Evacuation and Sheltering Plan Addendum

SUNPRAIRIE GRAIN TRANS-LOADING FACILITY

Burke County, North Dakota

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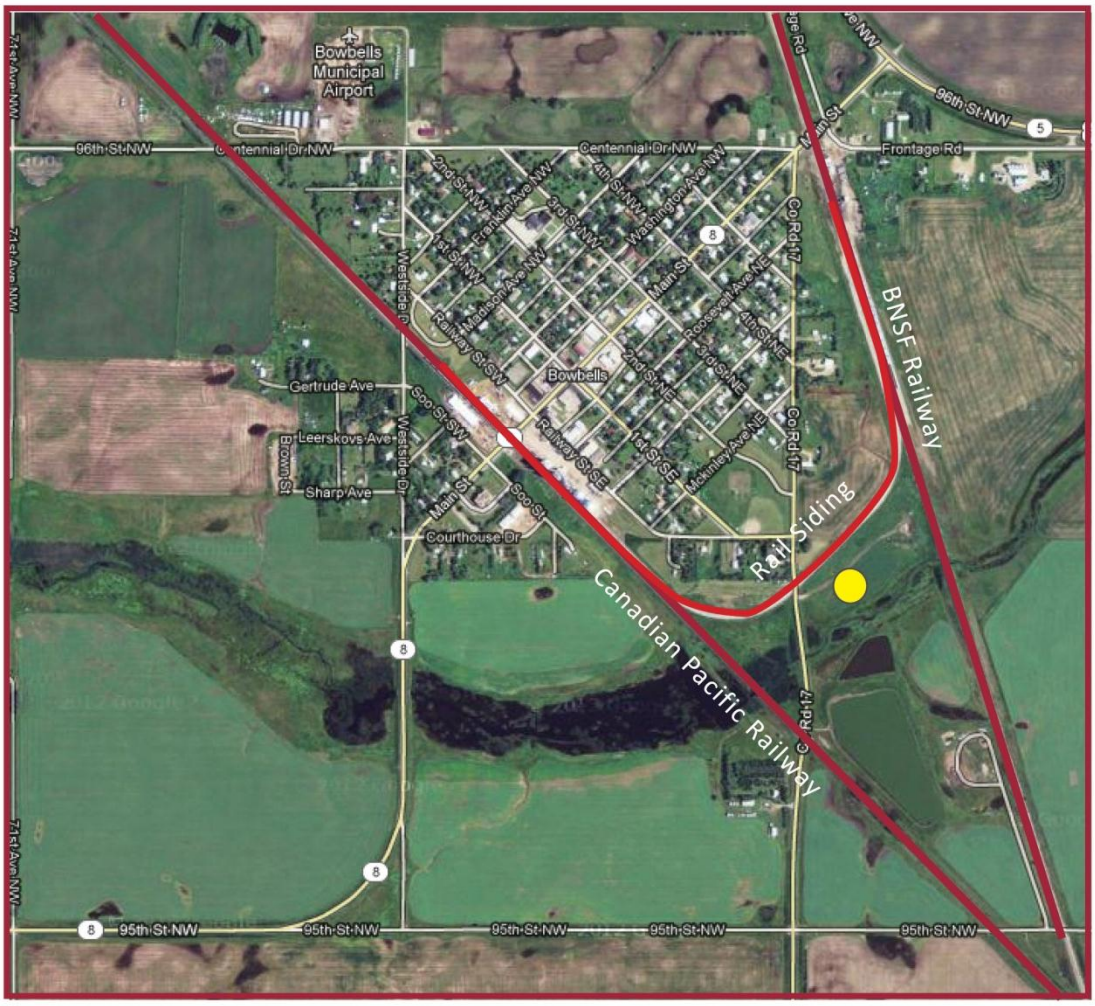
SunPrairie Grain Trans-Loading Facility
Bowbells, ND

A. Facility Location and Security

The trans-loading facility is located southeast of the intersection of County Road 17 and Railway Street SE north of the railway siding. The location of the facility is shown on **Figure 1**. The facility is not secured with fencing and there is no security patrol of the facility; however, the trans-loading operator is on site between 7:00 am and 6:00 pm.

