

**GW - 28**

**RCRA  
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2021**



**Certified Mail - Return Receipt Requested**

September 9, 2021

Kawika Tupou  
Environmental Manager  
HollyFrontier Navajo Refining LLC  
P.O. Box 159  
Artesia, New Mexico 88211-0159

**RE: APPROVAL  
REQUEST OF EXTENSION TO RESPOND TO "DISAPPROVAL – EVALUATION OF METHYL  
TERT-BUTYL ETHER (MTBE) IN GROUNDWATER"  
HOLLYFRONTIER NAVAJO REFINING LLC – ARTESIA REFINERY  
EPA ID NO. NMD048918817  
HWB-NRC-19-004**

Dear Mr. Tupou:

The New Mexico Environment Department (NMED) has received HollyFrontier Navajo Refining LLC, Artesia Refinery's (the Permittee) *Request of Extension to Respond to "Disapproval - Evaluation of Methyl Tert-Butyl Ether (MTBE) in Groundwater"* (Request), dated August 11, 2021.

The stated reason for the extension request is to address the extensive nature of the comments and requested revisions to the Report. The Permittee requests a 30-day extension from the original due date of August 31, 2021. NMED finds the basis for the extension request is acceptable in accordance with Permit Section I.J.12 (Extensions of Time) and hereby approves the extension request. The revised Report must be submitted to NMED no later than **September 30, 2021**, as requested.

Mr. Tupou  
September 9, 2021  
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If you have any questions regarding this letter, please contact Michiya Suzuki of my staff at (505) 690-6930.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Ricardo Maestas' with a stylized flourish at the end.

Ricardo Maestas  
Acting Chief  
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB  
L. Tsinnajinnie, NMED HWB  
M. Suzuki, NMED HWB  
T. McDill, NMED EMNRD  
J. Leik, HFNR LLC, Artesia Refinery  
L. King, EPA Region 6 (6LCRRC)

File: Reading File and NRC 2021



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September 9, 2021

Kawika Tupou  
Environmental Manager  
HollyFrontier Navajo Refining LLC  
P.O. Box 159  
Artesia, New Mexico 88211-0159

**RE: APPROVAL  
INTERIM MEASURES REPORT FOR AOC 32 EXCAVATION (WEST AREA) - REVISED  
HOLLYFRONTIER NAVAJO REFINING LLC – ARTESIA REFINERY  
EPA ID NO. NMD048918817  
HWB-NRC-20-004**

Dear Mr. Tupou:

The New Mexico Environment Department (NMED) has completed its review of the HollyFrontier Navajo Refining LLC, Artesia Refinery (the Permittee) *Interim Measures Report for AOC 32 Excavation (West Area) - Revised* (Report), dated March 2021. In the Report, the Permittee acknowledges that the contamination at the site was not fully removed and contamination remains in place where additional removal will compromise facility infrastructure. Therefore, further investigation and/or remediation within AOC 32 may be deferred until the area becomes accessible. All comments in the NMED's November 19, 2020 Disapproval were adequately addressed and NMED hereby provides this Approval.

This approval is based on the information presented in the document as it relates to the objectives of the work identified by NMED at the time of review. Approval of this document does not constitute agreement with all information or every statement presented in the document.

Mr. Tupou  
September 9, 2021  
Page 2

If you have any questions regarding this letter, please contact Michiya Suzuki of my staff at (505) 690-6930.

Sincerely,

A handwritten signature in blue ink, appearing to read "Ricardo Maestas" with a stylized flourish at the end.

Ricardo Maestas  
Acting Chief  
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB  
L. Tsinnajinnie, NMED HWB  
M. Suzuki, NMED HWB  
T. McDill, NMED EMNRD  
J. Leik, HFNR LLC, Artesia Refinery  
L. King, EPA Region 6 (6LCRRC)

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MICHELLE LUJAN GRISHAM  
GOVERNOR

JAMES C. KENNEY  
CABINET SECRETARY

**Certified Mail - Return Receipt Requested**

September 2, 2021

Mr. Kawika Tupou  
Environmental Manager  
HollyFrontier Navajo Refining LLC  
P.O. Box 159  
Artesia, New Mexico 88211-0159

**RE: APPROVAL  
EVALUATION OF SOIL FOR POTENTIAL REUSE –  
TANK 20 AND TANK 21 FOUNDATION EXCAVATIONS  
HOLLYFRONTIER NAVAJO REFINING LLC, ARTESIA REFINERY  
EPA ID NO. NMD048918817  
HWB-NRC-MISC**

Dear Mr. Tupou:

The New Mexico Environment Department (NMED) has reviewed HollyFrontier Navajo Refining LLC, Artesia Refinery's (the Permittee) letter, *Evaluation of Soil for Potential Reuse – Tank 20 and Tank 21 Foundation Excavations*, dated June 23, 2021 and received June 25, 2021 and hereby issues this Approval.

