

# H & M Gopher Control

www.handmgophercontrol.com

1979 County Rd 106  
Office (530) 667-5181

Tulelake, CA 96134  
Fax (530) 667-3885

4/19/12

Program Manager, USDA/AMS/TM/NOP,  
Room 4008-So., Ag Stop 0268,  
1400 Independence Ave., SW.,  
Washington, DC 20250

RE: Revised petition to add exhaust gas (carbon monoxide) as an amendment to  
§ 205.601 of the National List for the control of burrowing rodents.

Dear Sirs:

I am Allen W. Hurlburt, CEO and owner in partnership with Virginia L. Massey, CFO of H & M Gopher Control. We manufacture equipment used to inject exhaust gasses into the burrows of burrowing rodents. We advertise and market our equipment (trademarked PERC, Pressurized Exhaust Rodent Controller) nationwide and into Canada. We have been in business since 2005. I invented the machine that year and hold a patent for its manufacture.

Our equipment captures the exhaust gas from an internal combustion gas engine, routes it through a set of cooling coils and into the intake ports of a compressor. From there, it is pressurized and depending on the model unit, utilizes two, four or six air hoses and T bar hand pieces utilized to inject the exhaust gasses into the burrow of the targeted rodent pest.

The whole concept centers around the expulsion and replacement of the air in the rodents tunnel with exhaust gas (carbon monoxide), engulfing the rodent in a lethal concentration of carbon monoxide before it has a chance to block the tunnel or escape.

The equipment is designed and built to be very safe for the operator, the property owner as well as those within the vicinity of the area being treated. The environmental footprint left by the PERC unit is no more than the equivalent level of exhaust emitted by similar horsepower engines used in normal agricultural practices.

The effects of the exhaust gas that is injected into the burrows on the surrounding soil profile can in part be determined by comparing the soil exposed to the exhaust gas in the tunnels as a ratio of the surrounding soil that is adjacent to the tunnel.

For this example, I will use a sandy loam soil and the maximum average

depth of the burrow of 18 inches. The surrounding soil profile might be calculated at a volume of soil 36" wide, by 18" deep by 12" long or 7,776 cubic inches. A gopher burrow within that soil profile is about 3" in diameter by 12" in length for a volume of 85 cubic inches. This gives us a ratio of 1 to 91.5, or 1.1 percent of the soil profile is subject to exhaust gas (carbon monoxide) exposure.

While the 1.1 percent of the surrounding soil profile is a very low figure (a maximum of 16 ppm if the available 1500 ppm CO injected in the burrow was evenly distributed) a more realistic understanding is that the majority of the CO in the burrow will leak out through the loose soil in the burrow openings rather than spread into the surrounding soil.

This could be compared to the soil exposed to exhaust gasses under normal farming operations would be almost 100 percent of the depth of the portion of the soil that is tilled at any one tilling operation.

*As provided for in OFPA (7 U.S.C 6518(m)), when evaluating petitioned substances for amendment of the National List, the NOSB shall consider:*

*(1) The potential of such substances for detrimental chemical interactions with other materials used in organic farming systems;*

There is no known detrimental chemical interaction with any material used in organic farming systems with carbon monoxide (CO). Though we know of no studies in this regard, the exposure of almost all materials used in organic farming to carbon monoxide is one hundred percent because of the extensive use of internal combustion engines.

*(2) The toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment;*

Because CO is lighter than air, the lethal phase of CO in the burrow is very short lived once the injection process of about 5 minutes has ceased. Peripheral proof is that old burrows that have been treated with CO then left unattended can and are frequently reoccupied by burrowing rodents from non-treated boarder areas. These rodents are not visibly effected by any residual CO.

Residual environmental effects would be no more or less than the operation of a similar horsepower engine used in normal organic farming operations.

*(3) The probability of environmental contamination during manufacture, use, misuse or disposal of such substance;*

Carbon monoxide is not a manufactured product in the common sense of the term. Rather it is a by-product of the exhaust gasses produced any time an internal combustion engine is operated. CO can be misused if any internal combustion engine is operated in an enclosed space like a garage without adequate ventilation. Its normal state is a gas and as such breaks down to carbon dioxide and ozone when released into the atmosphere.

*(4) The effect of the substance on human health;*

(Source: Wikipedia.org)

**Carbon monoxide (CO)**, also called **carbonous oxide**, is a colorless, odorless, and tasteless gas that is slightly lighter than air. It can be toxic to humans and animals when encountered in higher concentrations, although it is also produced in normal animal metabolism in low quantities, and is thought to have some normal biological functions. In the atmosphere however, it is short lived and spatially variable, since it combines with oxygen to form carbon dioxide and ozone.

