August 24, 2011

CARMEN TRUTANICH
CITY ATTORNEY
City of Los Angeles
City Hall East
200 N Main Street, 8th Floor
Los Angeles, Ca 90012

RE: DERATED TANKS-REQUEST FOR INJUNCTION “ULTRAHAZARDOUS ACTIVITY”
RANCHO LPG 25 MILLION GALLONS OF BUTANE AT PETROLANE STORAGE FACILITY,
2011 NORTH GAFFNEY STREET, SAN PEDRO, CALIFORNIA

Dear City Attorney Trutanich,

I have attached a paper dated August 19, 2011 by Dr. John Miller, MD, President, San Pedro & Peninsula Homeowners Coalition, and an article today regarding a railcar explosion of propane in northern California.

I previously sent you the City Council notes on this facility from 2005 where the vote was 12-0-1 in favor of termination.

Since 2005 this ultra hazardous activity has been under the radar of the City Attorney, Mayor and City Council of Los Angeles.

As the leading candidate to be our next District Attorney of Los Angeles County, I am asking you to show your leadership abilities in representing the people and file an Injunction on their behalf:

DISASTER at RANCHO LPG HOLDINGS in SAN PEDRO COULD RELEASE AS MUCH ENERGY AS FORTY ATOMIC BOMBS

August 19, 2011

Introduction

This brief note attempts to convey the energy content of 25 million gallons of liquid butane fuel and the ominous implications of this. This is the maximum amount of liquid butane known to be stored at the Rancho LPG Holdings, LLC Facility in San Pedro, California.

Butane releases chemical energy by burning. This can be in the form of an explosion or by sustained combustion. An explosion may result from the sudden combustion of a mixture of butane gas and air (oxygen). Sustained combustion may occur at the boundary of an unmixed volume of butane gas or liquid and a source of oxygen such as air.

This note estimates the energy content in both modes assuming efficient combustion. Calculations comparing the amount of energy that would be released from either sudden combustion (explosion) or sustained combustion of the liquid butane at Rancho LPG reveal that as much energy as 40 atomic bombs of the type that destroyed Hiroshima, Japan would be released!
Escape of Butane

Butane is generally stored in above-ground tanks. Within the storage tank there should never be enough oxygen to support combustion – butane must escape from the tank to burn.

Butane must be stored at elevated pressure. The pressure within the tank varies according to temperature. Pressure is needed to maintain the butane in a liquid state. At 68 degrees F, the tank pressure is approximately 16 pounds per square inch (PSI) greater than atmospheric pressure. At 86°F, this rises to ~29 PSI and on a very hot day the pressure differential is ~42 PSI. In terms of structural pressures, these are substantial. An industrial building floor is generally designed to handle approximately 0.5 PSI.

Butane may be released from a tank in several ways. Something may cause a relatively small leak, in which case the butane will squirt out. Depending on the pressure, the speed of the squirt can be substantial. At 16 PSI, the nominal squirt velocity is over 40 MPH. A one-foot-square opening can leak nearly 500 gallons per second at this pressure. Thus, any event that creates a large breach in the tank walls will immediately allow overwhelming amounts of liquid butane to escape.

It is conceivable that a butane tank can experience a sudden, catastrophic failure. This can be the result of excessive pressure due to increased temperature or from the introduction of a local failure that spreads across the tank.

Increased temperature could be due to a man-made heat source such as a fire. Fuel for this fire could come from a leak in the very same butane tank or from another source. Depending on the design of the tank, it may be possible or likely that localized damage can spread due to the increased stresses at the periphery of some types of structural damage. Structural damage may result from direct human action or may result from a construction fault or corrosion, fatigue or other time-dependent mode.

Ignition

Butane is easily ignited over a wide range of butane-air mixtures. Explosive limits are 1.8 to 8.4% by weight. It is reasonable to assume that large quantities of liquid butane escaping from the tanks at Rancho LPG would soon meet an ignition source such as a streetlight or automobile.

It is also reasonable to believe that once a fire starts from a storage tank leak or failure, the fire cannot be extinguished. Thus all available butane will ultimately burn. This would be “efficient combustion”.

Explosion

Explosion of butane may result from sustained mixing of butane and air. A tank leak can spray out butane at a substantial rate as described above. At temperatures above freezing, this spray will evaporate and mix with the air. If this continues for some time, a substantial volume of mixed butane and air may form. If this mass meets with an ignition source it may explode with a sudden release of energy.

Pound-for-pound, butane has approximately 10 times the energy content of exploding TNT. If all 25 million gallons (~125 million pounds) of butane were somehow to mix with air and explode, it would release the energy of ~660 thousand tons of TNT. This is approximately 40 times the energy of the nuclear bomb that demolished much of Hiroshima, Japan in 1945.

The Hiroshima weapon “only” released the energy of about 15 thousand tons of TNT.

Combustion

If butane is efficiently burned, it provides tremendous heat energy per pound, more than gasoline or diesel fuel.

