

**Responses to Comments on the Draft Focused Feasibility Study (FS) for OU1 and OU3
NASA Jet Propulsion Laboratory, Pasadena, California**

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NASA-JPL
SSIC No. 9661

Commenter: Gary Takara, Pasadena Water and Power (Received July 24, 2013)

Item	Page	Section/ Paragraph	Comment	Response
1	1	Section 1.0, paragraph 4 and 5	It is not entirely clear to me if the FFS, following comments from the RPMs, becomes the final remedy. It is understood the alternatives in current use and described in the draft FFS may ultimately become the final remedy. It would be helpful to describe how the process transitions from the final FFS to a final remedy.	The last paragraph in Section 1.0 has been modified as follows: "Upon finalization of this Focused FS, the final remedy for OU1 and OU3 will be selected by NASA, in consultation with U.S. Environmental Protection Agency (U.S. EPA), the California Department of Toxic Substances Control (DTSC), and the Regional Water Quality Control Board (RWQCB), and presented in a Proposed Plan that will be available for public review and input. After public review of the Proposed Plan, NASA will respond to public comments and select and describe the final remedy in a final groundwater ROD, addressing groundwater at both OU1 and OU3."
2	3	Section 1.0, paragraph 1	Does a final remedy allow for future modifications, etc. to the OU-3 treatment systems (i.e. optimization plan)?	Yes, the final remedy allows for future modifications and optimization of the OU3 treatment systems. In addition, the current MHTS and LAWC optimization is being pursued as part of the interim remedy for OU3. Upon implementation of the optimization (i.e., system enhancements), the new infrastructure will become part of the MHTS and LAWC system. Upon finalization of the ROD for OU1 and OU3, the enhancements will become part of the Final Remedy. In addition, the remedy will be evaluated at least every five years, as part of the five-year review requirement under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP), which may result in additional optimization of the treatment systems.
3	1	Section 1.0,	Should there be a brief reference to the technical points (at a high level) as described in the optimization plan	The MHTS optimization and the selection of the Final Remedy are separate and independent processes. If for

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		Paragraph 4	considering these would be necessary enhancements of the treatment system?	some reason, the optimization does not happen, NASA would continue to pursue a Final Remedy for groundwater. A Final Remedy for groundwater is required under CERCLA because currently we only have two Interim Remedies. The current LAWC system and the MHTS are operating effectively and are fully protective of human health and the environment. NASA is pursuing the enhancements voluntarily, in an effort to reduce the cleanup timeframe and optimize the systems.
4	7	Section 2.1, Table 2-1	Garfield and Villa wells were also shut down due to perchlorate.	Table 2-1 has been updated to indicate that Garfield and Villa wells were also shut down due to perchlorate.

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Commenter: Alice Campbell, PG, CEG, CHg, Department of Toxic Substances Control (Received August 15, 2013)

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1	11	Figure 2-1	DWR bulletin 104's faults are long out of date. A more recent map with currently identified faults near JPL would be preferable.	Figure 2-1 has been updated with identified faults from the Southern California Earthquake Data Center (2005).
2	11	Section 2.0	A figure showing Monk Hill basin should be included. Figure 2-1 does not show the Monk Hill basin, but the basin is referred to in the text.	Figure 2-1 has been updated to show the Monk Hill Subarea within the Raymond Basin.
3	15, 16	Figures 2-5 and 2-6	A groundwater contour map layer should be added to Fig. 2-5 and 2-6. The small blue arrows are indistinct and oversimplify the flow system.	A groundwater contour map layer has been added to Figures 2-5, 2-6, and 2-7.
4	30	Section 4.3	The Arcadis study indicated that reducing conditions can break down perchlorate. Furthermore, figure 2-3 shows, and the text describes, that soil perchlorate concentrations are not uniform beneath the site, but that perchlorate is mainly localized to identified disposal areas. Although the study was for a barrier-type project, this does not preclude local 'spot' treatment of areas with high concentrations of perchlorate. Review of groundwater monitoring data indicates that wet winters can produce localized releases of high concentrations of perchlorate from the vadose zone, which then travel long distances before being intercepted. The existing treatment cannot treat perchlorate until it has reached groundwater, and the current decline in concentrations may reflect low groundwater levels and lack of recharge due to below-normal rainfall for most of the last decade. The 2005 recharge event occurred when groundwater levels were high, and many wells near source areas (for example MW-13) showed perchlorate spikes from saturation of source area soils. More recently, the wet winter of	<p>NASA has considered vadose zone perchlorate as part of previous efforts and determined that perchlorate has been effectively flushed through the coarse-grained vadose zone geology. In particular, significant resources were utilized during the ARCADIS study to locate vadose zone perchlorate; however, none was found. Excerpts from the Final Feasibility Study Report for OU-2 and the ARCADIS report are provided below.</p> <p>Section 1.3.7 of the Final Feasibility Study Report for Operable Unit 2 (dated July 2000), concluded the following regarding perchlorate: <i>"Finally, ClO₄⁻ is highly soluble, and is not believed to undergo appreciable adsorption in sands and gravels such as those present in the JPL vadose zone. ClO₄⁻ is therefore likely to be highly mobile in vadose zone soils at JPL. In addition, ClO₄⁻ concentrations in on-site groundwater monitoring wells MW-7 and MW-16 (the wells with the highest ClO₄⁻ concentrations) have undergone fairly wide fluctuations, but do not appear to be increasing with time (Foster Wheeler, 2000). Given the mobility of ClO₄⁻</i></p>