Worldwide, the largest source of carbon monoxide is natural in origin, due to photochemical reactions in the troposphere that generate about  $5 \times 10^{12}$  kilograms per year.<sup>[3]</sup> Other natural sources of CO include volcanoes, forest fires, and other forms of combustion.

In biology, carbon monoxide is naturally produced by the action of heme oxygenase 1 and 2 on the heme from hemoglobin breakdown. This process produces a certain amount of carboxyhemoglobin in normal persons, even if they do not breathe any carbon monoxide.

Carbon monoxide poisoning is the most common type of fatal air poisoning in many countries.<sup>[19]</sup> Carbon monoxide is colourless, odorless, and tasteless, but highly toxic. It combines with hemoglobin to produce carboxyhemoglobin, which is ineffective for delivering oxygen to bodily tissues. Concentrations as low as 667 ppm may cause up to 50% of the body's hemoglobin to convert to carboxyhemoglobin.<sup>[20]</sup> A level of 50% carboxyhemoglobin may result in seizure, coma, and fatality. In the United States, the OSHA limits long-term workplace exposure levels above 50 ppm.<sup>[21]</sup> Within short time scales, carbon monoxide absorption is cumulative, since the half-life is about 5 h in fresh air

*(5) The effects of the substance on biological and chemical interactions in the agroecosystem, including the hysiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;*

As noted in the excerpts from Wikipedia.org in section 4 on carbon monoxide, CO is a natural occurring gas produced in humans, animals and nature. It is only in confined spaces such as a gopher burrow or an enclosed building or vehicle that deadly concentrations can exist. Carbon monoxide is lighter than air so it not only rises out of harms way, it also dissipates when exposed to air to harmless carbon dioxide and ozone.

Though studies could prove otherwise, today's experts progress under the assumption that CO has a neutral effect on plant life as well as its effects on soil organisms. The extensive use of internal combustion engines to produce food and fiber on commercial farms today indicates that this assumption is not groundless.

*(6) The alternatives to using the substance in terms of practices or other available materials; and*

Alternatives to the use of pressurized CO in commercial organic agricultural is very limited. Poison baits are not allowed nor is propane/oxygen explosions. That leaves trapping which is not allowed in some states like Washington. Where trapping is allowed, it is not practical on large commercial acreages because of its labor requirement.

Use of the PERC system has proven very effective on non organic commercial farms.

*(7) Its compatibility with a system of sustainable agriculture.*

The simple fact that the use of pressurized exhaust gasses, CO, is very safe and is not intrusive to the natural soil organisms makes it very compatible with sustainable

agriculture.

Exploding populations of burrowing rodents not only eliminate the best plans for a sustainable cropping system, the economic damage is a serious threat to the short and long term viability of the farm.

In response to petition guidelines (72 FR 2167).

1. Carbon monoxide (CO)
2. Allen Hurlburt, CEO  
H & M Gopher Control  
1979 Co. Rd. 106  
Tulelake, CA 96134  
Phone: 530 667-5181  
Cell: 541 892-8282  
Fax: 530 667-3885  
[www.handmgophercontrol.com](http://www.handmgophercontrol.com)
3. Rodenticide – for the control and elimination of burrowing rodents and other burrowing animals that make and live in burrows. Includes but is not limited to: Gophers, moles, voles, ground squirrels, prairie dogs, voles, field mice and ground hogs.

The PERC system (injection of exhaust gas containing CO) is specifically instructed not to be used in or under a structure that is inhabited or might be inhabited by humans or animals.

4. Pressurized exhaust gas containing carbon monoxide is injected into the burrows of the targeted pest animal. The CO levels in the pure exhaust will vary from 22,000 parts per million (ppm) to 40,000 ppm. The injection rate at the tip of the probe that is put in the burrow is approximately 7 ½ cubic feet per minute (cfm). A single burrow system will be probed in several locations if possible and each probe left in the burrow from two minutes to five minutes. The desired level of CO in the burrow is 1,200 ppm.

The PERC system has been used throughout the United States to treat dry land pastures and range lands infested with ground squirrels and prairie dogs. Irrigated fields with crops such as but not limited to are alfalfa, vineyards, orchards such as almonds, walnuts, cherries, blueberries and grass seed. The horse industry uses PERC systems to keep burrowing rodents out of their paddocks and pastures. Pest control businesses use PERC's to eliminate burrowing rodents in private resident yards, public right of ways, parks and schools. Both schools and municipalities have purchased PERC units to keep burrowing rodents out of their athletic fields.