FIGURE 1 – FACILITY LOCATION

SUNPRAIRIE GRAIN TRANS-LOADING FACILITY



B. Facility Owner

SunPrairie Grain, a division of CHS Inc., owns the rail siding and is the operator of the trans-loading facility. CHS Inc. is a diversified global energy, grains and foods business company. Bryan Lewis is a

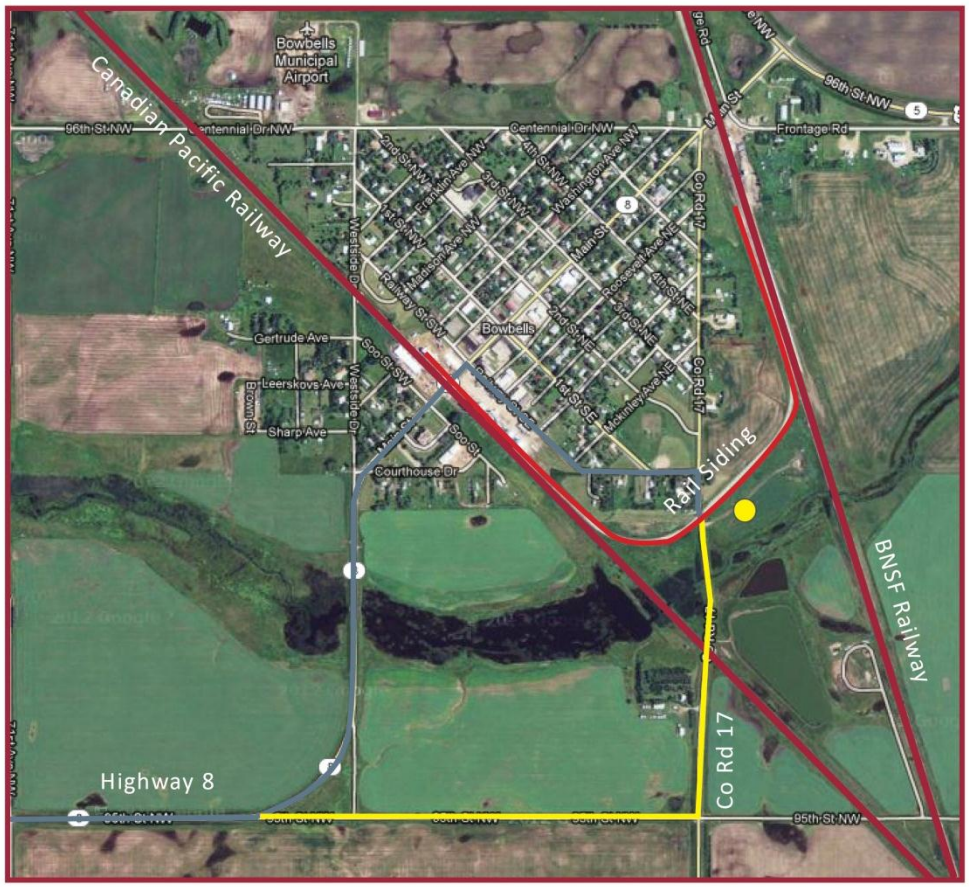
company safety manager who is very familiar with trans-loading facilities. Mr. Lewis's office phone number is 651 355 8425 and his cell phone number is 612 799 5480.

C. Transport of Fuels

Figure 2 shows the transport truck routes. The primary route to the facility is eastbound on Highway 8, eastbound on 95th Street NW and northbound on County Road 17. This route by-passes the City of Bowbells. If justified by weather, road conditions or other circumstances, the transport trucks will travel on Highway 8 into the city and proceed east on Railway Street SW to the facility (route shown in gray on Figure 2).

FIGURE 2 – TRUCK ROUTE

SUNPRAIRIE GRAIN TRANS-LOADING FACILITY



LEGEND
- CITY BYPASS ROUTE
- CITY ROUTE

Liquid propane and butane are delivered to the facility by transport trucks. During non-winter months an average of 9 to 12 transport trucks arrive at the facility each day. The maximum number of truck deliveries is 20 per day. During winter months, significantly fewer transport trucks deliver fuel to the facility because of the increased local demand for propane for home heating.

Transport trucks are typically at the facility between 7:00 am and 6:00 pm. Trucks generally must arrive at the facility by 4:00 pm and complete unloading by 6:00 pm.

The average volume transported on the transport trucks is 10,000 gallons of liquefied petroleum gas. The largest transport trucks can carry approximately 13,000 gallons. It typically requires three transport trucks to fill one railcar.

The cargo tank motor vehicles (CTMVs), or transport trucks, are made of steel and meet the DOT specification for a cargo tank. The sides of the containers are approximately 1/2" thick and the domed ends, or heads, of the containers are between 1/3" and 4/10" thick. The maximum allowable working pressure of the CTMV is typically 250 psi. There is at least one pressure release valve on the top of the CTMV, set to discharge, passively, if the pressure in the container approaches 250 psi. Table 1 shows the vapor pressure of the various products being handled at the trans-loading facility.