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			<p>2010-11 did not show comparable spikes because water levels were nearly 50 feet lower in the source area and soil sources did not saturate despite Dec. 2010's high rainfall. Treating vadose zone soils may be a cost-effective way to reduce overall treatment costs and should be considered in the options.</p>	<p><i>in soils such as those present at JPL, the general lack of increase in ClO_4^- levels in on-site groundwater monitoring wells, and the fact that any potential releases probably occurred over 30 years ago, it is reasonable to assume that most, if not all, of the ClO_4^- has been flushed through the vadose zone."</i></p> <p>The conclusion regarding perchlorate in the OU-2 FS was supported by investigative efforts conducted during the ARCADIS study. Section 3.3 of the March 2004 ARCADIS report states, "Based on earlier investigation efforts, ARCADIS believed that the vadose zone structure in the demonstration area might contain geology supportive of the generation of perched groundwater scenarios. Extensive effort was expended looking for vadose zone perchlorate source area during the installation of each of the wells involved in the pilot study. Though perchlorate is extremely soluble, previous investigation suggested the possibility that perchlorate might accumulate in geology supportive of perched groundwater. Accumulation of perchlorate in a hypothetical perched groundwater setting would represent a continuing subsurface perchlorate source at the JPL site. Consequently, careful planning had been conducted to facilitate remediating any perchlorate detected in the vadose zone using the IRZ technology. Despite the assessment by ARCADIS and NFESC that the vadose zone perchlorate was likely to be found in the demonstration area, extensive soil analysis did not result in perchlorate detection. Next, with the supplemental funding approved by NFESC and JPL, ARCADIS installed one borehole in the former Pit No. 30 area in an effort to</p>

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				<p><i>locate vadose zone perchlorate so as to support implementation of the portion of the work plan dealing with vadose zone perchlorate remediation. Again, vadose zone perchlorate was not detected in the former Pit No. 30 area. Therefore, the portions of the work plan addressing the remediation of vadose zone perchlorate were not implemented due to a general lack of conditions supportive of this portion of the planned demonstration."</i></p>

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Commenter: Judy C. Huang, P.E., U.S. Environmental Protection Agency, Region IX (Received August 16, 2013)

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General Comments			<p>Since 2007, two separate Interim Records of Decision (IROD) have been implemented for onsite groundwater (OU-1) and offsite groundwater (OU-3); the selected remedy for OU-1 is air stripping/liquid-phase granular activated carbon (LGAC) for volatile organic compounds (VOCs) and fluidized bed bioreactor (FBR) for treating perchlorates; the selected remedy for OU-3 is air stripping/LGAC for VOCs and ion exchange treatment for perchlorate. While both treatment systems are deemed to be operating successfully, pursuant to their originally intended purpose, by not defining the groundwater plume boundary there is insufficient data in the Draft Focused Feasibility Study for OU1 and OU3 National Aeronautics and Space Administration, Jet Propulsion Laboratory (NASA JPL), Pasadena, California (draft Focused FS) to determine the time it will take to achieve the Remedial Action Objectives and demonstrate that continued operation of the two treatment systems will achieve long-term protectiveness as a final remedy.</p> <p>EPA understands that due to past groundwater pumping and recharging activities, locations of existing groundwater monitoring wells, and the high costs associated with locating and installing new groundwater monitoring wells, it is difficult for NASA JPL to definitely determine the edge of the contaminated plume. However, it should be possible using existing groundwater monitoring wells to conservatively estimate the edge of the contaminated plume in order</p>	<p>A new figure has been included in Section 3.3 to depict the downgradient boundary of OU-3 above the remediation goals. See also response to Comment No. 1 below.</p> <p>The first paragraph in Section 5.2, Long-Term Effectiveness and Permanence sub-section, has been modified as follows: “Overall, there has been a general decreasing trend in perchlorate and VOC concentrations in the extracted groundwater over the duration of system operation for the source area treatment system at OU1. Based on the current data trends in the treatment plant influent and source area groundwater monitoring wells, it is estimated that it may take another 10 to 15 years to achieve RGs within the OU1 source area. Limited data are available at this time to evaluate long-term trends for the LAWC treatment system and MHTS at OU3, although chemical concentrations are anticipated to decrease as OU1 source area is remediated. Based on removal of three pore volumes of groundwater within the boundary of the JPL chemical plume, it is estimated that it may take another 15 to 20 years to achieve RGs in JPL groundwater (OU3).”</p>

