**Arroyo Grande Aquifer Exemption Request**

**Public Comment Summaries and Responses**

Prior to submitting the enclosed aquifer exemption request to the US EPA, the Department of Conservation, Division of Oil, Gas, and Geothermal Resources (Division) and the State Water Resources Board jointly conducted a public participation process to solicit input on the aquifer exemption proposal. Following publication of notice in a local newspaper, and mailing or emailing notice to interested parties, public comments on the proposal were accepted from August 20, 2015 through September 21, 2015. On September 21, the Division and the State Water Board jointly conducted a public comment hearing in San Luis Obispo. Subsequently, the Division and the State Water Board added additional explanatory materials to the aquifer exemption proposal, and once again, accepted public comments on the proposal from December 2, 2015 through December 16, 2015. Included below is a summary of all of the comments received from the public together with the Division's and State Water Board's responses.

Over the course of the two separate public comment periods, the Division received a wide variety of public comments via email, regular mail, public comment hearing, and fax. These comments ranged from very detailed comments on the proposed aquifer exemption application, to general concerns about all aspects of oil and gas production. Each commenter and subsequent comment was given a unique numerical signifier. The chart below provides the numerical signifier for each commenter. Below, you will find either grouped or individual comment numerical signifiers, followed by a summary or specific comment, followed by a response (italicized).

**Commenter's:**

| Number | Name and/or Entity |
|---|---|
| 0001 | Center for Biological Diversity |
| 0002 | Sierra Club California |
| 0003 | Clean Water Action |
| 0004 | Watson Planning Consultants |
| 0005 | Natural Resources Defense Council |
| 0007 | Natalie Risner |
| 0009 | John Brooks, CFROG |
| 0010 | Jeanne Blackwell |
| 0011 | Bailey Smith |
| 0012 | Celeste Whitlow |
| 0013 | Terre Dunivant |
| 0014 | Janet Blevins |
| 0015 | Elizabeth Warner |
| 0016 | Beverley Brown |

| | |
|---|---|
| 0017 | Victoria Wolf |
| 0018 | Russell Hodin |
| 0019 | Randy Freeman |
| 0020 | Suzanne and Benjamin Davis |
| 0021 | Laura Bjokhlund |
| 0022 | Susan Testa |
| 0023 | Sue Sawade |
| 0024 | Marcia Guthrie |
| 0025 | Rick Santos |
| 0026 | Rebecca and John Baer |
| 0027 | Joe Gerber and Lyn Schultz |
| 0028 | W David Conn |
| 0029 | Steven Zawalick |
| 0030 | Jessica Gardella |
| 0031 | Rodger Mastako |
| 0032 | Mary Webb |
| 0033 | Tom Rehkugler |
| 0034 | Cindy Hansen |
| 0035 | Dori Stone |
| 0036 | Betty Winholtz |
| 0037 | Trish Wilson |
| 0038 | Natalie Beller |
| 0039 | Denise Silva Topham |
| 0040 | Jarratt Trudy |
| 0041 | Michael Hannon |
| 0042 | Gregory Ross |
| 0043 | Sara Tregenza |
| 0044 | Jeannette Sofer |
| 0045 | Pat Connelly |
| 0046 | Steve Lain |
| 0047 | Pete Allen |
| 0048 | Jackie Relyea |
| 0049 | Karen Spease |
| 0050 | Rebecca Claassen |
| 0051 | Hilary Stovo Kuphal |
| 0052 | Dovo Mannon |
| 0053 | Tom Rehkugler |
| 0054 | Anonymous |
| 0055 | Jean Reeves |
| 0056 | Lorinda Howland |
| 0057 | Adam Hill, Board of Supervisors San Luis Obispo County |
| 0058 | Natalie Smith-Risner |
| 0059 | Andrew Grinberg, Clean Water Action |
| 0060 | Blair Knox, California Independent Petroleum Association (CIPA) |
| 0061 | Kay Gore |
| 0062 | Andrew Christie, Sierra Club |

| | |
|---|---|
| 0063 | Wayne Allen |
| 0064 | Lorinda Howland |
| 0065 | Ted Case |
| 0066 | Rebecca August |
| 0067 | Joey Recono |
| 0068 | Michael Law |
| 0069 | Jeanne Blackwell |
| 0070 | Maya Golden-Krasner, Center for Biological Diversity |
| 0071 | Damon Nagami, Natural Resource Defense Council |
| 0072 | Laurie Connelly |
| 0073 | Jonathan Beller |
| 0074 | Ed Hazard, National Association of Royalty Owners |
| 0075 | Diane Suderman |
| 0076 | Kurt Sutherland |
| 0077 | Dave Watson |
| 0078 | Ginger Lordus |
| 0079 | Debbie Peterson, former Mayor of Grover Beach |
| 0080 | Ash Lauth, Center of Biological Diversity |
| 0081 | Steve Lain |
| 0082 | Monique Roheda (Grateda?) |
| 0083 | Terry Joy and Trish Wilson |
| 0084 | Diane Mead |
| 0085 | Greg Bean |
| 0086 | Heidi Harmon |
| 0087 | Kathy Longacre |
| 0088 | Kathy Teuful |
| 0089 | Maia Kiley |
| 0091 | Assoc of Edna Valley Growers |
| 0092 | Enviro Center of San Luis Obispo |
| 0093 | Pete Allen |

**Comment Notes:** Sierra Club California "references and echos" comments made by Clean Water Action and Natural Resources Defense Council in letters dated September 25, 2015 and September 21, 2015. CBD Incorporates by reference their comments submitted September 21.

**Comment Summaries and Responses:**

**Opposition**

0025-1, 0040-1, 0031-1, 0032-1, 0042-1, 0029-1, 0026-1, 0039-1, 0016-1, 0017-1, 0020-1, 0043-1, 0027-1, 0030-1, 0022-1, 0024-1, 0028-2, 0048-1, 0044-1, 0035-1, 0023-1, 0033-1, 0036-1, 0036-2, 0010-1, 0013-1, 0013-2, 0015-1, 0015-2 0012-1, 0014-1, 0034-1, 0045-1, 0047-1, 0009-1, 0046-1, 0049-1, 0050-1, 0051-1, 0052-1, 0053-1, 0054-1, 0055-1, 0057-1, 0021-1, 0058-1, 0028-3, 0061-1, 0062-1, 0063-1, 0064-1, 0065-1, 0066-1, 0067-1, 0068-1, 0069-1, 0056-1, 0041-1, 0059-1, 0071-1, 0072-1, 0035-2, 0032-2, 0038-3, 0073-1, 0075-1, 0076-1, 0077-1, 0078-1, 0079-1, 0011-2, 0080-1, 0081-1, 0082-1, 0083-2, 0089-1, 0088-1, 0086-1, 0085-1, 0084-1, 0093-1, 0087-1, 0011-5, 0001-22, 0007-28

The Department received a variety of comment letters expressing general concerns regarding the aquifer exemption application, oil and gas production, oil and gas producers, and the Division of Oil, Gas, and Geothermal Resources. Those concerns are summarized below, and relate to:

- The impacts to drinking water sources, health, safety, property, and the environment (specifically subsidence, sinkholes, earthquakes, seepage, permeation, and drought conditions).
- The application being deficient, including the lack of technology cited, lack of data included, absence of an Environmental Impact Report, insufficient chemical and well information.
- The general disappointment with State government, local agencies, and the Division of Oil, Gas, and Geothermal Resources.
- The need to have a better oversight, monitoring, enforcement, testing of injected water, public input, and transparency.
- The general belief that the aquifer should not be exempted, because the oil companies cannot be trusted.
- The aquifer containing water that can be treated for other uses (municipal, domestic, agricultural).
- Requests for a scientific study, additional analysis, reports and research of the flow of water within and between neighboring aquifers.
- Information on pressure changes and the potential to induce fractures, faults, and earthquakes, that would threaten water quality. The
- The public having access to maps, sampling information, analysis of the Quality Analysis/Quality Control procedure programs, tests of all wells near the oilfield, and be privy to plans to drill new wells.
- The idea that all documents regarding any expansion should only be produced by a third party.
- The exhibits contained in the application, because are hard to understand.
- The need to track and monitor ongoing activities and clean up.
- The perceived lack of authority granted to the Division of Oil, Gas, and Geothermal Resources.

*The State of California Division of Oil, Gas and Geothermal Resources (Division or DOGGR) and Water Resources Control Board (State Water Board) and Regional Water Quality Control Board (collectively the State) is aware of the many concerns that have been shared pertaining to the proposed aquifer exemption area for the Arroyo Grande field. Those concerns include impact to water wells, public health, earthquakes, subsidence, and the need for more groundwater monitoring. The aquifer exemption process is only one piece of the process associated with injection in oil and gas production. The first piece of the process is to identify and evaluate the aquifer to determine if it is currently being used as a source of drinking water. Even though this is a requirement of the United States Environmental Protection Agency (US EPA), the State evaluates the aquifer to a stricter standard. The State looks to see if the aquifer is currently being used for any beneficial purposes. If the water in the aquifer is being used for a beneficial use, then the State will not pursue an aquifer exemption and the process would stop. If it is determined that the aquifer is not currently being used for beneficial purposes, then the State will determine if the water in the aquifer should be protected for potential future beneficial use. If the water does not require protection, and certain specific criteria are met, then the State may consider forwarding an aquifer exemption proposal to the US EPA.*

*The State Water Board and the Central Coast Regional Water Quality Control Board (Regional Water Board) worked with the Division on the review of the aquifer exemption proposal by evaluating current*

*and future beneficial sources of water to make sure the injection of fluids will not affect waters of current or future beneficial use, and the injected fluid will not migrate out of the proposed exempted area.*

*If the US EPA agrees with the assessment of the State, the US EPA may grant an aquifer exemption. This approval is not for any specific project, but is an evaluation by both the State and the US EPA of the aquifer in question. If the aquifer is exempt under the Safe Drinking Water Act, it is the State's responsibility, with oversight from the US EPA, to ensure that any injected water is confined to the exempted area. Public comments are requested for both the aquifer exemption process, as well as the underground injection control (UIC) project approval. During the public comment period for the aquifer exemption, stakeholders may present information/data to either support or oppose the proposed aquifer exemption. Any data provided will be evaluated to determine if modifications to the application are required.*

0037-1, 0014-2, 0021-2, 0078-2, 0083-1, 0058-2

The language used in the public notice and at the public comment hearing, "expected", "may reasonably be used for any beneficial use", "it appears", "unlikely" are nebulous. There needs to be scientific mapping, monitoring and evidence that demonstrate to the larger set of stakeholders that this fluid injection is safe for all. Concern about: impacts to water supply, mitigation for seepage of fluid into the water sources, and justification for this occurring.

*The State has evaluated the aquifer and has determined that this aquifer meets all the criteria for an aquifer exemption under 40 CFR Section 146.4. Based upon this finding, the State is pursuing the aquifer exemption for Arroyo Grande. This approval is not for any specific project, but is an evaluation by both the State and the US EPA of the aquifer in question. Future UIC projects will be reviewed and only approved if they are protective of waters of beneficial use.*

0031-2

There should be an ongoing County compliance verification paid for by Freeport McMoRan.

*The aquifer exemption process is carried out by the federal and state governments with DOGGR as the primary state agency. Any County compliance verification would be addresses outside of the aquifer exemption process, and will be addressed by the county of San Luis Obispo.*

0026-2, 0024-2, 0028-1

Under the Sustainable Groundwater Management Act adjacent groundwater basins are required to prepare sustainability plans and this process is to be carried out in 2016.

*The Sustainable Groundwater Management Act (SGMA) established a process for local agencies to request that the Department of Water Resources (DWR) revise the boundaries of groundwater basins. The Basin Boundary Emergency Regulation was developed through stakeholder process and was adopted on October 21, 2015 and went into effect on November 16, 2015.*

0038-1

The commenter submitted many general concerns and questions that relate to groundwater contamination plans in effect; groundwater monitoring; environmental impacts; drainage that may cause other aquifer contamination; deep basins of water that can potentially be used for drinking;

contamination due to drainage; brine water; independent geologist or hydrogeologist review; private/drinking well be sampling, and public notification.

*The State has reviewed the data supporting the aquifer exemption within the Arroyo Grande field. The data in the proposal supports an aquifer exemption. Separate from the aquifer exemption, the State will also review and evaluate existing and any future injection projects will ensure that the injected fluid stays in the exempted aquifer.*

*Before a UIC permit is issued, the operator provides project-specific information and assesses how the proposed injection activities will behave in subsurface and how containment within the exempted aquifer will be maintained throughout the life of the project.*

0038-2

Concern that there is new water wells being drilled inside the aquifer boundary and the county may not be aware of this.

*As of the date of this proposed application, there are no water wells affected by this application. The county of San Luis Obispo is pursuing a restriction on future water wells installed in this area.*

0011-1, 0007-26, 0007-29

The commenters submitted questions regarding long term costs, expected lifetime and impacts on abandoning wells, well casings, maintaining geologically distinct areas separate from the aquifer exemption and how a groundwater management program can be maintained in a way that monitors and prevents impacts to adjacent aquifers.

*Division is responsible to supervise the oil and gas development to prevent, as far as possible, damage to life, health, property, and natural resources. The Division permits, regulates and ensures that operations are in compliance with State laws. The Division also works with the State Water Boards to ensure waters of beneficial use are protected. This is accomplished through different programs through the different agencies. In addition, the Division requires well bonding to provide financial assurance, as well as requiring wells to be maintained in a leak-free condition. All injection wells are tested for mechanical integrity on a regular basis.*

0050-2

PPM TDS is not enough information to determine whether or not an aquifer is suitable for wastewater dumping. PPM dissolved petroleum versus saline must be disclosed.

*The State is following all guidelines provided by the US EPA regarding the submission of required data as part of an aquifer exemption application which includes an extensive analysis of the water quality of the proposed exempted aquifer and the injected fluid.*

**Neutral**

0018-1

Pismo Creek is receiving an increase of treated water, and this needs to be maintained because any decrease in water will negatively affect the creeks health.

