**Accufacts Inc.**
"Clear Knowledge in the Over Information Age"

8151 164th Ave NE
Redmond, WA 98052
Ph (425) 802-1200
kuprewicz@comcast.net

**Date: June 15, 2023**

**To: Ms. Niroop Srivatsa**
**City Manager**
**City of Lafayette, CA**

**Re: Accufacts Report for the City of Lafayette on the Status of the Tree Assessment Process with PG&E**

As outlined in the Tree Assessment Process Agreement and at the request of the City of Lafayette ("City"), the following is Accufacts' perspective on the state of the trees near PG&E gas pipelines within the City:

**Additional critical technical details are missing from PG&E arguments to remove trees.**

**1. A quick perspective on Tree Advisory Team interactions.**

In late 2021, the City and PG&E established a Tree Advisory Team ("Team") of four (two arborists and two pipeline experts, two representing the City and two representing PG&E's interest), to assist in possible resolution of tree issues related to PG&E's attempt to remove trees on or near their gas pipelines within the City. Accufacts Inc. ("Accufacts") represents the pipeline technical expert on the Team assisting the City in this matter. At the first meeting of the Team in early December 2021, I advised the Team members that there may be some pipeline issues upon which we will not come to agreement, especially given the history of past technical misinformation I was hearing on this matter. I clearly indicated that such disagreements would most likely be made public as a check on our decision processes. Accufacts provides decisionmakers with key specialized pipeline technical information to allow for a more informed decision process, at a time when pipeline misinformation is running rampant, especially as it relates to trees and gas pipelines.

In June/July 2022, while progress had been made on some fronts after approximately seven months, it became clearly obvious there are specific critical pipeline technical matters that I believe the Team's pipeline experts cannot agree upon. In fairness, from my perspective they are caught in the middle by an onslaught of misleading or downright false or incomplete technical information related to very specialized pipeline matters by PG&E or its representatives. The level of incomplete, misleading information by PG&E or its representatives leads me to conclude that PG&E is trying to drive a preordained decision based

on poor pipeline science that I have often observed in inadequate risk assessment approaches concerning such infrastructure. Based on a review of information supplied by PG&E, I see no technical pipeline need to remove healthy trees on or near PG&E's gas pipelines within the City as further discussed below. The presence of trees in poor or very poor health do not relate directly or indirectly to pipeline safety, rather their removal may improve the overall health of the trees of Lafayette.

From a pipeline safety perspective, many pipeline operators or their consultants lack specialized experience or don't grasp these important pipeline issues, so it can be understandable why the City and the public may have difficulties in understanding these matters in this highly specialized area. As a matter of reference, Accufacts has fifty years of experience, including but not limited to: pipeline operation and design in highly sensitive areas, right-of-way management, pipeline safety regulatory development, especially in integrity management for transmission and gas distribution pipelines, as well as process safety management, corrosion engineering, risk assessment, incident command, and too many pipeline failure investigations and tragedies.

**2. PG&E's gas pipelines within the City.**

All of PG&E's gas pipelines within the City, with the one exception identified below, operate at pressures well below 20% specified minimum yield stress level, or SMYS, at each pipeline's stated Maximum Allowable Operating Pressure, or MAOP, terms defined in minimum federal pipeline safety regulation carrying specific meaning.[1] Operation at such low pressure/stress levels indicate that these gas pipelines, from a pipeline fracture mechanics point of view, will not rupture fracture, such as which occurred in San Bruno, CA in 2010, but rather leak. The San Bruno rupture involved what I call a moderate pressure, large diameter 30-inch higher pressured pipeline, that ruptured below MAOP, on a pipeline that clearly was a higher stress gas transmission pipeline.[2]

A resorting of the various PG&E Excel spreadsheets provided to the Team will clearly show that most of the PG&E gas pipelines are smaller diameter, well below 12-inch diameter, operating at very low pressures and stress levels. Pipe diameter is a controlling factor as pipe diameter sets a thermodynamic limit gas release velocity should the pipe fail as a full-bore release, such as a girth weld complete separation. There is one pipeline segment of 12-inch and 16-inch diameter pipe (system 191-1), located in the eastern side of the City, that can reach 30% SMYS at MAOP. While some in the industry have tried to argue that a 30% SMYS

[1] 49CFR§192.3 Definitions.
[2] National Transportation Safety Board ("NTSB"), "Pacific Gas and Electric Company Natural Gas Transmission Pipeline Rupture and Fire San Bruno, California September 8, 2010 Accident Report," NTSB/PAR-11/01, adopted August 30, 2011.

threshold should be considered a transition point to leak versus pipeline rupture threshold, my experience would indicate that rupture is still possible at such lower 20 - 30% SMYS stress levels, though considerably diminished as anomalies or imperfections in the pipeline steel need to be fairly large to fail as rupture at these lower stress level thresholds.