The Permittee excavated soils to install two new tanks, Tanks 20 and 21, at Area of Concern (AOC) 3 (Southeast Tank Farm) located on the eastern side of the Refinery. Approximately 300 cubic yards of soil were excavated from the location of Tank 20 during construction activities. An estimated 100 cubic yards of visibly impacted soil was transported off-site for disposal. The remaining 200 cubic yards is stockpiled onsite). Approximately 10,000 cubic yards of soil was removed for the Tank 21 foundation. The excavation boundary for the Tank 20 foundation was approximately 86.5 feet in diameter and 2 feet in depth. The excavation boundary for the Tank 21 foundation was approximately 86.5 feet in diameter and 5 feet in depth. The Permittee collected one field composite soil sample, two discrete soil samples and one field duplicate soil sample from the soils excavated for the Tank 20 foundation and one field composite soil sample,

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ten discrete soil samples and one field duplicate soil sample from the soils excavated for the Tank 21 foundation.

### **Tank 20**

One field composite soil sample was analyzed for total petroleum hydrocarbons (TPH) diesel range organics (DRO), motor oil range organics (ORO), arsenic, lead, mercury, and selenium. Two discrete soil samples and one field duplicate soil sample were analyzed for TPH gasoline range organics (GRO), benzene, toluene, ethylbenzene, total xylenes (BTEX), methyl tert butyl ether (MTBE), and naphthalene.

NMED has reviewed the laboratory results for the Tank 20 composite, discrete and field duplicate soil samples. Although the composite soil sample exceeded residential (Res) soil screening levels (SSLs) for ORO (1,170 mg/kg), the synthetic precipitation leaching potential (SPLP) result (<0.0118 mg/L) was below the screening level for the unknown oil source. The results for the rest of the soil samples did not contain concentrations of contaminants (COCs) greater than the industrial/occupational (Ind/Occ) and construction worker (CW) SSLs or TPH GRO for all of the applicable SSLs. Therefore, NMED approves the Permittee's request to reuse the remaining 200 cubic yards of stockpiled soil as backfill or for the construction of tank or unit secondary containment berms within the boundary of the active Refinery.

### **Tank 21**

One field composite soil sample was analyzed for TPH DRO, ORO, arsenic, lead, mercury, and selenium. Ten discrete soil samples and one field duplicate soil sample were analyzed for TPH GRO, BTEX, MTBE, and naphthalene.

NMED has reviewed the laboratory results for the Tank 21 composite, discrete and field duplicate soil samples. Soil sample T21-SPOILS-05 was the only soil sample to exceed all of the applicable SSLs for GRO (554 mg/kg) and the SPLP results (0.147 mg/kg) for gasoline and unknown oil. The rest of the soil samples did not contain COCs greater than the Res, Ind/Occ, and CW SSLs. Therefore, NMED approves the Permittee's recommendation to characterize and dispose of 100 cubic yards of soil from the area surrounding sample location T21-SPOILS-05 and to reuse the remaining stockpiled soil as backfill or for the construction of tank or unit secondary containment berms within the boundary of the active Refinery.

This approval is based on the information presented in the document as it relates to the objectives of the work identified by NMED at the time of review. Approval of this document does not constitute agreement with all information or every statement presented in the document.

Mr. Tupou  
September 2, 2021  
Page 3

If you have any questions regarding this letter, please contact Leona Tsinnajinnie of my staff at (505) 690-7820.

Sincerely,



Dave Cobrain  
Program Manager  
Hazardous Waste Bureau

cc: L. Tsinnajinnie, NMED HWB  
M. Suzuki, NMED HWB  
T. McDill, EMNRD OCD  
J. Leik, HFNR LLC  
L. King, EPA Region 6 (6LCRRC)

File: Reading File and NRC 2021



**Certified Mail - Return Receipt Requested**

July 15, 2021

Kawika Tupou  
Environmental Manager  
HollyFrontier Navajo Refining LLC  
P.O. Box 159  
Artesia, New Mexico 88211-0159

**RE: DISAPPROVAL  
DESKTOP GROUNDWATER RECEPTOR SURVEY AND VAPOR INTRUSION EVALUATION  
OF OFF-SITE RECEPTORS, APRIL 2019  
HOLLYFRONTIER NAVAJO REFINING LLC – ARTESIA REFINERY  
EPA ID NO. NMD048918817  
HWB-NRC-19-003**

Dear Mr. Tupou:

The New Mexico Environment Department (NMED) is in receipt of the HollyFrontier Navajo Refining LLC, Artesia Refinery's (Permittee) *Desktop Groundwater Receptor Survey and Vapor Intrusion Evaluation of Off-Site Receptors* (Memorandum), dated April 2019. NMED has reviewed the Memorandum and hereby issues this Disapproval with the following comments.

**Comment 1**

None of the figures included in the Memorandum identifies the south end of the Facility property boundary located across Highway 82. Provide an additional figure that depicts the full extent of the Facility property boundary to include the southern property.

**Comment 2**

Volatile organic compounds (VOCs) have been detected in groundwater samples collected from the wells located in the vicinity of Eagle Creek. Although there are buildings/structures along Eagle Creek, receptors present in the area are not included in the discussion of the Memorandum. Revise the Memorandum to include Eagle Creek in the discussion.

**Comment 3**

In the *Groundwater Conditions – Hydrogeology* Section, page 3, bullet 1, the Permittee states, "[s]tatic water levels in groundwater monitoring wells completed within this zone are three to

five feet above the top of the shallow saturated zone, indicating groundwater in this zone is under confined conditions for some or most of the year.” It is not clear if the Permittee’s observation defines the top of the shallow saturated zone from the soil boring logs. Explain how the depth of the shallow saturated zone was determined and provide examples to justify the statement. In addition, provide a table that includes: (1) depths to water, (2) depths to soil saturation encountered during drilling and (3) depths to the screened interval for each well installed in the shallow saturated zone. Also, provide a discussion using data from the table to demonstrate that the aquifer is confined.