*If the aquifer exemption proposal from the State is approved by the US EPA, treated water will continue to be placed in the creek as long as the field produces oil. If the aquifer exemption is denied, the amount of water placed in the creek receives will likely be negatively affected.*

**Non-Opposition**

0019-1, 0060-1, 0074-1

Support for the planned aquifer exemption, and general support for DOGGR.

*Noted.*

0060-2

Prompt review on the geologic and technical data behind these applications is necessary to reduce public confusion. Encourage the review of focus stripping on technical and geological principals, not political principles.

*Noted.*

**General Objections / Opposition**

0001-1, 0003-1, 0058-3, 0001-16

The aquifer exemption application fails to provide critical information that would allow DOGGR or EPA to even begin to make any determination, fails to address the health, safety, and welfare of the surrounding environment and residents, and ignores potential impacts from a project to add hundreds of new wells and increase oil production up to nine to ten times current production levels. Without further information regarding the potential impacts of the massive expansion project on the hydrogeology and chemistry of the existing oil field and aquifer, and on risks to the area's groundwater resources, especially in a time of historic drought, the Arroyo Grande aquifer exemption request should be rejected.

*The aquifer exemption process is designed to determine if the water in the aquifer needs to be protected from the injection of fluids associated to oil and gas development. If after the evaluation of the aquifer meets the criteria for exemption, and the aquifer is exempted by the US EPA, the State will ensure on a project by project basis that any injected fluid is confined to the exempted zone. Any field expansion will undergo an extensive evaluation to ensure injected fluid will be confined. The final determination as to whether the application is complete and contains all the necessary information will be made by the US EPA.*

0007-1,
Based on our review of pertinent regulatory and site specific documentation, the aquifer exemption request by FM O&G should be denied by the local and state authorities, and the EPA based on lack of adequate and sufficient technical, scientific, environmental monitoring, and legal information presented by FM O&G. We strongly believe that the aquifer exemption request falls under the category of a substantial program revision as discussed in EPA (2014); therefore, the Administrator shall ultimately be responsible for approving or denying the request if it makes it to that level. This aquifer exemption request is a substantial program revision and therefore requires a considerably more complex review process. One reason for this is because the proposed exempted area is located adjacent to a large

number of Underground Sources of Drinking Water (USDWs) that are currently in use, and where the potential future use of the USDW is unclear. Additionally, as evidenced in our comments and requests for additional information, FM O&G's application lacks sufficient factual, technical, and legal basis for determination or approval of the request.

*The US EPA to determine if this is a substantial revision is necessary and requires whether approval from US EPA HQ is needed. All Aquifer Exemptions lack environmental monitoring, it is up to the appropriate State and local agencies to impose monitoring requirements after an aquifer exemption is made granted by US EPA and prior to approving new or additional injection wells. The requirements for any necessary monitoring would be determined through a detailed review of the project area and project and would be open subject to the public for additional comments and requirements.*

0001-2

The SDWA favors protecting drinking water over exemption. The burden should be on the operator to prove that the proposed exemption will not endanger a USDW; however the application fails to do so. Additionally, the application does not provide the specific constituents that will be injected into the aquifer, including chemicals from well stimulation and naturally occurring harmful chemicals in the produced water. Because there is an absence of information that the chemicals will not cause harm, it must conclude that the substances may cause harm and shouldn't enter a USDW.

*The process to apply and grant approval from the US EPA for an aquifer exemption does not address the specific constituents to be injected, as long as the fluid is consistent with the definitions of a Class II fluid as specified in the Safe Drinking Water Act. The federal regulations permitting aquifers to be exempt will only be allowed after a detailed evaluation of the aquifer in question and that the aquifer meets the criteria outlined in 40 CFR 146.4, according to the Safe Drinking Water Act.*

0001-3

In order to allow an aquifer to be polluted, active administrative processes must be undertaken to overcome the presumption of protection. Section 144.7 of the Federal Regulations to the SDWA provides that the Director "shall" protect as underground sources of drinking water all aquifers, and parts of aquifers, that meet the definition of a USDW. The obligation to protect USDWs arises whenever an aquifer meets the criteria of a USDW, regardless of whether the Director has not acknowledged the source as such. A USDW can only be exempt from the default protections if the Director actively undertakes the required administrative process.

*Under 40 CFR 146.4, aquifers may be exempted by the US EPA. Only after a determination is made that an aquifer is exempt and approved by the US EPA, can injection be allowed. If such a determination is made, the Director of the US EPA is no longer obligated to protect the aquifer since it is no longer considered an USDW.*

0001-4

Commenter details the Federal and State requirements for an aquifer exemption.

*The State will follow all the necessary requirements of the federal and State regulations associated to the aquifer exemption process.*

0001-7

The aquifer exemption must be rejected because the operator has failed to demonstrate that it meets the federal and State criteria for an exemption. The application does not demonstrate that specified risks of contamination of beneficial use waters are minimal.

*The application from the State for Arroyo Grande will be evaluated by the US EPA to determine if the requirements of the Safe Drinking Water Act have been followed. Since the application has shown that the aquifer contains petroleum hydrocarbons in commercial quantities, and demonstrated containment, no USDWs, no beneficial use, and no complete exposure pathways for potential risk receptors, the State has determined that the proposal has met all the necessary criteria.*

0003-3

An analysis of this proposed exemption expansion and the actual activities in this aquifer, call into question the validity of the existing exemption in the Arroyo Grande field. The Division and the State Board should evaluate the existing exemption with the same scrutiny and overturn the exemption if it fails to meet the standards for the expanded exemption, as there does not appear to be zonal isolation between the two sections of the aquifer.

*The State has evaluated both the existing and the proposed aquifer exemption areas and has concluded that both meet the criteria to be exempt. Additional information, including proposed expanded areas of production, has confirmed the presence of hydrocarbons in the new expanded area.*

0003-4, 0003-5

Neighbors of the proposed exemption and numerous local residents oppose the exemption, and the public demands protection of water resources. The State is not obligated to submit an application for exemption simply because the aquifer meets the criteria in 40 CFR 146.4.

*The State acknowledges the opposition by the local residents, but can only move forward based on scientific data and the requirements of the law and pertinent regulations. The State is required to balance all the needs of the State in the aquifer exemption proposal process. Because the aquifer exemption proposal has demonstrated that it meets the requirements of 40 CFR 146.4 and is protective of waters of current or potential future beneficial use, the State is pursuing an aquifer exemption with the US EPA.*

0003-6, 0005-1, 0005-18

The criteria for exempting aquifers in 40 CFR 146.4 are out of date and do not reflect the current and future water needs of California. The criteria do not reflect California's current water supply crisis, and therefore should not be the basis for determining which aquifers should be protected. When the USEPA was crafting its UIC program regulations in the early 1980s, the agency bowed to pressure from the oil industry and watered down the aquifer exemption criteria in response to a lawsuit brought by the American Petroleum Institute. The oil industry's influence on the exemption criteria was not rooted in science or groundwater needs, but rather was based on industry's fears that robust aquifer exemption criteria might prohibit the use of certain technologies.

*The State is still required to follow the requirements in 40 CFR 1 46.4 with the US EPA if the State is to apply for an aquifer exemption. Following the passage of recent State legislation in 2015, the State's program is stricter than the US EPA's and the State will evaluate injected fluid containment, and future*

*aquifers to ensure that waters of beneficial use are protected. Additionally, any future UIC project will be reviewed and only approved if they are protective of waters of current or potential future beneficial use.*

0008-1

The commenter is opposed to the exemption for the following reasons: the aquifer supplying their well water is at risk of contamination by this project regardless of the safety measures or geological features addressed in various reports; there is no guarantee that the geological features won't change as a result of natural or human factors; and there is a serious drought, local water quality and quantity is already compromised; fracking is a non-ecological use of water. Language in the PRELIMINARY CONCURRENCE ON THE DOLLIE SANDS OF THE PISMO FORMATION AQUIFIR EXEMPTION DOCUMENT from the State and Water Resources Control Board includes ambiguous language. All contaminated water is at risk of entering into the aquifer and local wells from this project. This project does not specifically address this clause on local homeowner's deeds , address the aquifer's unique and extensive infrastructure that supplies local wells and provides potable water; provide homeowners with sufficient notification of the direct and indirect drilling consequences within property boundaries; provide contractual agreements to protect home owner's rights and property values for the duration of this project or for future hazards as a result of current or future practices.

*The proposed area for exemption was scrutinized for accuracy on the extent of the aquifer and review by the State indicates all injection fluids within the proposed area will be contained. An aquifer exemption itself does not have monitoring requirements but if the proposed aquifer exemption is to be granted, the State will begin evaluate the any future injection projects that will consider monitoring. The State imposes requirements to ensure injection is occurring only within the approved area and in accordance with all state laws and regulations. The requirements will likely include injection volumes, injecting pressures, and the location and number of sentry groundwater monitoring wells. The public will be a part of the approval process and will have an opportunity to submit comments and concerns.*

**Inadequate Application: General**

0007-3

The information provided in the aquifer exemption application provides geospatial information that has not been made available to the public. This makes it particularly difficult to fully ascertain the geographic locations of proposed boundaries, geologic features, and monitoring information. Based on the documentation provided in the FEIR (Padre, 2004), USGS website GIS data for faults, the San Luis Obispo County website, and the aquifer exemption application documentation made available to the public, none of this information is available for our review. Please make all geospatial information available to the public for use in Geographic Information Systems (GIS) format (e.g. shapefiles). This includes but is not limited to geologic features (e.g. Edna fault line), Phase V boundaries, proposed aquifer exemption boundary, and any other relevant project GIS information that is presented in the FM O&G aquifer exemption application or EIR (Padre, 2004).

*The GIS data were not initially publicly available, but detailed maps have been provided as part of the Statement of Basis.*

0007-4

The inventoried water well locations (DWR Well Review) provided by CHG (2015) in Appendix G 1-1 lacks owner name, contact information, and name of aquifer for specific water wells. Please provide these in the form of tables in the application. Section C.1 of the Aquifer Exemption Checklist (EPA, 2014) requires that these elements are included.

*The listing of each individual well is in the appendix and has what aquifer it is capturing water from. Well completion reports in California are now publicly available but in compliance with privacy laws and regulations, the DWR has redacted the personal information for the well reports before they are given to the public.*

0007-5

There is no map in the application showing the areal extent of the exemption boundary with all the domestic wells considered potentially down gradient of the exemption boundary. There is no map showing domestic wells with hydraulic connection to the exemption boundary. Both of these are required in Section C.1 of the Aquifer Exemption Checklist (EPA, 2014). Please provide maps of both of these in the resubmitted application.

*A map was provided in the Statement of Basis that was made available for a second round of public comments shows all water wells within a 1-mile radius of the active oilfield. The area proposed for exemption is hydraulically isolated from adjacent aquifers.*

0007-6

The map provided in Appendix I 1-2 (Figure 5-7) does not provide well identifiers anywhere on the map. This makes it difficult to interpret. Please label the figure accordingly.

*The map has a key to identify the wells and the purpose for each. Adding the labels to each individual well made the map too complicated and hard to read. Additionally, a map has been provided in the Statement of Basis during the second round of public comments which depicts the general location of all known water supply wells within a 1-mile radius of the active oilfield.*

0007-7

There appears to be no map indicating direction and speed of groundwater in the aquifer of proposed exemption. Section C.1 of the Aquifer Exemption Checklist (EPA, 2014) requires that these elements are included. Please provide these maps and indicate how the information was obtained.

*The proposed area for exemption is hydraulically isolated from adjacent aquifers both geologically and hydraulically. The application states that because of the reduction in field pressure from the removal of the oil and water (through the reverse osmosis plant) creates a pressure sink in the center of the field that draws fluid from the outside of the proposed area to the center of the field.*

0007-14

Title Page of Application. The actual title page does not provide the date published nor does it even specify that this is an aquifer exemption request application. We recommend revising the document to reflect what it actually is (e.g. an aquifer exemption request application).

*Noted.*

0007-15

Figure 1 & Figure 1.1 of Application (Page 6 & 7) is difficult to read and is of poor quality and is not professionally prepared. The small font on the important descriptors of map features is pixilated and difficult to read. Please revise this map to be legible with large font and clearer.

*Figure 1 can be found in Appendix A 10, "AG Cumulative Oil Bubble Oil Map" and Figure 1.1 can be found in Appendix A 7 a, "AG Proposed Aquifer Exemption Boundary Map with Cross Section". Both appendices can be zoomed in to better read the smaller text.*

0007-16

There appear to a number of errors provided in the Core Data tables for porosity, grain density, max hydraulic conductivity, water saturation, and oil saturation where a value of -999.25 is indicated. Please fix this or explain why these errors occur.

*The data provided in the core data tables were created using software that inserts the value of -999.25 into cells that contain no data. If there is an entire row of the -999.25 value, then there was no core analysis performed at that depth. No analysis was performed most likely because a sample was supposed to be recovered from that depth, but it did not make it to surface or the tool malfunctioned and there was no formation available to test. If there is an individual -999.25 value, then that particular test (i.e. grain density, porosity) was not conducted.*

0007-18

Appendix I 1a provides the current monitoring well network; however, this section is poorly presented and lacks any credible presentation of the existing monitoring results (i.e. no graphs, tables, or statistical analysis). Additionally, there are no labels of monitoring locations provided in Appendix I 1-2. We request that this appendix is revised to better represent the existing data and clearly label all monitoring locations.

*An aquifer exemption itself does not have monitoring requirements attached to it. However the State administers the approval of future injection projects should the proposed aquifer exemption be granted by the US EPA. In any future approval for injection projects, the State imposes requirements to ensure injection is occurring only within the approved area and in accordance with all state laws and regulations. Some of the requirements could include injection volumes, injecting pressures, and/or location and number of groundwater monitoring wells. The public will be a part of the approval process and will have an opportunity to submit comments and concerns. Current monitoring required by the county was added to help explain the data that shows the proposed area for exemption is hydraulically isolated.*

0007-19

On page 232 of the Appendices (only) section of the application, it is difficult to read the tables because of poor formatting.

