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Via U.S. Mail and Email (SB4@conservation.ca.gov)

Ms. Adele Lagomarsino
Department of Conservation
Division of Oil, Gas and Geothermal Resources
801 K Street, MS 18-00
Sacramento, CA 95814

Re: City of Culver City Comments on SB 4 Draft Environmental Impact Report: Analysis of Oil and Gas Well Stimulation Treatments in California

Dear Ms. Lagomarsino:

On behalf of the City of Culver City ("City"), we submit the following comments to the Draft Environmental Impact Report regarding Analysis of Oil and Gas Well Stimulation Treatments in California (DEIR). The Inglewood Oil Field, the active surface portion of which includes 100's of wells operating on over 1000 acres, is a specific subject of the DEIR and is located partially with the City's jurisdictional boundaries and partly adjacent to the City, within the unincorporated area of the County of Los Angeles. Within and adjacent to the boundaries of the Inglewood Oil Field are densely populated urban communities with a number of sensitive uses.

Importantly, the Newport-Inglewood Fault, including a number of interrelated faults, appears to run throughout the active field where Well Stimulation Treatments (WST) are proposed to occur. The Newport-Inglewood Fault, is an active fault responsible for over 100 deaths and is considered to be capable of generating an earthquake up to a magnitude of 7.2 (M7.2). The Newport-Inglewood Fault is considered to be part of the San Andreas Fault system.

The City is in the process of developing a Specific Plan to address and regulate oil exploration and production activities within the City including well stimulation activities. However, it has concerns about the completeness and accuracy of the DEIR, as it may apply to activities within the Los Angeles County portion of the Field, as well as how it may apply to activities within the City's jurisdiction.

I. Regulatory Setting/Local Regulatory Framework:

The regulatory setting only addresses the statewide regulatory setting, not the local regulatory setting. The local regulatory setting is essential to provide a complete informational document required under CEQA. In addition, as a number of the recommended mitigation measures rely on local agencies requiring appropriate conditions of approval, the failure to address the local regulatory setting sets the stage for making assumptions that improperly rely on deferred mitigation, but for which the authority may be lacking. This is particularly problematic in the Inglewood Oil Field.

In 2008, Los Angeles County approved the Baldwin Hills Community Standards District (CSD) which adopts regulations for well activities within the County portion of the Inglewood Oil Field. An EIR was prepared in connection with the CSD, but the EIR did not address certain well stimulation activities, including hydraulic fracturing. Following the promulgation of the CSD, LA County has approved all subsequent Oil Field activities on a ministerial basis. Dozens of wells have been drilled since the implementation of the CSD, and LA County has approved each one ministerially. The Oil Field operator has performed hydraulic fracturing on a number of wells without discretionary approval from LA County nor any additional environmental review by LA County or DOGGR under CEQA. We anticipate that both the County and the Oil Field operator will maintain that no discretionary review is necessary for future hydraulic fracturing activities and that the County has no authority to impose conditions on hydraulic fracturing under the current CSD. Thus, any of the mitigation measures proposed in the DEIR, which assumes that the lead agency will or can impose conditions, particularly in the Inglewood Oil Field, may be based on a false premise. In light of the fact that hydraulic fracturing was not addressed in the EIR for the CSD, the City believes that environmental review under CEQA for future WST in the Inglewood Oil Field is necessary, but it appears that the County believes otherwise. Similarly, it is unclear whether DOGGR would assume lead agency status in the ostensible absence of discretionary authority by LA County. With the hydraulic fracturing/WST that occurred previously in the Inglewood Oil Field, DOGGR did not assume lead agency status and implement environmental review under CEQA. Prior to the promulgation of the CSD, when new oil wells could be drilled as of right under the County ordinance, DOGGR routinely approved new well permits, without CEQA compliance.

As noted above, Culver City is developing a Specific Plan that will regulate oil field activities in the City portion of the field. Until then, any new oil and gas production operations are subject to discretionary review.

II. Geology- Risk of Induced Seismic Event

A. Reliance on Statistical Surveys of Other Regions is not a Substitute for an Impact Analysis based on Site-Specific Risk of Significant Impact.