5. Carbon monoxide is unburned hydrocarbons that are found in the exhaust of internal combustion engines. It is found naturally in the emitted gas and material from volcanoes. (By far the largest source of CO released into the

atmosphere.) in addition, CO is made in minute levels in the bodies of humans and animals.

H & M Gopher Control does not 'manufacture' CO but rather captures pure exhaust emitted from an internal combustion engine that drives a compressor. The exhaust is cooled and routed into the intake ports of the compressor and pressurized in a pressure tank. It is then injected into burrows utilizing air hoses and T – bar hand probes with ball valves.

The process of pressurizing the exhaust and injecting it into underground burrows is patented, US patent # 7,581,349, held by Allen Hurlburt, CEO of H & M Gopher Control.

6. Two studies have been done on the use and safety of carbon monoxide. The first was done by Lompoc Valley Middle School, Lompoc, CA addressing safety concerns of those in proximity of an injection site such as children, the operator, school buildings.

Lompoc Valley Middle School Carbon Monoxide Gopher Machine Test Results

Date: Thursday 2/9/12 Location: LVMS Tester: John Webster and Tuan Nguyen

Condition: Using Lompoc City Pressurized Exhaust Rodent Controller and the Santa Maria Joint Union High School CO meter, we perform the following test at Lompoc Valley Middle School to record Carbon Monoxide reading.

The results are as follow:

Time (min)	Location/Distance from unit	Carbon Monoxide
0 min after unit starts	At the unit tank, around the engine	3 ppm
1 min after starting unit	At the unit, by the engine exhaust	200 ppm
1 min after starting unit	Truck exhaust, for comparison purpose.	145 ppm
1 min after starting unit	At probe #1, about 37 feet away from unit, with normal compact soil.	30 ppm
1 min after starting unit	At probe #1, about 37 feet away from unit, with open gopher hole near by (about 2 feet away)	> 1000 ppm
1 min after starting unit	At probe #1, about 37 feet away from unit, with semi mount dirt over gopher hole.	Range 50 ppm to 80 ppm
1 min after starting unit	At probe #2, about 37 feet away from unit, with normal compact soil.	30 ppm
5 min after starting unit	At probe #1, about 37 feet away from unit, with normal compact soil. Machine produces constant CO exhaust.	30 ppm
10 minutes after shutting off machine	At probe #1, about 37 feet away from unit, with normal compact soil. Machine is shut off.	5 ppm
10 minutes after shutting off machine	At probe #2, about 37 feet away from unit, with normal compact soil. Machine is shut off.	5 ppm

Analysis:

- Around the unit, after start up, the unit engine exhaust is producing around 200ppm. This is different from the CO reading at the probe. Design CO output at the probe is > 1000ppm.
- Around the unit tank, after start up, the CO reading is around 3 ppm. This shows that there is not very much CO leakage at the tank and connections.
- Temperature of CO exhaust is cool, around 60 degree F.
- At the probe location, with normal compact soil, the surface CO reading is around 30 ppm.
- At the probe location, with loose gopher mount soil, the surface CO reading is around 50 to 80 ppm
- 10 minutes after turning off the unit, the level at the probe location (37 feet away) drop to 5 ppm.

Recommendation

- After unit startup, user should avoid standing by the unit exhaust
- User should have a CO monitor to detect and stay clear of high CO level
- User needs to check the mount around the probe to insure proper CO protection and insure maximum CO level in the gopher hole.
- Provide a CO monitor at nearby portable structure (150 feet or less) as a precaution. Because some portables are sitting on dirt, there is potential gopher activity under the portable.
- We could not test the unit effectiveness because this is a time repetitive process. Based on Lompoc city usage for the last month and the reduction in gopher mount, this machine works very well to control gopher population.

The second study is not completed. It was done by Roger Baldwin, PhD and Steve Orloff, PhD, University of California Extension, Davis, CA March 19, 2012. This study concerns the effectiveness of the PERC system when treating gophers on a field wide basis.

7. In 2006, all information concerning the PERC system including the patent application was submitted to the EPA. The company was issued a EPA Establishment number, 83419-CA-001. We are required to give each unit a serial number, keep a record of who purchased those units and submit an annual report of numbers sold each

year. It was determined that CO was not a pesticide.

On October 2, 2011, California Governor Brown, signed into law, AB634 which took effect January 1, 2012. AB634 legalizes the use of carbon monoxide in California to kill burrowing rodents.

FDA has not been approached nor has issued a ruling on the use of CO to kill burrowing rodents.

8. There has not been an application for or issue of a Chemical Abstract Services number. CO is not classed as a pesticide or agricultural chemical.