**Comment 4**

In the *Groundwater Conditions – Hydrocarbon Plumes* Section, page 5, paragraph 2, the Permittee states, “[d]espite sometimes being under confined conditions, apparent PSH thicknesses in wells screened in the shallow saturated zone are generally inversely affected by fluctuations in groundwater elevations. Confined conditions result in the apparent in-well PSH elevation being higher than the actual PSH elevation in [the] formation.” Based on the statement, the PSH column thickness appears to increase as the groundwater elevation decreases at the site. This phenomenon may be characterized by an unconfined or leaky confined aquifer; therefore, the shallow aquifer at the site may be characterized as a leaky confined aquifer demonstrating the characteristics of unconfined conditions or as unconfined. Provide additional information to support that the shallow aquifer is under confined conditions or revise the statement, as appropriate.

**Comment 5**

In the *Water Wells* Section, page 6, paragraph 2, the Permittee states, “Table 1 summarizes the results of the AEA records search of potential shallow water [supply] wells located within 0.25 miles of the current extent of benzene and MTBE detections in shallow groundwater.” Contaminant plumes are not necessarily stationary, and the full extent of the plumes is not defined; therefore, the AEA records search of potential groundwater receptors must be expanded for the radius up to one mile from the plume boundaries. Revise the appropriate sections of the Memorandum.

**Comment 6**

In the *Water Wells* Section, page 6, paragraph 2, the Permittee states, “[t]he discrepancy between the [New Mexico Water Rights Reporting System (NMWRRS)] record locations and actual locations (based on Navajo sampling event data and records) can be [sic] seen on Figures 2 and 3 for the irrigation wells that are currently included in the Navajo facility-wide groundwater monitoring program: RA-01227, RA-03156, RA-04196, and RA-04798.” There appears to be a discrepancy with identifying the well locations in Figures 2 and 3. For example, two different locations for well RA-01227 are depicted in Figures 2 and 3. Therefore, it is not clear which wells identified on the figures are from the NMWRRS record locations or are the actual locations identified by the Facility. Identify the NMWRRS and actual well locations on the figures and indicate if they were NMWRRS or actual locations in the legend.

**Comment 7**

In the *Water Wells* Section, page 6, paragraph 3, the Permittee states, “[t]he only identified water wells that are located within the benzene and MTBE shallow groundwater plumes downgradient of the Facility are irrigation wells RA-04196 and RA-04798, which are sampled on a semiannual basis as part of the facility-wide groundwater monitoring program.” However, water wells RA-03890, RA-00768, RA-02723, and RA-01097 are also located within the extent of the plumes where water well RA-02723 is located downgradient of the Facility. Revise the statement to include the additional water wells.

**Comment 8**

In the *Water Wells* Section, page 7, paragraph 1, the Permittee states, “[w]ells RA-02342, RA-23420, and RA-11688 are also located outside the historical target VOC CGWSLs exceedance area.” However, the Permittee has not been able to locate wells RA-02342 and RA-23420. According to the figures, wells RA-02342 and RA-23420 are located west of the leading edge of the plumes. If these wells can be located, they may provide useful data for plume delineation. Investigate whether or not wells RA-02342 and RA-23420 exist and use data from these wells to further delineate the plume. Revise the Memorandum accordingly.

**Comment 9**

In the *Residences* Section, page 7, paragraph 1, the Permittee states, “[a]erial imagery and Eddy County Tax Assessor records were used to identify potential residences located within 0.25 miles (1,320 feet) downgradient or [cross-gradient] of the current lateral extent of benzene and MTBE detections in shallow groundwater.” Because of the mobility of the plume, all residences located up to a mile from the plume boundaries must be identified (see Comment 5). Revise the Memorandum accordingly.

**Comment 10**

In the *Residences* Section, page 7, paragraph 1, the Permittee states, “[f]ive residential properties were identified, as summarized in Table 2, and their locations are shown on Figures 2, 3, and 4.” The figures also depict two additional residences with access to the public water supply north and south of the Facility refinery fence line. Although there would be no potential exposure to the groundwater at these locations, the risk associated with vapor intrusion (VI) at these two locations must be evaluated because there are potential subsurface structures that may allow contaminants to enter these residences (e.g., piping). Include the discussion in the revised Memorandum.

**Comment 11**

In the *Residences* Section, page 7, bullet 1, the Permittee states, “[b]ased on the direction of groundwater flow and the extensive conceptual site model for the Facility (i.e., preferential groundwater flow pathways within gravel channels to the south of this area, as described in the April 2017 Revised Contaminant Migration Evaluation Investigation Report [Revised CME Report]), it appears the presence of the MTBE plume in the vicinity of NP-1 is isolated relative to the main groundwater plume.” The referenced report is not an approved document. The

reference must not be used and must be removed from the Memorandum. In addition, according to Figure 3, there are no groundwater monitoring wells located in the vicinity of well NP-1 to verify whether or not the MTBE plume is isolated around that well. The Permittee must provide additional information to support that the plume is isolated and must provide the work plan to install an additional monitoring well in accordance with the NMED's *Disapproval Evaluation of Methyl Tert-Butyl Ether (MTBE) in Groundwater*, dated May 7, 2021. Revise the Memorandum accordingly.