The question of whether hydraulic fracturing can induce a seismic event is one that has been the subject of significant public concern. Notwithstanding this public concern, the DEIR has entirely failed to undertake any study, critical review or analysis of site-specific conditions in California, including those in the special study areas, to assess the risk of a seismically induced earthquake capable of threatening lives and property. The DEIR, at Section 19, describes a team of over 100 preparers and reviewers. Incredibly, given the importance and potential consequences of a major induced seismic event and the public concern, there is not one scientist in that team who addresses geology and soils that has an advanced degree in seismology, geophysics or any other formal training that would reflect an advanced expertise in seismology. Likewise, neither the California Geological Survey nor the U.S. Geological Survey was consulted in the preparation of the DEIR. Rather, the DEIR relies almost entirely, and inappropriately, on published "studies" and even as to those studies, fails to analyze those studies to determine their qualifications, limitations and applicability to California in general or to the conditions in the specific oil fields discussed in the EIR, particularly the Inglewood Oil Field (discussed below). Unfortunately, the DEIR could not await the completion of the independent scientific study, required by SB4, that is currently being conducted as that should shed more light on the specific risks from WST in areas where there are active faults.

For example, the DEIR relies heavily on the NRC report, which essentially concludes based on a statistical analysis of hundreds of thousands of earthquakes worldwide, most of which did not occur within active fault systems, that the relative likelihood of an induced earthquake from WST is not high. But the NRC report also indicates that hydraulic fracturing can cause induced seismicity depending on subsurface conditions, particularly the specific properties of faults, their orientation and the critical state of stress of the rocks. (p.7) Pore fluid pressure and volume of fluids are also key components.

> "If stresses in a rock formation are near the critical stress for fault rupture, theory predicts and experience demonstrates that *relatively modest* changes of pore fluid pressures can induce seismicity. Generally, induced earthquakes are not damaging, but if preexisting stress conditions or the elevated pore fluid pressures are sufficiently high over a large fault area,

> then earthquakes with enough magnitude or intensity to cause damage can potentially occur (NRC, p 31)... "*Any* perturbation in the stress or pore pressure that is associated with an increase of the shear stress magnitude...could be destabilizing; such a perturbation brings the system close to critical conditions for failure... a *small* destabilizing perturbation of the stress and/or the pore pressure could cause a critically oriented fault to slip." (NRC, 31 and 39) emphasis added

That there have been few instances that hydraulic fracturing has been directly proven to cause earthquakes is an artifact of the extreme difficulty in establishing a causal link between a human caused event and the slippage of rocks miles below the surface; a problem that the NRC report acknowledges. Thus, the lack of few proven WST induced earthquakes is not evidence that they are not likely to occur under certain conditions.

As the NRC report notes, it is impossible to predict the likelihood of an induced seismic event without understanding site specific information regarding the fault system. All the NRC can do, and all the DEIR does, is generally conclude that not many earthquakes have happened elsewhere so the overall risk is low. Yet, under certain conditions – such as the Inglewood Oil Field – the risk could be very high.

> Although the general mechanisms that create induced seismic events are well understood, current computer modeling techniques cannot fully address the complexities of natural rock systems in large part because the models *generally lack information on local crustal stress, rock properties, fault locations and properties, and the shape and size of the reservoir into which fluids are injected or withdrawn. When adequate knowledge of this information is available, the possibility exists to make accurate predictions of earthquake occurrences.* Without this detailed information, hazard and risk assessments have to be based on statistical analysis of data from analogous regions. NRC (2013) at p.7

In any event, as the NRC report notes, though, such a statistical analysis cannot accurately predict site-specific risk. With respect to the Inglewood Oil Field, in particular, there are no "analogous regions" from which a statistical analysis would be helpful, because the pervasive and dangerous fault system that underlies it is not replicated anywhere else. Before an informed decision can be made regarding WST in a field such as the Inglewood Oil Field - which is riven with faults throughout the Field - the information necessary to allow at least a fighting chance at assessing the risk must be obtained. While existing models may have shortcomings in predicting the number and magnitude of quakes that

may be triggered by WST, they can provide far more relevant and meaningful information about the risk of a seismically induced event and that is what CEQA requires. Thus, it is absolutely essential that before any WST occur in an area within a known active fault system, that all the information necessary to run a predictive model be obtained. If it is not feasible to do so, then WST should not be permitted until it is feasible. In the Inglewood Oil Field for example, advanced seismic 3D testing was conducted by the Oil Field operator which may provide at least a starting point if not the basis for running a predictive model. This information, as far as we know, has never been made available to public agencies. It should be.