9. Carbon monoxide's chemical symbol is CO.

(a) When released into the atmosphere, CO rapidly breaks down into carbon dioxide, and ozone. Carbon dioxide is a necessary part of photosynthesis that facilitates plant growth. A requirement for successful organic agriculture.

(b) CO is highly toxic to air breathing mammals. It attaches to the red blood cells and causes severe damage to the nervous system as well as the brain. CO does not remain in the atmosphere as such but breaks down to carbon dioxide and ozone.

(c) The environmental impacts of the use of pressurized exhaust (CO) to kill burrowing rodents is no more nor no less than the use of any internal combustion engine. They all produce carbon dioxide as well as carbon monoxide.

(d) CO is very detrimental to human health. EPA regulations require exposure not exceed 35 ppm. Exposure to 800 or more ppm for any length of time can cause permanent brain and nervous system damage or death. Internal combustion engines should never be operated inside a structure that is inhabited by people or animals.

(e) The effect of CO on soil organisms is negligible. (see paragraph above describing the possible ppm levels in the effected soil profile when rodent burrows are treated.) The effect on animals in open air is zero.

10. There is no MSDS nor substance report from the National Institute of Environmental Services on the use of pressurized exhaust gas to control burrowing rodents.

11. Except for the two studies mentioned in item 6 above, the use of CO in treating burrowing rodents has not been pursued that extensively. The use of poison baits and aluminum phosphate are not allowed in organic farming and trapping is outlawed in some state, notably Washington.

While there are several 'home brewed' deterrents for burrowing pests like moth balls, experienced results report that the target rodent will bury the material and ignore it. Trapping and home brewed remedies can work for small farms, but today's organic agriculture encompasses thousand cow dairy's, multi thousand acre hay farms, grain farms and orchards. Consequently, serious yield loss, serious reductions in quality that ultimately results in the consumer paying more for a poor grade product is common.



April 18, 2012, Modoc County Road 106, Tulelake, CA. 95 acre, seven year old stand of alfalfa, certified organic. Serious stand loss from gopher infestation. Dirt in the hay causes loss of quality. There has been no gopher control program in this field. The farmer grows about 900 acres of certified organic alfalfa. Estimated yield in crop year 2011, 3 tons per acre.

It should be noted that the two fields in these pictures are two very different farmers who use very different farming philosophies on similar soil types. But the hay grown organically is damaged from gophers both in yield and quality. While the organic hay commands a premium, it puts the purchasing dairy at a disadvantage because the poor quality will not produce the milk that the superior quality conventionally grown hay will.

To compensate for his much higher feed cost, the organic dairy has to command higher prices from the consumer to compensate his use of organically grown hay.



April 18, 2012 , Modoc County Road 106, Tulelake, CA. 100 acre, 5 year old stand of alfalfa, grown conventionally. This field does have a gopher problem, but it is managed by conventional methods. Stand loss from gophers is minimal and hay quality is consistently top grade. Estimated yield in crop year 2011, 7 tons per acre. This grower has 1,200 acres of alfalfa.

12. (A) The inclusion of carbon monoxide does not fit the definition of a Synthetic. It occurs naturally in volcanoes and is produced naturally in small amounts in both animals and humans.

There are severe losses in both crop quality and crop yield from burrowing rodent predication and damage to irrigation and harvesting equipment. In some instances, burrowing rodent burrows can cause safety hazards for people working in the fields.

The only non Synthetic burrowing rodent control is trapping. While practical on small acreages, it is not practical on commercial farms due to both labor and logistical limitations.

The benefits from the use of pressurized exhaust, (carbon monoxide) are several.

CO does not effect beneficial soil organisms and may benefit plant growth by adding additional CO<sub>2</sub> at the plant level.

The use of pressurized exhaust (CO) is very safe for the operator, people that are in the vicinity and occupied building in the vicinity. The very fact that CO dissipates very rapidly when released into the atmosphere from an enclosed area, (a burrow) and breaks down into CO<sub>2</sub> and ozone establishes a 'fail safe' option that protects people that are in the area of operation.

13. Confidential Business Information Statement.

There is very little about this submission or H & M Gopher Control that is confidential. We submitted a patent application in 2005 and it was approved and registered. US Patent No. 7,581,349. To get this patent, we had to submit a complete set of drawings that would show a person with the appropriate skills to make the patented machine. Our patent covers the pressurization of exhaust gas and its injection into the burrows of burrowing rodents. While we have no objection to farmers making their own pressurize exhaust burrowing rodent machine for their private use and even will give supportive advice on how they can best succeed, we will and do investigate and enforce our patent against those that violate our patent for commercial production. This does not include the commercial pest control business that purchases our equipment for their business. We will enforce our patent when a machine is built and used for fee based commercial applications.