**Comment 12**

In the *Residences* Section, page 7, bullet 2, the Permittee states, “[t]he extent of the benzene, MTBE, and PSH plumes in shallow groundwater to the west of this property [Parcel ID 4-154-098-397-381] is not fully delineated.” There is a shallow irrigation well located south of the property identified as RA 00400 or RA 01183. Evaluate the shallow irrigation well (RA 00400 or RA 01183) to determine whether the well is suitable for use in the delineation of the contaminant plumes.

**Comment 13**

In the *Residences* Section, page 8, bullet 2, the Permittee states, “Navajo observed one apparent domestic well (likely RA-03195) located near the residential structure on this parcel, but the well did not appear to be operable. As shown on Table 1 and in supplemental well records provided in Attachment C, the well record for RA-03195 is associated with the repair of irrigation well RA-00397 (completed in the deep artesian aquifer) and therefore this well may not exist.” The information provided in this statement is not clear. Part of the statement indicates that well RA-03195 exists and was associated with the repair of irrigation well RA-00397 while the other part of the statement indicates that the well does not exist. The Permittee may be suggesting that wells RA-03195 and RA-00397 are the same well; however, these wells are more than 500 feet apart (as depicted on the figures) and are not likely to be the same well. Investigate whether or not both wells RA-03195 and RA-00397 exist and clarify the statement in the revised Memorandum.

**Comment 14**

In the *Pecan Orchard* Section, page 8, paragraph 1, the Permittee states, “[t]he Pecan Orchard is located immediately downgradient to the east of the Facility and is present above the benzene and MTBE shallow groundwater plumes and the PSH plume. The Pecan Orchard operates a subsurface “pecan pit” where harvested pecans are temporarily deposited and then moved into the pecan plant by means of a conveyor belt system. This pit is located within an open-air structure along the western property boundary of the Pecan Orchard immediately downgradient of a Navajo recovery trench.” Figure 5 depicts the location of the Pecan Orchard plant; however, the location of the subsurface pecan pit is not identified in the figure. In addition, the Memorandum states that the pecan pit is equipped with a French drain with pumps. Provide a revised figure with the location and dimensions of the pit, and a schematic of the pit including all equipment associated with its operation in the revised Memorandum. Provide the figure to scale, and if appropriate, a call out box with the details.

**Comment 15**

In the *Pecan Orchard* Section, page 8, paragraph 1, the Permittee states, “[p]rior to liner installation, the pit was subject to fluctuating groundwater levels that could cause infiltration of shallow groundwater and PSH. The depth of the pit is approximately 16 feet bgs and is lined on the exterior.” Due to the potential presence of PSH at the pit location, it would be beneficial if the liner is capable of preventing both polar and non-polar constituents from entering the pit (e.g., high-density polyethylene (HDPE) and ethylene vinyl alcohol (EVOH)). Verify the composition of the liner in the pit and provide a statement in the revised Memorandum about the liner’s ability to prevent VOCs from entering the pit.

**Comment 16**

In the *Pecan Orchard* Section, page 9, paragraph 1, the Permittee states, “RA-04196 is screened within the valley fill zone (from 280 to 292 feet bgs) and RA-04798 is screened in the deep artesian aquifer (from 840 to 850 feet bgs), as documented in Navajo’s monitoring plans and reports. RA-04798 was misidentified as a shallow domestic water well within the [New Mexico Office of the State Engineer (NMOSE)] records search, but it is actually an irrigation well. No target VOCs have been detected in exceedance of CGWSLs in either of these irrigation wells based on sampling since 2006. In addition, the deep artesian aquifer is not considered to be hydraulically connected to the valley fill alluvium.” MTBE has been detected below the applicable critical groundwater screening levels (CGWSLs) in groundwater samples collected from these wells. Therefore, it is premature to conclude that the deep artesian aquifer is not hydraulically connected to the valley fill alluvium based on the absence of exceedances of CGWSLs for the target VOCs. MTBE has a high solubility, making it the most mobile VOC and would be a better indicator for determining the hydraulic connectivity between the deep artesian aquifer and the valley fill alluvium. Re-evaluate the information using MTBE analytical data to demonstrate that the deep artesian aquifer is not hydraulically connected to the valley fill alluvium. The NMED’s *Disapproval Evaluation of Methyl Tert-Butyl Ether (MTBE) in Groundwater*, dated May 7, 2021, requires a work plan to investigate the extent of MTBE in the valley fill and artesian aquifers. Revise the statement accordingly.

