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**ATTACHMENT "A"**



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CENTER FOR CATASTROPHIC RISK MANAGEMENT  
DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING  
BERKELEY, CALIFORNIA 94720-1710

April 20, 2015

Mr. Ronald Conrow  
Rancho LPG Holdings, LLC  
2110 North Gaffey Street  
San Pedro, CA 90731



Re: Letter dated April 9, 2015 with responses regarding my statements contained in the YouTube video about the Rancho LPG Facility in San Pedro, CA

Dear Mr. Conrow:

I have reviewed the contents of your letter to me dated April 9, 2015 regarding my statements contained in the YouTube video about the Rancho LPG Facility in San Pedro, CA. This letter summarizes my responses to the four quotations I made in the YouTube video.

Before I address the four quotations, I would like to address several statements contained in your letter to me. First, you state:

"We are concerned not only about the inflammatory nature of this video, but the fact the claims portrayed in the video by you and other commenters are lacking proven scientific information required to quantify exactly how the events described in the video can even happen."

The background I reviewed and analyzed that formed the foundation for my statements in this video came from documentation I have obtained since 2011 regarding the Rancho LPG Facility, surrounding facilities, and similar LPG facilities in other locations. This documentation included several qualitative and quantitative 'risk analyses' of the Rancho LPG Facility that addressed some of the major hazards that confront these facilities and the uncertainties associated with performance of these facilities given the different kinds of hazards. These hazards included effects on the facilities and surrounding communities and industrial facilities of intense earthquakes, ground instability (e.g. liquefaction during earthquakes, instability developed as a result of intense storm effects), tsunamis, terrorist activities, and those associated with operations and maintenance of the facilities (e.g. LPG transport into and out of the facilities). This background included several hundred documents.

After I completed review of the background documentation, in mid-2011, I advised Mr. Anthony Patchett that the primary conclusion I reached after analyzing the available background was:

"the only sensible way forward is to have an advanced, high quality, thorough, validated risk analysis performed...this would be similar to advanced analyses that are done for critical facilities such as nuclear power plants."

Mr. Patchett commissioned a detailed review of the background documentation pertaining to Quantified Risk Analyses (QRA) of the Rancho LPG facilities by Mr. Philip Meyers of PEMY Consulting. Mr. Meyers issued a report at the end of December 2011 summarizing the results of his review. Mr. Meyers developed a series of detailed recommendations that addressed development of a comprehensive QRA for these facilities; thus, corroborating my primary conclusion.

The consequence of these developments is that your request for "proven scientific information required to quantify exactly how the events described in the video can even happen" does not exist at this time. The statements I made in the video represent my synthesis of the information and conclusions regarding the risks of major accidents associated with the existing Rancho LPG facilities.

In your letter you state: "you should be able to provide the technical information to support your claims and those of the other video commenters." Your contention that I should be able to provide the technical information to support those of the other video commenters is not correct. Prior to release of the video, I was not able to review, validate, or comment on the comments and observations made by the other video commenters. Those individuals should be given the opportunity to respond as I am responding to the four comments I made during the video.

Further, in your letter you state: "However, if you support the claims contained in the video, it should be quite simple for you to produce quantitative validation required to defend the positions of you and the other video commenters. Later in this letter, I will provide the background for the four comments I made during the video. As I summarized in the foregoing paragraph, I will not "defend the positions... of the other video commenters."

Finally, in your letter you state:

"The questions posed by Quest are straightforward (no gotcha questions) with the intention of scientifically explaining how an event can or cannot happen. The residents of San Pedro concerned about 'public safety' are deserving of facts based upon science and not rhetoric!"

I agree that the residents of San Pedro and the local, State, and Federal government agencies having responsibilities for these facilities are deserving of facts based on science not rhetoric. Unfortunately, based on the available background information I have reviewed which includes a QRA performed by Quest Consultants Inc., I do not think there is sufficient valid and validated information (qualitative and quantitative) to inform the residents of San Pedro and the responsible local, State, and Federal government agencies regarding the 'public safety' and risks of major accidents associated with the Rancho LPG facilities. I think it is incumbent upon Rancho LPG Holdings LLC to provide the residents of San Pedro and the responsible government agencies the scientifically based information on the 'public safety' and risks (likelihoods and consequences) associated with major accidents involving the Rancho LPG facility.