Table 1: Vapor Pressure for Butane and Propane

Approximate Vapor Pressure in psig									
Temperature		Propane →			To →				Butane
° F	° C	100%	95/5*	80/20	60/40	50/50	40/60	20/80	100%
-40	-40.0	3.6	1.3						
-30	-34.4	8	5.5	4.5					
-20	-28.9	14	11	9.2	4.9	1.9			
-10	-23.3	20	17	16	9	6	3.5		
0	-17.8	28	24	22	15	11	7.3		
10	-12.2	37	32	29	20	17	13	3.4	
20	-6.7	47	41	36	28	23	18	7.4	
30	-1.1	58	52	45	35	29	24	13	
40	4.4	72	63	58	44	37	32	18	3
50	10.0	86	77	69	53	46	40	24	6.9
60	15.6	102	93	80	65	56	49	30	12
70	21.1	127	109	95	78	68	59	38	17
80	26.7	140	128	125	90	80	70	46	23
90	32.2	165	149	140	112	95	82	56	29
100	37.8	196	172	168	137	123	100	69	36
110	43.3	220	197	185	165	148	130	80	45
* HD5, Commercial Grade Propane									

The CHS-owned rail siding has the capacity to store up to 110 railcars. On a typical day there are between 20 and 25 railcars on the siding. Whether the railcars are full or empty depends largely upon railroad service and transport availability. The maximum capacity of a railroad tank car is 34,500 gallons.

Access to the rail siding is controlled by the Canadian Pacific (CP) and Burlington Northern Santa Fe (BNSF) Railroads. The railroad staff will activate a main line switch to allow delivery or removal of railcars for the siding. CP provides service to the siding every other day and BNSF provides service three times a week.

D. Facility Operations

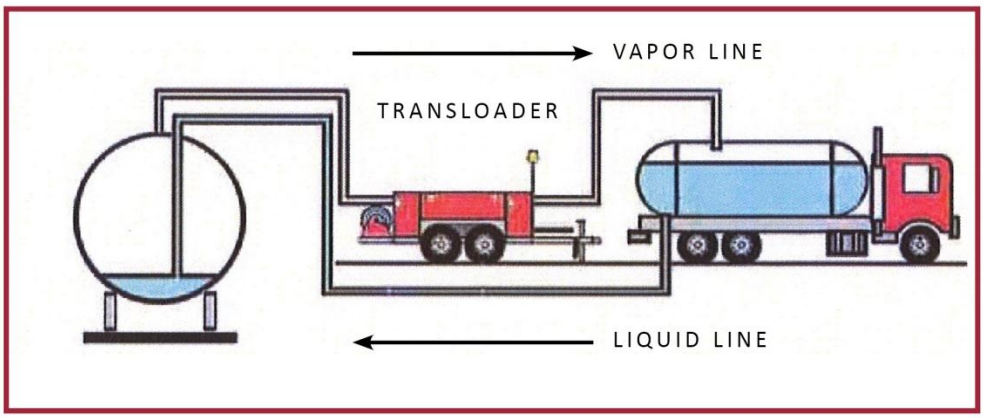
The trans-loading facility transfers liquefied petroleum gas from CTMVs to railroad tank cars. The trans-loading operation is illustrated by **Figure 3**. During the transfer of product, liquefied petroleum gas

vapor is displaced by liquid inside the railroad tank car filling it with liquefied petroleum gas. The liquefied petroleum gas vapor is transferred from the railroad tank car to the CTMV. As a result, the CTMVs arrive at the facility loaded with liquid fuel and leave the facility empty of liquid, but with residual liquefied petroleum gas vapor. The railroad tank cars on site typically arrive empty of liquid LP-Gas, containing residual vapor, and are filled with liquefied petroleum gas.

The number of trans-loaders that physically transfer the fuel from the trucks to the railcars can vary from one or more. Each truck requires connection to a trans-loader so at any one time, no more than one truck can transfer product through one trans-loader. Therefore, if there are two trans-loaders on site, there can be no more than two trucks transferring product at any given time.

FIGURE 3 – TRANS-LOADING PROCESS ILLUSTRATION

SUNPRAIRIE GRAIN TRANS-LOADING FACILITY



Figures 4 and 5 are photographs of the trans-loading operation in process. The trans-loading operation requires two staff, the truck driver, who is responsible for transferring the fuel from the CTMV and the on-site trans-loader operator, who is responsible for operating the trans-loader and safely facilitating the transfer of LP-Gas into the railroad tank car.

There are numerous safety features built into the product transfer process. There are emergency shutoff valves (ESVs) located throughout the piping and hoses on the trans-loader and at the railroad tank car. ESVs can be activated one of three ways-manually, remotely or thermally.

There are emergency shutdown stations located on the driver's side front and passenger side rear of the CTMV. The CTMV liquid hose or the discharge system on the CTMV has a passive shutdown system that activates without human intervention in the event a hose rupture between the transport and the transloader, effectively closing off the flow of product with the only product loss being the contents of the hose.

There are at least two remote shutdown stations located on the driver's side behind the cab and at the top of the ladder going to the railroad tank car on a trans-loader. Some of the trans-loaders have an additional shutdown station on the rear of the unit. In addition, the trans-loader operator has a remote control on hand throughout the entire transfer process, which can be activated up to 150 feet away from the transloader to operate the ESVs and to stop the engine of the trans-loader from running in the event of an emergency. By activating any of the stations or the remote control, the ESVs close off product flow, effectively containing the product to the CTMV, trans-loader or railroad tank car.

