warm up gas detection devices at least 30 minutes before zeroing in.

- Start volatilizer and heat water to 200 °F or above. A minimum temperature of 150 °F is required at all times during the introduction process.
- Place fumigant cylinder with gas introduction line on scale and take initial weight reading. Make sure the gas introduction line is attached to the cylinder. After obtaining the correct weight, subtract the dosage to be introduced into the enclosure. After the fumigator has introduced the proper amount of gas, the scale will be balanced.
- Check that tarpaulin is placarded and the area is secured. Only people working on the fumigation may be in the area.
- Check tarpaulin to make sure it is free from rips and tears.
- Check that all gas sampling tubes are labeled and are **not** crimped or crushed. Inspect tubes visually, or use a T/C analyzer, an electric pump, or a Mityvac hand pump to check tubes for unrestricted flow.
- Check that there is enough gas in the cylinder and if necessary, that other cylinders are available.
- Check all safety equipment, especially SCBA, is available and in working order.
- If using a T/C, install Drierite® and Ascarite® tubes on the gas sample tube attached to the T/C unit. Make sure the Drierite®granules are blue, if pink, replace Drierite®. If humidity is high, additional Drierite® tubes or frequent changes may be necessary

Other gas detection devices may not require the use of Drierite® or Ascarite®.

Conducting the Fumigation

Step 1—Introducing the Gas

The acceptable air concentration level for methyl bromide (MB) is 5 ppm. A respirator (approved SCBA or MSHA/NIDSH) is required if the MB concentration level in the air is greater than 5 ppm at any time. You and the fumigator must use SCBA while introducing the gas, checking for leaks, and when taking aeration readings.

Turn on all fans before introducing the gas. When using large cylinders of MB, have the fumigator open the cylinder valve slightly, then close the valve. With an APHIS-approved leak detection device, check all connections on the gas introduction line for leaks. If no leaks are found, then open the valve to the

point where 3 to 4 pounds of MB are being introduced per minute. The water temperature in the volatilizer should never go below 150 F at any time during gas introduction. The water in the volatilizer may include antifreeze and should be handled with the appropriate safeguards.

The fumigation time begins once all the gas has been introduced. Record the time gas introduction was started and completed in Block 32 on the PPQ Form 429.

If using the electronic 429 database, record the fumigation date, gas introduction start and finish time in the corresponding fields under the "GAS INTRODUCTION" heading on the Treatment form.

Run the fans for **60 minutes** to achieve even gas distribution. Turn the fans off and take the initial concentration reading **60 minutes** after all the gas has been introduced.

Do **not** begin counting fumigation time until all the gas has been introduced and valve on the MB tank is closed.

Step 2—Testing for Leaks

Wear the SCBA while checking for leaks. Use an APHIS-approved leak detection device to test for leaks before the 60 minute reading or anytime when the concentration level is unknown or above 5 ppm. Test around the perimeter of the tarpaulin on the floor, corners, and especially where electric cords, gas sampling tubes, or gas introduction lines are present. When leaks are detected, have them sealed using more sand or sand snakes for floor leaks and tape for sealing small holes in the tarpaulin. Use loose, wet sand to reduce leakage from electric cords, gas sampling tubes, gas introduction lines, or uneven flooring.

If an employee encounters unsafe conditions (such as holes in the tarpaulin or a breach in safety protocol) and the condition(s) cannot be corrected in a timely manner, the employee may CANCEL the fumigation. Consult with a PPQ Supervisor prior to cancellation.

If you detect excessive leakage (concentration readings of 50 percent or less of the minimum concentration) in a tarpaulin which cannot be corrected in a practical way, do **not** attempt to correct the problem by adding more gas. Quickly evacuate the remaining gas from the enclosure, eliminate the problem, and construct a new enclosure. Aerate as usual following procedures on **page 2-9-22**. Record the aborted fumigation in Block 40 (Remarks) of the PPQ Form 429 or in the "Remarks" form in the electronic 429 database. Restart the fumigation in the new enclosure.