*The cell with the poor formatting reads "Radionuclides with MCLs in 22 CCR §64441 and §64443--- Radioactivity".*

0007-22

The proposed aquifer exemption application lacks sufficient studies on earthquake or seismic activity known within the region and the potential effects on the existing groundwater system. Please explain how this will be achieved.

*There has not been a specific seismic study for this application and the State does not believe one is necessary for the aquifer exemption process. An aquifer exemption itself does not have monitoring requirements but if the proposed aquifer exemption is to be granted, the State will begin evaluate the any future injection projects that will consider monitoring. The State imposes requirements to ensure injection is occurring only within the approved area and in accordance with all state laws and regulations. The requirements will likely include injection volumes, injecting pressures, and the location and number of sentry groundwater monitoring wells. A more detailed monitoring program could have a seismicity tracking portion as part of it. The public will be a part of the approval process and will have an opportunity to submit comments and concerns.*

0007-23

The proposed aquifer exemption application lacks sufficient information of the potential effects of climate change in the region including continued drought or extreme storm events and the subsequent effects on existing groundwater system.

*Climate change is not a deciding factor for determination of an exempt aquifer by the US EPA and as such is not a part of the proposal.*

0007-24

The EPA suggests specific information for exempting an aquifer under 40 CFR 146.4(b), including production history of wells in the vicinity of the aquifer, availability of alternative water supplies, ability of current supplies in the area to meet future needs, costs of treatment, and cost of developing the water supply from the proposed exemption area. There does not appear to be a Statement of Basis which is essential to approving any exemption. Please explain why this is not included, and explain how the applicant will be required to provide this information and resubmit the application.

*A statement of basis was written and posted to the DOGGR website December 2, 2015. The document details reasons the State is submitting this application to the US EPA. The previous oil production history is presented in the application and can readily be found on the DOGGR website. There is also a discussion of the local water supply and how it is not directly connected to the proposed exempted aquifer.*

**Alternative methods of disposal**

0005-3

The suggestion that discharge of water should be allowed to occur at the expense of possibly contaminating USDWs is wholly inappropriate and outside the regulatory scope of the proposed exemption application. If the injection of waste waters threatens USDWs, then it is absolutely appropriate that injection cease. This scenario presented by the applicant is also a false choice.

None of the parties involved are proposing to completely prohibit subsurface disposal, merely requiring that it occur only into appropriate zones that are not non-exempt USDWs and will not contaminate nonexempt USDWs. The applicant's threat also implies that there are no means other than injection to dispose of reject water from the WRF, which is false.

*The Safe Drinking Water Act requires that injection must be into a non-USDW. Therefore, the State is proposing to exempt the aquifer in question based upon many factors including that there are petroleum hydrocarbons present throughout the proposed exempted aquifer and that the injected fluids will remain in the proposed exempted area If the US EPA agrees with the State's assessment and approves the aquifer exemption proposal, the State may allow the injection since it will not be into a USDW.*

**CEQA**

0001-6

The aquifer exemption is likely tied to the operator's project to add 350 new wells and 100 replacement wells, in order to accommodate the large increase in the amount of produced water. Even if the decision to exempt the aquifer in order to allow wastewater injection is a separate project, it alone has the potential to create a myriad of significant environmental impacts--to water quality, public health, and wildlife, among others-- none of which has been analyzed in FM's application. For these reasons, before DOGGR and the water boards--who have responsibility to analyze the impacts and determine whether to submit the proposed exemption to EPA--can approve this project for submittal they must conduct environmental review under CEQA.

*The consideration to add additional groundwater monitoring wells is not specifically associated to this aquifer exemption proposal process. The county of San Luis Obispo has conducted CEQA review for existing oil and gas production operations in the area, and it is also our understanding that a CEQA document is being prepared to address a potential expansion of operations. Therefore, any CEQA related questions should be addressed to the county.*

**Large production operations in or near the proposed exemption area**

0001-5

The State and EPA must reject the Aquifer Exemption request because the application ignores a foreseeable major expansion in the number of wells, well pads, and oil production, which will drastically increase the amount of wastewater. There are too many questions that accompany this project that must be answered before an aquifer exemption is considered. These questions are in regard to water volume, aquifer pressure, subsidence, groundwater flow, induced seismicity, and the chemicals used to produce the oil.

*These concerns will be addressed as part of any future proposed injection projects at Arroyo Grande. The aquifer exemption process is designed to determine if the water in the aquifer needs to be protected from the injection of fluids associated with oil and gas development. If evaluation of the aquifer shows that the water meets the criteria for exemption, and the aquifer is exempted, the state will ensure on an injection well project review that the injected fluid is confined to the proposed exempted zone. Any field expansion will undergo an extensive evaluation to ensure injected fluid confinement. In regards to the adequacy of the application, the final determination as to whether the application is complete and contains all the necessary information falls to the US EPA.*

0001-13

King Ventures, Inc. is pursuing the annexation to Pismo Beach and development of nearly 1,700 acres in the Price Canyon area. This new development will need water. Oil development and residential development are going to increasingly collide over water resources; what is more, this development could have significant impacts on Pismo Creek and surrounding areas. The County, DOGGR, the water boards, and the Department of Fish and Wildlife, the Department of Water Resources, and other environmental and land use agencies need to conduct a much more in-depth analysis of how to protect this area, rather than haphazardly sacrificing California's dwindling water and environmental resources to the oil industry.

*DOGGR and the State Water Board have determined that the proposed aquifer exemption area has petroleum hydrocarbons throughout. Therefore, this aquifer exemption proposal is being applied for on the basis that aquifer should not be considered as a potential source of drinking water for any future development.*

**Migration of oil and/or wastewater**

0004-1, 0004-5

The exemption area is within 1,000 feet of [a] water source, and [there are] no guarantees that migration of oils or injected wastewater would be monitored and reported to nearby property owners. The proposed expansion of the aquifer exemption adjoining [specified] property is significant, and could represent a potential contaminant to the groundwater supplies [relied upon] for vineyard and residential sites.

*Based upon the analysis within the application, there will be a net decrease of the fluid in the aquifer proposed for exemption. Production volumes (outputs) are higher than the injection volumes (inputs) and create a pressure sink towards the center of the production area which helps to prevent the migration of injected fluids. In addition, the proposed exempted area is isolated by the syncline geologic structure that will help prevent the movement of injected fluid outside of the proposed exempted area.*

0006-3

The application indicates that a tremendous amount of "produced" or reclaimed water is being discharged into the Pismo Creek. Please provide us the permit for such water discharge. The discharged water must be free of contamination to protect wildlife and riparian habitat. In addition, the creek will discharge directly into the ocean during heavy rains, and therefore possibly endanger surfers.

*The National Pollutant Discharge Elimination System (NPDES) permit is not relevant to this application. The permit was issued by the Central Coast Regional Water Quality Control Board before the reverse*

*osmosis plant was commissioned. The permit associated with the discharge into Pismo Creek is in Order no. R3-2013-0029.*

0007-8

How does the applicant plan to demonstrate that the proposed injection and oil and gas operations will not significantly affect the long term water quality and quantity outside of the proposed aquifer exemption area? Based on available documents, isolation has not been demonstrated. The report provided in Appendix A7f (CHG, 2009) focused on the Pismo Creek stream flow and Pismo Creek Valley alluvial groundwater as it relates to supply for agriculture on the King Ventures Spanish Springs North and South Ranches. This information was intended to assist with determining a protocol for a future water management program. Has this information been used to develop a more detailed groundwater flow modeling analysis? Has there been a detailed water management program developed from this information? Please refer to Figure 2 in Attachment 1 for the locations of the concerned parties and USDW locations, there are many more not shown on this map. In fact, CHG (2015) indicates there are 53 water supply wells within a one mile radius of the Arroyo Grande Oilfield. It is indicated in CHG (2015) that the subsurface hydraulic connection between the Edna sub basin and Price Canyon water-bearing zones is restricted by faulting and folding, which act as barriers to groundwater flow. However, it also states that when aquifers of the Edna Valley are fully saturated, subsurface flow into Price Canyon may occur through alluvial deposits. Has there been a groundwater flow model for the region, specifically for the properties with USDWs? Has this model been validated with real time data?

*The proposed area for exemption is hydraulically isolated from the surrounding aquifers. The State has conducted a comprehensive review of the data presented in the application and will submit the application to the US EPA for approval. An aquifer exemption itself does not have monitoring requirements but if the proposed aquifer exemption is to be granted, the State will begin evaluate the any future injection projects that will consider monitoring. The State imposes requirements to ensure injection is occurring only within the approved area and in accordance with all state laws and regulations. The requirements will likely include injection volumes, injecting pressures, and the location and number of sentry groundwater monitoring wells. The public will be a part of the approval process and will have an opportunity to submit comments and concerns.*

**Potential for future as drinking water / water supply**

0001-9

The operator has failed to demonstrate that the aquifer is not now, nor could be in the future used for drinking water, supply a public water system, or that exemption of the aquifer and injection into the aquifer will not affect other sources of water used for drinking water or other beneficial uses. The groundwater in the aquifer contains less than 3,000 mg/1 TDS (and in some cases less than 1,000 mg/1), which means that without the produced water chemicals injected into the aquifer, there is reason to believe it could be treated and used to supply a public water system.

*The State has assessed the aquifer and determined that it is not currently a source of drinking water and is not expected to serve as a source of drinking water or other beneficial use in the future. The Safe Drinking Water Act requires that an aquifer that meets the definition of a USDW be exempted before injection is permitted. The State is proposing to exempt the aquifer in question because it meets Federal and State requirements for exemption, including containing petroleum hydrocarbons. If the US EPA agrees with the State's assessment and approves the aquifer exemption proposal, the State will allow future injection projects since it will be exempted.*

0001-10, 0004-2

Most of the 100 wells identified (generally identified, without exact locations supplied) to be within one mile of the oil field tap into the Pismo formation, which compromises the proposed exempted area. Without exact well locations and depths, it is not possible to determine whether others are drawing on this aquifer for water supplies, or whether this aquifer could be affecting other sources of water. Aside from a cross section diagram pointed out there are nearby ranch wells and a vague bubble map noting that there are wells within a mile of the oil field that draw from roughly the same area, the application fails to provide any other data on the direction of groundwater flow or specific characteristics of nearby wells.

*The proposed aquifer exemption area underwent a thorough survey of water supply wells. The Division and State Water Board have determined that there are no water supply wells located in the existing exempted area and no wells exist in the proposed area of expansion. In addition, none of the nearby water supply wells are pumping water from the Dollie Sands member of the Pismo Formation. The water well survey included reviewing available well completion reports (well logs) from the DWR in the proposed area, as well as the surrounding area. The operator also conducted a walking survey of the area and worked closely with staff from both the State Water Board and Central Coast Regional Water Quality Control Board (Central Coast Water Board) in their analysis. Data supporting the proposed aquifer exemption includes a map indicating the location of the nearest water supply wells (see Statement of Basis). The absence of water supply wells in the area proposed for aquifer exemption expansion is not a surprise since the Dollie Sands contain significant amounts of oil.*

0001-11

The application fails to provide samples from nearby wells, many of which are used for domestic use and/or irrigation. This is even more concerning given that neighbors have described problems with their water wells. The application must, at a minimum, include a detailed, specific map, with latitudinal and longitudinal coordinates, that shows all drinking water wells within at least a two-mile radius of margins of the proposed exemption area. It addition, it must include a comprehensive well survey, including an analysis of the wells' water chemistries, depth screened intervals, and pumping rates.

*The State has evaluated the available data and concluded that the water supply wells are not drawing water from the proposed aquifer to be exempted. A map of the water supply wells in the area of the proposed aquifer exemption is provided in the Statement of Basis.*

0001-12

Water supply wells are being drilled increasingly deeper. Groundwater in agricultural areas of the State, including the coastal regions, is particularly vulnerable during a drought because it is used to replace unavailable surface water supplies for agriculture, which reduces available water for both agricultural and potable use purposes. Increased pumping already stresses this "last resort" resource because it decreases groundwater levels below wells ("overdraft"), requires more and deeper wells, reduces groundwater quality (by drawing waters from more sources increasing the likelihood of cross-contamination), increases land subsidence (irreversibly reducing the storage capacity of the aquifer network), and threatens drinking water supplies to the many communities that depend mostly or entirely on groundwater for their potable water supply. Newly deepened wells reduce the water pressure in existing shallow wells, forcing nearby users to also drill deeper wells as the existing wells risk running dry. Increased pumping and decreased surface water supplies makes any existing aquifers that are available for potential use in agriculture or as a drinking source -that much more valuable during the

current drought. Even if fluid injection is at a minimum of 450 feet from the surface, as the application states, there is no guarantee that nearby well owners won't drill at least that deep, or drill new wells, into the same Edna Member, Dollie Sands and/or Pismo Formation, to access water.

*The State has evaluated the available data and concluded that the water supply wells are not drawing water from the proposed aquifer exemption area. The volume of water is removed from the proposed aquifer exemption area through oil field development (production of oil) is greater than the water re-injected as wastewater and steam. Therefore, there is a net loss of water (dewatering) from the proposed aquifer exemption area. As a result, injected Class II fluid within the proposed exempted area is contained hydraulically, both vertically and laterally, due to the inward hydraulic gradient (groundwater flow direction is towards the center of the synclinal geologic structure or "bowl"). In addition, the water from the proposed exempted zone without treatment would not be used as a beneficial purposes because of the presence of natural contaminants from the hydrocarbons in the zone.*

0001-14, 0003-7

There is evidence that water from the Arroyo Grande aquifer is, in fact, already used for drinking water and for municipal water systems. Groundwater from the Arroyo Grande aquifer is imported into the Pismo Creek Watershed. The produced water that is filtered through the WRF is discharged into Pismo Creek. Pismo Creek helps recharge the Santa Maria water basin. The aquifer is currently a source of drinking water and other beneficial uses, and cannot be exempted from the SDWA.