At a minimum, a predictive model must be run with the necessary inputs obtained through a detailed investigation of the subsurface rock system in the Inglewood Oil Field. Without it, the DEIR fails to inform the DOC of the real risks from WST in the Inglewood Oil Field, and other fields over or near active faults and the DEIR's analysis and any subsequent certification would fail to meet the requirements of CEQA.

The DEIR must also include an adequate description of not only the probability of an earthquake from WST in the Inglewood Oil Field but what the potential impacts from earthquakes ranging from M3 up to M7.2 would be on surrounding communities and communities in the region, including estimates of loss of life, injury, property damage and economic losses. Without this impact analysis, the document will not meet the requirements of CEQA as it will fail to inform decision-makers of the potential impacts of its decision. With respect to the Inglewood Oil Field, particular emphasis must be given to an analysis of buildings which do not meet current earthquake requirements. The Inglewood Oil Field is near a number of disadvantaged communities where substandard housing and commercial buildings may result in disproportionate impacts.

B. The Department of Conservation Must Apply an Appropriate Significance Criteria. The Mitigation Measures Proposed Cannot be Found to Reduce the Risk to Insignificant.

To assess the risk the NRC report notes, detailed information regarding the properties of the faults that may be impacted, the existing state of stress and brittleness of the rock, and complex modeling must be conducted. The fracturing event itself may only cause a microseism, but it's the effect of the fracturing on the rock that is the concern. The creation of the fractures will cause the impacted rock formation to expand causing increased shear pressure above and below. Without knowledge of the state of the fault system, it remains unknown whether the increased sheer or pore pressure will be all that it takes to cause the fault,

and/or interconnected faults to fail. Thus, while the overall risk of an induced seismic event from hydraulic fracturing may be statistically small, on a global basis based on the thousands of treatments that have occurred (the vast majority in locations without active faults) and the few quakes that have been proven to result from those treatment, the risk is relatively high if the hydraulic fracturing is taking place in a fragile system that is already at a critical state.

Under the significance criteria set by the DEIR and derived from the CEQA Guidelines, any induced seismic event which causes ground shaking is a significant impact (DEIR, p. 10.11-36) We already know that there is a likelihood of such ground shaking from WST based on the seismic events occurring during 2011 (discussed below). A significance threshold based on the probability of a quake capable of loss of life and property must be also established. For example, a commonly used risk threshold use for toxic air emissions is whether the release of toxic contaminants over a period of years would result in more than 10 people contracting cancers out of a million. In other words, the emissions would have to be mitigated to reduce the chance of anyone getting cancer to less than 1 in 100,000. But a major earthquake can kill dozens or hundreds of people and inflict significant injury on hundreds or thousands more. For example, if a magnitude 6.0 quake centered on the Newport- Inglewood Fault is considered to be capable of killing or significantly injuring 1000 people, then the DOC would have to determine that there is less than a 1 in 100 million likelihood for such an earthquake to occur as a result of WST to find that the risk is "insignificant" under the same significance criteria used for toxic air emissions.

The greater the magnitude (e.g.1000 injured or killed) from a single event, the less the probability necessary to require more stringent mitigation measures including the prohibition of WST which use high volume and/or pressures, unless the risk can be proven to be below the established significance criteria.

Based on a very conservative and purely statistical analysis – the chance of a significant quake that could occur -- given the two or three "proven" quakes resulting from 350,000 hydraulic fracturing treatments worldwide (NRC 2013) -- would be 1 in 100,000 or about 10 in 1,000,000. Using the DEIR assumption of 15 hydraulic fracturing treatments annually over a 20-year period, then the risk of a significant quake during that time becomes about 1 in 333. However, when one considers the risk of such an earthquake on a site specific basis, the risk in the Inglewood Oil Field is certainly at least one or two orders of magnitude higher given the uniquely dangerous fault system (out of the 350,000 mentioned above, the vast majority occurred in areas without active faults). Given the fault system, the likelihood of one that is of a magnitude of 5 or greater, resulting in loss of life and property, is also much higher. The latter is harder to predict, but even with

the benefit of a doubt, there is no reasonable basis to conclude that the risk is insignificant with the nominal mitigation measures suggested and that conclusion in the DEIR is arbitrary and capricious.