FIGURE 4 – TRANS-LOADING OPERATION

SUNPRAIRIE GRAIN TRANS-LOADING FACILITY

FIGURE 5 – TRANS-LOADING OPERATION

SUNPRAIRIE GRAIN TRANS-LOADING FACILITY

E. Properties of Propane and Butane

Propane and butane are non-toxic and highly flammable. Propane, in its natural state, is tasteless, colorless and odorless. An odorant is added to propane, giving it its distinctive smell. Butane has a faintly disagreeable natural gas or gasoline-like odor.

Similar to water, liquefied propane and butane will vaporize when they reach their respective boiling points. The boiling point of propane is -44° Fahrenheit and propane will vaporize at temperatures above -44° Fahrenheit. The boiling point for butane is 32° Fahrenheit and butane will vaporize at or above that

temperature. To prevent vaporization of the liquid propane and butane, LP-Gas is stored and transported as a liquid under pressure. When liquid propane is released to the atmosphere above its boiling point, the propane liquid rapidly vaporizes. When propane changes from liquid to vapor, its expansion ratio is 270 times the volume of the liquid propane (expansion rate of 270). Simply put, one cubic foot of propane liquid will rapidly expand into 270 cubic feet of propane vapor. Similarly, when liquid butane reaches it boiling point and is released to the atmosphere above its boiling point, the volume of butane vapor is 230 times the volume of liquid butane (expansion rate of 230). Simply put, one cubic foot of butane liquid will rapidly expand into 230 cubic feet of butane vapor.

If there is an unintended release at the facility, liquid propane will nearly always vaporize and liquid butane will vaporize if the outdoor temperature is at or above 32° Fahrenheit (its boiling point). Given the expansion rates of the liquid fuels a liquid release would quickly create a very large vapor cloud or plume. A liquid release of LP-gas is generally more dangerous than a vapor release.

Propane and butane vapors have a specific gravity of 1.52 and 2.01 respectively, meaning that both products are heavier than air. A vapor release will tend to settle into low areas in the surrounding terrain. Wind currents can carry the vapors and disperse them quickly.

Assuming a flat terrain and a calm day with no wind the vapor cloud will generally remain close to the ground and occupy a large area. If there are depressions or low spots at the leak location, the vaporized fuel may collect in those areas and extend beyond when the volume of the depression or low spot is filled with vaporized fuel. In essence, the movement of vaporized propane and butane will migrate to low areas in the terrain.

If the outside temperature is below 32° Fahrenheit a release of liquid butane will remain in its liquid state and collect in low areas of the terrain, similar to liquid water.

The greatest danger of a fuel vapor leak is on a calm day. In such conditions, the vapor plume will remain large and intact. However, if there are windy conditions, the vapor plume will be less intact because it will be displaced by objects it is blown into, lessening the concentration of the vapor plume.

The concentration of the plume is a very important factor in determining its combustibility. Both gases have lower and upper flammable limits (also referred to as explosive limits) based on the percentage of the gas relative to the volume of air. Below the lower flammable limit the gas is not concentrated enough relative to air to burn and above the upper flammable limit the gas is too concentrated relative to air to burn. The flammable limits in Table 1 are expressed in terms of the percentage of gas relative to air.

Table 2: Explosive Limits for Butane and Propane

Substance	Lower Flammable Limit	Upper Flammable Limit	Ideal Combustion Concentration
Butane	1.55%	8.6%	3.2%
Propane	2.15%	9.6%	4.2%

Source: *Propane Emergencies,* Third Addition, Michael S. Hildebrand and Gregory G. Noll

Between the upper and lower flammable limits for propane and butane, an ignition source with a temperature of 920° Fahrenheit or greater is required to cause combustion. The head of a lit match, a lit cigarette, a gas pilot for a stove or furnace and the electric arc for turning on a 110 volt switch all can ignite propane and butane and cause combustion when the concentration of the gas is between the lower and upper flammable limits.

Both butane and propane have specific concentrations in relation to air that produce “ideal” combustion. Ideal combustion will result in a clean burn of the gases. The ideal combustion

concentration for butane and propane gas is shown in Table 1. For propane, if combustion does not occur at the ideal combustion concentration an incomplete combustion will occur resulting in the generation of harmful by-products including carbon monoxide, sulfuric acid and aldehydes. For butane the by-products of incomplete combustion include carbon dioxide and carbon monoxide. The major threat of incomplete combustion is the creation of carbon monoxide which is an odorless gas. Table 2 shows the effects of exposure to carbon monoxide at different concentrations expressed as a percentage of carbon monoxide (CO) in air.