PG&E's Excel spreadsheets contain a column for potential impact radius, or PIR, a term defined under federal pipeline safety regulation for gas transmission integrity management programs ("TIMP") for pipeline segments in high consequence areas.[3] Given the low pressure for the systems, I believe PIR does not apply to such low-stress pipelines. For example, the use of PIR for such low-pressure low-stress pipeline systems is well below and beyond the range of the data utilized to develop the empirical PIR equation, established in federal gas transmission pipeline safety regulation. PIR was intended for high-stress high-pressure gas transmission pipeline rupture potential impact radius, where a potential failure of the pipeline "could have significant impact on people or property as a rupture."[4] Application of such PIR attempts well below the range of the empirical data, represents, in my opinion, "very poor engineering practices," a term I do not use lightly. The potential impact radius, or PIR, defined in TIMP is intended for higher stress higher pressure gas transmission pipelines that can exhibit pipe rupture fracture from higher stresses. Only one limited pipeline segment within the City operates at higher pressures at MAOP (20 - 30% SMYS) than the rest of the PG&E pipelines that operates at well below 20% SMYS at MAOP, and even that pipeline is not operated above 30% SMYS. PIR was never intended for the low stress PG&E gas pipelines within the City, so it is a misuse by PG&E of PIR for this purpose.

Low stress PG&E gas transportation pipelines within the City are usually defined as distribution gas pipelines as compared to high pressure gas transmission pipelines. While not illegal, for some reason PG&E has chosen the highly unusual and very rare approach to label their gas pipelines under our review within the City as "transmission" pipelines. While PG&E can call such gas pipelines transmission, they were never intended to fall under the transmission integrity management program, or TIMP, regulation that was really developed to focus on gas pipeline rupture consequences, such as that which occurred in San Bruno in 2010.[5] Having assisted in the development of the federal transmission integrity management program safety regulations, or TIMP, and then gas distribution integrity management program, or DIMP, regulations between 2000 and 2011, I suspect PG&E's highly unique approach has more to do with falling under the less definitive reporting obligations of TIMP regulations

[3] 49CFR§192 – Subpart O – Gas Transmission Integrity Management.
[4] 49CFR§192.903 What definitions apply to this subpart.
[5] The new proposed PHMSA Phase II of the gas mega-rule permits a pipeline operator to define a transmission pipeline as one that "Is voluntarily designated by the operator as a transmission pipeline." Federal Register/Vol. 87, No. 163/Wednesday, August 24, 2022/Rules and Regulations, §192.3 Definitions *Transmission Line*.

versus the clearer requirements of DIMP federal pipeline minimum safety regulations that tend to be more prescriptive in nature.

**3. An experienced perspective on PG&E's claims of "unacceptable risk trees" within the City.**

PG&E's labeling of the identified trees within the City as "unacceptable risk trees" is apparently driven by Dynamic Risk Reports conducted for PG&E indicating tree risks to pipelines, more specifically tree root risks to pipeline external coatings.[6] As explained further below, I would describe these studies as, at best, incomplete, driving one to false conclusions, given my decades of pipeline experience involving too many pipeline failure investigations.

A resorting of PG&E's Excel spreadsheet supplied to the Team addresses specific identified trees by PG&E pipeline number, pipe diameter, and an important factor, MAOP, and % SMYS stress level at MAOP. There are many additional columns in the spreadsheet that can further assist in evaluating tree threats to gas pipelines within the City. One column that is not relevant, as previous mentioned, is the column calculating PIR for each pipeline segment.