C. *The Inglewood Oil Field Contains a Unique and Dangerous Fault System Creating Heightened Risk that is Not Properly Assessed by the DEIR. The DEIR Fails to Acknowledge or Assess Seismic Events that Appear to Have Been Induced by Well Stimulation Treatments. Site Specific Analysis and the Use of a Predictive Model is Necessary.*

The Newport-Inglewood Fault (NI Fault) runs through the Inglewood Oil Field. The NI Fault is not a straight line fault but one which is a network of faults which run vertically, laterally and in-between. (See Cardio Entrix Report and Attachment A for cross-section from Cardio Entrix report.) Surface maps may show only where the fault may run at the surface. (See e.g. 11-8-8 of DEIR Map Book.) The cross-sections, however, show that the faults appear to underlie the entire Inglewood Oil Field throughout the different geological zones and run laterally through the Sentous and Nodular Shale zones, zones in which the Inglewood Oil Field operator is most likely to conduct hydraulic fracturing operations.

The NI Fault is a relatively shallow fault which raises significant questions regarding whether WST in the areas where movement could occur could trigger a significant quake. The NI Fault is considered to be a particularly dangerous one, capable of causing an earthquake of M7 or greater and was responsible for significant loss of life and property in the Long Beach earthquake of 1933. On September 10, 2001, a 4.7 magnitude quake at the northern end of the NI Fault was estimated to be only 2.5 miles deep, give or take a half mile. (LA Times, Quake Occurred Along Fault Said to Be Among Area's Most Dangerous, September 11, 2001.) Notably, the Sentous and Nodular Shale formations extend more than 2 miles below the surface. These are the zones where hydraulic fracturing is most likely to occur. (See Cardno Entrix and Halliburton reports, and see An Independent Scientific Assessment of Well Stimulation in California, CCST,, January 2015, Vol 1, p. 242 "CCST Report" http://www.ccst.us/projects/hydraulic_fracturing_public/SB4.php.) Prior WST by the Inglewood Oil Field operator have been conducted nearly 2 miles below the surface. (See Halliburton Report, Appendices C and D.)

In addition to the Newport-Inglewood Fault, there is an additional unnamed fault identified in the DEIR Map Book which also transects the Inglewood Oil Field, north to south, and is located on surface maps as more westerly (11-8-8 of DEIR Map Book) from and parallel to the NI Fault. The DEIR classifies this fault as Late

Quarternary. (According to the USGS, Late Quaternary faults are "sometimes" considered active. http://earthquake.usgs.gov/learn/glossary/?term=Late%20Quaternary) However, Caltech identifies this same fault as part of Newport-Inglewood Fault system. http://scedc.caltech.edu/significant/index.html. This fault appears to begin in downtown Culver City and runs uninterrupted along the north edge of Culver City Park and through the entirety of the Inglewood Oil Field until it reaches a populated neighborhood south of the Field. There is nothing in the DEIR to reflect whether the unnamed fault was considered as part of the potential impact analysis (it is not mentioned in the text) should be considered to be part of the NI Fault, whether it's active, or whether it could be the source of seismic activity if triggered by the low seismic or even micro seismic events (See p. 11.11-2). Additionally, as discussed above, the network of NI Faults extends well into the areas where the unnamed Late Quarternary fault runs, meaning that the two faults are likely interconnected, or otherwise be influenced by stresses on the other, which may create an increased risk of a major earthquake should one or the other fail in proximity to the other.

As noted in the DEIR, the Inglewood Oil Field Operator Freeport McMoran conducted well stimulation activities in the Inglewood Oil Field over approximately a fourteen month period as part of a study. The WSTs included high rate gravel packing in shallower geologic zones and hydraulic fracturing in the deeper Sentous, Myonier and Nodular Shale zones[1]. The fractures created were as long as **2110 feet** – nearly half a mile (See Appendix C to Halliburton Report) and vertically has much as 95 feet (See Appendix D to Halliburton Report) at depths of almost 2 miles. These activities were reported in the Cardno Entrix report and the related Halliburton Report. While the dates of all the WST were oddly not reported, it appears the reported WST occurred over a 14 month period, from approximately mid-November 2010 to early January 2012. While both Cardno Entrix and Halliburton reported on the monitored seismic intensity of