Any "closed-door" treatment that is aborted cannot be retreated until the remaining containers have completed treatment and all have aerated for a minimum of 48 hours. Refumigate aborted containers with both container doors open. Report aborted fumigations in the 429 as required by the Environmental Protection Agency.

Step 3—Taking Concentration Readings

Before taking a reading, always purge sampling lines with a mechanical or hand pump. If using a T/C unit, connect it to the sampling lead, adjust the gas flow rate to 1.0, and wait until the meter registering "ounces per thousand cubic feet" stabilizes before taking a reading. (This may take a minute or more, depending upon the length of the tubing and whether or not an auxiliary pump is used.)

Take concentration readings with an APHIS-approved gas detection device to determine the gas concentration and distribution within the enclosure. If used, check desiccant tubes before each reading and change Drierite® if its color is pink. Allow gas concentration readings to stabilize; do not disconnect the sampling line from the gas detection device when the minimum concentration reading has been met.

Take concentration readings at the times designated in the treatment schedule. Concentration readings should **not** differ more than **10 ounces** among the leads. If they do, run the fans for an additional 30 minutes and take another reading to verify that gas concentration levels have equalized. In some cases, several cycles of fan operation may be necessary to equalize the readings. Record all gas readings on the PPQ form 429 or in the electronic 429 database. Regardless of the number of containers under each tarp, every container must have a separate 429 record.

Avoid using hand-held two-way radios near the T/C unit. Using two-way radios near the T/C unit will interfere with an accurate concentration reading.

Step 4—Determining the Need to Add Gas and Adjust Exposure

If the lowest gas reading is BELOW the required minimum indicated by the treatment schedule, you must add gas and extend the exposure period.

Use the following formula to determine the amount of gas to add:

$$\frac{1.6 \times \text{Number of oz. below minimum} \times \text{Volume ft3}}{1000\,\text{ft3}} = \text{Oz. of gas to Add}$$

Use the **Table 2-9-1** to determine how long to extend the exposure period.

Table 2-9-1 Determine the Extended Exposure Period

If any individual reading is below minimum by:[1]	Then extend exposure:
10 oz. or less	10 percent of the time lapse since the last acceptable reading
11 oz. or more	2 hours or 10 percent of time lapse since last acceptable reading, whichever is greater

1 If any individual reading is 50 percent or more below the minimum concentration reading, then abort the treatment. For oak logs (T312-a, T312-a-alternative), refer to *Special Procedures for Adding Gas to Oak Logs Using T312-a or T312-a-Alternative* ***on page 2-9-16*** for specific instructions.

Follow these procedures when adding gas:

1. Heat water in volatilizer.
2. Turn on fans.
3. Take weight of the cylinder.
4. With SCBA on, open valve on cylinder and introduce the gas.
5. Close valve when the weight of the cylinder indicates that the needed amount of gas has been added.
6. Record quantity of fumigant added in Block 34 and the additional fan time in Block 30 of the PPQ Form 429.
7. If using the electronic 429, record the amount of additional gas listed in the Treatment Manual in the “Additional Gas Recommended” field and the actual amount of additional gas added in the “ACTUAL ADDITIONAL GAS” field. Record the additional fan time in the “TIME FANS OPERATED” field in the Treatment form.

Note the time the fumigator started introducing additional gas and the time the fumigator finished introducing gas and record in Block 40 (Remarks) of the PPQ Form 429 or in the “Remarks” form in the electronic 429 database. Run the fans for **30 minutes**. Turn off fans, then take a concentration reading. If all readings are above minimum concentration levels and within **10 ounces** of each other, then proceed as usual with the remaining scheduled concentration readings. If the readings are not above the minimum or within 10 ounces of each other, run the fans for another 30 minutes. It may take several cycles to stabilize the gas concentration.

Special Procedures for Adding Gas to Oak Logs Using T312-a or T312-a-Alternative

There are two alternative treatments for the MB fumigation of Oak logs. Refer to **Table 2-9-2** and **Table 2-9-3** for actions to take during the fumigation of Oak Logs using T312-a or T312-a-Alternative.

Use the following formula to calculate the amount of gas to add to the enclosure:

$$\frac{1.6 \times \text{Number of oz. below minimum} \times \text{Volume ft3}}{1000\,\text{ft3}} = \text{Oz. of gas to Add}$$

After adding gas, run the fans for 30 minutes and take additional gas concentration readings.