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			to calculate cost and time required to achieve Remedial Action Objectives. Please provide this information and revise the draft Focused FS.	
1	5	Section 2.1	The boundary for OU-3 is not specifically defined and justified. While the upper boundary for OU-3 appears to be at the JPL boundary, the downgradient extent and cross gradient boundaries are not shown. For example, Figure 2-5 depicts the perchlorate plume (reported as at 3.4 micrograms per liter, ug/L) extends to monitoring well MW-20, whereas the carbon tetrachloride (CTC) and trichloroethene (TCE) plumes (0.5 ug/L and 2 ug/L, respectively) only extend to LAWC#5; it is also noted that the TCE plume appears to extend slightly southwest of the CTC plume. Given that JPL acknowledges perchlorate, CTC, and TCE are sourced from the JPL facility, please depict the downgradient boundary of OU-3 that will be addressed in the combined ROD and the wells that monitor this boundary.	<p>A new figure has been included in Section 3.3 to depict the downgradient boundary of OU-3 above the remediation goals.</p> <p>In addition, the last paragraph of Section 2.3.2 has been modified as follows: “The Sunset Reservoir wells were discussed at the April 30, 2013 RPM meeting (NASA, 2013b). Additional meetings and technical discussions were conducted by PWP, U.S. EPA, DTSC, and RWQCB representatives regarding perchlorate in the Sunset Reservoir wells. U.S. EPA issued a letter on November 19, 2013 to Ms. Phyllis Currie, PWP General Manager (U.S. EPA, 2013), which stated that U.S. EPA, DTSC, and RWQCB agreed that based on currently available information, the Sunset Reservoir well area is not part of the NASA JPL CERCLA site. The path forward for the Sunset Reservoir wells consists of continued monitoring of groundwater between the JPL site and the Sunset Reservoir wells. Data from this monitoring will be evaluated, at a minimum, as part of the CERCLA Five-Year Reviews for JPL.”</p>
2	20	Section 2.4.1	The second paragraph states that concentration in the OU1 area have decreased significantly to “approximately 45 ug/L in 2013,” but the text does not list what chemical has achieved this concentration and at which monitoring well; examination of Figure 2.5 suggest perchlorate may be the chemical in this	<p>MW-4 is outside the capture zone of the Source Area Treatment System. Section 2.4.1 has been modified as follows: “Since system startup in early 2005, the OU1 treatment system has successfully treated more than 2,600 acre feet of groundwater, removing approximately 1,700</p>

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			example. This figure also shows that monitoring well 4 (MW-4) at the JPL facility boundary had a concentration of 220.0 ug/L in February 2013. The text also does not state the perchlorate concentrations that are currently attained in the effluent from the FBR. Please revise the text to more accurately describe the perchlorate concentration within OU1, particularly at the JPL boundary.	pounds of perchlorate and 40 pounds of VOCs. Influent perchlorate concentrations at the OU1 system have decreased significantly, from approximately 2,300 µg/L in February 2005 to approximately 45 µg/L in February 2013 (see Figure 2-8). Concentrations of perchlorate and VOCs at the effluent of the OU1 system (i.e., treated water) are consistently non-detect. In addition, operation of the source area treatment system appears to have resulted in a significant reduction of chemicals of concern in wells MW-7, MW-16 and MW-24, which are located within the treatment zone (NASA, 2013c). Semi-annual progress reports are prepared as part of the JPL CERCLA program to document system operations and performance.”
3	20-21	Section 3.2	The text states that the “treatment of the source area [OU-1] has been targeted to prevent migration of dissolved chemicals to OU3 at concentrations that would negatively impact drinking water production,” and specific targeted concentration goal in the OU-1 Interim ROD is only listed as asymptotic behavior, but the historical decreases in influent and effluent concentrations are not shown in the Draft Focused FS. Please provide the historical data that demonstrates the effectiveness of the OU-1 treatment system and the extent to which asymptotic behavior has been achieved.	A new figure (Figure 2-8) showing the influent concentrations of perchlorate over time at the source area treatment system has been included in Section 2.4.1. Also, please see response to U.S. EPA Comment No. 2.
4	22	Section 3.3	Please change the title of this section to Remediation Goals. The word “preliminary” is inaccurate.	The title of Section 3.3 has been changed as requested.
5	22	Section 3.3	The discussion of Preliminary Remediation Goals (PRGs) does not include the chemicals 1,2,3-trichloropropane (123TCP) and 1,4-dioxane. The 2007 IROD for OU3 states that NASA and the City of Pasadena were working	Samples are collected and analyzed for 1,2,3-TCP and 1,4-dioxane by PWP and LAWAC to comply with CDPH permit requirements. Section 2.4.2 has been revised as follows:

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			with the State (DHS, Department of Health Services at the time) to ensure that 123TCP and 1,4-dioxane would be treated in the centralized treatment system for OU-3; however the effectiveness in treating these contaminants is not demonstrated in this draft ROD. Table 5-6 (page 20) of the IROD indicates that 123TCP was measured at 0.071 ug/L in MW-18 compared to its Notification Level of 0.005 ug/L. The chemical 1,4-dioxane was measured at 1.9 ug/L at the same well, and is compared to a Notification Level of 3 ug/L; however, as of 2010 the current EPA Regional Screening Level (RSL) for tap water is 0.67 ug/L. It should also be recognized that neither ion exchange nor LGAC is expected to treat 1,4-dioxane. Because 123TCP exceeded the current RSL, please discuss the most recent monitoring results and treatment effectiveness for these two chemicals, if present, and whether they should be added as chemicals of concern with the attendant PRGs.	“During the design and permitting of the MHTS and LAWC system, there was some concern that low levels of 1,2,3-trichloropropane and 1,4-dioxane may be present in the raw water due to detections in MW-18 (Screen 4). As part of the drinking water permits for the two systems, periodic monitoring of the raw water for these compounds is required by CDPH. To date, all samples collected at Arroyo Well, Well 52, Ventura Well, LAWC#3, and LAWC#5 have been non-detect for 1,2,3-trichloropropane (i.e., <0.005 µg/L) and 1,4-dioxane (i.e., <1 µg/L). Windsor Well has not yet been used during system operation due to elevated nitrate levels, so samples have not been collected. Periodic monitoring will continue as part of system operations.”
6	23	Section 3.4.1	Chemical Specific ARARs, Federal Safe Drinking Water Act (SDWA) and Federal MCLs. Please revise the last sentence to: “Therefore, MCLs are potential chemical-specific federal ARARs for the final groundwater remedial action at OU1 and OU3.”	The sentence has been revised as requested.
7	26	Section 3.4.3	Action Specific ARARs, RCRA Land Disposal Restrictions. Please delete the last two sentences starting with “If no promulgated drinking water standards exist, then relevant...” They are unnecessary and confusing.	The sentences have been deleted as requested.
8	29	Section 4.1	It is unnecessary to evaluate no action as a technology in the technology identification and screening section.	Section 4.1 has been removed as requested.

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			Please delete.	
9	29-30	Section 4.2	<p>The EPA does not agree with the implications in this section that adjudicated water rights are functionally similar to institutional controls (ICs) for providing groundwater protectiveness at the JPL site. The third sentence states, “The adjudicated water rights act to restrict groundwater extraction of, and therefore exposure to, groundwater in OU1,” but adjudicated water rights address volumes of water that are extracted and do not consider water contamination so human exposure concerns are not explicitly addressed; also, <i>de minimis</i> water users may not be subject to water adjudication. While the California Department of Public Health (CDPH) does require permits for drinking water treatment systems such regulatory control is separate from adjudicated water rights actions.</p> <p>The subsequent paragraph states that, “Other ICs that may be implemented as part of groundwater remedies...,” but does not describe how such restrictions will be enforced to prevent human exposure to contaminated water. Please evaluate the cited adjudication regarding <i>de minimus users</i> and prepare an enforceable strategy to prevent all potential water users from exposure to contaminated water from the JPL facility.</p>	<p>Section 4.2 has been modified as follows: “Both OU1 and OU3 at the JPL site are located within the Raymond Basin, which is subject to adjudicated water rights. The adjudicated water rights act to restrict groundwater extraction in accordance with the safe yield determined by the Raymond Basin Adjudication. All extractions from the Basin are tracked, monitored, and reported as part of the adjudication, and installation of new wells must be coordinated with the Raymond Basin Management Board. So while adjudicated water rights are not directly associated with the JPL CERCLA site, it is noted that this control is currently in place, and as such, restricts groundwater extraction and use within the Raymond Basin...”</p> <p>“ICs that could be implemented specifically as part of groundwater remedies discussed in this focused FS include Memoranda of Agreement (MOAs), or other agreements, with the Raymond Basin Management Board and/or CDPH. These agreements could include commitments that require these agencies to notify NASA of any proposed new extraction wells in the Monk Hill Subarea, and that NASA, in coordination with the agencies, evaluate the impact of any proposed extraction wells within/near the capture zones on the implemented remedies at OU1 and OU3. In addition, NASA could conduct annual reviews of new well permits in the Monk Hill subarea as an additional control to evaluate and prevent potential exposure to site-related chemicals.”</p>