One gallon of liquid butane can heat a medium size swimming pool by nearly half a degree. 25 million gallons of butane can heat 100,000 of the same pools by ~125°F. Alternatively, 25 million gallons of propane can heat a lake one mile square by 15 feet deep by 100°F. It is noteworthy that water takes much more energy per pound to heat than many other common materials.
Conclusion
25 million gallons of butane represents a tremendous amount of energy, on the scale of nuclear weapons. Propane may escape from its tank for a range of reasons including direct human action, fire, structural failure or overpressure. Propane may explode or burn, releasing very great quantities of energy. This energy can do great damage.

For example, a single tanker truck loaded with propylene (another light hydrocarbon and one of the constituents of LPG) had an accident releasing its content near a campground in at Tarragona, Spain in 1978. The resulting blast and fireball (which was estimated at over 1000 degrees C and left a 65x5 foot crater) destroyed everything within a 300 meter radius (about 1000 feet)! 217 people were killed and 300 more were wounded, many were severely burned. This was caused by combustion of only a small fraction of the amount of light hydrocarbon stored at RANCHO. (source Wikipedia-Los Alfaques Disaster)

The Rancho LPG facility can hold over 2000 tanker truckloads.

Additional Thoughts
These notes may serve as the basis for questions or subjects to be investigated by experts.

- Is the structure of the tank designed to limit damage to a certain size or can a crack or hole propagate?
  - For what size hole can the tank avoid propagating damage?
  - At what outside temperature (or internal pressure) does this size apply?
    - What happens if the weather has been very hot for several days?
- What is the design life of the tank?
  - What aspects were considered in determining the design life of the tank?
    - Examples:
      - Fatigue
        - Differential thermal expansion
        - Fill / empty cycles
        - Wind spectrum
        - Earthquake history
      - Corrosion
      - Mechanical damage
        - Fire
        - Dropped tools, truck collisions, etc
        - Number of repairs
- Was differential thermal expansion considered in the design of the tank?
  - On a severe day, what is the temperature range of the tank structure that is above the surface of the liquid butane?
    - To what extent does this vary from the sunny side to the shady side?
  - On a severe day, what is the temperature range of the tank structure that is below the surface of the liquid butane?
    - What range of stresses do these differential temperatures impose on the tank structure?
    - What fraction of the tank’s limit stress do these stresses represent?
• At this stress level, how many thermal cycles can the tank withstand before fatigue damage becomes significant?
  • In the event of a major leak, evaporation of the butane will result in a drop in temperature of the remaining liquid butane.
    • What is the lowest temperature the butane will reach in this scenario?
    • What temperature does the tank structure reach?
    • What stresses arise from differential thermal expansion in this case?
• What analysis methods were used in the design of the tank structure?
  • How do these methods compare to those now in use for projects of similar size and importance?
  • Has the design of the tank been validated using current structural analysis tools?
• During construction, what methods were used to ensure that the tank was made according to the design specification?
  • How do these methods compare with methods now in use for projects of similar size and importance?
  • Has the construction of the tank been validated using current inspection methods to make sure that it was constructed according to specification?
• Testing
  • How is the tank inspected for structural integrity? How do you know if there is corrosion or fatigue damage?
  • How frequently is the tank tested?
  • The airplane industry uses several methods of non-destructive inspection including X-ray, eddy current, magnetic flux, dye penetrant and acoustic testing.
    • Do you use any of these methods?
    • Can you detect corrosion on the inside of the tank?
    • Can you detect fatigue cracks at joints and fittings?
• Earthquake
  • When at rest with rated capacity and pressure, what is the maximum stress on the tank structure? What fraction of the yield capacity of the relevant tank material is this?
  • What magnitude earthquake is the tank designed to withstand when it is at its rated capacity and pressure?
  • For what vertical acceleration is the tank designed when the contents are at rated capacity and pressure?
  • For what lateral acceleration is the tank designed when the contents are at rated capacity and pressure?
  • Does the tank have a slosh mode? What is the critical case for the slosh mode in which the contents couple with the oscillating frequency of the earthquake?
    • How do loads from this case compare to other earthquake loads?
  • How many earthquakes of what magnitude can the tank withstand when at rated capacity?
    • What happens if this number is exceeded?
- Repairs
  - Is the tank designed to be repaired in the event of local damage?
  - How is the integrity of a repair assured?
  - How can the flow of liquid butane from a hole in the tank be stopped?

- Pressure
  - Is pressure in the tank limited?
    - How is this done?
      - If butane gas is vented, what happens to it?
        - Is this a fire hazard?
      - What rate of gas escape can this vent permit while limiting pressure to the design limit?
      - How much heat must be applied to the tank to achieve this rate?
        - What happens if this heat application is exceeded?
          - For example, by a fire at the base of the tank.