Refer to **Table 2-9-2** if using T312-a and **Table 2-9-3** if using T312-a-Alternative to determine how much additional time must be added to the fumigation to compensate for the low gas concentrations.

EXAMPLE: The treatment schedule is T312-a-Alternative. The size of the enclosure is 2400 ft^3. The required reading at 48 hours must be a minimum of 140 ounces. The actual lowest reading is 132 ounces. Calculate the amount of gas to add to the enclosure using the formula:
1.6 x (the number of ounces below 140) x (volume in ft^3)/1000 ft^3
ANSWER:
140-132=8
1.6 x 8 x 2400=30,720/1000 = 30.72 ounces of gas to add
30.72/16 = 1.92 pounds of gas to add

Determine the amount of time to add by referring to **Table 2-9-3**. In this example, 1 hour will be added to the total fumigation time.
Take the regularly scheduled reading at 72 hours (the minimum should be 100 ounces.)
Take another reading at 73 hours (the minimum should be 100 ounces.)
If the minimum is not 100 ounces, add more gas and time according to **Table 2-9-3**.

Instructions for Adding Gas and Time to Schedule T312-a

Do **not** combine schedules T312-a and T312-a-Alternative. The treatment must be aborted if any individual gas concentration readings are 50 percent or more below the minimum required concentration.

Table 2-9-2 Determine Gas Concentration Values and Corrections for Oak Log Fumigations Using Schedule T312-a

If the Reading is Taken At:	And the lowest individual concentration reading is:	Then:
1.0 hour	121-239	1. ADD gas, and 2. EXTEND exposure by 0.5 hour
	0-120	ABORT
2.5 hours	160-239	1. ADD gas, and 2. EXTEND exposure by 0.5 hour
	121-159	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	0-120	ABORT
12 hours	190-199	1. ADD gas, and 2. EXTEND exposure by 0.5 hour
	180-189	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	170-179	1. ADD gas, and 2. EXTEND exposure by 1.5 hours
	160-169	1. ADD gas, and 2. EXTEND exposure by 2.0 hours
	150-159	1. ADD gas, and 2. EXTEND exposure by 2.5 hours
	140-149	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	130-139	1. ADD gas, and 2. EXTEND exposure by 3.5 hours
	120-129	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	110-119	1. ADD gas, and 2. EXTEND exposure by 4.5 hours
	101-109	1. ADD gas, and 2. EXTEND exposure by 5.0 hours
	0-100	ABORT

Table 2-9-2 Determine Gas Concentration Values and Corrections for Oak Log Fumigations Using Schedule T312-a (continued)

If the Reading is Taken At:	And the lowest individual concentration reading is:	Then:
24 hours	120-239	1. Add gas to bring the total concentration to 240 ounces. 2. DO **NOT** ADD TIME.
	110-119	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	100-109	1. ADD gas, and 2. EXTEND exposure by 2.0 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	70-79	1. ADD gas, and 2. EXTEND exposure by 5.0 hours
	61-69	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	0-60	ABORT
36 hours	150-159	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	140-149	1. ADD gas, and 2. EXTEND exposure by 1.5 hours
	130-139	1. ADD gas, and 2. EXTEND exposure by 2.5 hours
	120-129	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	110-119	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	100-109	1. ADD gas, and 2. EXTEND exposure by 4.5 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 5.5 hours
	81-89	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	0-80	ABORT

Table 2-9-2 Determine Gas Concentration Values and Corrections for Oak Log Fumigations Using Schedule T312-a (continued)

If the Reading is Taken At:	And the lowest individual concentration reading is:	Then:
48 hours	110-119	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	100-109	1. ADD gas, and 2. EXTEND exposure by 2.0 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	70-79	1. ADD gas, and 2. EXTEND exposure by 5.0 hours
	61-69	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	0-60	ABORT
72 hours	70-79	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	60-69	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	50-59	1. ADD gas, and 2. EXTEND exposure by 9.0 hours
	41-49	1. ADD gas, and 2. EXTEND exposure by 12.0 hours
	0-40	ABORT

Important

If additional time has been added to the treatment, the 72 hour reading AND the extended time reading MUST be taken. If the minimum of 80 ounces is **not** met, time and gas MUST be added according to this Table.