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10	32	Section 4.4.1	This section focuses on groundwater extraction as a method of hydraulic containment. Groundwater extraction is also a prerequisite to any ex situ treatment. Please expand the discussion to include ex situ treatment.	Section 4.4, 4.5, and 4.6 have been combined into a single section called <i>Groundwater Extraction and Ex-Situ Treatment</i> .
11	39-41	Section 5.2	This section combines the onsite and offsite remedies under a single alternative, and indicates that more stringent ICs would be developed to address concerns as discussed in the above comment. This alternative also suggests that components of the remedy could be modified with the ROD as part of this effort. Please evaluate if the Raymond Basin Water Board and the CDPH maintain records of well installation application/permits that are either allowed or rejected, and if the record maintenance system can alert JPL immediately when such applications are filed so that JPL may immediately initiate actions as necessary to maintain the ICs.	<p>NASA had a very informative conference call with RBMB on September 9, 2013 regarding permitting records and notification. As it turns out, RBMB has been considering implementation of a permitting process for all new municipal and private wells within the Raymond Basin, similar to a permitting process that is already in place for the Main San Gabriel Basin. The new Raymond Basin permitting process would be integrated with processes currently in place at CDPH, Los Angeles County, and Department of Water Resources. NASA and EPA could be notified of any application for a new well (municipal or private) within the Monk Hill Subarea, as a documented component of the permit process. RBMB is working up a draft policy/process for NASA and EPA to review. RBMB believes a formal permitting process can be approved in 2014.</p> <p>Section 5.2 has been modified as follows: “...ICs could consist of MOAs or other agreements with the Raymond Basin Management Board and/or CDPH requiring these agencies to notify NASA of any proposed new extraction wells in the Monk Hill Subarea, and that NASA, in coordination with the agencies, evaluate the impact of any proposed extraction wells within/near the capture zones on the implemented remedies at OU1 and OU3. In addition, NASA could conduct annual reviews of new well permits in the Monk Hill subarea as</p>

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				an additional control to evaluate and prevent potential exposure to site-related chemicals.”
12	40	Section 5.2	Third paragraph: This paragraph discusses existing groundwater monitoring program. In addition to monitoring the existing NASA JPL monitoring wells as stated, NASA also funds perchlorate monitoring at adjacent water districts. Please include a discussion of NASA JPL’s monitoring efforts with local water districts.	Section 5.2 has been updated to mention monitoring efforts at RCLWA wells.
13	42-43	Section 5.2	Reduction in Toxicity, Mobility, or Volume through Treatment. This paragraph stated that “The FBR, which treats perchlorate from source area groundwater at OU1, meets the U.S. EPA preference for reduction in toxicity and volume by degrading the perchlorate through biological treatment. At OU3, perchlorate is not permanently degraded, but rather mobility of the chemical is reduced...” Please revise the paragraph to include the volume of perchlorate reduced in OU1. In addition, it is unclear from this paragraph if the volume of perchlorate in OU3 and volumes of VOCs and perchlorate at OU1 and OU3 are also reduced. Please clarify	Section 5.2 has been modified to indicate that the volume of perchlorate- and VOC-impacted media is greatly reduced by the FBR and ion exchange treatment technologies by destroying or transferring the chemicals to other media (i.e., LGAC and ion exchange resin).
14	48	Section 7	The references cited to support this draft Focused FS are appropriate, but can be difficult to locate in the on-line Administrative Record (AR). Please list the AR document number for each cited document to facilitate access to the document on-line.	The AR document numbers have been added to the references provided in Section 7.

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Commenter: Anthony C. Zampello, Raymond Basin Management Board (Received August 16, 2013)

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		General Comment	<p>The California Department of Public Health (CDPH) requires water purveyors to implement specific precautions when considering treatment of extremely impaired water for potable purposes. CDPH created "Policy 97-005 Guidance for Direct Use of Extremely Impaired Sources." Based on CDPH Policy No. 7-005, "...high quality drinking water should not be allowed to be degraded by the planned addition of contaminants. In other words, the MCLs should not be used to condone contamination up to those levels where the addition of those contaminants can be reasonably avoided." Based on past experiences, CDPH requires treatment facilities to treat contaminants in water to "non-detectable levels" and <u>not</u> to the MCLs. Consequently, all existing and planned treatment facilities should remove all contaminants to non-detectable levels and not at the MCLs.</p>	<p>NASA has worked closely with CDPH to investigate and prepare final documentation associated with Policy No. 97-005, as it applies to the Monk Hill Subarea (Battelle, 2010). In addition, NASA worked closely with CDPH, LAWC, and PWP to obtain drinking water permits for the LAWC system and the MHTS. The OU3 treatment systems have and will continue to be operated in accordance with CDPH permitting requirements. In addition, NASA has established Remediation Goals in accordance with all applicable laws and regulations.</p>
		General Comment	<p>In addition, the RBMB is concerned whether the remedies are operating "effectively" to contain the contamination. Water quality data indicates perchlorate and VOC contamination may have reached the downgradient wells. The Draft Focused FS should further investigate the source of contamination at the downgradient wells and establish appropriate remediation.</p>	<p>Please see response to comment No. 1 from the U.S. EPA. The extent of chemicals originating from JPL have been better delineated in the revised Focused FS.</p>
		General Comment	<p>Finally, the RBMB understood that JPL was planning to install additional site-specific extraction well(s) for this remedy. However, these new, additional extraction wells are not discussed in this draft FS.</p>	<p>The additional wells (i.e., optimization) and the selection of the Final Remedy are separate and independent processes. If for some reason, the optimization does not happen, NASA would continue to pursue a Final Remedy for groundwater. A Final</p>