*The water sources for Pismo Creek is from the Arroyo Grande oilfield aquifer. The produced water is treated and then is discharged to the creek under an active permit from the Regional Water Board. This source of water for the creek would not be available if the production of oil ceased in the Arroyo Grande field.*

0003-8

Because there are current and potential future beneficial uses for waters contained in this aquifer, the operator must submit a plan under California's Antidegradation Policy (Resolution No. 68-16) and the State Board must agree that any degradation of this aquifer is in the best interest of the people of the state. There has not been an antidegradation analysis conducted for this proposed exemption to determine what level of degradation will occur because of activities enabled by the exemption nor any determination that such degradation would be in the best interest of the people of the state of California. It also does not appear that such a determination has been made for the existing exemption, calling into question its compliance with this policy.

*Aquifers are proposed for exemption under the Safe Drinking Water Act, not the Porter-Cologne Water Quality Control Act. Therefore an antidegradation analysis is not required. If the aquifer has no actual or potential beneficial uses, then the Antidegradation Policy does not apply in that context either. The Central Coast Regional Water Quality Control Board may in the future consider de-designating, in accordance with the Porter-Cologne Water Quality Control Act, potential beneficial uses for the aquifer at issue to be consistent with the Safe Drinking Water Act.*

**Shut-in wells**

0003-2

The proposed area for exemption is the site of 14 disposal wells and 76 enhanced recovery wells. These wells were issued permits illegally, in violation of SDWA, to inject into protected waters and must be shut in immediately. They must only be allowed to operate if an exemption is granted by US EPA. The operator has been injecting illegally into a non-exempt aquifer. Rather than rewarding this behavior by changing the boundaries of the exemption, the State should enforce existing laws and work to change the culture of non-compliance by the oil industry. Allowing an expanded aquifer exemption where an operator has been illegally injecting undermines efforts to change the culture of the Division and how it relates with the regulated industry. Denying this application and issuing fines for illegally injecting into a non-exempt aquifer would be the appropriate way to enforce the law.

*The State and US EPA have agreed to a schedule to bring all injection projects into regulatory compliance. If an aquifer exemption is not granted by February 15, 2017, all injection into USDWs will cease. During this time of the compliance schedule, the State is pursuing an aquifer exemption in Arroyo Grande to bring the operation into compliance. The State's application for the aquifer exemption proposal to US EPA indicates that it meets the Federal and State criteria for an aquifer exemption.*

0005-2

DOGGR needs to explain why the specified disposal wells haven't been shut-in already. Commenter submitted a comparison of relevant characteristics of the nine wells shut down in March 2015 and the disposal wells currently operating in non-exempt aquifers, and API and Well Numbers of 11 of the 14 non-compliant water disposal wells within the proposed aquifer exemption boundary.

*The State and US EPA have agreed to a schedule to bring all injection projects into regulatory compliance. If an aquifer exemption is not granted by February 15, 2017, all injection into USDWs will cease. During this time of the compliance schedule, the State is pursuing an aquifer exemption in Arroyo Grande to bring the operation into compliance. The State's application for the aquifer exemption proposal to US EPA indicates that it meets the federal and state criteria for an aquifer exemption.*

**Specified protections and/or suggestions**

0004-3

Commenter submitted a property map in relation to the proposed aquifer exemption area. Based on this map, the following is of concern: Protecting North Spanish Springs/Tract 2388's underground water supply from migration of produced and/or treated wastewater. Establishing setbacks along our common property line from any injection wells, consistent with State and Regional Water Control Board recommendations in the "aquifer exemption" staff memorandum from August.

*In the course of permitting, the State will require measures to ensure that future injection projects will be confined to the proposed aquifer exemption area, and will consider groundwater monitoring of any future injection projects.*

0004-4

Commenter requests a new Condition of Approval: "Construction and operation of oil wells, and disposal wells for produced and wastewater byproducts within the expanded "aquifer exemption" area,

shall be set back a minimum of 200' from the adjoining Tract 2388 property. Such disposal wells shall be limited to disposal of treated (Reverse Osmosis) water from FMO&G's on-site facility. Monitoring within the expanded "aquifer exemption" area shall be implemented through the use of sentry wells along the common property boundary."

*The State and Regional Water Boards have reviewed the data supporting the aquifer exemption. Any expansion of the injection activity will undergo a review from the Division and the State and Regional Water Boards. If additional monitoring is needed, the Division will work with the Water Boards to develop an appropriate groundwater monitoring program.*

**UIC Regulations / UIC Program**

0005-5

Granting this exemption may set a dangerous precedent, allowing operators of Class II wells to first potentially contaminate USDWs and then retroactively apply for exemptions for the very USDWs they may be contaminating. This may create a situation and an expectation whereby aquifers that previously would not have met the criteria for an exemption may in future qualify for one due to pollution caused by the operator.

*The State and US EPA have agreed to a schedule to bring all injection projects into compliance. If an aquifer exemption is not granted by February 15, 2017, injection into non-exempt aquifers will cease. During this time of the compliance schedule, the State is pursuing an aquifer exemption to bring the operation into compliance. The State's application to exempt the aquifer shows that this aquifer meets the criteria for an exemption. This will not set a precedent to allow operators to begin injection before an aquifer exemption is approved.*

0001-16

The exemption should not be granted until new UIC program regulations have been adopted. Without knowing what the requirements and mitigation measures for injection will be, there is no way to analyze how or whether continuing to allow illegal injection into the aquifer could migrate, harm the environment, or degrade nearby water wells. As a result, unless and until FM has submitted a constructive and comprehensive application that actually proves the Arroyo Grande Oil Field aquifer meets the standards for an exemption, and unless and until the State has finalized its UIC program regulations, the application must be rejected and injection into the non-exempt portions of the AGOF must cease immediately.

*The Division's existing regulations were reviewed by US EPA, and as described in the Division's application to the US EPA for Primacy, proved to be adequate to justify Primacy. The updated regulations will at least be as stringent as the current regulations which require that the injected fluids remain in the exempted aquifer area. The State will require groundwater monitoring for any future projects as appropriate.*

**Zonal Isolation**

0001-8

The operator cannot show that this aquifer is, and will be, zonally isolated. As current and previous environmental review records have noted, there is potential for injected wastewater to affect nearby potable groundwater and municipal water sources; and there are over 100 water wells within one mile

of the oil field. Moreover, the application does not analyze the potential for changes in pressure, earthquakes, and unused wells to open new connections and redirect water flow. There are, therefore, real, foreseeable risks that the wastewater injected into the aquifer will affect other beneficial and drinking water sources, and without any analysis of these risks, the State and EPA cannot approve this exemption based on the application before it.

*The State is basing its decision to apply for an aquifer exemption on an evaluation of scientific data. After a comprehensive review, the State has determined that the aquifer is not being used for beneficial purposes and contains petroleum hydrocarbons in commercial quantities that justify this aquifer to be exempt. See the Statement of Basis for additional information on zonal isolation.*

0005-9

The applicant and its consultant have not definitively determined that the various subbasins are indeed isolated from the proposed exemption zone, stating, "The Indian Knob Valley subbasin appears structurally and hydraulically isolated from other water-bearing zones in the study area," and "The Oak Park subbasin, which covers areas mapped as Edna and Squire Members of the Pismo Formation, appears structurally and hydraulically isolated from other water-bearing zones in the study area" (p. 20). This is an unacceptable condition for adequate protection of USDWs.

*After a review by the Division, State and Regional Water Boards, the State has determined that the aquifer is not being used for beneficial purposes and contains hydrocarbons in commercial quantities that justify this aquifer to be exempt. See the Statement of Basis for additional information on zonal isolation.*

**Other**

0001-15

Commenter provided an example of a different aquifer exemption.

*Noted.*

0005-8

On page 14 of the application it is not clear what is meant by "events" or how the lack such events demonstrate that injection operations do not endanger groundwater. In a similar statement, the applicant claims, "No incidents or observed detrimental effects to the localized environment or groundwater resources have been documented since injection operations into the Dollie zone were initiated, thus providing anecdotal support to the observations that the reservoir is geologically confined." (p. 17) Again, the meaning of "detrimental effects" is not defined and is not clear whether the operator has actually been monitoring for such effects.

*Noted.*

0007-9

We request that additional comprehensive groundwater studies be performed by a qualified hydrogeologist or groundwater engineer on the proposed aquifer exemption area, within the AROF, our specific properties, and our neighboring properties which include the following (See Figure 2, Attachment 1):

- 115 Tolosa Place, San Luis Obispo, CA 93401
  125 Tolosa Place, San Luis Obispo, CA 93401
  150 Tolosa Place, San Luis Obispo, CA 93401
  170 Tolosa Place, San Luis Obispo, CA 93401
  1620 Old Oak Park Road, Arroyo Grande, CA 93420
  1606 Old Oak Park Road, Arroyo Grande, CA 93420
  365 W. Ormonde Road, San Luis Obispo, CA 93420
  777 Erhart Road, Arroyo Grande, CA 93420
  1470 Paseo Ladera, Arroyo Grande, CA 93420
  98 Moore Lane, Arroyo Grande, CA 93420

*The State has conducted a comprehensive review of the data presented in the application and will submit the application to the US EPA for approval. In the event that the US EPA requires additional data, the State will gather that data.*

0007-12

In the event that our USDW system is compromised by the proposed operations, what type of financial surety is in place to compensate us or other landowners? Additionally, having the proposed aquifer exemption area so close to our property boundary will likely lower the real estate value of our property- what type of compensation is proposed by FM O&G to us and other landowners that are directly affected by this application request? Have there been any socio-economic studies associated with the proposed application request?

*Financial surety or compensation is not a part of the aquifer exemption process and as such is not included in this application. The State has conducted a comprehensive review of the data for the proposal and the data support that the area is isolated from adjacent aquifers and will proceed with submitting the application to the US EPA.*

0007-13

We request that a 1,250 foot radius buffer zone be applied to our property where the Aquifer Exemption Area may not be located. If this cannot be provided, we request some form of compensation for loss in real estate prices and/or other socioeconomic hardship associated with the stigma of having an Aquifer Exemption Area that close to our property boundary.

*The proposed area for exemption was scrutinized for accuracy. The State has conducted a comprehensive review which indicates that injected fluids will remain within the proposed area. In the course of permitting, the State will place conditions on the operating limits (i.e. injection volumes, pressures, location) to further ensure injection fluid will stay within the proposed area.*

**Specific Technical Considerations**

0005-4

Commenter discusses the intent of 40 CFR § 146.4 and PRC Section 3131.

*Noted.*

0005-6, 0005-19

Criterion 146.4(a) has not been met. The applicant has not adequately demonstrated that the proposed aquifer does not currently serve as a source of drinking water. The applicant's well water analysis demonstrates that roughly 105 water supply wells are located within 1 mile of the aquifer exemption boundary. Of those, only 53 have well completion reports and known completion depths and spatial locations. First, as a minimum requirement of satisfying 146.4(a), the application must identify the depths, status, and use of the remaining unidentified 52 wells. The application relies heavily on anecdotal evidence and contains numerous vague and/or confusing statements indicating that the analysis of existing drinking water wells/uses is incomplete.

*After a review by the Division, State and Regional Water Boards, the State has determined that the aquifer is not being used for beneficial purposes and contains petroleum hydrocarbons in commercial quantities that justify this aquifer to be exempt. The proposed area underwent a comprehensive survey of water supply wells. The Division and State Water Board have determined that there are no water supply wells located in the existing exempted area and no wells exist in the proposed area of expansion. In addition, none of the nearby water supply wells are pumping water from the Dollie Sands member of the Pismo Formation. The water well survey included reviewing available well completion reports (well logs) from the DWR in the proposed area, as well as the surrounding area. The operator also conducted a walking survey of the area and worked closely with staff from both the State Water Board and Central Coast Regional Water Quality Control Board (Central Coast Water Board) in their analysis. Data supporting the proposed aquifer exemption includes a map indicating the location of the nearest water supply wells (see Statement of Basis). The absence of water supply wells in the area proposed for aquifer exemption expansion is not a surprise since the Dollie Sands contain significant amounts of oil.*

0005-7

The current application has not adequately identified groundwater flow directions, either local or regional, and how pumping activities within and around the aquifer exemption boundary impacts the hydraulic gradient. Information must be collected that demonstrates water level data, relevant geological features, and discharge rates for steady-state and non-steady state aquifer responses; to ultimately identify any potential current communication to the aquifer exemption boundary through a radius of influence induced by a discharge promoted cone of depression.

*Based upon the analysis within the application, there will be a net decrease of the fluid in the aquifer. Production volumes are higher than the injection volumes and create a pressure sink towards the center of the production area. In addition, the proposed exempted area is isolated by the syncline (geologic structure) that will also assist in preventing the migration of injected fluid outside of the proposed exempted area.*

0005-10

The applicant claims that the proposed aquifer exemption is justified based on the criterion at 40 CFR §146.4(b) (1). The applicant has not adequately demonstrated that this criterion has been met.

*See the Statement of Basis for additional information on aquifer exemption criteria.*

0005-11, 0005-22

Presence of hydrocarbons in commercial quantities has not been adequately demonstrated. The applicant states that the claim "There are only hydrocarbon-bearing sands in the oilfield" is supported by sidewall and whole core data, production data, and well logs. However, there are core data deficiencies, well log data deficiencies, and completion data deficiencies.