Table 3: Concentration Levels and Physiological Effects of Carbon Monoxide

Concentration of CO in Air	Physiological Effects
0.08%	Dizziness, nausea, and convulsions within 45 minutes. Unconsciousness within 2 hours. Death within 2-3 hours.
0.16%	Headache, dizziness, and nausea within 20 minutes. Death within 1 hour.
0.32%	Headache, dizziness, and nausea with 5-10 minutes. Death within 30 minutes.
0.64%	Headache, dizziness, and nausea with 1-2 minutes. Death within 10-15 minutes.
1.28%	Death within 1-3 minutes.

Source: *Propane Emergencies,* Third Addition, Michael S. Hildebrand and Gregory G. Noll

Recommended Amendments to the Burke County Evacuation and Sheltering Plan

Given the type of possible emergencies associated with the trans-loading facility, the Bowbells Fire Department will assume Incident Command responsibilities. Bowbells Fire Department staff will also assume the responsibilities of Evacuation Branch Director and Perimeter Group Supervisor.

The Bowbells Fire Department will direct the evacuation escort, property security and traffic control teams.

To effectively respond to gas vapor leak at the trans-loading facility it is strongly recommended that the Bowbells Fire Department acquire portable butane and propane gas meters. The gas meters will enable to measure the presence of butane or propane gas which will facilitate isolation and evacuation measures.

Phase 1 – Prevention, Mitigation and Preparation

Bowbells Fire Department

- Develop first response and evacuation SOPs for all risks identified in this Addendum to the Burke County Evacuation and Sheltering Plan.
- Coordinate with a CHS Inc. Safety Manager to conduct an on-site first response exercise. Observe the trans-loading operation and identify and document (with pictures) all shut-off valves on the transport truck, the trans-loader and railcar.
- Participate in training exercises in responses to all identified risks.
- Coordinate with CHS Inc. to acquire mobile gas detectors for first responders.
- Acquire the ND Department of Emergency Services, Operations and Plans Chief, Amy Anton cell phone telephone number.

Sheriff's Department

- Determine if existing planned shelters have sufficient capacity to accommodate the entire population of the City of Bowbells. The City population in 2010 was 366 persons.

Phase 2 – Response

Sheriff's Department

- Assist the Bowbells Fire Department in establishing isolation, evacuation, sheltering zones and evacuation priorities.
- Assist the Bowbells Fire Department in documenting evacuation progress to avoid gaps or duplications.
- Assist the Bowbells Fire Department plan and manage over all traffic control.
- Have a representative at the press briefing area.
- Plan and manage assembly areas for those without vehicles.
- Assist the Bowbells Fire Department to identify evacuation teams to do street-by-street or house-by-house evacuations.
- Assist the Bowbells Fire Department to organize and direct security in zones throughout the incident.

- Coordinate with the Bowbells Fire Department to notify and coordinate with county extension service for locations and direction for the evacuation of animals.
- Obtain contact information (Social Services) and provide evacuation transportation for functional needs residents.

Fire Department

- Assume command and initiate evacuation with authority from The International Rural Fire Code 104.11 (as adopted by the State of North Dakota).
- As per command, give a Public Address Announcement to be broadcast on the Emergency Alert System.
- As per command, instruct State Radio to initiate county callback.
- Establish isolation, evacuation, sheltering zones and evacuation priorities.
- Evaluate all areas with an LEL monitor, especially low lying areas or below grade spaces.
- Establish a press briefing area.
- Perform search, rescue and evacuation in the immediate vicinity of the incident.
- Determine if evacuation or sheltering zone is safe for re-entry.
- Immediately contact the ND Department of Emergency Services, Operations and Plans Chief, Amy Anton, office 701 328 8124.

Public Health

- As per command, give message to be broadcast on the Emergency Alert System.
- As per command, initiate staff callback.
- Assist the Bowbells Fire Department in establishing isolation, evacuation, sheltering zones and evacuation priorities.
- Inform sector EMS of priorities.
- Have a representative at the press briefing area.
- Assist the Bowbells Fire Department with evacuation or sheltering decisions concerning institutional facilities.
- Notify institutional facilities with evacuation or sheltering decisions and assist with planning.
- Notify hospitals outside evacuation area.
- Assist the Bowbells Fire Departments in determining if evacuation or sheltering zone is safe for re-entry.
- Provide technical assistance to shelter operators with public health-related issues.
- Coordinate mental health services with Social Services.

Burke County Extension

- Coordinate with the Bowbells Fire Department to organize evacuation of agricultural animals and pets.

State Radio

- Alert/call back dispatchers and support staff as needed.
- Ensure critical communications capabilities and supplemental emergency communications.
- Activate Burke County Warning procedures.