- Major leak
  - In the event of a major leak of liquid butane from the tank, what happens to the liquid?
    - If the liquid becomes a gas, what temperature is this gas when it first is gasified?
      - What is its density?
      - How does this compare to the density of air:
        - On a cold day?
        - On a hot day?
    - If the liquid butane gasifies and becomes denser than air:
      - Will it flow downhill over the landscape in the manner of fog from dry ice?
      - Or?
      - If the entire contents of the tank are spilled and a gaseous flow is generated, what area will be covered by the flow, assuming that combustion does not occur?
        - Can you show us on the map the boundary of the region covered by the flow?
      - How long will it take this flow to mix with air?
        - What mechanism will heat the gas to cause it to mix with the air?
      - Before it mixes with air, is the gas-air interface flammable?
        - If this interface catches fire, will the fire spread to the entire surface of the flow?
        - What mechanism will extinguish the combustion?
      - After it mixes with air, is the mixture explosive?
- If this mixture is ignited, what mechanism results in the gas flow becoming extinguished?

- Will a person be suffocated by this flow?
  - What can a person do if surrounded by this flow?

- Will combustion or explosion of the gas flow result in other combustible materials catching fire?
  - Can houses be ignited in this way?
  - How far away can houses be ignited by the radiant heat produced by the column of fire produced by a vapor pool fire occurring after a tank failure?
    - Is there anything one can do to one’s house to limit its chance of being ignited?
  - If one is in a house that is ignited, what is the best procedure to follow?
  - Will vegetation also catch fire?
  - Will vegetation or structure fires started by a gas flow tend to spread to other areas not directly in the flow area?
  - If multiple structures and vegetation are ignited due to the radiant heat at a distance from a pool fire, wouldn’t this create a “firestorm”? A firestorm creates its own high winds which further fan and intensify the fires. This occurred in the World War II bombings of Hiroshima and Dresden
  - How will emergency services take care of people and structures in the middle of the flow area if combustion occurs?
  - How will emergency services take care of people and structures at the periphery of the flow area?
  - Why haven’t residents of nearby neighborhoods been informed of proper evacuation routes and procedures to follow if a disaster begins to unfold?

- Attacks
  - What measures have been taken to prevent malicious attacks on the tank structure?
    - For example:
      - How do you prevent a light plane from diving into the tank?
        - Do you know if a light plane can penetrate the tank?
      - How do you prevent a tanker truck from driving through the gate to the base of the tank?
        - Do you know what happens if someone ignites 60,000 lb of fuel (a tanker truck load) at the sidewall of the tank?
      - How do you make sure that your employees are trustworthy?
      - How would you prevent a suicidal rocket propelled grenade attack?

San Pedro area residents deserve answers to these questions.
Burning liquid propane rail car explosion could level homes, schools
By The Associated Press
Posted: 08/24/2011 09:30:48 AM PDT
Updated: 08/24/2011 10:19:30 AM PDT

Firefighters spray water on a railroad tanker leaking propane in Lincoln, Calif., on Tuesday, Aug. 23, 2011. Authorities evacuated the neighborhood for a half-mile radius as a precaution against the possibility of an explosion. (AP Photo/The Sacramento Bee, Randall Benton) (Randall Benton)

LINCOLN - Firefighters in a Northern California suburb were trying to keep a burning rail car from exploding and leveling nearby houses, schools and businesses as authorities on Wednesday kept an evacuation order in place that affected thousands of homes.

The 29,000-gallon tanker loaded with liquid propane caught fire midday on Tuesday at a Northern Propane Energy yard in Lincoln, a city of 40,000 north of Sacramento.

Firefighters set up four fixed hoses to soak the tanker and to keep its temperature down as the propane burns off, a process that officials on Tuesday said could take until Wednesday. Trying to directly extinguish the flames shooting into the air from a vent could create a propane gas cloud
that could ignite into a fireball, California Department of Forestry and Fire Protection spokesman Daniel Berlant said.

"Our fear is that not only does that rail car tank explode, but so do the tanks around it and with about a half million gallons of propane in that field," he told KXTV-TV (http://bit.ly/ofmirQ).

A gas pipeline also runs through the affected area, authorities said. Three strike teams from the California Department of Forestry and Fire Protection, along with engines from several other fire departments, were waiting near the scene of the fire in case the tanker exploded. It was unclear how the tanker caught fire. A worker who was tending to the tanker was hurt and transported to a local hospital, although details on the extent of the injuries weren’t available.”

They are worried about a half a million gallons exploding in Lincoln? How does that compare to (25) twenty five million gallons at Rancho LPG in San Pedro?

When you add the exhibit book; 2005 City Council notes; Dr Miller’s paper; Carl Southwell’s paper on Rancho LPG; CACI’s jury instruction 460 (Strict Liability for Ultra Hazardous Activities); ECM Group, environmental consultant Charles Lamoureux’s opinion to the mountain of circumstantial evidence presented, an Injunction should be filed in Superior Court.

Sincerely,

Anthony G. Patchett
CC: Dan Weikel