Instructions for Adding Gas and Time to Schedule T312-a-Alternative

Do **not** combine schedules T312-a and T312-a-Alternative.

Table 2-9-3 Determine Gas Concentration Values and Corrections for Oak Log Fumigations using Schedule T312-a-Alternative

If the Reading is Taken At:	And any individual concentration reading is:	Then:
1.0 hours	121-239	1. ADD gas, and 2. DO **NOT** EXTEND exposure.
	0-120	ABORT
2.5 hours	160-239	1. ADD gas, and 2. DO **NOT** EXTEND exposure
	121-159	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	0-120	ABORT
24 hours	140-239	1. Add gas to bring the total concentration to 240 ounces. 2. DO **NOT** ADD TIME.
	130-139	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	120-129	1. ADD gas, and 2. EXTEND exposure by 2.5 hours
	110-119	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	100-109	1. ADD gas, and 2. EXTEND exposure by 5.5 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 7.0 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 8.5 hours
	71-79	1. ADD gas, and 2. EXTEND exposure by 10.0 hours
	0-70	ABORT

Table 2-9-3 Determine Gas Concentration Values and Corrections for Oak Log Fumigations using Schedule T312-a-Alternative (continued)

If the Reading is Taken At:	And any individual concentration reading is:	Then:
48 hours	130-139	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	120-129	1. ADD gas, and 2. EXTEND exposure by 2.5 hours
	110-119	1. ADD gas, and 2. EXTEND exposure by 4.5 hours
	100-109	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 8.5 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 9.5 hours
	71-79	1. ADD gas, and 2. EXTEND exposure by 11 hours
	0-70	ABORT
72 hours	90-99	1. ADD gas, and 2. EXTEND exposure by 1.5 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	70-79	1. ADD gas, and 2. EXTEND exposure by 7.5 hours
	60-69	1. ADD gas, and 2. EXTEND exposure by 8.5 hours
	51-59	1. ADD gas, and 2. EXTEND exposure by 11.0 hours
	0-50	ABORT

Important

If additional time has been added to the treatment, the 72 hour reading AND the extended time reading MUST be taken. If the minimum of 100 ounces is **not** met, time and gas MUST be added according to this Table.

Step 5—Exhausting the Gas

Exhaust the gas at the completion of the exposure period. Detector tube readings and the time interval from the aeration must be recorded in the corresponding fields in the "DETECTOR READINGS" form.

Aerating the Enclosure

Aeration procedures are designed to provide safe working conditions during the aeration period and to assure that commodities are safe for handling, storage, and transportation. A fumigant must be aerated in accordance with Environmental Protection Agency (EPA) label requirements, the Occupational Safety and Health Administration (OSHA), and the PPQ Treatment Manual.

When treatments are conducted in a particular location on a regular basis, a permanent site should be designated. At such sites, the fan used to remove the fumigant from the enclosure during aeration must be connected to a permanent stack extending above the roof level.

Responsibility for Aerating the Commodity

The label requires that at least two people trained in the use of the fumigant must be present at all times during gas introduction, treatment, and aeration. The PPQ official, however, is **not** required to be continuously present at the fumigation site throughout the aeration process unless specified by the label or by State or local regulations.

If the fumigation is performed under a Section 18 Exemption, then a PPQ official must be present at the initiation of aeration and to verify the final aeration readings.

Materials Needed

The following materials will be needed to aerate the enclosure:

- SCBA[4]
- Colorimetric tubes (Draeger or Kitagawa for example)
- Exhaust fan[5]
- Exhaust duct[5]
- Danger signs and materials for limiting access to area (barricades, rope)[7]
- PPQ Form 429[4]

4 Materials required for both PPQ and the commercial fumigator.
5 Materials to be furnished by the commercial fumigator.

Securing the Area

Assuming that you have already restricted access and secured the fumigation area, you now must restrict access to the area where the exhaust duct extends on the ground beyond the enclosure.