Next, I will address each of the four statements I made in the video as summarized in your letter to me and further detailed in the letter from Quest Consultants Inc. to you (dated April 7, 2015).

**Dr. Bea: "Rancho is a very volatile, explosive, flammable gas."**

The commentary provided by Quest (page 2) properly characterizes the LPG contained in the name of your company: Rancho LPG Holdings LLC: Liquefied Petroleum Gas:

Clearly, the Rancho facility is not a gas, but the Rancho facility does store flammable liquefied gases (propane and butane in liquefied form). It would be beneficial to educate the listener that volatility only applies to liquids (or some solids that sublime like carbon dioxide) but not to gases. Other common materials are both volatile and flammable. Materials such as gasoline, diesel, kerosene, acetone, and ethyl alcohol, are all volatile liquids and are quite common and, once vaporized, will produce a flammable gas. If a material is flammable, it can be involved in an explosion. Thus, all the materials outlined above are also "explosive."

**Dr. Bea: “It also has very high risk because of the population and community that surrounds it.”**

The commentary provided by Quest (page 3) properly defines the information that should be *but is not* available:

**The statement is made in reference to Rancho being “high risk” due to the population around the facility. Since risk is a product of consequence and frequency, in order to make the statement above, Dr. Bea must have calculated both components of risk, as well as defined what “high” means in regard to risk. Since this exercise must have already been completed by Dr. Bea in order to make such a statement, it should be straight-forward to identify the following components that make Rancho a “high risk” facility.**

My statement is based on the information contained in the series of ‘risk analyses’ documents I cited earlier in this document. My synthesis of that information led to my qualitative assessment of “high risk”. That assessment included an assessment of the likelihoods of major accidents due to the multiple categories of hazards I cited earlier (earthquakes, severe storms, ground instability, terrorist activities, and operating and maintenance activities) and the consequences (deaths, severe injuries, property and productivity damages, and direct and indirect monetary costs).

During the past 45 years, I have been involved as an originator, contributor and reviewer of more than one hundred QRAs involving ‘High Risk Systems.’ This work has been associated with design, construction, maintenance, and operation of onshore and offshore industrial oil and gas exploration, production, transportation, and refining systems. Several of these QRAs were associated with oil and gas production and transportation facilities located onshore and offshore Southern California near the Rancho LPG facilities. I have written three books, contributed chapters in 4 other books, written several hundred refereed technical papers and reports, and taught university undergraduate and graduate courses on System Risk Assessment and Management (SRAM) of engineered systems for more than 20 years. This work has been closely associated with my forensic engineering work as a primary investigator on more than 30 major accidents and disasters that have primarily involved oil and gas exploration, production, transportation, and refining systems. This work has been involved with more than 40 major national and international joint industry – government sponsored research projects that addressed SRAM of complex engineered systems.

The latest of these SRAM research projects was a 6-year duration project sponsored by the National Science Foundation. The goal of this project was to develop and validate advanced SRAM methods to address the complex, interconnected, interactive infrastructure systems (gas storage and transportation, power and water supply, marine, highway, and railway transportation, communications, flood protection) located in the California Delta. This research project addressed primary deficiencies found in previous formal quantitative QRAs and PRAs: 1) omission of important categories of uncertainties, 2) systematic incorporation of optimistic human and organizational ‘biases,’ 3) assumptions integrated into the risk analyses that were not validated, 4) systematic underestimate in the consequences of major accidents, 5) omission of important interactions between infrastructure components and systems, and 6) application of inappropriate risk ‘acceptability’ and ‘tolerability’ criteria. All of these deficiencies resulted in dramatic under-estimates of the infrastructure risks and inappropriate acceptance – tolerability of those risks. I have detected evidence of all of these deficiencies in the existing formal QRAs that have been performed for the Rancho LPG facilities.