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				Remedy for groundwater is required under CERCLA because currently we only have two Interim Remedies. The current LAWC system and the MHTS are operating effectively and are fully protective of human health and the environment. NASA is pursuing the enhancements voluntarily, in an effort to reduce the cleanup timeframe and optimize the systems.
1	1	Section 1.0	The Draft Focused FS should provide clarification or reference to the fact that even though there are three separate operable units, there is no physical barrier between the three.	The second paragraph has been modified as follows: "...For CERCLA purposes, the JPL site has been divided into three operable units (OUs). The three OUs are spatially distinct areas, but are connected in terms of transport of chemicals originating from JPL."
2	3	Section 1.1	The RBMB is concerned whether the remedies are operating "effectively" to contain the contamination. Water quality data indicates perchlorate and VOC contamination may have reached the downgradient wells. The Draft Focused FS should further investigate the source of contamination at the downgradient wells and establish appropriate remediation.	Please see response to comment No. 1 from the U.S. EPA. The extent of chemicals originating from JPL have been better delineated in the revised Focused FS.
3	14	Section 2.3.2	The U.S. EPA Superfund law imposes liability on parties for, in whole or in part, the presence of hazardous substances at a site (joint and severable liability). Any one potentially responsible party (PRP) may be held liable for the entire cleanup of the site (when the harm caused by multiple parties cannot be separated). A PRP cannot simply say that it was not negligent or that it was operating according to industry standards. If a PRP is responsible for some amount of hazardous waste found at the site, under EPA CERCLA that party is liable.	This comment was provided in reference to the discussion on perchlorate detected in the Sunset Reservoir Wells, located approximately 3 to 4 miles downgradient of the JPL Site. In 2005, NASA conducted an additional investigation to determine if the occurrence of perchlorate in the Sunset Reservoir wells was associated with chemical migration from the JPL facility. Upon completion of the investigation and subsequent technical interactions with PWP and the regulators, NASA concluded that (1) the chemicals from the JPL facility are captured within the Monk Hill Subarea, and (2) the perchlorate detected at the Sunset

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				<p>Reservoir wells is of a different origin than that used at, and originating from, JPL (NASA, 2007d; 2008).</p> <p>In 2012, PWP prepared additional technical memoranda concerning perchlorate in the Sunset Reservoir wells. NASA thoroughly evaluated these memoranda and again concluded (1) the chemicals from the JPL facility are captured within the Monk Hill Subarea, and (2) the perchlorate detected at the Sunset Reservoir wells is of a different origin than that used at, and originating from, JPL (NASA, 2012b).</p> <p>The Sunset Reservoir wells were discussed at the April 30, 2013 RPM meeting (NASA, 2013b). Additional meetings and technical discussions were conducted by PWP, U.S. EPA, DTSC, and RWQCB representatives regarding perchlorate in the Sunset Reservoir wells. U.S. EPA issued a letter on November 19, 2013 to Ms. Phyllis Currie, PWP General Manager (U.S. EPA, 2013), which stated that U.S. EPA, DTSC, and RWQCB agreed that based on currently available information, the Sunset Reservoir well area is not part of the NASA JPL CERCLA site. The path forward for the Sunset Reservoir wells consists of continued monitoring of groundwater between the JPL site and the Sunset Reservoir wells. Data from this monitoring will be evaluated, at a minimum, as part of the CERCLA Five-Year Reviews for JPL.</p>
4	23, 25, 26	Sections 3.4.1, and 3.4.3	CDPH requires special precautions before using treated water and created Policy 97-005 Guidance for Direct Use of Extremely Impaired Sources. Based on CDPH Policy No. 97-005, "...high quality drinking water should	NASA has worked closely with CDPH to investigate and prepare final documentation associated with Policy No. 97-005, as it applies to the Monk Hill Subarea (Battelle, 2010). In addition, NASA worked closely with CDPH,

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			<p>not be allowed to be degraded by the planned addition of contaminants. In other words, the MCLs should not be used to condone contamination up to those levels where the addition of those contaminants can be reasonably avoided.” Based on past experience with CDPH, CDPH requires treatment facilities to treat contaminants in water to “non-detectable levels” and <u>not</u> to the MCLs. In addition, treating water to MCLs and reinjecting this water near or close to potable well supplies will cause those potable well supplies to pump the same contaminants, which may be detected at or above the MCL. CDPH may find cause to shutdown those potable well supplies and require treatment at those potable well supplies to non-detectable levels. It is critical the Draft Focused FS require all treated water to be treated to non-detectable levels prior to reinjection. The groundwater supply must be cleanup up to provide “unrestricted” potable use.</p>	<p>LAWC, and PWP to obtain drinking water permits for the LAWC system and the MHTS. The OU3 treatment systems have and will continue to be operated in accordance with CDPH permitting requirements. The OU1 treatment system has been and will continue to operate in accordance with approved plans. NASA has established Remediation Goals in accordance with all applicable laws and regulations.</p>
5	24	Section 3.4.2	<p>The Draft Focused FS should provide discussion on actions taken to ensure none of the treated groundwater from OU1 and OU3 is wasted, i.e., not beneficially used.</p>	<p>The following paragraphs have been added to Section 3.4.2 under Adjudicated Water Rights: “NASA has worked closely with RBMB, PWP, and LAWC to ensure that treated groundwater is used in the most beneficial manner. For the MHTS and LAWC system, treated groundwater is used for drinking water supply and quantities are reported to the RBMB in accordance with the adjudication. All wastewater generated by the OU3 systems is treated as required to meet surface water discharge requirements and discharged to the Arroyo Seco where it infiltrates back into the aquifer.</p> <p>While NASA is not a party to the adjudication, NASA has worked closely with the RBMB, designing/installing</p>