[1] While the fracturing in the Sentous zone was characterized as "conventional" as opposed to "high volume", the pressures used were higher than the so-called high volume, up to 9551 psi.(See, Appendix C to Halliburton Report)

two of the five hydraulic fracturing operations, neither these reports nor the DEIR reported the following:

> During the 14 month period that the well stimulation operations were being conducted, **three earthquakes of M 2.0 or greater occurred** within or very near the active portion of the Inglewood Oil Field where most of the WST occurred -- bounded by Slauson Ave. to the south, Jefferson Blvd. to the west, Rodeo Road to the north and La Cienega Blvd. to the south. (See USGS Earthquake Archives.) According to the USGS online earthquake archives, only one such quake occurred in this area in the fifty (50) years preceding the well stimulation treatments. During PXP's 14 month well stimulation study period**, three** occurred.

As noted by the NRC report, the frequency of earthquakes following fluid injection in an area that had previously been aseismic is a pretty good indicator that the increase in pore or shear pressure was a cause of the earthquakes. (NRC at 32). To put it in mathematical terms, based on prior history as shown in the USGS Earthquake Archives, there is a 1 in 50 chance of an earthquake randomly occurring in this area due to natural causes in a given year; thus, there is a 1 in 125,000 or a 0.0008% chance that 3 would randomly occur in a given year. In other words, there is a 99.9992 % likelihood that the earthquakes were not randomly caused by natural causes, but from anthropomorphic activities.

As neither the Cardno Entrix Report nor the Halliburton Report reported the dates of most of the hydraulic fracturing operations in the deeper zones, which in and of itself is odd for reports as thorough and detailed as they purport to be, it is not possible to tie the time of any particular activity to the earthquakes. It may well be that WST may cause a chain of slow motion changes that may not manifest itself in a fault failure until sometime later. For example, repeated or single perturbations may gradually and/or cumulatively push faults to the breaking point. These are the kind of concerns that absolutely require more study.

At least two of the quakes M2.0 or greater appear to be along the Late Quarternary fault. Subsequent to the well stimulation activities, smaller quakes also appear to have occurred along the same fault including a M1.5 near City Hall in downtown Culver City. Since 1950, no measurable earthquakes originated or have been centered in this area. Thus, to the extent that the unnamed Late Quarternary fault was dormant before, it appears to be active now, probably as a result of the well stimulation activities.

We understand that quakes in the range M1 or M2 are not going to cause bodily injury or property damage, but they do demonstrate that WST are likely capable

of triggering an earthquake, and the DEIRs premise to the contrary is likely false. Future earthquakes may be of greater magnitude and the repeated occurrence of smaller earthquakes can cause a larger earthquake.

The DEIR fails to present a table showing the distance of the Inglewood Oil Field to major faults, as it does with the Wilmington Field and Sespe Field. Such a table should be included as it will alert the more casual reader to the heightened risk. One can only speculate why it was left out, but we certainly hope it was not to obscure the fact that one of the most significant faults in California runs directly through the Inglewood Oil Field. The text itself states: "Distances to active faults would be similar to those presented on Table 11.11-1" which is simply not true because that table shows the distance to the NI fault is over 2 miles. At the Inglewood Oil Field, the NI Fault is right underneath the Field and its network of faults permeate the Field.

The DEIR's discussion of Impact Analysis in section 10.11.5 states that fractures are typically 200 feet long, though it notes the possibility that they may exceed 1000 feet. Hydraulic fracturing in the Nodular Shale created fractures of as much as 2100 feet (Halliburton, Appendix C), with most over 1000 feet. (Id at Appendices C and D.) These size fractures in the Inglewood Oil Field appear to be more the norm than the exception. The DEIR also notes that typical depths are between 2000 and 3000 feet. At the Inglewood Oil Field, past and future hydraulic fracturing is likely to occur between 8000 to 10,000 feet below the ground surface. Thus, to the extent that the DEIR assessment assumes typical fractures at typical depths, none of those assumptions hold true in the Inglewood Oil Field. As the DEIR itself notes, the deeper the fracture, the more risk of induced seismicity. (See, e.g. 10-1-50.) The longer the fracture, the greater the risk of induced seismicity. The magnitude 4.2 Newport-Inglewood quake mentioned above was the result of a fault rupture of only about 500 square meters.