Highway Superintendent

- Assist with barricades and signs for traffic control and security.
- Coordinate with the Bowbells Fire Department to establish detour routes when needed.
- Coordinate with the Bowbells Fire Department to provide priority service to evacuation routes.
- Provide a representative to the press briefing area when requested.
- Assist with heavy equipment as necessary.
- Assist the Bowbells Fire Department with establishing evacuation and sheltering zones.
- Assist the Bowbells Fire Department with planning evacuation routes.
- Monitor traffic flow on evacuation routes to divert traffic from bottlenecks.

Ambulance

- Coordinate medical evacuation requirements with Incident Command/EOC.
- Coordinate with the Bowbells Fire Department to establish medical triage at incident scene.
- Coordinate incident scene decontamination procedures with Bowbells Fire Department.
- Communicate and coordinate with local hospitals for treatment.

Volunteer Coordinator (Church Groups, Red Cross, etc.)

- Coordinate volunteer services as requested by IC/EOC
- Perform shelter operations management in accordance with the American Red Cross shelter modeling.

Citizen Emergency Response Team (CERT) (If/When Established and Trained)

- Provide basic disaster response services at scene.

Social Services

- Coordinate/assist with sheltering.
- Coordinate mental health services with Public Health.

School Superintendents

- Coordinate/assist with sheltering.

Phase 2: Response – Operational Phases

No amendments.

Phase 3: Recovery

Sheriff's Department

- Assist Bowbells Fire Department in determining if evacuation or sheltering zone is safe for re-entry.
- Regulate safe re-entry.
- Critique LE operations and update plan with changes required.

- Complete reports as required.
- In coordination with the Bowbells Fire Department, determine ability of evacuees to return safely.
- In coordination with the Bowbells Fire Department, establish traffic control for return of evacuees.
- Assist with return of special needs groups as required.

Health Department

- Critique Health operations and update plan with changes required.
- Complete reports as required.

Fire Department

- Determine if evacuation or sheltering zone is safe for re-entry.
- Critique fire operations and update plan with changes required.
- Complete reports as required.
- Determine ability of evacuees to return safely.
- Assist with return of special needs groups as required.

Highway Superintendent

- Assist the Bowbells Fire Department in planning safe re-entry.
- Recover barricades and signs.

Evacuation Routes

All or portions of the City of Bowbells will need to be evacuated if a leak of propane or butane of a sufficient magnitude or concentration occurs. Table 4 shows the evacuation routes out of the city that should be used based on the direction of the wind.

Table 4: Recommended Evacuation Routes Based on Wind Direction

Wind Direction	Evacuation Route	Direction
North	Hwy 5	Northbound or Eastbound
	96th Street NW	Westbound
Northeast	Hwy 5	Northbound or Eastbound
	96th Street NW	Westbound
Northwest	Hwy 5	Northbound
	96th Street NW	Westbound
	Hwy 8	Westbound
East	Hwy 5	Northbound or Eastbound
West	Hwy 5	Northbound
	96th Street NW	Westbound
	Hwy 8	Westbound
South	Hwy 8	Westbound
	Hwy 5	Eastbound
	96th Street NW	Westbound

Southeast	Hwy 5	Eastbound
	Hwy 8	Westbound
Southwest	96th Street NW	Westbound
	Hwy 8	Westbound

First Responders Protective Equipment

Minimum personal protective equipment should be Level B: fire-retardant protective clothing, gloves and self-contained breathing apparatus. Only non-sparking tools and equipment should be used. Gas meters should be brought to the site to measure the concentration of propane or butane gas.