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				treatment equipment to minimize the amount of wastewater. In fact, since 2005 NASA has reinjected 99.9% (2,853 extracted and 2,850 ac-ft reinjected) of the treated groundwater, and the small quantity of wastewater that is generated is reported to the RBMB on a monthly basis.”
6	35	Section 4.7	RBMB disagrees with this concept for the Raymond Basin. As previously discussed under “General Comments,” CDPH requires special precautions before using treated water and created Policy 97-005 Guidance for Direct Use of Extremely Impaired Sources. Based on CDPH Policy No. 97-005, “...high quality drinking water should not be allowed to be degraded by the planned addition of contaminants. In other words, the MCLs should not be used to condone contamination up to those levels where the addition of those contaminants can be reasonably avoided.” Based on past experience with CDPH, CDPH requires treatment facilities to treat contaminants in water to “non-detectable levels” and <u>not</u> to the MCLs. Consequently, all treatment facilities should remove all contaminants to non-detectable levels and not at the MCLs prior to discussing the option of natural attenuation.	CDPH Policy No. 97-005 is not an ARAR. Even so, NASA will continue to work closely with CDPH, PWP, and LAWC to ensure compliance with approved drinking water permits. NASA has established Remediation Goals in accordance with all applicable laws and regulations.
7	39	Section 5.2	The RBMB is concerned whether the remedies are operating “effectively” to contain the contamination. Water quality data indicates perchlorate and VOC contamination may have reached the downgradient wells. The Draft Focused FS should further investigate the source of contamination at the downgradient wells and establish appropriate remediation. In addition, as previously discussed per CDPH Policy 97-005, the	Please see response to comment No. 1 from the U.S. EPA. The extent of chemicals originating from JPL have been better delineated in the revised Focused FS.

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			treatment facilities for OU1 and OU3 should treat all contaminants to non-detectable levels and not the MCLs.	
8	45	Section 6.0, 2 nd paragraph	The RBMB does not agree with this statement. There is no way of knowing the real health or ecological exposures and/or risks at this point.	The paragraph has been modified as follows: “Although there are no human health or ecological exposure pathways for chemicals in groundwater at OU1, Alternative 1 (No Action) would not address the chemicals known to be in groundwater at OU1, and these chemicals may adversely impact the downgradient area at OU3 in terms of life-cycle costs and time of operation.”
9	45	Section 6.0, 4 th paragraph	The RBMB is concerned whether the remedies are operating “effectively” to contain the contamination. Water quality data indicates perchlorate and VOC contamination may have reached the downgradient wells. The Draft Focused FS should further investigate the source of contamination at the downgradient wells and establish appropriate remediation.	Please see response to comment No. 1 from the U.S. EPA. The extent of chemicals originating from JPL have been better delineated in the revised Focused FS.

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Comments Received April 21, 2014 from Yarissa Martinez León

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1 -		General	NASA has presumptively evaluated pump and treat technology utilizing existing municipal supply wells with the addition of above ground treatment. The remedy was identified and implemented as an interim remedy for both OU1 and OU3. NASA JPL has demonstrated that the remedy can remove contaminants; however, the effectiveness of the remedy in containing and capturing the contaminants needs to be demonstrated as well. Capture and containment is a critical component of a pump and treat remedy which should be part of this Focused Feasibility Study (FFS). Therefore, we recommend the addition of the following Remedial Action Objective (RAO): "Prevent migration of VOCs and perchlorate beyond OU3". This RAO should be carried through the document and the remedial alternatives evaluation, to make sure that the proposed remedy adequately provides capture and containment of site contamination.	EPA's recommended RAO has been added to the Focused Feasibility Study (FS), and the remedial alternatives evaluation has been revised to address the additional RAO.
2 -		General	Furthermore, a lack of alternative or additional water rights in the event that the City of Pasadena or Lincoln Avenue Water Company (LAWC) are not able to continue pumping in a given year could compromise implementability of the remedy. In order to preserve the CERCLA remedy, a contingency should be evaluated which would facilitate reinjection of treated water in OU3 in the event that LAWC must cease pumping.	Both LAWC and PWP have base annual groundwater pumping rights under the Raymond Basin Adjudication, which are then added to by "spreading credits" from infiltration of rainwater in the Arroyo Seco. The existing wells and water rights have provided effective containment since at least the 1980s (i.e., since chemical data has been collected from production wells), and the chemical data are supported by groundwater modeling. Therefore, it is reasonable to assume that effective containment will continue. In addition, we believe that the new RAO (See response to Comment No. 1) addresses the concern