*The State has evaluated both the existing and the proposed aquifer exemption areas and has concluded that both meet the criteria to be exempt. Please noted that the original area exempted was solely based on the productive areas of the field in 1974. Additional information, including expanded areas of production identified by addition producing wells, has confirmed the presence of petroleum hydrocarbons in the proposed exempted area.*

**Core Data Deficiencies**

A significant amount of sidewall and whole core data is available for the field. However, the depth to the shallowest core sample is 122 feet. The average shallowest core sample depth is 462 feet. Consequently, much of the shallow subsurface of the oil field within the proposed aquifer boundary is not characterized with core data. The applicant also has not provided the dates on which these core samples were taken nor the methodology used to determine oil and water saturation, making it difficult to accurately interpret this data. Oil saturation is typically determined indirectly based on water saturation. Accurately determining oil saturation requires knowing whether cored intervals contain only moveable hydrocarbons, or both moveable hydrocarbons and moveable water. The latter situation can occur in oil fields with long development histories, such as Arroyo Grande, and requires more sophisticated analysis to determine saturation. Additionally, samples taken years or decades ago likely no longer represent the current saturation state of the cored intervals, particularly those in which enhanced recovery operations have occurred. As presented, the core data is insufficient to establish the presence of commercially producible hydrocarbons throughout the entire proposed exemption volume.

*There is no core data for the alluvium and the State has not required this data as the State is not requesting an exemption in the alluvium. The aquifer exemption is for the Dollie formation. The additional area that is being requested to be included in the proposed aquifer exemption has around 122 wells that have shown commercial production.*

**Well Log Data Deficiencies**

The applicant claims that resistivity logs demonstrate the presence of oil saturated sands throughout the entire proposed exemption volume, both vertically and aerially. The applicant appears to claim that resistivity readings greater than a cutoff value indicate the presence of hydrocarbons, which is represented as green shading on resistivity logs. However, neither the value(s) of this cutoff nor the justification for using such cutoff has been provided in the application. The applicant has not justified how a resistivity cutoff value can be used to distinguish water-bearing zones from hydrocarbon-bearing zones. Given that the applicant's claim that hydrocarbons are ubiquitously present throughout the field is heavily reliant on its assertion that resistivity logs demonstrate the presence of hydrocarbon-bearing zones, this is a significant shortcoming of the application. As presented, the log data is insufficient to establish the presence of commercially producible hydrocarbons throughout the entire proposed exemption volume.

*The application does not rely solely on resistivity logs to determine the presence of petroleum hydrocarbons. Physical testing (i.e. core holes, sidewall samples) correlated to resistivity logs were used as the basis to determine the boundary lines for the proposed area. The physical testing shows the actual oil content for the formation and has been used extensively in the area.*

**Completions Data Deficiencies**

The applicant states that pre-1974 completion data, "...demonstrate oil production at all levels of the reservoir that are being developed currently." However, Appendix A7a7, AG Pre-1974 Well Completions Cross Section, indicates that wells are typically completed approximately between the top M1/M2 Marker and tar seal/top M12 Marker of the Edna/Dollie Sands Member. This is also confirmed by well files for a sample of recently completed wells, which show that the top perforation or top slot for wells completed with a slotted liner coincides approximately with the top M1/M2 Marker, and the lowest perforation or bottom slot coincides approximately with the top of the M12 Marker: [see inserted chart). Additionally, the applicant states that, "... fluid injection is a minimum of 450' from surface," confirming that production and injection do not take place in the shallow subsurface. Despite this, the applicant is proposing to exempt the entire Edna/Dollie Sand Member from surface to the top of the Miguelito Member. The applicant has not demonstrated that commercial production is occurring or possible, as required by 40 CFR §146.4(b)(l), either shallower than approximately the top M1/M2 Marker or deeper than the tar seal/top M12 Marker. As such, these intervals are not eligible for an aquifer exemption. Including the portion of the Edna/Dollie member from the tar seal/top M12 Marker to the top Miguelito in the exemption significantly increases the total exempted volume, particularly in the up dip portions of the field to the north and west where the productive horizons thin and shallow, as demonstrated in x-sections B-B', C-C', and D-D'. Additionally, exempting this portion of the Edna/Dollie member is inconsistent with the applicant's claim that the tar seal is in fact a basal confining zone capable of preventing the movement of fluids. The proposed aquifer exemption boundary must either be revised, the applicant must provide additional information to demonstrate that 40 CFR §146.4(b)(1) is met for the entire proposed exemption volume, or the applicant must rely on a different criterion to justify the exemption.

*The proposed aquifer exemption area extends from surface to the top of the Miguelito (-1,700') and the proposed area for exemption is from 250 feet below ground surface the top of the Miguelito. The tar sands extend from surface to around 250 feet below ground surface have been extracted and could be considered productive. The application is not asking to have the surface tar sands be exempt, but does show its productive nature. The remainder of the Dollie sands from 250 feet below ground surface to the top of the Miguelito is demonstrated to be productive using a combination of electronic resistivity logs and physical measurements (i.e. core holes or sidewall samples) and direct petroleum hydrocarbon production data.*

0005-12, 0005-20

The applicant has not adequately demonstrated that the requirements under 40 CFR §146.4(b)(1) are met for the entire proposed aquifer exemption volume. Therefore, for the EPA to consider this aquifer exemption so that it complies with 146.4(b), the applicant must demonstrate one of the other 146.4(b) criteria has been adequately satisfied.

*The State has conducted a comprehensive review and the demonstration for the case for an exemption has been met. See the Statement of Basis for additional information. The final decision will be made by the US EPA.*

0005-13

40 CFR §146.4(b)(2) requires that: "It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technically impractical." Since the proposed exemption is from the ground surface through the Edna member of the Pismo formation, this option is inappropriate. The depth to the bottom of the formation varies, but generally is <1,000 feet deep. This is more than economically feasible and practical for drinking water purposes, now and in the future. According to the applicant's private well analysis of DWR data (page 278), there are -53 private supply wells (with well completion reports, 105 total private supply wells) within 1 mile that are drawing water from aquifers generally <1,000 feet deep.

*Noted. The application and its associated justification for the aquifer exemption is based upon 40 CFR §146.4(b)(1), not 40 CFR §146.4(b)(2).*

0005-14

40 CFR §146.4(b)(3) requires that: "It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption." Water quality data presented in the application (page 251)12, was sampled from wells within the currently exempted, hydrocarbon bearing aquifer. This aquifer represents an already exempted, hydrocarbon bearing aquifer and data from this aquifer does not represent geochemical conditions and groundwater quality outside the hydrocarbon bearing zone. For this condition to be adequately satisfied, the applicant would need to demonstrate a statistically sound number of random groundwater samples outside of the hydrocarbon bearing portion of the aquifer to adequately characterize the groundwater. For characterizing the water quality, EPA's unified guidance on establishing groundwater monitoring programs should be used. Roughly 63 million gallons of waste water have already been injected into this aquifer. From the data available currently, it's largely unclear what impacts have transpired on groundwater quality. However, the applicant is treating 21,000 bwpd of produced water at the WRF, three quarters of which is discharged to Pismo Creek. This demonstrates that it is already economically and technologically practical to render this water fit for beneficial uses. Based on the sampling results and analysis, justification for 146.4(b)(3) could be either supported or denied based upon the presence of water contamination making these portions of the aquifer unfit for human consumption. However, adequate supporting analysis to that effect has not been presented, and indications are that such a demonstration would be unlikely.

*Noted. The application and its associated justification for the aquifer exemption is based upon 40 CFR §146.4(b)(1), not40 CFR §146.4(b)(3).*

0005-15

Exemption under 40 CFR §146.4(b)(4) is not applicable. 40 CFR §146.4(b)(3) requires that: "It is located over a Class III well mining area subject to subsidence or catastrophic collapse." This exemption application is not associated with a Class III well mining area, and this option is irrelevant. Additionally, the Division and Water Boards under the California Public Resources Code are tasked with ensuring that "the injection of fluids will not affect the quality of water that is, or may reasonably be, used for any beneficial use" before submitting an aquifer exemption application to EPA. Regardless of the requirements under 40 CFR §146.4(b), given the shallow depth of the field and the already existing beneficial use (industrial), it appears that submission of this application to EPA is inappropriate.

*Noted. The application and its associated justification for the aquifer exemption is based upon 40 CFR §146.4(b)(1), not 40 CFR §146.4(b)(4).*

0006-2, 0007-2

Regarding test wells [MW-1, MW-2, MW-3a, and MW-3b.], It appears that MW-2 was not tested at all, and that MW-3a and MW-3b had so much oil it could not be tested. However, that begs the question of why so much oil was in MW-3a and 3b? MW-3a and MW-3b are only 40-50 feet deep, and had previously been used to take water samples. [See Appendix D attached to Exemption Application.) The commenter requests to know what sampling protocol was followed.

*The petroleum hydrocarbons in monitoring (test) wells MW-3a and MW-3b is oil found naturally in the area and is the basis for the aquifer exemption. The entire interval of the proposed area is petroleum hydrocarbon (oil) bearing. The test wells are located on the outer boundary of the oil field to the south and are used to determine if injection fluids are proceeding outside the boundaries of the oil field. The county of San Luis Obispo required that the monitoring wells be installed as part of the land use approval process. The testing protocol can be found in Appendix I 2 "Entrix 2006 Sentry Well Report". The location and depths of the monitoring wells were approved by San Luis Obispo County and are used to detect if injection is leaving the field and could enter local aquifers. In the nearly decade of monitoring, there has been no evidence of fluid migration.*

0007-21

We recommend that further information is collected on the physical environment within the Arroyo Grande Oil Field and the proposed aquifer exemption area in order to adequately model the rate and direction of groundwater movement in order to develop a comprehensive environmental monitoring sampling plan. It is critical that expert knowledge plays an important role when selecting future groundwater monitoring well locations. A monitoring well in the wrong location is useless for detecting leaks in the system. Based on available monitoring data, the applicant has not shown that sufficient information is available to warrant no further monitoring. Please indicate how this will be achieved and by whom (e.g. by the applicant, the Division, or the EPA.). Please discuss how the target population unit will be defined and explain how the sampled population will equal the target population. Since there is available information on the geology a cost-effective sampling plan can be devised. Please describe the proposed sampling frequency and locations.

*An aquifer exemption proposal is separate from monitoring requirements associated with any the future injection projects. It is up to the State to approve or deny any future injection project. Should the proposed aquifer exemption be granted, the State review and approve any proposed injection project at the Arroyo Grande field. The State imposes requirements to ensure injection is occurring only within the approved exempted area and in accordance with all state laws and regulations. Some the requirements could include injection volumes, injecting pressures, and/or location and number of monitoring wells. The public will be a part of the project approval process and will have an opportunity to submit comments and concerns.*

0006-4

If the exemption is approved for the Arroyo Grande Oil Field, any permits issued for injection for waste disposal or enhanced oil recovery include provisions for water testing along the perimeter of the aquifer exemption. Although the application claims that the Dolly formation is cutoff from neighboring aquifers, the geology is not so clear to ensure 100% protection of other aquifers.

*An aquifer exemption proposal is separate from monitoring requirements associated with any future injection projects. It is up to the State to approve or deny any future injection project. Should the proposed aquifer exemption be granted, the State review and approve any proposed injection project at the Arroyo Grande field. The State imposes requirements to ensure injection is occurring only within the approved exempted area and in accordance with all state laws and regulations. Such requirements could include injection volumes, injecting pressures, and/or location and number of monitoring wells. The public will be a part of the project approval process and will have an opportunity to submit comments and concerns.*

0007-2

This aquifer exemption lacks statistically sound environmental monitoring data; there is not enough water quality information to adequately characterize the existing groundwater quality conditions within the proposed exemption area or within the regional wells being used for beneficial use that can be potentially affected hydraulically; and there has been only one groundwater sample analyzed (W-1) [URS, 2014] within the northern area of the Arroyo Grande Oil Field located north of the Edna fault line but outside of the proposed aquifer exemption area. This is not significant enough to show the water quality on the north side of the AROF or within the proposed aquifer exemption area meets 40 CFR 146.4. In 2015, FM O&G installed four fiber optic temperature monitoring wells; however, there appears to be no planned water quality monitoring program for these wells. Please carefully consider that the applicant has not demonstrated that exemption of this aquifer will not negatively impact the surrounding USDWs. There is general lack of qualified flow modeling, lack of baseline monitoring, and lack of overall knowledge of the complex dynamics of the groundwater system. If a hydraulic connectivity does exist between the AROF and our property, there is potential for other areas not known to also be affected. We do not believe the applicant has adequately proven this. While the areas within the proposed exemption area may not be suitable for drinking water, this has not been proven in the application with sufficient monitoring data.

*The proposed area for exemption was scrutinized for accuracy as to the extent of the aquifer. The State has conducted a comprehensive review of the data which demonstrates that injected fluids will be contained in the proposed area. An aquifer exemption proposal is separate from monitoring requirements associated with any the future injection projects. It is up to the State to approve or deny any future injection project. Should the proposed aquifer exemption be granted, the State review and approve any proposed injection project at the Arroyo Grande field. The State imposes requirements to ensure injection is occurring only within the approved exempted area and in accordance with all state laws and regulations. Some the requirements could include injection volumes, injecting pressures, and/or location and number of monitoring wells. The public will be a part of the project approval process and will have an opportunity to submit comments and concerns.*

0007-10

In the FM O&G aquifer exemption application, there is no water quality data for any wells within the 1-mile radius. Appendix G 1-1 presents a review of DWR Well Completion Reports for wells within one-mile radius of the Freeport-McMoRan Arroyo Grande Oil Field (CHG, 2015). There is no water quality data for any of these wells. The only water quality data made available in the application is from the URS (2014) memo analyzing Well No. 1 (W-1) located on the northern portion of the Freeport-McMoRan property on the east side of Price Canyon Road. This well is located approximately 3,500 feet to the northwest of our property as shown in Figure 2. One static data point of groundwater quality data is not a statistically sufficient data (nor is it spatially acceptable) to provide an indication or demonstrate the

water quality for the region. Similarly, there are no groundwater quality data provided within the proposed aquifer exemption area to show that the aquifer does not meet the drinking water standard criteria required for an aquifer exemption as stated in 40 CFR 146.4.