This experience has provided me with an extensive ‘library’ of experience and knowledge about QRAs, PRAs (Probabilistic Risk Analyses), PSM (Process Safety Management), Safety Cases, and other relevant technologies that apply to understanding the risks posed by the Rancho LPG facilities. The combination of this previous experience together with the knowledge I developed from my review of the previous studies of the Rancho LPG facilities provided the basis for this and the other statements I made in the video.

**Dr. Bea: “ (If) One of the tanks fails, within a three mile radius of that tank approximately half a million people live. That’s high risk.**

Based on the results contained in the previous Rancho LPG ‘risk analysis’ studies I reviewed, the three mile radius was the distance I estimated that there could be significant negative effects or consequences from the explosion of one of the Rancho vertical LPG storage tanks. That distance could be significantly greater if both of the vertical storage tanks failed during a single event or other nearby facilities (e.g. Rancho horizontal LPG storage tanks, adjacent refining facilities) were involved in a cascade or propagation of fires and explosions. I estimated the number of people who could live, work, and be present in this densely populated and industrial area during such an event. My qualitative assessment of the likelihood and consequences associated with such an event indicated the risks could be ‘High’.

**Dr. Bea: “A large amount of propane in storage tanks that can be affected by strong earthquakes, ignited, that’s a natural hazard, or (plus) human hazards: hubris, arrogance, greed, ignorance, and indolence is a disaster sooner or later.”**

The commentary provided by Quest (page 4) properly characterizes the storage tanks I referenced:

“The propane is stored in the horizontal pressure vessels, the butane is stored in horizontal pressure vessels and vertical refrigerated tanks.”

This commentary also defines the potential types of gas ignition as:

“flash fire, torch fire, pool fire, or vapor cloud explosion” and combinations of these types.

The Quest commentary further observes:

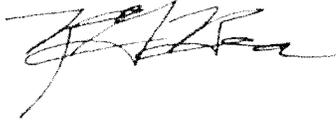
**The word hazard refers to “a chemical or physical condition that has the potential for causing damage to people, property, or the environment.” Thus, the fact that a flammable liquefied gas is stored on site presents a hazard. Using this rational, every car on the road or plane in the sky (or on the runway) presents a hazard. Is that correct Dr. Bea?**

Yes, I think these are correct statements. It is for these very reasons that the technology associated with SRAM has been developed. There are many important hazards that need to be properly recognized, evaluated and managed before there are major accidents that can have dramatic negative effects on people, property, productivity, environmental quality and the quality of life.

The Quest commentary requested that I address the “human hazards” I detailed in my quotation and how they are relevant to Rancho. These human hazards were part of the ‘equation’ (analytical expression) I developed to explain simply why and how major disasters have and continue to happen. I based this ‘Equation for Disaster’ on my detailed ‘Root Causes Analyses’ studies of more than 600 major accidents and my more than 30 forensic engineering investigations of major disasters that have included the failures of the flood protection system for the Greater New Orleans area during and following Hurricane Katrina, the BP Deepwater Horizon Macondo well blowout in the Gulf of Mexico, and the PG&E San Bruno gas pipeline fires and explosions.

The Equation for Disaster is:  $A + B = C$ . ‘A’ are natural hazards like explosive hydrocarbons, corrosion, metal fatigue, earthquakes, tsunamis, hurricanes, and instability of the ground. ‘B’ are human hazards including hubris, arrogance, greed, complacency, ignorance, and indolence. ‘C’ are disasters sooner or later. The definitions of these human hazards in the Quest commentary (page 5) are appropriate.

At this point in my review of the documentation associated with the Rancho LPG facilities, I have detected plentiful evidence of the presence of ALL of the 'B' human hazards in the 'Equation for Disaster.' In addition, there is ample valid evidence available to characterize the multiplicity of significant natural hazards at and in the vicinity of these facilities. I conclude it is time for Rancho LPG Holdings LLC to take effective actions to avoid the 'C' results associated with the facilities it owns and operates.



**Robert Bea, PhD, PE (retired)**  
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**Center for Catastrophic Risk Management**  
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