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				for lack of alternative or additional water rights. The JPL groundwater monitoring and performance monitoring program consists of quarterly monitoring of JPL monitoring wells; weekly monitoring of groundwater extracted from the OU-1, LAWG, and PWP treatment systems; and weekly monitoring of the Rubio Cañon Land and Water Association (RCL&W) wells. Collection of these data will continue as part of the Final Remedy and will be used to evaluate compliance with the RAOs. If it is determined that migration of VOCs and/or perchlorate beyond OU-3 is occurring, NASA would take action. In that event, we would want to consider a range of possible solutions, one of which could be reinjection. Accordingly, for the Focused FS, NASA believes it is better not to limit our solution to a single alternative.
3	26	Section 3.4.2	EPA understands the complications of remediating an adjudicated groundwater basin. NASA JPL must ensure that a selected remedy is implementable by either ensuring sufficient water rights exist to operate the selected remedy or propose a contingency of reinjection of treated groundwater.	Based on historical data, NASA believes that sufficient water rights exist to achieve the RAOs. Please see response to Comment No. 2 above.
4	34	Section 4.3.1	The previous comment applies here as well. Groundwater extraction may not be easily implementable as a result of current drought conditions and in the event that additional extraction wells are needed to capture the entire JPL plume.	Please see response to Comment No. 2 and No. 3 above.
5	37	Section 4.4	This is not an adequate evaluation of MNA. EPA has published numerous guidance documents which explain how MNA can be evaluated to determine if it can be considered as a remedy alternative. EPA recommends	The section has been deleted.

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			<p>either deleting this section or revising following EPA guidance. Relevant MNA guidance documents can be found at http://www.epa.gov/superfund/health/cnmedia/gwdocs/munit.htm</p>	
6	42	Section 5.2	<p>The third bullet referring to MNA should be modified. MNA has not been evaluated and should not be identified as a remedy component. The discussion on the groundwater monitoring program should mention whether the entire three dimensional extent of the contaminant plumes are monitored and constrained by existing monitoring wells. A performance monitoring program will be established post Record of Decision as a Remedial Design (RD) document.</p>	<p>The third bullet has been modified to remove reference to MNA.</p> <p>Section 5.2 has been modified as follows: “A groundwater monitoring program is currently in place and groundwater monitoring would continue until RAOs are achieved. The existing JPL monitoring well network is sufficient to monitor the three dimensional extent of the chemical plumes in OU1 and OU3. A total of 25 monitoring wells are currently sampled on either a quarterly or semi-annual basis (NASA, 2013a), including well MW-25 located downgradient of OU3 near the Sunset Reservoir wells. Fifteen of the 25 wells in the JPL groundwater monitoring network are multi-level wells that monitor up to five zones within the aquifer. Altogether, there are 82 discrete sampling locations. In addition, the JPL monitoring well network is supplemented by performance data from production wells in the Monk Hill Subarea. For example, NASA funds weekly monitoring for perchlorate at RCL&W#4 and RCL&W#7. The location and frequency of monitoring may change in the future with concurrence from the regulatory agencies based on changing site conditions over time. ”</p>

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Comments Received June 5, 2014 from Yarissa Martinez León

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1	22	3.1	Can you include a table of COCs per OU? This would help in the RAO #3. Contaminants of concern are: OU 1 - x, y & z; OU 3 - x, y & z.	NASA agrees that this section should more clearly identify the COCs. The following sentence has been added to the end of the section: "The chemicals of concern in OU1 and OU3 are carbon tetrachloride, TCE, and perchlorate."
2	23	3.2	If the COC table is included, just refer to it and to the figure where current OU 3 boundary is depicted. If not it can read as "Prevent migration of carbon tetrachloride, tce and perchlorate beyond current OU 3 boundaries (shown in Figure 3-1)	NASA agrees with the clarification to Remedial Action Objective (RAO) #3. The third RAO has been modified as follows: "Prevent further migration of carbon tetrachloride, TCE, and perchlorate beyond the current extent." In addition, the following sentence has been added to Section 3.2 following the RAOs: "The current extent of carbon tetrachloride, TCE, and perchlorate, and the boundary of OU3 are shown in Figure 3-1."
3	24	Figure 3-1	OU 3 Boundary?	NASA agrees to the clarification. The figure title has been changed from "Figure 3-1. Boundary of the Chemical Plume Originating from JPL Exceeding the RGs" to "Figure 3-1. Boundary of the Chemical Plume Originating from JPL Exceeding the RGs, which Defines the Boundary of OU3."
4	40	5.1	Mention that this alternative does not address the RAOs.	NASA agrees. The following sentence has been added to last paragraph of Section 5.1: "In addition, the No Action alternative would not meet the RAOs."
5	47	6.0	[Focused FS currently states, "Groundwater monitoring data demonstrate plume containment."] Except in the area of LAWC #5, where perchlorate has not been contained.	NASA agrees that the sentence should be clarified. The sentence has been modified as follows: "Groundwater monitoring data demonstrate that the plume is mostly contained by the MHTS and LAWC treatment system and that the chemicals originating from JPL have not migrated to the RCL&W Association production wells at levels exceeding the RGs."