**Comment 17**

In the *Facility Groundwater Monitoring Network and Program Effectiveness* Section, page 10, bullet 1, the Permittee states, “[t]he [cross-gradient] extent of [benzene and PSH] is not defined on the Facility to the south of monitoring wells M-58 and MW-132. Navajo now owns a majority of the land and water rights to the south of these wells. Additional monitoring wells are not required in this area to monitor or control the PSH and benzene plumes as groundwater is consistently flowing to the east and PSH and benzene have not historically been detected in monitoring wells [KWB-13 and MW-57].” The statement is not accurate. Although the groundwater does appear to flow east, there are monitoring wells south of U.S. Highway 80 that contain PSH and benzene. Monitoring wells MW-109, MW-110, KWB-2R and MW-58 are south of U.S. Highway 80 and have reported MTBE detections. In addition, the benzene and PSH plumes have not been properly delineated in this area because there are not enough wells south of U.S. Highway 80 to fully characterize the benzene and PSH plumes. The Permittee did

not include a statement about the lack of monitoring wells south of U.S. Highway 80 which would help to delineate the cross-gradient extent of benzene plume south of U.S. Highway 80. Revise the statement to clarify that the area south of U.S. Highway 80 is not fully delineated because of a lack of monitoring wells across U.S. Highway 80. In addition, NMED is aware that the Permittee has acquired the property south of the Facility and U.S. Highway 80. Propose to install additional monitoring wells to properly delineate the area south side of U.S. Highway 80.

**Comment 18**

In the *Facility Groundwater Monitoring Network and Program Effectiveness* Section, page 11, paragraph 1, the Permittee states, “[a]dditional monitoring wells installed to the west of monitoring well NP-1, near the southwestern and eastern corners of the upgradient residential property (Parcel ID 4-153-098-515-219), are recommended to better delineate the isolated MTBE plume.” PSH is present in well MW-133 and there is no monitoring well located between well MW-133 and well NP-1. PSH in the vicinity of well MW-133 may potentially be a source of MTBE in well NP-1. Propose to install an additional monitoring well between well MW-133 and well NP-1 downgradient of the wells currently proposed in the area to delineate the MTBE plume.

**Comment 19**

In the *Dataset Used in the Vapor Intrusion Evaluation* Section, page 12, paragraph 1, the Permittee states, “[t]he samples utilized in this [vapor intrusion (VI)] evaluation are presented in Table 3 and include groundwater data collected from 2016 through 2018.” Table 3 does not include all of the data collected from the wells located within 100 feet of the building/structure where PSH is present or constituent concentrations exceed the screening levels (e.g., RW-12). All data that are relevant for the evaluation of VI must be included in the revised Memorandum.

**Comment 20**

The *Selection of Constituents of Concern* Section, pages 13 through 14, summarizes the discussion regarding the comparison of maximum detected concentrations (MDCs) to NMED vapor intrusion screening levels (VISLs). These comparisons are used to identify constituents of concern (COCs) that are retained for further evaluation. The comparisons yield six COCs, limited to wells KWB-7 and KWB-8. Section 2.5.2 (Evaluation of the Vapor Intrusion Pathway) from NMED’s *2019 Evaluation of the Vapor Intrusion Pathway, of Risk Assessment Guidance for Site Investigations and Remediation Volume I Soil Screening Guidance for Human Health Risk Assessments* (2019 NMED SSG) indicates site VI investigations should be classified as one of three designations: 1) incomplete pathway and no action required; 2) potentially complete pathway and a qualitative evaluation required; or 3) complete pathway and quantitative evaluation required. According to the information presented in the Memorandum, the VI pathway is potentially complete and must be subjected to a quantitative evaluation as described in Section 2.5.2.3 (Complete Pathway; Quantitative Assessment) of the 2019 NMED SSG (i.e., consistent detections of constituents with MDCs that exceed the applicable VISLs, existence of potential exposure point for receptors, exceedances of applicable VISLs, suspected

source of volatile and toxic constituents in groundwater at KWB-7 and KWB-8). As described in Section 2.5.2.3 of the 2019 NMED SSG, the cumulative risk and hazard over all analytes at the two well locations must be calculated, and the results presented in the revised Memorandum. While not reported in the Memorandum, the six COCs that exceeded the groundwater VISLs at well KWB-8 represent relatively high estimates of cancer risk ( $8 \times 10^{-3}$ ) and hazard (11). By itself, the benzene exceedance detected in well KWB-7 results in a risk of  $2 \times 10^{-5}$ , which is higher than the NMED risk target level of  $1 \times 10^{-5}$ . In addition, the results must be retained for summation with other sites risks impacting the same receptor populations (e.g., indoor/outdoor industrial workers at the Pecan Orchard Plant). Revise the Memorandum to include an estimate of cumulative risk and hazard for all applicable analytes at KWB-7 and KWB-8.

#### **Comment 21**

The *Lines of Evidence Approach* Section, page 14, paragraph 2, lists the lines of evidence (LOE) considered in the Memorandum in evaluation of the off-site VI pathway that are VISL exceedances, separation distance between the groundwater source and building foundations, identification of buildings within 100 feet of the VISL exceedances, concentration trends in wells KWB-7 and KWB-8, and the presence of phase separated hydrocarbons (PSH) in wells as the applicable LOE. These LOE are discussed in detail in subsequent sections of the Memorandum. Section 2.5.2.3 of the 2019 NMED SSG states that the following LOE also be considered in cases where the applicable VISLs have been exceeded:

- a) Information on vapor migration and attenuation in the vadose zone (e.g., soil gas data that represents spatial and vertical variations in soil gas concentrations, identification of any preferential pathways for vapor transport between the source and buildings).
- b) Information on building foundations (e.g., information on construction materials, openings in the foundation, heating/cooling/ventilation system characteristics, photoionization detector readings at potential openings to the subsurface, indoor air samples, and information on building pressure gradients).
- c) Information on the building interior including subslab soil gas measurements, results of site-specific transport modeling, comparisons of subslab soil gas and indoor air sampling results to determine site-specific attenuation factors.
- d) Information on potential sources of VOCs within the building and in ambient air.