*The State has conducted a comprehensive review of the data presented in the application and will submit the application to the US EPA for approval. The area proposed for exemption is hydraulically isolated from the adjacent aquifers and is not currently used as a source for beneficial use water.*

0007-11

To our knowledge, there have been no comprehensive monitoring programs, setup to determine baseline concentrations for the existing USDWs within the northern portion of the AROF project limits or general vicinity of the proposed aquifer exemption area. Appendix I 1-2 provides the Monitoring Wells Map showing three wells to the North near our parcel and more monitoring wells to the south. However, there has been no comprehensive monitoring program on any of the residential water supply wells or USDWs. Without a sufficient groundwater model for the region of all potentially affected parties with existing USDWs, there is no way to be certain what the effects of the proposed operations will be, and there are no baseline data available. We understand that the Division feels that given the current geologic stratification that we will not be affected; however, there is not enough information on our specific properties to give us the feeling that we will be safe. In fact, our water was tested in 2012 and was determined to be safe for drinking. Please see Attachment 2 for the water quality and well completion results conducted on our USDW. We request a more comprehensive groundwater monitoring program needs to be in place prior to approval of this application by the Division and the Water Boards.

*An aquifer exemption proposal is separate from monitoring requirements associated with any future injection projects. It is up to the State to approve or deny any future injection project. Should the proposed aquifer exemption be granted, the State review and approve any proposed injection project at the Arroyo Grande field. The State imposes requirements to ensure injection is occurring only within the approved exempted area and in accordance with all state laws and regulations. Such requirements could include injection volumes, injecting pressures, and/or location and number of monitoring wells. The public will be a part of the project approval process and will have an opportunity to submit comments and concerns.*

0007-17

The only water quality data made available in the application is from the URS (2014) memo analyzing Well No. 1 (W-1) located on the northern portion of the Freeport-McMoRan property on the east side of Price Canyon Road. Please revise Figure 2 of URS (2014) to include the proposed aquifer exemption boundary with respect to the well sampled. Additionally, there is no mention of a field quality assurance/quality control (QA/QC) program for the environmental groundwater monitoring of the one well. Please revise and provide information on the data validation and QC (i.e. rinsate collection, field duplicate samples, etc.). There is no mention of the methods and results of the QC analysis in the technical memorandum itself.

*Water analysis results for the water to the north of the Arroyo Grande fault and for the monitoring wells to the south of the field were presented. Any monitoring of formations outside of the proposed area would be as a result of the approval of the injection which can only be done if injection is first allowed in the proposed area through an approved aquifer exemption.*

0007-20

It has been documented that water wells inside and outside the oil field limits are naturally contaminated with hydrocarbons because of the prevalence of the tar accumulations (Freeport-McMoRan, 2015). This is a broad statement because there was no data collected prior to the initial development of the oil fields in the early 1900s. Please comment on how you can conclude that these are naturally contaminated when the actual oilfield production began in 1906 when no baseline data was available prior to this time period.

*There are numerous wells and core holes that have been drilled outside of the Arroyo Grande field boundaries. The results of the physical testing of the wells both inside and outside of the Arroyo Grande field boundary shows the prevalence of tar accumulations far outside the field boundaries. Production began in the Arroyo Grande field in 1880 as mining of the surface tar. Injection did not commence in the field until 1949.*

**Hydraulic analysis**

0005-16, 0005-23

EPA does not need an applicant to demonstrate hydraulic confinement to grant an aquifer exemption. This alarming fact demonstrates a severe flaw in this regulatory program and demonstrates how little analysis is required for this scientifically invalid regulatory process. However, as demonstrated above, the proposed aquifer exemption has not met EPA's requirements for criteria 40 CFR §146(a) and 40 CFR §146.4(b). Therefore, EPA must not approve this aquifer exemption application in its current form. Furthermore, as discussed above, the State of California sets a higher bar, requiring that the applicant demonstrate that injected fluid will remain in the aquifer or portion of the aquifer that would be exempted. This standard has not been met, as discussed in detail below, and the Division and Water Boards should not submit this application to EPA in its current form.

*The State has conducted a comprehensive review and the demonstration for the case for an exemption has been met. The final decision will be made by the US EPA. In addition, based upon the analysis within the application, there will be a net decrease of the fluid in the aquifer. Production volumes are higher than the injection volumes and create a pressure sink towards the center of the production area. Also, the proposed exempted area is isolated by the syncline geologic structure that will prevent the movement of any injected fluid outside of the proposed exempted area.*

0005-17, 0005-26, 0005-27

The applicant needs to explicitly define "tar seal." First and foremost, the applicant needs to define the intrinsic properties as a seal that would preclude the transmission of contaminants or potentially impaired groundwater outside the boundary of the proposed exemption. The blanket assumption that this 'tar seal' will act as an impermeable, barrier indefinitely is grossly underestimating the potential for off-site migration of contaminants into USDWs and potential drinking water sources.

Furthermore, the injection of steam is a cause for concern, since steam could (further) impair the integrity of the seal. For example, the well-established extraction technique known as Steam Assisted Gravity Drainage used for hydrocarbon production from tar sands relies on injecting steam to melt the bitumen and allow it to flow to a nearby well. The technique is used extensively in Canada.l5 Given this ability of steam; we call into question the assertions of confinement put forward by the operator.

Confinement on east and west side of the proposed exemption boundary has not been established. On page 16, the applicant notes, "The reservoir thins and pinches out (facies change) up-dip into the less permeable, finer-grained Edna Member sands and to the very fine-grained Miguelito Member siltstones and claystones. The reduction in permeability to finer-grained sands, siltstones and claystones provides the seal preventing fluid or steam migration eastward or westward from the oilfield."

This statement is troubling for several reasons. First, according to Hall 1973, the Miguelito member is inconsistently distributed throughout the proposed spatial area. Hall 1973 definition16 suggests discontinuities in the Miguelito member which could significantly alter preferential flow paths and hydrogeological characteristics throughout this aquifer. Next, according to throughout DWR's (application page 278) private well report, 6 well completion reports are located within 1 mile of the proposed aquifer exemption and are located in the Miguelito Member. The presence of private wells currently drawing from this aquifer suggests 1) it is capable of storing and transmitting significant amounts of groundwater, 2) it is an aquifer, not a confining aquitard or aquitude, and 3) depending on various hydrogeological factors, there's a potential of well discharge to enhance the hydraulic gradient away from the aquifer exemption boundary.

Additionally, as shown in maps and cross-sections provided by the applicant, permeable Edna Member sands extend to the east-southeast and west-northwest of the proposed exemption boundary (Appendix A4-l and Appendix A7a2). The applicant has not adequately demonstrated that there are any geologic features at the proposed boundary that could prevent injected or displaced fluids from migrating beyond the proposed boundary into these permeable Edna Member sands. The applicant has not provided any permeability or porosity maps or cross- sections documenting the alleged loss in permeability it claims will provide confinement on the east and west sides of the field. The applicant has not presented any density porosity or neutron porosity logs and, as discussed above, although core permeability and porosity data are available, these have not been plotted on the cross-sections submitted by the applicant. Finally, for the current 'hydraulic analysis' to be appropriate for this site, the applicant needs to demonstrate I) site specific information of confined aquifer conditions, 2) adequate characterization of the boundary conditions and not assumptions, and 3) quantitative aquifer properties and understanding of head level responses. It's unclear whether or not the proposed aquifer is under confined or unconfined conditions, which has significant implications on predicting how phreatic (or potentiometric) surface will be influenced by various injection and recovery activities. Artificial changes to the hydraulic gradient must be assessed in order to understand local groundwater flow conditions, along with a quantitative description of the structural aquifer characteristics.

*The subsurface tar seals, referenced in the application, act as an additional fluid barrier to the facies change. It is a combination of stratigraphic and permeability conditions that restrict groundwater flow to areas outside of the proposed aquifer exemption area. Steaming has occurred in the Arroyo Grande field since 1965 and there has been no evidence of the tar seals breaking down from the heat of the steam. The facies change from high permeability sandstone (Dollie) to a nearly impermeable mudstone (Miguelito) helped to create conditions in the oil field that trapped the oil. Without the facies change, the oil would have migrated out of the area long ago. The same geologic conditions that trapped the oil also help ensure the containment of injected fluids in the oilfield. The aquifer exemption proposal defines the boundaries of the oil producing areas. The geologic conditions where the oil exists have not changed since primacy was granted in 1983. According to the DWR report contained in the aquifer exemption proposal, the six water supply wells screened in the Miguelito are also screened in the Edna. The data gathered for this application describe the Miguelito as a nearly impermeable mudstone. It is likely for those water supply wells screened in the Miguelito and Edna that the water is coming from the Edna*

*portion of screened interval. The Edna is not hydraulically connected to the oil bearing Dollie sandstone inside the proposed aquifer exemption area.*

**Presence of Surface Tar Seal Not Adequately Demonstrated**

As part of its justification for exempting the Edna/Dollie Sands Member from surface to depth, the applicant claims that a "tar seal" is present across the entire surface of the proposed exemption boundary. To support this claim, the applicant references maps and cross-sections prepared by DOGGR in 1944 and 1958 showing the location and distribution of tar sands. Neither of these maps is consistent with the applicant's interpretation that the "tar seal" is present across the entire surface of the proposed exemption. Both publications from DOGGR show that the tar sands occur in discrete and discontinuous deposits that outcrop at various locations throughout the field, contradicting the applicant's stylized cross-sections in Appendices A7a1 - A7a6, which depict the "tar seal" as a single, continuous deposit at the surface.

*The DOGGR maps and cross-sections show the commercially productive areas and zones at the time of the maps. As economics changed, so did the maps. The 1961 DOGGR maps shows a much larger area as the producing horizon than did the 1974 map that was used in the granting the regulatory authority of Class II wells from US EPA to DOGGR. There are extensive records showing the presence of oil continuously throughout the proposed area. The application is asking for an exemption under the provision in 40 CFR §146.4(b)(1) that the area contains "hydrocarbons that considering their quantity and location are expected to be commercially producible". Appendix A 3-2 shows a simplified map of the tar sands with higher oil content. Any surface alluvium that has developed over the centuries through erosion into the valleys and draws of the proposed area are from the surrounding tar sands and would not be usable for potable water.*

**Additional Comments**

0005-21

Understanding a base water level and hydraulic conductivity, in combination with horizontal and vertical basin characteristics, is how groundwater flow directions are characterized. To reiterate, the applicant, supported by DOGGR and SWRCB, has not collected or presented any of this information, even after a public comment period where these issues were previously raised.

*DOGGR, State Water Board, and the Regional Water Quality Control Boards, have reviewed the data supporting the aquifer exemption within the Arroyo Grande field. The data supports an aquifer exemption. Separate from the aquifer exemption, the State will also review and evaluate existing and proposed injection projects to ensure that the injected fluid stays in the exempted aquifer.*

*Before a UIC permit is issued, the operator provides project-specific information and assesses how the proposed injection activities will behave in subsurface and how containment within the exempted aquifer will be maintained throughout the life of the project.*

0092-1

No contingency or emergency plan is included in the application or the presentation by Freeport-McMoRan. These types of infrastructure projects are capable of failure from manmade and/or natural

disasters. In this case the consequences could be catastrophic to the watershed and aquifers (including aquifers covered by the Sustainable Groundwater Management Act). Failure to plan is a plan to fail.

*The Division is responsible to supervise the oil and gas development to prevent, as far as possible, damage to life, health, property, and natural resources. The Division permits, regulates and ensures that operations are in compliance with State laws. The Division also works with the State Water Boards to ensure waters of beneficial use are protected. This is accomplished through different programs through the different agencies. In addition, the Division requires well bonding to provide financial assurance, as well as requiring wells to be maintained in a leak free condition. All injection wells are tested for mechanical integrity on a regular basis. In addition, the application is to exempt the aquifer because it meets the requirements of 40 CFR 146.4, and the application to US EPA does not require a contingency plan.*

0010-2

Has DOGGR determined that Freeport McMoRan is financially sound and able to cover all damages and loses incurred due to a natural disaster, in particular an earthquake that could release billions of gallons of toxic waste to surrounding residents and world renowned vineyards and contaminate scarce clean water resources? If the aquifer is determined by you, Department of Oil, Gas and Geothermal Resources, to be impermeable and safe for lethal injection of hazardous waste known to the State of California to cause cancer are you then the lead agency and responsible party if any breach is to occur?

*The Division is responsible to supervise the oil and gas development to prevent, as far as possible, damage to life, health, property, and natural resources. The Division permits, regulates and ensures that operations are in compliance with State laws. The Division also works with the State Water Board to ensure waters of beneficial use are protected. This is accomplished through different programs through the different agencies. In addition, the Division requires well bonding to provide financial assurance, as well as requiring wells to be maintained in a leak free condition. All injection wells are tested for mechanical integrity on a regular basis.*

0005-28

Neither the applicant nor the State have demonstrated that the injection of fluids will not affect the quality of water that is, or may reasonably be, used for any beneficial use. An analysis demonstrating the current and future technical or economic impossibility of beneficial use, based on levels of contamination, ease of access, technological availability of purification options and other factors is missing. In addition, we do not believe that the current data and proposed project operation practices demonstrate hydrologic isolation for the injectate. it is clear that the water in the proposed exemption area is currently serving a beneficial purpose. The applicant is treating 21,000 bwpd of produced water at the Water Reclamation Facility ("WRF"), three quarters of which is discharged into Pismo Creek. As the applicant, DOGGR, and SWRCB state, this discharge helps support habitat for the Southern California Steelhead and Tidewater Goby and recharges groundwater. Ongoing injection activity could compromise these beneficial uses. The concentrated waste from the treatment facility is reinjected into the Arroyo Grande oilfield using the disposal wells. Neither the applicant nor DOGGR and SWRCB have analyzed the potential impact to the existing beneficial uses from the injection of this contaminated waste water.

*The application will be evaluated by the US EPA to determine if the requirements of the Safe Drinking Water Act have been followed. Since the application has shown that the aquifer contains hydrocarbons in commercial quantities, and demonstrated containment, no USDWs, no beneficial use, and no complete exposure pathways for potential risk receptors, the State has determined that the proposal meets the necessary criteria.*

0005-30

Given that no information regarding groundwater flow directions has been provided and basic groundwater direction vectors and magnitudes are unknown, how will the State determine where the wells will be placed?