The DEIR and all the relevant studies agree that wastewater disposal presents an even higher risk of induced seismic events than hydraulic fracturing. This is particularly true in the Newport-Inglewood Fault. While existing regulations limit the pore pressure of such injection, such pressures are poorly monitored and the impact of such fluids on faults is not well understood. As with hydraulic fracturing, the deeper the injections, the greater the potential for an induced seismic event. With wastewater disposal, off-site disposal is a feasible alternative that should be used to avoid significant impacts.

D. Proposed Mitigation Measures for Effects of Induced Seismic Events

Merely requiring the operator to demonstrate to DOGGR that it's safe to conduct WST is not enough without requiring more specificity. Additionally, there is no evidence that DOGGR has on its staff expert seismologists with the requisite expertise to meaningfully evaluate any information that an operator may provide. As the NRC report concludes, the task of assessing the risk of the potential for induced seismicity is very difficult. The use of state of the art modeling designed to determine whether certain stresses could cause an earthquake, at a minimum, is required. As discussed above, there are also significant questions about the enforceability of any restrictions that DOGGR or the County of Los Angeles would impose even if they had sufficient information, a predictive model and the expertise to evaluate the information in the model. At the time the CSD was promulgated, the County essentially approved well production for the ensuing twenty years, subject only to the restrictions in the CSD (which do not address WST) and annual approval of well plans and periodic review which do not necessarily include any discretionary approval subject to CEQA. DOGGR has entirely failed to address WST in the past and there is a significant question as to whether DOGGR would or could include conditions of approval on future permits given its prior history and the oil field operator's inevitable legal position that the County, as the lead agency, has already approved oil and gas production, regardless of technique, in the Inglewood Oil Field. (Culver City will, of course, take a hard look at WST in the development of its Specific Plan and any oil field production involving drilling in its portion of the Field will require discretionary approval prior to the implementation of the Specific Plan.)

The proposed mitigation measures for the Inglewood Oil Field refer back to the MM for Geo-1, in section 10.11.5. However, those mitigation measures by their terms are largely designed to mitigate potential seismic impacts to the well stimulation treatments themselves, not to mitigate impacts caused by earthquakes on nearby communities. The MM must be restated to reflect the need to also protect persons and property in the areas near WST.

There should be a prohibition on WST, not only in the APFZ, but throughout the Inglewood Oil Field at least until appropriate inputs (discussed above) are obtained to develop a predictive model that can provide a state of the art and reasonably reliable estimate of the likelihood of earthquakes occurring as a result of WPA. The APFZ is too narrow and only covers a portion of the Field. As discussed above, the NI network of faults permeate virtually the entire Field at subsurface depths. Given the unique fault system under the Inglewood Oil Field and evidence that WST have already triggered earthquakes in the Field, there is no substantial evidence to rule out the possibility that a future earthquake

triggered by high volume pressures and/or fluid volumes could cause bodily injury or property damage. This is not just an environmental impact, this threatens lives, homes and businesses. Importantly, there is already some evidence that WST have caused earthquakes in the Inglewood Oil Field. It would simply be arbitrary and capricious to allow any WST involving high pressures and/or high volumes. So-called conventional gravel packing may be the sole exception. Any assessment of risk and appropriate MMs to address such risk must be measured not only by the probability of an impact, but the magnitude of the potential impact. If the probability of an earthquake for certain WST exceeds appropriate significance criteria, which should be a sliding scale or probability based on magnitude, then the oil field operator must limit its WST to procedures that would not exceed those criteria. For example, WST may be limited to treatments designed to have limited fracture lengths (e.g. no more than 200 feet as assumed by the DEIR and fracture depths (no more than 1000 feet) as assumed by the DEIR.)

The seismic monitoring should occur for a period of at least 90 days following a WST. There is no evidence presented in the DEIR that an induced earthquake would occur only within the first 10 days of treatment. The trigger for reporting should be lower than a magnitude of 2.7. If there has been a history of seismic events of a magnitude of 1.0 or more, then two or more of M1.0 or more within a 90 day period should cause the shut down and evaluation called for in the regulations while one M2.0 would do the same. If no such history, than even a single quake of M1.0 or more should stop WST until it can be evaluated.