The two arborists on the Team came to an agreement on which trees should be removed based on their surface evaluations of each tree's health. The arborists' determination to recommend such tree removal was based on tree health and had nothing to do with a threat to pipeline safety, or even implied safety issues above ground. Of the remaining trees not identified for removal by the Team's arborists because of poor tree health, based on Accufacts' extensive experience, the controlling factors then become driven by specific pipeline technical issues within the City related to: 1) pipe diameter 2) %SMYS at MAOP, 3) year installed, 4) coating type, and finally 5) "special note" such as risk of massive landslide or major creep, or possible girth weld type. It should be noted, related to girth welds, that there is nothing magical about 1962 identified by PG&E when it comes to girth weld quality, as there are many older steel hydrocarbon pipelines operating at much higher stress levels than those in the City where the girth welds operate without failure. The girth weld column in the spreadsheet only identifies the year 1962, which misses some important older welding pipeline possible concerns. Older welds, such as those containing acetylene girth welds, can operate reliably in stable soils. Acetylene girth welds, however, are old welding technology subject to snapping like glass under certain shear external loads such as massive breakaway earth movement or landslide. The Team's two pipeline experts could not make further progress on tree removal for trees not recommended for removal because of poor or very poor tree health as determined by the

[6] Dynamic Risk Assessment Systems, Inc., "Tree Root Interference Assessment – Final Report Volume 1 prepared for PG&E," January 17, 2014 and Dynamic Risk Assessment Systems, Inc., "Tree Root Interference Assessment – Attachments Final Report Volume II prepared for PG&E," April 27, 2015 (collectively "Dynamic Risk Reports").

arborists. My recommendation is not to remove these remaining trees. There is one grouping of trees on the larger diameter pipeline segment 191-1, that can operate at higher stress levels greater than 20 % SMYS, where leakage from a girth weld failure might be possible, albeit a low possibility. It should be noted that this pipeline segment, 191-1, based on the Excel spreadsheets and supplied KMZ files produced for the Team does not appear to have many trees near it.

**4. The Dynamic Risk Reports misrepresent and overstate the significance and risk of tree roots to PG&E safe pipeline operation within the City.**

The Dynamic Risk Reports misrepresent and overstate the significance of pipeline coating to prevent external corrosion damage to steel gas pipelines and the threat of trees (or their roots) on or near PG&E pipelines within the City.[7] NACE Standard Practice makes clear the important role that cathodic protection ("CP") plays in addressing external corrosion to pipelines well beyond just coating condition.[8] This standard establishes minimum approaches to address external corrosion protection, and nothing prevents a pipeline operator from exceeding such cathodic protection minimums. Dynamic Risk Assessment Systems, Inc. knew, or should have known, the important role that CP plays to assure external corrosion control is being mitigated, as no coating, even modern new types of pipeline coating in new pipeline installations, are perfect nor adequate to protect against external corrosion to pipelines for many reasons. The fact that coating condition is overplayed while downplaying the more important role of CP in the Dynamic Risk Reports raise many questions about the independence, thoroughness, and credibility of these studies.

The coating types reported by PG&E on the pipelines listed in their provided Excel spreadsheets, identify coating of late 1940's, 1950's, and early 1960's vintage, consisting largely of somastic, hot applied asphalt, or tape. These older forms of pipeline external coatings are well known to exhibit very poor coating protection on steel pipeline of that vintage, as they easily deteriorate with time for various reasons. The Dynamic Risk Reports fail to recognize that such coatings, especially those specific coating types and age, are already likely ineffective in preventing steel pipeline external corrosion. Such coatings should be matched with proper cathodic protection to work toward effectively mitigating external corrosion attack, especially with coatings on the PG&E system within the City.

In addition, the previous cited PHMSA Gas Transmission Mega-rule will require that pipeline operators perform aboveground electric assessment/testing of pipeline coating condition and

---

[7] *Ibid*.