*These concerns will be addressed as part of the UIC permit review. The aquifer exemption process is designed to determine if the water in the aquifer needs to be protected from the injection of fluids associated with oil and gas development. If evaluation of the aquifer shows that the water meets the criteria for exemption, and the aquifer is exempted, the State will ensure on an injection well project review that the injected fluid is confined to the proposed exempted zone. Any field expansion will undergo an extensive evaluation to ensure injected fluid confinement. In regards to the adequacy of the application, the final determination as to whether the application is complete and contains all the necessary information falls to the US EPA.*

0005-24

The injection balance considering the aquifer as a 'bowl' does not consider the horizontal and vertical heterogeneities of the aquifer and surrounding water users. Treating this system as a self-contained system where everything 'flows downhill' gravely underestimates potential for contaminants to migrate off-site into USDWs. The statement "The second layer of protection for nearby aquifers is that the bowl is surrounded to the east, south, and west with a layer of nearly impermeable siltstone and claystone called the Miguelito member of the Pismo Formation" is inconsistent and not supported by the presence of forty-six water wells drilled into the "Pismo Formation Aquifers," as shown in the map included with supplemental information. Private users are actively using the Pismo Formation as a source of groundwater. Since there's ample evidence that many users are currently discharging groundwater from this aquifer, the assertion that it is impermeable is highly questionable and lacks supporting data. There's no attempt to distinguish the Pismo Formation from the Miguelito Member of the Pismo formation around the project area.

*The State has determined that the aquifer in question has petroleum hydrocarbons throughout. Therefore, this aquifer is being applied for as a non-USDW and should not be considered as a potential source of drinking water for any future development. In addition, the State has evaluated the available data and concluded that the water supply wells in the vicinity of the Arroyo Grande field are not drawing water from the aquifer proposed to be exempted. The analysis was based on a well survey conducted by the operator.*

0001-19

FMOG cannot rely on the "hydrocarbon-bearing" or "over 3,000 mg/L TDS" criteria to exempt its aquifer, and must instead assert that the aquifer is not and cannot be used for drinking water, and that it will not threaten nearby groundwater with beneficial uses. FMOG cannot meet these criteria.



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FMOG cannot show that the water is sufficiently isolated so as not to affect beneficial use groundwater. For example, the Statement of Basis relies on the fault that forms the northern boundary to restrict water flow, but provides no supporting pump tests or aquifer tests. The Statement of Basis also asserts that the Miguelito Member forms a layer of protection from drinking water wells. However, the Miguelito Member forms the bottom of the alleged synclinal bowl that underlies the Edna Member. It cannot, therefore, serve as a barrier between the wells in the exempt area and water wells completed in the Edna Member. In fact, there are six wells that are completed in the Miguelito Member, suggesting it is an aquifer rather than an aquitard. Furthermore, FMOG and DOGGR place great emphasis on the tar seal providing a hydraulic barrier that would prevent drinking water from being contaminated by FMOG's injection into this aquifer. The permeability and even existence of the tar seal at the locations depicted in cross section B to B', however, is inferred at best, and the public should not be forced to rely on FMOG's and the agencies' sincerest hope that these inferences are correct.

FMOG cannot demonstrate that the water is not or cannot be used for domestic water. Indeed, at least 24 wells are known to have been completed in the Edna Member of the Pismo Formation, the same geologic unit that is proposed for exemption. Many of these are just "outside" the inferred tar seal. The Statement of Basis notes that none of the water supply wells are located in the Dollie Sands, but this assertion is misleading and a red herring; the Dollie Sands are part of the Edna Member and are not a recognized separate geologic unit or formation. Indeed, despite the fact that at least 24 wells draw from the same water bearing unit at similar depths, FMOG has not presented any geologic cross sections that would depict the relationship of drinking water wells to the injection wells or production wells. While the scale of the aerial map provided in the "new" information supporting the exemption request is too large to precisely identify the location of nearby water wells, it is clear that water wells within several hundred feet of the proposed exemption boundary draw water from the Edna Member at similar depths as that which injection occurs. At the very least, therefore, FMOG *must* provide *specific* latitudinal and longitudinal points for the wells, their depths, and confirmation of the vertical interval into which the wells have been completed before DOGGR and US EPA can act on its request.

*The State has evaluated the available data and concluded that the water supply wells in the vicinity of the Arroyo Grande field are not drawing water from the aquifer proposed to be exempted.*

0007-27

A letter to the applicant from the Regional Water Board states a list of wells and location map of all water wells within one mile of all injection must be provided. My property, and my neighbor's property, within one mile of injection, have wells that have not been tested. Therefore information is lacking and needs to be completed. We also request a numerical groundwater model be completed for the area.

*The State has evaluated the available data and concluded that the water supply wells are not drawing water from the proposed aquifer exemption area.*

0001-21

Even if the documentation did support an exemption under the federal criteria (which it does not), the criteria itself is antiquated, and cannot be the only criteria used to determine whether to allow FMOG to use California's aquifers to inject oil field waste water and steam. DOGGR and US EPA must instead

apply 21st-century standards and to 21st-century needs when analyzing whether it is truly appropriate to exempt this aquifer from the protections of the Safe Drinking Water Act. The Center further objects to using this antiquated criteria to legitimize illegal injection into protected aquifers at the AGOF. There are at least eight wells operating at the AGOF permitted to inject into groundwater that is currently protected under the SDWA.

*The State and US EPA have agreed to a schedule to bring all injection projects into regulatory compliance. If an aquifer exemption is not granted by February 15, 2017, all injection into USDWs will cease. During this time of the compliance schedule, the State is pursuing an aquifer exemption to bring the operation into compliance. The State's application to exempt the aquifer shows that this aquifer meets the criteria for an exemption.*

0005-29

As aquifer exemptions are granted in perpetuity, the potential for injected contaminants to migrate off-site is uncertain; however from the currently available data presented in the aquifer exemption application, it's unclear where and when any potential off-site contaminant migration could occur, and what contaminants those might be. The supplemental information indicates that adding "sentry groundwater monitoring wells" outside the proposed exemption boundary is being "considered." While we support the concept of enhanced monitoring, the supplementary information does not provide sufficient information to determine the adequacy of this monitoring program, or sufficient assurance that such monitoring will even take place. The requirement to perform monitoring must be included in the permit for the injection project.

*The State and Regional Water Boards have reviewed the data supporting the aquifer exemption. Any expansion of the injection activity will undergo a review from the Division and the State and Regional Water Boards. If additional monitoring is determine necessary, the Division will work with the Water Boards to develop an appropriate groundwater monitoring program.*

0001-24

Drinking water wells immediately adjacent to the area proposed for exemption need to be identified and accurately mapped. The Statement of Basis states "none of the nearby water supply wells are pumping water from the Dollie Sands member of the Pismo Formation" (p. 3) but fails to state that the Dollie Sands are part of the Edna Member of the Pismo Formation, the source of drinking water for the 24 wells adjacent to the exemption area. According to information included in the Application, some wells in the Edna Member produce drinking water from depths up to 510 feet. Injection into the Edna Member in the exemption area occurs at depths as shallow as 600 feet (p. 17). No map has been prepared for inclusion in the public record for the exemption process or for the Project to accurately show where the 105 drinking water wells are located in an aerial sense. The only maps that have been prepared show well locations in a very general sense. The map that is included delineates an "Area with no known water supply wells" that touches upon the northeast corner of the "Proposed aquifer exemption boundary." The juxtaposition of these two boundaries indicates no aerial buffer between the exemption area and the adjacent drinking water. The Application and the Statement of Basis should identify and disclose the distance of all drinking water wells within a one-mile radius to the exemption area and should confirm the vertical interval (i.e. Geologic Formation and Member) in which the wells are completed. The Application and Statement of Basis should also evaluate the ability for proposed

sentry wells to adequately serve as a warning system for potential contamination. Because of the proximity of the drinking water wells to the exemption area, a detection of contamination in the sentry wells would likely be too late to serve as adequate warning to shut down drinking water wells.

*The proposed area for exemption was scrutinized for accuracy as to the extent of the aquifer. The proposed area for exemption was scrutinized for accuracy on the extent of the aquifer and review by the State indicates all injection fluids within the proposed area will be contained. An aquifer exemption does not have monitoring requirements attached to it. It is up to the State to administer the approval to inject. In the approval to inject, the State imposes requirements to ensure injection is occurring only within the approved area and in accordance with all state laws and regulations. Some the requirements could include injection volumes, injecting pressures, and/or location and number of monitoring wells. The public has and will be a part of the approval process and will have an opportunity to submit comments and concerns. In addition, the State and Regional Water Boards have reviewed the data supporting the aquifer exemption. Any expansion of the injection activity will undergo a review from the Division and the State and Regional Water Boards. If additional monitoring is determine necessary, the Division will work with the Water Boards to develop an appropriate groundwater monitoring program.*

0001-17, 0001-23

The exemption request must be denied because FMOG has consistently refused to provide critical information, such as accurate nearby water well locations, depth and samples, or a numerical groundwater flow model, which are critical to demonstrating that this aquifer meets the criteria set forth in state and federal law. Also, the new information provided raises only more concerns about the integrity of the "boundaries" of the aquifer, the lack of data about nearby wells, and the use of antiquated criteria to legitimize currently illegal injection activity. Data from the California Air Resources Board demonstrates that this oil field is extremely water and carbon intensive to produce, which raises policy concerns about the utility of sacrificing California's groundwater to an increasingly inefficient oil field during a time when water is at a premium and the climate is at risk.

*The State has conducted a comprehensive review and the demonstration for the case for an exemption has been met. The final decision will be made by the US EPA. Climate change is not a deciding factor for determination of an exempt aquifer by the US EPA and as such is not a part of this application.*

0001-25

The hydraulic intercommunication with the exemption area and the drinking water wells needs better evaluation. The claim that the exemption area is hydraulically isolated from drinking water wells is supported by highly interpretive data. The application and the Statement of Basis summarize a conceptual model to support this idea but it is a model that has not been evaluated through aquifer tests or through use of numeric groundwater models. Further evaluation of the lateral boundaries is imperative because drinking water wells are located directly adjacent to the exemption area. None of the boundary conditions cited by the Applicant are known to create an impermeable hydraulic barrier that would preclude the intercommunication of drinking water aquifers with oil field activities, which include injection and extraction. The ability of the four boundary conditions cited in the Application and Statement of Basis to contain water in the exempted area from intercommunication with adjacent wells is unknown. Boundary conditions need to be evaluated through use of a numerical groundwater model to estimate response in the aquifer to Project injection and pumping. Numerical (computer-based)

models of groundwater systems are commonly used to simulate the flow of groundwater, including the response of water levels across aquifer boundaries under conditions of injection and pumping. Aquifer tests, where water is removed or added and where response in adjacent wells is measured, are also critical to test the concept of hydraulic barriers.

*The subsurface tar seals, referenced in the application, prevent the migration of fluids vertically, not horizontally. Steaming has occurred in the Arroyo Grande field since 1965 and there has been no evidence of the tar seals breaking down from the heat of the steam. The facies change from high permeability sandstone (Dollie) to a nearly impermeable mudstone (Miguelito) helped to create conditions in the oil field that trapped the oil. Without the facies change, the oil would have migrated out of the area long ago. The same geologic conditions that trapped the oil also help ensure the containment of injected fluids in the oilfield. The aquifer exemption proposal defines the boundaries of the oil producing areas. The geologic conditions where the oil exists have not changed since primacy was granted in 1983. According to the DWR report contained in the aquifer exemption proposal, the six water supply wells screened in the Miguelito are also screened in the Edna. The data gathered for this application describe the Miguelito as a nearly impermeable mudstone. It is likely for those water supply wells screened in the Miguelito and Edna that the water is coming from the Edna portion of screened interval. The Edna is not hydraulically connected to the oil bearing Dollie sandstone inside the proposed aquifer exemption area.*

0001-29

The tar seal is identified on the east and west sides of the proposed exempted area "to act as a fluid barrier and restrict groundwater flow across these boundaries" (Statement of Basis, p. 4). This statement admits that groundwater flow is restricted but not contained across the tar sands. Since flow is not hydraulically contained, the aquifer that serves as the source of drinking water for adjacent wells is hydraulically connected to the exemption area. The very presence of the tar seal is also in doubt. A geologic cross section prepared by the Applicant shows the boundary of the tar seal to be represented by a dashed line (Aquifer Exemption Application, Appendix A 7 a 2, Cross Section B to B'). The use of a dashed line in these cross section means that the existence of the tar seal is uncertain, according to geologic mapping conventions. Therefore, the ability of the tar seal to form a lateral boundary separating Project wells from drinking water wells is unknown.

*The subsurface tar seals, referenced in the application, prevent the migration of fluids vertically. Steaming has occurred in the Arroyo Grande field since 1965 and there has been no evidence of the tar seals breaking down from the heat of the steam. The facies change from high permeability sandstone (Dollie) to a nearly impermeable mudstone (Miguelito) helped to create conditions in the oil field that trapped the oil. Without the facies change, the oil would have migrated out of the area long ago. The same geologic conditions that trapped the oil also help ensure the containment of injected fluids in the oilfield. The aquifer exemption proposal defines the boundaries of the oil producing areas. The geologic conditions where the oil exists have not changed since primacy was granted in 1983. According to the DWR report contained in the aquifer exemption proposal, the six water supply wells screened in the Miguelito are also screened in the Edna. The data gathered for this application describe the Miguelito as a nearly impermeable mudstone. It is likely for those water supply wells screened in the Miguelito and Edna that the water is coming from the Edna portion of screened interval. The Edna is not hydraulically connected to the oil bearing Dollie sandstone inside the proposed aquifer exemption area.*

0001-26

The Statement of Basis states that there is a facies change to the east of the proposed exempted area and states the Miguelito Member forms the base of a synclinal bowl that represents a low permeability "layer of protection for adjacent drinking water wells." What the Statement of Basis fails to mention is that 24 drinking water wells within the one-mile radius are completed in the Edna Member, and only 6 are completed in the Miguelito Member.4 The Statement of Basis makes an even greater omission by failing to state that four drinking water wells in Section 32 and seven wells in Section 5, the areas that contain wells nearest to the exemption area, are completed in the Edna Member of the Pismo Formation, the same geologic member and formation that is the subject of the Application. Therefore, the Miguelito Member which underlies the Edna Member, cannot serve as a barrier to hydraulic intercommunication between wells in the exemption area and drinking water wells completed in the Edna Member.