In the Inglewood Oil Field – if any WSTs are permitted at all- even one of 1.0 or more, given the history of the Field, should cause a cessation to evaluate whether it may be related to the WST. As noted above, there is already some evidence of earthquakes caused by WST.

Under the current regulations, the oil field operator is not required to submit any information regarding the potential risk of an induced seismic event. At a minimum, the operator should now be required to provide the following if the WST is within 2500 feet of a known or suspected fault:

- Identification of each fault, its orientation and other key characteristics within 2500 feet of the proposed location of the WST. In the Inglewood Oil Field, the so-called unnamed Late Quarternary fault must be further assessed given, among other things, its apparent recent activity that may have been triggered by WST.
- Seismic 3D model of the geology surrounding the WST and within a 2500 foot radius. This model is in the possession of the Inglewood Oil Field

operator. They must make this available. Among other things, it will allow the evaluation of how the faults interconnect, where the stresses occur.

- An assessment of the current state of stress that exists in the formations, above and below, where the treatments will occur. If they are in a critical or near-critical state of stress and an induced seismic event caused by the volumes or pressures introduced by the proposed WST cannot be ruled out, then the proposed WST must not be permitted. Among other things, this assessment must include an assessment of the existing and residual stresses created by prior and ongoing wastewater disposal practices, prior WSTs, prior injection practices and oil and water withdrawal.
- The development of a predictive model using those inputs that are necessary for the model to provide as accurate estimate as feasible. The Oil Field Operator should be responsible for obtaining those inputs at its cost.

All wastewater in the Inglewood Field should be disposed off-site. If such disposal is not feasible, then disposal should be limited to shallower depths of no more than 2500 feet below ground surface and all fluid pressures in the formations to which wastewaters are disposed should be constantly monitored during injection activities and no less than monthly throughout the life of the Field.

III. Air Quality

The DEIR fails to adequately address the risk from releases of hydrogen sulfide. In 2005 and 2006, the Inglewood Oil Field operator caused a massive release of emissions from what it characterized as a pocket of pressured gas in the Nodular Shale. Nearby residents reported a variety of symptoms from exposure to the emissions and reported that the emissions smelled like rotten eggs- a telltale sign of hydrogen sulfide. Acute and chronic exposure to Hydrogen Sulfide can be toxic at very low levels.

IV. Cumulative Impacts

The DEIR wholly fails to consider the cumulative impact of existing projects on and around the Inglewood Oil Field, including the existing impacts related to existing and future impacts caused by ongoing oil and gas operations.

These include:

- Localized impacts of continuing diesel, benzene and other air emissions from oil exploration and production wells additive to the emissions from WST the combination of the two is likely to exceed the significance criteria set by the SCAQMD (See the Baldwin Hills CSD Final EIR).
- The addition of noise from WST to noise from existing and future oil field operations will cause the Oil Field operations to exceed existing noise limits. In many areas around the field, those limits have already been exceeded (See CSD Final EIR, Baldwin Hills EIR, 2008)
- WST will further degrade aesthetic quality in viewsheds visible from surrounding communities

V. Conclusion

The foregoing should not be viewed as an exhaustive list of Culver City's concerns with well stimulation techniques and the DEIR. Given limitations on time and resources, the City has focused on those that are likely to have the greatest impact on the local communities and those which issues may uniquely apply to the Inglewood Oil Field. In the course of preparing Culver City's Specific Plan, the City will conduct its own environmental review and address all of these issues in more depth. However, the Department of Conservation must not rely on local action to protect against the impacts discussed above and throughout the DEIR. It must undertake to obtain the necessary information to evaluate the risks of significant impacts using appropriate significance criteria, perform the studies that are feasible, and reach a reasonable determination as to the potential for significant impacts. In addition, the DOC should implement feasible mitigation measures, including an alternative of not permitting certain well stimulation techniques, unless and until significant impacts can be ruled out or avoided through appropriate mitigation.

Sincerely,

Carol A. Schwab

Carol A. Schwab
City Attorney
City of Culver City

Cc: Mayor Meghan Sahli-Wells and Members of the City Council
John Nachbar, City Manager
Martin Cole, Assistant City Manager/City Clerk