First Responders Tactical Measures

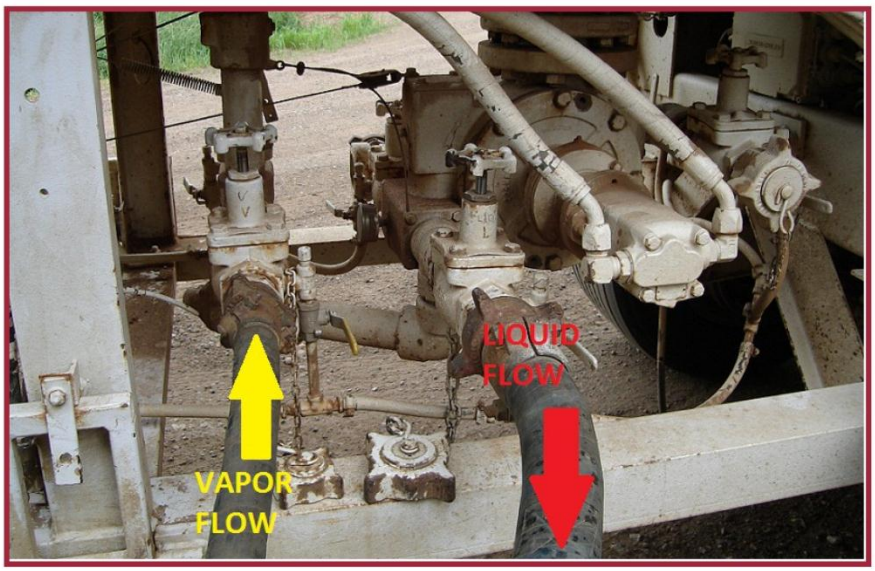
Gas/Vapor Leak

As an immediate precautionary measure, all unauthorized personnel should be kept 330 feet away in all directions from the leak site. First responders should immediately measure the concentration of the propane or butane gas to determine if the gas concentration is within the lower and upper explosive limits. Determine the wind direction and temperature. Always approach the source of the leak upwind (in the direction the wind is blowing), then locate and seal the source of the leaking gas. **Figures 6 and 7** show the liquid and vapor lines/valves for the railcar and transport truck fuel containers. Protect personnel attempting to shut-off the leak with water-spray. If the leak cannot be stopped due to a damaged hose, pipe or valve, a fiberglass wrap material known as "Stop It" ™ can be used to control the leak. The roll of fiberglass wrap is wetted and wound around the damaged hose, pipe or valve. The control measure is effective only for vapor leaks.

Deploy hose lines into the area where propane or butane concentrations are measured to disperse and dilute the concentration of the gas. Two 1 ½" or 1 ¾" hose lines or larger flowing 100 gpm or higher are recommended. If the ambient temperature is above the temperature of the hydrant or tank water, cone spray the fuel container. This will reduce the temperature of the container and reduce the pressure level in the container to reduce the volume of gas leakage.