As for trade secrets, there is none, either in production or information offered our customers. We believe that everyone benefits from an open door policy. If it works, use it, if it doesn't, don't. We are available for all questions and inquiries, past, present and future.

#### In Summary:

Burrowing rodents in agriculture result in crop yield reductions, loss of quality and long term damage to crop stands. In forage crops, especially alfalfa hay production, estimated per acre losses in gross income can be fifty to over a hundred dollars per acre.

Harvest delays, machinery breakdowns and dirt in the hay are only a few of the problems caused by gopher and squirrel mounds in commercial hay fields.

Root damage in vineyards and orchards weaken plants and cause reduced yields. New plantings can have plants killed by gophers causing a very expensive process to be repeated.

Water has become the underlying theme as to weather farming is viable in any given area. The development of drip irrigation to conserve water has attracted a lot of farmers that want to extend the sustainability of their farm. Gopher damage to buried drip lines can cause dangerous hidden mud holes as well as expensive repairs.

The use of pressurized exhaust – CO, is a growing part of aggressive management practice to control burrowing rodents that farmers are incorporating in their operations.

---

With good management, many farmers have reduced their gopher populations to a very small percentage of what they had to contend with prior to the incorporation of CO use in their fields.

Organic farmers have a severe handicap because of burrowing rodents. Some states outlaw the use of traps which effectively means that their only mode

of control is to depend on nature's own, birds of prey and coyotes.

Many fields become so heavily infested with gophers and ground squirrels that the farmer has to resort to plowing, deep tillage and replanting to try and chase the rodents out of the field. A very short term fix at best.

Thank you,

A handwritten signature in cursive script that reads "Allen Hurlburt". The signature is written in black ink and is positioned below the "Thank you," text.

Allen Hurlburt

Lompoc Valley Middle School Carbon Monoxide Gopher Machine Test Results

Date: Thursday 2/9/12 Location: LVMS Tester: John Webster and Tuan Nguyen

Condition: Using Lompoc City Pressurized Exhaust Rodent Controller and the Santa Maria Joint Union High School CO meter, we perform the following test at Lompoc Valley Middle School to record Carbon Monoxide reading.

The results are as follow:

Time (min)	Location/Distance from unit	Carbon Monoxide
0 min after unit starts	At the unit tank, around the engine	3 ppm
1 min after starting unit	At the unit, by the engine exhaust	200 ppm
1 min after starting unit	Truck exhaust, for comparison purpose.	145 ppm
1 min after starting unit	At probe #1, about 37 feet away from unit, with normal compact soil.	30 ppm
1 min after starting unit	At probe #1, about 37 feet away from unit, with open gopher hole near by (about 2 feet away)	> 1000 ppm
1 min after starting unit	At probe #1, about 37 feet away from unit, with semi mount dirt over gopher hole.	Range 50 ppm to 80 ppm
1 min after starting unit	At probe #2, about 37 feet away from unit, with normal compact soil.	30 ppm
5 min after starting unit	At probe #1, about 37 feet away from unit, with normal compact soil. Machine produces constant CO exhaust.	30 ppm
10 minutes after shutting off machine	At probe #1, about 37 feet away from unit, with normal compact soil. Machine is shut off.	5 ppm
10 minutes after shutting off machine	At probe #2, about 37 feet away from unit, with normal compact soil. Machine is shut off.	5 ppm

Analysis:

- Around the unit, after start up, the unit engine exhaust is producing around 200ppm. This is different from the CO reading at the probe. Design CO output at the probe is > 1000ppm.
- Around the unit tank, after start up, the CO reading is around 3 ppm. This shows that there is not very much CO leakage at the tank and connections.
- Temperature of CO exhaust is cool, around 60 degree F.
- At the probe location, with normal compact soil, the surface CO reading is around 30 ppm.
- At the probe location, with loose gopher mount soil, the surface CO reading is around 50 to 80 ppm
- 10 minutes after turning off the unit, the level at the probe location (37 feet away) drop to 5 ppm.

Recommendation

- After unit startup, user should avoid standing by the unit exhaust
- User should have a CO monitor to detect and stay clear of high CO level
- User needs to check the mount around the probe to insure proper CO protection and insure maximum CO level in the gopher hole.
- Provide a CO monitor at nearby portable structure (150 feet or less) as a precaution. Because some portables are sitting on dirt, there is potential gopher activity under the portable.
- We could not test the unit effectiveness because this is a time repetitive process. Based on Lompoc city usage for the last month and the reduction in gopher mount, this machine works very well to control gopher population.