During the first 10 minutes of aeration, it is recommended that no one be within 200 feet of the exhaust duct outlet.

If this buffer zone is regulated by the State or municipality where the fumigation takes place, local regulations must be followed.

If it is impossible to restrict people from the area of aeration during regular work hours, consider aeration during another time of the day. When securing the duct outlet area, consider the direction of the wind. Face the duct outlet toward an open area, and away from people. Point the duct outlet upward to aid in dispersing the exhausted gas.

Advise the fumigator to use a physical barrier such as ropes, barricades, or walls to secure the area.

Placard the secure area near the exhaust outlet with the appropriate DANGER/PELIGRO signs. Make sure the placards meet the appropriate fumigant label or labeling requirements. The skull and crossbones should be present as well as “AREA UNDER FUMIGATION, DO NOT ENTER/NO ENTRE”; date of the fumigation; name of the fumigant used; and the name, address, and telephone number of the fumigator. Unless you authorize their use, do **not** allow motorized vehicles to operate within the secure area.

Wearing Respiratory Protection

The fumigator and the PPQ official monitoring the aeration must wear approved respiratory protection (SCBA, air supplied respirator, or a combination unit) when:

- Installing the exhaust system
- Opening the tarpaulin for aeration
- Opening the container door(s)
- Anytime during the aeration process when a risk of exposure to concentrations above 5 ppm exists. This includes any time the concentration is unknown.

Aerating Commodities in Closed-door Containers—Indoors and Outdoors

Step 1—Installing the Exhaust System

Advise the fumigator to:

- Integrate an exhaust fan (minimum of 5,200 cfm capacity) with one end of a round ventilation duct at least 16 inches in diameter, oriented so that the fan pulls air through the duct. The fan dimensions should complement the diameter of ductwork chosen, fitting flush and tight so that no leaks exist between the fan and duct. For indoor fumigations, extend the exhaust duct (fan end) at least 30 feet beyond the building or into a vertical stack extending through the roof. For outdoor fumigations, the exhaust duct will be at least 30 feet in length with the fan end placed external and alongside the container extending toward the nose, so the exhaust air is directed away from the end of the container which is opened during aeration.

Palletized Partial Loads

For palletized partial loads (where at least 2 feet of open space is present at the door end of the container), extend the exhaust duct intake (non-fan end) on the container floor with the duct face flush against the bottom of the load along a side of the container. Store the remaining section of the exhaust duct and fan at the rear of the load so it is easily accessible at the start of aeration.

Full Loads

For full loads (where less than 2 feet of open space is available at the door end of the container and there is no central aisle between pallets), if there is room to store the exhaust duct inside the container during fumigation, secure the exhaust duct intake (non-fan end) face flush against the load at the floor/pallet/commodity interface along a side of the container so it will not shift or twist during aeration. Use straps, ties, or other fasteners to secure this interface tightly. If there is not sufficient room to pre-install the exhaust duct prior to fumigation, carry out these steps at the start of aeration.

For partial or full loads where a central aisle exists between the pallets run the exhaust intake duct along the floor center and extend 1-2 feet into this space if possible. Store the remaining section of the exhaust duct and fan at the rear of the load so it is easily accessible at the start of aeration.

Non-palletized Logs

For non-palletized logs, secure the duct face flush against the load at the floor/interface on a side of the container so it will not shift or twist during aeration.

Important

If commodities other than logs are not palletized, consult CPHST-AQI before treatment.

- Integrate an air introduction fan (minimum 3,750 cfm) with a round ventilation duct at least 12 inches in diameter, oriented so that the fan pushes the air through the duct. The fan dimensions should complement the diameter of ductwork chosen, fitting flush and tight so that no leaks exist between the fan and duct. Extend the introduction duct (non-fan end) along top of the load two-thirds of the length of the container. For partial loads, the intake duct may run along the container floor, with the end placed on top of the load. Store the remaining introduction duct and fan at the rear of the load so it is easily accessible at the start of aeration.
- Integrate an additional exhaust fan (minimum of 5,200 cfm capacity) with one end of a round ventilation duct at least 16 inches in diameter, oriented so that the fan pulls air through the duct. The fan dimensions should complement the diameter of ductwork chosen, fitting flush and tight so that no leaks exist between the fan and duct. This duct will be used to aerate the space between the container and tarp prior to tarp removal. The duct length should be approximately 10 feet and should remain outside the tarp during fumigation.