FIGURE 7 – TRANSPORT TRUCK VALVES

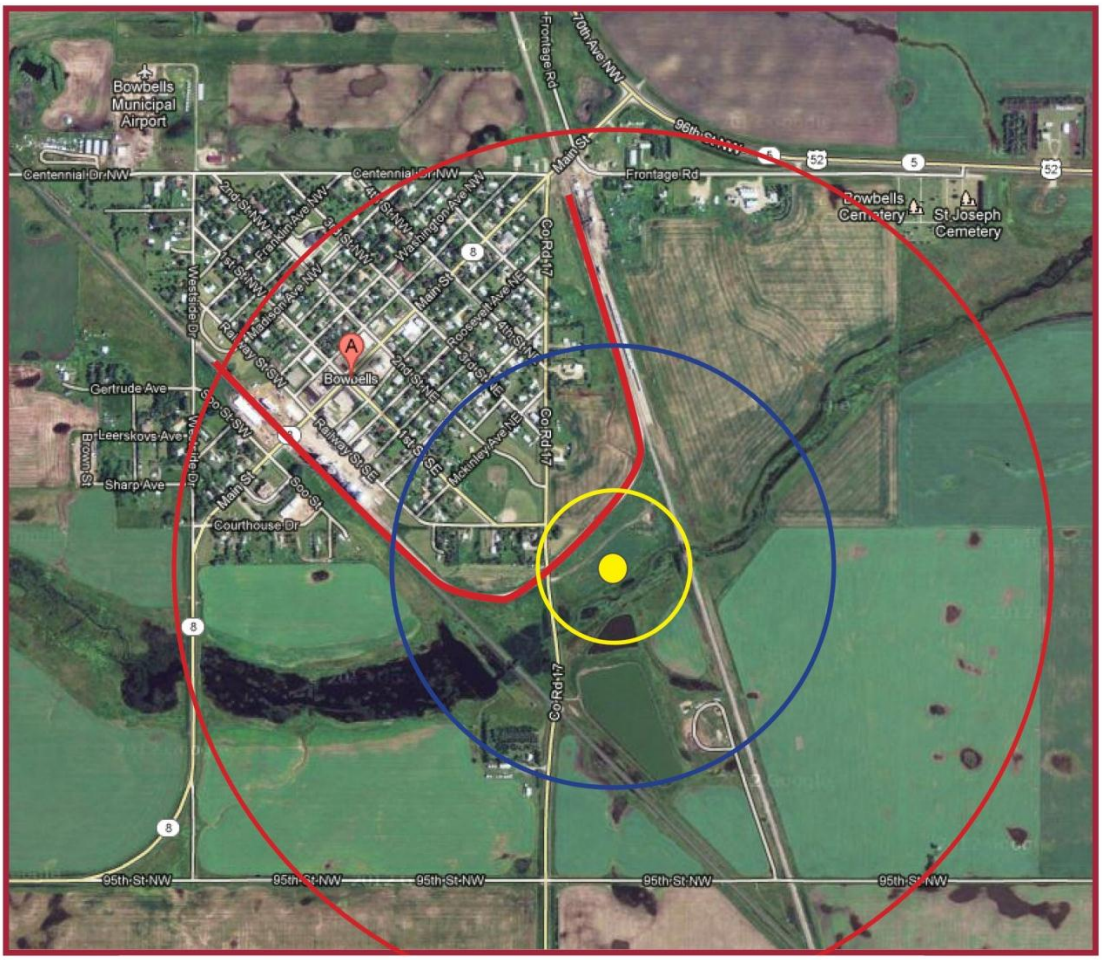
SUNPRAIRIE GRAIN TRANS-LOADING FACILITY



Using the gas meters, determine the geographic extend of the gas/vapor plume. Based on the geographic extend, location and concentration of the plume, the Incident Commander should immediately activate evacuation procedures. Guide 115 recommends that in the event of “large” vapor leaks or liquid leaks that vaporize an initial downwind evacuation of at least ½ mile should be implemented. **Figure 8** shows the radius of the 330’ immediate isolation area and the radius for a ½ mile evacuation measured from the trans-loading facility. Depending on the wind direction and magnitude of the vapor or vaporized liquid leak, it may be necessary to evacuate the entire City of Bowbells.

FIGURE 8 – EVACUATION ZONES

SUNPRAIRIE GRAIN TRANS-LOADING FACILITY



LEGEND

- 330 FOOT EVACUATION ZONE
- 1/2 MILE EVACUATION ZONE
- ONE MILE EVACUATION ZONE

If the plume extends into an area with occupied structures, occupants must be notified of the presence of the vapor and required to evacuate the structure. High concentrations of propane and butane gas (above the lower explosive limit) can cause an oxygen-deficient environment and suffocation can occur. When oxygen levels are reduced to 6-10 percent, the symptoms of exposure include nausea and vomiting and collapse or loss of consciousness. With oxygen levels below 6 percent, symptoms of exposure include convulsive movements, possible respiratory collapse and death.

First-aid measures for vapor exposed persons include removing the victim(s) to fresh air as quickly as possible, administration of supplemental oxygen and cardio-pulmonary resuscitation, if necessary.

Fuel Container and/or Structure Fire

If the gas plume within the lower and upper flammable limits reaches a structure with an ignition source, the vapor will ignite with enough force to destroy one or multiple structures. The ignited vapor will flash back to the leaking fuel container. Conventional fire suppression techniques can be used for any structure fires.

If the fuel container is on fire, the fire should be fought from maximum distance or by using unmanned hose holders or monitor nozzles. Cool the top of the container with flooding quantities of water well after the fire is out. Do not direct water at the source of the leak or safety devices because icing may occur. Firefighters should withdraw immediately in case of rising sound from venting pressure relief valves or discoloration of the container. For a massive fire where unmanned hose holders or monitor nozzles are not available, firefighters should withdraw from the area and let the fire burn.

A fuel container can have a boiling liquid expanding vapor explosion (BLEVE). This occurs with a container failure with a release of energy, often rapid and violent, which is accompanied by a release of gas to the atmosphere and propulsion of the container or container pieces due to an over-pressure rupture. A study prepared by the Department of Mechanical Engineering of Queens University, Kingston, Ontario and the Canadian Transport of dangerous Good Directorate found that projectiles from induced BLEVE of 80 to 100 gallon propane tanks traveled a distance of more than 300 feet. Small projectiles such as bolts and small sections of pipe were not studied.

The US Environmental Protection Agency studied the explosive force of a 33,000-gallon propane container, which is equivalent to the size of the fuel containers on the railcars. A ½ psi increases in pressure, sufficient to shatter windows, extended 4/10th of a mile from the explosion.

Guide 115 of the 2012 North American Emergency Response Guidebook recommends that if a tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. **Figure 8** shows a one-mile radius from the trans-loading facility.

Liquid Fuel Leak

As an immediate precautionary measure, all unauthorized personnel should be kept 330 feet away in all directions from the leak site. A liquid fuel leak with no vaporization can occur if the product released is liquid butane when the ambient temperature is below 32° Fahrenheit. It is very important for first responders to know the current and forecasted temperature. If the temperature is forecasted to rise above 32° Fahrenheit before the liquid butane release can be remediated, first responders should prepare for tactical measures of a gas/vapor leak. A propane liquid release will rapidly vaporize unless the ambient temperature is below -44° Fahrenheit.

First responders should locate the source of the leaking liquid LP-Gas. LP-Gas valves should be closed. If the liquid leak cannot be stopped due to a damaged hose, pipe or valve, a freeze wrap should be applied to the source of the leak. A towel or fabric wrap is wetted and then wrapped around the leaking hose, pipe or valve. The wet wrap will freeze due to the very low temperature of liquid propane and the relatively low temperature of LP-Gases. Fire fighters must wear heavy neoprene gloves suitable for working with low temperatures to avoid frostbite.

Once the leakage liquid butane is stopped and the temperature is below 32° Fahrenheit, if there is sufficient time before the ambient temperature reaches 32° Fahrenheit, a permeable vertical barrier should be erected between the spill site and the City of Bowbells of sufficient length to block vaporized butane from entering the city limits. Isolated pools of liquid butane should be channelized to where most of the liquid butane is collected to confine the spill to one location. This will reduce the length of vertical barrier that needs to be collected.