Other than noting slab on grade construction for the Pecan Orchard Plant buildings, the Permittee did not include information that addressed these bulleted items in the Memorandum. However, the *Recommendations* Section, pages 16 through 17, recommends collection of geotechnical parameters and information on existing buildings so that LOE for these four bulleted items can be developed for the site. Revise the Memorandum to indicate that the additional information identified in the *Recommendations* Section will be collected to

develop LOE on vapor migration and attenuation, building construction features and interiors, and information on potential sources of VOCs within such buildings or in the ambient air for locations potentially affected by VI. The revised Memorandum must also state that all LOE will be used to refine the conceptual site model (CSM) and develop a thorough characterization of the subsurface vapor source. In addition, indicate that all LOE will be evaluated for concordance and note that further evaluation of VI concerns for the site will be informed by the evaluation of all developed LOE as outlined in the revised *Recommendation* Section.

**Comment 22**

The *Separation Distance Criteria* Section, pages 14 through 15, states that the depth to groundwater for off-site groundwater monitoring/recovery wells with residential VISL exceedances was measured to determine whether adequate separation distance exists between the groundwater vapor source and site building foundations. The Permittee cites USEPA's *Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites*, dated June 2015 (OUST VI Guidance) recommendation of six feet as the maximum vertical separation between a groundwater vapor source of concern and the bottom of the foundation of a potentially impacted building. However, page 3 of the OUST VI Guidance indicates that petroleum contamination at sites that are not comparable to underground storage tank sites should be addressed under USEPA's *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air*, dated June 2015 (OSWER VI Guidance). Refineries are the first example listed as a type of facility not covered by the OUST VI Guidance. Therefore, the use of the vertical separation distance criterion from the OUST VI Guidance must not be used as an LOE as it is not appropriate for use at this type of facility. Revise the Memorandum to eliminate the use of a vertical separation distance of six feet between the water table and the bottom of potentially impacted buildings as a LOE for eliminating concerns related to the VI pathway. Revise all affected sections and tables (e.g., Table 8) accordingly.

**Comment 23**

In the *Building Distance Criteria* Section, page 15, paragraph 2, the Permittee states that the OSWER VI Guidance recommends 100 feet as an adequate radial distance between a building and the location of a VISL exceedance to prevent the building from exerting enough advective force to pull vapors from the subsurface through cracks in the building's foundation. The Permittee applies this condition to exclude the VISL exceedances at well KWB-7 from further evaluation. Furthermore, Figure 5, *Groundwater Vapor Intrusion Screening Level Exceedances and PSH Requiring Further Evaluation*, depicts well KWB-8 within 100 feet of an existing building foundation at the Pecan Orchard Plant and also depicts well KWB-7 located east of well KWB-8; therefore, confirming that the 100-foot radius surrounding well KWB-7 does not capture any currently identified off-site receptors associated with the Peach Orchard Plant or nearby residences.

The OSWER VI Guidance indicates a buffer zone of approximately 100 feet can often be used to define an initial lateral inclusion zone for vapor intrusion assessment (i.e., for identifying

buildings that are 'near' a subsurface vapor source and generally warrant assessment) where the 100-foot buffer represents a lateral or vertical distance between a building foundation and the boundary of subsurface vapor concentrations. The OSWER VI Guidance also notes that the 100-foot distance assumes no significant surface cover present and the existence of no preferential vapor migration routes in the subsurface. The OSWER VI Guidance also allows for determination of a site-specific lateral inclusion zone based on the evaluation of subsurface vapor migration characteristics. The OSWER VI Guidance acknowledges that anecdotal evidence at some sites indicates buildings greater than 100 feet from the boundary of subsurface vapor contamination are affected by vapor intrusion, even when diffusion is the presumed mechanism of vapor migration. Furthermore, the presence of conduits like sewer and drain lines that intercept and carry subsurface contamination, as well as permeable bedding for sewer lines or other utilities, constitute preferential hydrogeologic pathways that facilitate unattenuated vapor migration in the vadose zone. Also, uncertainties in delineating applicable boundaries may extend the recommended inclusion distance for a vapor intrusion investigation.

Figures 1, 2, and 3 indicate that wells KWB-7 and KWB-8 fall within the plumes defined by the historical extent of target VOC exceedances of CGWSLs, benzene concentrations of 0.0001 milligrams per liter (mg/L), and MTBE concentrations of 0.0001 mg/L, respectively. The figures also indicate that the two wells are located within plume areas where PSH is present. In addition, the Memorandum does not present any information on vapor migration in the vadose zone, the possible existence of preferential vapor migration routes, or the impact of future changes in land use and/or future structure and receptor locations. Based on the information provided in the Memorandum, development of a site-specific lateral buffer zone appears warranted for areas within the plume boundaries potentially impacted by VI. Revise the Memorandum to clearly state that well KWB-7 can be eliminated from the initial VI evaluation because no buildings are present within 100 feet of the well location. In addition, revise the Memorandum to indicate that well KWB-7 will be considered in further VI evaluations and will ultimately be retained or eliminated based on vapor migration characteristics in the vadose zone and the potential for off-site receptors to locate within the plume boundaries in the vicinity of well KWB-7 in the future.