[8] National Association of Corrosion Engineers ("NACE") International, "Standard Practice, SP0169-2013, Control of External Corrosion on Underground or Submerged Metallic Pipeline Systems," revised 2013-10-04.

corrosion control monitoring to help assess the condition of the external coating and that the CP system is effective in preventing external pipeline corrosion. In September/October of 2022 I asked PG&E to provide their latest above ground electric coating assessment evaluations and CP close interval surveys (aka CISs) of the pipelines that PG&E claims are being affected by the trees within the City. PG&E did not provide this information. The technologies of above ground electric coating assessment/evaluation and CP effectiveness measurement have advanced considerably especially in the last 10 years or so, to the point that PHMSA has prescriptively incorporated such regulations into new minimum gas pipeline safety regulations.[9]

What is clearly missing in the Dynamic Risk Reports is that such systems should be combined with the more important CP design especially as a pipeline CP system whose purpose is to deal with some types of coating failure can change with time that has nothing to do with tree roots.[10] While such pipelines are required to have CP, there was no requirement, until recently, that such CP systems be effective. The irony is that significant advances in coating assessment from surface measurement electric assessments and CP surveying/monitoring technology over the past decade have been made in determining a CP system's effectiveness utilizing advances in different surface electric measurement techniques and technologies.[11] The Dynamic Risk Reports fail to adequately explore this important matter. Buried in an Attachment 5 to one of the Dynamic Risk Reports is a Det Norske Veritas ("DNV") evaluation that addressed three specific technical questions relevant to this matter:

- "Whether the presence of tree roots (dead or alive) affect the likelihood or severity of external corrosion and or stress corrosion cracking (SCC),
- Whether the presence of tree roots alter the effectiveness of CP to mitigate external corrosion on a steel pipeline, and
- Whether the presence of tree roots affect aboveground CP and coating survey measurements."[12]

---

[9] Gas Transmission Mega-rule Phase II, 49CFR§192.461 External Corrosion Control: Protective Coating and 49CFR§192.465 Corrosion Control: Monitoring.

[10] The type of coatings on PG&E's gas pipelines within the City are prone to coating disbondment, separation of the coating from the pipe steel in which protective CP current cannot penetrate to reach the steel. In this situation tree root damage to the coating actually improves CP effectiveness.

[11] National Association of Corrosion Engineers ("NACE") International, "Standard Practice, SP0169-2013, Control of External Corrosion on Underground or Submerged Metallic Pipeline Systems," revised 2013-10-04, Section 10 Operation and Maintenance of CP Systems.

[12] Dynamic Risk Assessment Systems, Inc, "Tree Root Interference Assessment – Attachments Final Report Volume II prepared for PG&E," April 27, 2015, specifically Attachment 5, DNV Final Report, "Effects of Tree Roots on External Corrosion Control," p. ii & iii.

While tree roots can obviously cause coating damage, **such damage is not the controlling issue for pipeline external corrosion**, especially given the age and type of coatings on PG&E's pipelines within the City. An effective external corrosion CP program is the relevant factor on these pipelines and external coating damage by tree roots can actually improve the effectiveness of CP on these vintage systems within the City, especially where coating disbondment has occurred, a common risk on these types of older external coatings. The DNV Report, buried in an Attachment of one of the Dynamic Risk Reports, goes on to conclude:

"7. There is no evidence from this study to indicate that tree roots alter the effectiveness of CP to mitigate external corrosion on a pipeline.

8. There was no evidence from this study that tree roots deleteriously affect aboveground CP and coating surveys."[13]

It is a credit to DNV that they have adhered to science in developing their conclusions and findings in Attachment 5 that also agree with my extensive experience. Unfortunately, Dynamic Risk Assessment Systems, Inc. has chosen to fail to prioritize these important DNV findings as it relates to tree root threats, and buried DNV's important observations in an Attachment that most readers likely won't read.

Since the previously cited Dynamic Risk Reports identify that tree roots can cause stress corrosion cracking, or SCC, a highly specialized form of corrosion that is a combination of general corrosion loss but, more importantly, specialized cracking that can result in high stress transmission pipeline rupture, I need to comment on these Dynamic Risk Assessment Systems, Inc. assertions as an expert in various forms of SCC rupture failure. Given various major factors, such as the extremely low stress levels of the PG&E gas pipelines within the City, SCC is not a threat risk of concern in these pipeline segments.

The Dynamic Risk Reports are thus overstating the ability of coating to protect the PG&E steel pipelines within the City, that must rely on CP being effective to complete a prudent risk assessment evaluation. Ironically, no mention is made of evaluation of CP systems within the City in PG&E's provided Excel spreadsheets concerning the trees. Such an omission is a serious gap in integrity management approaches that fails to prudently address pipeline external corrosion threats that go well beyond coating conditions in a prudent integrity management program.

[13] *Ibid.,* p. 13.