NOTICE

Install introduction and exhaust ducts prior to fumigation in order to limit human exposure to the fumigant at the start of aeration.

Refer to **Figure 2-9-2** for detailed diagrams of air and exhaust ducts. In this diagram, air introduction ducts are blue and exhaust ducts are red.

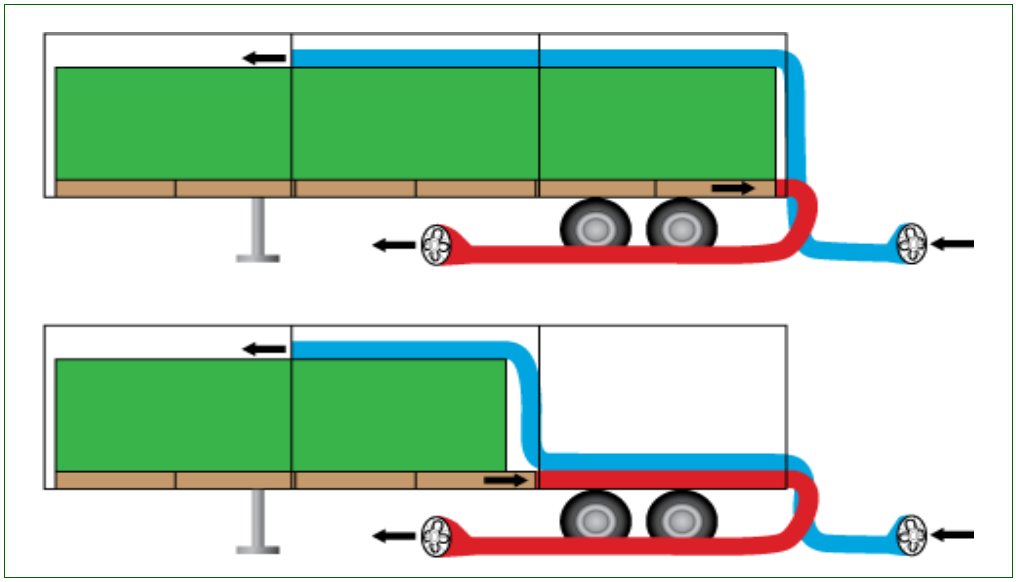

Figure 2-9-2 Ductwork configuration for aeration of containers: full loads (top) and partial loads (bottom)

Step 2—Aerating the Commodity

Advise the fumigator to:

1. While wearing SCBA, insert a spacer (at least 16 square inches in area) to vent the tarpaulin at the nose end of the container. At the opposite end of the tarp, insert the additional exhaust duct 5 feet under the tarp and turn the fan on.
2. Exhaust the gas from underneath the containers before opening the doors of the containers for at least 15 minutes or until the gas concentration level underneath the containers is below 5 ppm.
3. While wearing SCBA, remove the tarp when the gas concentration level underneath the containers is below 5 ppm.
4. With the tarp removed and while wearing SCBA, turn off the fan used to aerate the space and open the doors of each container.
5. Turn on all fumigant circulation fans inside the container and leave them on throughout the aeration.
6. Start the container introduction and exhaust ducts fans. Require a minimum of **4 hours** aeration for all sorptive commodities. Sorptive commodities generally require 12 hours or longer to aerate, however, since sorptive commodities vary in their rates of desorption, aeration may be completed in less than 12 hours.
7. Aerate Oak logs and lumber a minimum of **48 hours**. If, after 48 hours, the concentration is 5 ppm or greater, continue aeration for 24 more hours. Continue this procedure until concentration readings are less than 5 ppm.
8. Stop the fans and take concentration readings with colorimetric tubes in the airspace around and, when feasible, within the log stack.
9. RELEASE the commodity when the concentration reading is 5 ppm or less.