#### **Comment 24**

In the *Presence of PSH* Section, page 15, paragraph 4, the Permittee states, "[a] final line of evidence evaluates whether PSH present in seven off-site groundwater monitoring/recovery wells (KWB-4, KWB-7, KWB-8, RW-15C, RW-20A, RW-20B and RW-22) may present a VI concern to nearby building occupants (within 100 feet laterally), which is summarized in Table 9." The Permittee must also include wells with PSH where the lateral distance from the nearest building/structure exceeds 100 feet but the extent of the PSH from the wells is not completely delineated (e.g., MW-132) in the VI evaluation. In addition, according to Figure 1, there appears to be more off-site buildings/structures approximately 100 feet north and northeast from well MW-58 where PSH is present. Identify these buildings/structures and evaluate VI risk for the buildings/structures, as appropriate.

**Comment 25**

In the *Lines of Evidence Conclusions* Section, page 16, paragraph 1, the Permittee states that only two wells, KWB-8 and RW-22, indicate a potential VI concern for off-site workers. The remaining wells currently identified as off-site receptors are not considered at-risk due to VI based on the LOE approach presented in the Memorandum. Further evaluation of KWB-8 and RW-22 in relation to the Pecan Orchard Plant buildings is recommended by the Permittee. While NMED agrees that further evaluation around wells KWB-8 and RW-22 is warranted, the VISL exceedance at well KWB-7 must not be excluded from the VI evaluation. The single exceedance represents an elevated level of risk via the VI pathway without consideration of the contribution of other target VOCs at well KWB-7. The well's location and the lack of sufficient LOE for dismissing the groundwater VISL exceedance supports further consideration of potential impacts from VI in the vicinity of well KWB-7. Revise the discussion to include well KWB-7 among the areas recommended for further evaluation of VI. The Permittee must provide sufficient LOE to support exclusion of the area around well KWB-7 from further VI evaluation.

**Comment 26**

The *Data Gaps and Limitations, Off-Site Vapor Intrusion Evaluation* Section, page 16, paragraph 5, notes the need for geotechnical parameter values to further evaluate potential VI exposure and the information related to vapor migration in the vadose zone (possibly including collection of active soil vapor samples), information on the potential existence of preferred migration pathways in the subsurface, and information on potential future construction within the plume boundaries depicted in Figures 1, 2, and 3, to better characterize impacts to off-site receptors through the VI pathway. This information must be provided and the evaluation of the VI pathway updated based on the results. Revise the discussion of data gaps and limitations to include the need to obtain this type of information.

**Comment 27**

In the *Recommendations* Section, pages 16 through 17, the Permittee recommends conducting VI modeling using groundwater data from well KWB-8 to determine any potential risk and hazard through the VI pathway at the Pecan Orchard Plant buildings. If the predicted indoor air risk based on VI modeling is unacceptable, the Permittee recommends collection of soil gas data and further VI modeling of the Pecan Orchard Plant buildings. Based on the information provided in the Memorandum (e.g., elevated risk and hazard levels at well KWB-8 stemming from groundwater VISL exceedances) it is not clear that the Permittee's recommendations for further evaluation of the VI pathway will address current conditions at the Pecan Orchard Plant buildings in a timely and effective manner. In addition, the recommendations do not appear to reflect the approach outlined in the NMED SSG and USEPA's OWSWER VI Guidance for further evaluation of the VI pathway. Given the elevated preliminary risk and hazard estimates at well KWB-8, the potential for risks in excess of NMED's target level of  $1 \times 10^{-5}$  at well KWB-7, and the lack of information on subsurface vapor migration, building characteristics, and the potential for future construction within the plume boundaries, the discussion must be revised to indicate timely actions will be taken to fully assess current site conditions and that those actions (as well

as any future actions related to VI that result from the assessment of current conditions in the vicinity of wells KWB-7 and KWB-8) will be communicated and agreed to beforehand by NMED, OCD, and the Permittee. To ensure expectations are met, indicate that the agreed to approach will be documented in a way that does not delay work at the site and clearly establishes a basis for reporting the result of all future VI evaluations at the site in the revised Memorandum.

**Comment 28**

In the *Recommendations* Section, page 17, paragraph 1, the Permittee proposes to, “[i]nstall two monitoring wells near the residential property with Parcel ID 4-153-098-515-219 as shown on Figures 2 and 3, to identify whether the potential domestic water well RA-10378 is affected by the dissolved-phase hydrocarbon plume.” Propose to collect groundwater samples from well RA-10378 to identify if the well is affected in the revised Memorandum.

**Comment 29**

In the *Recommendations* Section, page 17, bullet 1, the Permittee proposes to, “[i]nstall one monitoring well to the north of monitoring well MW-133, near the southwestern corner of Parcel ID 4-153-098-515-219, to better delineate the [cross-gradient] extent of the benzene and MTBE plumes.” The proposed well is located more than 700 feet north of well MW-133 where the contaminants are detected; therefore, the location of the proposed well may be too far from the edge of the plumes and may be insufficient for delineation. Propose to install an additional well halfway between well MW-133 and the current location of the proposed well or propose another location for the proposed well to better define the plumes in the revised Memorandum.