*The proposed area for exemption was scrutinized for accuracy as to the extent of the aquifer. The State has conducted a comprehensive review and the demonstration for the case for an exemption has been met. An aquifer exemption does not have monitoring requirements attached to it. It is up to the State to approve injection well projects. In the approval to inject, the State imposes requirements to ensure injection is occurring only within the approved area and in accordance with all state laws and regulations. Some the requirements could include injection volumes, injecting pressures, and/or location and number of monitoring wells. The public has and will be a part of the approval process and will have an opportunity to submit comments and concerns.*

0073-2

When I read cross section B and Figure 1, it sure looks like you have a drinking water well within the tar seal of the proposed injection aquifer. It looks like this well is outside the injection boundary but within the same aquifer and within the tar seal. This is the green circled number 5 well in figure 1 on the far east side of cross section B. How can you exempt part of the aquifer for injection and protect this drinking water well that appears to share the same aquifer outside the injection zone. How can you ignore the resident on Hwy 227 that had an unexpected oil geyser on her property from an injection well. This exemption is careless and reckless to the residents surrounding the Arroyo Grande oil field.

*The proposed area for exemption was scrutinized for accuracy as to the extent of the aquifer. The proposed area for exemption was scrutinized for accuracy on the extent of the aquifer and review by the State indicates all injection fluids within the proposed area will be contained. An aquifer exemption does not have monitoring requirements attached to it. It is up to the State to approve injection projects. In the approval to inject, the State imposes requirements to ensure injection is occurring only within the approved area and in accordance with all state laws and regulations. Some the requirements could include injection volumes, injecting pressures, and/or location and number of monitoring wells. The public has and will be a part of the approval process and will have an opportunity to submit comments and concerns.*

0062-2, 0055-2

Per the determination that the proposed expansion meet the requirements of PRC 3131(a)(3), the commenter notes that wastewater disposal is the primary cause of the recent increase in earthquakes in the central United States. USGS has found that oil wastewater injection can raise pressure levels more

than enhanced oil recovery and thus increases the likelihood of induced earthquakes. DOGGR should be required to analyze the proposed Arroyo Grande aquifer exemption in light of the documented rise in injection-induced seismicity in the central and eastern United States between 2008-2014 and the confirmation of the link between increased seismicity and the practice of pumping produced wastewater from oil and gas production into the ground. The state should require an analysis before affirming that the requirement of PRC 3131(a)(3) has been met in the proposal to expand the exemption area for the Dollie Sands of the Pismo Formation. The analysis should determine the proposed injection rate and total volume injected; the presence of faults large enough to produce felt earthquakes; stresses large enough to produce earthquakes; and the presence of pathways for the fluid pressure to travel from the injection point to faults.

*There has not been a specific seismic study for this application and that is not a component of the aquifer exemption process. If the aquifer exemption is granted for the proposed area, a more detailed monitoring program will be established in the course of permitting and could have a seismicity tracking portion as part of it.*

0011-3

No matter the current findings that cyclic steam injection has no effect on the local area geology and seismological activity associated with these extractive activities, those who live in the shadow of the oil fields, and the Arroyo Grande fault; fear for the immediate threats of increased seismicity from high pressure steam injection and waste water disposal injection wells will also create further risks to well failure and casing ruptures from the secondary seismic repercussions from the short term activities of the oil extraction at the site. Though limited experience from the past activities over the last 30 thirty years of limited cyclic steam extraction wells in the area, increasing the proposed phase V expansion shows 450 more wells all based on the increased cyclic steam injection and water disposal wells will have unanticipated effects on the surrounding area's seismic stability and the long term environmental health of the domestic water producing aquifers which will become increasingly more valuable in the future of scarcity caused by the short term thinking of the state water board, the division of oil, gas and geothermal resources and the oil company's working with these extractive agencies.

*There has not been a specific seismic study for this application and that is not a component of the aquifer exemption process. If the aquifer exemption is granted for the proposed area, a more detailed monitoring program will be established in the course of permitting and could have a seismicity tracking portion as part of it.*

0087-2, 0055-3, 0036-2

We are told that the oil fields geological underlay is a "bowl" and all the toxic injections will stay in the bowl and not affect our drinking water. Just how much injected concentrated brine disposal fluids can the "bowl" take before it spills over into a drinking water aquifer? Or a small earthquake on the Arroyo Grande fault that cracks the "bowl", what happens to the concentrated toxic contents of the cracked bowl?
*The proposed area for exemption is hydraulically isolated from the surrounding aquifers. The State has conducted a comprehensive review of the data presented in the application and will submit the application to the US EPA for approval. An aquifer exemption does not have monitoring requirements attached to it. It is up to the State to approve injection well projects. In the approval, the State may*

*require specific monitoring requirements to ensure the injection is staying within the approved area of exemption. The approval process is also open to the public for comments and concerns.*

0011-4

Based on the letter from the State Water Board attached to the supplementary documentation in the DOGGR's application for aquifer exemption, the assumptions for safe operation of the expansions are based on the assertion no domestic water wells with 1.5 miles of the oil field. Sadly, the State Board of Water Resources has missed my family's farm in their analysis. We have lived in the shadow of the oil field, less than 1 mile from the oil field boundaries for the last 35 years. While we have had good neighborly relations with the oil fields, we fear for the future health of the land adjacent our family's property based on the proposed doubling of oil production wells.

*The State has conducted a comprehensive review of the data presented in the application and will submit the application to the US EPA for approval. If the US EPA requires additional data, the State will gather that data.*

0005-32

There is no discussion about what water quality parameters would be sampled, what sampling and analysis protocols used, and what quality controls would be implemented. The applicant suggests that groundwater is already contaminated with various toxic compounds (i.e. BTEX, selenium, etc.), therefore, these and other constituents must be identified. We request a full suite of measurements from ICP-MS (heavy metal suite), HPLC (organics), GC (VOCs), and IC (anions, such as nitrates). With what frequency and duration will the sampling occur? Given that groundwater transport can take years, and therefore, impacts to groundwater beyond the exemption boundary can occur years after the pumps are shut off and operations cease, monitoring needs to continue well beyond plugging and abandonment of the injection wells. Class VI regulations, for example, require monitoring for fifty years post-closure, unless operators can demonstrate that a shorter time frame is appropriate. We request a detailed baseline sampling procedure, what concentrations would constitute an 'impact', and what the remedies would be in case of a potential contaminant migration offsite into USDWs.

*An aquifer exemption does not have monitoring requirements attached to it. It is up to the State to approve injection well projects. Should the proposed aquifer exemption be granted, the State will begin the process of updating the approval to inject at the Arroyo Grande field. In the approval to inject, the State imposes requirements to ensure injection is occurring only within the approved area and in accordance with all state laws and regulations. Some the requirements could include injection volumes, injecting pressures, and/or location and number of monitoring wells. The public has and will be a part of the approval process and will have an opportunity to submit comments and concerns.*

0001-18

FMs Hydraulic analysis remains inadequate, and does not demonstrate isolation from drinking water. FMOG should provide, and the agencies should require, a numerical groundwater model to map and analyze groundwater flow under various pumping and injection conditions. FMOG should provide, and the agencies should require, detailed information about water wells within one mile of the proposed exempted area. Instead, FMOG and the agencies rely on vague, anecdotal, and inferred evidence to

assert that the aquifer is not hydraulically connected to nearby water wells, and that the aquifer's boundaries are nearly impermeable.

*The proposed area for exemption was scrutinized for accuracy on the extent of the aquifer and review by the State indicates all injection fluids within the proposed area will be contained. An aquifer exemption does not have monitoring requirements attached to it. It is up to the State to approve injection well projects. In the approval to inject, the State imposes requirements to ensure injection is occurring only within the approved area and in accordance with all state laws and regulations. Such requirements could include injection volumes, injecting pressures, and/or location and number of monitoring wells. The public has and will be a part of the approval process and will have an opportunity to submit comments and concerns.*

0001-20

Information required by Regional Board, regarding technical reports containing information about nearby water supply wells, including domestic wells within a one-mile radius of the injection wells which was to include a list and location map of all water supply wells, including domestic wells, within one mile of each injection well, are not included to support the exemption. It is important to have this information prior to making a decision on the exemption, in part because FMOG uses solvents and acids to clean and maintain injections wells that must not be allowed to contaminate drinking water. In addition to the water well data already required by the Regional Board, the studies and data FMOG must conduct and provide to demonstrate the safety of an exemption are not particularly exceptional or rare, and there is no reason the agencies should not require them in order to protect Californians. There are available tests and models that can effectively determine or demonstrate FMOG's assertions of aquifer isolation. It is unclear why, then, the agencies are content to rely on guesstimates and inferences rather than require FMOG to submit fundamental information necessary to ensure the safety of those who live near the oil field and of California's scarce water resources.

*The proposed area for exemption was scrutinized for accuracy on the extent of the aquifer and review by the State indicates all injection fluids within the proposed area will be contained. An aquifer exemption does not have monitoring requirements attached to it. It is up to the State to administer the approval to inject. In the approval to inject, the State imposes requirements to ensure injection is occurring only within the approved area and in accordance with all state laws and regulations. Such requirements could include injection volumes, injecting pressures, and/or location and number of monitoring wells. The public has and will be a part of the approval process and will have an opportunity to submit comments and concerns.*

0091-1

In addition to the safeguards inherent in the permitting process, we can support the aquifer exemption based upon the following technical considerations:
The subsurface hydraulic connection between the Edna sub-basin and Price canyon water bearing zones is restricted by faulting and folding, which act as barriers to groundwater flow.
The reservoir is bounded by the Arroyo Grande Fault and multiple fault splays north of the main fault. This fault and its splays provide a seal to fluid or steam migration northward from the oilfield.

*Noted.*

0010-3

If exempted, does that automatically qualify the Arroyo Grande Oil Fields as an EPA certified hazardous waste disposal site or do they have to apply for another permit from the EPA to legally dump their hazardous waste on site? And if it is a legally certified hazardous waste disposal site does that mean that anyone can dispose of their radioactive, hazardous waste there and it will be included on the EPA's list of approved sites?

*The application to the US EPA is for an aquifer exemption for Class II fluid injection. This fluid is not certified as hazardous waste disposal.*

0005-25

The supplemental information asserts that the juxtaposition of oil-bearing sandstones with lower permeability siltstone and claystone across the Arroyo Grande Fault will act as a barrier to migration of injected fluids outside the exempted zone of the aquifer. However, supplemental cross-section A-A' shows that Edna Member sands are present on both sides of the fault, and in fact are in direct contact across the fault in the shallower zones where the Arroyo Grande Fault splays.

*Noted.*

0007-25

There is not enough research to show that a fault line can act as a barrier. A recent study shows evidence of earthquakes and faults being reactivated from injection of wastewater from enhanced oil recovery. Are you sure that the Edna Fault won't be activated by injection?

*There has not been a specific seismic study for this application and that is not is not a component of the aquifer exemption process. If the aquifer exemption is granted for the proposed area, a more detailed monitoring program will be established in the course of permitting and could have a seismicity tracking portion as part of it.*

0001-27

The fault that forms the northern boundary of the proposed exemption area is also cited in the Statement of Basis as a barrier to "restrict" (p. 4) flow to/from adjacent drinking water. No tests, including pump tests or aquifer tests, have been performed to validate this idea and how much hydraulic "restriction" is represented by the fault barrier in the area adjacent to drinking water wells. Given that drinking water wells exit in the Edna Member directly across the fault from the proposed exemption area, the idea that the fault "restricts" water flow should be evaluated using an aquifer test where water is added or withdrawn within the exemption area and the hydraulic response in adjacent drinking water wells is measured. Another important line of evaluation would be the use of a numerical groundwater model to simulate conditions of pumping and withdrawal in the exemption area and the hydraulic response in adjacent water wells.

*The proposed area for exemption was scrutinized for accuracy on the extent of the aquifer and review by the State indicates all injection fluids within the proposed area will be contained. An aquifer exemption does not have monitoring requirements attached to it. It is up to the State to approve injection well*

*projects. In the approval to inject, the State imposes requirements to ensure injection is occurring only within the approved area and in accordance with all state laws and regulations. Such requirements could include injection volumes, injecting pressures, and/or location and number of monitoring wells. The public has and will be a part of the approval process and will have an opportunity to submit comments and concerns.*

0001-28

Inward hydraulic gradients are also touted as protecting adjacent drinking water, preventing overflow of water in the bowl to adjacent groundwater. However, the inward gradient may induce flow of groundwater across the fault boundary and across any hydraulic boundary that is represented by the tar sands. Any boundary condition cited by the applicant as an impermeable hydraulic seal isolating the oil field with the adjacent drinking water aquifers, must be evaluated in light of the amount of water that is removed from the oil field, a condition known as dewatering. Since approval of the Project, aquifer dewatering has been actively pursued by the applicant. Over the past two years, net water extraction from the aquifer has averaged of 18,050 barrels, or 2.33 acre-feet/day. The dewatering lowers hydraulic pressure and creates a "sink," according to the applicant. The impact of this pressure sink on inducing flow from adjacent drinking water resources and across the exemption boundaries has not been evaluated and should be tested using aquifer tests and a numeric model.

*Based upon the analysis within the application, there will be a net decrease of the fluid in the aquifer proposed for exemption. Production volumes (outputs) are higher than the injection volumes (inputs) and create a pressure sink towards the center of the production area which helps to prevent the migration of injected fluids. In addition, the proposed exempted area is isolated by the syncline geologic structure that will prevent the movement of injected fluid outside of the proposed exempted area.*