**5. Pictures of tree roots wrapped around a pipeline misrepresent the risks of pipeline failure from trees within the City.**

I need to touch on one matter related to discussions with the City concerning pictures shown me of tree roots wrapping around pipelines. These pictures do not indicate what species of trees were involved, the pipeline locations, such as which state, the pipeline type, and the depth of the pipelines in the produced photos. While this is an arborist call, my experience with trees in pipeline rights-of-way has found that depth of tree roots are very tree species specific, and many pipelines are buried well below a depth that a specific tree may encroach on a buried pipeline. Federal pipeline safety regulations are very clear that the pipeline operator, PG&E is responsible for evaluating pipeline depth of coverage ("DOC") that can change with time for various reasons. Such DOC surveys are usually periodically performed from electrical measurements taken from the surface along the pipeline right-of-way. If a specific tree species is suspected of threatening a steel pipeline, from possible tree roots that go deep enough to wrap around a pipeline, PG&E should provide a timely DOC at the specific tree site to confirm with the City that a specific tree may warrant removal.

In addition, an inexperienced pipeline observer could conclude that such pictures of tree roots around pipelines could convey possible real threats to a steel pipeline should the tree fall. However, these are steel gas pipelines operating at very low stress levels within the City that can handle certain levels of abnormal external loading. If such forces were to occur, the pipeline failure would most likely cause cracking showing up as a natural gas leak, not a rupture.

**6. PG&E appears to be confusing the risk of trees near high voltage electric transmission powerline infrastructure with gas transportation pipelines which are very different risks.**

In reviewing the many discussions in the past year plus of Team interactions, it appears to me that PG&E is confusing the impact of trees on electrical high voltage transmission powerlines. Tree proximity to such electrical infrastructure have resulted in much loss of life from fires caused by power line failures and resulting fires within California associated with poor maintenance practices around such high-power electric facilities.

Trees in close proximity to gas pipelines, whether transmission or gas distribution lines, represent a different threat than that from electrical power lines. Trees near gas pipelines are very good leak indictors. In the event a gas leak becomes a fire, trees provide thermal shields or heat sinks that can buy nearby individuals precious time to leave the area if caught nearby, should such leaks ignite. Lastly, given the false arguments I have recently heard against trees in pipeline ROWs, I need to also mention that tree foliage does not prevent the use of remote methane leak detection processes ("RMLD"), as this technology has been well known for many decades to shoot through tree foliage to assist in remote methane gas leak detection.

**Conclusion**

I cannot support continued actions by PG&E or its consultants that are in violation of sound science and decades of pipeline experience and pipeline safety regulatory development. After a series of Team meetings spanning many months, it has become clear that the Team's pipeline safety technical experts cannot reach appropriate agreement on the remaining trees beyond that which the arborists have determined are in such poor shape that they should be removed. My pipeline experience dismisses the Dynamic Risk Reports as gravely incomplete, even biased, pertaining to tree root risks to PG&E steel gas pipelines within the City.

It is worth noting that federal pipeline safety regulations do not require the removal of trees near gas pipelines, or on pipeline right-of-way, for many reasons. A review of the federal pipeline incident databases will uncover that trees are not a bona-fide risk of concern to steel pipelines as most pipeline operators know how to deal with this possible integrity threat that doesn't require tree removal. There are many different surface electrical assessment approaches that if prudently applied by the pipeline operator, address risks that trees might pose to steel pipelines well before such possible threats approach pipeline failure.

I believe a search of various records should demonstrate that PG&E was instrumental in having direct assessment incorporated into integrity management regulation to address threats of external corrosion of steel pipelines when we were working on gas federal TIMP regulation development in the early 2000s. PG&E should thus know and be using these many electrical surface assessments methods (such as alternating current voltage gradient surveys, or ACVG, direct current voltage gradient surveys, or DGVG, as well as close interval surveys, or CISs, to assess not only pipeline external coating conditions, but also their CP systems effectiveness to address corrosion potential. ACVG or DVVG, coupled with CIS surveys and DOC surveys, will help identify if any specific tree is a bona fide threat to any PG&E gas pipeline with the City. Such critical information should be provided in a manner to the City that can be independently verified as to whether any specific tree is a legitimate threat to any gas pipelines.

Richard B. Kuprewicz,
President,
Accufacts Inc.