**Comment 30**

In the *Recommendations* Section, page 17, bullet 2, the Permittee proposes to, “[i]nstall one monitoring well to the west of monitoring well NP-1, across Bolton Road from the eastern portion of Parcel ID 4-153-098-515-219, to better delineate the upgradient extent of the isolated MTBE plume near monitoring well NP-1.” It is not appropriate to reference the area surrounding well NP-1 as the “isolated MTBE plume” because there has been no clear demonstration that the plume is isolated. There are currently no other groundwater monitoring wells in the area that would support the statement that the site as an “isolated plume.” Propose to install a monitoring well between NP-1 and MW-133 to determine whether the plume is isolated. Revise the statement by removing “isolated” in the revised Memorandum.

**Comment 31**

In the *Recommendations* Section, page 17, bullet 5, the Permittee proposes to, “[c]ontinue mitigation activities at the Pecan Orchard pit to continue to ensure impacted groundwater and PSH do not infiltrate the pit.” Include a description of on-going activities associated with mitigation of impacted groundwater and PSH in the revised Memorandum. Currently, the PSH recovery pilot test involving injection of the extracted groundwater was proposed and approved by NMED. Future remediation activities may affect the scope of the Memorandum.

The mitigation activities may need to be modified based on the effects of future remediation activities and must be re-evaluated after remediation activities are completed.

**Comment 32**

According to Table 6 (Selection of Off-Site Residential Groundwater Vapor Intrusion COCs), the constituents with MDCs that exceed the VISLs are retained as COCs; however, the NMED SSG states, “[i]t is emphasized that the NMED VISLs are not meant to be used as action standards or cleanup levels. Rather, they should be used as a tool to estimate potential cumulative risks.” Accordingly, the constituents detected below the VISLs must also be retained to estimate potential cumulative risks. The NMED SSG also states, “if multiple chemicals are present, a health threat may exist at a specific building or site even if none of the individual substances exceeds its VISL.” Revise the Memorandum to follow the quantitative assessment method described in the NMED SSG.

**Comment 33**

According to Figures 2 and 3, the benzene, MTBE and PSH plumes are present beneath the Pecan Orchard. Some trees readily absorb organic contaminants from the roots. Evaluate whether the roots of the pecan trees reach the depth of shallow groundwater zone. Include a discussion regarding the possibility of the accumulation of organic contaminants in the pecan trees if the roots reach the shallow groundwater zone in the revised Memorandum.

**Comment 34**

In Attachment B, *Transmittal Letter RE: Limited Updated to Draft Report of Navajo Refining Company Possible Shallow Receptor Records Study Artesian, NM* (February 2016), page 2, the Permittee states that, “[c]opies of the database query spreadsheets are attached. Cells with noted changes are highlighted yellow in both query iterations. Cells without changes are highlighted green in the 2019 queries.” The Permittee did not provide a description for the status of wells that are not highlighted yellow or green. In the response letter, provide the status of the wells that are not highlighted by yellow or green.

**Comment 35**

Chlorinated solvents (e.g., TCE) have been historically detected in the groundwater samples collected at the Facility. The Permittee must prepare to analyze for 1,4-dioxane using EPA Method 8270 SIM for the groundwater samples collected from all monitoring wells where chlorinated solvents have been detected within the past ten years. Propose to analyze for 1,4-dioxane for two consecutive events in the upcoming Facility-Wide Groundwater Monitoring Plan. NMED will review the results from the events and determine if additional sampling is required.

**Comment 36**

Upon review of the Memorandum, it is clear that the off-site receptor survey is limited to current receptors and current buildings and structures: future conditions are not addressed. The Memorandum concluded that current conditions do not present a risk to existing

downgradient, off-site receptors through direct contact (i.e., ingestion and dermal contact) with shallow groundwater. However, it could be possible for Pecan Orchard Plant workers to be exposed to COCs in the Plant buildings through the VI pathway. The lack of information in the Memorandum about future off-site land use, downgradient off-site receptors, and construction in relationship to future plume conditions has not been identified and is considered a data gap. Revise the Memorandum to acknowledge this data gap and include a discussion to address these future off-site conditions.

The Permittee must submit a revised Memorandum that addresses all comments contained in this letter. Two hard copies and an electronic version on a CD/DVD of the revised Memorandum must be submitted to NMED. The Permittee must also include a redline-strikeout version of the Memorandum in electronic format showing where all revisions to the Memorandum have been made. The revised Memorandum must be accompanied with a response letter that details where all revisions have been made, cross-referencing NMED's numbered comments. The revised Memorandum must be submitted to NMED no later than **December 31, 2021**.

Should you have any questions, please contact Michiya Suzuki of my staff at 505-690-6930.

Sincerely,

A handwritten signature in blue ink, appearing to read "Ricardo Maestas", with a long horizontal flourish extending to the right.

Ricardo Maestas, Acting Chief  
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB  
L. Tsinnajinnie, NMED HWB  
M. Suzuki, NMED HWB  
J. Leiks, HFNR LLC, Artesia Refinery  
M, Holder, HFNR LLC, Artesia Refinery  
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L. King EPA Region 6 (6LCRRC)

File: Reading File and NRC 2021 file